Technical Manual

IND780batch
Terminal

METTLER TOLEDO

IND780batch Terminal

METTLER TOLEDO Service

Essential Services for Dependable Performance of Your IND780batch Terminal

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use of your new equipment according to this Manual and regular calibration and maintenance by our factory-trained service team ensures dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget. Further information is available at www.mt.com/service.

There are several important ways to ensure you maximize the performance of your investment:

1. **Register your product**: We invite you to register your product at www.mt.com/productregistration so we can contact you about enhancements, updates and important notifications concerning your product.
2. **Contact METTLER TOLEDO for service**: The value of a measurement is proportional to its accuracy – an out of specification scale can diminish quality, reduce profits and increase liability. Timely service from METTLER TOLEDO will ensure accuracy and optimize uptime and equipment life.
   a. **Installation, Configuration, Integration and Training**: Our service representatives are factory-trained, weighing equipment experts. We make certain that your weighing equipment is ready for production in a cost effective and timely fashion and that personnel are trained for success.
   b. **Initial Calibration Documentation**: The installation environment and application requirements are unique for every industrial scale so performance must be tested and certified. Our calibration services and certificates document accuracy to ensure production quality and provide a quality system record of performance.
   c. **Periodic Calibration Maintenance**: A Calibration Service Agreement provides on-going confidence in your weighing process and documentation of compliance with requirements. We offer a variety of service plans that are scheduled to meet your needs and designed to fit your budget.
   d. **GWP® Verification**: A risk-based approach for managing weighing equipment allows for control and improvement of the entire measuring process, which ensures reproducible product quality and minimizes process costs. GWP (Good Weighing Practice), the science-based standard for efficient life-cycle management of weighing equipment, gives clear answers about how to specify, calibrate and ensure accuracy of weighing equipment, independent of make or brand.

METTLER TOLEDO RESERVES THE RIGHT TO MAKE REFINEMENTS OR CHANGES WITHOUT NOTICE.

IMPORTANT NOTE

Due to changes in the database structure, older versions of BatchTool 780 are only compatible with older IND780batch firmware:

Firmware 7.1.xx or older, must use BatchTool 780 version 1.1.07

Firmware 7.2.xx or newer, must use BatchTool 780 version 1.2.xx

Firmware 7.3.xx or newer, must use BatchTool 780 version 1.3.xx

FCC Notice

This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her expense.

- Declaration of Conformity is available at http://glo.mt.com/global/en/home/search/compliance.html/compliance/.

Disposal of Electrical and Electronic Equipment

In conformance with the European Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

Contents

1 Introduction

1.1. Overview

Congratulations and thank you for purchasing the IND780batch terminal as your batch control solution. METTLER TOLEDO has long been an innovator in batch products, and IND780batch is the next step in advanced batch control solutions. Batch-780 is an advanced application package for the IND780 terminal, engineered exclusively for applications that require:

- Stand-alone operation without PLC connectivity
- A flexible user-defined sequence
- Simultaneous multi-scale batching
- Any combination of multi-material filling, manual formulation, blending and dosing
- Storage of multiple recipes
- Simple operational user security, track & trace, and reporting features.
- Conformity to the SP-88 batch standard.
- Ability to use flow meter Option Board to control flow meters or other pulse output devices as part of a batch recipe.

The IND780batch is the successor to the Lynxbatch Controller, offering extended features and capabilities to serve a wide array of applications.

This manual provides an overview of the IND780batch terminal, and instructions for setup, configuration, and operation.

IMPORTANT NOTE

Due to changes in the database structure older versions of BatchTool 780 are only compatible with older IND780batch firmware:

Firmware 7.1.xx or older must use BatchTool 780 version 1.1.07

Firmware 7.2.xx or newer must use BatchTool 780 version 1.2.xx

Firmware 7.3.xx or newer must use BatchTool 780 version 1.3.xx

Note: For all IND780 information not specifically batch-related, please refer to the **IND780 Installation Manual**, **User's Guide** and **Technical Manual**, provided on the documentation CD-ROM.

1.2. Terminology

The following product terms are used in this and other IND780batch documentation:

- **IND780** refers to the standard hardware terminal. You may be asked to reference the standard IND780 documentation if the subject matter applies directly.
- **Batch-780** refers to the Batch application (software and firmware) designed to function with the IND780 hardware terminal.
- **IND780batch** refers to the combination of the IND780 hardware terminal with the Batch-780 software and firmware application.
- **BatchTool 780** refers to the PC-based utility used to configure the elements of the batching system.

1.3. Batching

1.3.1. What is Batching?

As defined by the ISA SP-88 standard, batching is a process that leads to the production of finite quantities of material by subjecting quantities of input materials to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.

In more general terms, batching takes a fixed amount of raw input materials and performs some type of processing activity to make them into a new output material.

1.3.2. Recipes

The recipe is the set of information that uniquely identifies the production requirements for a specific product. It defines how much of each input material should be added and processed to make a new product.

For example, to make cookies the first requirement is a list of ingredients (materials) – for example:

- Water; Sugar; Flour; and Eggs

The next information required is the quantity of each material to add to the mixing bowl:

- Add 3 kg water; 0.5 kg sugar; 1.8 kg flour; and 0.2 kg eggs

Finally, it is necessary to specify the sequence in which materials are added to the mixing bowl, the actions to perform once the materials are in the bowl, and the processes to carry out after mixing is complete.

When this information is combined, it becomes a recipe.

1.4. IND780batch Features

As a professionally-engineered batch control solution, each IND780batch terminal is fully configurable, documented, supported and deployed globally. Depending on the options selected for the application, the batch terminal combines powerful feed control algorithms with best-practice material feed features, including:

- Spill Only feed algorithm
- Storage of 1,000 master recipes of up to 99 phase steps each
- Command states (status, error handling)
- Material feed states (status, error handling, overflow)
- Dump-to-Empty control algorithm
- Gain-in-Weight, Loss-in-Weight, Hand Add, and Discharge Material feed types
- Batch size adjustable per order by % of batch size, target value, or ingredient amount
- Optional advanced Q.iMPACT material feed control algorithm for enhanced material feed speed and accuracy (K1 or K2 predictive adaptive control algorithm)
- Batch can be Paused, Parked or Aborted
- Convert Batch utility eliminates waste by recalculating or repurposing an existing incomplete batch
- Multiple modes of operation – Manual, Semi-Automatic and Automatic
- Enhanced two-speed feed control
- Auto material jog capability – jog to tolerance, jog to target
- Power loss recovery
- Tolerance check
- Print capability for end of batch summary and custom print messages
- Pre-feed condition checks – stable scale, vessel overflow
- Post-feed check and report, for accurate and reliable data
- Flow alarm management
- Support up to 40/56 discrete I/O for flexibility in system design
- Drain time management
- Ability to interface with up to four scales or flow meters (maximum, 4 devices)
- Instrument zero shift management
- Instrument cross check maintenance
- Abnormal situation management
- Support for up to 999 material paths
- Reasonableness checking

1.5. BatchTool 780 Features

- Intuitive, tree-based structure for easy access to all configuration screens
- System components organized logically to correspond to system setup sequence

- Simple creation and editing functions for user, terminal, equipment, recipe and order setup, with tabbed basic and advanced options
- Read recipe and configuration data from IND780batch terminals; write configuration, recipe and order data to single or multiple IND780batch terminals, to assure consistent deployment of setup information
- Export and import all system configuration data via .csv file
- Read recipe from IND780batch terminals, and write recipe and order data to single or multiple IND780batch terminals, to assure consistent deployment of batching information
- User management – based on login credentials, security settings restrict access to certain features in the Tool
- Comprehensive set of reports, including batch history and order list, with statistical reports for equipment, materials and recipes
- Exportable audit trail, change and error logs provide Track & Trace functionality

1.6. Inspection and Contents Checklist

Verify the contents and inspect the package immediately upon delivery. If the shipping container is damaged, check for internal damage and file a freight claim with the carrier if necessary. If the container is not damaged, remove the IND780batch terminal from its protective package, noting how it was packed, and inspect each component for damage.

If shipping the terminal is required, it is best to use the original shipping container. The IND780 terminal must be packed correctly to ensure its safe transportation.

The package should include:

- IND780batch Terminal
- IND780 Documentation CD
- IND780batch Documentation CD
- Bag of parts including ferrites, grommets, etc., depending on terminal configuration

1.7. IND780batch Terminal

1.7.1. Versions

The IND780batch can be purchased in three versions:

- as a panel-mount IND780 terminal
- as a desk/wall-mount, IP69K harsh environment IND780 terminal
- as a packaged system which includes an IND780 terminal integrated with additional operator I/O and interface logic

All versions feature a color display. Figure 1-1 shows a harsh environment IND780batch.

Figure 1-1: IND780batch Terminal in Harsh Environment Enclosure

1.7.2. Creating an IND780batch Terminal

The intrinsic hardware security key feature found within every IND780 enables the Batch-780 application.

Figure 1-2: IND780 Hardware Key Socket on Mother Board

There are two ways to create an IND780batch terminal:

- The Batch-780 application can be purchased with a new IND780, installed, tested and labeled from the factory.
- The Batch-780 application hardware security key can be purchased separately as an upgrade to an existing IND780 terminal.

Both approaches produce the same result. There are no differences in exterior appearance between an IND780 and an IND780batch.

1.7.2.1. Determining the Terminal Type

The simplest way to determine the type of IND780 is to access its information recall screens. In the IND780batch terminal, press A4 to access the scale view.

1. From the scale view screen (Figure 1-3), press the INFORMATION RECALL softkey (typically in the second row of softkeys).

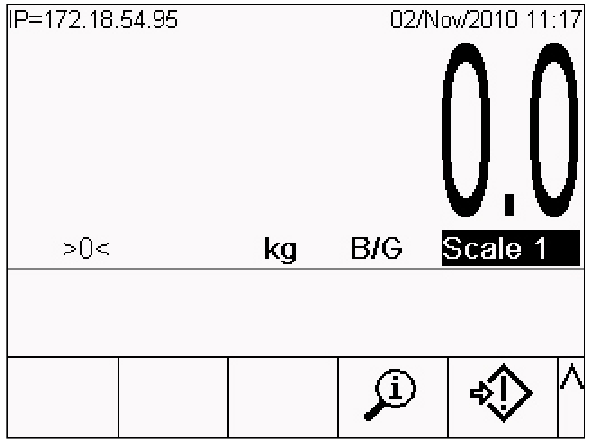


Figure 1-3: IND780 Home Screen Showing Information Recall Softkey

2. The information recall screen will display.

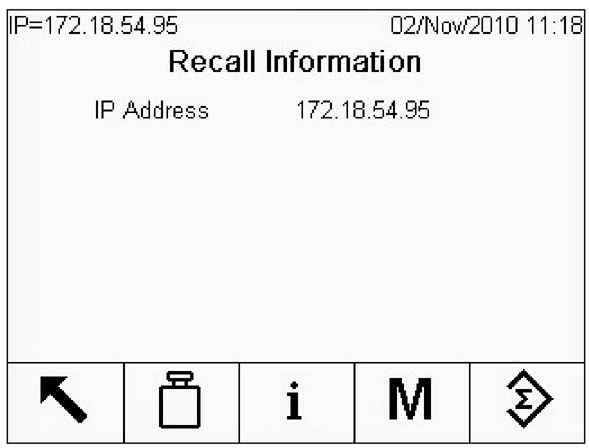


Figure 1-4: System Recall Information Screen

3. Press the INFORMATION softkey **i**.
4. Scroll down using the DOWN arrow key. In the ID column of the information screen, one of the following will appear, indicating that the terminal is a IND780batch:
    - 780Bat+xQi (where x indicates the number of PAC Licenses, 1 to 4)

1.7.2.2. Upgrade Note

When upgrading to Batch-780 from a standard IND780 terminal, check any installed option boards against the list of boards compatible with IND780batch, provided in the **Options** section on page 1-13. Once the IND780 is transformed into an IND780batch, only the option boards listed will be recognized by the Batch-780 application.

- Note: When upgrading a standard IND780 terminal with the Batch 780 application, confirm that a 2GB or larger Compact Flash (CF) card is installed in the terminal. To obtain the corrected 2GB CF card, order CIMF# 64056477 from METTLER TOLEDO.

Also, please refer to Figure 1-5 for the appropriate slot locations for option boards in an IND780batch terminal.

1.8. Model Identification

The IND780batch model number is located on the data plate on the back of the terminal along with the serial number. Refer to Figure 1-5 to verify the terminal that was ordered.

- A total of four scale or flow meter channels can be configured in any combination in the IND780batch terminal. Note that each flow meter board has two channels.

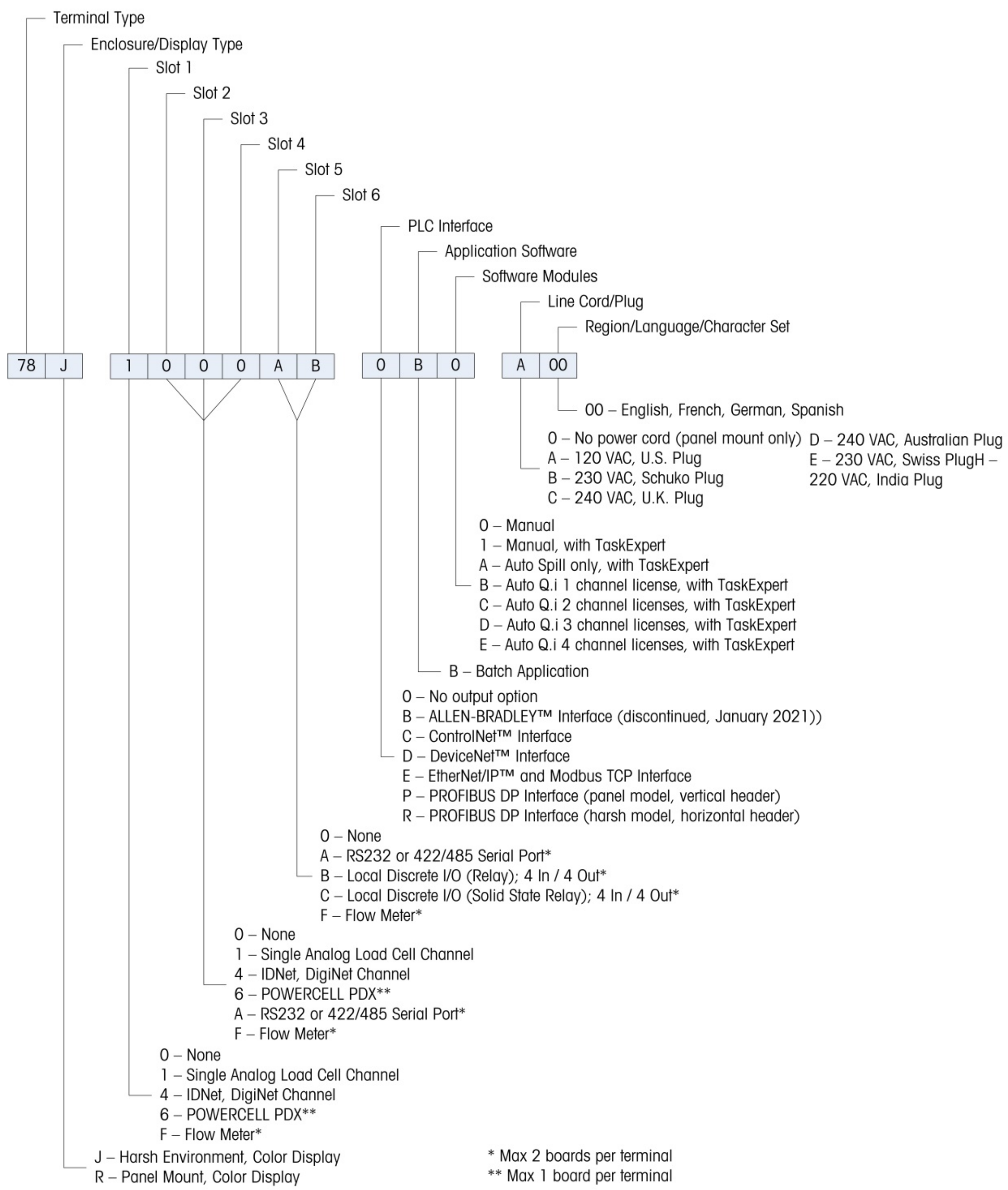


Figure 1-5: IND780batch Model Identification Numbers

1.9. IND780batch Terminal Specifications

1.9.1. Physical Dimensions

The physical dimensions of the panel mount, harsh environment and packaged IND780batch terminals are shown in Figure 1-6, Figure 1-7, Figure 1-8 and Figure 1-9. All measurements are given in inches and [mm].

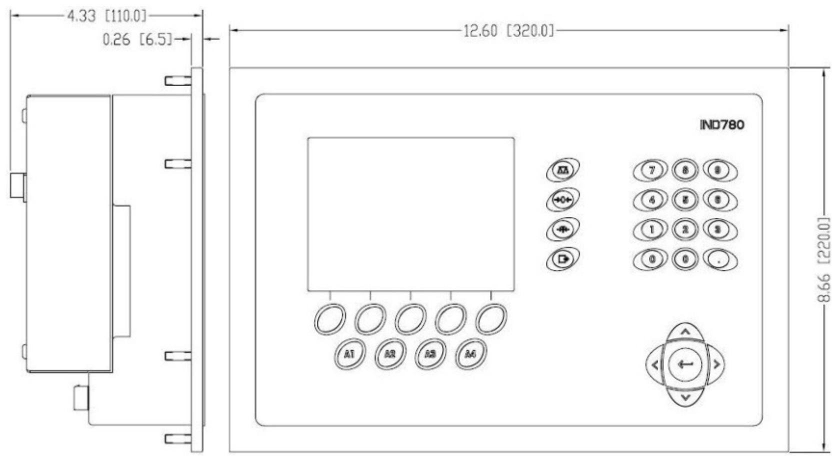


Figure 1-6: IND780batch Panel Mount Terminal Dimensions

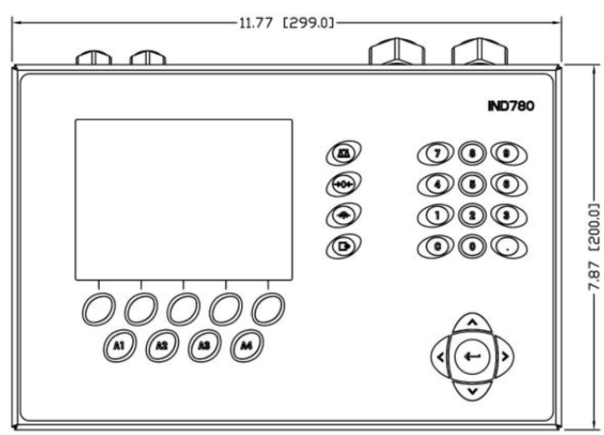


Figure 1-7: IND780batch Harsh Enclosure Terminal Dimensions, Front

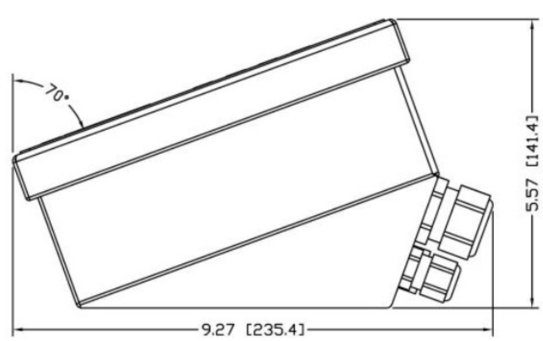


Figure 1-8: IND780batch Harsh Enclosure Terminal Dimensions, Side

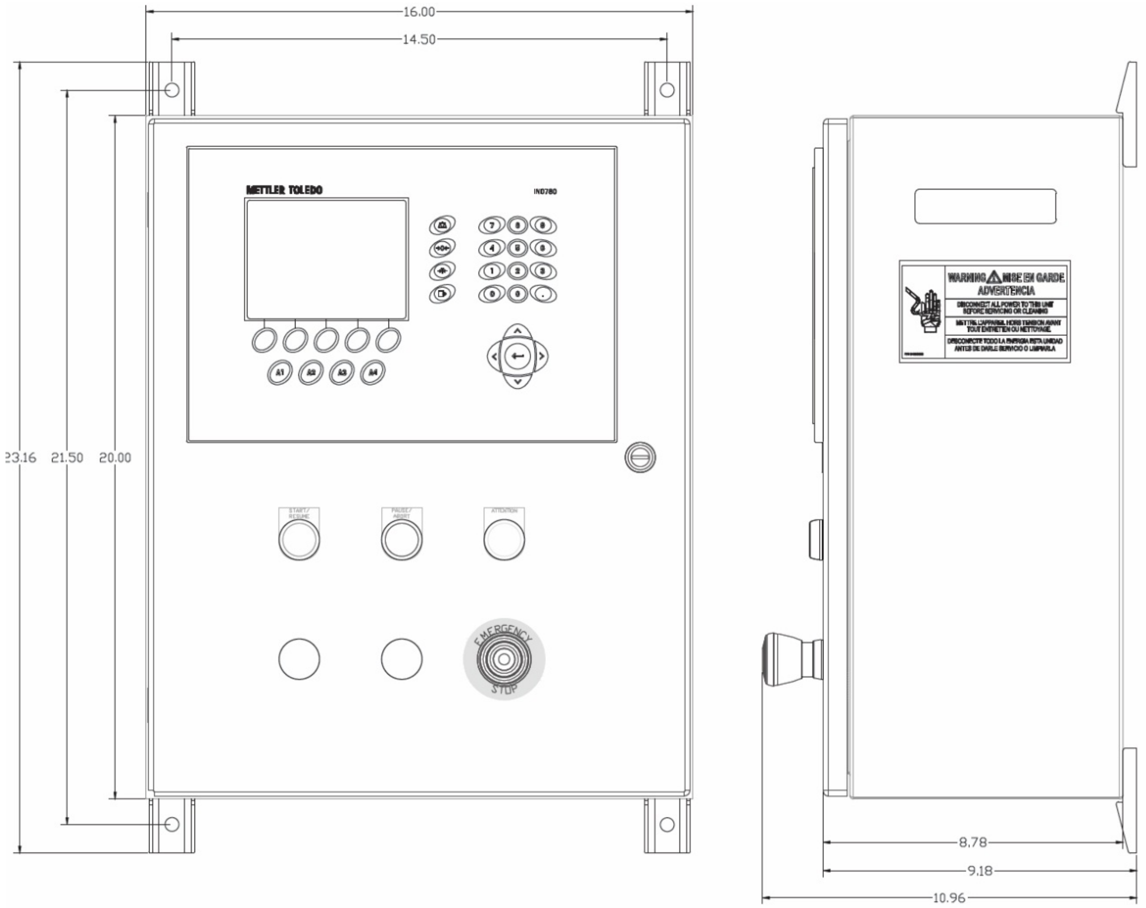


Figure 1-9: Packaged IND780batch Dimensions, Front and Side

1.9.2. Specification table

The IND780batch terminal conforms to the specifications listed in Table 1-1.

Table 1-1: IND780batch Specifications

IND780batch Specifications	
Enclosure Type	Panel Mount – stainless steel front panel
	Harsh environment desk/wall/column-mount – type 304 L stainless steel enclosure
Dimensions (l × w × d)	Panel Mount: 320 mm × 220 mm × 110 mm (12.6 in. × 8.7 in. × 4.3 in.)
	Harsh Environment: 299 mm × 200 mm × 141 mm (11.8 in. × 7.9 in. × 5.6 in.)
Shipping Weight	5 kg (11 lb)
Environmental Protection	Panel Mount front panel sealing provides Type 4x and Type 12 protection – comparable to IP65 rating
	Harsh Environment meets IP69K requirements

IND780batch Specifications	
Operating Environment	The terminal (both enclosure types) can be operated at temperatures ranging from -10° to 40° C (14° to 104°F) at 10% to 95% relative humidity non-condensing
Hazardous Areas	Not all versions of the IND780 can be operated in areas classified as Hazardous by the National Electrical Code (NEC) because of the combustible or explosive atmospheres in those areas. Contact an authorized METTLER TOLEDO representative for information about hazardous applications
Power	Operates at 100–240 VAC, 49–61 Hz, 400 mA (both enclosure types) Panel Mount version provides a terminal strip for AC power connections Harsh environment version includes a power cord configured for the country of use **Note**: When an IND780 is installed in an area classified as Division 2 or Zone 2/22, special AC wiring requirements must be met. See document 64063214, IND780 Division 2, Zone 2/22 Installation Guide
Display	320 x 240 pixel dot-matrix backlit graphic active, TFT color LCD with the capability of displaying weight in 34-mm high characters; alternate multiple channel display
Weight Display	Displayed resolution of 1,000,000 counts for analog load cell scales Display resolution for high-precision IDNet bases is determined by the specific base used
Number of Scales	Interface for up to four scale channels plus a sum scale
Flow Meters	Up to four flow meter channels, for a maximum of four devices (scales or flowmeters)
Keypad	30 keys; 1.22-mm thick polyester overlay (PET) with polycarbonate display lens
Communications	**Serial Interfaces** **Standard**: Two serial ports COM1 (RS-232) and COM2 (RS-232/RS-422/RS-485), 300 to 115,200 baud; Ethernet 10/100 Base-T **Protocol** **Serial Inputs**: ASCII characters, ASCII commands for CTPZ (Clear, Tare, Print, Zero), SICS (most level 0 and level 1 commands) **Serial Outputs**: Continuous or Demand with up to ten configurable print templates or SICS host protocol, report printing, interfaces with external ARM100 Input/Output modules, and DeviceNet Bridge

IND780batch Specifications		
Approvals	**Weights and Measures** USA: NTEP CoC # 06-017 Class II, 100,000d Class III, IIIL, 10,000d Canada: AM-5592 Class II 100,000d Class III 10,000d and Class IIIHD 20,000d Europe: TC6944 Class II, approved divisions determined by platform Class III, IIII, 10,000e	
	Hazardous Areas	
	UL	Class I,II,III; Div 2; GP C, D, F, G T4
	ATEX	Zone 2 - II 3 G Ex ic nA [ic] IIB T4 Gc Zone 22 - II 3 D Ex tc IIIC T85°C Dc -10°C ≤ T amb ≤ +40°C
	IECEx	Zone 2 - Ex ic nA [ic] IIB T4 Gc Zone 22 - Ex tc IIIC T85°C Dc -10°C ≤ T amb ≤ +40°C
	Certificate Numbers	
	UL – US/Canada **ATEX** **IECEx**	UL E152336 DEMKO 07ATEX0520819X IECEx UL 10.0014X

1.10. System Hardware

1.10.1. Main PCB

The IND780 terminal's main printed circuit board (PCB) includes provisions for the microprocessor, main memory, battery, application module key, Ethernet, USB and serial communications, and mounting of option boards.

The main board contains the COM1 and COM2 serial ports. COM1 provides RS-232 communication, while COM2 supports RS-232, RS-422, or RS-485 communication. These ports are bidirectional and can be configured for various functions such as demand output, SICS host communications, continuous output, ASCII command input (C, T, P, Z), ASCII character input, report printing, totals printing, or connection to a remote ARM100 module.

1.10.2. Scale Bases

The IND780batch supports Analog, IDNet, POWERCELL® PDX®and SICS bases.

1.10.2.1. Analog Load Cell Scale Base

The IND780batch supports this scale type through an analog load cell interface. The terminal can drive up to sixteen 350-ohm analog load cells, with up to eight 350-ohm load cells on one channel.

1.10.2.2. IDNet™ Scale Base

The IND780batch supports both the newer T-brick style of high-precision base and the older "PIK-brick" transducers, through the IDNet scale interface. For T-brick bases, the interface provides the +12 volts and communication required to operate this newer style of base. The port also provides +30 volts, to support PIK-brick high-precision bases. The base's cable determines which voltage is used.

1.10.2.3. POWERCELL® PDX® Scale Base

The IND780batch supports scales that use the POWERCELL PDX communications network found in large hopper / tank applications as well as vehicle scales that use PDX™ load cells. This interface also supports the use of the RAAD Box, which converts analog load cell signals into digital ones.

1.10.3. Options

The following additional options are available for the IND780. Only options compatible with the IND780batch terminal are listed here.

- 4 Scale or flow meter interfaces per IND780batch (Max. 4 per terminal)
- Predictive Adaptive Control (PAC) algorithms
- 2 Discrete I/O boards (Dry Contact or Solid State) (Max. 2 per terminal)
- 2 Serial Communication boards (RS-232/RS-422/RS-485) (Max. 2 per terminal)
- Mounting hardware – brackets for wall and column mounting of the harsh enclosure

The scale measurement channel, flow meter measurement channel, serial and discrete I/O options are connected to the IND780 through six internal option slots. Various combinations of options may be ordered to match the application solution requirements.

1.10.3.1. Flow Meter Interface Board

The Flow Meter Interface Board is a two-channel isolated Counter/Flow Meter board for use in the IND780batch terminal. It is intended to provide a flow-meter totalizer target comparison to directly control on-board discrete outputs. The module is capable of counting input pulses at up to 50 kHz on each of two isolated input channels, as well as measuring the frequency of the input signal. A jumper-selectable switching threshold for each input channel is available, as well as a jumper-selectable 15 kHz analog filter. The input level range for the AC mode is 50mV to 50Vrms. The input level range for DC mode is 2.5 volts to 42 volts.

The outputs are 7407 open-collector drivers. Each module provides 150 mA of 5V power to drive opto-22 or similar devices. A total of two flow meters may be connected to a single flow meter card. Each terminal can connect to as many as 4 flow meters.

1.10.3.2. Predictive Adaptive Control Algorithms

The powerful Predictive Adaptive Control (or PAC) Algorithms automatically compensate for natural process variations and adjust the material feed cutoff accordingly. Patented and exclusively available from METTLER TOLEDO, the PAC algorithms were developed to reduce material fill variation, increase throughput and lower capital equipment costs. The algorithms can be applied to scale equipment channel modules and flow meter equipment channel modules. The PAC Algorithms are enabled on the IND780batch terminal when you select the appropriate software module along with the Q.i application module.

1.10.3.3. Discrete I/O

The discrete I/O interface options include both internal and remote I/O.

The internal version is available with dry-contact relay or solid state relay outputs. Both types will switch up to 30 volts DC or AC and up to 1 amp of current. The inputs are switch-selectable as either active (for simple pushbutton control) or passive (for connection to PLCs or other devices that supply their own power for the I/O). Each internal board supports four inputs and four outputs.

The remote I/O is supported with the ARM100 remote module that provides dry-contact outputs. The inputs are passive on the ARM100. Each ARM100 supports four inputs and six outputs. An external 24-volt DC supply is required to operate the ARM100.

A total of two internal Discrete I/O boards (each providing 4 inputs and 4 outputs) are supported, with an additional 32 inputs and 48 outputs in up to eight remote I/O modules.

1.10.3.4. Serial Communications

Additional communications cards provide RS-232, RS-422 or RS-485 communication at rates from 300 to 115.2k baud. A maximum of two serial communications cards may be installed in the IND780.

1.10.3.5. Mounting Hardware

Please refer to Chapter 4, **Parts and Accessories**, of the **IND780 Technical Manual,** and the **IND780 Installation Manual**.

1.11. Optional Q.iMPACT® Material Transfer Control Strategy

- The Q.i option is available with software modules B, C, D and E.

1.11.1. Q.iMPACT Trial Period

Even if the IND780batch system is not configured with the K1/K2 Q.i feed algorithms enabled, the algorithms can be used for the first 500 material feeds. This makes it possible to compare material feeds using the standard "Spill Only" feed algorithm with feeds using Q.iMPACT.

If the Q.i feed algorithms show a significant improvement in the throughput and accuracy of the process, contact your METTLER TOLEDO representative to purchase a Hardware Security Key, to enable Q.i in the terminal permanently.

1.11.2. Overview

Before setting up and using the IND780batch terminal, it is important to understand:

- How the Q.i material transfer control strategy works
- The role Q.i plays in your process control operation
- When to apply the Q.i material transfer control strategy

1.11.2.1. Predictive Control Algorithms

At the heart of the Q.iMPACT application, patented predictive adaptive control algorithms (PACs) build a real-time mathematical model of the material transfer process for each material. These algorithms learn and compensate for process variations in each active material transfer – a function known as auto-tuning. The point in time at which the terminal will stop adding material is adjusted continuously during the transfer, as the terminal learns to predict how the delivery system will react. This allows the system to adapt to changes in the flow rate of the material while the transfer is in progress.

This produces a very high degree of accuracy in controlling material transfer, using only a single fast feed. Each material transfer is treated as a separate transaction, initiated when the Host system (normally a PLC or DCS) sends a target value to the IND780batch terminal for a particular scale or flow meter feed. The terminal then controls the addition of the material and, when the transfer is complete, sends the result to the Host system.

The result is a material transfer system that delivers optimal performance, by producing significant reductions in costly raw material over-feed, unacceptable under-feed and material feed time.

1.11.2.2. Material Feeds

A material feed is the most basic and most frequently used operation in a batch control system or filling operation. To complete a batch recipe, two or more material feed phases must occur. For a filling or packaging cycle, typically one feed phase occurs repeatedly.

The most challenging and critical part of any material feed occurs at the end of a phase, when the feed is cut off in accordance with a recipe, formulation or filling operation. Virtually all material feed inconsistencies result from inaccurate cut-off, making this a significant area for process improvement.

Normally, a number of material transfers must take place in order to create a batch. The exact order, sequence and quantity of each material transfer is determined by the "Recipe".

1.12. Examples of IND780batch Systems

Batch systems can be comprised of several different operational features. An automatic system may contain control valves, screw feeders, vibratory feeders, knife gates, clam-shell gates, belt feeders, rotary feeders and diverter valves, and can require the control of ancillary devices such as mixers, pumps, heaters and agitators. These devices require a certain amount of automation and control in the batching process, and in automatic mode the IND780batch can control each device using its configurable I/O.

Manual Batch systems can be quite simple in operation, involving the addition of ingredients by hand, but they can also include valves that are controlled manually by an operator. This section provides illustrations of an automatic system and a manual system, to show how the system can be configured in different ways, and to demonstrate the flexibility of the Batch-780 design.

1.12.1. Automatic Batching System

Figure 1-10 shows an automatic batching system, including a packaged IND780batch. This system exemplifies a batch system that uses a Material Transport Header to transfer each material into the vessel. It also displays the capability to have a 2-speed feed mechanism for each material (designated by Fast Feed and Fine Feed valves). This example shows that there is one hand-added material to consider, for a total of 6 material feeds (five automatic feeds plus 1 hand-add). There is also a mixer which must be turned on and off, and a Discharge valve to empty the vessel once the batch is complete.

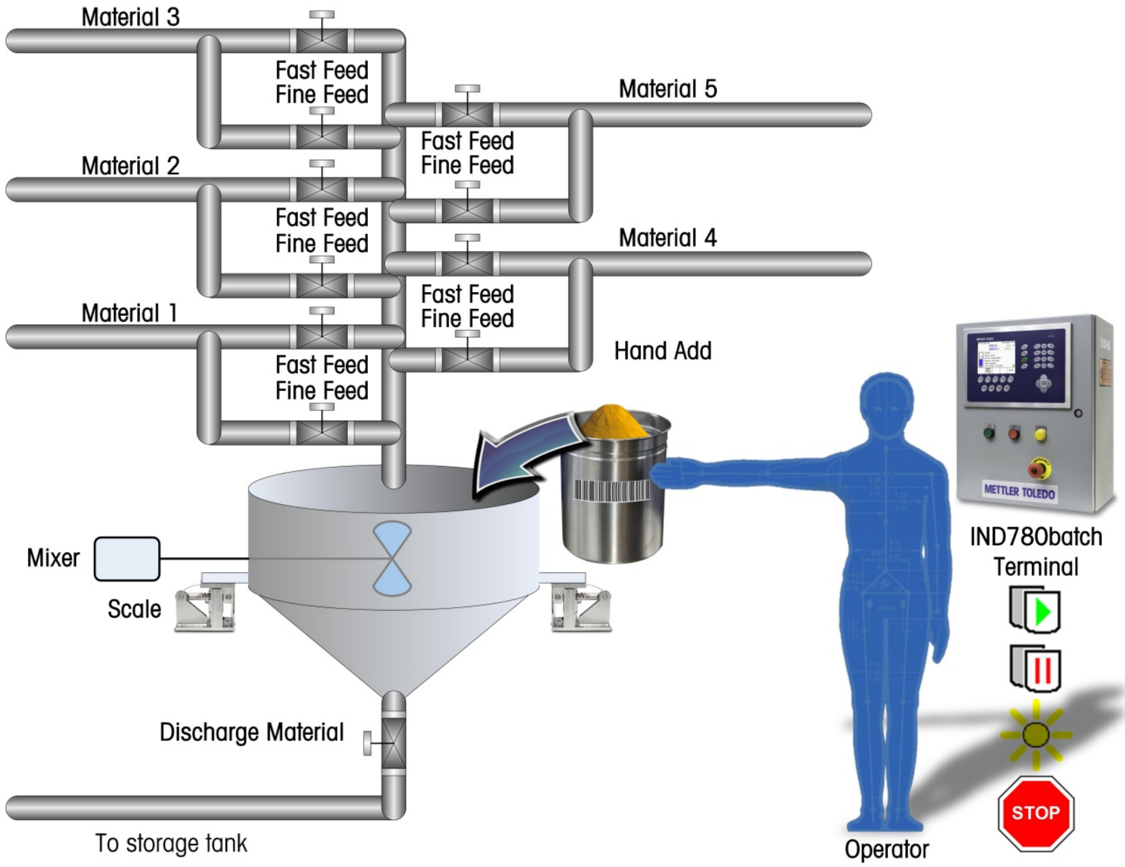


Figure 1-10: Automatic Batching System, Six Materials

1.12.2. Manual Batching System

Figure 1-11 shows an example of a manually-controlled batching system including an IND780batch, a bench scale with container, and a barcode scanner.

Figure 1-11: Manually Controlled Batching System

1.13. Communicating with the IND780batch Terminal

There are two ways to communicate with the IND780batch:

- Through the IND780 terminal control panel
- Using BatchTool 780, the PC-based configuration utility

Settings configured using the terminal interface are detailed in Chapter 3 of this manul, **Configuration**. The use of the PC Configuration Tool is detailed in the **BatchTool 780 PC Configuration Tool User's Guide**, included on the documentation CD-ROM.

1.13.1. Terminal Control Panel

Batch-780 parameters can be viewed, set up and modified from the IND780batch terminal's front panel. The setup menu tree is shown in Figure 1-12, with the **Batch-780** branch expanded.

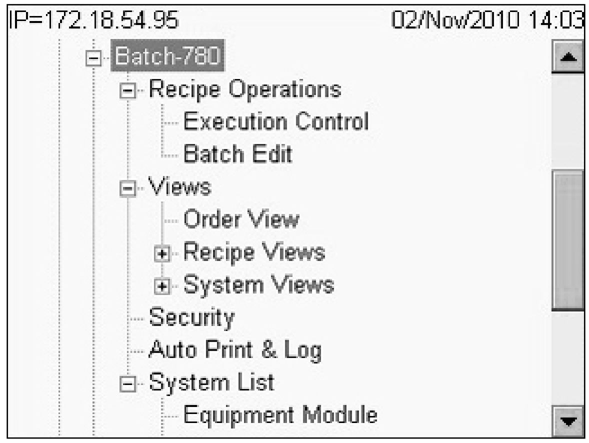


Figure 1-12: Setup Menu Tree, Batch-780 Configuration Branch Expanded

1.13.2. BatchTool 780 PC Configuration Tool

The BatchTool 780 configuration tool is a PC-based HMI utility developed exclusively for the IND780batch terminal. To use this utility:

- The tool must be loaded on your PC
- The PC must be equipped with a standard Ethernet connection
- The IP address of the IND780batch terminal must be known
- Refer to Section II of this document for details on using BatchTool 780.

Figure 1-13 shows an example of the BatchTool 780 interface, with the Order List displayed. The left pane contains a list of all Equipment Modules, Material Paths, Recipes and Orders configured for the current project.

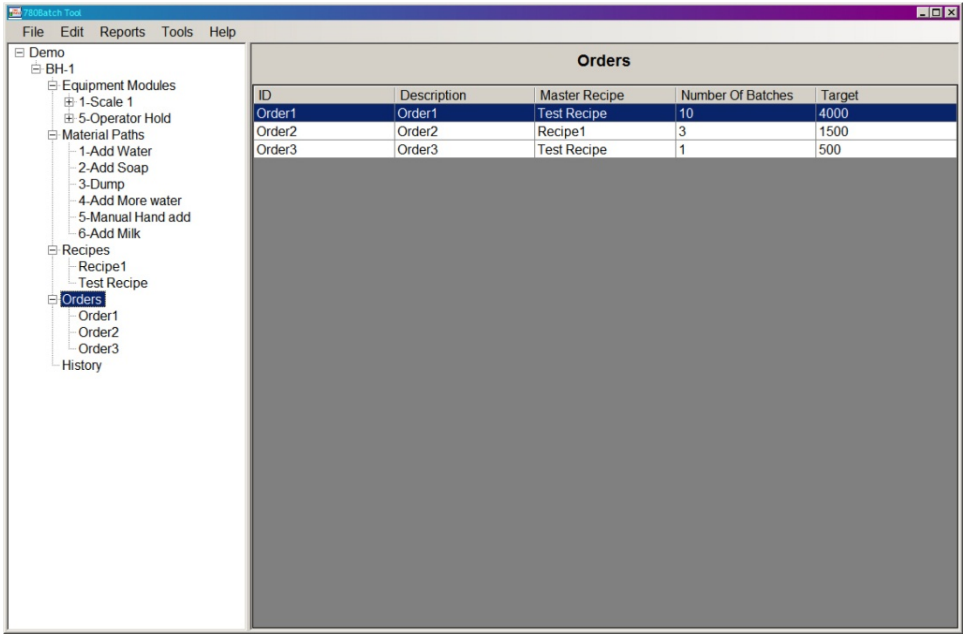


Figure 1-13: BatchTool 780 Interface, Orders Page

1.14. Optional PLC/DCS Interfaces

The IND780batch PLC interface options include:

- PROFIBUS® DP
- ControlNet™
- EtherNet/IP®
- A-B RIO (discontinued, January 2021)
- The PLC/DCS option board mounts in a dedicated socket on the IND780 main board, and does not occupy one of the system's four "option board" slots.

For detailed information on configuring these interfaces, please refer to the **IND780 Technical Manual** and the **IND780 PLC Interface Manual**, provided on the IND780 documentation CD.

1.14.1.1.1. PROFIBUS DP

The IND780batch Terminal communicates to a PROFIBUS-DP master according to DIN 19 245. The PROFIBUS option consists of a module, together with firmware that resides in the IND780 Terminal to implement the data exchange.

1.14.1.1.2. ControlNet and EtherNet/IP

The IND780batch supports ControlNet communications communications or EtherNet / IP interface options and the appropriate driver software.

1.14.1.1.3. Allen-Bradley RIO

- The Allen Bradley RIO interface was discontinued in January 2021. The AB-RIO information in this manual is provided to support legacy installations only.

The A-B RIO option enables data exchange by bi-directional communications using the Discrete Data Transfer or Block Transfer mode. The IND780 Terminal initiates a communication exchange with the PLC approximately 20 times per second utilizing the Allen-Bradley Discrete Data Transfer protocol. This communication is a high-speed, real-time message interface between the IND780 Terminal and the PLC for process control. Division, integer, and floating point values are supported.

The IND780 A-B RIO interface also supports Block Transfer mode for transmission of larger amounts of data. Additional details about this interface can be found in the **IND780 PLC Interface Manual** on the IND780 documentation CD.

1.15. Guide to Batch-780 Documentation

The following sections outline the general scope of different types of procedure necessary before and during operation of the batching system. The figures below refer to this **Manual**, to the **IND780 Technical Manual**, and to the IND780batch system **control drawing**.

1.15.1. Commissioning

Batch system commissioning involves a series of operations. The figures below show which reference materials are relevant to each operation.

1.15.1.1. General

Initial setup of the batching system relies largely upon the IND780 terminal documentation, as well as the Packaged Batch System control drawing.

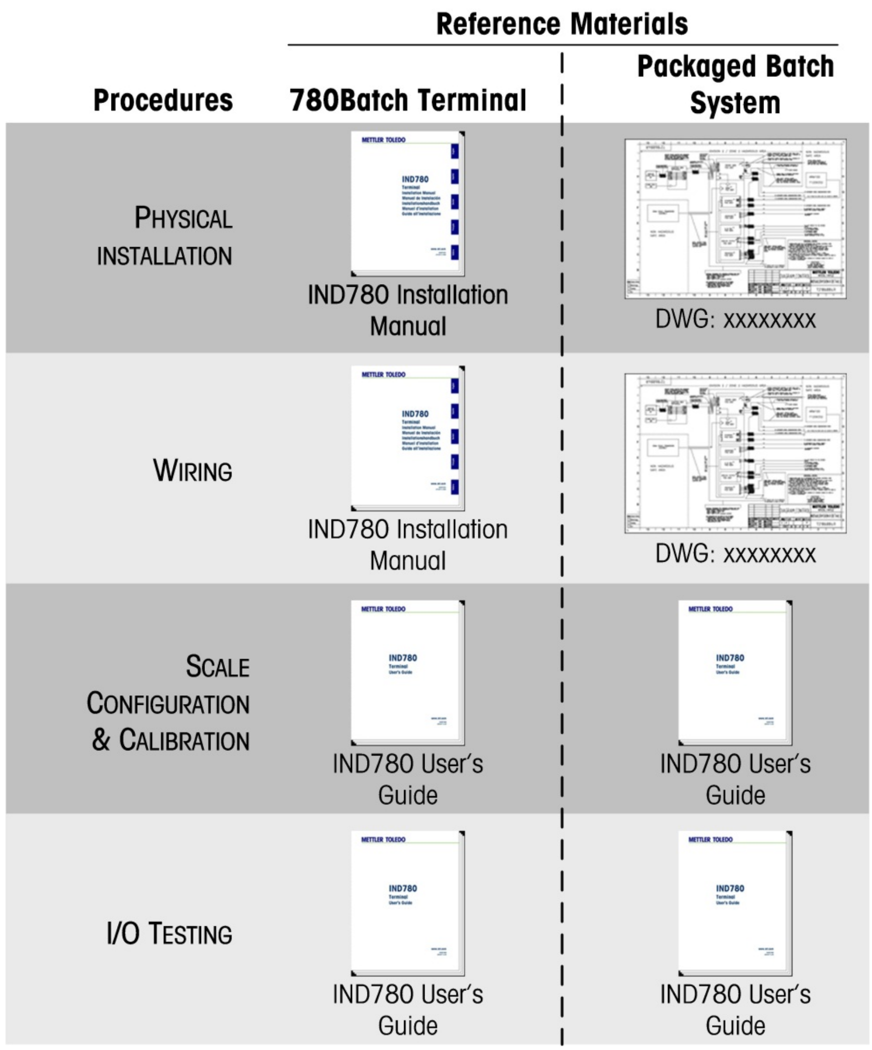


Figure 1-14: General Commissioning

- For PLC interface configuration, please refer to the IND780 Terminal PLC Interface Manual.

1.15.1.2. Batch System

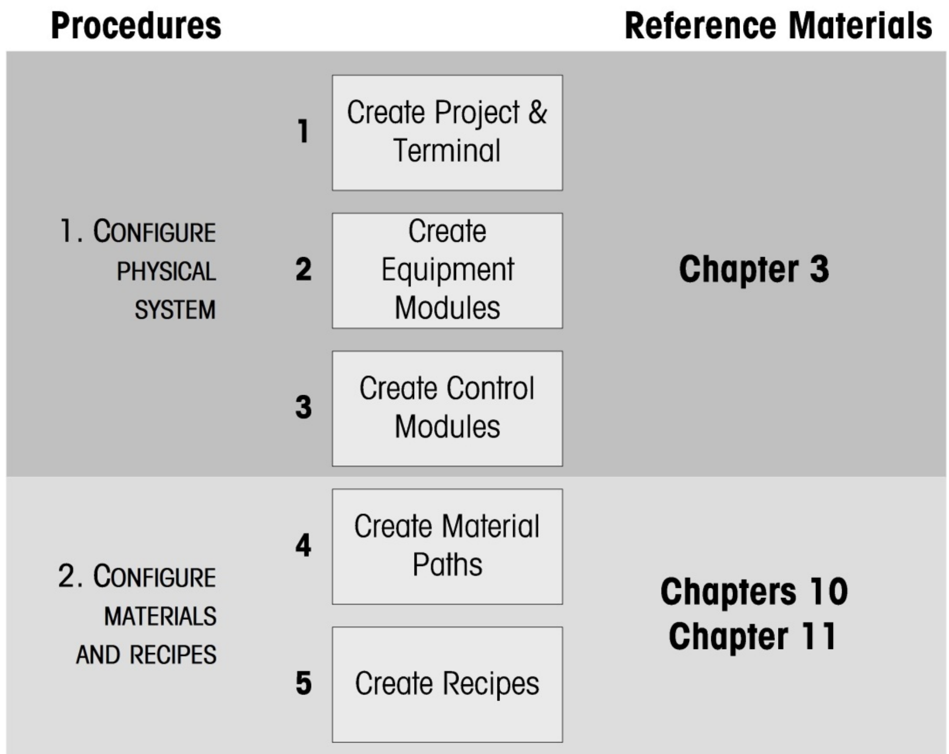


Figure 1-15: Batch System Commissioning, Part 1

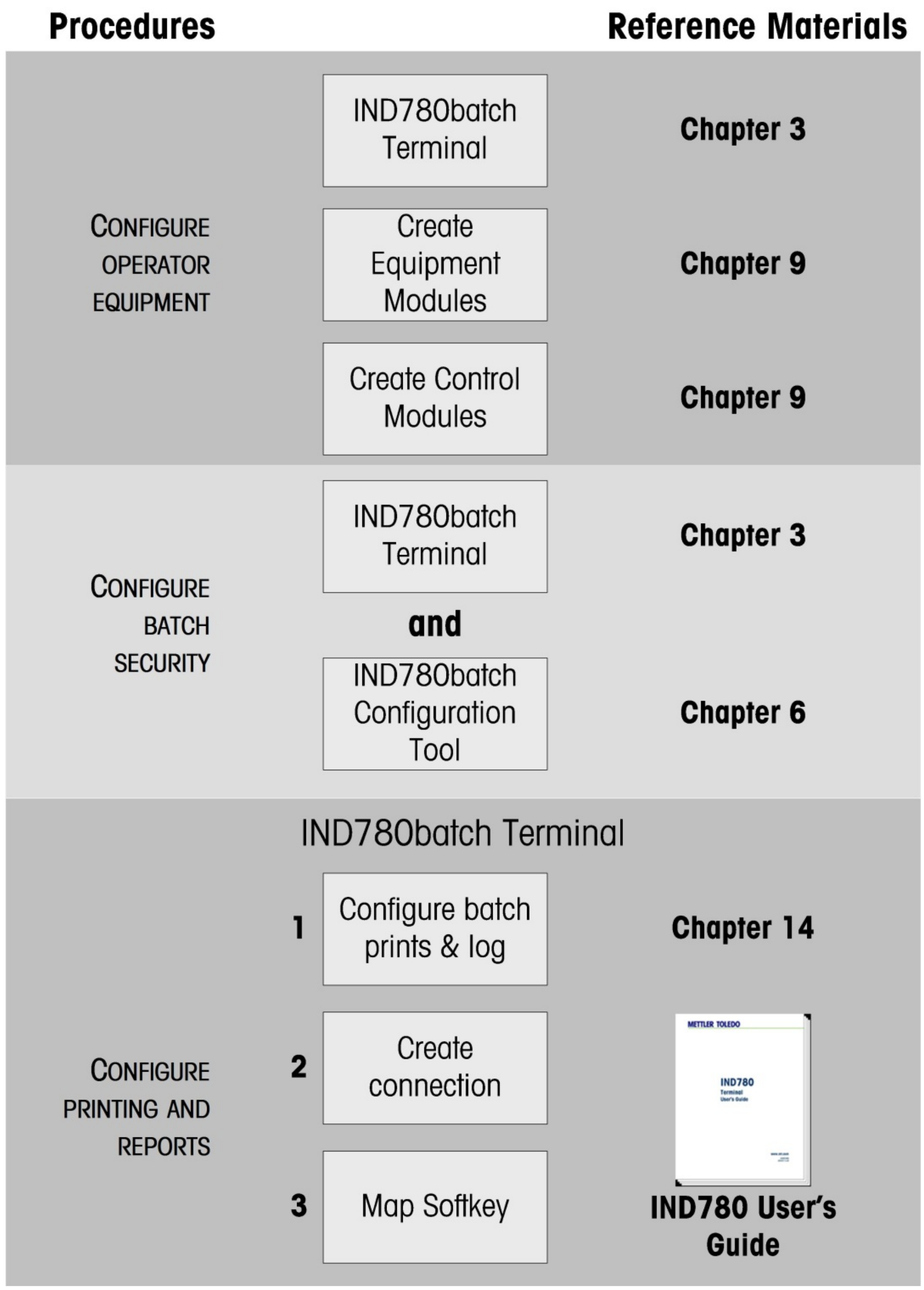


Figure 1-16: Batch System Commissioning, Part 2

1.15.2. Operation

1.15.2.1. Material and Recipe Management

Procedure		Reference Material/s
CONFIGURE OR EDIT MATERIALS	Create or edit Material Paths	Chapter 10
CONFIGURE OR EDIT RECIPES	Create or edit Recipes	Chapter 11

Figure 1-17: Batch System Operation: Material and Recipe Management

1.15.2.2. Order Management

Procedure		Reference Material/s
CREATE BATCH ORDERS	IND780batch Terminal	Chapter 2
	or	
	IND780batch Configuration Tool	Chapter 12

Figure 1-18: Batch System Operation: Order Management

1.15.2.3. Runtime

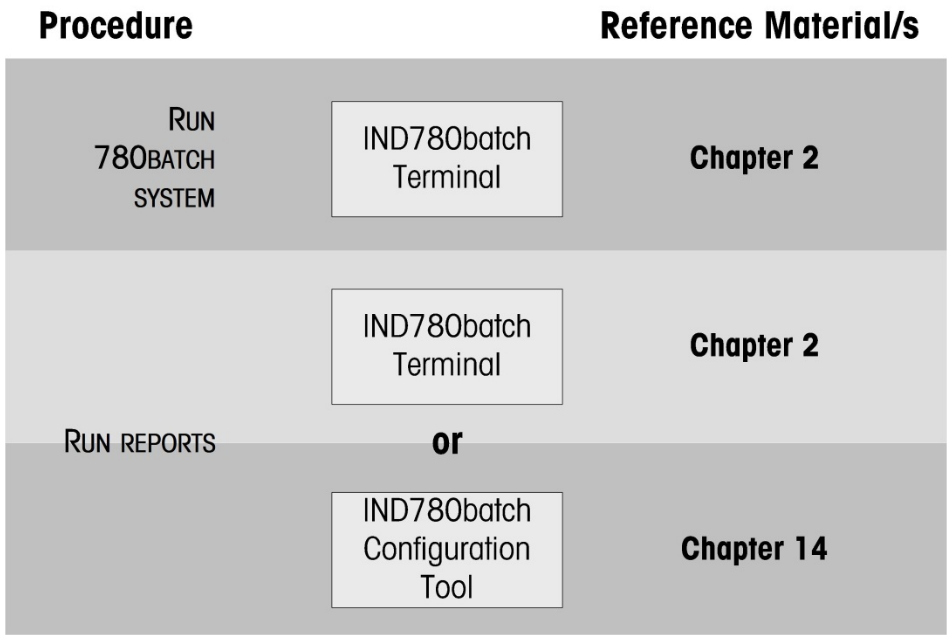


Figure 1-19: Batch System Operation: Runtime

2 Operation

2.1. Introduction

This chapter explains the use of the IND780batch from the point of view of the operator. It does not discuss the overall logic of a complete batch production system, but focuses on the IND780batch terminal's role in the process, including operator actions and inputs, and recovery from error conditions.

2.2. Definition of Terms

For a full description of the special terms used in this chapter, please refer to the Appendix A, Glossary.

2.3. Overview of Operator Interaction with Batch-780

The IND780batch is available either as a stand-alone terminal, or as a packaged system including basic I/O features.

- Not all features and functions will be available to all users. The appearance of many of the screens shown in this chapter will vary depending on the terminal's configuration. Please refer to Chapter 3, Configuration, for detailed information about setting up access to functions and the appearance of screens.

Figure 2-1 and Figure 2-2 show the IND780batch terminal and packaged terminal, respectively, and indicate the interface features of the system.

Figure 2-1: IND780batch Terminal

Figure 2-2: Packaged IND780batch

2.3.1. Security

Access to the features of the IND780batch software is controlled by the security settings configured in setup at Application > Batch-780 > Security. Four levels of access are available. Each level has access to the features available to all lower levels, plus additional features as determined in configuration. In ascending order of access, these levels are:

Operator	Supervisor	Maintenance	Administrator

2.3.2. Application Keys, Softkeys and Icons

Table 2-1: Terminal Application Keys

Key	Function
A1	Displays **Order View** screen (see Figure 2-6)
A2	Displays **Recipe Overview** screen (see Figure 2-23)
A3	Displays **Equipment View** screen (see Figure 2-35)
A4	Displays **Scale View** screen – the standard IND780 display (see Figure 2-7)

Two of the softkeys described in Table 2-2 (log in and log out) are specific to the Batch-780 application. They appear in the softkey list in setup at **Terminal > Softkeys**, and can be set to appear in the softkey rows of the IND780batch weighing (home) screen. The third softkey (change password) is displayed when the login softkey is pressed and the login screen appears.

Table 2-2: User Access Softkeys

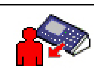
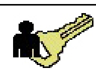
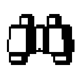
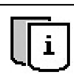
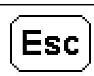
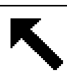
Icon	Name	Function/s
	Login	
	Logout	
	Change Password	

Table 2-3: Recipe and Order Softkeys

Icon	Name	Function/s
	VIEW TABLE	Opens the table search screen, where search filtering parameters can be entered.
	SEARCH	In the table search screen, starts the table search, applying any filtering selected in the table search screen, and opens the resulting table list.
	BATCH INFORMATION	Displays the **Batch Information** screen, where looping, number of batches and rescaling amounts can be set.
	CONVERT BATCH	Displays the **Convert Batch** screen, where a new Batch ID can be entered.
	ESCAPE/QUIT	Returns to the previous screen without saving changes.
	OK	Confirms changes made in the current screen.
	EXIT	Exits current screen.

Icon	Name	Function/s
	AUTO-SCROLL	Controls scrolling through the recipe list view. If Manual Scroll is selected, the EDIT softkey appears, allowing the user to edit the key parameter of the phase in focus.
	MANUAL SCROLL	
	VIEW RECIPE DETAIL	Displays the recipe as a list of phases.
	VIEW EQUIPMENT DETAIL	Displays a detailed view of equipment, status, etc., of the currently executing phase. View varies depending on type of phase.
	NEW	Opens the **Add Order** screen, where a new order can be created.
	EDIT	For an existing order, opens the **Add Order** screen so that modifications can be made. In **Recipe Details** view with Manual Scroll, allows editing of the key parameter of phase in focus.
	DELETE	In the **Order View** screen, deletes the selected order.

Table 2-4: Batch Control Softkeys

Icon	Name	Function/s
	CHANGE MODE	Displays **Recipe Operation** screen.
	AUTOMATIC	Shown in **Recipe Operation** screen; used to select operating mode
	SEMI-AUTOMATIC	
	MANUAL	
	RUN	Starts (or resumes) batch execution for the current order.
	HOLD AT END	For any multi-batch Order, toggles batch execution between holding at the end of the current batch, and continuing to the next batch without holding.
	PARK	Parks the currently executing batch and saves the batch state for later completion.
	ABORT	Aborts the currently executing batch and deletes the order from the order list.
	STOP/PAUSE	Stops and pauses the currently executing batch. Has no effect on a paused or idle batch.

Table 2-5: Reports, History and Track and Trace Softkeys

Icon	Name	Function/s
	REPORTS	Displays the Reports Run screen.

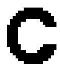
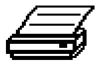
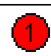
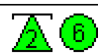
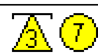
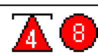
Icon	Name	Function/s
	CLEAR	For Batch Details and Batch Overview, deletes all records in the Batch History table.
	PRINT	Print's the entire table to the Reports connection.
	VIEW TABLE	Opens the table search screen (depending on the Report Type selected in the Reports Run screen – Batch Overview, Batch Details, Order List, Recipe List or Action Log), where search filtering parameters can be entered.
	SEARCH	In the table search screen, starts the table search, applying any filtering selected in the table search screen, and displays the resulting table list.

Table 2-6 describes the icons that appear when the detailed recipe status is displayed. The layout of this screen is configured in setup. Up to four Scale EMs and four Operator EMs can be displayed.

Table 2-6: Equipment Module Status Icons

Icon	Explanation
EM Types	
	Scale EM, with EM number
	Operator EM, with EM number
EM Status Color Code	
	Ready or idle
	Running, OK
	Operator attention required, or warning (waiting for operator response)
	Error

2.4. Operating Modes

The IND780batch system has three operating modes – automatic, semi-automatic and manual.

In **automatic** mode, depending on how the recipe is configured, once an order is started it runs through to completion or continues to loop, without further user intervention.

In **semi-automatic** mode, at the end of each phase in the recipe the user is prompted to move to the next phase. This mode is usually used only for testing purposes, to assure that a recipe functions correctly.

In **manual mode**, the user can select and execute any step in the recipe, in any order.

2.4.1. Vertical and Horizontal Campaigns

If the batching system is so configured, it is possible to choose between vertical and horizontal campaigns.

A vertical campaign runs a recipe consecutively, so that an order sequence including three batches of three phases each might take the form shown in Figure 2-3.

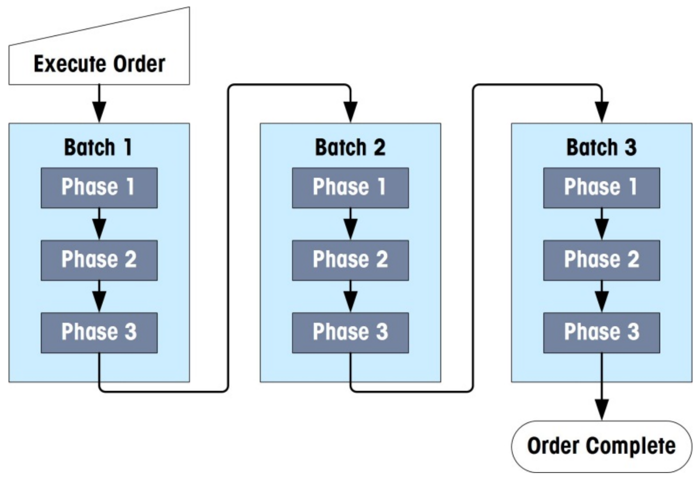


Figure 2-3: Structure of a Vertical Campaign

A horizontal campaign runs the same batch multiple times, in parallel. Each phase must complete for all three batches before the next phase can be executed. Figure 2-4 shows the general sequence of a horizontal campaign with the three, four-phase batches. Note that Phases 2 and 3 have been defined as components of a Horizontal Block (contained in the dotted boxes). If the **Execution Type** for the block is set to **All Recipes**, operations within the block are carried out in each batch before they are executed in the next batch. If **Execution Type** is set to **First Recipe Only**, the block will execute once, during the first batch of a multiple batch order.

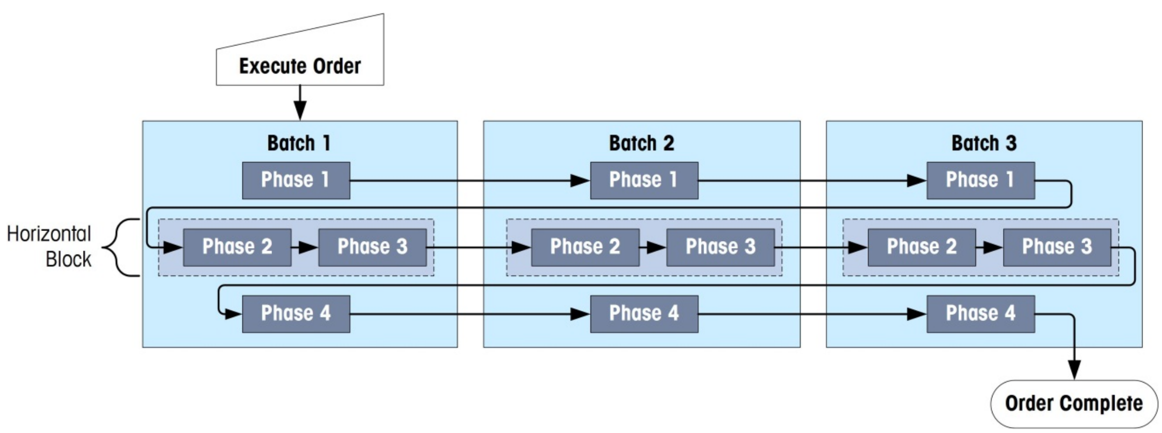


Figure 2-4: Structure of a Horizontal Campaign

2.4.2. Unit Procedures

A Unit Procedure is a set of operations carried out using a defined group of equipment. During the batching process, multiple unit procedures can be run in parallel. Each unit procedure must use unique equipment; for example, two parallel procedures cannot use the same scale.

In IND780batch systems the scale, together with its associated material paths and other outputs, takes the role of the unit.

When a unit procedure is added to a recipe, an additional **End Procedure** step is also created. Additional unit procedures created before the **End Procedure** step will be carried out in parallel. The recipe will not proceed to its next step until each parallel unit procedure's process has completed.

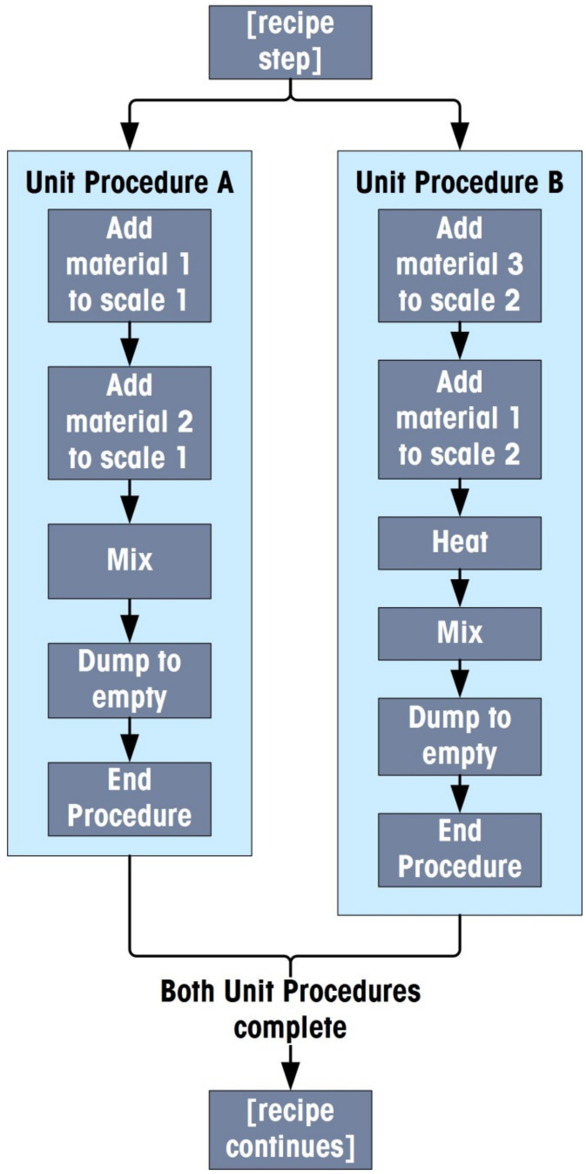


Figure 2-5: Example of Unit Procedure

2.5. Phases of Operation

2.5.1. Default Screen

When power is applied to the IND780batch terminal, by default its interface displays the **Order View** screen (Figure 2-6). This screen displays a list of all incomplete and pending orders. The contents of this screen are configured in setup at Batch-780 > Views > Order View.

1. At any time, press the A1 Application Key to access the Order View screen.

Figure 2-6: Order View Screen

2. From this screen, depending on system status, it is possible to:
   - view all pending orders
   - search for existing orders
   - create a new order
   - delete an order
   - Start, Pause, Park or Abort a batch

2.5.2. Scale View Screen

The standard IND780 scale view screen can be viewed by pressing the A4 Application Key. Press the DOWN arrow to view the second row of softkeys, and press the SETUP softkey to access the terminal's configuration menus. Figure 2-7 shows the screen with the Log-in, Log-out and Reports softkeys configured.

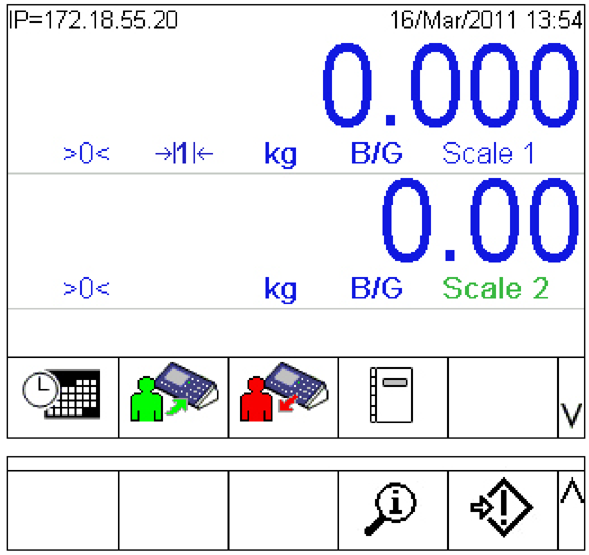


Figure 2-7: Scale View Screen (top) and Second Row of Softkeys (bottom)

2.6. Preparing to Execute an Order

2.6.1. Before Executing an Order

Before an order can be executed, the following conditions must be true:

- A Master Recipe must exist.
- Any equipment used by the selected recipe to execute a batch must be on-line and error-free (Figure 2-8).

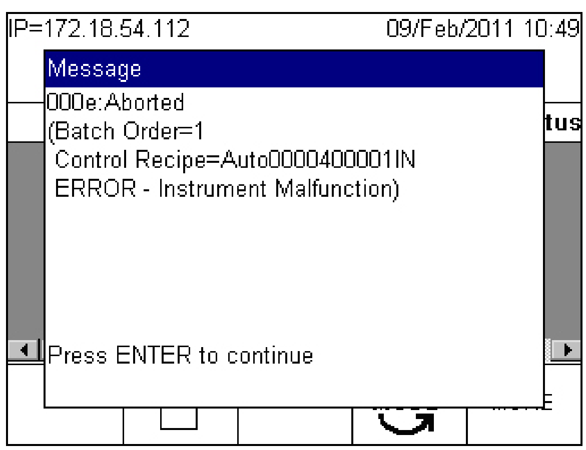


Figure 2-8: Order Check: Equipment Error Message

- Vessels must be capable of containing the amounts of materials to be delivered (Figure 2-9).

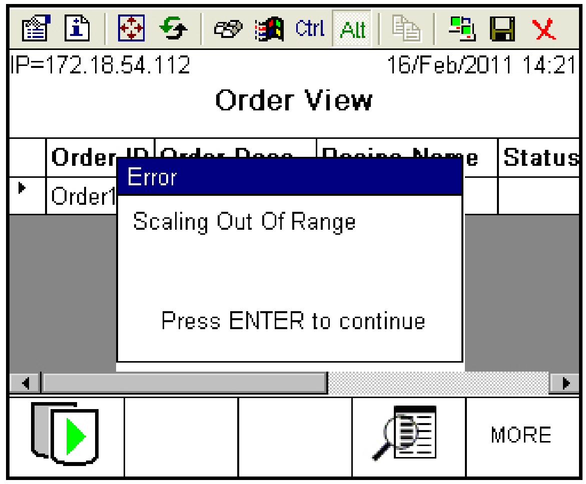


Figure 2-9: Order Check: Capacity Error Message

2.6.2. Defining an Order

2.6.2.1. Initial Setup and Recipe Selection

Press the NEW softkey to access the **Add Order** screen. From here, the batch can be rescaled (from the Batch Information screen) and converted (from the Convert Batch screen). On the second screen, accessed by scrolling down, the type of order can be set to **Single** or **Endless**. An **Endless** order will remain in the terminal until an operator deletes it. This feature is useful when the same recipe and number of batches are to be run every day.

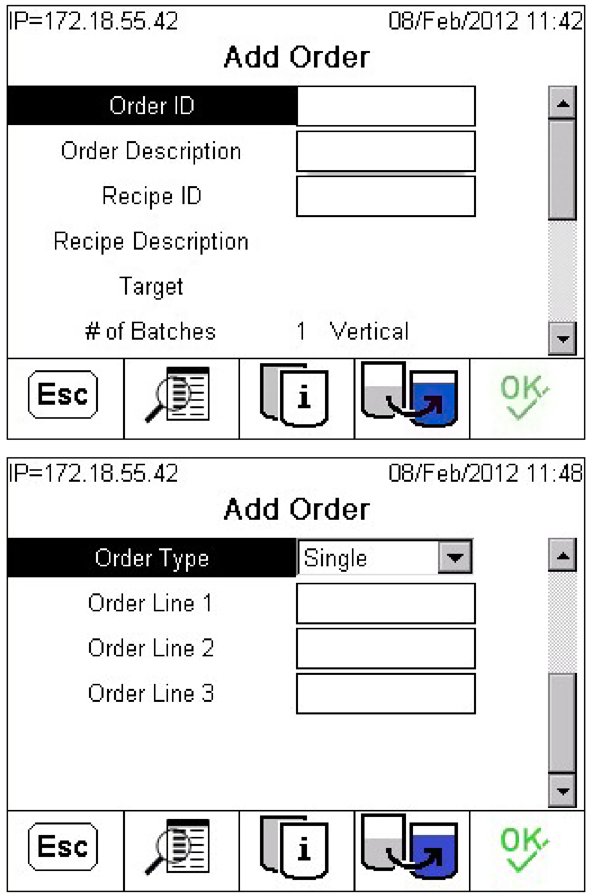


Figure 2-10: Add Order Screens

When an entry field is selected, the softkeys and application keys can be used as alphanumeric entry keys.

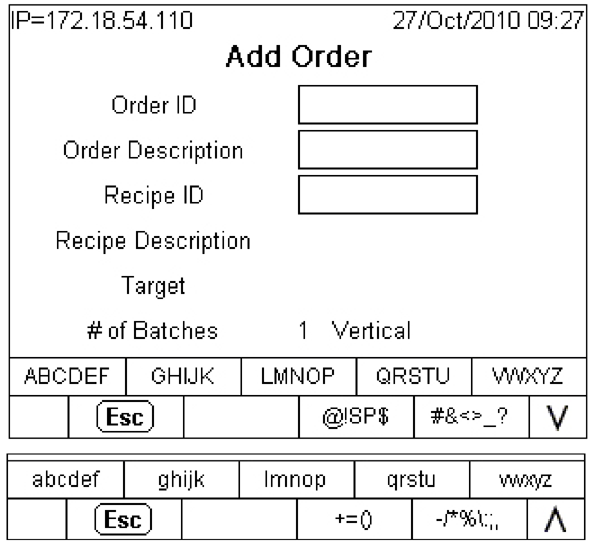


Figure 2-11: Alpha Key Sets for Data Entry

Use the associated softkey or application key to display the character set required, then press a softkey or application key to enter the character.

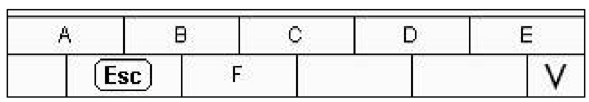


Figure 2-12: Alpha Character Set

To complete the Recipe ID field when the ID is not known, press the Table Search softkey to display the **Master Recipe Table Search** screen.

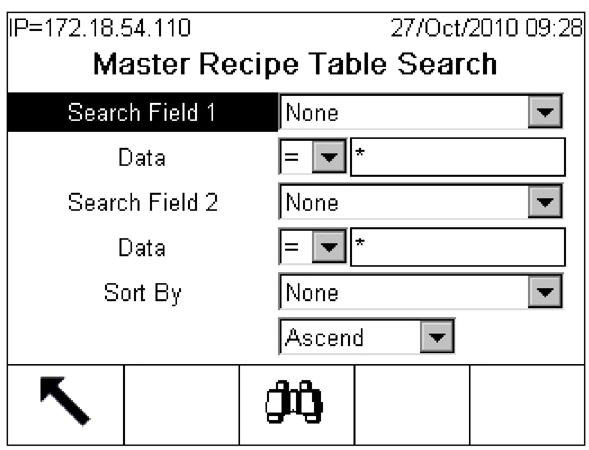


Figure 2-13: Recipe Table Search Screen

Enter the appropriate values to filter the search, or simply press the SEARCH softkey to view all available master recipes. The **Master Recipe List** will display

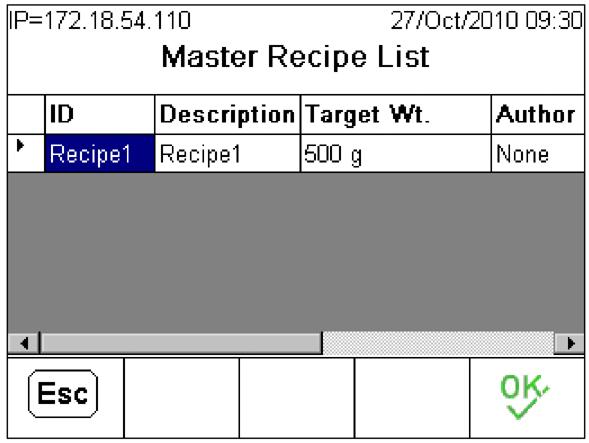


Figure 2-14: Search Result: Master Recipe List

2.7. Modifying the Recipe: Batch Information

Two additional softkeys are available in the **Add Order** screen (Figure 2-10) – BATCH INFORMATION and CONVERT BATCH . Each of these softkeys opens a configuration screen.

The **Batch Information** screen (Figure 2-15) allows a number of modifications to the order. The recipe can be looped a set number of times, and rescaled within parameters set in the recipe. When looping is set to **Endless**, the batch will run continuously until the operator presses the HOLD AT END softkey. When Endless looping is selected, the **# of Batches** field is not shown.

The units displayed here are controlled by those defined in the recipe. If a value is entered that exceeds the rescaling parameters set for the recipe, or the capacity of equipment used by the recipe, the order will fail the pre-execution checks. This will cause the batch to be aborted before it starts, and the order will then be deleted from the Order View list.

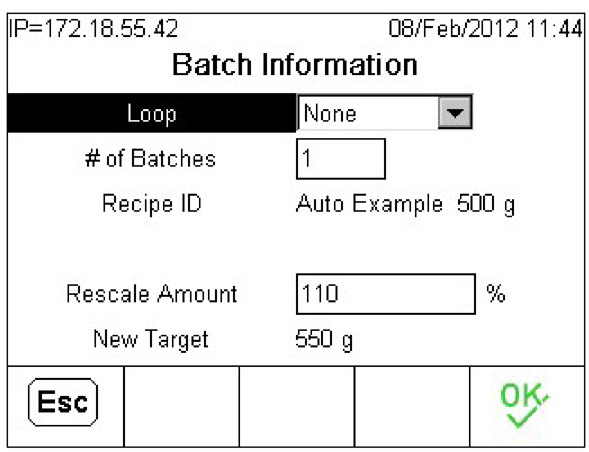


Figure 2-15: Batch Information

Loop	Select **None** or **Endless**, to determine whether the order runs the batch a fixed number of times (determined by the value entered for **# of batches**) or continuously until the process is paused, parked or aborted.
# of Batches	This field appears if **Loop** is set to **None**. Enter the number of times the order should run the specified recipe.
Rescale Amount	Enter a value for the recipe target; component materials of the recipe will be re-sized accordingly. The rescaling amount can be configured (in setup at **Application > Batch-780 > Recipe Operations > Batch Edit**) as a percentage of current weight value, as in Figure 2-15, or as an absolute weight value.
New Target	This value displays the recipe's target value after rescaling.

An attempt to press OK before a recipe has been selected will display an error message.

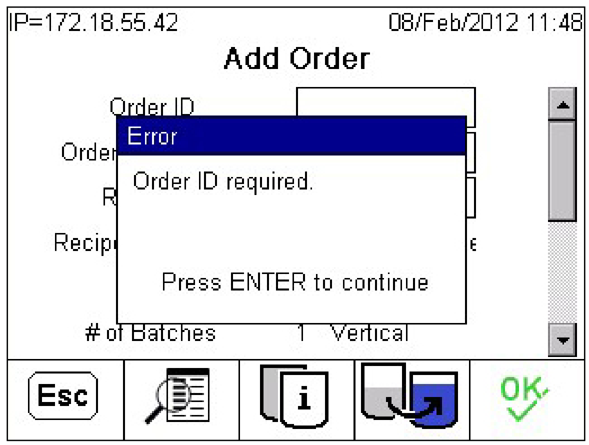


Figure 2-16: Missing Recipe ID Error Message

Once the order is completely defined, the **Add Order** screen will be fully populated.

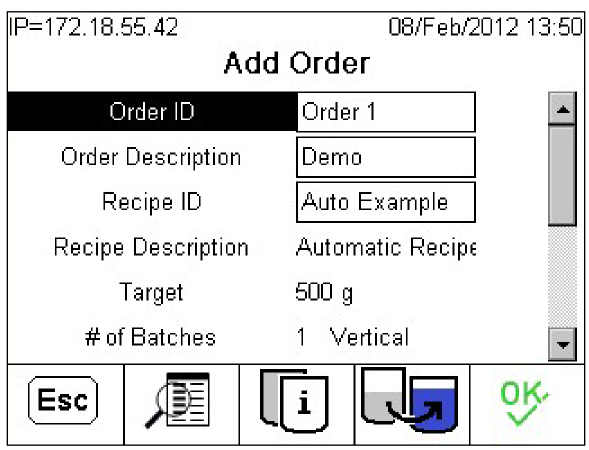


Figure 2-17: Add Order Screen, Complete

2.8. Modifying the Recipe: Convert Batch

Pressing the CONVERT BATCH softkey in the Add Order screen opens the **Convert Batch** screen, shown in Figure 2-18.

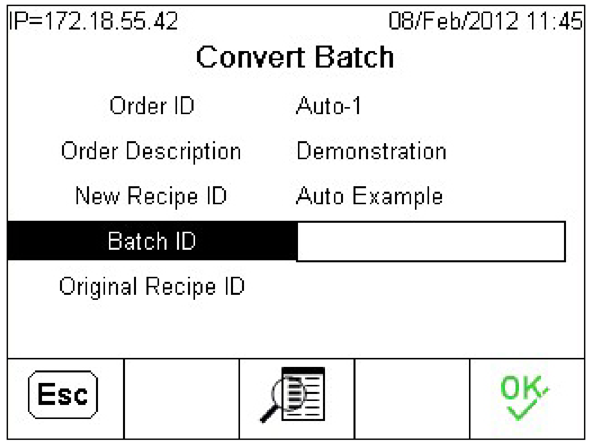


Figure 2-18: Convert Batch Screen

For further details on the Convert function, refer to the **Convert Batch** section in Chapter 12, **Orders**.

2.9. Recipe Operation

Press OK to move to the **Order View** screen (Figure 2-6). Press the MORE softkey to display the CHANGE MODE softkey. Press CHANGE MODE to access the **Recipe Operation** screen.

Here, the currently selected mode is displayed, and softkeys for the other two appear. In Figure 2-19, Automatic mode is selected, and the softkeys for Semi-Automatic and Manual modes are displayed.

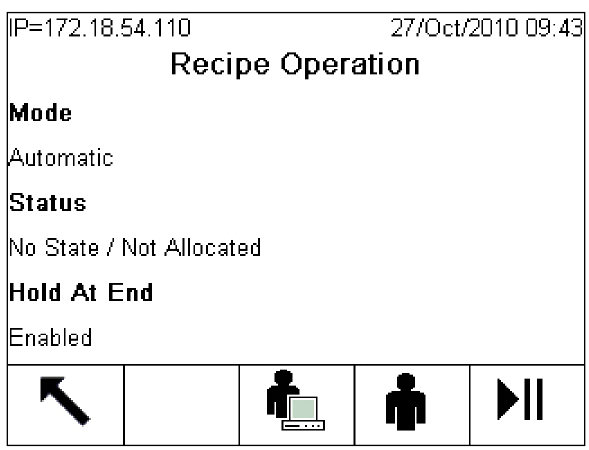


Figure 2-19: Recipe Operation Screen

The following elements are included in the **Recipe Operation** screen.

Mode Displays the batching systems's operating mode.

Status Shows the status of the phase of the recipe that is currently being executed.

Hold At End Indicates whether the order will hold at the end of the current batch, or will continue to loop.

To enable **Hold At End**, access the Recipe Operation screen (Figure 2-19) and press ▶||. The current batch will pause when completed, and the system will wait for the operator to resume the order.

Returns the view to the Order View screen

Selects Automatic Mode

Selects Semi-Automatic Mode

Selects Manual Mode

Softkey is displayed only for modes **not** currently selected.

Toggles between states:

If **Hold at End** shows **Disabled** in the **Recipe Operation** screen, then pressing this softkey causes the system to hold after completing execution of the current batch.

If **Hold at End** shows as **Enabled**, then pressing this softkey causes the system to continue looping batches, if so configured.

For example, the screen shown in Figure 2-19 indicates that the system will hold once it has completed executing the current batch. Pressing this softkey will allow it to continue to the next batch without holding.

When the **Order View** screen is accessed after the order has been defined, an additional, DELETE, softkey appears in the center position.

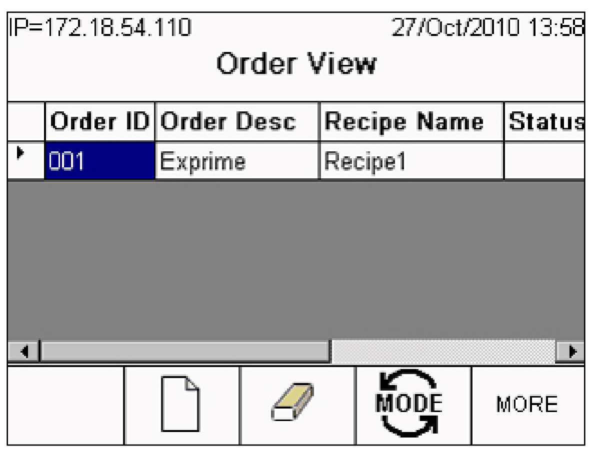


Figure 2-20: Order View with Delete Softkey

Note that pressing this softkey will delete the selected order **with no further warning**.

Pressing the CHANGE MODE softkey in this screen displays the **Recipe Operation** screen (Figure 2-19).

Pressing the MORE softkey displays two additional softkey icons.

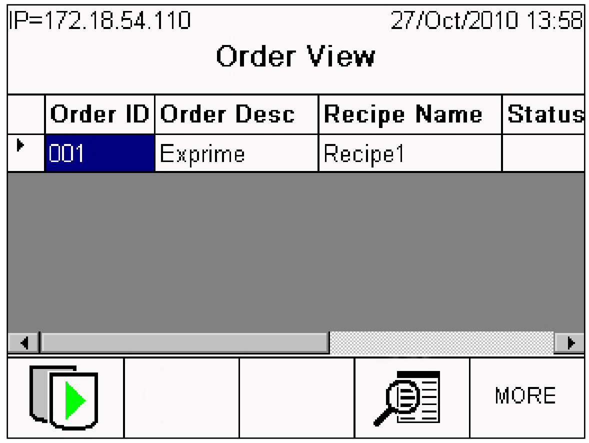
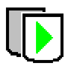


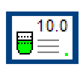
Figure 2-21: Order View, Second Row of Softkeys

 Starts executing the batch.

 Displays Order Search screen.

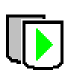
Once the START BATCH softkey has been pressed, the PAUSE BATCH and RECIPE DETAILS softkeys appear in the center and fourth position, respectively:

 Pauses the batch – turns off I/O to halt any currently active feed, etc. This function stops the process directly, without completing the current step.



Opens the EQUIPMENT DETAILS screen (Figure 2-26).

After the PAUSE BATCH softkey has been pressed, the user has several choices, available by toggling between rows using the MORE sofkey:

Icon	Row/Position	Explanation
	1 / 1	Continue executing the batch.
	1 / 3	Opens an **Abort Batch** confirmation screen (Figure 2-22). This screen offers three choices – the batch can be terminated and the order deleted; the current feed can be ended, but the batch continued; or the abort can be cancelled: ▪ Abort current batch & remaining order ▪ End feed (step *n*): *Phase Description* The choice is confirmed by pressing , or cancelled by pressing ESCAPE. If the abort is cancelled, the **Order View** for the running batch is diaplayed.

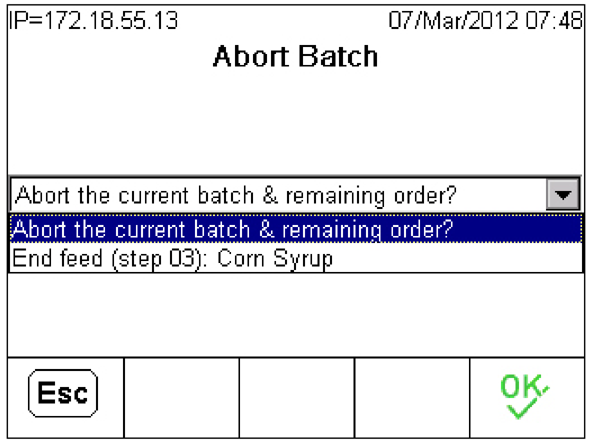
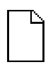


Figure 2-22: Abort Batch Confirmation Screen

Icon	Row/Position	Explanation
	1 / 4	Displays Order Search screen.
	2 / 1	Completes the phase currently being executed, then parks the batch and keeps a record of its state. The order remains in the order list, with its status as **Parked**.
	2/ 2	With batch paused, a new order (Figure 2-10) can be created.
	2 / 4	Accesses the **Recipe Operation** screen (Figure 2-19).
Esc		Cancels Abort command and returns to **Order View** screen in running mode.
OK		Aborts batch and returns to **Order View** screen, with aborted batch removed from list.

2.10. Viewing Recipe Phases and Phase Details

When the order is running, it is possible to view and inspect the status of each phase as it occurs.

Press the A2 Application Key to display the **Recipe Overview** screen. The contents are this screen are configured in setup at **Batch-780 > Views > Recipe > Recipe Overview**.

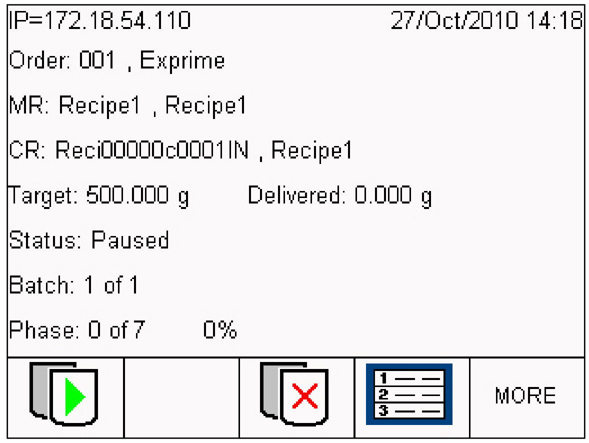


Figure 2-23: Recipe Overview Screen, Batch Paused

Note the string of characters in the Control Recipe (**CR:**) identifier in this screen. This identifier is unique to the current batch, and comprises the first four characters of the recipe name, a serial number, and the first two characters of the terminal ID.

Press the MORE softkey to show an additional row of icons including two further softkeys.

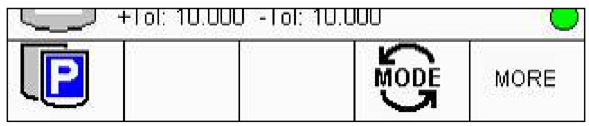
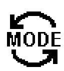


Figure 2-24: Recipe Overview Screen, Second Softkey Row



Displays the Recipe Operation screen

Parks the recipe, saves the current phase's state, and leaves the Order in the Order list.

In the **Recipe Overview** screen (Figure 2-23), press the RECIPE DETAIL softkey  to view a list of the current recipe's phases in the **Recipe Details** screen.

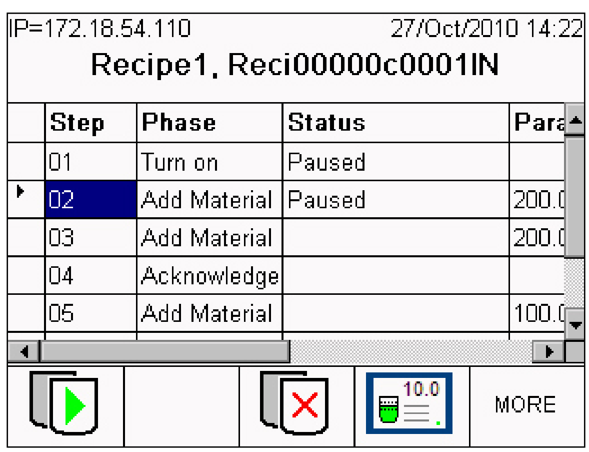
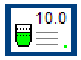


Figure 2-25: Recipe Phases, Batch Running



The EQUIPMENT DETAIL softkey opens a screen like the ones in Figure 2-26 and Figure 2-27, displaying details for the currently executing phase. The contents of this screen vary depending on the type of phase, and are configured in setup at **Batch-780** > **Views** > **Recipe** > **Recipe Details**.

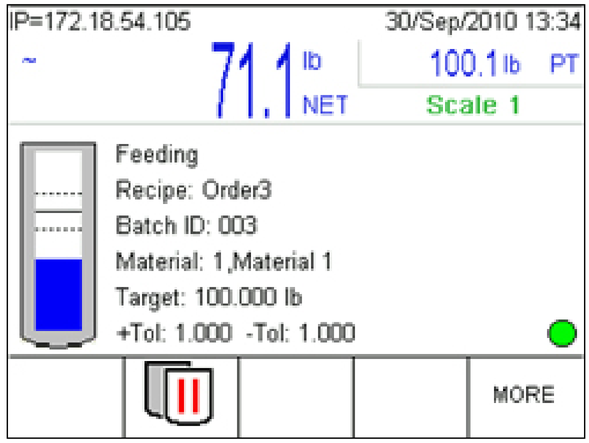


Figure 2-26: Equipment Details– Automatic Material Transfer

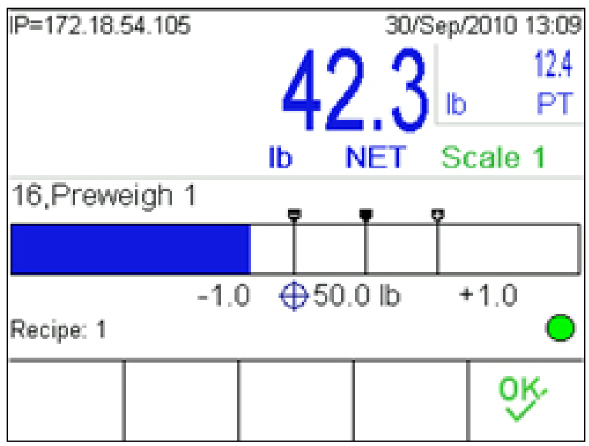


Figure 2-27: Equipment Details – Manual Material Transfer

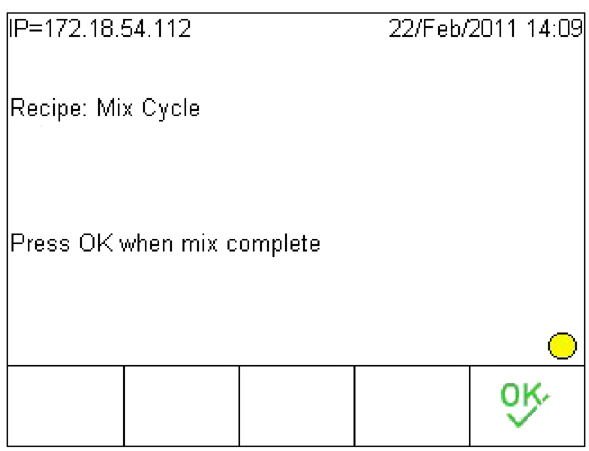


Figure 2-28: Operator Hold – Acknowledge

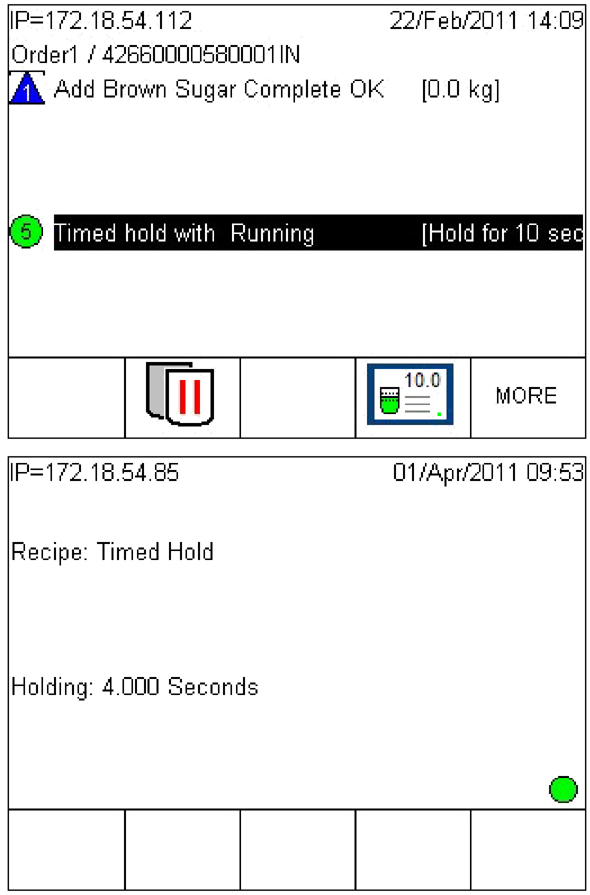


Figure 2-29: Timed Hold

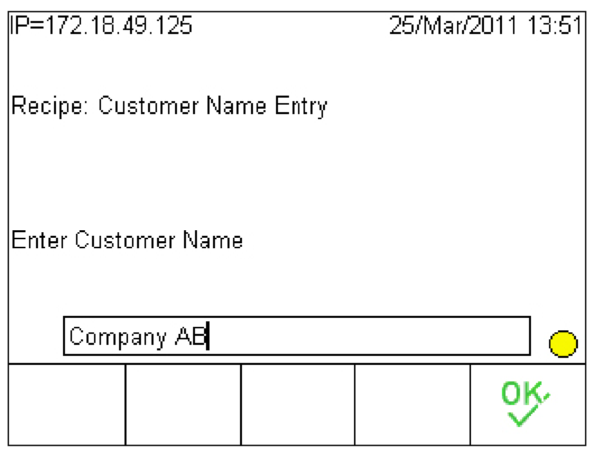


Figure 2-30: Text Box Entry Screen

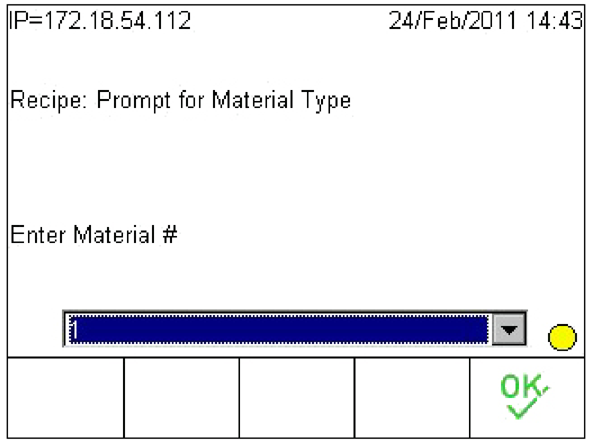


Figure 2-31: Selection Entry Screen

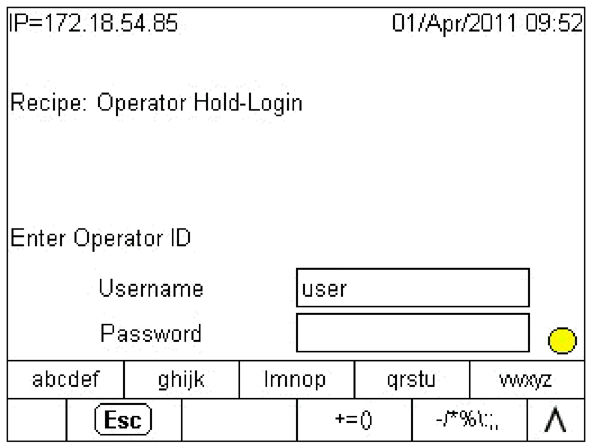


Figure 2-32: Signature Screen

2.10.1. Accessing and Modifying Recipe Phases

When the **Recipe Details** screen is displayed, depending on the batch execution mode the user can scroll through phases in order to access and edit them.

Figure 2-33 shows the appearance of the second **Recipe Details** softkey row (i.e., MORE softkey pressed in the screen shown in Figure 2-25) when Auto-Scroll and Manual Scroll modes are active. Whichever mode is active, the softkey for the alternative mode is displayed.

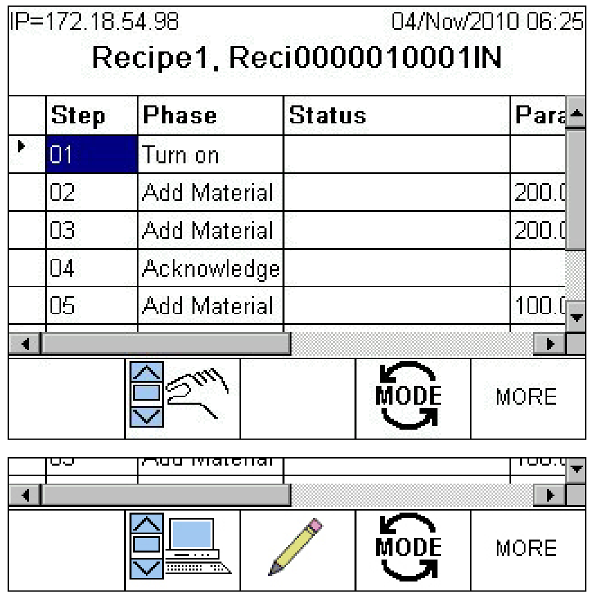
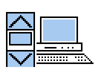
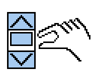


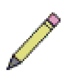
Figure 2-33: Automatic (top) and Manual (bottom) Scroll Modes in Recipe View



Auto-scroll: The currently executing recipe phase is automatically selected in the Recipe List.



Manual scroll: Allows the user to scroll up and down the list in order to select a particular recipe phase, and to run or edit it.



Edit: Opens a screen from which the manually-selected phase can be modified.

Press the EDIT softkey  to open an editing screen for the selected phase. Figure 2-34 shows the screen that displays when Step 3 in the Recipe shown in Figure 2-33 is selected, and the EDIT softkey pressed. This screen displays the step number, the phase description, the current value of the parameter, and a field in which the new value can be entered.

Figure 2-34: Recipe Edit Screen

2.11. Viewing Equipment Details

Press the A3 Application key to view the **Equipment Details** screen. The contents of this screen, and the softkeys included with it, are configured in setup at Application > 780 Batch > Views > System Views > Equipment View.

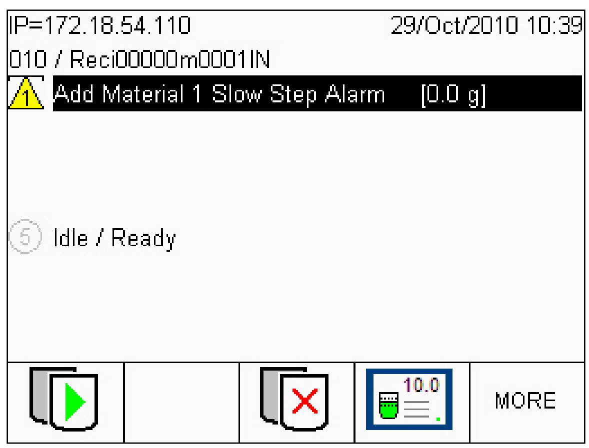


Figure 2-35: Equipment View Screen

The screen shown in Figure 2-35 includes a list of Equipment Modules and their status. During batch execution, the display will include any current alarms. Refer to Table 2-6 for an explanation of the icons and color codes displayed in these screens.

2.12. Resuming a Parked Batch

To resume a parked batch (refer to page 2-18):

1. Open Order List and select the parked order
2. In manual batch processing mode:

a. Access recipe details for the parked order.

b. Scroll to the last completed phase.

c. Press the START/RESUME softkey.

3. In automatic batching mode, the process resumes at the last incomplete step.

2.13. Reports

A variety of reports can be viewed on, and printed from, the IND780batch terminal. These include:

View and Print	Print Only
Batch Overview	Batch Details
Order List	
Recipe List	
Action Log	

2.13.1. Configuration for Printing

2.13.1.1. Batch Transaction and Summary Reports

To print a Batch Transaction and Summary report from the IND780batch terminal, a demand output connection must be configured.

The demand output connection is created in setup at **Communication > Connections**. Use either an available serial or Eprint port. Set the **Trigger** to **Batch**, as shown in Figure 2-36

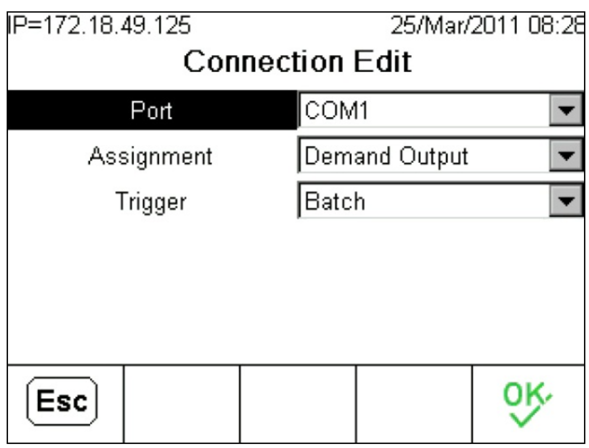


Figure 2-36: Connection Edit Screen

The reports will print automatically when running a recipe, or when triggered by a Communication phase.

2.13.1.2. Other Reports

In order to be able to print the types of reports listed in Figure 2-39, a COM port connection must be assigned to reports, as shown in Figure 2-37.

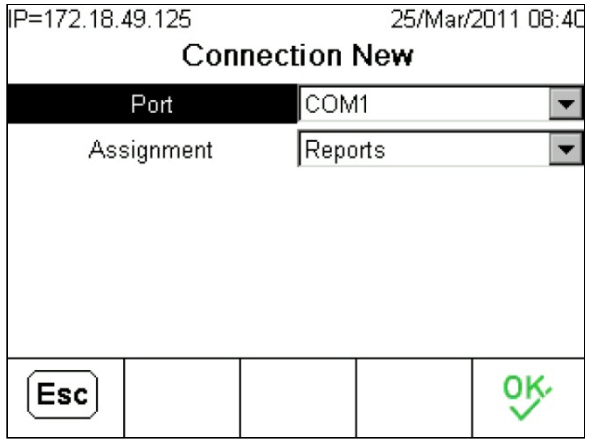


Figure 2-37: Connection New: Configuring a COM Port for Reports

2.13.2. Viewing and Printing a Report

1. Ensure that the REPORTS softkey appears in one of the rows of softkeys visible on the Scale View screen. Access the Scale View screen by pressing A4 .

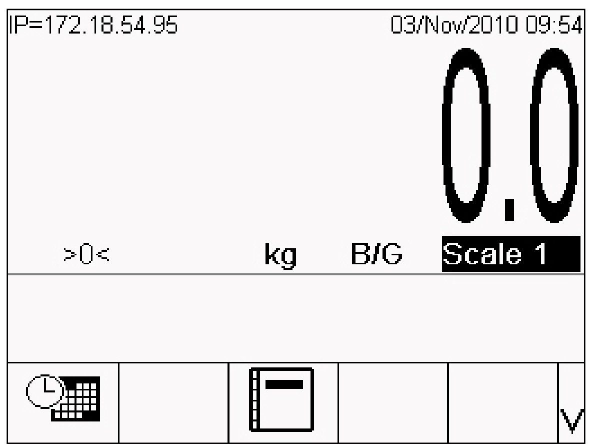


Figure 2-38: Scale View Screen, Reports Softkey Displayed

2. Press the REPORTS softkey to display the Reports Run screen. Select the Report Type field to display a drop-down list of available reports.

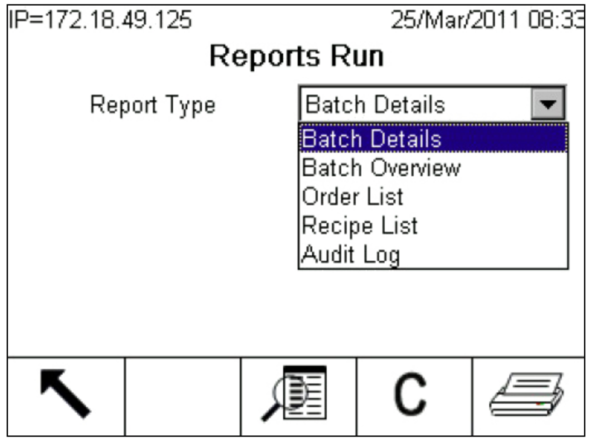


Figure 2-39: Reports Run Screen Showing Selection List

1. Select the Report Type from the drop-down list, then press the TABLE VIEW softkey. This will open a table search screen with filtering options that vary depending on the type of report selected. Figure 2-40 shows the Order List Search screen.

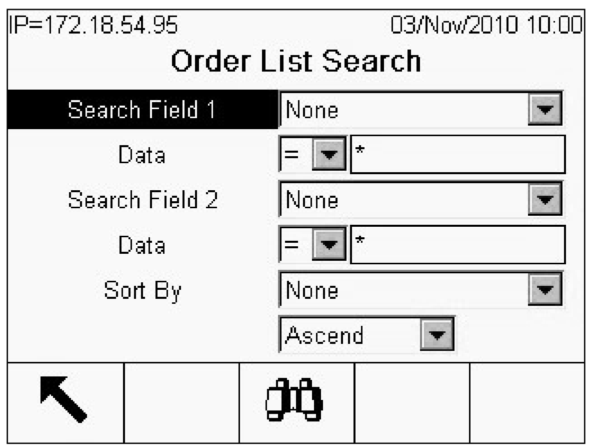


Figure 2-40: Order List Search Screen

The elements of this screen are explained in Table 2-7, with default values indicated in bold with an asterisk (*). As configured by default, the search will return the entire contents of the selected table.

Table 2-7: Table Search Options

Label	Options / Function
Search Field 1	First search parameter. Options vary by Report Type:
Batch Overview Batch Details	**None***, Batch ID, Date (YYYMMDD), Order ID, Order Desc, Recipe ID, Recipe Desc
Order List	**None***, Order ID, Order Desc, Recipe ID, Recipe Desc
Recipe List	**None***, Date (YYYMMDD), Recipe ID, Recipe Desc
Action Log	**None***, Action, Date (YYYMMDD)
Data Operator	< (less than), <= (less than or equal to), **=* (equal to)**, <> (not equal

Label	Options / Function
	to), >= (greater than or equal to), > (greater than)
Data entry field	Alphanumeric data entry used for comparison by the Operator. Default is *** (all)**.
Search Field 2	Same options as Search Field 1
Sort by	Determines sorted parameter. Options vary by Report Type, and are the same as for the Search Fields.
	Ascend*, Descend

2. Finally, press the TABLE SEARCH softkey to display the filtered results of the search. For the example shown, the Order List screen (Figure 2-41) will display, including only those orders defined by the search filters. This screen will include a PRINT softkey, permitting the list to be printed via the Reports connection.

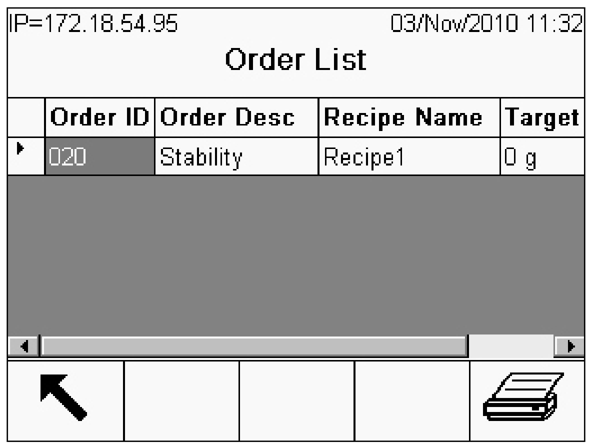


Figure 2-41: Search Results: Order List Screen with PRINT Softkey

For further details, including a description of the contents of each type of report, please refer to Appendix D, **Reports and History**.

3 Configuration

3.1. Overview

3.1.1. System Configuration Using BatchTool 780

To configure system components (Equipment and Control Modules, Material Paths, Recipes and Orders) for the IND780batch terminal, use the PC Configuration Tool provided with the system. The PC hosting the tool communicates with the terminal via an Ethernet connection. All configuration settings can be created using the tool, and then downloaded to one terminal, or to multiple terminals. Similarly, terminal configurations can be uploaded to the tool, and table data can be retrieved and saved. Please refer to the **BatchTool780 PC Configuration Tool User's Guide** for details on using this resource.

3.1.2. Interface Configuration at the Terminal

Terminal-specific configuration must be performed using the terminal's display and front panel buttons. The terminal's setup menus include a number of screens used to set the appearance and functions of the terminal interface during batching operation. These functions cannot be set using the PC Configuration Tool, and must be set up for each terminal.

This document describes the configuration options as they are presented in the IND780batch's setup menu tree, and provides a complete account of the settings and parameters available in each screen

3.1.2.1. Softkeys and Icons

Many of the softkeys and icons specific to IND780batch are configured using settings described in this chapter. For a complete list of these softkeys and icons, please refer to Chapter 2, **Operation**, in this manual.

3.1.3. Glossary of Terms

For a description of each of the special terms used in this chapter, please refer to Appendix A, **Glossary**.

3.2. Setup Menu Tree

Figure 3-1 shows an expanded view of the IND780batch branch (**Setup > Application > Batch-780**) of the IND780 terminal setup menu tree. The other branches of this tree are unchanged from those of the standard IND780 terminal – refer to Chapter 3, **Configuration**, of the **IND780 User's Guide** for details on the options available in the standard branches.

- Note: The Flow Meter branch displays only if a flow meter board is installed.

- Login
- Home
- Setup
  - Scale
  - Flow Meter
    - Channels 1 & 2
      - Board Settings
      - Channel 1
      - Channel 2
    - Channels 3 & 4
    - Reset
  - Application
    - Memory
    - Operation
    - Discrete I/O
    - Batch-780
      - Recipe Operations
        - Execution Control
        - Batch Edit
        - K1 & K2 parameters
      - Views
        - Order View
        - Recipe
          - Recipe Overview
          - Recipe Details
        - System Views
          - Equipment View
          - Auto Material Transfer View
          - Manual Material Transfer View
      - Security
      - Auto Print & Log
      - System List
        - Equipment Module
        - Control Module
        - Material Path
        - Recipe
    - TaskExpert
    - Reset
  - Terminal
  - Communication
  - Maintenance

Figure 3-1: IND780batch Setup Menu Tree Branches

3.3. Recipe Operations

3.3.1. Execution Control

The **Execution Control** configuration screen sets the options available in the Recipe Operation screen, accessed by pressing the CHANGE MODE softkey .

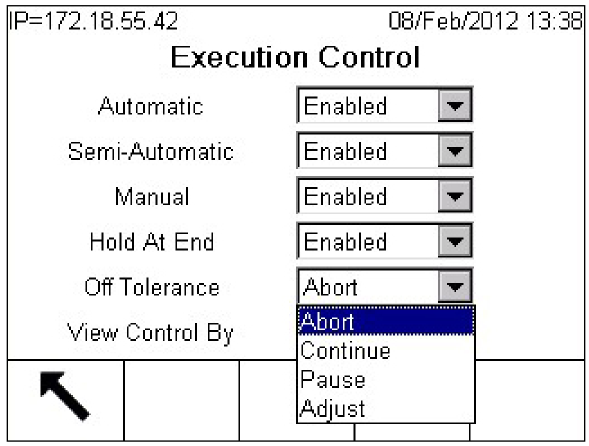


Figure 3-2: Execution Control

3.3.1.1. Automatic, Semi-Automatic, Manual

Each of these modes can be **Enabled** or **Disabled**. If a mode is enabled, it can be selected by any user with sufficient rights, as defined by the security settings (refer to page 3-13).

By default, Automatic mode is enabled, and the other two disabled.

Automatic mode executes the transition between recipe phase steps automatically. When one step completes, the next is started without operator intervention. Steps are executed in the order defined in the recipe.

Semi-Automatic mode requires an operator acknowledgement , in the form of a START softkey press or a discrete input, to begin each step. Steps are executed in the order defined in the recipe.

Manual mode requires the operator to both select and start each step. In this mode, steps may be executed in any order.

3.3.1.2. Hold At End

Hold at End can be **Enabled** or **Disabled**. If Enabled, when an order is configured to loop endlessly (refer to page 3-5), the operator will be permitted to pause at the end of each batch operation using the Hold-At-End softkey.

3.3.1.3. Off Tolerance

There are four options for the Off Tolerance parameter, which determines the system's behaviour when an out-of-tolerance condition occurs:

Abort Stops the batch, completes as a failed batch, and removes the order from the list.

Continue Continues the batch

Pause Pauses execution and allows the operator to choose whether to resume or abort the batch.

Adjust If a feed completes over tolerance, Adjust allows the operator to adjust the feed and bring it back within the tolerance range.

3.3.1.4. View Control By

The **View Control By** parameter, which determines how the recipe's progress is represented on the terminal screen during execution, has two options. Refer to the **Recipe Execution** sections of Chapter 15, **Batch Application Examples**, to see an illustration of the practical effect of this selection.

Phase During recipe execution, the EQUIPMENT DETAIL screen (e.g. **Figure 2-26**) is displayed.

Equipment During recipe execution, the EQUIPMENT VIEW screen (e.g. **Figure 2-35**) is displayed.

3.3.2. Batch Edit

The **Batch Edit** configuration screen controls the operator's access to various batch parameters.

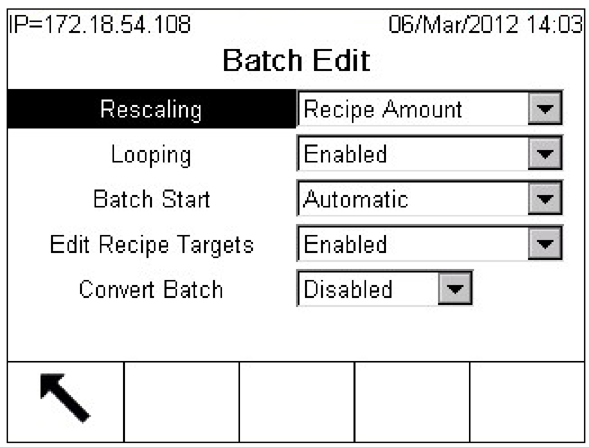


Figure 3-3: Batch Edit

3.3.2.1. Rescaling

There are four options for Rescaling:

Disabled The batch cannot be rescaled by the operator.

Material Material re-scaling allows the operator to re-scale a batch based on a single material.

For example, if a recipe calls for 100kg of a material, and only 80kg is available, all the other materials in the batch can be scaled down to produce the correct proportions.

Recipe % The batch size can be adjusted by percent, plus and minus, within

	the parameters established by the **Rescaling Factor, Min and Max** setting in the Recipe screen in the PC Configuration tool.
Recipe Amount	The batch size can be adjusted by an absolute weight value, plus and minus, within the parameters established by the **Rescaling Factor, Min and Max** setting in the Recipe screen in the PC Configuration tool.

3.3.2.2. Looping

Looping may be **Disabled** or **Enabled**. If it is Enabled, and **Loop** is set to **Endless** in the BatchTool 780 Orders configuration screen, the order will cycle through each batch automatically until it is complete, unless the **Hold at End** softkey (if enabled – refer to page 3-3) is pressed at the start of each batch. Looping is only active in Automatic phase execution.

- If an Order is set to loop endlessly, the system will ignore any value entered for number of batches set in the Order Configuration screen.

3.3.2.3. Loop Start

If Looping is **Enabled** and the order is set up to loop, the start of looping can be **Automatic**, without operator intervention, or **Manual**, starting only after the operator acknowledges a prompt. If **Loop Start** is set to **Manual**, the operator must start the next batch by pressing .

3.3.2.4. Edit Recipe Targets

By default, **Edit Recipe Targets** is **Disabled**. If it is **Enabled**, the operator can edit individual targets within the recipe.

- Unlike rescaling, editing recipe targets can change the ratio of materials in the product.
- It is unusual to enable the **Edit Recipe Targets** feature. A more typical approach would be to program operator inputs into a recipe where individual phases may require modification, for example due to environmental changes that affect materials.

To edit targets, set recipe step scrolling to manual from the Recipe Details screen, so that the operator can select the step to be edited. Then press the EDIT softkey to access the **Recipe Edit** screen for the selected step.

3.3.2.5. Convert Batch

By default, **Convert Batch** is **Disabled**. If it is **Enabled**, the operator can convert a batch. The convert feature allows a batch to be converted into a completely different batch, which eliminates the need to throw out unfinished batches of material. Unfinished batches can be re-run to make a finished product. Refer to Chapter 12, **Orders**, for details on the Convert feature.

3.3.3. K1 & K2 Parameters

The **K1 & K2 Parameters** configuration screen allows the behavior of the Q.iMPACT Predictive Adaptive Control (PAC) algorithms to be adjusted. These feed algorithms are used to calculate the spill value dynamically during a feed.

K1 is used when the relationship between flow rate and spill quantity is linear, and where flow rate is moderate and repeatable. K2 is used where the relationship between flow rate and spill quantity is non-linear, and where the flow rate is rapid.

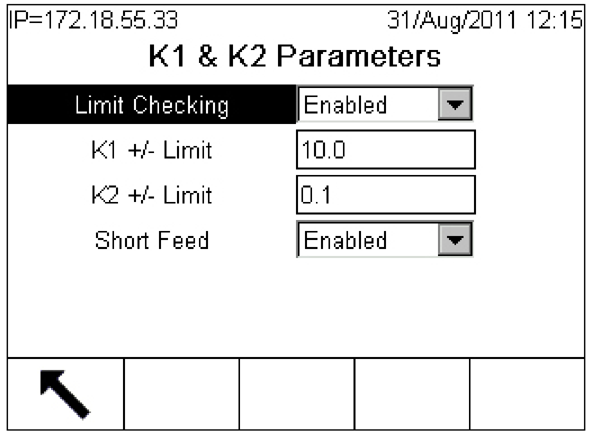


Figure 3-4: K1 & K2 Parameters Configuration Screen

3.3.3.1. Limit Checking

Limit checking can be **Enabled** or **Disabled** (the default). When it is enabled, the K1 and K2 parameters are used during fills, and the Limit setting fields appear, as seen in Figure 3-4.

3.3.3.2. K1 +/- Limit, K2 +/- Limit

These limit parameters specify the maximum values for the feed adjustments introduced by the K1 and K2 algorithms, respectively. Because the K2 algorithm is used with higher feed rates, the limit typically is considerably smaller than the limit for K1.

3.3.3.3. Short Feed

Short Feed can be **Enabled** or **Disabled** (the default). If any material has a feed time of 5 seconds or less, this option should be enabled.

In order to predict the cut-off with a high degree of accuracy, the PAC algorithms need 5 seconds or more feed time with the flow rate within limits.

3.4. Views

The screens in the Views section determine the elements that are visible to the user on the IND780batch terminal display. Certain elements appear by default, while others appear only when enabled.

3.4.1. Order View

The **Order View** configuration screen can be accessed by pressing A1 . The settings on this screen configure the operator's access to various control and information features of the software.

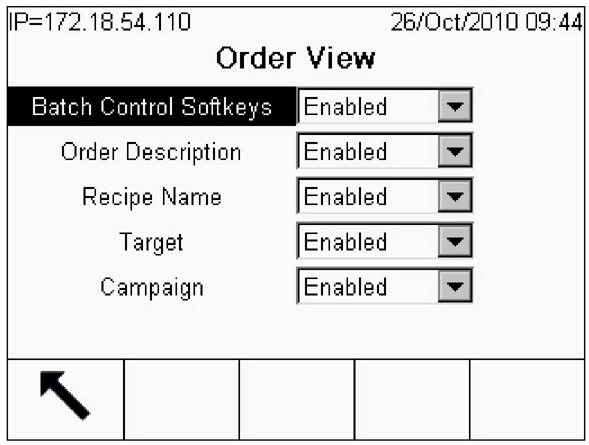


Figure 3-5: Order View

3.4.1.1. Batch Control Softkeys

The **Batch Control Softkeys** can be **Enabled** or **Disabled**. If they are disabled, the operator will not have access to these softkeys from the **Order View** screen.

3.4.1.2. Order Description

The **Order Description** can be **Enabled** or **Disabled**. If enabled, the operator can enter a description for the order when it is created, and it will appear as a column in the **Order View**.

3.4.1.3. Recipe Name

The **Recipe Name** can be **Enabled** or **Disabled**. If enabled, the name of the recipe used for the order will appear as a column in the **Order View**.

3.4.1.4. Target

Target can be **Enabled** or **Disabled**. If enabled, the recipe target will appear as a column in the **Order View**.

3.4.1.5. Campaign

Campaign can be **Enabled** or **Disabled**. If enabled, the campaign type will appear as a column in the **Order View**.

3.4.2. Recipe

3.4.2.1. Recipe Overview

The **Recipe Overview** configuration screen controls information that appears when the operator presses A2 to display the **Recipe Overview** screen.

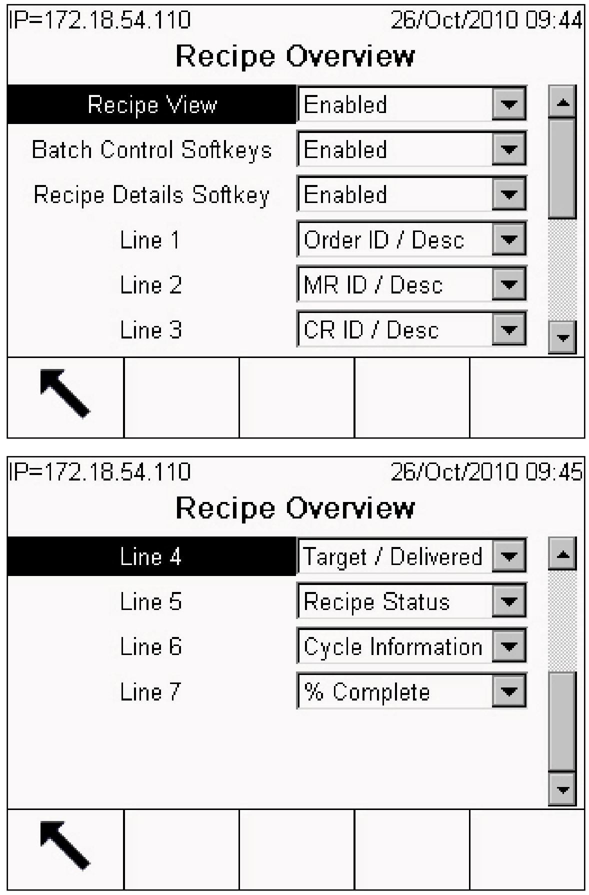


Figure 3-6: Recipe Overview

3.4.2.1.1. Recipe View

The **Recipe View** can be **Enabled** and **Disabled**. If it is disabled, the remaining options on this screen will have no effect, since the operator will not have access to any of the features they control.

3.4.2.1.2. Batch Control Softkeys, Recipe Details Softkey

The **Batch Control** and **Recipe Details** softkeys can be **Enabled** or **Disabled**. If Recipe View is Enabled, any enabled softkeys will be available to the operator.

3.4.2.1.3. Line1, 2, 3, 4, 5, 6, 7

Each of these drop-down lists offers the same 17 options. Table 3-1 details the effect of each selection on the displayed information, and notes the default selection for each Line number in the **Recipe Overview** screen.

Table 3-1: Recipe Overview Line Options

Option	Displayed Information	Default for Line:
None	Nothing displayed on this line	4
Order ID/Desc	Order ID number and Description	1
Order ID	Order ID number	
Order Desc	Order Description	
MR ID/Desc	Master Recipe ID number and Description	2
MR ID	Master Recipe ID number	
MR Desc	Master Recipe Description	
CR ID/Desc	Control Recipe ID number and Description	3
CR ID	Control Recipe ID number	
CR Desc	Control Recipe Description	
Target wt	Order target weight	
Delivered wt	Weight delivered for this order	
Target / Delivered	Comparison between target and delivered weights for this order	7
Recipe status	Status of current recipe phase	5
Cycle info	Batch number out of total number of batches (x / y)	
% complete	Number of steps currently complete divided by the total number of steps in the recipe, expressed as a percentage	6
Start/end T&D	Time and date stamps for the start and end of the batch execution of the order	

3.4.2.2. Recipe Details

The **Recipe Details** configuration screen controls information that appears in the **Recipe Details** screen when the operator presses the VIEW RECIPE DETAIL softkey .

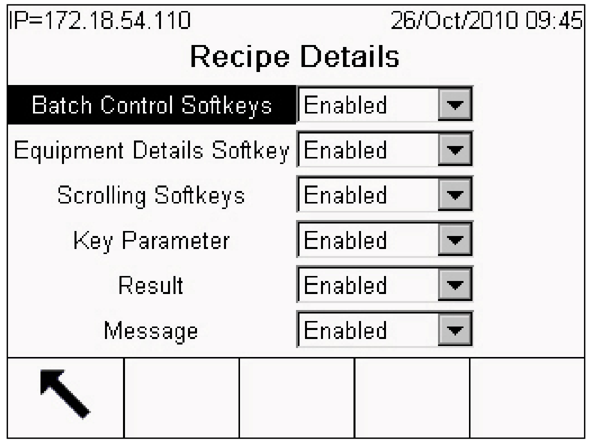


Figure 3-7: Recipe Details

3.4.2.2.1. Batch Control Softkeys, Equipment Details Softkey, Scrolling Softkeys

Each parameter can be **Enabled** or **Disabled**. Enabling one of these parameters causes the system to make the respective softkeys available to the operator.

3.4.2.2.2. Key Parameter

When **Enabled**, displays the key parameter column in the Recipe Details view. Key parameters vary depending on phase type, but include items such as target value and hold times.

3.4.2.2.3. Result

When **Enabled**, displays the result value column in the Recipe Details view. Results vary depending on phase type, but include values such as delivered weight or operator entries.

3.4.2.2.4. Message

When **Enabled**, displays the message column in the Recipe Details view. The message field can be used by the recipe to provide operator messages specific to the current phase.

3.4.3. System Views

3.4.3.1. Equipment View

The **Equipment View** configuration screen is used to determine which information and functions are available in the **Equipment View** screen that appears when the operator presses A3 .

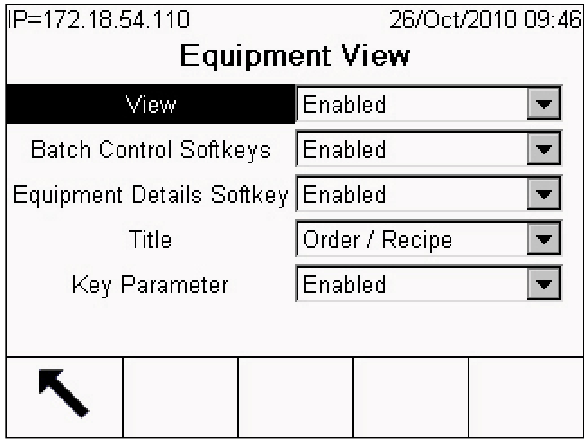


Figure 3-8: Equipment View

3.4.3.1.1. View

View can be **Enabled** or **Disabled**. If enabled, the operator can access the Equipment View screen.

3.4.3.1.2. Batch Control Softkeys

The **Batch Control Softkeys** can be **Enabled** or **Disabled**. If enabled, these softkeys will be available to the operator.

3.4.3.1.3. Equipment Details Softkey

The **Equipment Details Softkey** can be **Enabled** or **Disabled**. If enabled, the operator will be able to access the Equipment Details screen by pressing the softkey.

3.4.3.1.4. Title

Title sets the heading for the Equipment Details screen. Options are:

Disabled	**Order Only**
Order / Recipe / Batch#	**Recipe / Batch #**
Order / Batch #	**Recipe Only**
Order / Recipe	**Recipe w/ Target**

3.4.3.1.5. Key Parameter

Key Parameter can be **Enabled** or **Disabled**. The Key parameter is shown in addition to the phase status during batch execution. In the Equipment View, the Key Parameter is the target value.

3.4.3.2. Auto Material Transfer View

The **Auto Material Transfer View** configuration screen is accessed by pressing the EQUIPMENT DETAIL softkey . Settings on this screen determine the contents of the **Auto Material Transfer View** screen.

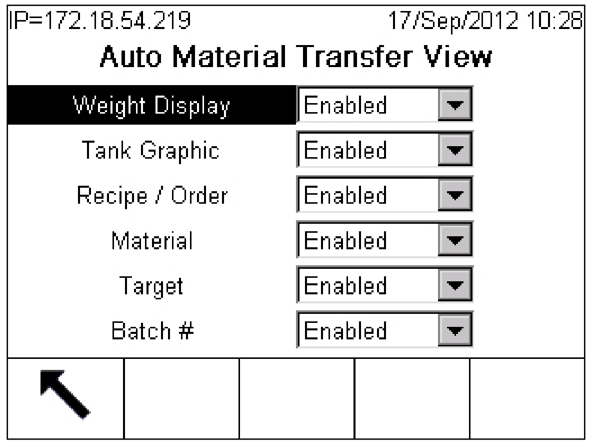


Figure 3-9: Auto Material Transfer View

3.4.3.2.1. Weight Display

When **Enabled**, the current weight value is displayed.

3.4.3.2.2. Tank Graphic

When **Enabled**, the tank graphic showing fill progress is displayed.

3.4.3.2.3. Recipe / Order

When **Enabled**, the Recipe and Order identifiers are displayed.

3.4.3.2.4. Material

When **Enabled**, the name of the material currently being fed is displayed.

3.4.3.2.5. Target

When **Enabled**, the target value for the current phase is displayed.

3.4.3.2.6. Batch

When **Enabled** the number of the current batch is displayed.

3.4.3.3. Manual Material Transfer View

The **Manual Material Transfer View** configuration screen is accessed by pressing the EQUIPMENT DETAIL softkey . Settings on this screen determine the contents of the **Manual Material Transfer View** screen.

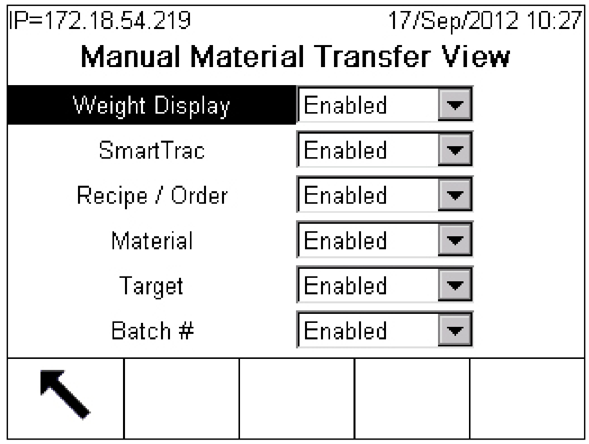


Figure 3-10: Manual Material Transfer View

3.4.3.3.1. Weight Display

When **Enabled**, the current weight value is displayed.

3.4.3.3.2. SmartTrac

When **Enabled**, the SmartTrac graphic (if enabled in the terminal's setup menu tree at Operation > Target > Scale, and configured at Terminal > Display) is displayed.

3.4.3.3.3. Recipe / Order

When **Enabled**, the recipe and order identifiers are displayed.

3.4.3.3.4. Material

When **Enabled**, the name of the material currently being fed is displayed.

3.4.3.3.5. Target

When **Enabled**, the target value for the current phase is displayed.

3.4.3.3.6. Batch #

When **Enabled** the number of the current batch is displayed.

3.5. Security

The Security screen configures access to the batching system controls, depending on login level.

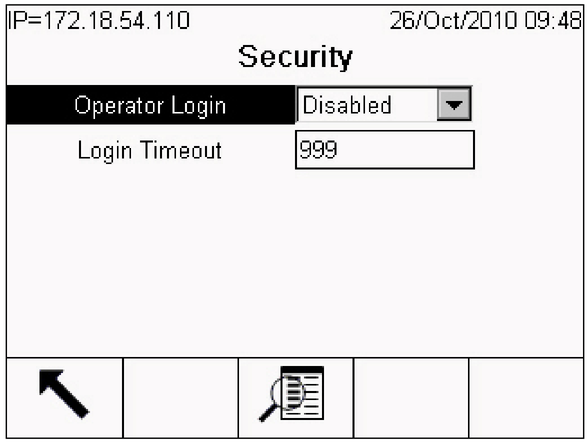


Figure 3-11: Security

3.5.1.1.1. Operator Login

The **Operator Login** parameter can be **Enabled** or **Disabled**. If it is enabled, the operator must log in to the system in order to run orders. If it is disabled, any user will be able to run the system, with no constraints on access to functions.

3.5.1.1.2. Login Timeout

The **Login Timeout** parameter sets the period of inactivity, in minutes, before which the system will automatically log out any currently logged-in user and display a pop-up message indicating the logged-out condition.

- There must be a valid log-in for any operation to be carried out.

3.5.1.2. Access Level Configuration

The View softkey opens the Access Level configuration screen shown in Figure 3-12. Use the terminal's arrow keys to scroll down to the second set of access parameters.

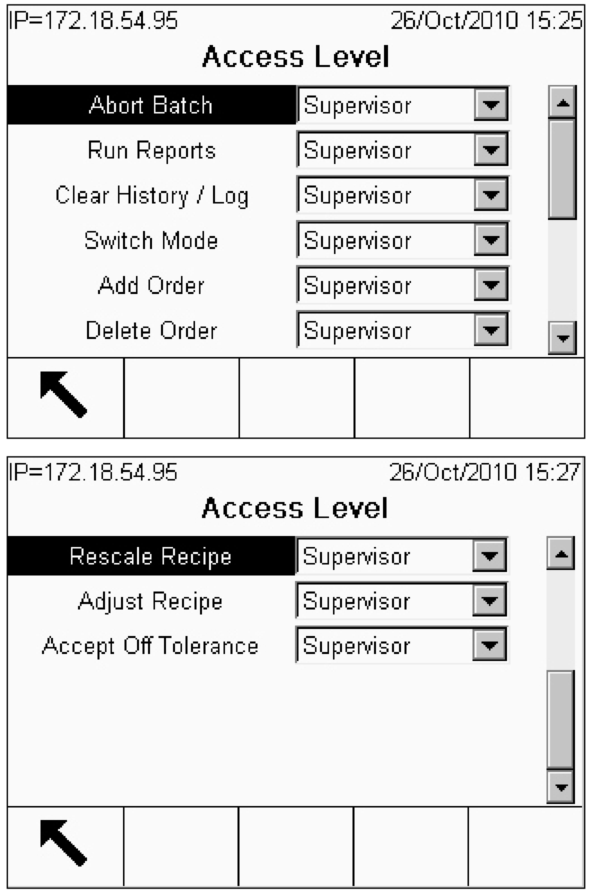


Figure 3-12: Access Level Screens

From these screens, access to specific functions of the system can be set for each different login level – **Operator**, **Supervisor**, **Maintenance** and **Administrator**.

An **Operator** has the lowest level of access. **Supervisor** and **Maintenance** users can access everything available to an operator, with additions relating to their respective functions. An **Administrator**-level login will give access to all features and functions.

Login access can be set for each of the items detailed in Table 3-2.

- Whatever access level setting is in force, the user always has access to the RUN , PAUSE and PARK softkeys.

Table 3-2: Access to Functions

Function	Explanation
Abort Batch	Abort a running batch
Run Reports	View or print reports

Function	Explanation
Clear History / Log	Clear history and log records
Switch Mode	Change mode between Automatic, Semi-Automatic and Manual
Add Order	Add a new order to the list
Delete Order	Delete an existing order from the list
Rescale Recipe	Modify the size of a recipe, if so configured
Edit Recipe Targets	Permits editing of recipe targets – refer to page 3-5
Accept Off Tolerance	Permit a batch to complete when the result of the current phase is outside target tolerance. In the case of multiple batches of the same recipe, the out-of-tolerance value must be accepted every time it is encountered

3.6. IND780batch Security and Users

When security is enabled, Users must be specified in the terminal. There are four types of User, each with specific access rights: Administrator, Supervisor, Maintenance, or Operator level.

Administrator An Administrator account has unlimited access to all areas of the operating and setup system. There can be multiple Administrator accounts. A Primary Administrator account exists by default, and it can be modified but not deleted. This Primary Administrator account is configured at the factory, without a password, so that no login or password is required to enter the setup mode. All functions of the terminal are available to all users until a password for the Primary Administrator account is set up.

Maintenance Access is generally the same as the Administrator level, with the exception of access to metrologically significant areas of the setup.

Supervisor Access is generally limited to editing tables and setting time and date.

Operator One default operator account is provided. Sites with validation requirements might create many operator accounts, each with a username and password entry requirement. The Operator-class of security is the most restrictive, allowing the user to use and view, but not change, records within tables.

3.6.1. Users

The IND780 terminal is configured at the factory with two usernames: "admin" and "anonymous". Neither of these is configured with a password. Without passwords, there will be no security challenge for entering setup and making changes. Once a password has been set up for the "admin" user, entry to setup will require a valid login. These two default usernames can be modified by the addition of passwords, but they cannot be deleted. All functions of the terminal will be available to all users until a password is entered.

- **Important**: To allow easy login and logout, Login and Logout softkeys should be configured to appear in the home screen, accessed by the A4 application key. To add these two icons, refer to the directions that follow in this document.

3.6.1.1. Modifying Users

1. To access Users, enter Setup and navigate to **Terminal > Users.**

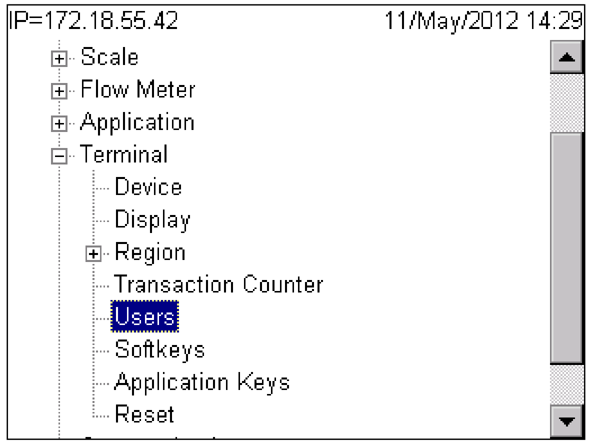


Figure 3-13: Users Branch of Terminal Menu Tree

2. With the Users branch highlighted, press ENTER to access the Users setup screen.

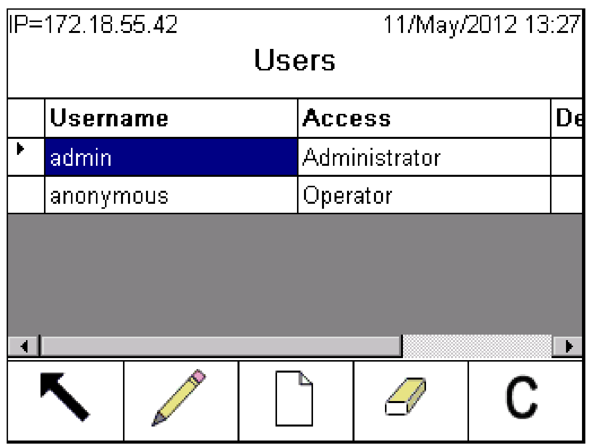


Figure 3-14: Users Setup Screen

To modify and/or enter a password for an existing username:

1. Move focus to the username to be edited.

2. Press the EDIT softkey to access the Users Edit screen.

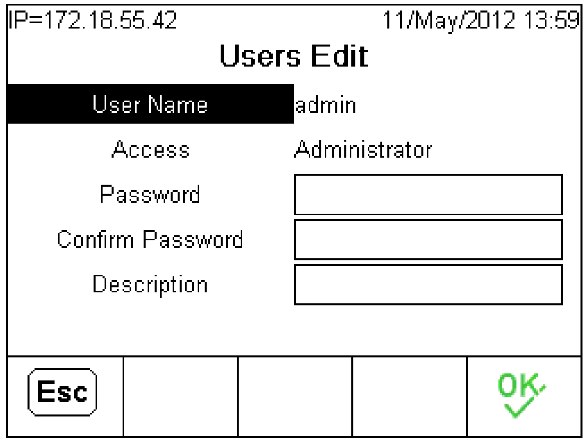


Figure 3-15: User Configuration Screen

3. Use the DOWN navigation key to highlight the Password field. Press ENTER to access the field.
4. Enter the desired password, then repeat the process in the Confirm Password field.

- Note: Passwords are case-sensitive. All numbers and all characters available in the alpha keys are valid for use in passwords. Be sure to store a record of the password in a safe place. Without the correct password access to the setup menu will not be possible.

5. Press the OK softkey OK to accept the password as entered.
6. Press the ESCAPE softkey Esc to exit without saving the password.
7. Press the DELETE softkey to delete a username from the table on the Users screen. Usernames "admin" and "anonymous" cannot be deleted.
8. Press the CLEAR softkey C to restore the factory default setting, which deletes all users except the “admin” and “anonymous” users and restores the passwords to null.

3.6.1.2. Adding User Names and Passwords

To enter a new username and password:

1. Press the NEW softkey to access the User Edit screen.

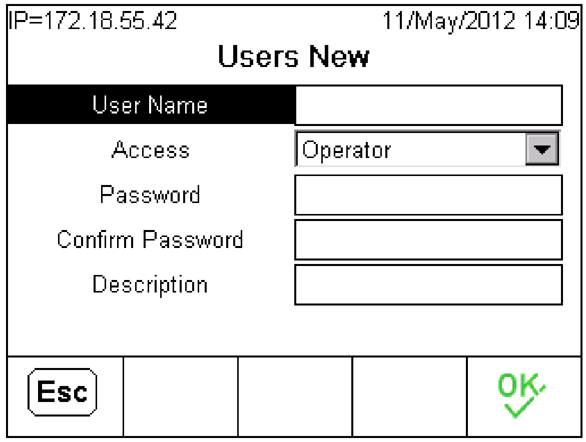


Figure 3-16: User Creation Screen

2. Use the alphanumeric keys to enter the desired username in the Username field.
3. Use the Access selection box to assign the appropriate access level to the user. The following Access levels are detailed above as well as in the IND780 Technical Manual if additional information is required.

    Administrator

    Maintenance

    Supervisor

    Operator

4. Press the DOWN navigation key to access the Password and Confirm Password fields.
5. Use the alphanumeric keys to enter the desired password in the Password and Confirm Password fields.
6. In the Description Field you can add a description for the user if you wish.
7. Press the OK softkey to accept the username and password as entered.
8. Press the ESCAPE softkey Esc to exit without saving the username and password.

3.6.1.3. Adding Login and Logout Softkeys

Once security is enabled and Users have been added to the terminal, the Login and Logout softkeys must be added to the home screen, to enable users to log into and log out from the terminal.

1. First press the A4 softkey to access the home screen.

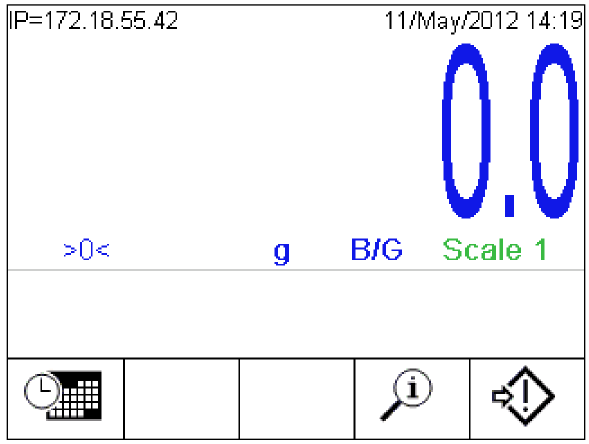


Figure 3-17: Home Screen

2. Press the Setup softkey to access terminal setup.

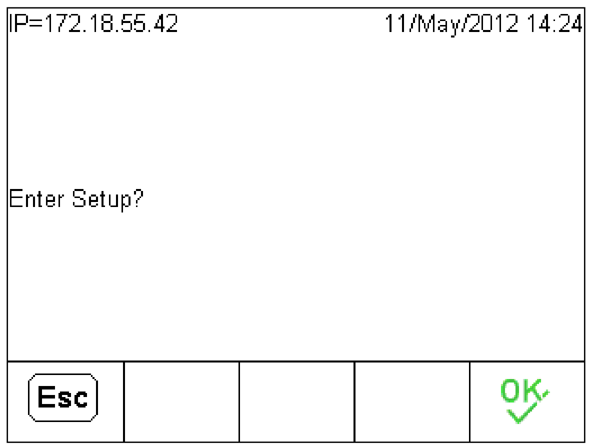


Figure 3-18: Setup Entry Confirmation Screen

3. Press the OK softkey to enter setup.

4. In setup, use the down and right arrow keys to navigate to **Terminal > Softkeys**.

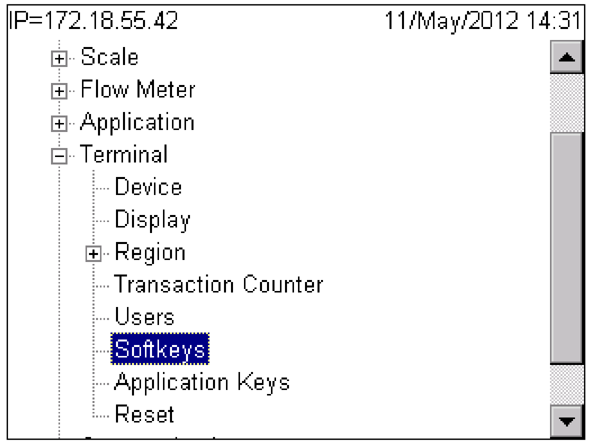


Figure 3-19: Softkeys Branch of Terminal Menu Tree

5. Press ENTER to access the softkeys setup screen.

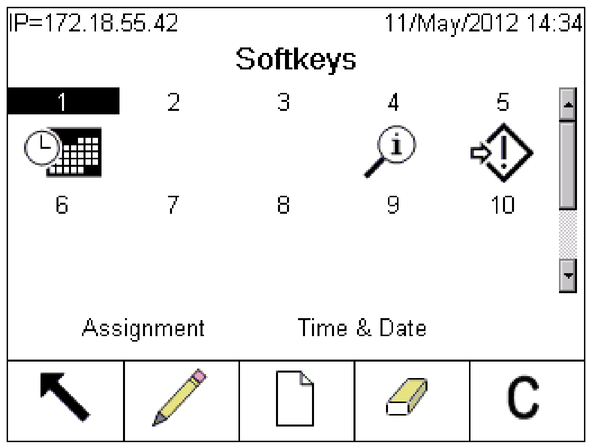


Figure 3-20: Softkey Assignment Screen

The **Edit** softkey allows the current softkey assignment to be modified.

The **New** softkey adds a new softkey assignment in at the highlighted softkey position.

The **Delete** softkey deletes the selected softkey assignment

The **Clear** softkey will reset all softkey assignments to default setting. This retains only the Info and Setup softkeys in their current positions.

6. To add the Login Softkey, move the focus to position 2 and press New .

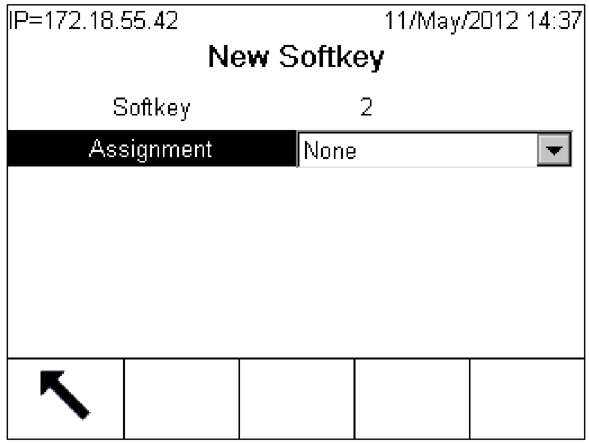


Figure 3-21: New Softkey Configuration Screen

7. Press ENTER and scroll down to find the Login softkey assignment.

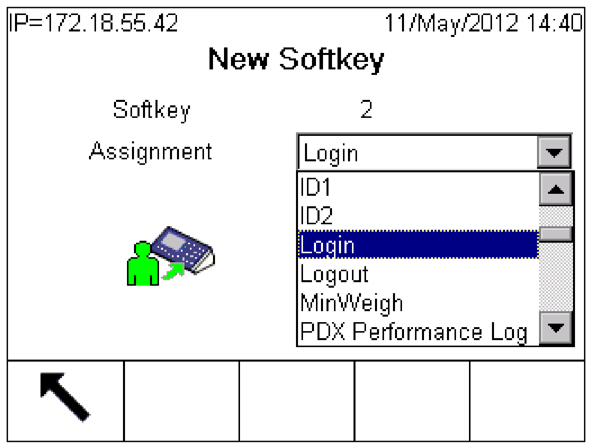


Figure 3-22: Softkey Assignment Drop-Down List

8. Press ENTER to accept this softkey assignment and press the BACK softkey to return to the Softkeys screen.

9. Repeat the process to assign the Logout softkey in position 3.

Security is now ready for use in your IND780batch terminal. In order to perform any function in the IND780batch, a user must first log in. If a user attempts to make a change or perform an action that their access level does not permit, an error will appear, resembling one of the messages shown below.

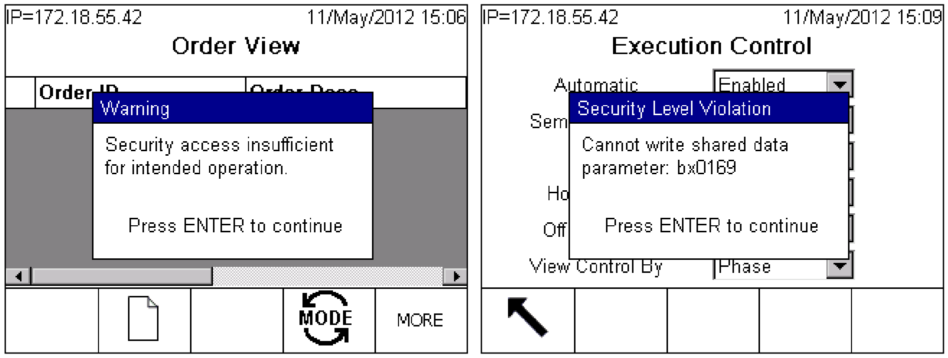


Figure 3-23: Access Error Examples

When a message of this type is displayed, a user with the appropriate access rights must log in to make the change or perform the operation.

3.7. Auto Print & Log

This screen controls the output of data to print and log after each batch is completed.

3.7.1. Configuration for Printing

The appropriate connections must be configured in setup at Communication > Connections, in order for the data to be directed correctly.

- To print Audit Trail and Batch Details, a **serial connection** must be configured.
- To print Batch Transaction and Summary Reports, a **Demand Output** must be configured, with the **Trigger** set to **Batch**.

For further details, refer to the **IND780 Technical Manual**.

3.7.2. Auto Print & Log Configuration

The first two parameters in this screen control print functions, and the second two determine what data is logged.

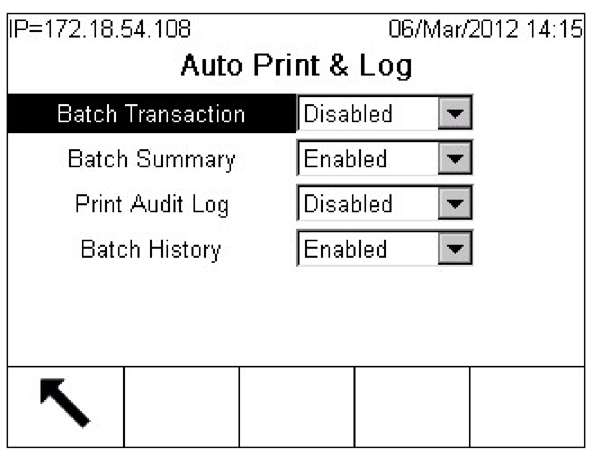


Figure 3-24: Auto Print & Log

3.7.2.1.1. Batch Transaction

When **Batch Transaction** is **Enabled**, data is automatically printed (or output to a file) after each recipe phase.

```
BATCH TRANSACTIONS
-----------------------------------
EM MAT Twt Dwt
1 Material 1 200 kg 200.7 kg
1 Material 2 200 kg 200.9 kg
1 Material 3 200 kg 201.3 kg
```

Figure 3-25: Example of Batch Transaction Output

3.7.2.1.2. Batch Summary

When **Batch Summary** is **Enabled**, sequence and total data are printed upon completion of the batch.

```
----------------------------------------
BATCH SUMMARY REPORT
----------------------------------------
Batch ID = 727100000b0001IN
Batch Order=98765432 1/1
Recipe ID = 72711
Rec Name = Manual Demo
Rescale = 100%
ST=2011/07/26 09:23:10
ET=2011/07/26 09:26:36
Target Weight=600 kg
Delivered Weight=606.300 kg
%err = 1.05
```

Figure 3-26: Example of Batch Summary Output

3.7.2.1.3. Print Audit Log

When **Print Audit Log** is disabled, the Audit Log is written to the Compact Flash card.

When **Print Audit Log** is enabled, the Audit Log is written to the Compact Flash card and to the configured LPRINT device.

This log records all changes made at the terminal. When the terminal containing the log is connected to the BatchTool, a project using that terminal can connect and read the contents of this log.

3.7.2.1.4. Batch History

When **Batch History** is enabled, phase execution records are logged. When the terminal containing the history is connected to the BatchTool, a project using that terminal can connect and read the contents of the history.

- The BatchTool will clear the terminal's Batch History and Audit Log information once it has successfully read in these files.

3.8. System List

The System List screens are read-only. They show all the elements configured for the batching system, and are used to confirm the configuration downloaded from the PC Tool.

The lists show Equipment Modules (EMs), their associated Control Modules (CMs), the Material Paths (MPs) that use them, and the Recipes constructed from these elements.

3.8.1. Equipment Module

The **Equipment Module** list shows the ID number, type and description of each EM configured for the batching system.

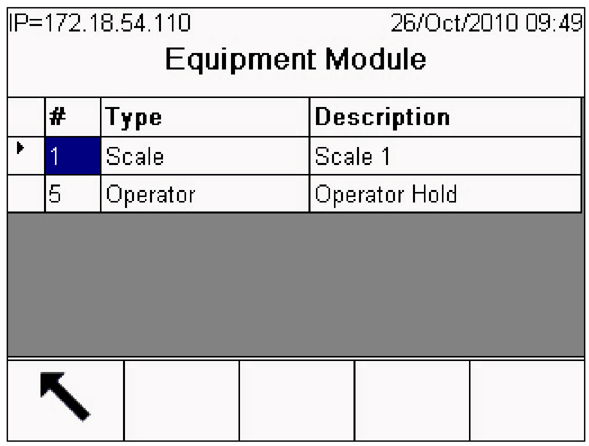


Figure 3-27: Equipment Module

3.8.2. Control Module

The **Control Module** list shows the ID number, type and description of each CM configured for the batching system.

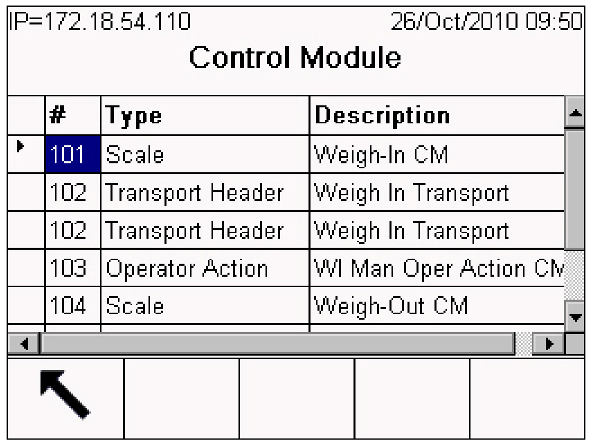
CM ID numbers are formatted as follows:

xyy

where

x = scale number (1-4) *or* operator action number (5-8)

yy = 01-10 (for scale CMs) *or* 11-13 (for operator action CMs)


IP=172.18.54.110 26/Oct/2010 09:50

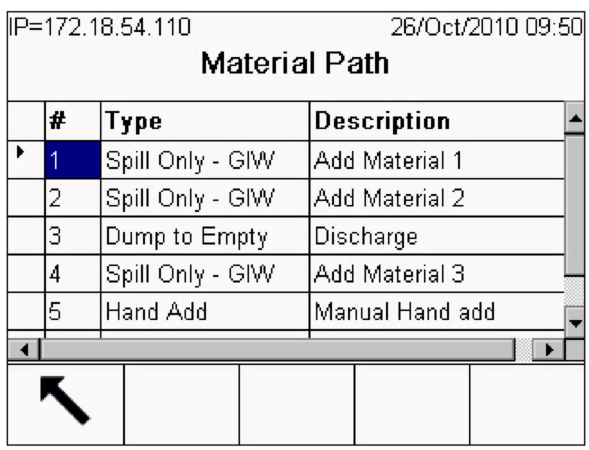
Control Module

#	Type	Description
101	Scale	Weigh-In CM
102	Transport Header	Weigh In Transport
102	Transport Header	Weigh In Transport
103	Operator Action	WI Man Oper Action CM
104	Scale	Weigh-Out CM

Figure 3-28: Control Module

3.8.3. Material Path

The **Material Path** list shows the ID number, type and description of each MP configured for the batching system.


IP=172.18.54.110 26/Oct/2010 09:50

Material Path

#	Type	Description
1	Spill Only - GIW	Add Material 1
2	Spill Only - GIW	Add Material 2
3	Dump to Empty	Discharge
4	Spill Only - GIW	Add Material 3
5	Hand Add	Manual Hand add

Figure 3-29: Material Path

3.8.4. Recipe

The **Recipe** list shows basic information for each configured recipe:

- ID
- description
- target weight
- author
- creation date and time
- version number

Use the terminal's arrow keys to scroll right and view the additional columns of data.

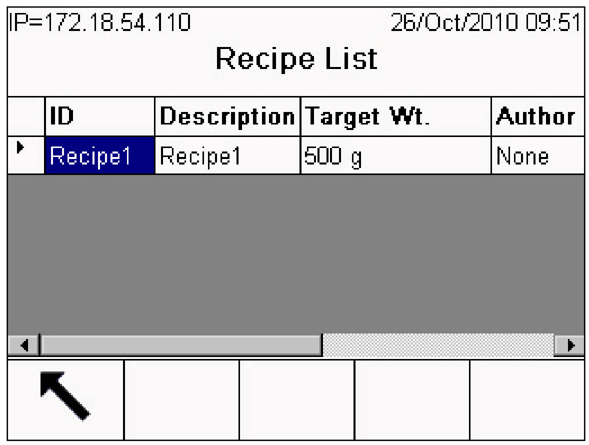


Figure 3-30: Recipe List

3.9. Flow Meter Setup in IND780batch Terminal

3.9.1.1. Configuration Overview

- The Flow Meter Option Board hardware is described in Appendix E, **Flow Meter Interface**.

If the IND780 terminal is equipped with a Flow Meter Option Board (64068605), the Setup menu tree will display a new branch called "Flow Meter. Flow Meter Option board settings are configured here.

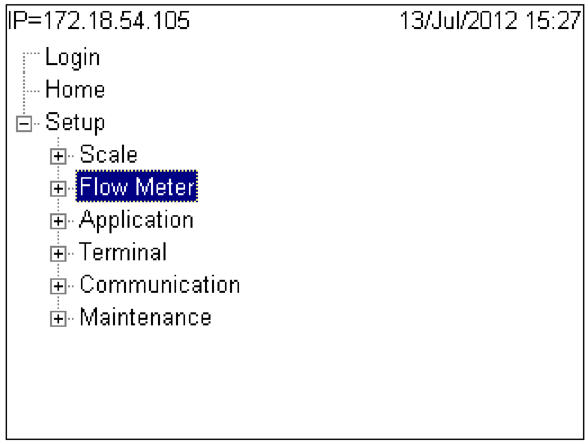


Figure 3-31: Flow Meter Branch in Setup Menu Tree

Press RIGHT arrow key to expand the tree and view the Channel Configuration branches.

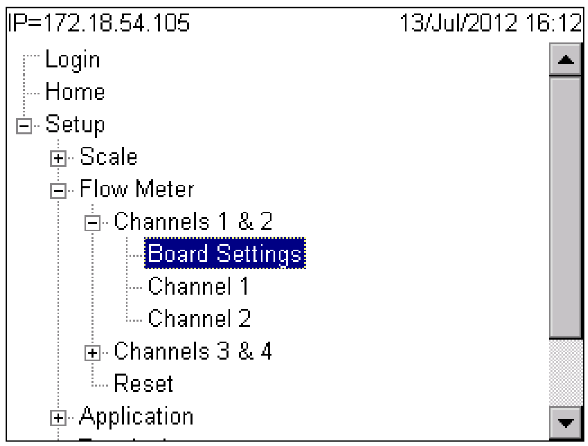


Figure 3-32: Board Settings Branch in Flow Meter Setup Menu

3.9.2. Board Settings

A Board Settings screen is shown in Figure 3-33.

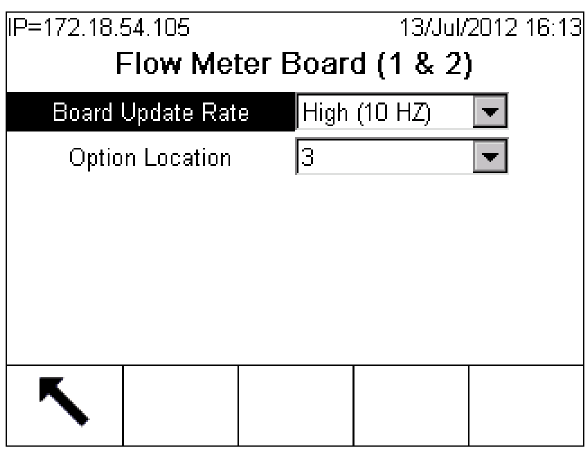


Figure 3-33: Board Settings Screen

Board Update Rate The name "Board Update Rate" can be confusing. It is **not** the update rate of the flow meter information; it is the **update rate of the IND780 LCD display**. The flow meter board can accept up to 50,000 pulses per second from the flow meter itself.

Option Location Defines the Option card slot location where the Flow Meter Option board is nstalled in the IND780. In the example shown in Figure 3-33i, the Flow Meter Option board for channels 1 & 2 is installed in slot 3. **Please Note: When this value is modified, as soon as the EXIT softkey ↖ is pressed, the terminal will restart to write the changes to its internal memory. This restart is normal.**

3.9.2.1. Channel 1 Configuration

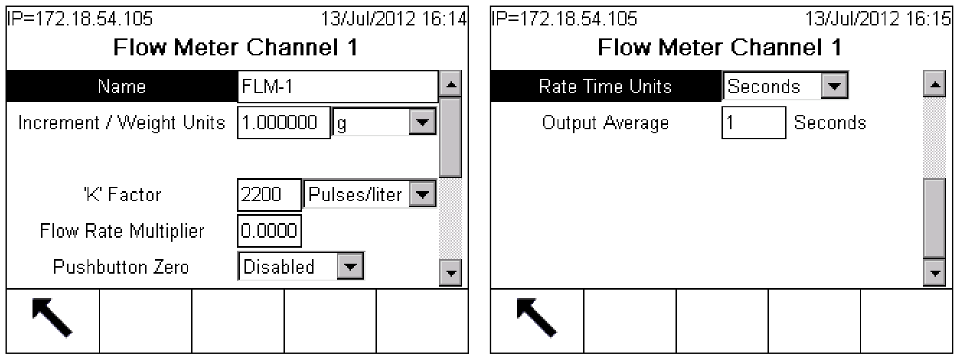


Figure 3-34: Flow Meter Channel Configuration Screen

Each flow meter board has two channels, and an IND780batch terminal can be configured with any combination of scale and flow meter channels up to a maximum of four. If only one flow meter channel is used on a flow meter option board, it is only necessary to configure the channel in use.

3.9.2.1.1. Name

Enter a name to identify the Flow Meter channel.

3.9.2.1.2. Increment/Weight Units

Select the increments and units to be used by the flow meter card. Specify the required increment size just as for a scale. Take care with the selected size – just as one count per division is required in a scale base, the flow meter channel needs **at least one pulse per increment** to make the increment valid.

If too small an increment is selected, the IND780 will display a "Calibration Error" message. In the example below, an increment of 1g is correct, while 0.1g is not.

Example

The increment value can be calculated easily. The key is that the IND780 uses the density of water to calculate weight from liters. 1 liter of water weighs 1000g, and 1 gallon of water weighs 8.34 Lbs.

Thus, if the flow meter provides 2,200 pulses per liter, this can be understood as 2,200pulses per 1,000g. If I want to choose an increment size of 0.1g then we solve the equation

$$\frac{2{,}200 \text{ pulses}}{1{,}000\text{g}} = \frac{X}{0.1\text{g}}$$

If 1,000g of water produces 2,200 pulses, we can calculate how many pulses will be produced by 0.1g:

$$x = \frac{0.1 \text{ x } 2{,}200 \text{ pulses}}{1{,}000\text{g}} = .22 \text{ pulses per increment}$$

This increment cannot work, because there is **less than 1 pulse per increment**. A similar equation shows that **1g is a usable increment**:

$$x = \frac{1.0 \text{ x } 2{,}200 \text{ pulses}}{1{,}000\text{g}} = 2.2 \text{ pulses per increment}$$

This increment value works because there is **at least one** pulse per increment.

Note that the increment can be expressed as any of a number of units:

- None – disables the flow meter channel
- lb
- kg
- g
- t (metric ton)
- ton (short ton)
- oz (weight oz., not fluid oz.)
- Custom (can be any unit not defined here, such as feet, meters, revolutions, etc.) Note that when a custom increment is selected, the K Factor will only display pulses/unit. Because the increment is a custom unit, the K Factor is now also a custom unit) When Custom is selected, an additional box will appear, where the name of the unit is entered. This field (Figure 3-34) is limited to 3 characters.

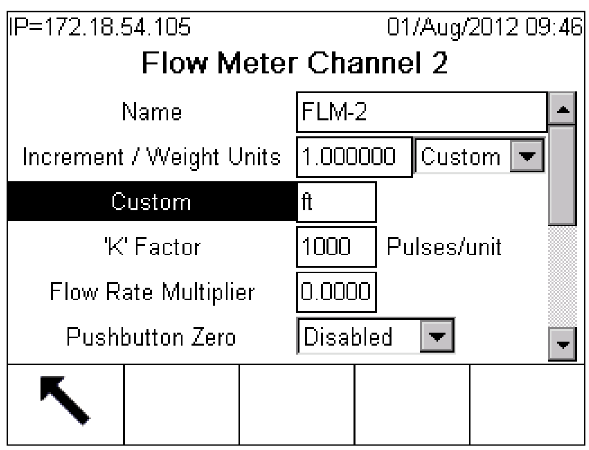


Figure 3-35: Flow Meter Channel Configuration Screen

3.9.2.1.3. ‘K’ Factor

The **K Factor** specifies how many pulses from the flow meter will yield a certain volume or weight value. The K Factor value is always provided by the flow meter manufacturer on the flow meter data sheet. It is typically given in Pulses per Liter or Pulses per Gallon, but could also be in Pulses per gram, or some other weight unit. For every liter of material passing through the flow meter, the meter provides a fixed number of pulses. In the IND780batch terminal, it is only necessary to enter the number of pulses and select pulses/liter. The terminal automatically calculates the equivalent weight of 1 liter of material. In this example the weight is in grams.

Figure 3-36 shows a chart from an Omega flow meter data sheet. It references the FTB2004 Flow Meter which gives 2200 pulses/liter. This chart was used to get the K Factor used in the examples used here.

Part Numbers	Flow Ranges				Pulses		
	Normal		Extended				Frequency
3/8" NPT	GPM	LPM	GPM	LPM	Per Gallons	Per Liters	Output
FTB2001	.13-1.3	.5-5	.07-2.6	.25-10	26100	6900	58-575 Hz
FTB2002	.26-2.6	1-10	.07-2.6	.25-10	12500	3300	55-550 Hz
FTB2003	.26-4	1-15	.07-4	.25-15	17400	4600	76-1150 Hz
FTB2004	.26-4	1-15	.07-5.3	.25-20	8300	2200	37-550 Hz
FTB2005	.53-7.9	2-30	.13-7.9	.5-30	3800	1000	33-500 Hz

Figure 3-36: Example of K Factor Chart for a Flow Meter

Use the chart provided with your flow meter to find the correct factor. In this example, enter **2200** for the **K Factor** and then enter **Pulses/liter** for the unit. Options are Pulses/liter, Pulses/cc, Pulses/gal, Pulses/fl.oz, Pulses/lb, Pulses/kg, Pulses/g, and Pulses/oz. The IND780 will automatically calculate the correct weight value as the material is filled.

3.9.2.1.4. Flow Rate Multiplier

This parameter provides a means to adjust the density of materials other than water. If the material is water, set the Flow Rate Multiplier to"0.000" to disable the multiplier. If the material is not water, then the Flow Rate Multiplier provides a correction factor for the new material density.

This example shows how to use the Flow Rate Multiplier for a material other than water:

$$\text{Pulses/g} = \frac{2{,}200 \text{ pulses}}{1 \text{ Liter}} \times \frac{1 \text{ Liter}}{1{,}000\text{g}} \times \text{Flow Rate Multiplier}$$

If the **Flow Rate Multiplier** is set to anything other than "0.000", it is enabled and the calculation above is used. The flow rate multiplier applies a correction factor which is a ratio of the density of the material to the density of water. For example if you are filling isopropyl alcohol the density of this material is 1Liter/785.40g. Since the water calculation is always in the equation the Flow Rate Multiplier has to be calculated as 1000g/785.40g.

$$\text{Pulses/g} = \frac{2{,}200 \text{ pulses}}{1 \text{ Liter}} \times \frac{1 \text{ Liter}}{1{,}000\text{g}} \times \frac{1{,}000\text{g}}{785.40} = 2.8$$

So 2.8 pulses = 1 gram of isopropyl alcohol, compared to 2.2 pulses for 1 gram of water.

If **Pushbutton Zero** is enabled, the user can reset the pulse count to zero by pressing the ZERO  key on the IND780. Otherwise, the IND780batch will reset the pulse to zero at the start of the next feed for the selected flow meter.

The **Rate Time Units** should be set to "Seconds" and the **Output Average** should be "1".

4 Parts and Accessories

For a list of parts and accessories for the standard IND780, please refer to Chapter 5, Parts and Accessories, of the **IND780 User's Guide** or **Technical Manual**.

The following IND780batch-specific items are available for purchase from METTLER TOLEDO:

Description	Part Number
Batch Manual Application Pac	64083593
Batch Automatic	64083595
Batch Automatic with 1 License Q.iMPACT	64083596
Batch Automatic with 2 Licenses Q.iMPACT	64083597
Batch Automatic with 3 Licenses Q.iMPACT	64083598
Batch Automatic with 4 Licenses Q.iMPACT	64083599

5 Configuration Tool Guide: Introduction

5.1. Overview

The BatchTool 780 is the main method of configuring and programming the IND780batch system before operation. It is also used to create, store and download master recipes and orders; to archive batch history data; and to generate complex reports.

This document describes the use of the Tool, and explains the function of each element of the interface.

System configurations can be created and stored outside the IND780 terminal. The PC tool also allows batch history data to be archived. A live connection to the IND780batch terminal is only required during setup, and for subsequent data retrieval.

IMPORTANT NOTE
Due to changes in the database structure older versions of BatchTool 780 are only compatible with older IND780batch firmware: Firmware 7.1.xx or older – must use BatchTool 780 version 1.1.07 Firmware 7.2.xx or newer – must use BatchTool 780 version 1.2.xx Firmware 7.3.xx or newer – must use BatchTool 780 version 1.3.xx

5.2. General Configuration Sequence

The components of a batching system must be configured in sequence. To simplify the configuration process, the tool incorporates this sequence in its structure, and provides initial working default settings.

5.2.1. Hardware Setup

In general, the physical elements of the batching system must be set up in the following sequence:

1. **Terminal** – parameters such as name, units, address.
2. **Equipment Modules** (EMs) – set up a functional grouping of equipment (e.g. a scale) to carry out processing activities.

3. **Control Modules** (CMs) – determine how the EMs will be used (e.g. for weigh-out measurements).

4. **Material Paths** – set up the control of material flow using the EMs and CMs configured in Chapter 9, **Equipment and Control Modules**.

5.2.2. Batch Configuration

Once the physical system is defined using the steps above, the batch system can be configured for use.

A **Master Recipe** is created using the defined hardware components. Master Recipes can contain up to 99 steps, including both automatic and manual sequences.

Once a recipe has been defined, an **Order** can be created. Orders transform the master recipe into a control recipe that can actually run a batch.

5.2.3. Reports

The tool can generate three types of report:

- Reports describing the system's hardware and recipe configurations
- Reports including order, batch and material consumption information, and other statistics
- Reports to provide an audit trail which can include lot tracking, action, change and error logs, and a tool change log.

5.2.4. History

Batch histories of various kinds can be exported or printed. By default, these include:

- A general batch history report
- A report including only completed batches
- A report including only failed batches

Custom reports can also be created.

6 Configuration Tool Guide: Installation and Initial Setup

6.1. Installing BatchTool 780

By default, the BatchTool 780 PC Configuration Tool installs in the Program Files folder of the host PC:

C:\Program Files\Mettler Toledo\780Batch Tool

The program itself requires less than 3.5 MB of hard disk space. Configuration and recipe files can be saved to and read from a user-defined location.

6.2. Features of the Interface

Figure 6-1 shows the PC Configuration Tool interface connected to a terminal (BH-1) and with a project (Demo) read from the terminal.

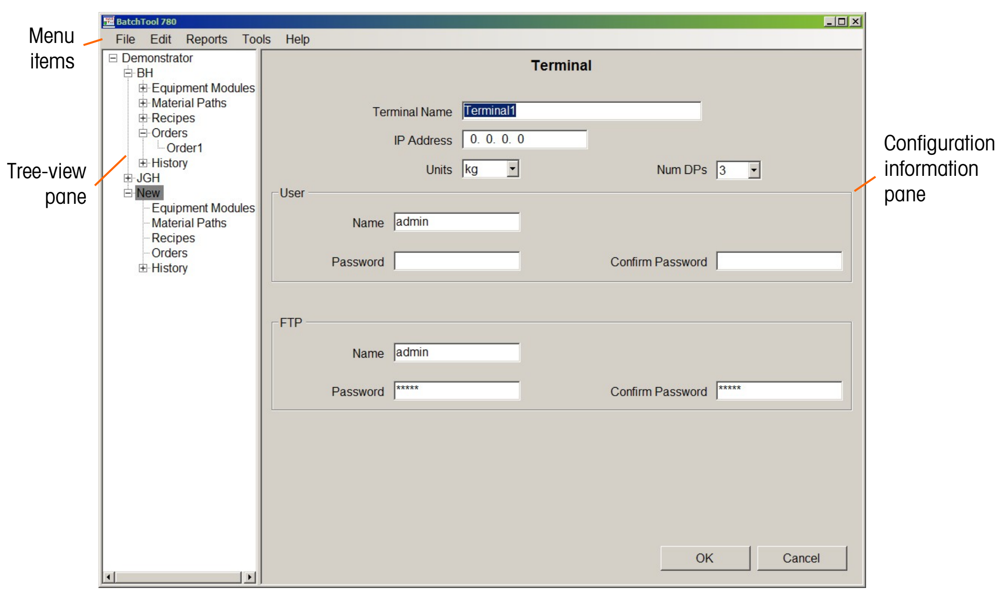


Figure 6-1: PC Tool Interface Layout

The PC Tool interface consists of three main components:

- A menu bar at top

- A tree-view pane at left
- A configuration information pane at right

6.2.1. Menus

- Menus include **File**, **Edit**, **Reports**, **Tools** and **Help**.

The **File** menu is used for initial log-in to the tool, and for management of project files, which can be opened, created, deleted and closed.

The **Edit** menu is used to create or delete tree elements such as Equipment Modules and Material Paths. Configurations can also be imported from a file and exported to a file using this menu – a browser dialog allows the user to choose the file location from with to read or to which to write the data. If an item in the tree-view pane is selected (in focus), selecting Export or Import will only write or read configuration data for that item.

The **Reports** menu allows the generation of Configuration, Production and Audit Trail reports. Selecting one of the items in this menu opens a print dialog. Reports can be output to any connected printer, including Adobe Acrobat.

The **Tools** menu gives access to configuration screens general system settings are managed.

6.2.2. Tree-View

The tree-view pane provides a graphical representation of all configured Equiment Modules, Material Paths, Recipes and Orders, and also includes a History branch that can be expanded to access a variety of types of report.

Each main item in the tree-view can be expanded or contracted.

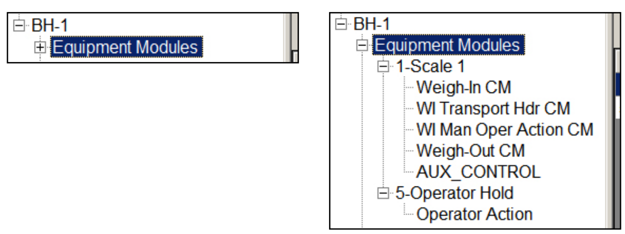


Figure 6-2: Tree Item Contracted (left) and Expanded (right)

- Note that the Tool's window has a default minimum size, which can be increased in order to display all its contents properly. The width of the tree-view pane can also be adjusted as necessary by clicking and dragging on its right edge ( ).

6.2.2.1. Tree-View Context Menu

Right-clicking on a tree item will display a context menu offering a variety of options, depending on the type of item selected.

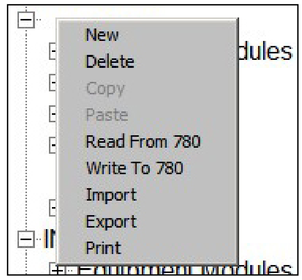


Figure 6-3: Tree Item Context Menu

NOTICE
WHEN A RECIPE IS READ FROM AN IND780BATCH TERMINAL, THE UNITS CONFIGURED IN THE TERMINAL SCREEN OF THE BATCHTOOL 780 WILL OVERRIDE THE RECIPE UNITS SET ORIGINALLY IN THE TERMINAL. BEFORE READING FROM THE TERMINAL, ENSURE THAT THE UNITS SET IN EACH PLACE MATCH.

Table 6-1: Context Menus by Tree-View Item

Tree Item	New	Delete	Copy	Paste	Read from 780	Write to 780	Import	Export	Print
Project	x	x			x	x	x	x	x
Equipment Modules	x	x		x	x	x	x	x	x
Equipment Module	x	x	x						x
Control Module		x	x						
Material Paths	x			x	x	x	x	x	x
Material Path		x	x						
Recipes	x			x	x	x	x	x	x
Recipe		x	x						x
Orders	x					x			x
History	n/a								

When **Project** is in focus, selecting any of the Read, Write, Import or Export items will apply to all components of the project. When an item within the project, such as a Material Path, is selected, only the data relating to that item will be read, written, imported or exported.

When Reading from a terminal, a prompt will appear warning if an existing item will be overwritten, and asking for confirmation:

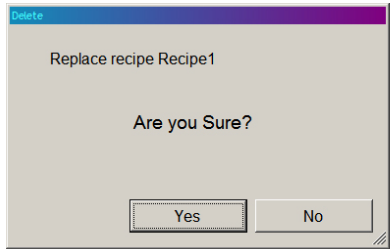


Figure 6-4: Read from 780 Over-Write Warning

The **Copy/Paste** functions make it easy to replicate complete EMs, MPs and Recipes, or items within them, complete with the settings already configured for the copied item.

6.2.3. Configuration information

The contents of the configuration information pane vary depending on which item in the tree-view is selected. Some configuration displays include multiple tabs (e.g. **Users** and **Permissions**, in Figure 6-6) to accommodate different types of data, or to distinguish between **Basic** and **Advanced** settings.

Some configuration displays (e.g. Figure 11-1) include a 'more' button (). Click this button to display a pop-up screen (e.g. Figure 11-3) for additional data entry.

6.3. Tools

The Tools menu includes the following items:

- Users
- Configuration
- History Management
- Data Management

6.3.1. Users

The PC tool permits the creation of user IDs with a variety of levels of access to batch system configuration and functions. Each ID can be created either as an Administrator or a User. Access **Tools | User Admin** from the PC Tool's file menu.

- The users configured here are not related or connected to users configured in the IND780batch terminal's setup screens. Access applies only to users of the BatchTool 780.

The User Information dialog has two tabs – User and Permission. The User tab permits the User ID to be associated with a user's name and a password:

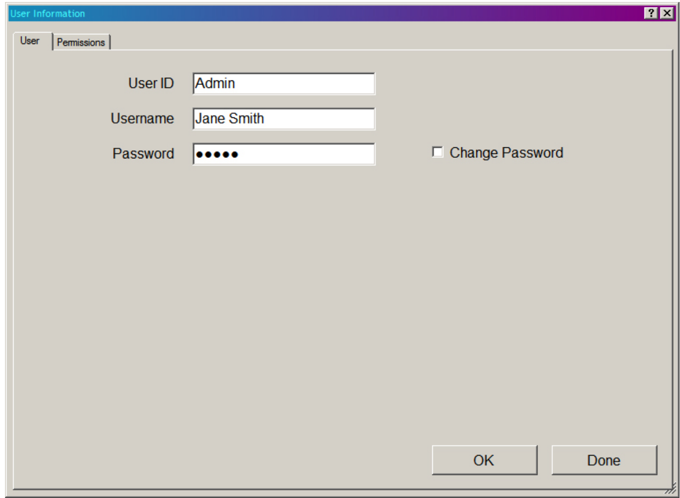


Figure 6-5: User Information, User Tab

The first user ID created must be an Administrator. On the Permissions tab, the Administrator/User option is grayed and inaccessible:

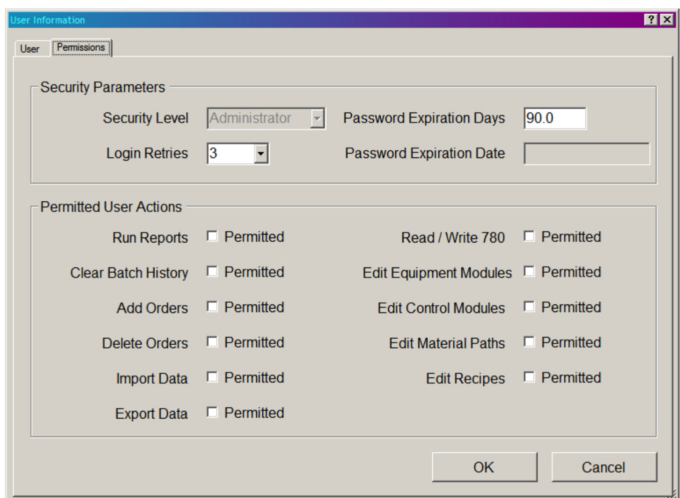


Figure 6-6: Creating the Initial Administrator, Permissions Tab

To ensure continued system security, a password expiration can be set. The default value is 90 days, but the system will accept values between 3 and 9,999 days. The number of failed logins permitted can be set to 2, 3 or 4 attempts. Once the maximum number of attempts has been made, the system prevents access, requiring an administrator to modify the user's password, or to reset the number of login retries for that user.

Checkboxes beside items in the **Permitted User Actions** section determine the degree of access granted to this user or administrator. The options are the same regardless of the type of user, permitting maximum flexibility in defining basic and more advanced users, for example.

Once the Administrator exists, the tool will prompt for a user name and password when it is run. Additional IDs may be defined either as an Administrator or a User:

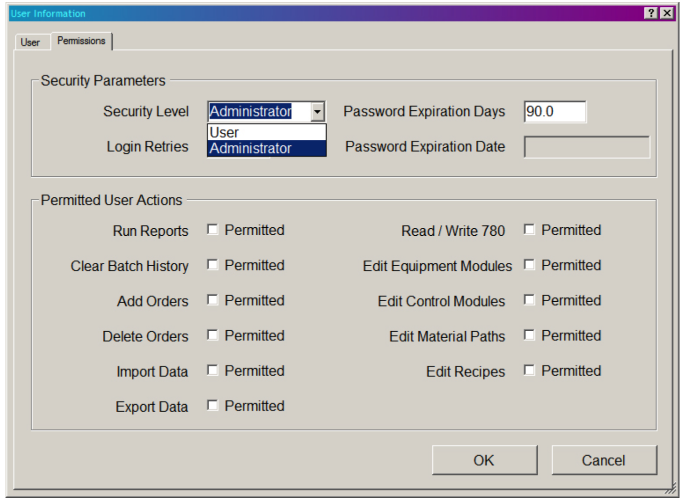


Figure 6-7: Permissions Tab, User or Administrator

6.3.2. Config

When selected, the **Tools | Config** menu item opens the screen shown in Figure 6-8. This screen sets global defaults for the BatchTool.

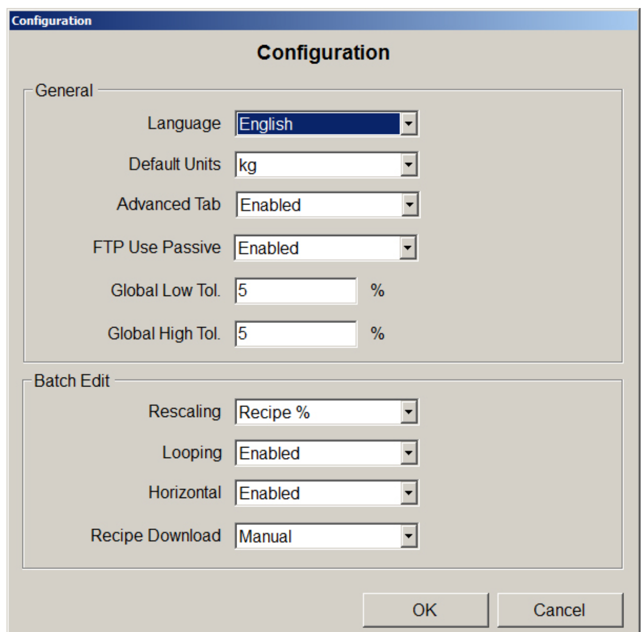


Figure 6-8: Configuration Screen

Element	Explanation	Options
General		
Language	Sets the display language for the BatchTool.	English*, French, German, Spanish, Chinese, Italian, Portuguese, Russian

Element	Explanation	Options
Default Units	Sets the units used by the BatchTool. Note that the IND780batch terminal's primary units must match the setting made here.	kg*, g, t, ton, ozt, dwt, oz
Advanced Tab	Determines whether the Advanced tab appears in system configuration screens.	Enabled*, Disabled
FTP Use Passive	When enabled, sends the PASV command to the server. This command requests the server to listen on a data port and to wait for a connection, rather than initiate one upon receipt of a transfer command. If FTP Use Passive is disabled, a firewall can raise an alert and block file transfer. Generally, this setting should be left as Enabled.	Enabled*, Disabled
Global Low Tol.	Sets the default tolerance value for targets; used if a tolerance is not entered in a configuration screen.	5%*
Global High Tol.		5%*
Batch Edit		
Rescaling	Determines whether a recipe can be rescaled, and whether rescaling is expressed as an absolute value or as a percentage of the recipe's target.	Disabled, Material, Recipe Amount, Recipe%*
Looping	Determines whether a recipe is permitted to loop. Note that setting this to Enabled will have no effect unless looping is also enabled by the IND780batch terminal, in setup at **Batch-780 > Recipe Operations > Batch Edit**.	Enabled*, Disabled
Horizontal	Determines whether Horizontal Blocks can be executed by a recipe.	Enabled*, Disabled
Recipe Download	If set to **Automatic**, all recipes will be written to the IND780batch terminal. If set to **Manual**, it is possible to transfer one recipe at a time to the terminal.	Manual*, Automatic

6.3.3. Config Custom Phase

Element	Explanation	Options
Config Custom Phase	Allows configuration of a custom TaskExpert phase to be used in a batch recipe.	

When selected, the **Tools > Config Custom Phase** menu item opens the screen shown in Figure 6-9. This screen configures a Custom (TaskExpert) Phase, which can then be included as part of a Batch recipe. The custom phase allows a user to execute a TaskExpert program. The program performs an operation that is not directly supported by the standard phase types available in IND780batch, such as managing a unique process as part of the manufacturing sequence. To use a Custom Phase in Batch, three requirements must be fulfilled:

- The Custom Phase must be configured, as detailed below.

- The Custom Phase must be included in a Master Recipe.
- A TaskExpert program must be written and stored in the IND780batch terminal.
- BatchTool 780 does not provide a means to transfer The TaskExpert files to the IND780batch terminal. These ***.cpt** files must be transferred using one of the methods described in Chapter 4 of the IND780 **Technical Manual**.

6.3.3.1.1. Creating a Custom Phase

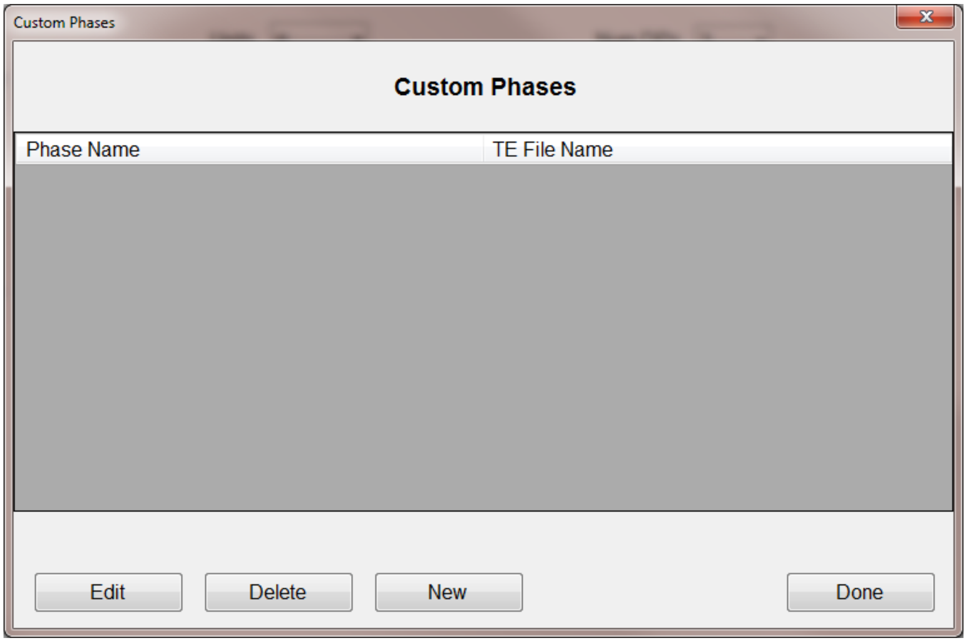


Figure 6-9: Custom Phase Configuration Screen

In this screen, the following functions are available:

New Allows a user to add a new Custom Phase for use in a recipe

Edit Allows a user to edit a previously created Custom Phase from those available in the list

Delete Allows a user to delete a Custom Phase from those available in the list.

Done Closes the Custom Phase Configuration screen.

Pressing **New** displays the screen shown in Figure 6-10:

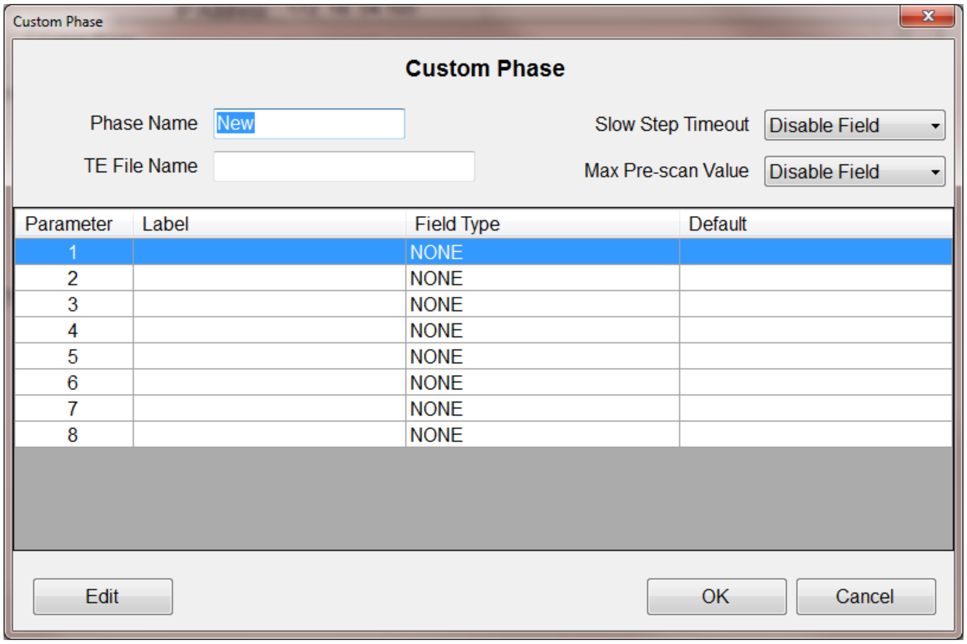


Figure 6-10: New Custom Phase

Phase Name Names the Custom Phase. This is used in the recipe to identify which Custom Phase is to be executed.

TE File Name Specifies the TaskExpert file to be executed as part of the recipe. The file performs a custom sequence of operations that are not provided as a standard function of the batch recipe commands. The name of the TaskExpert file must exactly match the name of the file to be executed from the IND780 terminal. This file will have a .cpt extension, and must reside in the IND780.

- **Note**: BatchTool only provides the Custom Phase mechanism to start and execute a TaskExpert Program. Development of the program itself must be done by an experience user of TaskExpert, using the TaskExpert Editor program.

Slow Step Timeout This selection can be enabled or disabled. If it is enabled, a field will appear in the phase's configuration screen in the recipe, so that a Slow Step Timeout value for the custom phase can be specified.

Max Pre-scan value This selection can be enabled or disabled. If it is enabled a field will appear in the phase's configuration screen in the recipe, so that a Max Pre-Scan Value for the custom phase can be specified.

When a variable is used in place of an absolute value in a recipe for batching, its maximum value must be constrained. This is because, when the system scans the recipe before it is run, it will abort the recipe if it finds an unconstrained value that might overflow the vessel into which the batch is being mixed, for example, or exceed the scale's capacity. This value is a means for the recipe to indicate to the system that the value will never exceed the programmed, acceptable, value.

Edit Allows an individual parameter to be altered for the Customer phase in which it is used. Figure 6-11 shows the Custom Phase Parameter Edit screen.

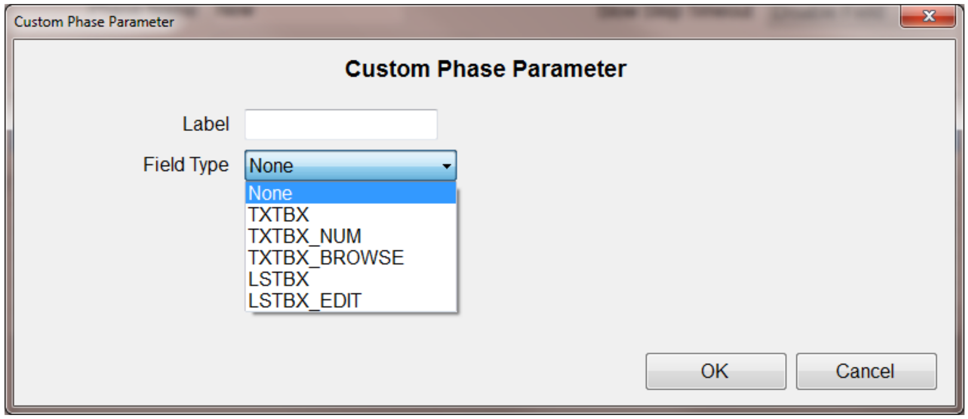


Figure 6-11: Custom Phase Parameter Editing Screen

The Custom Phase Parameter Edit screen allows the user to define a name for the Custom Phase Label (user specified label up to 16 characters in length), along with the Field Type. The available field types are:

TXTBX

TXTBX_NUM

TXTBX_BROWSE

LSTBX

LSTBX_EDIT

As seen in Figure 6-10, up to eight parameters can be selected for use with each Custom Phase created.

TXTBX Field Type

Figure 6-12 shows the data fields that are available with the TXTBX Field Type selection.

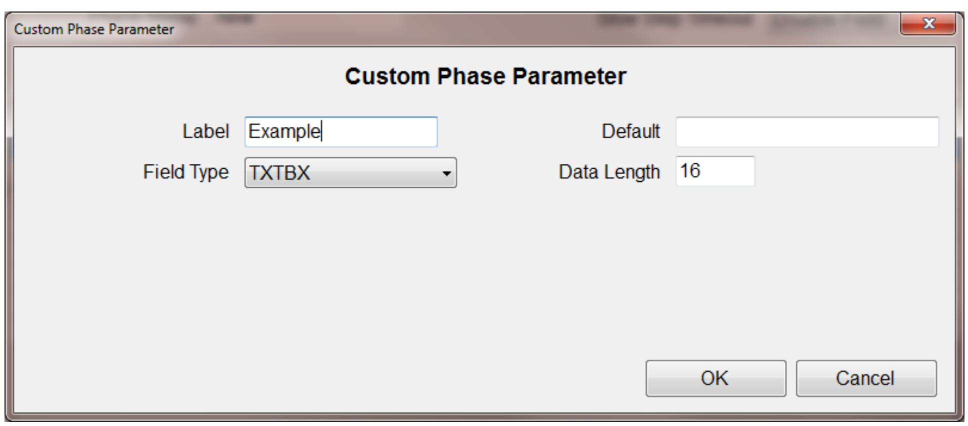


Figure 6-12: Text Box Custom Phase Parameter

TXTBX Establishes a text box entry field for the Custom Phase in the recipe.

Default Specifies a default value to appear in the text box.

Data Length Maximum length of the data entry. For Parameters 1 to 5, the maximum field length is 16 characters; for Parameters 6 to 8, the maximum is 40 characters.

TXTBX_NUM Field Type

Figure 6-13 shows the data fields that are available with the TXTBX_NUM Field Type selection.

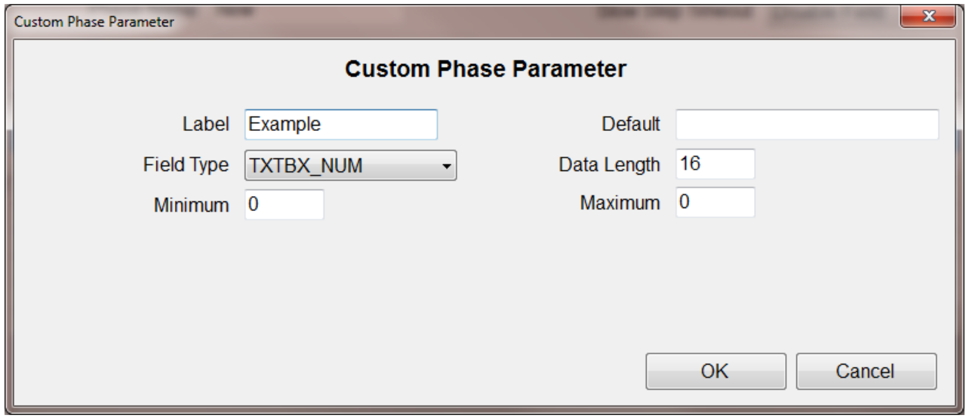


Figure 6-13: Number Box Custom Phase Parameter

TXTBX_NUM Establishes a number box entry field for the Custom Phase in the recipe. This field will only accept a numeric entry.

Default Specifies a default value to appear in the number box.

Data Length Maximum length of the data entry. For Parameters 1 to 5, the maximum field length is 16 characters; for Parameters 6 to 8, the maximum is 40 characters.

Minimum The minimum value of the numeric entry that will be permitted.

Maximum The maximum value of the numeric entry that will be permitted.

TXTBX_BROWSE Field Type

Figure 6-14 shows the data fields that are available with the TXTBX_BROWSE Field Type selection

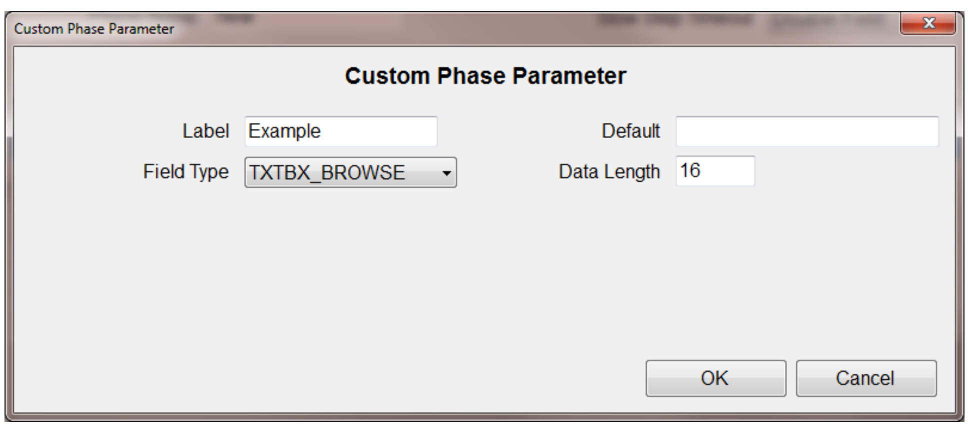


Figure 6-14: Browse Variables Custom Phase Parameter

TXTBX_BROWSE Establishes a box which allows the user to browse the Batch Variables and Shared Data Variables for use in the Custom Phase in the recipe.

Default Specifies a default value to appear in the text box.

Data Length Maximum length of the data entry. For Parameters 1 to 5, the maximum field length is 16 characters; for Parameters 6 to 8, the maximum is 40 characters.

LSTBX Field Type

Figure 6-15 shows the data fields that are available with the LSTBX Field Type selection.

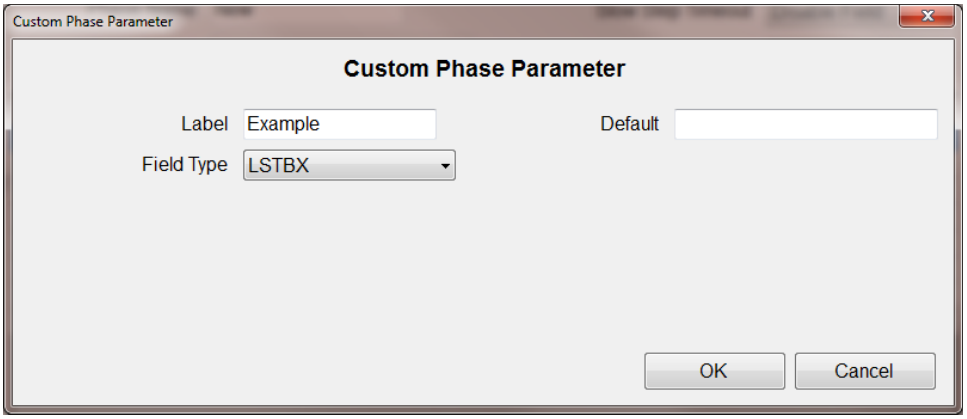


Figure 6-15: List Box Custom Phase Parameter

LSTBX Provides the user a drop down list of all of the batch variables in the master recipe

Default Specifies a default value to appear in the text box.

LSTBX_EDIT Field Type

Figure 6-16 shows the data fields that are available with the LSTBX_EDIT Field Type selection

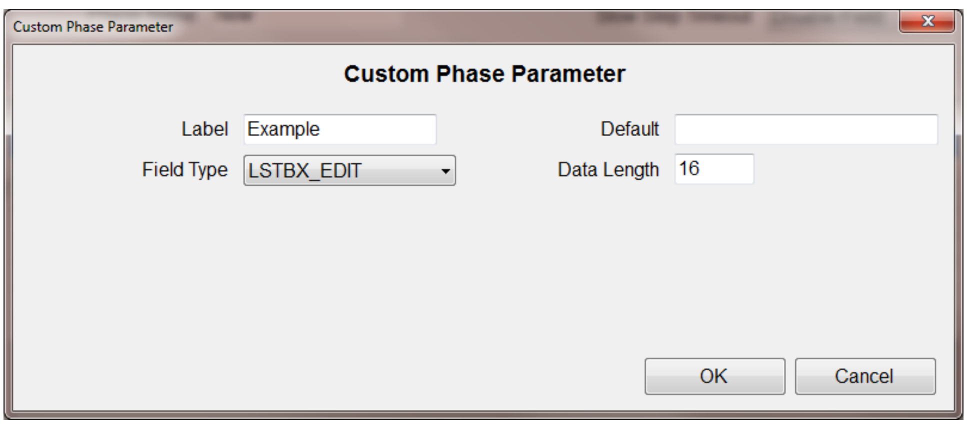


Figure 6-16: Batch Variable List Box Custom Phase Parameter

LSTBX_EDIT Provides the user a drop down list of all of the batch variables in the master recipe, and allows the user to create their own custom variable if needed

Default Specifies a default value to appear in the text box.

Data Length Maximum length of the data entry. For Parameters 1 to 5, the maximum field length is 16 characters; for Parameters 6 to 8, the maximum is 40 characters.

Once the Custom Phase parameters have been defined, a Custom Phase can be added into a Batch recipe.

6.3.4. History Management

The **Tools | History Management** menu item offers a series of options for handling history records. Each type of record can either be **Export**ed or **Delete**d:

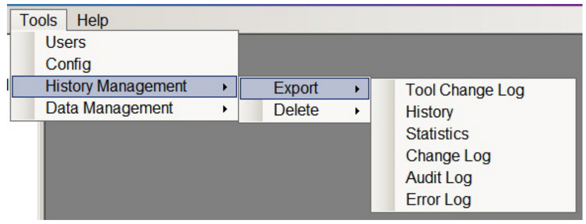


Figure 6-17: History Management Options

6.3.5. Data Management

The **Tools | Data Management** menu allows the user to delete configurations, users and projects from the BatchTool.

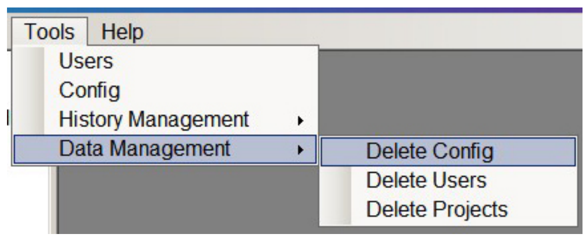


Figure 6-18: Data Management Options

When one of these options is selected, a confirmation screen displays.

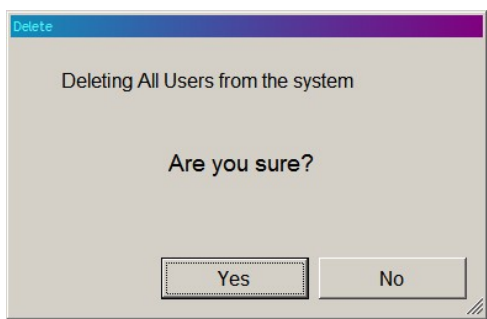


Figure 6-19: Data Management Deletion Confirmation Screen

6.4. Help

The Help menu includes two options – **Help** and **About BatchTool 780**.

The **Help** option opens a pdf of the system documentation (this manual).

The **About** option displays an information screen like the one shown in Figure 6-20.

Figure 6-20: About BatchTool 780

7 Configuration Tool Guide: Terminal Configuration

Before any other hardware and process configuration can be carried out, at least one terminal must be set up with address and log-in information. Both User and FTP login information can be configured in this window, accessed from the PC Tool's file menu at **Edit | New | Terminal**. Note the layout of the Tool window – a set of menus at the top, a tree pane at left, and a configuration window at right. The appearance of the configuration window will change depending on selections made in the menus and the tree.

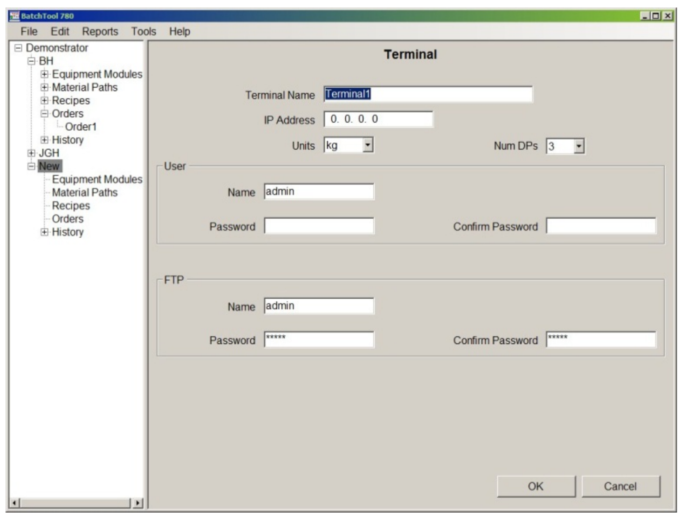


Figure 7-1: Defining a Terminal

The elements and functions available in this screen are as follows:

- In this and other tables in this document, an asterisk (*) is used to indicate a default value.

Element	Explanation	Options
Terminal Name	This is separate from the name configured in Setup at **Terminal > Device** in the IND780batch terminal.	Terminal1*
IP Address	The IP address of the networked terminal.	0.0.0.0
Units	This is separate from the primary units configured in Setup at **Scale 1 > Units** in the IND780batch terminal. Units defined here are used in all recipe calculations.	lb*, kg, g, t, ton, ozt, dwt, oz

Element	Explanation	Options
Num DPs	Defines the number of decimal places to display in the operator and batch reports. e.g. is 2 is selected, target weights will always be displayed as XX.YY kg on the display as well as in the BatchTool. If a recipe uses more decimal places for target weights, rounding will occur, to the number of decimal places specified.	0, 1, 2, 3*, 4, 5
User		
User Name	A user name and password used to log in to the terminal, as configured in Setup at **Terminal > Users** in the IND780batch terminal. The **Confirm Password** field must also be completed. **Note**: Only a user with administrator access can transfer data from the BatchTool to the IND780batch terminal, or read info from the IND780batch terminal.	
User Password		
FTP		
FTP Name	User Name and password for access to the IND780batch terminal's ftp server. By default, when a new terminal is added these fields contain **admin**. If no unique user name or FTP name is used in the terminal, this default value should be used. Otherwise, enter the user name and password as configured in the terminal.	
FTP Password		
The PC Tool uses both forms of communication, so both the User and FTP names and passwords must be set up to permit the tool to communicate with the terminal.		

8 Configuration Tool Guide: Managing Configurations

Configuration data, including EMs, CMs, MPs and Recipes can be saved as a project, exported to file, and written to multiple terminals. This chapter describes how to save configuration data for back-up purposes, and how to propagate saved configurations to other IND780batch terminals.

8.1. Exporting Configuration Data to File

To save configuration data to a file, open the project to be saved. The project details will display in the left pane of the PC Tool window.

First, ensure that the source terminal's configuration is displayed in the PC Tool. If necessary right-click the terminal and select **Read from 780** to import the data.

Once the data is correctly displayed in the PC tool, right-click the source terminal, from which data is to be exported.

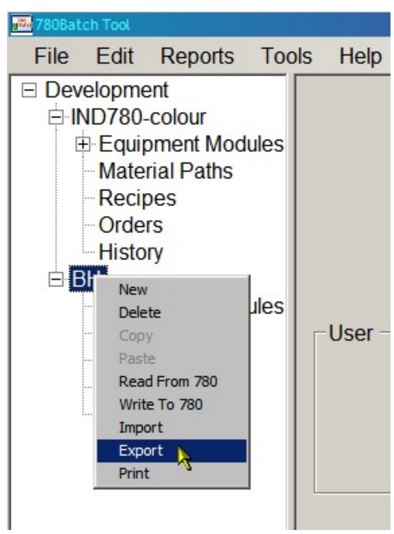


Figure 8-1: Context Menu – Export Configuration Data

A file browser window will open, permitting the user to select a location in which to save the exported files.

- It is important to maintain a carefully named and organized folder structure for exported files, because **each export will overwrite any .csv files already in the selected folder**.

Depending on the configuration selected, some or all of the following files will be saved to the selected folder:

File Name	Contents
Standard_A3.csv	Recipe information
Standard_A4.csv	Equipment Module configuration
Standard_A5.csv	Control Module configuration
Standard_A6.csv	Material Path configuration
CustomCfg.csv	Configuration settings used by a TaskExpert program when it is executed by a Custom phase as part of a Batch recipe.

8.2. Importing Configuration Data to a Terminal

With the .csv files saved to an accessible location, it is possible to copy the configuration data they contain to other terminals.

- The hardware available to the target terminal must correspond to that used by the source terminal, or the pre-order recipe check will result in an error, and the recipe will be unable to run.

First, make sure that target terminal is displayed in the left pane of the PC Tool. If necessary, right-click the Project name and select **New Terminal**, then enter the appropriate connection information for the target terminal.

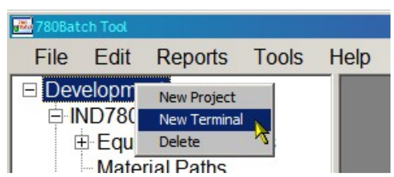


Figure 8-2: Opening a New Terminal

Once the target terminal is displayed in the left pane, right-click its name and select **Import**.

- Note: If any of the .csv files are open, for example in Microsoft Excel, the import will fail. Close the file/s and retry the import.

A file browser window will open, permitting the user to select a location from which to import the configuration data.

Once the import is complete, the configuration for the source and target terminals will be identical.

Finally, right-click the target terminal's name and select **Write to 780** to complete the process.

9 Configuration Tool Guide: Equipment and Control Modules

9.1. Adding an Equipment Module

An Equipment Module (EM) is a functional group of equipment (for instance, a scale or a mixer) that can carry out minor processing activities. various EMs execute the phases (steps) of the Recipe as an Order is processed. Click on the Equipment Modules branch in the tree pane at left in the PC Tool, then select **Edit | New | Equipment Module** from the menu. This menu item offers two options:

- **Scale Equipment Module** – used to weigh materials
- **Operator Hold Equipment Module** – used to inform the operator or accept input from the operator
- **Flow Meter Equipment Module** – used to measure flow

Up to four of each of these types can be configured per IND780batch terminal.

9.1.1. Control Modules

Each EM has its own list of Control Module (CM) types. A CM is a collection of sensors and actuators that act as a single control entity.

Only available CMs are shown in the configuration windows.

9.2. Scale Equipment Module

The Scale Equipment Module configuration window has two tabs – **Basic** and **Advanced**. These are shown below, with their default values displayed.

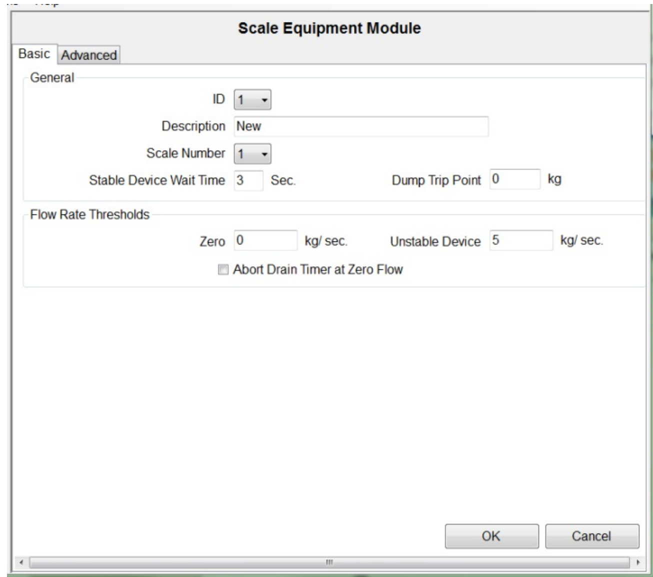


Figure 9-1: Scale Equipment Module, Basic Tab

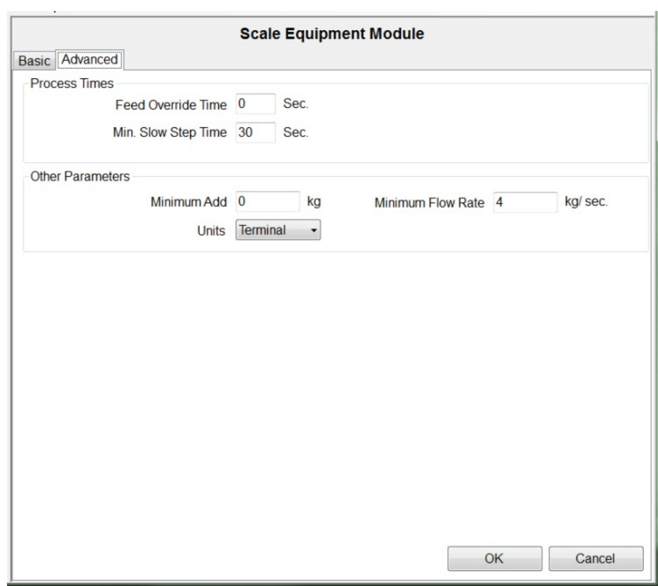


Figure 9-2: Scale Equipment Module, Advanced Tab

The elements and functions available in these screens are as follows:

- Weight units for these settings are determined by the Units configured in the Terminal setup screen – refer to Chapter 7, **Terminal Configuration**.

Element	Explanation	Options
	Basic Tab	
General		
Description	An alphanumeric string used to identify this module.	
Scale Number	Assigns a number to the scale EM.	1* – 4
Note: The Scale Number must match the slot number the scale card occupies in the IND780 terminal. For example, if the scale card is located in slot 3 of the iND780 terminal, scale 3 must be selected for the Scale Equipment Module configuration. All the scale settings configured for this EM will be applied to the scale card in slot 3.		
Stable Device Wait Time	Amount of time to wait before returning an "unstable device" failure status. Suggested initial value: 3 sec.	0 Sec.*
Dump Trip Point	This should be set to 3% of calibrated scale capacity.	0 lb*
Flow Rate Thresholds		
Zero	Sets the zero flow rate for the measuring device. A flow rate below this value will be considered OFF, and the measuring device will be considered stable. Suggested value is 5 x scale resolution *or* divisions.	0 lb/sec.*
Unstable Device	Sets the flow rate above which the scale will be considered unstable during the Stable Device Wait Time period. If the Stable Device Wait Time period times out and the measuring device flow rate exceeds the value set here, the feed will be flagged as failed, because the measuring device was very unstable. If the measuring device flow rate is below this value, the feed will be considered complete without error. Suggested initial value: 5 lb/sec.	0 lb/sec*
Abort Drain Timer	If a drain timer is set, and the Zero flow rate threshold is reached, the timer will be aborted and the process will continue without further delay.	Checkbox clear
	Advanced Tab	
Process Times		
Feed Override Time	The time in seconds before the completion of a material transfer when the controller's algorithm prohibits any commands from disrupting the Feed. An **Abort** command during the **Feed Overide Time** will be ignored.	0 Sec.*

Element	Explanation	Options
Min. Slow Step Time	The Automatic Material Transfer algorithm computes a Slow Step Time using the Target weight , Average Flow rate and Slow Step Timer Factor: $\text{Slow Step Time} = \text{Slow Step Timer Factor} * \frac{\text{Target Weight}}{\text{Avg Flow Rate}}$ The system compares the computed time and the time set by this parameter, and uses the larger of the two.	0 Sec.*
Other Parameters		
Minimum Add	A minimum target value that can be set per instrument. Any Start Feed commands with a target value below this value will be ignored.	0 lb*
Minimum Flow Rate	After the Minimum Open Time in the Material Path has expired, and if the flow rate is above the minimum value, then the PAC algorithm is applied to the feed. Suggested initial value: 4 lb/sec.	0 lb/sec*
Units	Each Scale Equipment Module can have its own units. However, if this parameter is set to Terminal, the SEM will use the value set in the Terminal configuration screen, shown in Figure 7-1.	Terminal*, lb, g, kg, ton, ozt dwt, oz

9.2.1. Control Module Types

The following CM types are available for the Scale EM:

Control Module Type	Explanation
Weigh-In	Controls the automatic weighing of a material onto the scale.
Weigh-In Transport Header	Controls which material to feed when the Weigh-in scale has multiple material sources.
Weigh-In Manual	Controls the manual weighing of a material onto the scale by the operator.
Weigh Out	Controls the automatic weighing of a material from the scale.
Weigh-Out Transport Header	Controls which path to feed to when the Weigh out scale has multiple destinations.
Weigh-Out Manual	Controls the manual weighing of a material from the scale by the operator.
Aux1	Used to control other scale-related I/O – for example, mixers and heaters.
Aux2	
Aux3	
Aux4	

9.2.1.1. Weigh-In Control Module

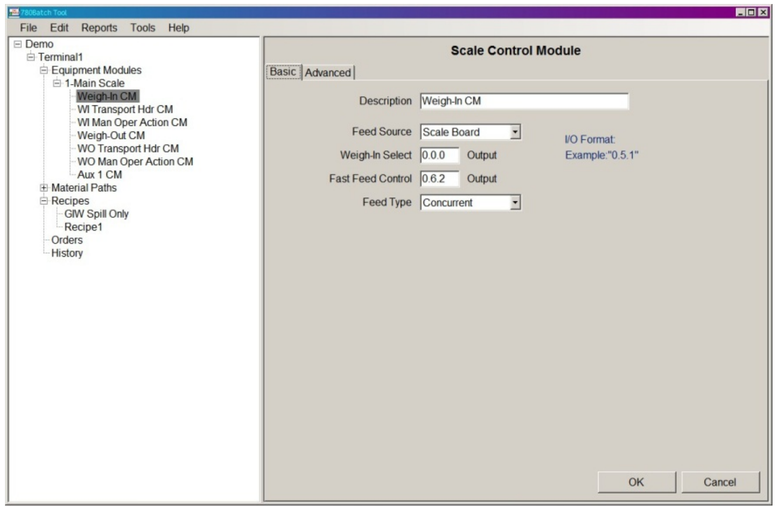


Figure 9-3: Weigh-In CM, Basic Tab

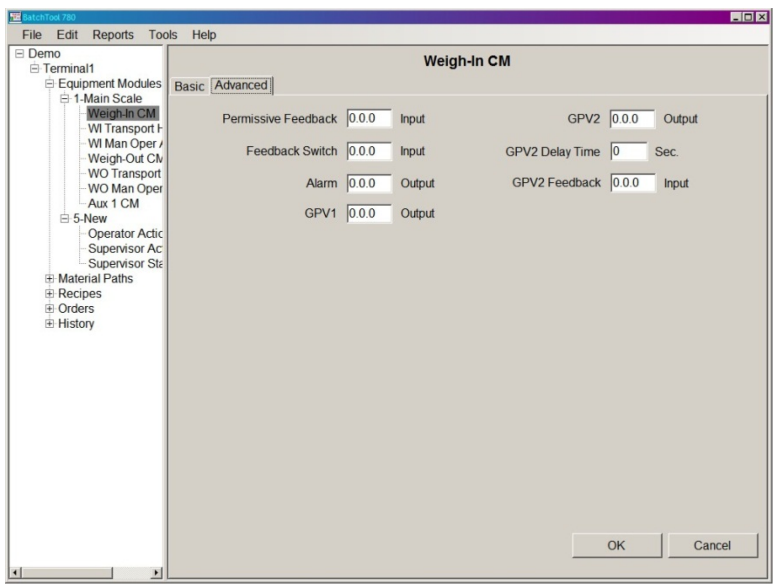


Figure 9-4: Weigh-In CM, Advanced Tab

Element	Explanation	Options
Basic Tab		
Description	Descriptive label for this Control Module	
Feed Source	Source of the weigh-in feed.	Scale Board*, Other I/O

<table>
<tr><th>Element</th><th>Explanation</th><th>Options</th></tr>
<tr><td>Weigh-In Select</td><td>The analog scale card has only one FCE; Weigh-In Select uses this output address to toggle the FCE for use either as a weigh-in feed or as a weigh-out feed. See Figure 9-5 below, for an example of how this output is used.
ON sets the FCE to a Weigh-In feed, OFF to a Weigh-Out feed.</td><td>User-configurable address</td></tr>
<tr><td>Fast Feed Control</td><td>Output address. Used to turn fast feed on and off.</td><td>User-configurable address</td></tr>
<tr><td>Feed Type</td><td>In a two-speed system, sets the relationship between fast and slow feeds.
Concurrent = when fast feed, both fast and slow feeds on
Independent = when fast feed, only fast feed on</td><td>Concurrent*, Independent</td></tr>
<tr><td colspan="3">Advanced Tab</td></tr>
<tr><td>Permissive Feedback</td><td>Input address which, when ON, enables feeds to the scale.</td><td>User-configurable address</td></tr>
<tr><td>Feedback Switch</td><td>Input address that provides feedback indicating that the GPV1 device is ON.</td><td>User-configurable address</td></tr>
<tr><td>Alarm</td><td>Output address for an alarm that is turned ON if scale data is lost during a feed.</td><td>User-configurable address</td></tr>
<tr><td>GPV1</td><td rowspan="2">These outputs control the first and second gate, pump or valve separately from the FCE. They are typically used to ensure positive pressure before feeding, by running a pump first and then opening a valve.</td><td>User-configurable address</td></tr>
<tr><td>GPV2</td><td>User-configurable address</td></tr>
<tr><td>GPV2 Delay Time</td><td>Sets the delay after GPV1 is turned on before GPV2 is turned on, to ensure proper sequencing of elements in the feed system.</td><td>0* Sec.</td></tr>
<tr><td>GPV2 Feedback</td><td>Input address that provides feedback indicating that GPV1 device is on.
This input is typically used to confirm that the correct pressure has been reached before the feed is begun.</td><td>User-configurable address</td></tr>
</table>

Figure 9-5 illustrates the use of the Weigh-In Select function in a Weigh-In CM, showing an automatic material transfer with two materials and fast feed control.

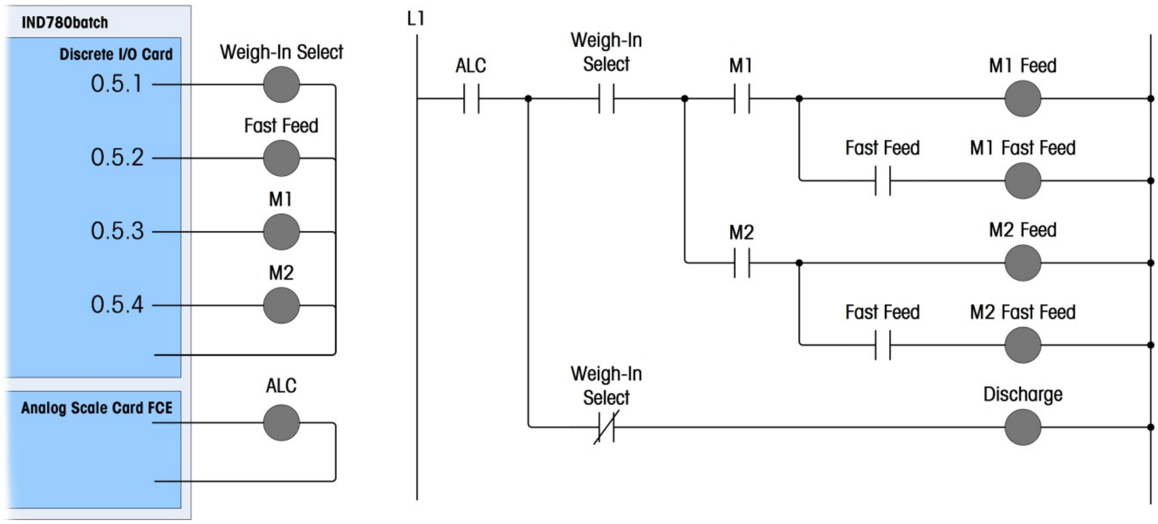


Figure 9-5: Weigh-In Select Example

9.2.1.2. Weigh-In Transport Header Control Module

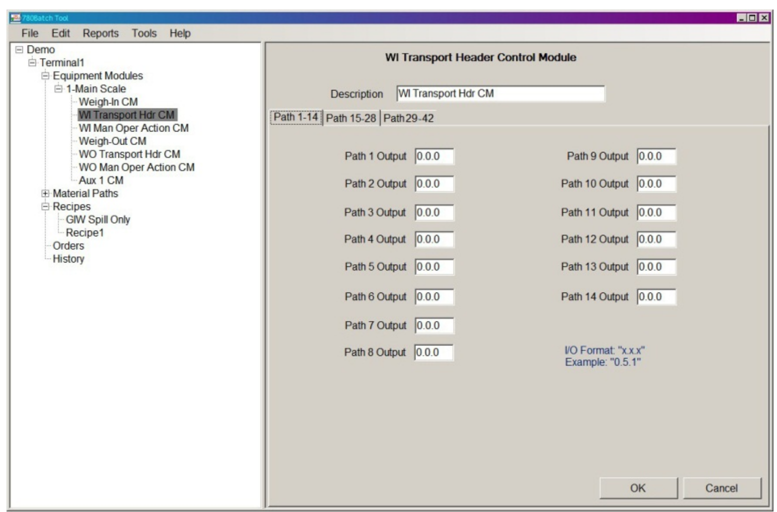


Figure 9-6: Weigh-In Transport Header CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Paths 1 - 42		
Path *n* Output	These outputs configure output addresses of internal I/O or of I/O in an ARM100 module.	User-configurable address

9.2.1.3. Weigh-In Manual Control Module

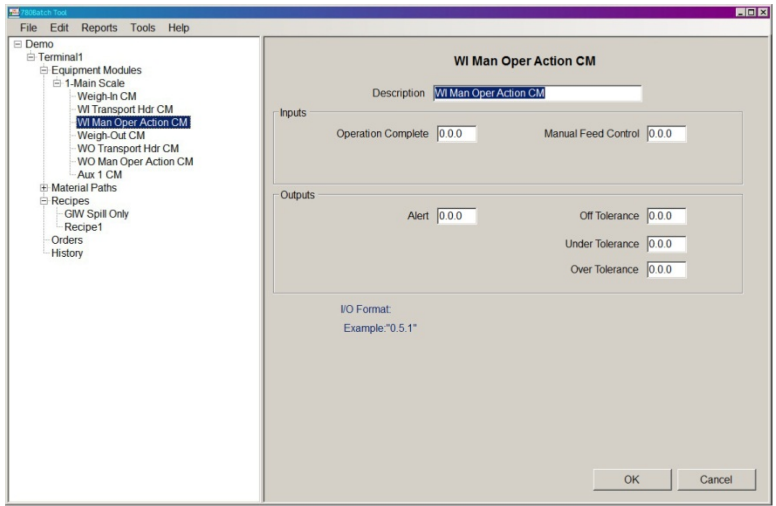


Figure 9-7: Weigh-In Manual CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Inputs		
Operation Complete	Address for 'Operation Complete" input. Used for an input to tell the system the manual weigh-in is complete	User-configurable address
Manual Feed Control	Address for manual feed control input. Allows operator to jog the feed source manually, for the scale defined in the Weigh-In CM	User-configurable address
Outputs		
Alert	Output to tell operator to begin a manual feed	User-configurable addresses
Off Tolerance	Addresses for outputs signifying each of these conditions	
Under Tolerance		
Over Tolerance		

9.2.1.4. Weigh-Out Control Module

The Weigh-Out Control Module has two tabs – Basic and Advanced.

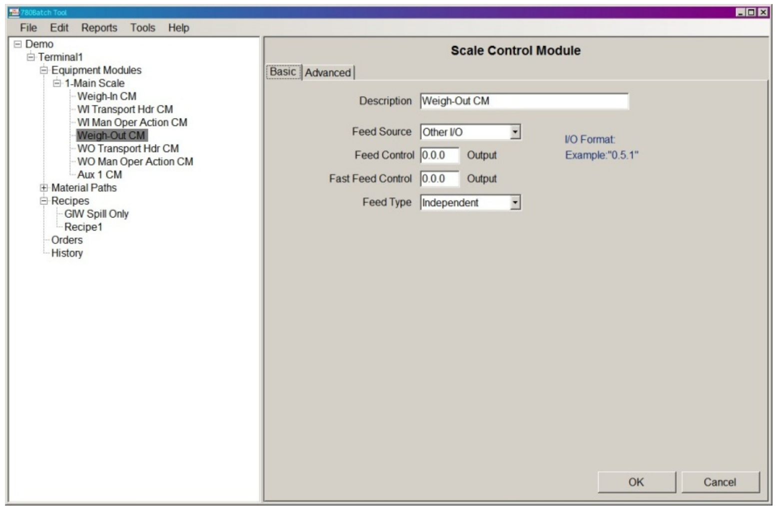


Figure 9-8: Weigh-Out CM, Basic Tab

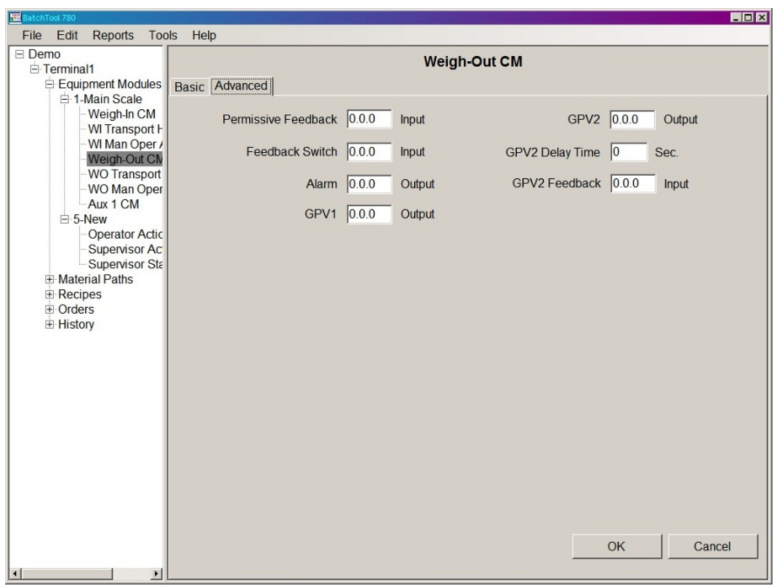


Figure 9-9: Weigh-Out CM, Advanced Tab

Element	Explanation	Options
Basic Tab		
Description	Descriptive label for this Control Module	
Feed Source	Source of the weigh-out feed.	Other I/O*, Scale Board
Feed Control	Output address used to control the weigh-out feed.	User-configurable address
Fast Feed Control	Output address used to control the weigh-out fast feed.	User-configurable address

Element	Explanation	Options
Feed Type	In a two-speed system, sets the relationship between fast and slow feeds. Concurrent = when fast feed, both fast and slow feeds on Independent = when fast feed, only fast feed on	Independent*, Concurrent
Advanced Tab		
Permissive Feedback	Input address for a permissive input that must be on to allow the feed to proceed.	User-configurable addresses
Feedback Switch	Input address that provides feedback that GPV1 device is ON.	
Alarm	Output address for an alarm that indicates a permissive or feedback error.	
GPV1	These outputs control the first and second gate, pump or valve separately from the FCE. They are typically used to ensure positive pressure before feeding, by running a pump first and then opening a valve.	
GPV2		
GPV2 Delay Time	Sets the delay after GPV1 is turned on before GPV2 is turned on, to ensure proper sequencing of elements in the feed system.	0* Sec.
GPV2 Feedback	Input address that provides feedback indicating that GPV2 device is on. This input is typically used to confirm that the correct pressure has been reached before the feed is begun.	User-configurable address

9.2.1.5. Weigh-Out Transport Header Control Module

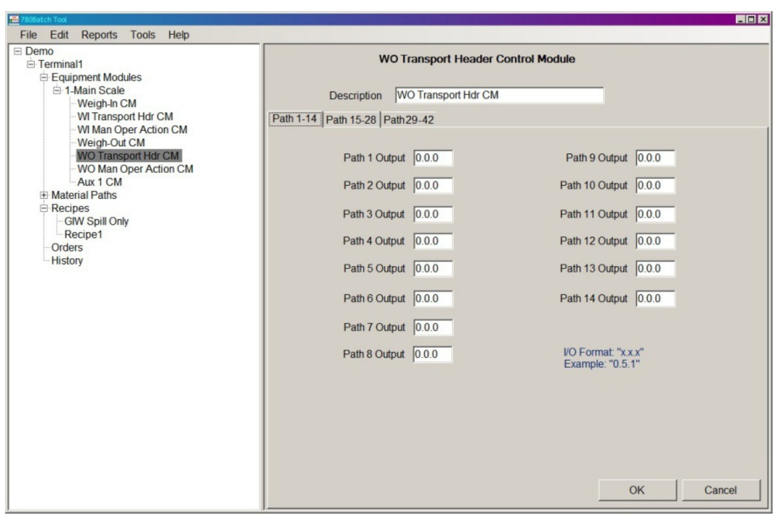


Figure 9-10: Weigh-Out Transport Header CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Paths 1 - 42		
Path *n* Output	These outputs configure output addresses of internal I/O or of I/O in an ARM100 module.	User-configurable address

9.2.1.6. Weigh-Out Manual Control Module

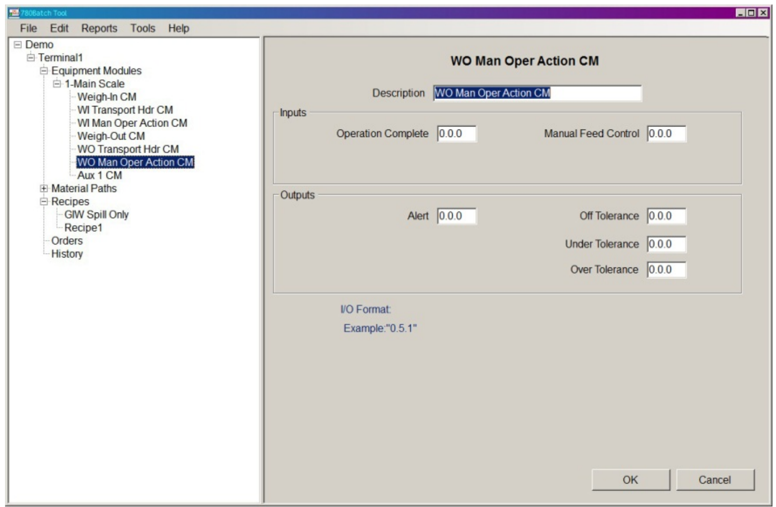


Figure 9-11: Weigh-Out Manual CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Inputs		
Operation Complete	Input to tell the system that the Manual Weigh-Out is complete	User-configurable address
Manual Feed Control	Input that allows the operator to manually jog the feed source for the scale, as defined in the Weigh-Out CM	User-configurable address
Outputs		
Alert	Output to tell the operator to begin a manual feed	User-configurable addresses
Off Tolerance	Addresses for outputs signifying each of these conditions.	
Under Tolerance		
Over Tolerance		

9.2.1.7. Aux Control Module

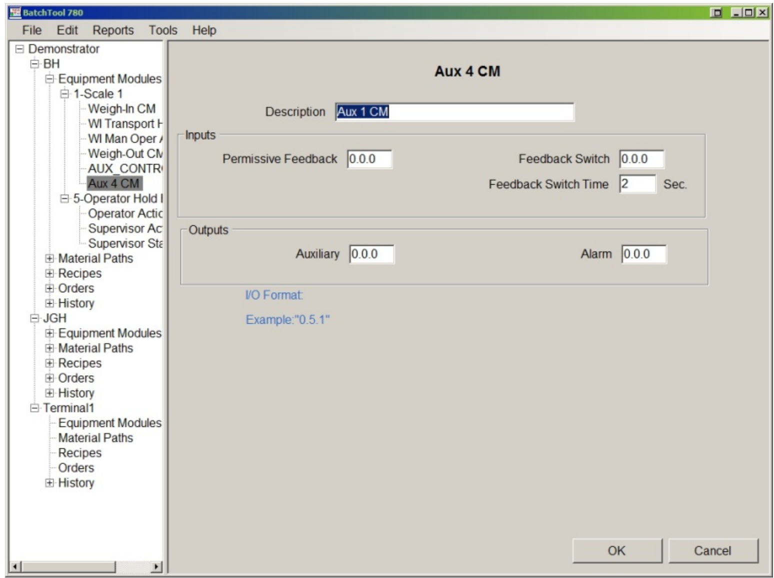


Figure 9-12: Aux CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Inputs		
Permissive Feedback	Input address for a permissive input that must be on to allow the Aux to operate	User-configurable addresses
Feedback Switch	Input address that provides feedback that the Aux is on	
Feedback Switch Time	Length of time in milliseconds to wait for Feedback Switch input to come on after turning on the Auxiliary Control output.	2 Sec.
Outputs		
Auxiliary	Addresses for the Aux CM and an alarm output for signaling the need for operator input.	User-configurable addresses
Alarm		

9.3. Operator Hold Equipment Module

The Operator Hold Equipment Module setup screen does not have tabs.

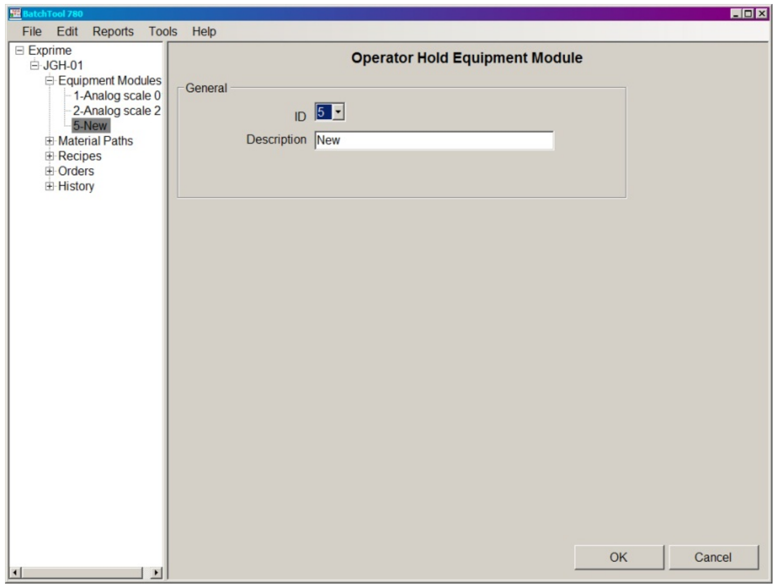


Figure 9-13: Operator Hold Equipment Module

Element	Explanation	Options
ID	Each Scale Equipment Module configured in the system must have an Operator Hold Equipment Module.	5* – 8
Description	An alphanumeric string used to identify this module.	

9.3.1. Control Module Types

The following CM types are available for the Operator Hold EM:

Control Module Type	Explanation
Operator Action	One input for operator action, and one output each for an alert and an alarm.
Supervisor Action	8 inputs for various commands available to supervisors.
Supervisor Status	10 outputs for various alarms and status reports available to supervisors.

9.3.1.1. Operator Action Control Module

The Operator Action CM permits a user at non-Administrative log-in level to receive alerts and alarms, and acknowledge them.

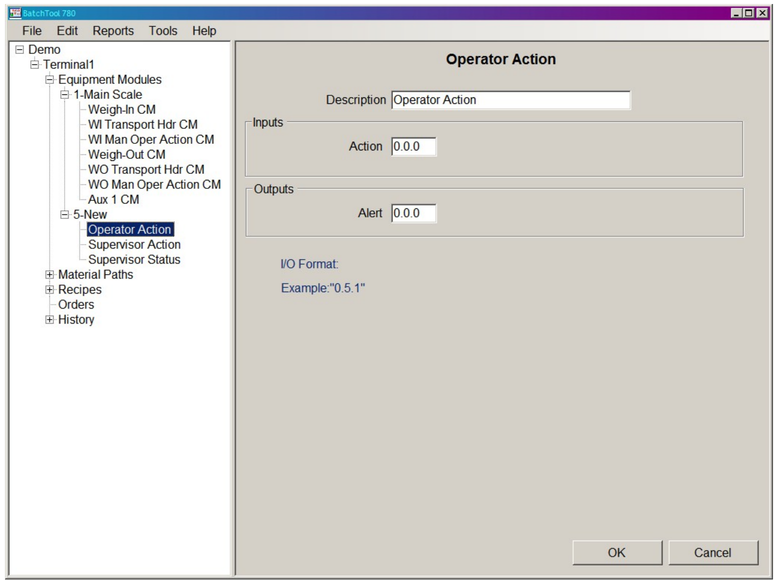


Figure 9-14: Operator Action CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Inputs		
Action	Discrete input address that acknowledges an operator hold phase.	User-configurable address
Outputs		
Alert	Output addresses used to control a light or other equipment to let operator know attention is required for a manual operation	User-configurable address

9.3.1.2. Supervisor Action Control Module

This CM defines the physical discrete outputs that communicate the status of the batch operation via a discrete input, as defined by the input address in the field beside each input element, under **Inputs** in Figure 9-15.

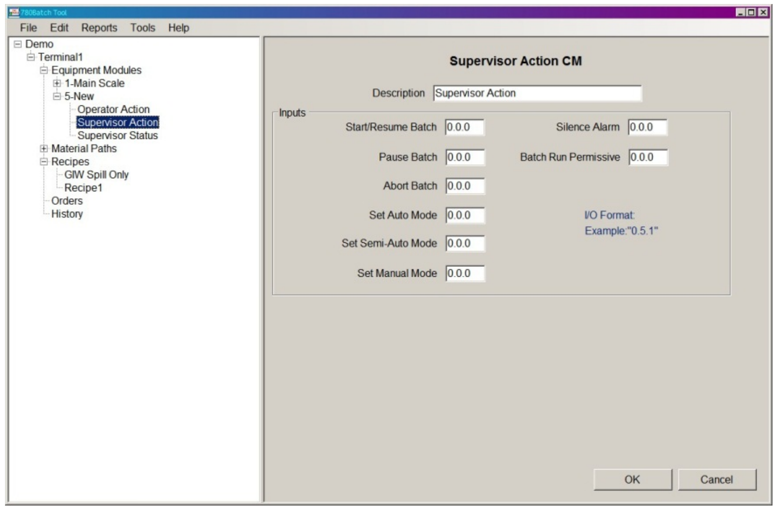


Figure 9-15: Supervisor Action CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Inputs		
Start/Resume Batch	This input starts the order currently highlighted on the Order View Screen (A1 screen) or resumes a paused or parked batch.	User-configurable input addresses
Pause Batch	This input pauses the current batch.	
Abort Batch	This input Aborts a batch that has been paused. The batch must be paused before it can be aborted.	
Set Auto Mode	This input switches phase execution into Auto mode, if that mode is enabled in the IND780batch. Refer to Chapter 3 under **Execution Control** for details on enabling modes of operation.	
Set Semi-Auto Mode	This input switches phase execution into Semi-Auto mode, if that mode is enabled in the IND780batch. Refer to Chapter 3 under **Execution Control** for details on enabling modes of operation.	
Set Manual Mode	This input switches phase execution into Manual mode, if that mode is enabled in the IND780batch. Refer to Chapter 3 under **Execution Control** for details on enabling modes of operation.	
Silence Alarm	This input allows an operator to silence a batch alarm.	

Element	Explanation	Options
Batch Run Permissive	If input is low, will not allow a batch to start. If a batch is running and the input goes low, the batch will pause	

9.3.1.3. Supervisor Status Control Module

This CM defines the physical discrete outputs that communicate the status of the batch operation to the operator via a discrete input, as defined by the output address in the field beside each output element, under Outputs in Figure 9-16.

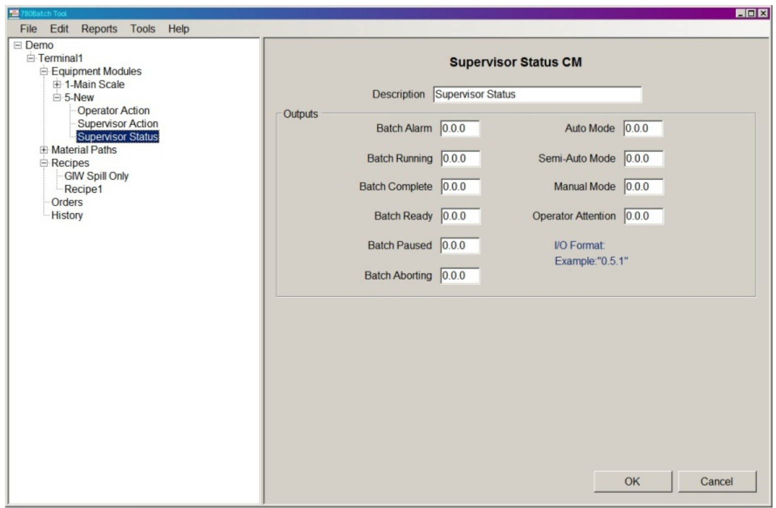


Figure 9-16: Supervisor Status CM

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Outputs		
Batch Alarm	This output turns on when a batch alarm condition occurs.	User-configurable output addresses
Batch Running	This output turns on when a batch is running, and turns off when a batch completes or a batch pauses.	
Batch Complete	This output turns on when a batch has completed an order and remains on until another order is started.	
Batch Ready	This output turns on when the batch system is ready and no batch alarms occur.	
Batch Paused	This output turns on when a batch is paused.	
Batch Aborting	This output turns on when a batch is aborted.	
Auto Mode	This output turns on when the phase execution is set to Auto.	
Semi-Auto Mode	This output turns on when the phase execution is set to Semi-Auto.	

Element	Explanation	Options
Manual Mode	This output turns on when the phase execution is set to Manual.	
Operator Attention	This output turns on when Operation Attention is required for any Operator Hold phase.	

9.4. Flow Meter Equipment Module

The Flow Meter Equipment Module configuration window has two tabs – Basic and Advanced. These are shown below with their default values displayed.

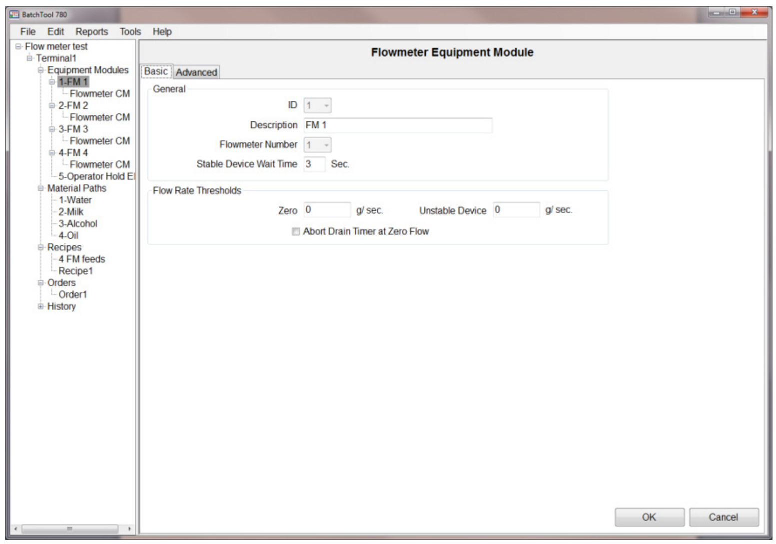


Figure 9-17: Flow Meter Equipment Module, Basic Tab

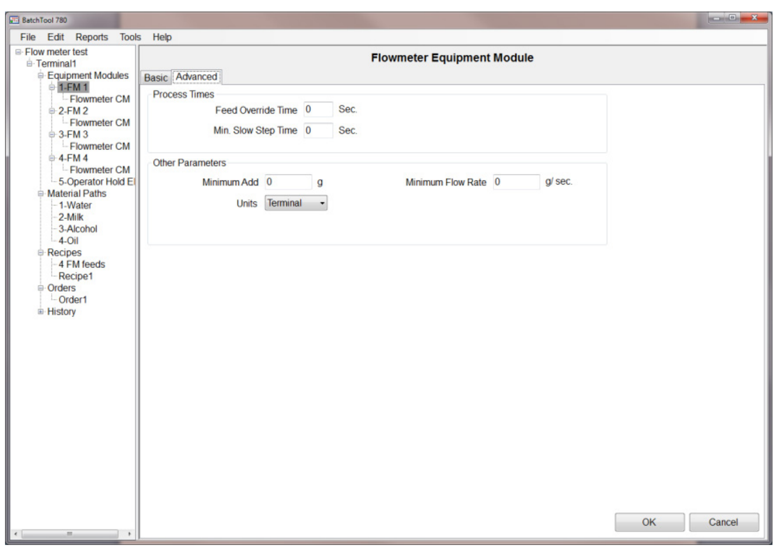


Figure 9-18: Flow Meter Equipment Module, Advanced Tab

The parameters in these screens are identical for those in the Scale Equipment Module screens described on page 9-3, except that there is no Dump Trip Point for a Flow Meter.

9.4.1. Control Module Types

The following CM types are available for the Flow Meter EM:

Control Module Type	Explanation
Flow Meter	Controls the automatic feeding of a material via a flow meter.
Transport Header	Controls which material to feed when the Flow Meter CM has multiple material sources.
Manual Operator Action	Permits a manual feed via a flow meter.
Aux1	Used to control other flow meter-related I/O – for example, mixers and heaters.
Aux2	
Aux3	
Aux4	

9.4.1.1. Flow Meter Control Module

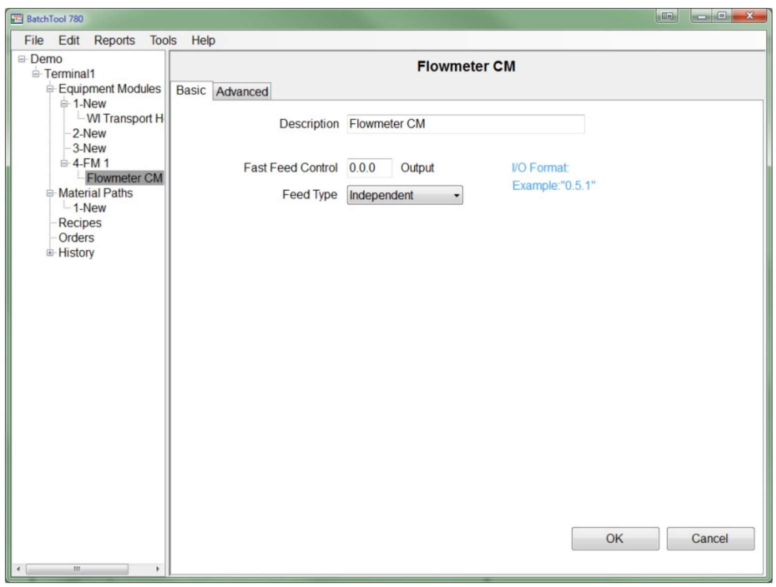


Figure 9-19: Flow Meter Control Module, Basic Tab

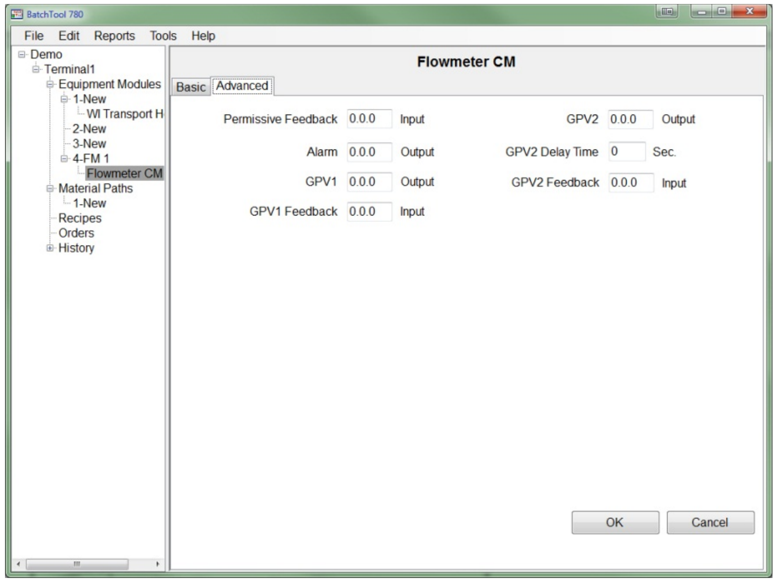


Figure 9-20: Flow Meter Control Module, Advanced Tab

Element	Explanation	Options
Basic Tab		
Description	Descriptive label for this Control Module	
Fast Feed Control	Output address used to control the weigh-out fast feed.	User-configurable address
Feed Type	In a two-speed system, sets the relationship between fast and slow feeds. Concurrent = when fast feed, both fast and slow feeds on Independent = when fast feed, only fast feed on	Independent*, Concurrent
Advanced Tab		
Permissive Feedback	Input address for a permissive input that must be on to allow the feed to proceed.	User-configurable addresses
Alarm	Output address for an alarm that indicates a permissive or feedback error.	
GPV1	These outputs control the first and second gate, pump or valve separately from the FCE. They are typically used to ensure positive pressure before feeding, by running a pump first and then opening a valve.	
GPV2		
GPV1 Feedback	Input address that provides feedback indicating that GPV1 device is on. This input is typically used to confirm that the correct pressure has been reached before the feed is begun.	User-configurable address

Element	Explanation	Options
GPV2 Delay Time	Sets the delay after GPV1 is turned on before GPV2 is turned on, to ensure proper sequencing of elements in the feed system.	0* Sec.
GPV2 Feedback	Input address that provides feedback indicating that GPV2 device is on. This input is typically used to confirm that the correct pressure has been reached before the feed is begun.	User-configurable address

9.4.1.2. Transport Header Control Module

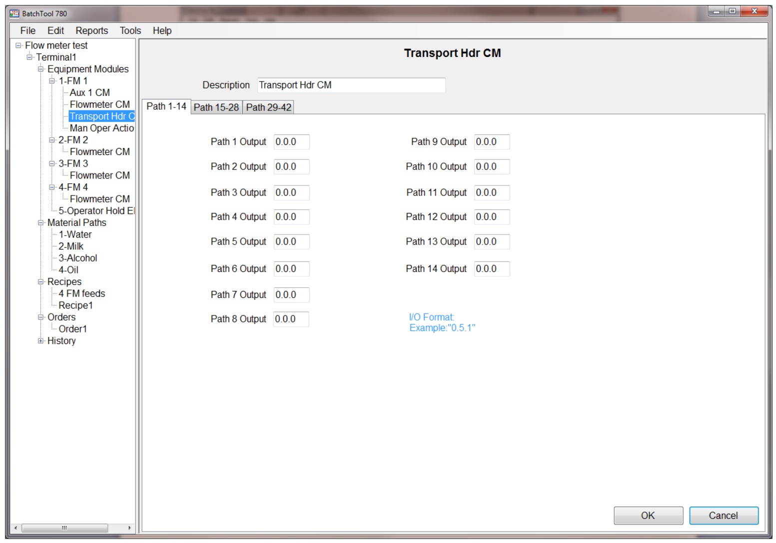


Figure 9-21: Transport Header Control Module, Paths 1-14

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Paths 1 - 42		
Path *n* Output	These outputs configure output addresses of internal I/O or of I/O in an ARM100 module.	User-configurable address

9.4.1.3. Manual Operator Action Control Module

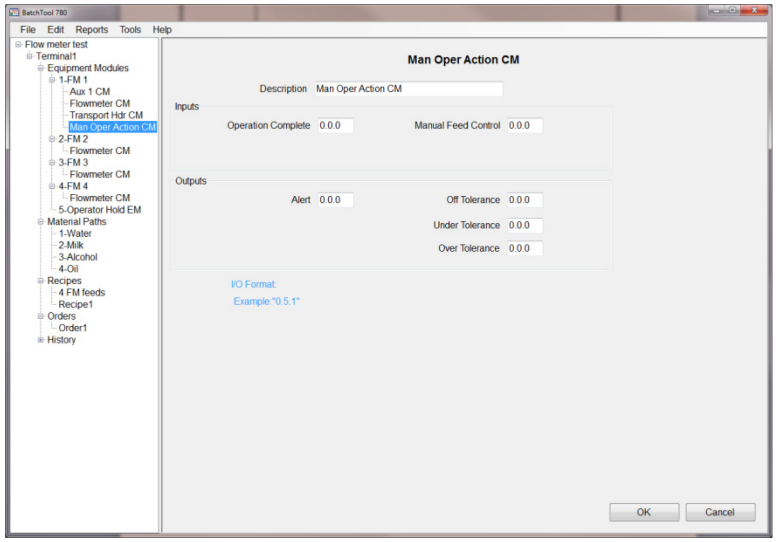


Figure 9-22: Manual Operator Action Control Module

Element	Explanation	Options
Description	Descriptive label for this Control Module	
Input: Operation Complete	Address for an input device used by the operator to indicate that the manual feed has been completed.	User-configurable address
Input: Manual Feed Control	Address for an input device used by the operator to perform a manual feed.	
Output: Alert	Address for an output device used by the system to alert the operator to that a manual feed can begin.	
Output: Off Tolerance	Output address to an indicator used to alert the operator to an off-tolerance condition.	
Output: Under Tolerance	Output address to an indicator used to alert the operator to an under-tolerance condition.	
Output: Over Tolerance	Output address to an indicator used to alert the operator to an over-tolerance condition.	

9.4.1.4. Auxiliary Control Module

Up to four Auxiliary Control Modules can be defined per Flow Meter.

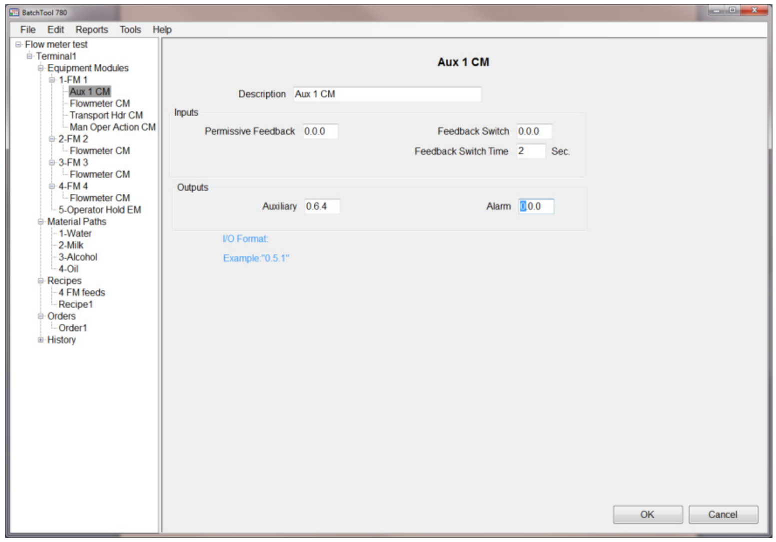


Figure 9-23: Auxiliary Control Module

Parameters for this Control Module are the same as those described on page 9-12.

10 Configuration Tool Guide: Material Paths

A Material Path (MP) sets material delivery control parameters based on the specific hardware (EMs and CMs, such as valves, pumps, motors and piping) included in that path. These parameters control the movement of material from one location to another. As many as 999 MPs can be created, including both automatic and manual materials. A maximum of 28 automatic MPs is allowed.

- Note that in a manual batch system each material must nevertheless have a Material Path, with the Feed Algorithm set to one of the three manual options.

10.1. Standard Material Path

A typical MP is defined by the material or mix of materials that travel through it, and it comprises all the hardware and control elements involved in that movement of material.

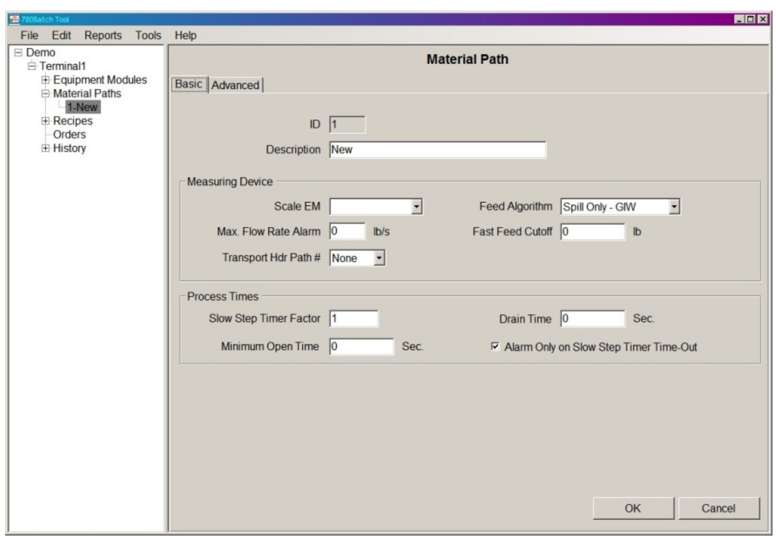


Figure 10-1: Material Path, Basic Tab

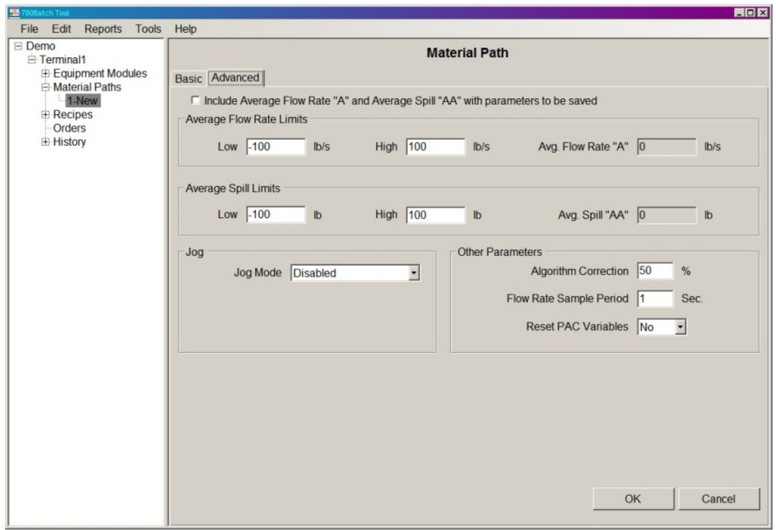
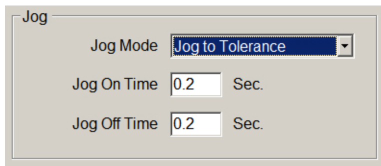


Figure 10-2: Material Path, Advanced Tab

The elements and functions available in these screens are as follows:

Element	Explanation	Options
Basic Tab		
Material	Serial number assigned to the Material Path, based on sequence in which the MPs are created. Cannot be modified.	
Description	Name assigned to identify this MP – typically, the material in question.	
Measuring Device		
Scale EM	Drop-down selection list permits the inclusion in the MP of any Scale Equipment Module that has been defined.	
Feed Algorithm	Determines the feed method used by this MP.	**For Scales**: Spill Only - GIW; Spill Only – LIW; K1 Feed GIW; K1 Feed LIW; K2 Feed GIW; K2 Feed LIW; Dump to Empty; Hand Add; Hand LIW; Hand Dump to Empty; Pre-weighed Hand Add **For Flow Meters:** Spill Only; K1 Feed; K2 Feed; Hand LIW
Max. Flow Rate Alarm	Flow rates above this value generate an alarm and terminate the feed. Setting the value to 0 turns alarm checking OFF.	0 lb*
Fast Feed Cutoff	Defines the absolute amount of material that will be fed at the slower rate, in a two-speed feed system. Fast feed is cut off when target weight minus delivered weight equals this value. E.g. if target is 100 kg and Fast Feed Cutoff is 10 kg, the fast feed will stop when 90 kg have been delivered.	0 lb*

Element	Explanation	Options
Transport Hdr Path #	For multi-material feeds, designates the number of the Transport Header path.	None*, 1 – 28
Process Times		
Slow Step Timer Factor	The Slow Step Timer calculation factor multiples the Slow Step Timer value by target divided by average flow (Factor * (target/average flow)). e.g. a factor of 1.5 means the material feed can take up to 50% longer than expected before an alarm or abort is generated.	1*
Drain Time	Time in seconds that the system will wait for material to drain into or from a vessel after the material transfer process has cut off the feed and before it tests the material delivery tolerance. Suggested initial value: 5 sec.	0 Sec.*
Minimum Open Time	The amount of time the system waits at the beginning of a material transfer, before applying the feed algorithm. This allows the material flow to stabilize before the feed algorithm is applied, so that the algorithm does not have to account for surges in material flow rates when the feed starts. Suggested initial value: 1 sec.	0 Sec.*
	Advanced Tab	
[Check box]	Check to include Average Flow Rate "A" and Average Spill "AA" with parameters to be saved.	
Average Flow Rate Limits		
Low	The upper and lower limits for the Average Flow Rate. No Control Algorithm updates will occur if the actual flow value is outside the range defined by these parameters.	-100 lb/s*
High		100 lb/s*
Avg. Flow Rate "A"	Calculated value; cannot be modified.	
Average Spill Limits		
Low	The upper and lower limits for the Average Spill. No Control Algorithm updates will occur if the actual spill value is outside the range defined by these parameters.	-100 lb/s*
High		100 lb/s*

Element	Explanation	Options
Avg. Flow Rate "AA"	Calculated value; cannot be modified.	
Jog		
Jog Mode	If Jog to Tolerance or Jog to Target is selected, additional parameters appear: 	Disabled*, Jog to Tolerance, Jog to Target
Jog On Time	Time at which the jog output is turned on.	0.2 Sec.*
Jog Off Time	Time at which the jog output is turned off.	0.2 Sec.*
Other Parameters		
Algorithm Correction	Determines the degree of change when recalculating the control system's new operating parameters. A value of 40 would mean that a 40% change would be applied to the current material when the new parameters are calculated, based on the Material Feed just completed.	50%*
Flow Rate Sample Period	Used by the optional Q.iMPACT algorithms to set the period in seconds (from 1 to 60) during which the flow rate is calculated. Smaller values allow the controller to respond more quickly to changes in rate, while larger values permit the rate to change more smoothly. In most cases, lower values give better cutoff results.	1* – 60 Secs.
Reset PAC Variables	Determines whether the Predictive Adaptive Control algorithms developed during batch processing are re-set to their default values when the MP is next downloaded from the BatchTool 780.	No*, Yes

- Weight units for these settings are determined by the Units configured in the Terminal setup screen – refer to Chapter 3, **Configuration**.

10.2. Flow Meter Material Path

The Material Path for a Flow Meter is the same as that for a Scale Material Path with two exceptions, both of which appear on the Basic tab of the Material Path configuration screen:

- A Density parameter is included
- The Material Path must always specify a destination Equipment Module.

Figure 10-3 shows the Basic tab of the Flow Meter Material Path configuration screen, with the unique elements highlighted. All other elements on this screen, and on the Advanced tab, are identical to those described above for the Standard Material Path.

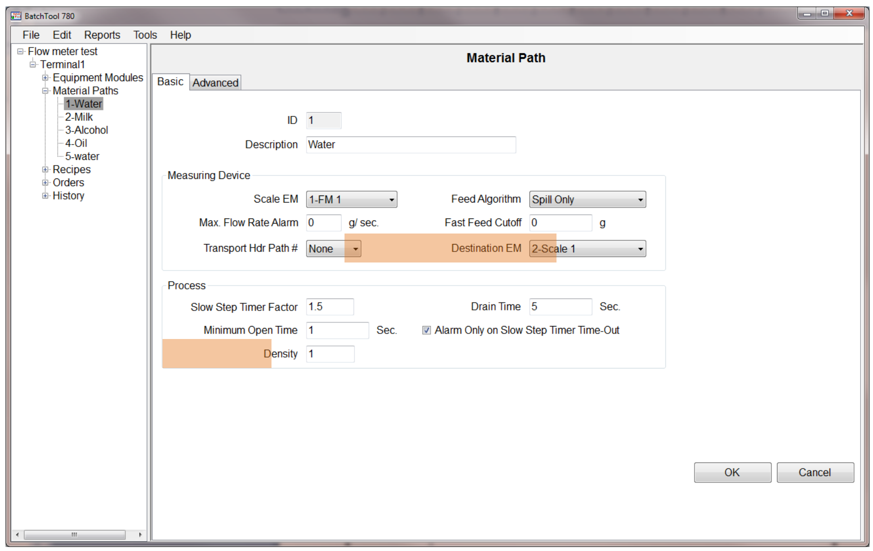


Figure 10-3: Flow Meter Material Path, Basic Tab

10.2.1. Density

This parameter is exactly the same as the *Flow Rate Multiplier* in the Flow Meter setup in the IND780. It is a correction factor that represents the density of the material relative to that of water. A density to 1 means that the material has the same density as water.

The following example shows how to use the Density for a material other than water.

$$\text{Pulses/g} = \frac{\text{2,200 pulses}}{\text{1 Liter}} \times \frac{\text{1 Liter}}{\text{1,000g}} \times \text{Density}$$

If **Density** is set to anything other than 1, the parameter is enabled and the system makes the calculation shown above. For example, the density of isopropyl alcohol, is 1Liter/785.40g. Since the water calculation is always in the equation, the Flow Rate Multiplier must be calculated as 1000g/785.40g.

$$\text{Pulses/g} = \frac{\text{2,200 pulses}}{\text{1 Liter}} \times \frac{\text{1 Liter}}{\text{1,000g}} \times \frac{\text{1,000g}}{785.40} \quad 2.8$$

So 2.8 pulses = 1 gram of isopropyl alcohol compared to 2.2 pulses for 1 gram of water.

10.2.2. Destination EM

A Destination EM must be specified in the Flow Meter Material Path. The destination can be a **Scale EM** or **Out of System**, meaning that the FM feed is being delivered to a non-scale device.

11 Configuration Tool Guide: Recipes

11.1. Overview

Once the equipment and control elements of the project have been defined, and the material paths configured, recipes can be created.

Click on the Recipes branch in the tree view under the appropriate Terminal, and then select **Edit | New | Recipe** from the menu. The initial recipe configuration screen will appear:

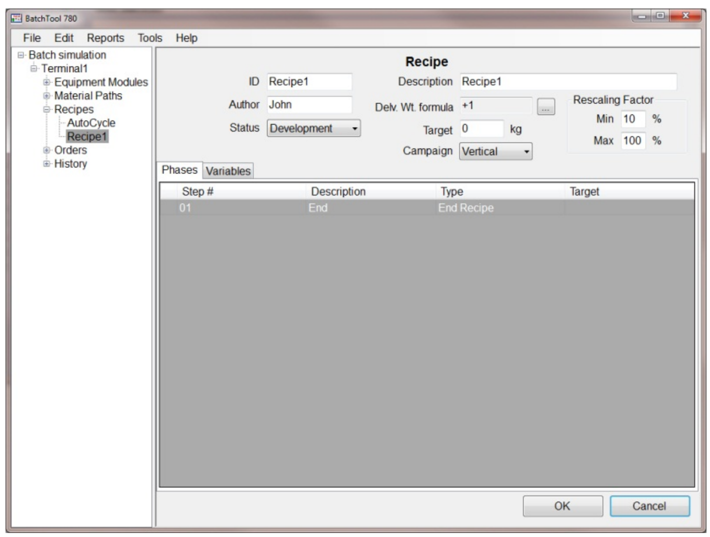


Figure 11-1: Recipe, Initial Screen – Phases

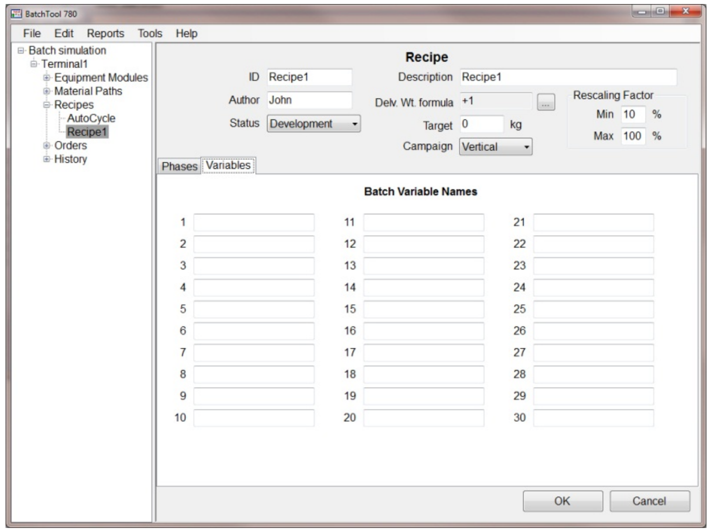


Figure 11-2: Recipe, Initial Screen – Variables

11.2. Recipe Controls

The elements and functions available in the recipe screens are as follows:

Element	Explanation	Options
General		
Recipe Name	Name used to identify this recipe.	
Description	Brief description of the recipe.	
Author	Name of creator of the recipe – defaults to name of currently logged-in user.	
Delv. Wt. formula	When ... is clicked, a Delivered Weight Calculation screen (Figure 11-3) appears. Refer to the Delivered Weight Value Dialog section, on page 11-3.	+1*
Include Materials	Sets materials to include in the delivered weight calculation.	Fed To*, Fed From
To / From Equipment Modules	Lists each EM included in the system. EMs can be included (Yes) or excluded (No)	Yes*, No
Status	Defines the status of the recipe.	Development*, Testing, Released
Target	Sets the overall target weight for the recipe.	0 lb*
Rescaling Factor, Min and Max	Sets the range within which the Recipe can be scaled up or down, expressed as a percentage of the target weight.	Min: 10%* Max: 100%

Element	Explanation	Options
Campaign	Controls the behavior of the recipe. For a detailed explanation of each type of campaign, refer to the **Vertical and Horizontal Campaigns** section of Chapter 2.	
Phases		
A table showing all included phases (steps) in the recipe. For each step, the table shows a sequence number, a description, the type of step, and the target if appropriate.		
Variables		
This screen (Figure 11-2) lists names for each of up to 30 Batch Variables which, once named, can represent values produced in the course of the recipe, or values to be used by phases in the recipe.		

- Weight units for these settings are determined by the Units configured in the Terminal setup screen – refer to Chapter 7, **Terminal Configuration**.

11.2.1. Delivered Weight Value Dialog

The Delivered Weight formula is used by the terminal to determine what weight values are used to calculate the delivered weight value. Because the batch sequence can contain both Gain In Weight (GIW) and Loss In Weight (LIW) feeds to more than one scale, the user must select which scale and type of feed should be used in the calculation. The product of the calculation, delivered weight, is used in a comparison with the recipe target weight to calculate the percentage of error for the batch.

By default, the delivered weight formula is configured to add any GIW material transfers fed to scale 1. To edit or review these settings, click on the ellipsis button to the right of the **Delv. Wt. formula** field. The screen shown in Figure 11-3 will appear.

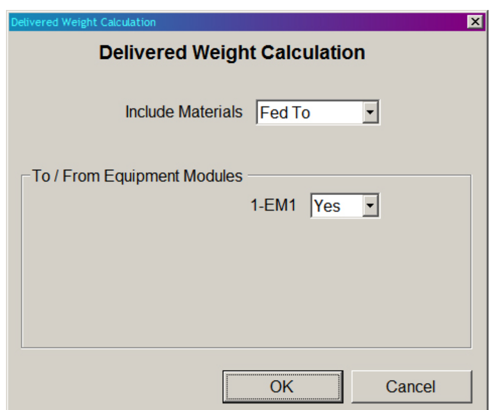


Figure 11-3: Delivered Weight Calculation Screen

The choice of configuration here depends on how the recipe is configured. For example, a typical mix batch it would be appropriate to capture all additions to scale 1. However, in a dosing application where a mix is fed into individual containers, the material is removed from the scale, so subtractions from the scale should be captured to determine the delivered weight. The table below summarizes the setting options for this configuration screen.

Accessing this screen automatically triggers a recalculation of the recipe target. The BatchTool will sum the target of every individual material transfer, regardless of EM or feed type, and place the value in the recipe Target field (Figure 11-2). This value can be edited directly, if manual entry of the total batch weight is preferred.

Element	Explanation	Options
General		
Delv. Wt. formula	When ... is clicked, a Delivered Weight Calculation screen (Figure 11-3) appears. +1 –the Delivered Weight will be the sum of all weight additions to the scale. -1 – the Delivered Weight will be the sum of all weight subtractions from the scale. Note that more than one scale can be included in the calculation, but all included scales must have the same mode – addition to or delivery from. If material fed from Scales 1 and 2 are included, the **Delv. Wt. formula** field would read -1 2.	+1*
Include Materials	Sets materials to include in the delivered weight calculation.	Fed To*, Fed From
To / From Equipment Modules	Lists each EM included in the system. EMs can be included (Yes) or excluded (No)	Yes*, No

11.3. Recipe Phases

Table 11-1 lists the types of phase available from the list at **Edit | New | Recipe** (Figure 11-4).

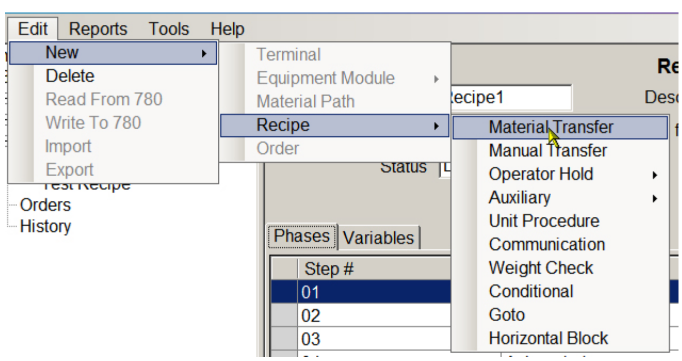


Figure 11-4: Creating a New Phase from the Edit > New Menu

Phases can also be added from within the Recipe view screen (Figure 11-1), by right-clicking on the phase that should follow the new phase. Phase type is selected from the context menu that appears.

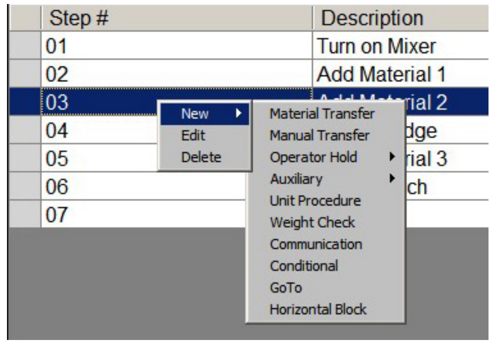


Figure 11-5: Phase Types Context Menu

Table 11-1 lists the types of phase that can be added to a recipe.

- Double-clicking a phase in the Recipe list (Figure 11-1) will open its configuration screen.

Table 11-1: Phases: Components of a Recipe

Phase	Explanation
Material Transfer	Step for controlling the automatic transfer of material
Manual Transfer	Step for operator's control of transfer of material
Operator Hold – Timed	Waits for a set period.
Operator Hold – Acknowledge	Waits until the operator issues an acknowledgement via the terminal's front panel, or using I/O.
Operator Hold – Entry	Waits until the operator enters data via the terminal's front panel.
Operator Hold – Selection	Waits until the operator selects a value via the terminal's front panel, or using I/O.
Operator Hold – Login	Waits until the operator logs in to indicate who was in control of processing at this step.
Operator Hold – Timed w/ Discrete	Waits until a specified time has passed, after which the operator can issue a command to continue via I/O.
Operator Hold – Acknowledge w/ Discrete	Stops processing the order until the operator issues an acknowledgement via I/O.
Operator Hold – Verify Container	Waits until the operator verifies that the correct container is on the scale.
Operator Hold – Verify Material	Waits until the operator verifies that the correct material is being used. Phase can also be used for Lot Number verification.
Operator Hold – Display Delivered Weight, Timed	Pauses execution of the batch and displays the delivered weight for a specified period.
Operator Hold – Display Delivered Weight, Acknowledge	Pauses execution of the batch and displays the delivered weight until the operator acknowledges the display by pressing the OK softkey.

Phase	Explanation
Auxiliary – Timed Pulse w/Delay	Turns on an Aux CM output for a specified period, after a specified delay.
Auxiliary – Timed Pulse w/Thresh	Turns on an Aux CM output for a specified period, after a specified weight value is reached.
Auxiliary – Pulse Btwn Thresh	Turns on an Aux CM output when a specified weight threshold is passed, and leaves it on until a specified upper weight limit is reached.
Auxiliary – Span Phases	Turns on an Aux CM output and keeps it on while one or more recipe phases are processed. E.g. keeps a mixer running while several materials are added in sequence.
Unit Procedure	An ordered set of phases that a single scale unit carries to completion, like a subroutine. Multiple unit procedures can execute simultaneously.
Communication	Sends messages (print, operator, email) during the running of the recipe.
Weight Check	Before continuing, verifies that the appropriate gross weight is on a scale within a specified tolerance.
Conditional	Makes a decision to branch to one of two different recipe steps, based on the status of a comparison of values of batch variables.
Goto	Branch to a different step in the recipe.
Horizontal Block	Grouping for multiple phases to be run together during horizontal batch execution. When a Horizontal Block phase is defined, an End Horizontal Block step is automatically added. Steps added between these two will be carried out in parallel.
Math	Performs a mathematical operation on one or two defined values, which can be absolute values or batch variables, and outputs a result.
End Recipe	Identifies the final step of the recipe.
Noop	A phase with No Operation.
Custom	Allows the user to implement a custom TaskExpert application from within the recipe.

11.3.1. Phase Controls

11.3.1.1. Recipe Navigation Using Arrows

At the top right of each phase configuration screen, a pair of previous/next buttons can be used to step backward (upward, relative to the list of phases) or forward through the recipe to access a phase for review or modification.

Once the desired phase is highlighted, double-clicking on it opens the basic tab of its configuration screen.

11.3.1.2. Temporarily De-Activating Phases Using Comment

With the exception of the mandatory **End** phase, any phase in a recipe can be excluded from the recipe's execution by right-clicking it and selecting the first item in the context menu, **Comment**.

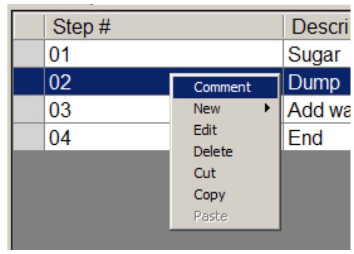
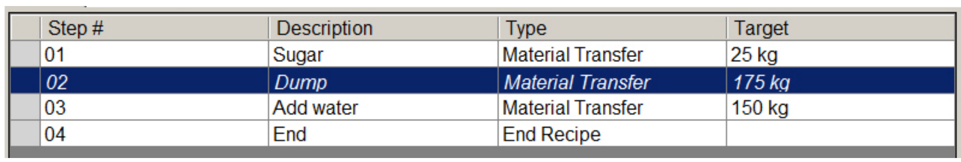


Figure 11-6: Commenting Out a Phase

When a phase has been commented out in this way, it appears in the recipe list in italics.



Step #	Description	Type	Target
01	Sugar	Material Transfer	25 kg
02	*Dump*	*Material Transfer*	*175 kg*
03	Add water	Material Transfer	150 kg
04	End	End Recipe	

Figure 11-7: Commented Phase Displayed as Italic

To re-activate a commented phase, right-click on it and select **Uncomment**. The appearance of the phase in the recipe list will return to normal.

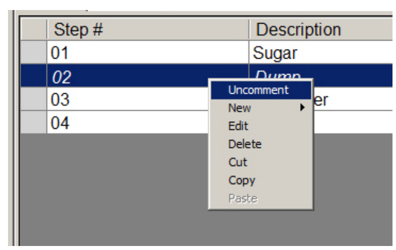


Figure 11-8: Restoring a Commented Phase

11.3.1.3. Manipulating Phases Using the Context Menu

A phase in the recipe view can be deleted by selecting it, right-clicking and choosing **Delete** from the context menu.

To move or duplicate a phase in the recipe view, use the **Cut**, **Copy** and **Paste** options. These appear in the context menu (Figure 11-9) opened by right-clicking on the selected phase.

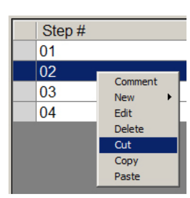


Figure 11-9: Cut, Copy and Paste Options in the Recipe Configuration Screen

Once either **Cut** or **Copy** has been selected, the **Paste** option becomes available. This means that a phase can be left in place but copied and pasted to another location, or removed and re-inserted in another location.

When a phase has been copied, select the phase that should appear **after** the paste phase, right click and select **Paste**.

11.3.2. Material Transfer

This phase initiates a material transfer, with a target weight and high and low tolerances. The Advanced tab associates the transfer with variables.

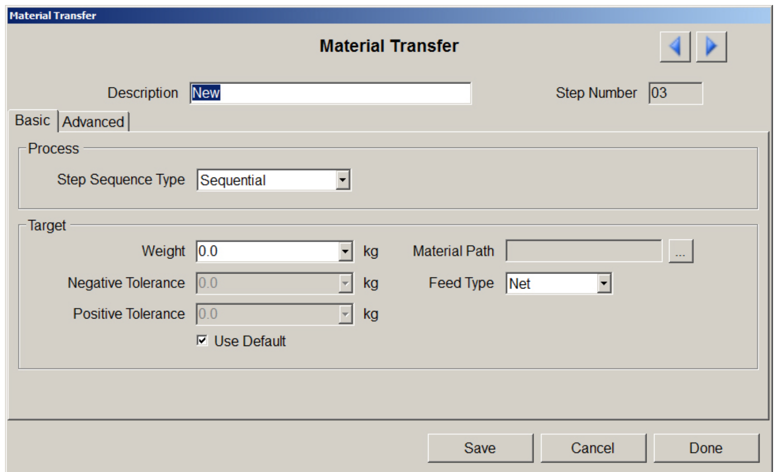


Figure 11-10: Phase: Material Transfer, Basic Tab

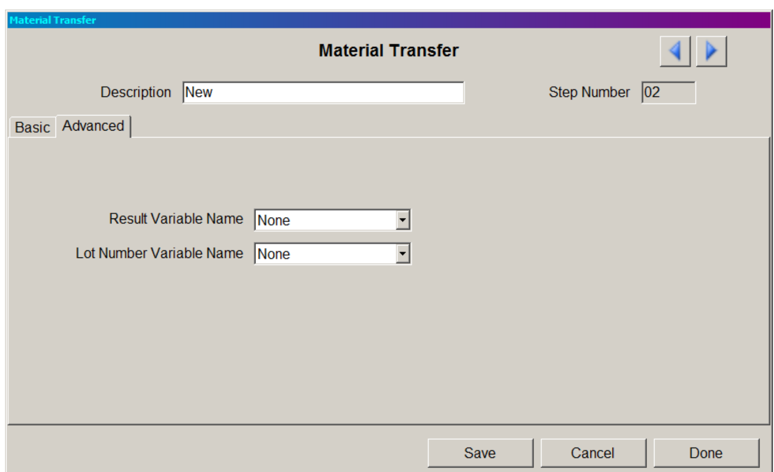


Figure 11-11: Phase: Material Transfer, Advanced Tab

Element	Explanation	Options
	Basic	
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	

Element	Explanation	Options
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Target		
Weight	Sets the weight value of the target for this Material Transfer phase.	0.0 kg*
Material Path	Pressing the button opens a list from which the MP associated with this phase can be selected.	
Negative Tolerance	Defines the lower limit of the tolerance range around the target weight.	0.0 kg*
Positive Tolerance	Defines the upper limit of the tolerance range around the target weight.	0.0 kg*
Use Default	When checked, uses the default (global) tolerances. Note that selecting **Use Default** when the target value is provided by a Batch Variable will set the tolerances to zero, since the system cannot calculate a tolerance from a variable.	
Feed Type	Determines whether weight is added based on the net or gross weight on the scale.	Net*, Gross
	Advanced Tab	
Operator Runtime Message	An on-screen message to the operator that will appear during the execution of this phase.	
Result Variable Name	A drop-down selection list of all the Variables defined in the Variables tab of the Recipe configuration window; the selected variable is populated with the result from this material transfer.	None*
Lot Number Variable Name	A drop-down selection list of all the Variables defined in the Variables tab of the Recipe configuration window; the selected variable is populated with the lot number associated with this material transfer.	None*

- Weight units for these settings are determined by the Units configured in the Terminal setup screen – refer to Chapter 3, **Configuration**.

11.3.3. Manual Transfer

This phase represents a material transfer carried out by an operator.

Parameters a **Manual Transfer** are the same as for a **Material Transfer**.

11.3.4. Operator Hold – Timed

This phase pauses the control recipe for a set time, after which the operator must press the Start/Resume softkey to continue processing.

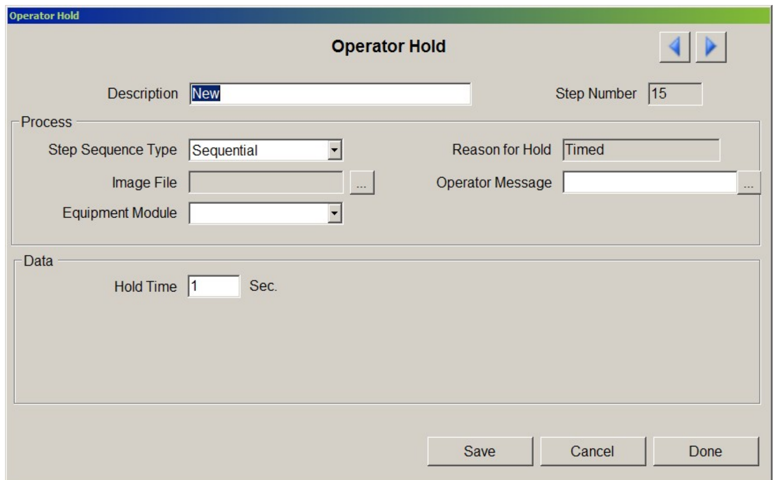


Figure 11-12: Phase: Operator Hold, Timed

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Reason for Hold	Indicates the type of Operator Hold phase selected; cannot be modified.	Timed*
Image File	Pressing the button opens a browser dialog that allows a customized image file to be associated with this phase. ■ The image file graphic cannot be larger than 320 pixels wide by 47 pixels high.	
Equipment Module	A drop-down selection list including all defined EMs.	
Operator Message	Defines a message of one or two lines that appears on-screen during the execution of this phase.	

Element	Explanation	Options
Operator Message2	Click on the to select a Shared Data Variable value to display as the message (Figure 11-13).	
Data		
Hold Time	Defines the time during which the phase is held, after which the operator can resume processing.	1 Sec.*, 30,000 max.

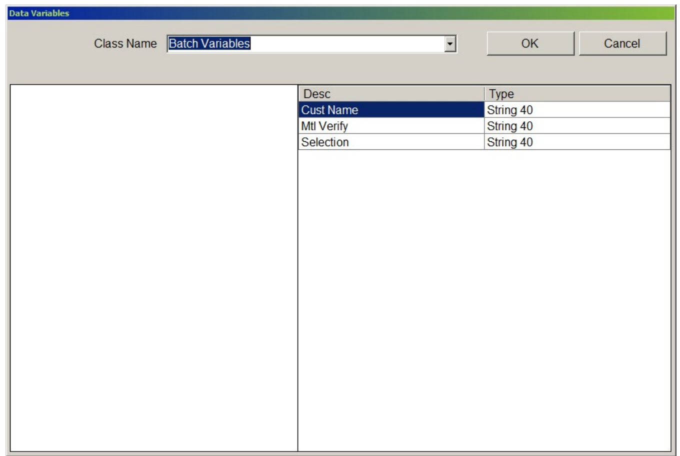


Figure 11-13: Shared Data Variable Selection for Operator Message

11.3.5. Operator Hold – Acknowledge

This phase presents the operator with a message of up to two lines and a customizable image. The recipe will not continue until the operator acknowledges the message either by pressing the OK softkey, or via a discrete input.

The configuration dialog for the **Operator Hold – Acknowledge** phase is identical to that shown in Figure 11-12, except that the **Reason for Hold** field shows **Acknowledge**, and there is no Data section.

11.3.6. Operator Hold – Entry

The **Operator Hold – Entry** phase adds a section of Data parameters.

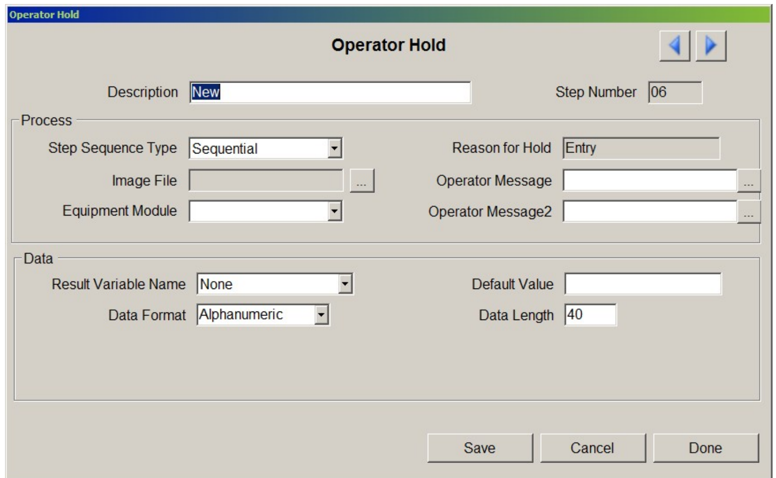


Figure 11-14: Phase: Operator Hold, Entry

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

Element	Explanation	Options
Data		
Result Variable	A drop-down selection list of all the Variables defined in the Variables tab of the Recipe configuration window.	None*
Data Format	Defines the format of the required data entry. If **Numeric** is selected, three new parameters are displayed (Figure 11-15).	Alphanumeric*, Numeric
Num DPs	Sets the number of decimal places that the Operator Hold Entry will expect for entered data. If the entered value does not contain the specified number of decimal places, an error message will be displayed and the operator will be prompted to re-enter the information.	0
Minimum	Constrains result variable to a range defined by these upper and lower limits.	0
Maximum		0
Default Value	Sets a default value for the entered data.	
Data Length	Sets the maximum string length or maximum number of digits of the entered data. Valid values are 0 - 40. Setting Data Length to zero disables entry.	40* (characters)

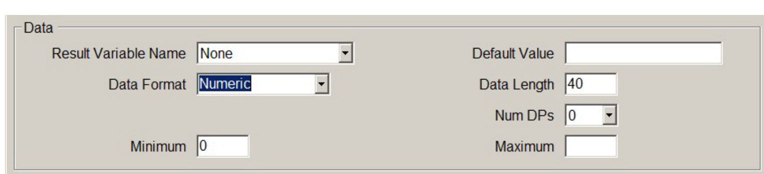


Figure 11-15: Operator Hold – Additional Parameters for Numeric Data Format

11.3.7. Operator Hold – Selection

The **Operator Hold – Selection** dialog presents the operator with a message, allows a selection to be made from a Selection List and, optionally, outputs a result to one of the variables defined on the **Recipe | Variables** tab.

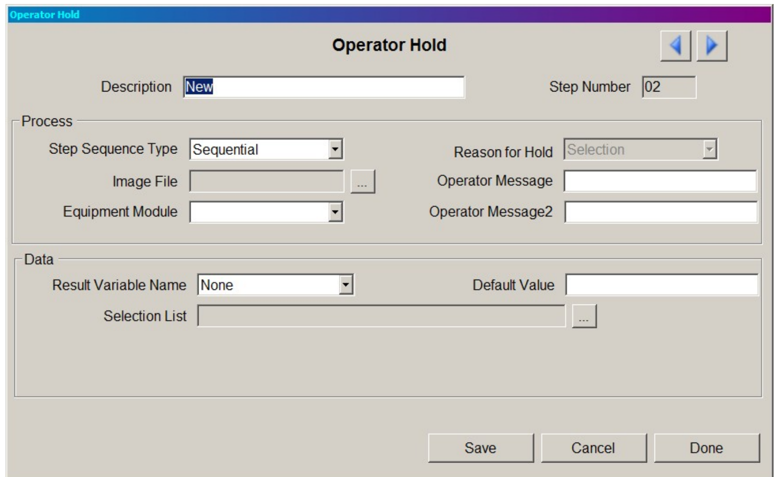


Figure 11-16: Phase: Operator Hold, Selection

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

Element	Explanation	Options
Data		
Result Variable	A drop-down selection list of all the Variables defined in the Variables tab of the Recipe configuration window.	None*
Selection List	The ... button opens a window (Figure 11-17) into which items for the list can be entered, separated by pressing <ENTER>.	Contents of list cannot exceed 200 characters
Default Value	Sets the default item from the selection list.	

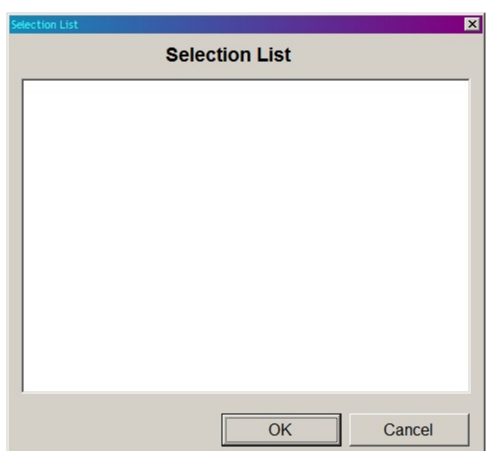


Figure 11-17: Selection List Entry Window

11.3.8. Operator Hold – Login

When an Operator Hold - Login phase is included in a recipe, the next step will not begin until the operator has logged in with a valid user name and password. This information is included in the audit log and history, and allows tracking of which operator was responsible for carrying out/completing the following phase.

The configuration dialog for the **Operator Hold – Login** phase is identical to that shown in Figure 11-12, except that the **Reason for Hold** field shows **Login**, and there is no Data section.

11.3.9. Operator Hold – Timed w/Discrete

This phase waits for a specified time, then requires an input to continue.

- This phase will not execute, and the recipe will abort, unless an Alert output is specified in the Operator Action Control Module. If no alert output is specified in the CM, and an attempt is made to copy a recipe that includes an **Operator Hold – Timed with Discrete** phase to the terminal, the BatchTool will display an error message and the recipe will not be transferred.

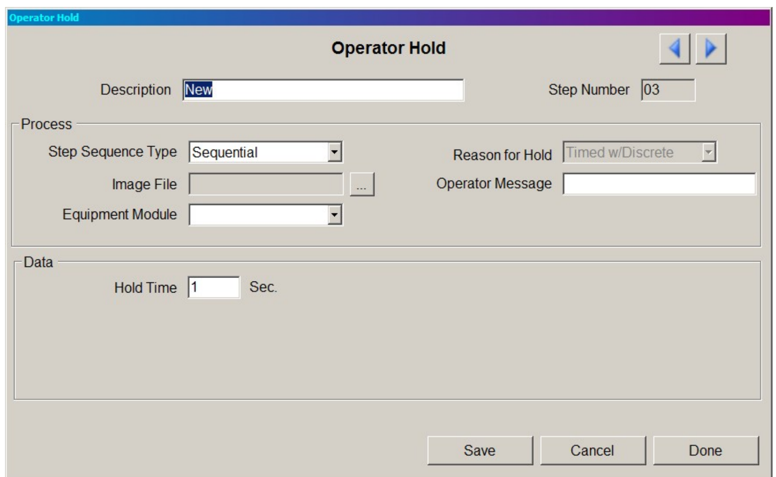


Figure 11-18: Phase: Operator Hold, Timed with Discrete

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

Element	Explanation	Options
Data		
Hold Time	Sets a time in seconds during which processing will wait. After this time has lapsed, an acknowledge input must occur to continue processing.	1 Sec.*

11.3.10. Operator Hold – Acknowledge w/Discrete

The configuration dialog for the **Operator Hold – Acknowledge w/ Discrete** phase is identical to that shown in Figure 11-12, except that the **Reason for Hold** field shows **Ack w/Discrete**, and there is no Data section.

11.3.11. Operator Hold – Verify Container

This phase pauses the execution of the order, and prompts the operator to confirm that the correct container for the current phase is on the scale.

- This phase will not execute, and the recipe will abort, unless an Alert output is specified in the Operator Action Control Module. If no alert output is specified in the CM, and an attempt is made to copy a recipe that includes an **Operator Hold – Timed with Discrete** phase to the terminal, the BatchTool will display an error message and the recipe will not be transferred.

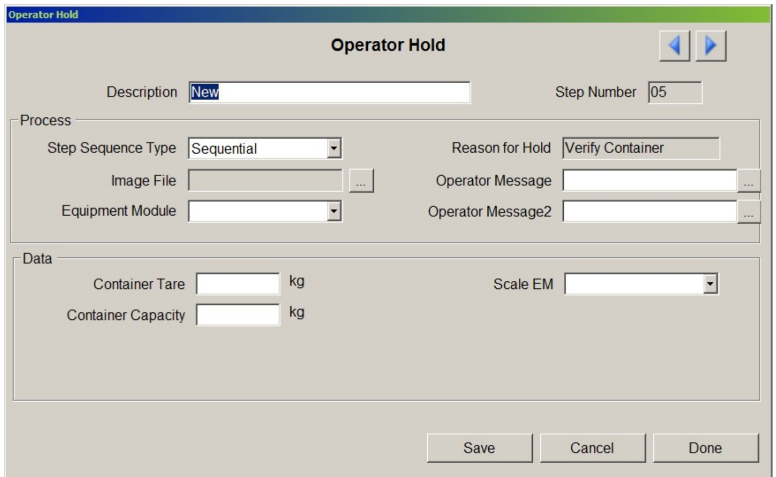


Figure 11-19: Operator Hold – Verify Container

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

The heading and Process sections of this phase configuration screen are the same as those for other Operator Hold phases, except for the Reason for Hold description.

Element	Explanation	Options
Data		
Container Tare	Enter the tare weight of the container to be used for this phase.	n/a
Container Capacity	Enter the capacity of the container to be used for this phase.	n/a
Scale EM		List of defined Scale Equipment Modules

11.3.12. Operator Hold – Verify Material

This phase pauses the execution of the order, and prompts the operator to confirm that the correct material is being used for the phase. This phase could also be used for Lot # verification, or container verification if containers have a specific ID associated with them.

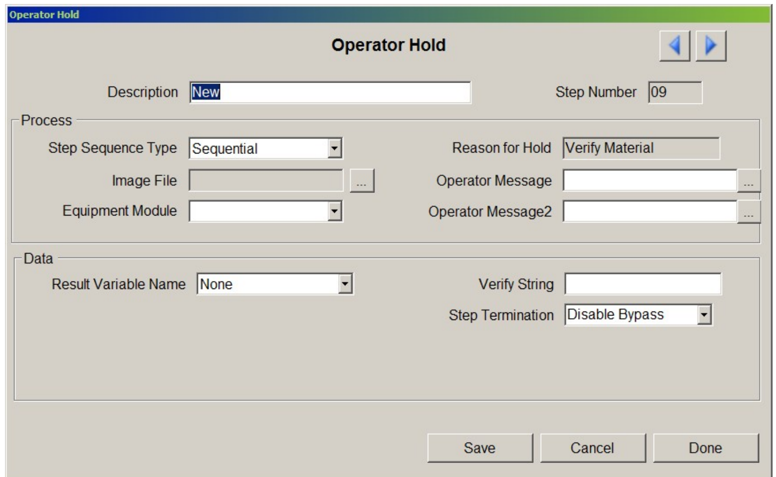


Figure 11-20: Operator Hold – Verify Material

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

The heading and Process sections of this phase configuration screen are the same as those for other Operator Hold phases, except for the Reason for Hold description.

Element	Explanation	Options
Data		
Result Variable Name	Determines the name of the variable with which the entered or scanned data is associated.	Any variable defined in the recipe
Verify String	The operator's data input (scanned or entered via the keypad) must match this string for the verification to be valid.	n/a
Step Termination	Determines whether the operator can bypass the verification of material if the phase is not validated. When **Disable Bypass** is selected, the recipe will not be allowed to continue until the entered data matches the **Verify String**. **Allow Bypass** permits the recipe to continue whether or not the entered data matches the **Verify String**.	Disable Bypass*, Allow Bypass

11.3.13. Operator Hold – Display Delivered Weight, Timed

This phase pauses the execution of the order, and displays the delivered weight for a specified amount of time.

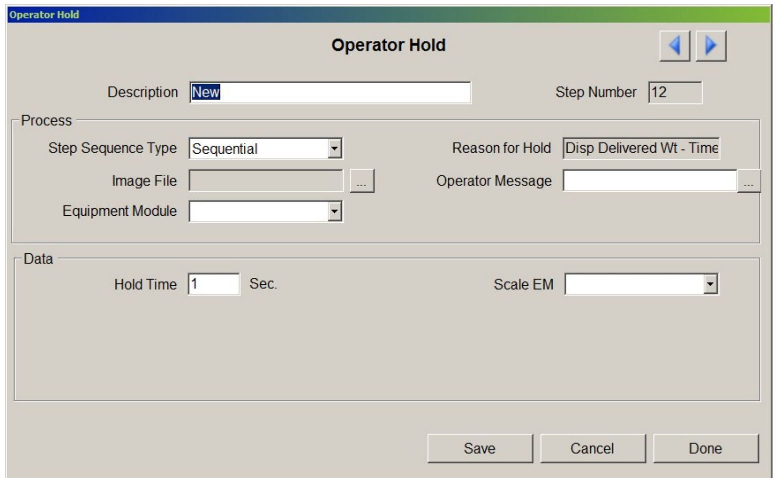


Figure 11-21: Operator Hold – Display Delivered Weight, Timed

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

The heading and Process sections of this phase configuration screen are the same as those for other Operator Hold phases, except that there is only one Operator Message field, and the Reason for Hold description.

Element	Explanation	Options
Data		
Hold Time	Sets the amount of time for which the delivered weight will be displayed.	1 Sec.
Scale EM	Determines the scale equipment module for which the delivered weight will be displayed.	Any configured Scale EM

11.3.14. Operator Hold – Display Delivered Weight, Acknowledge

This phase pauses the execution of the order, and displays the delivered weight until the operator presses the OK softkey to acknowledge it.

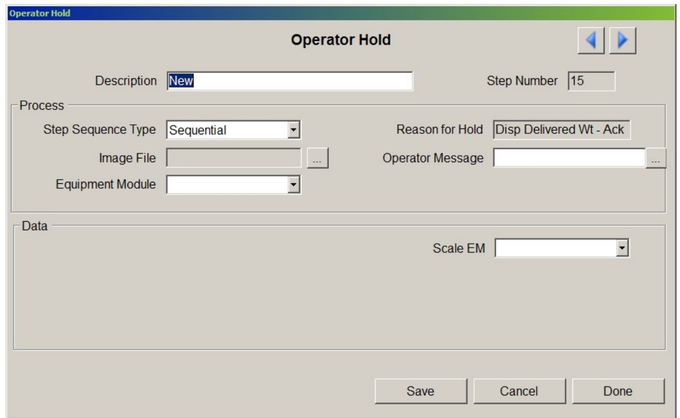


Figure 11-22: Operator Hold – Display Delivered Weight, Acknowledge

- The **Image File** graphic cannot be larger than 320 pixels wide by 47 pixels high.

The heading and Process sections of this phase configuration screen are the same as those for other Operator Hold phases, except that there is only one Operator Message field, and the Reason for Hold description.

Element	Explanation	Options
Data		
Scale EM	Determines the scale equipment module for which the delivered weight will be displayed.	Any configured Scale EM

11.3.15. Auxiliary – Timed Pulse w/Delay

This phase turns on an Aux control such as a mixer, after a specified delay and for a defined period.

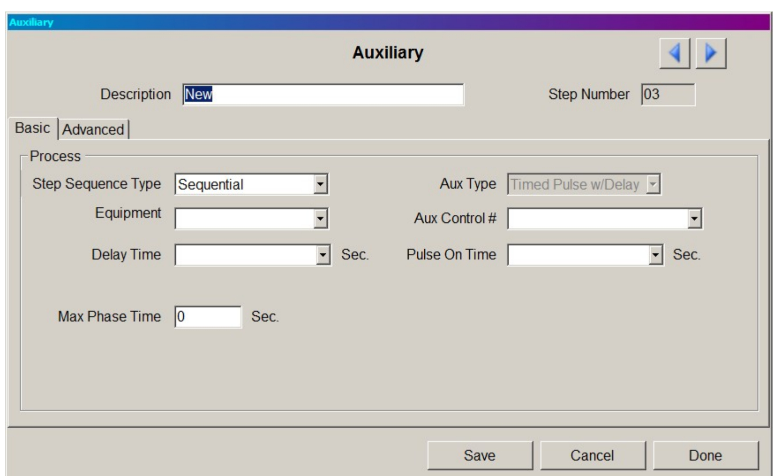


Figure 11-23: Phase: Auxiliary – Timed Pulse w/Delay, Basic Tab

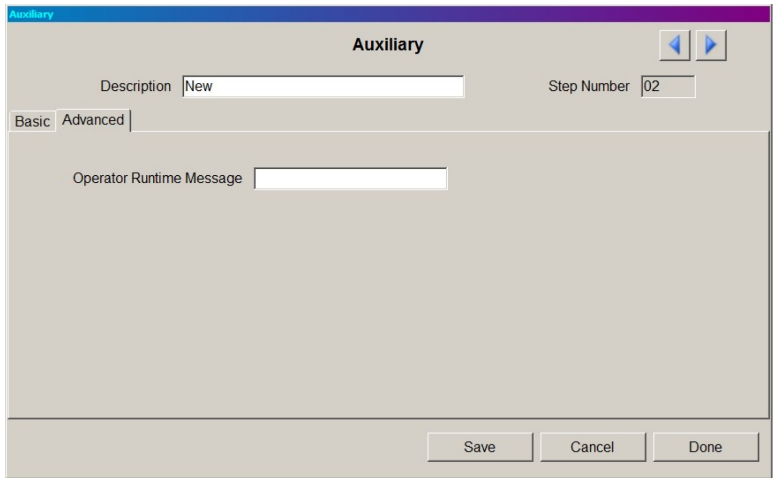


Figure 11-24: Phase: Auxiliary – Timed Pulse w/Delay, Advanced Tab

Element	Explanation	Options
	Basic	
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Stop Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Aux Type	Indicates the type of Auxiliary phase selected; cannot be modified.	Timed Pulse w/Delay
Aux Control#	Determines the Aux CM to be activated by this step.	1* – 4
Equipment	A drop-down selection list including all defined EMs.	
Delay Time	Sets delay following completion of the previous step after which the Aux CM will be turned on.	Sec.
Pulse On Time	Sets the time, in seconds, for which the Aux CM will be turned on.	Sec.
Max. Phase Time	When set to a value other than zero, this is the maximum time this phase will run when none of the starting or terminating conditions occur.	Sec.
	Advanced	
Operator Runtime Message	An on-screen message to the operator that will appear during the execution of this phase.	

11.3.16. Auxiliary – Timed Pulse w/Thresh

This phase turns on an output after a time delay, but only if a threshold weight has been reached.

The **Advanced** tab of the **Auxiliary – Timed Pulse w/Thresh** dialog is identical to that shown in Figure 11-24.

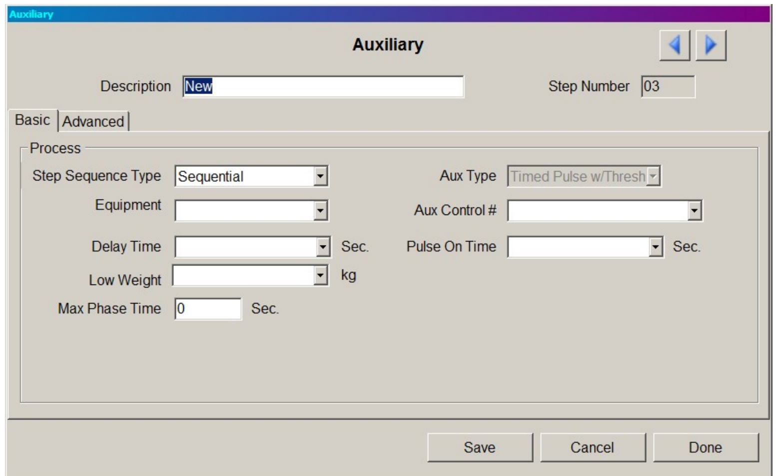


Figure 11-25: Phase: Auxiliary, Timed Pulse w/Thresh, Basic Tab

Element	Explanation	Options
Basic		
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Equipment	A drop-down selection list including all defined EMs.	
Aux Type	Indicates the type of Auxiliary phase selected; cannot be modified.	Timed Pulse w/Thresh
Aux Control #	Determines the Aux CM to be activated by this step.	1* – 4
Delay Time	Sets delay following completion of the previous step after which the Aux CM will be turned on.	
Pulse On Time	Sets the time, in seconds, of the output ON pulse.	Sec.
Low Weight	Sets the weight threshold that must be exceeded before this step begins to execute (including time delay, if defined)	Kg

Element	Explanation	Options
Max. Phase Time	When set to a value other than zero, this is the maximum time this phase will run when none of the starting or terminating conditions occur.	Sec.
Advanced		
The contents and functions of the Advanced tab are identical to those shown in Figure 11-24.		

11.3.17. Auxiliary – Pulse Btwn Thresh

This phase turns on an Aux output once a low weight threshold is reached, and turns it off when a high weight limit is reached.

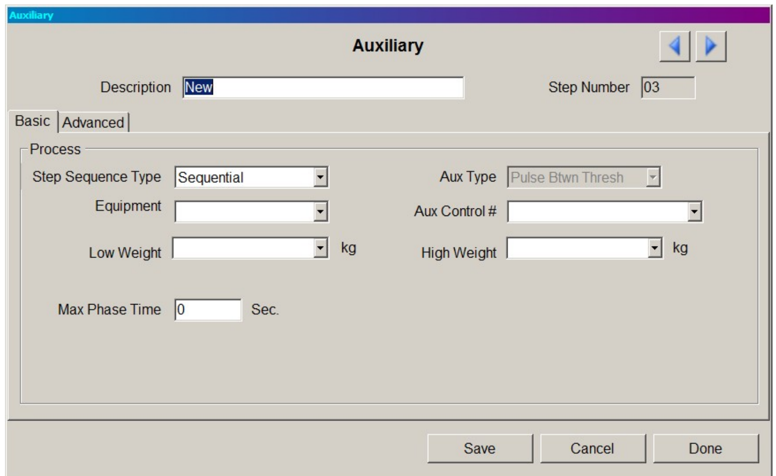


Figure 11-26: Phase: Auxiliary, Pulse Between Thresholds, Basic Tab

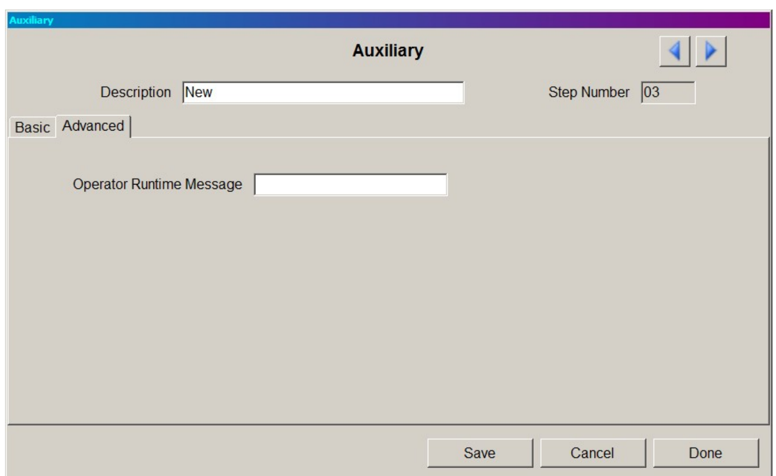


Figure 11-27: Phase: Auxiliary, Pulse Between Thresholds, Advanced Tab

Element	Explanation	Options
Basic		
Step Number	Determined by the phase's position in the recipe; cannot be modified.	

Element	Explanation	Options
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Equipment	A drop-down selection list including all defined EMs.	
Aux Type	Indicates the type of Auxiliary phase selected; cannot be modified.	Pulse Btwn Thresh
Aux Control #	Determines the Aux CM to be activated by this step.	
Low Weight	Sets the lower weight at which the Aux CM is turned on.	Kg
High Weight	Sets the upper weight at which the Aux CM is turned off.	Kg
Max. Phase Time	When set to a value other than zero, this is the maximum time this phase will run when none of the starting or terminating conditions occur.	Sec.
	Advanced	
Operator Runtime Message	An on-screen message to the operator that will appear during the execution of this phase.	

11.3.18. Auxiliary – Span Phases

This phase allows an auxiliary control to be turned on at a specific phase number, and turned off when some subsequent phase is reached. This phase must be positioned before the first of the phases to be spanned.

The **Advanced** tab of the **Auxiliary – Span Phases** dialog is identical to that shown in Figure 11-27.

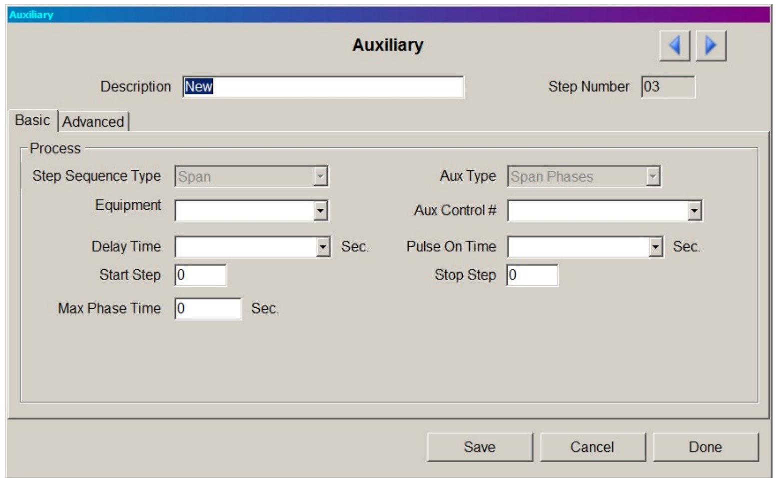


Figure 11-28: Phase: Auxiliary, Span Phases, Basic

Most of the elements of this screen are identical to those described for the Timed Pulse w/ Delay step (Figure 11-23). Only the **Start Step** and **Run until step** parameters are unique to Span Phases.

Element	Explanation	Options
Basic		
Process		
Start Step	The action determined by the **Equipment**, **Aux Control #**, **Delay** and **Pulse Time** settings will begin at the Start Step and end at the Stop Step. This phase must be defined in the recipe before the Start Step.	
Run until step		

11.3.19. Unit Procedure

This phase defines an ordered set of steps that a single scale unit carries to completion, like a subroutine. Multiple unit procedures can execute simultaneously. When a unit procedure is added to a recipe, an End Procedure step is also needed. Additional unit procedures included immediately after the End Procedure step will execute in parallel, if the Step Sequence Type is so configured.

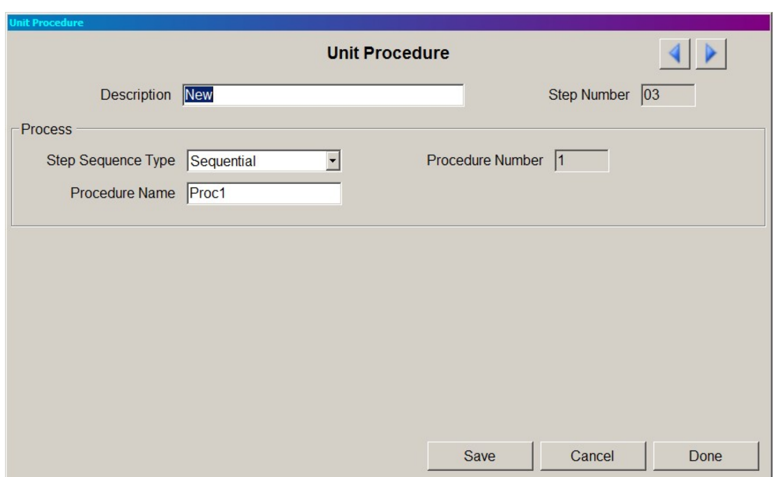


Figure 11-29: Phase: Unit Procedure

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Typically, Unit Procedures will be marked to execute in **Parallel**.	Sequential*, Parallel
Procedure Number	Serial number determined by the recipe.	
Procedure Name	Descriptive name given to the Unit Procedure during configuration.	

11.3.20. Communication

This phase causes the recipe to communicate information in the form of an email, printout or operator message. The content is defined by the Custom Print fields.

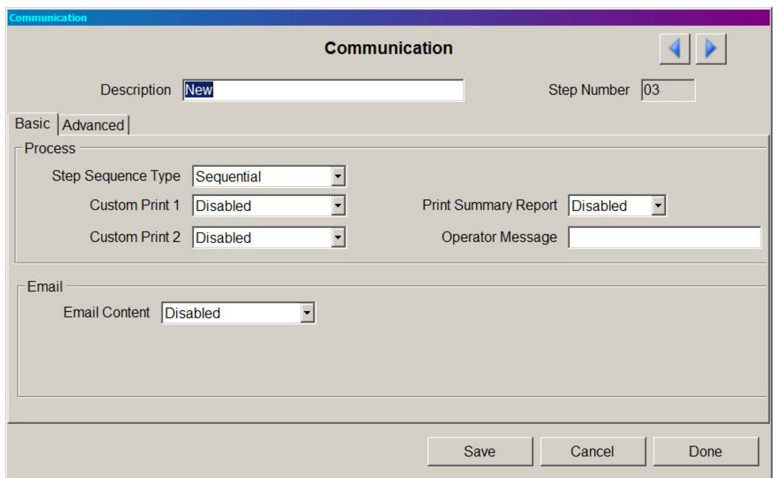


Figure 11-30: Phase: Communication, Basic

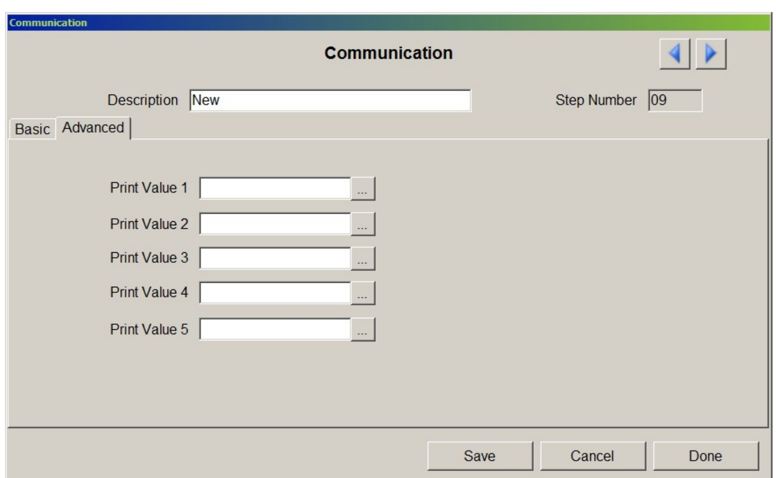


Figure 11-31: Phase: Communication, Advanced

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
	Basic	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Custom Print 1	These drop-down selection lists permit a variety of triggers to produce the content of the email.	Disabled*, Trigger 1 – 10
Custom Print 2		Disabled*, Trigger 1 – 10
Print Summary Report	When enabled, the execution of this phase also causes a summary report to be sent to the configured print output.	Disabled*, Enabled
Operator Message	An on-screen message to the operator that will appear during the execution of this phase.	
Email		
Email Content	If this value is set to **Disabled**, the screen will appear as in Figure 11-30. If a **Template** or the **Summary Report** is selected, the Email Address and Subject fields appear. If **Message** is selected, the Email Address, Subject and Message fields appear.	Disabled*, Template 1 – 10, Summary Report, Message
Subject	Sets the subject of the email triggered by this phase.	
Email Address	If the **Use Default** box is checked, the system uses the email address configured for the IND780batch terminal in setup at **Communication > Network > Email Alert > Recipients**. If the **Use Default** box is clear, then an email address can be entered in the text field.	
	Advanced	
Print Value 1…5	Data entered into Print Values 1 to 5 (which can either be fixed data or a batch variable) is stored in Shared Data Variables AK0555 to AK0559. The data can then be used as part of a custom print template, configured from the IND780batch terminal. 1 - 5: 16	

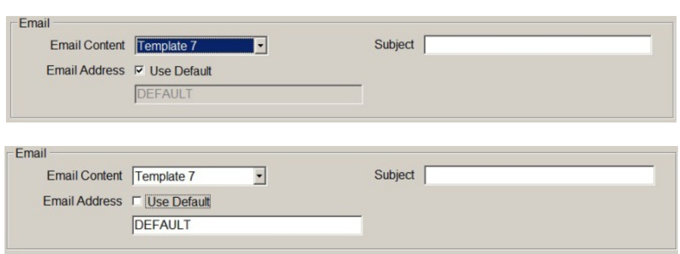


Figure 11-32: Communication Phase: Email Options – Use Default (top) and Without Default (bottom)

11.3.21. Weight Check

This phase reads the current weight reported by a specified scale EM and saves it as a variable (identified by the name given it in the Recipe's Variables tab). The variable is then compared to a target, which may be a specific weight, or may be another variable, within tolerances which may also be variables. The result of this comparison is output to another variable.

- A Weight Check phase must always be followed by a Conditional phase, which uses the output variable to decided how the batch should proceed.

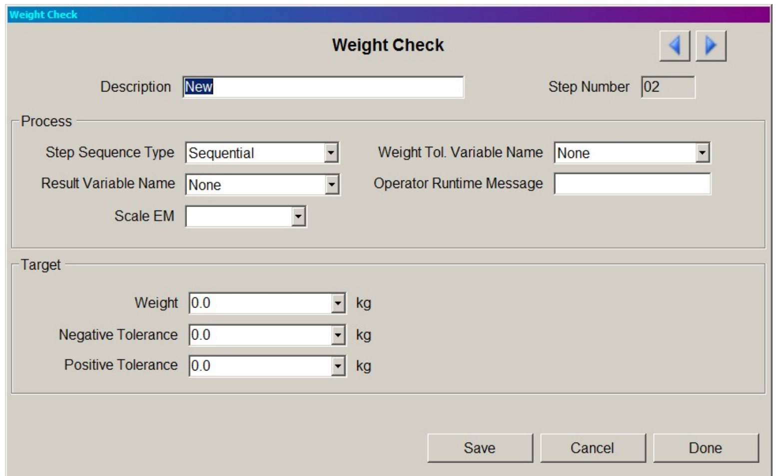


Figure 11-33: Phase: Weight Check

Element	Explanation	Options
Result Variable Name	A dropdown list of variables defined in the **Recipes I Variables** tab. This content of this variable is compared to the value determined by the **Target** section.	As defined in Recipe
Weight Tol. Variable Name	The result of the comparison between the **Result Variable** and the **Target** is output to the variable selected here. A number of pre-defined outputs are provided. This variable is used by an immediately following Conditional phase to determine how the recipe should proceed.	As defined in Recipe, or: 1 = In tolerance, no motion 2 = Below tolerance, no motion 3 = Above tolerance, no motion, 11 = In tolerance, motion 12 = Below tolerance, motion 13 = Above tolerance, motion 99 = Error
Operator Runtime Message	An on-screen message to the operator that will appear during the execution of this phase.	
Scale EM	Drop-down selection list for selection of source EM where weight is to be checked.	None*
Target		
Weight	Sets a weight target with tolerances, to which the result variable is compared.	0.0* or variable defined in Recipe

Element	Explanation	Options
Negative Tolerance		
Positive Tolerance		

11.3.22. Conditional

This phase performs a specified comparison between values. The next step to be performed in the recipe depends on the status of the comparison.

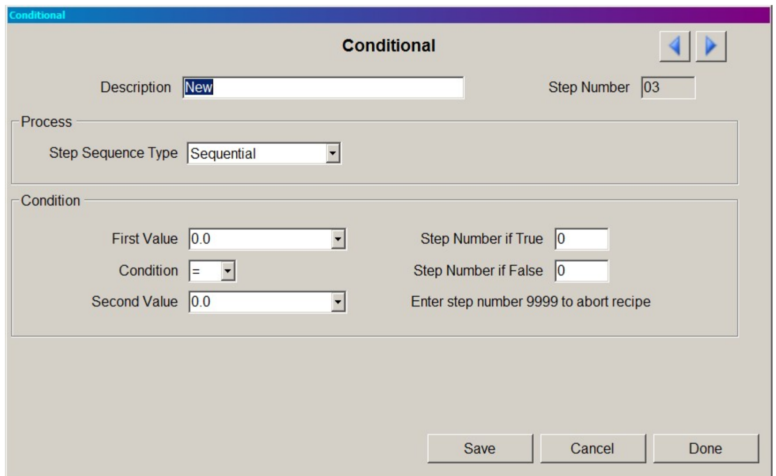
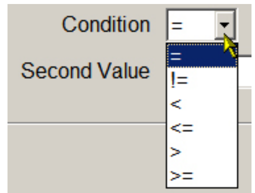


Figure 11-34: Phase: Conditional

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Condition		
First Value	First of two values to be used in the conditional comparison.	0.0

Element	Explanation	Options
Condition	This drop-down selection list permits the selection of the condition to be used in the comparison. 	Equals (=)*, Not equal to (!=), Is less than (<), Less than or equal to (<=), Greater than (>), Equal to or greater than (>=)
Second Value	Second of two values to be used in the conditional comparison.	0.0
Step Number if True	Step to perform if the condition is met. The step must appear in the recipe after this phase. Entering a value of 9999 will abort the batch if this condition is met.	0*
Step Number if False	Step to perform if the condition is not met. The step must appear in the recipe after this phase. Entering a value of 9999 will abort the batch if this condition is met.	0*

11.3.23. Goto

This phase directs the recipe to a specified step number. It can be used to go directly to a later step in the recipe.

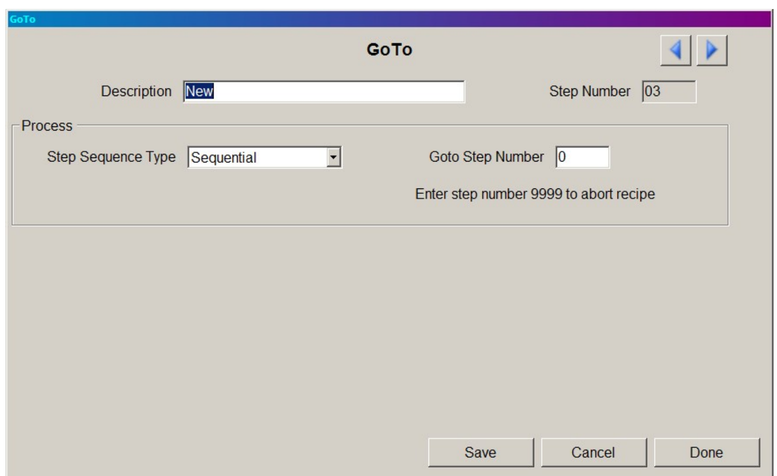


Figure 11-35: Phase: Goto

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	

Element	Explanation	Options
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Goto Step Number	Next phase to be carried out. The target phase cannot appear earlier in the recipe than this phase's step number. Entering a value of 9999 will abort the batch.	0*

11.3.24. Horizontal Block

The **Horizontal Block** phase adds two steps to the recipe –**Start Horizontal** and **End Horizontal**. Phases to be performed together during horizontal batch execution can be added between these two steps.

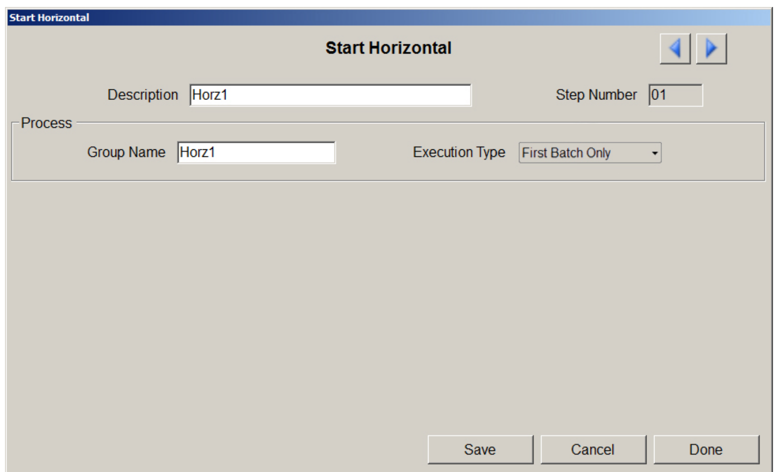


Figure 11-36: Phase: Horizontal Block

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Group Name	Names the group which will contain the horizontal execution.	New*
Execution Type	When set to **First Batch Only**, this horizontal phase is only executed in the first horizontal control recipe cycle in the order. This allows data, such as lot number, to be entered (using an Operator Hold phase) once and then used by all subsequent recipe cycles in the order.	All Recipes*, First Batch Only

Once a Horizontal Block has been added to a recipe, the Start and End phases appear in sequence.

Figure 11-37: Horizontal Block, Start and End Phases

To add a phase within the block, select the End phase (or a phase within the block that should come immediately after the added phase) and either access **Edit | New | Recipe**, or right-click to display the context menu (Figure 11-5).

11.3.25. Math Phase

This phase allows the recipe to perform a variety of operations on variables or fixed values, and store the result of the operation in a variable field.

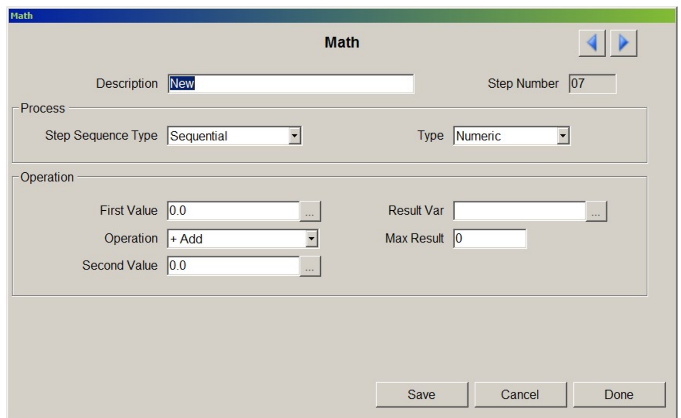


Figure 11-38: Phase: Math

- If a Batch Variable is used as a target weight for a material transfer, the variable must first be initialized using the **Max Result** field. This value is used to ensure that the variable result cannot exceed the container or scale capacity. When the system scans the recipe before execution, and the recipe includes a Batch Variable with no maximum result defined, the recipe will not run.

Element	Explanation	Options
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Process		
Step Sequence Type	Choice of sequence execution. **Sequential** requires the step to finish before the next starts. **Parallel** allows the next step to start before this one completes.	Sequential*, Parallel
Type	Determines the type of operation to be performed.	Numeric*, Logical, String

Element	Explanation	Options
Operation (Numeric)		
First Value	Determines the first term in the operation. This can be an absolute value, or selected () from defined variables (Figure 11-13).	0.0*
Operation	Sets the operation to be performed on the two values.	+ Add*, - Subtract, * Multiply, / Divide
Second Value	Determines the second term in the operation. This can be an absolute value, or selected () from defined variables (Figure 11-13).	0.0*
Result Var	Press to select (Figure 11-13) the variable to which the result of the operation is sent to be stored.	n/a
Max Result	Sets a maximum value for the result of the operation – for example, to prevent an overflow or overweight situation. During recipe execution, if the result of the Math Phase exceeds this value, the recipe is aborted.	0*
Operation (Logical)		
First Value	Refer to Numeric, above	0.0
Operation	Sets the operation to be performed on one (NOT) or two (AND, OR) values. These operations are numeric only, and result in either 1 or 0: AND 0 when either operand is 0, 1 when both operands are 1 OR 0 when both operands are 0, 1 when either operand is 1 NOT 1 when operand is 0, 0 when operand is 1	& AND, I OR, ! NOT
Second Value	Appears if operation is AND or OR.	0.0
Result Var	Refer to Numeric, above	
Operation (String)		
First Value	Refer to Numeric, above	

Element	Explanation	Options
Operation	Sets the operation to be performed on one (Assign) or two (^1, ^2, ^3, #) values. These operations have the following results: Assign First value is moved to the result variable ^1 Concatenates the strings represented in the two values ^2 Concatenates the strings represented in the two values, and inserts a space between them ^3 Concatenates the strings represented in the two values, inserts a space between them, and inserts a Carriage Return/Line Feed at the end of the concatenated string # Inserts the second string value where ### appears in the first	= Assign ^1 Concatenate ^2 Concatenate w/ space ^3 Concatenate w/ space and CR/LF at end # insertion at ### tag
Result Var	Press to select (Figure 11-13) the variable to which the result of the operation is sent to be stored.	n/a

11.3.26. NOOP

A NOOP (no operation) phase can be used as a placeholder in a recipe. A different phase type can be substituted in its place later.

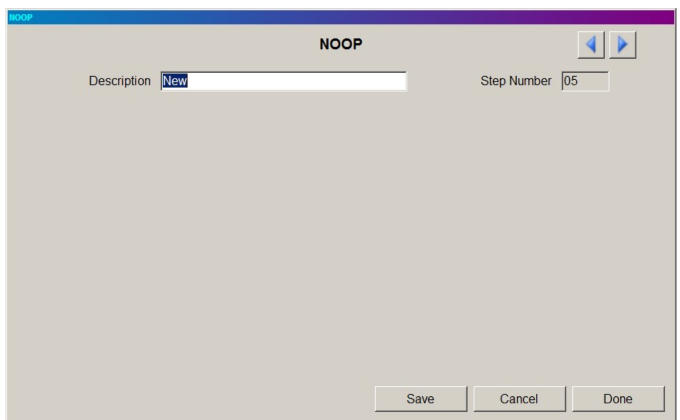


Figure 11-39: Phase: Noop

11.3.27. Custom

A custom phase can be inserted into a recipe by right clicking on the step in the recipe where the custom phase should be inserted, then selecting **New > Custom**. From the list, select the name of the custom phase to be executed when the recipe reaches this step. Figure 11-40 shows this menu selection. All existing TE programs will be listed – in Figure 11-40, only one, named **Example**, is visible.

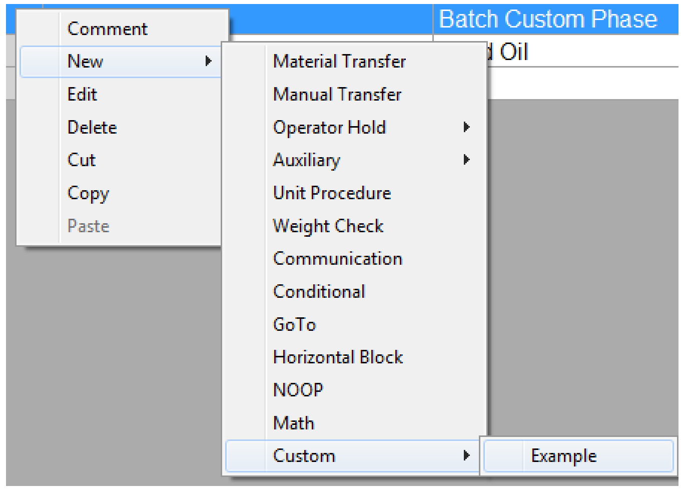


Figure 11-40: Selecting a Custom Phase from the "New" Context Menu in a Recipe

Figure 11-41 shows the Custom phase for the recipe. This allows the custom parameters set up in the "Config Custom Phase" screen (refer to page 6-8) to be filled with the data required for use by the TaskExpert program.

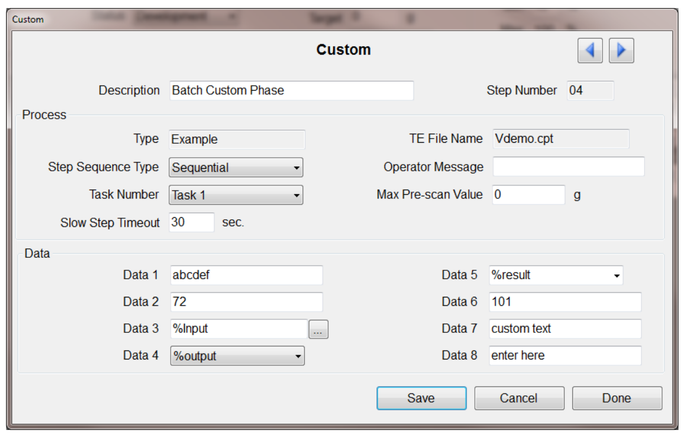


Figure 11-41: Custom Phase Configuration Screen

- **Note**: Custom Phases must be created by users trained in writing TaskExpert programs. When a Custom Phase is used, the TaskExpert program can use the A4 (Scale View screen) button in several ways:

  - To display custom graphics and visual content
  - To display custom soft keys to the operator
  - To control I/O for special operations.

  Please consult the TaskExpert Reference manual for additional information on using a TaskExpert program with IND780batch.

Refer to Chapter 15, **Batch Application Examples** to review some examples of a Custom Phase used in a Batch recipe.

Element	Explanation	Options
Description	A description of this phase for on-screen display and for inclusion in batch tracking and history records.	
Step Number	Determined by the phase's position in the recipe; cannot be modified.	
Process		
Step Sequence Type	Choice of sequence execution. Sequential requires the step to finish before the next starts. Parallel allows the next step to start before this one completes.	Sequential*, Parallel
Type	An identifier that appears in the drop-down list when adding a Custom Phase to a recipe. This field is not editable – it displays the **Label** parameter defined when the Custom Phase is configured – refer to the **Config Custom Phase** section on page 6-7.	
Task Number	A drop-down list that selects between TE tasks. The maximum number of possible tasks is 4.	1-4
TE File Name	The TaskExpert program file name which will be executed as part of this phase.	
Operator Message	Defines a message that appears on-screen during the execution of this phase. If a "/" precedes the first character, this represents that this is a graphical image instead of a text message.	
Slow Step Timeout	Specifies the maximum time that this phase should take to execute. If the phase specified time is exceeded the batch will abort, unless the tag "ALARM" follows in this field, and then IND780batch will only generate an alarm. There should be a blank space between the time value and the tag.	
Max Pre-Scan Value	If custom parameter 1 is an input variable to a subsequent Material Transfer Phase, this is the maximum value permitted for a successful Recipe pre-scan. Refer to the description of this parameter on page 6-9.	
Data		
This section contains up to eight custom data fields that are configured in the "Config Custom Phase" configuration page in Chapter 10. It allows data to be passed to the TaskExpert program. These fields are only necessary if specific data needs to be passed to the TaskExpert program – they are not required for the Custom Phase to execute correctly.		

12 Configuration Tool Guide: Orders

12.1. Overview

An order translates a selected master recipe into a control recipe that is used to run a batch.

When the Orders branch of the tree-view is selected, the configuration pane shows any orders that are currently set up. The list includes the order ID, its description, the associated master recipe, the number of batches to be run, and the target weight value. The target weight value represents the total output of the order, which is the batch size multiplied by the number of batches to be run.

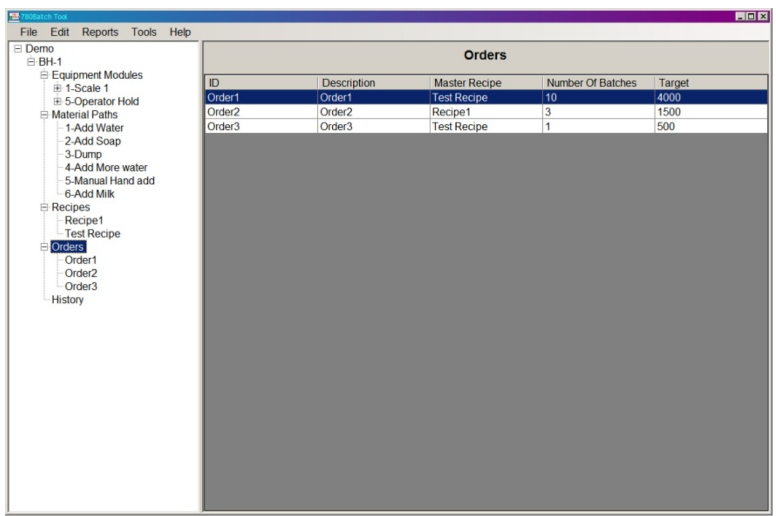


Figure 12-1: Orders List

12.2. Creating Orders

Right-click the Orders item in the tree-view and select New to create an order, or select **Edit | New | Order** from the menu. The order configuration screen (Figure 12-2) will appear.

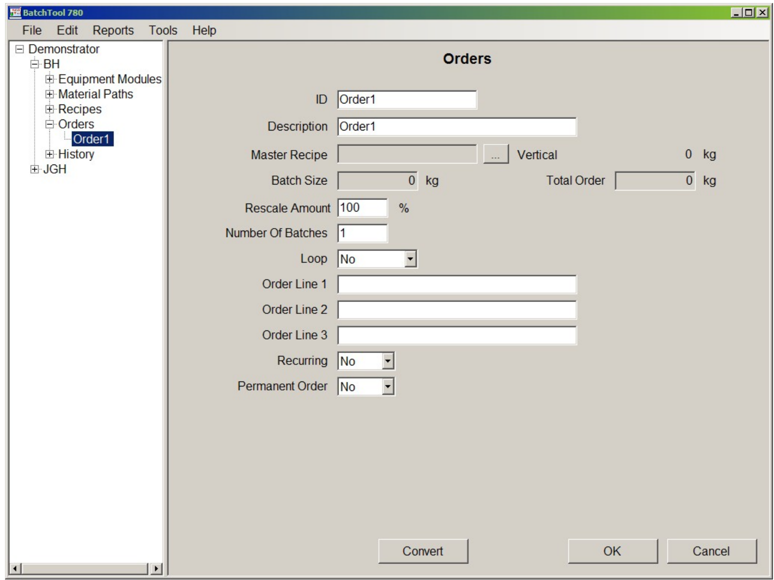


Figure 12-2: Orders: Configuration Screen

The elements and functions available in these screens are as follows:

Element	Explanation	Options
ID	Title for this order.	
Description	Brief description of this order.	
Master Recipe	Displays the name of the selected recipe. Click on the 'more' button ( ) to display a list of available recipes (Figure 12-3).	
Batch Size	Displays the size of the batch that the order will produce. This value takes account of the Order's rescaling factor.	
Rescale Amount	Amount, expressed as a percentage of total target weight, by which to re-size the order.	100%*
Loop	Allows the current control recipe to loop continuously until stopped by an operator. **Note**: Looping must also be set to Enabled in the IND780batch terminal setup, at **Application > Batch-780 > Recipe Options > Batch Edit**. If Loop is set to Endless, but Looping is not enabled in the terminal, looping will not occur.	No*, Endless
Number of Batches	Sets the number of batches to be processed in this order. Ignored, if the Loop is set to Endless	1*
Total Order	Displays a weight corresponding to the Batch Size multiplied by the Number of Batches.	

Element	Explanation	Options
Campaign	Determines whether the order will run the batches in horizontal or vertical sequence..	Vertical*, Horizontal
Recurring	When set to "Yes", the Order will continue to appear in the BatchTool 780 Orders list after it has been downloaded to the terminal.	No*, Yes
Permanent	When set to "Yes", the order will continue to appear in the IND780batch Order View list until a user deletes it from the terminal.	No*, yes

- It is possible to have any number of orders stored in the IND780batch terminal, but only one order can be executed at a time. It is possible to Pause, then Park several orders if the process requires this.

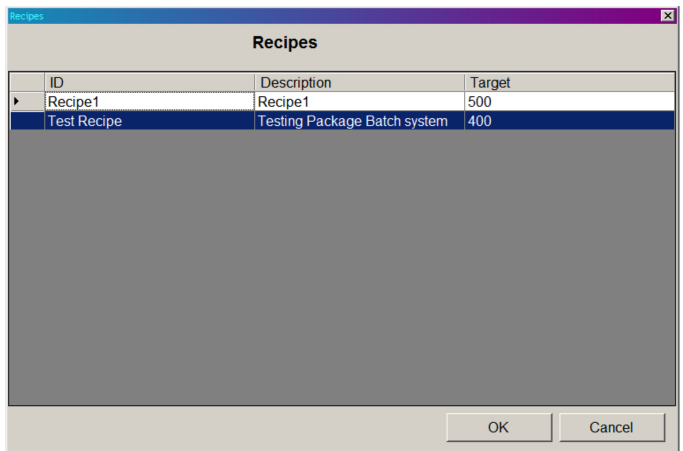


Figure 12-3: Orders: Recipe Selection

12.3. Convert Batch

12.3.1.1. Overview

This section details an advanced feature in IND780batch called Convert. There may be occasions when a batch is completed in an unfinished state, or there may be a batch of base material to be converted into a completed batch. The convert feature allows a batch to be converted into a completely different batch, which eliminates the need to throw out unfinished batches of material. Unfinished batches can be re-run to make a finished product. In general, there are five different methods of converting a batch. Convert Batch can:

1. Re-calculate the recipe after too much of a material has been fed.
2. Repurpose an existing batch by converting it into something different.
3. Create a new, larger batch from an existing batch.
4. Use existing materials as part of a new batch.
5. Adjust material quantities based on lab analysis of an existing batch.

There are some constrains that govern whether a batch can be converted – for example, whether or not a batch was completed within tolerance. Also, if the batching system is automatic and the batch to be converted has been **discharged from the scale**, the system will not perform the convert operation because there is no material on the scale to allow the operation to proceed. If there was a **partial discharge** of the material in the scale, it would be possible to run the Convert feature on the remaining amount of material on the scale, but there would be no way to determine the composition of that remaining material without performing a material analysis on it.

This section will use several step-by-step examples to show how the Convert feature works, and how it might be applied to other processes.

12.3.1.1.1. General Notes on Convert Batch

- The convert operation can be run however the recipe's re-scale parameter is configured – for percent, target amount, or material amount.
- In most of the examples given below, it is assumed that the batch to be converted is on the scale and can be executed. If no material is on the scale, the Convert feature will not run. For example, after a batch that ends with a Dump to Empty phase, an attempt to run Convert will cause the system to display a message "Cannot Convert batch". The Convert function checks for a Dump To Empty operation and, if it finds one, it will not run.
- If you have a batch in which a Material substitution is to be performed (meaning, assign a material already in the scale as part of a material in the target batch), you must use the Convert feature in BatchTool 780. The Convert feature in the terminal cannot handle this type of batch conversion.

  If an attempt is made to perform a batch conversion on a batch which had two material transfers of the same material in its recipe (e.g., flour is added to a recipe twice during the recipe sequence), and the target recipe only calls for that material to be added once, the conversion must be performed using BatchTool 780, as the terminal cannot manage this type of conversion.

  The IND780batch terminal cannot convert a batch that has a Control Recipe where GIW feeds follow LIW Feeds at the Destination EM.

  It is not possible to convert a batch that uses a Batch Variable as a target weight.

  If in doubt about what types of conversions are possible, refer to the examples provided below, as these cover the main methods available to convert a batch.

12.3.2. Example Scenarios

12.3.2.1. Example 1: Adjust material quantities based on analysis of current batch

In this example the customer is batching Hand lotion. After each batch is run, the laboratory manager will take a sample of the batch and examine its composition. Based on laboratory results, certain ingredients may need to be adjusted to bring the batch within specifications.

Recipe 1 is run. It includes four materials:

- Water = 250 kg

- Aloe = 100 kg
- Lanolin = 100 kg
- Lavender Oil = 50 kg

This gives a total output of 500.0 kg. Laboratory tests are conducted and it is determined that the resulting batch needs an additional 5 kg of Water (2%) and 1kg of lavender oil (1%), because the lot of lanolin used had a higher consistency than previous lots used.

The first step is to create a new recipe that reflects what the batch **should have contained**. In this example, the operator created a new recipe as follows:

- Water = 255 kg
- Aloe = 100 kg
- Lanolin = 100 kg
- Lavender Oil = 51 kg

This recipe is almost identical to the original recipe, but with 5kg more water and 1kg of additional lavender oil.

Next, a new order is created, using the revised recipe as its target:

1. In BatchTool 780, go to **Edit > New > Order** and enter an Order ID and Order Description. Select the Master recipe "Converted Hand Lotion".
2. Next click on the **Convert** button at the bottom of the Order page.

Figure 12-4: Convert Button

3. A dialogue box will help guide the user through the convert feature:

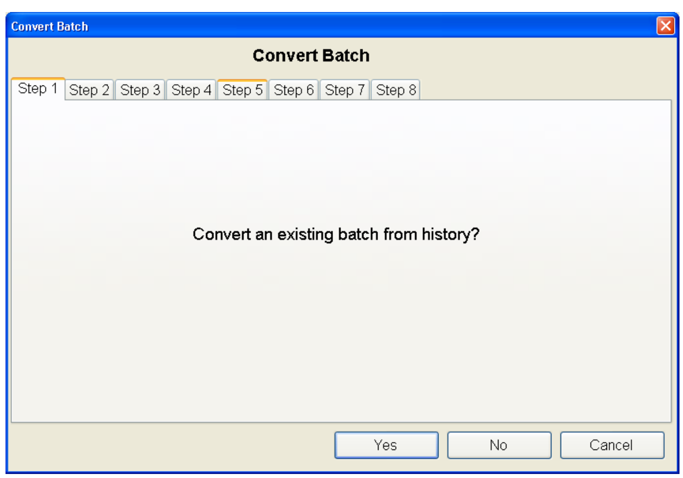


Figure 12-5: "Convert Batch from History?" Confirmation Screen

4. The first step allows the user to convert a batch from history. For this example, the history information for the current batch of hand lotion must be read from the IND780batch terminal. This information is used to convert the actual results of this batch into a batch that reflects the modified recipe. Click on **Yes** to continue.

5. Step 2 displays a history screen, from which the user selects the recipe to be converted. In this case, it is the first entry, Master recipe ID HL0201. Click on **OK** to continue.

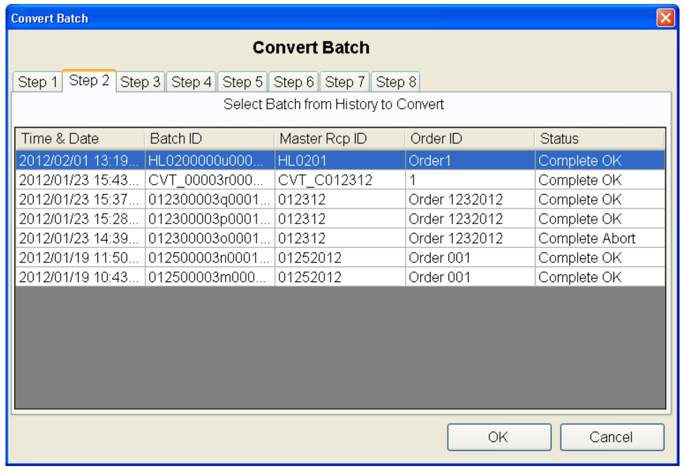


Figure 12-6: Convert Batch Recipe Selection Screen

6. Convert batch now calculates the new target weights for each material. Table 12-1 shows the original amount delivered and the new required target, together with a calculation of how much of each material must be added to the batch to make it fulfill the laboratory analysis.

Table 12-1: Batch Conversion Calculation

	Base recipe		New Recipe, per Lab Analysis	
Material	**Target Wt (kg)**	**Delivered Wt (kg)**	**Target Wt (kg)**	**Target Wt (kg)**
Water	250	249.8	255.0	5.2
Aloe	100	100	100.0	0.0
Lanolin	100	100	100.0	0.0
Lavender Oil	50	49.8	51.0	1.2
Total	**500**	**499.6**	**506.0**	

7. When **OK** is selected, the Convert batch function re-calculates the target weight for the recipe based on the entered data, and displays the new target values, as shown in Figure 12-7. It is important to review this screen to ensure that the new target weights are correct, before proceeding.

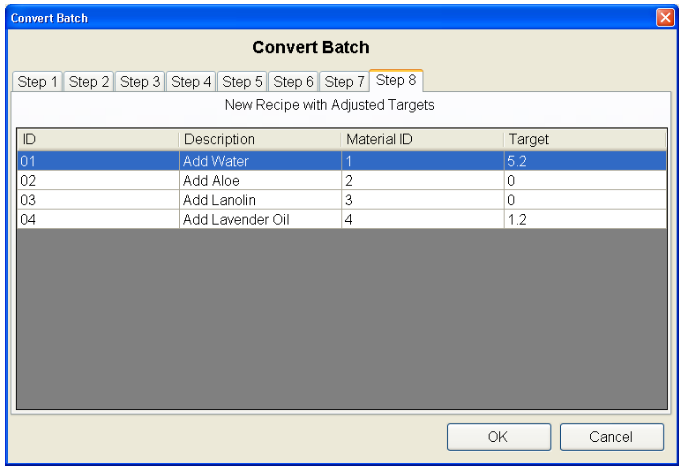


Figure 12-7: Converted Batch, Showing New Target Values

8. As Figure 12-7 shows, Convert has calculated that 5.2 kg of Water and 1.2 kg of Lavender Oil must be added to the batch to fulfill the requirements determined by the laboratory analysis.

9. Note that when you select **OK** in the screen shown in Figure 12-7, the system will automatically create a copy of the recipe with all of the conversion changes applied. This recipe can easily be identified in BatchTool, because the system assigns an extra **0** (zero) at the beginning of the recipe name Figure 12-8 shows an example.

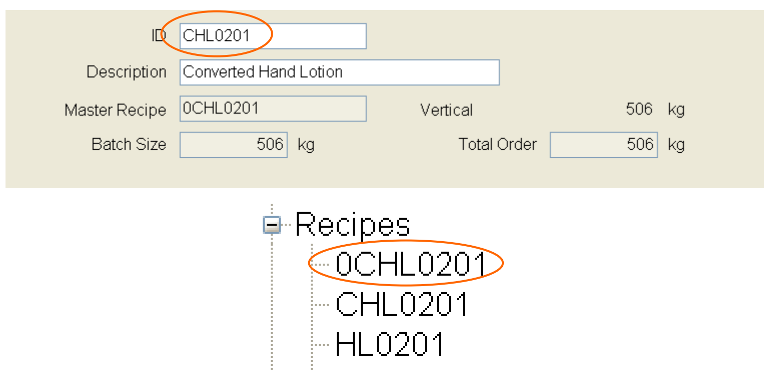


Figure 12-8: Displays in BatchTool 780 and Terminal, Showing a Converted Batch

- When this Order is written to the IND780batch terminal, it takes this converted recipe with it, and removes it from BatchTool. A converted Recipe is only valid for the order with which it is associated and, once executed, will be removed from BatchTool.

10. Once the order is written to the IND780batch terminal, the operator can execute the converted recipe and produce the corrected batch.

12.3.2.2. Example 2: Paint batch manufacturing

12.3.2.2.1. Overview of Process

Paint is composed of a solvent and various combinations of pigments to achieve a desired color. The Acme Paint Co. has just received an order to make 5 batches of Royal Splendor (dark purple) and 5 batches of Olive Mist (an olive drab).

Royal Splendor consists of:

- Red 39%
- Yellow 11%
- Blue 50%

Olive Mist consists of:

- Red 38%
- Yellow 25%
- Blue 37%

Each batch of Royal Splendor and Olive Mist will total 1500 kg, including 100 kg of solvent and 900 kg of Base (white). The pigments will total 500 kg. All tolerances are +/- 1%.

Royal Splendor pigment targets:

- Red 195.0 kg
- Yellow 55.0 kg
- Blue 250.0 kg

Olive Mist pigment targets:

- Red 190.0 kg
- Yellow 125.0 kg
- Blue 185.0 kg

Acme Paint uses a feed system like the one shown in Figure 12-9. All materials are auto fed into a weigh hopper, which is calibrated for a maximum of 3,000 kg.

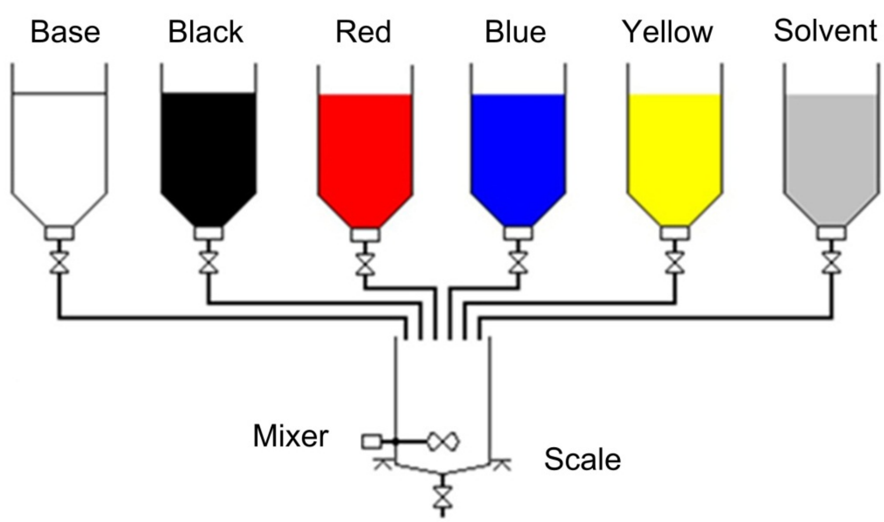


Figure 12-9: Hopper System for Paint Batching

12.3.2.2.2. Example 2A: Use existing materials as part of a new batch scenario

Acme Paints made several batches of the Royal Splendor color paint. After completion the operator cleans the vessel with a small amount (25 kg) of water, and wants to use this amount of water as part of the next batch. The water can be substituted as the solvent ingredient for the next batch of paint.

This type of Covert Batch operation is called **material substitution**. The target weight for the solvent must be reduced by the amount indicated above – 25 kg – since this cleaning solution is to be included as part of the solvent material in the next batch. In BatchTool, the user would take the following actions:

1. Review the recipe that is to be run – in this case, a batch of Olive Mist Paint. Its recipe is shown in Figure 12-10.

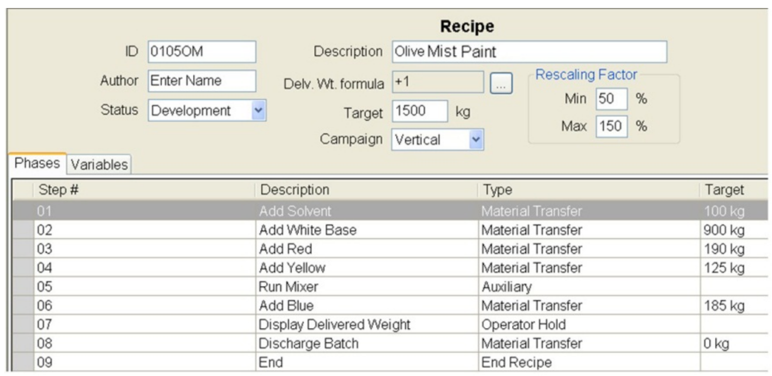


Figure 12-10: Recipe for Olive Mist Paint

The original target weight for solvent is 100 kg, but this must be reduced by 25kg since that quantity is already on the scale. The next step is to create an order based on this target master recipe:

2. In BatchTool at **Edit > New > Order**, enter an Order ID and Order Description, and select the Master recipe "Olive Mist".

3. Next click on the **Convert** button (Figure 12-4) at the bottom of the Order page.

4. A dialogue box will help guide the user through the convert feature – see Figure 12-5. The first option is to convert a batch from history. However, in this example we are not converting a recipe from history. Instead we are going to convert our master recipe. Click on **No**.

5. A screen like the one shown in Figure 12-11 will appear. Select the recipe to be converted from the list – in this case, "Olive Mist Paint" is highlighted. Click on **OK** to continue.

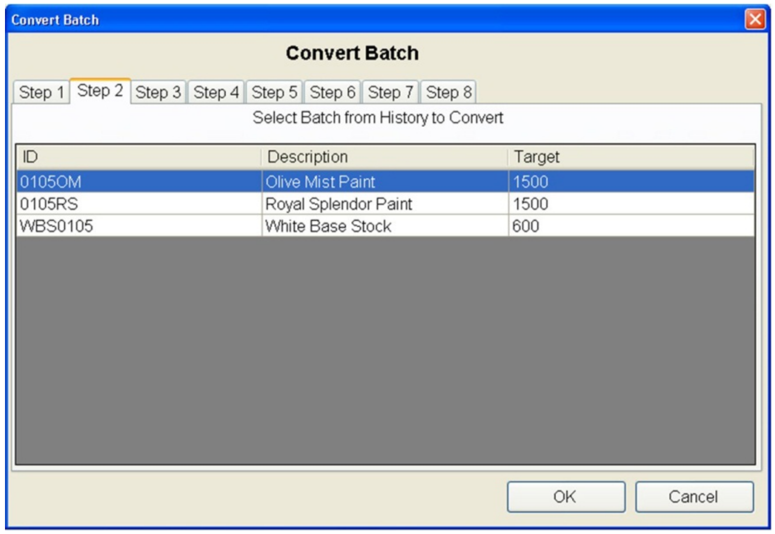


Figure 12-11: Recipe Selection Screen

6. The system then asks if the batch was completed. Since the batch has not yet been run, click on **No**.

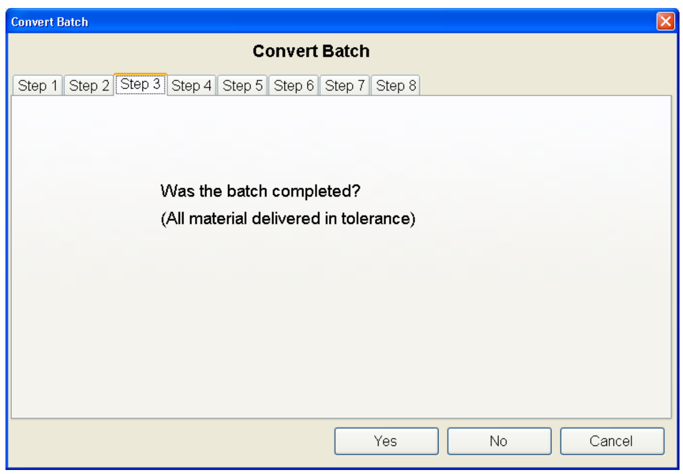


Figure 12-12: Batch Completion Dialog

7. Figure 12-13 shows the next screen, where the target weight for each material can be adjusted. In this example, enter a delivered weight for **Solvent** of 25 kg, since the scale already contains the 25 kg we wish to use as part of the Solvent material. Set all the other materials to 0 kg, since we have not yet executed this batch and no other materials are present on the scale.

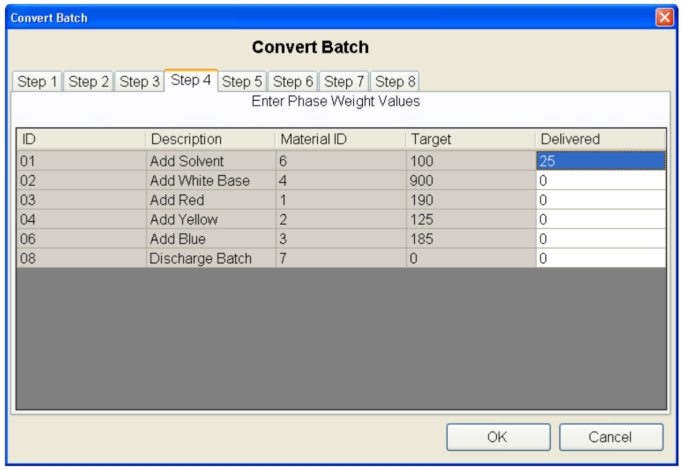


Figure 12-13: Setting the Delivered Quantities

8. Click on **OK**. The Convert batch function re-calculates the target weight for the recipe based on the data entered in Figure 12-13. The new target values appear, as shown in Figure 12-14. It is important to review this screen to ensure that the new target weights are correct before moving on.

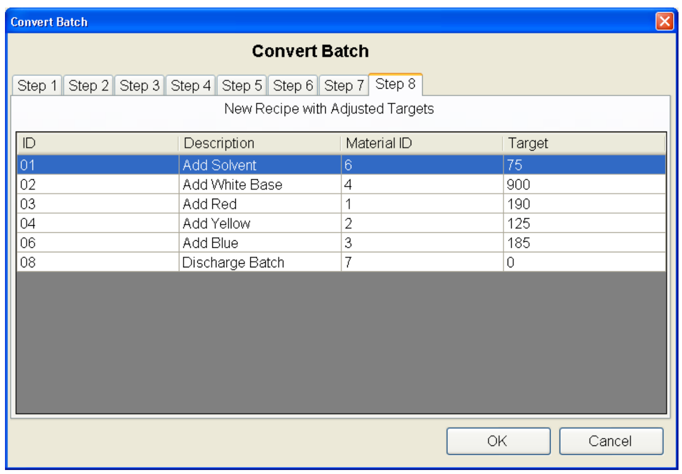


Figure 12-14: Target Weights Re-Calculated

9. Now, the converted recipe shows the correct target weight for Solvent, while all other material targets are unchanged. Click on **OK** to create an order for this converted recipe.

10. Note that when you select **OK** in the screen shown in Figure 12-14, the system will automatically create a copy of the recipe with all of the conversion changes applied. This recipe can easily be identified in BatchTool, because the system assigns an extra **0** (zero) at the beginning of the recipe name Figure 12-15 shows an example.

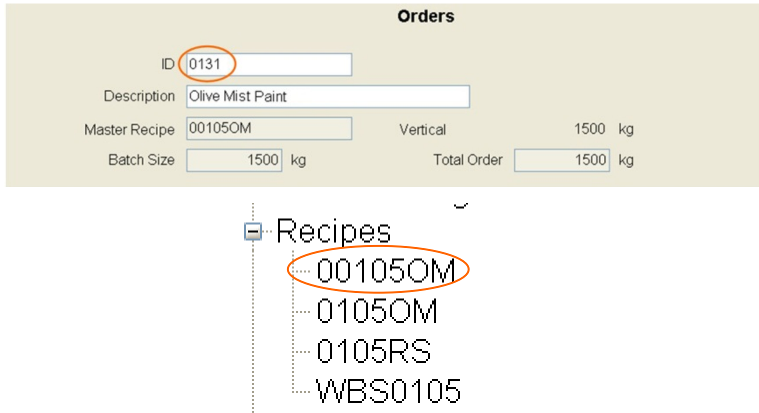


Figure 12-15: Displays in BatchTool 780 and Terminal, Showing a Converted Batch

- When this Order is written to the IND780batch terminal, it takes this converted recipe with it, and removes it from BatchTool. A converted Recipe is only valid for the order with which it is associated and, once executed, will be removed from BatchTool.

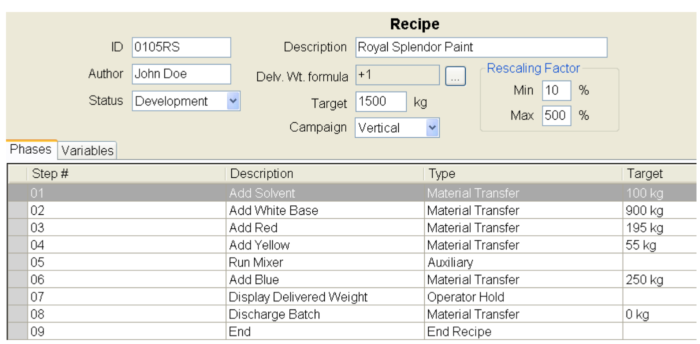
11. Once the order is written to the IND780batch terminal, the operator can execute the converted recipe and produce the batch.

12.3.2.2.3. Example 2B: Batch re-purpose

Acme Paint received an order for 10 batches of the Royal Splendor paint. They currently have 12 batches of the Olive Mist in stock and would like to convert this into the Royal Splendor color to fulfill the order.

Using the Convert Batch feature, it is easy to convert the Olive Mist paint into Royal Splendor to fulfill the order. This will involve re-scaling the quantities of various components to correspond to the balance of pigments required for Royal Splendo.

12. First, review the Royal Splendor recipe:



Step #	Description	Type	Target
01	Add Solvent	Material Transfer	100 kg
02	Add White Base	Material Transfer	900 kg
03	Add Red	Material Transfer	195 kg
04	Add Yellow	Material Transfer	55 kg
05	Run Mixer	Auxiliary	
06	Add Blue	Material Transfer	250 kg
07	Display Delivered Weight	Operator Hold	
08	Discharge Batch	Material Transfer	0 kg
09	End	End Recipe	

Figure 12-16: "Royal Splendor" Paint Recipe

In this example, a batch will be created by converting an 'incorrect' recipe. First, the target recipe in the order must be selected – in this case, the Royal Splendor recipe. The Convert function will then step through the rest of the process.

1. Next, create an order based on this target master recipe. In BatchTool, go to **Edit > New > Order** and enter an Order ID and Order Description. Select the Master recipe "Olive Mist".

2. Next press the "Convert" button at the bottom of the Order page (Figure 12-4). This runs the Convert wizard that will help convert the Olive Mist Paint into Royal Splendor Paint.

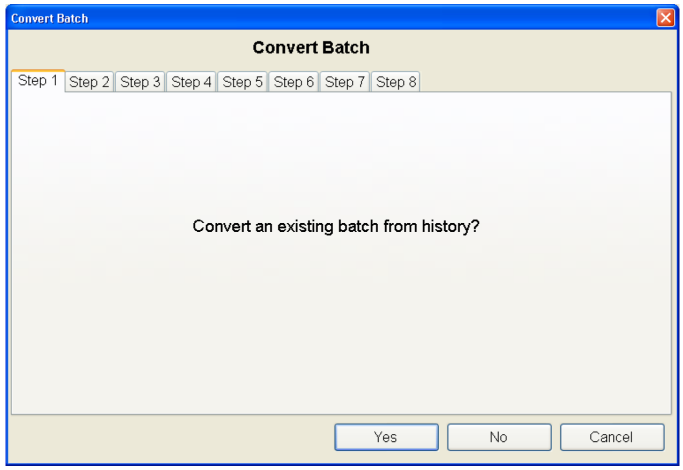


Figure 12-17: "Convert Batch from History?" Confirmation Screen

3. Click on **No**. The wizard then asks if this is a batch that has been completed.

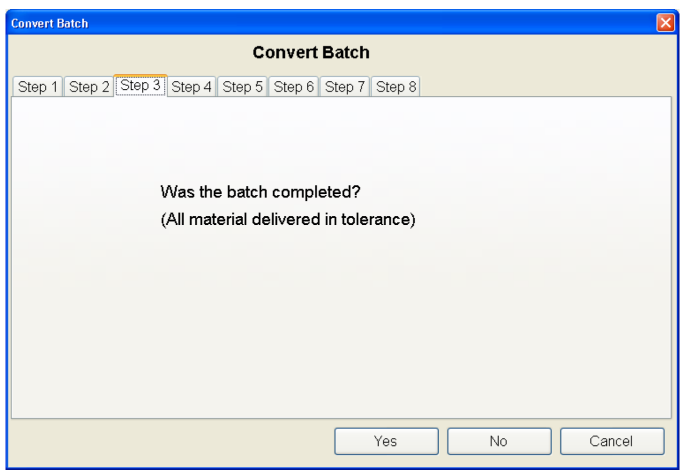


Figure 12-18: Batch Completion Confirmation Screen

4. If the batch that to be converted was completed and all materials were delivered in tolerance (which in this example is true, since the converted batch is based on existing paint), click on **Yes**.

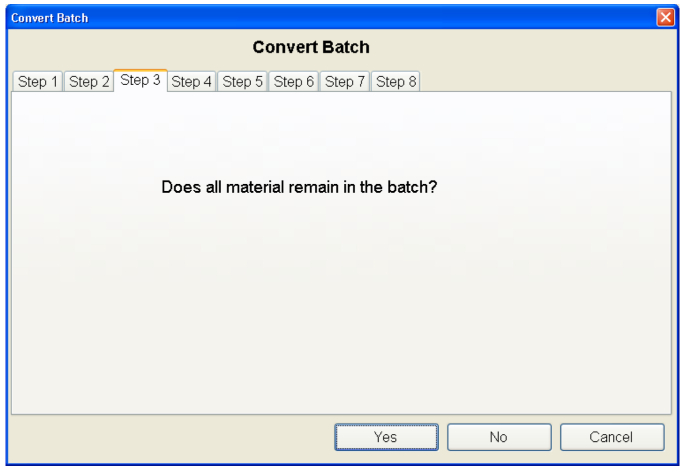


Figure 12-19: Remaining Material Confirmation Screen

5. Next, confirm that all the material in the current batch will be used in the new batch. Click on **Yes**, because the new batch is a re-purposing of an existing one.

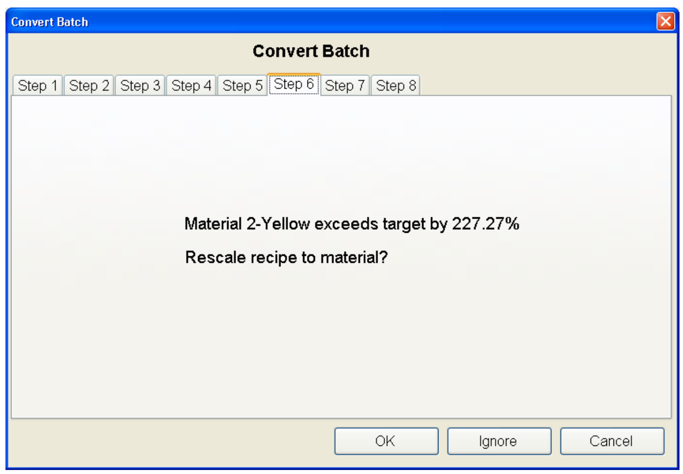


Figure 12-20: Conversion Calculation Screen

6. Figure 12-20 shows that the Convert feature has examined all the materials and determined that proportion of **Material 2 –Yellow** differs most between recipes. It must be rescaled by the amount shown – 227.27%. The same re-scale percentage will be applied to all the other materials in the batch. Click on **OK.**

7. The next screen (Figure 12-21) will show the re-scaled values in the recipe.

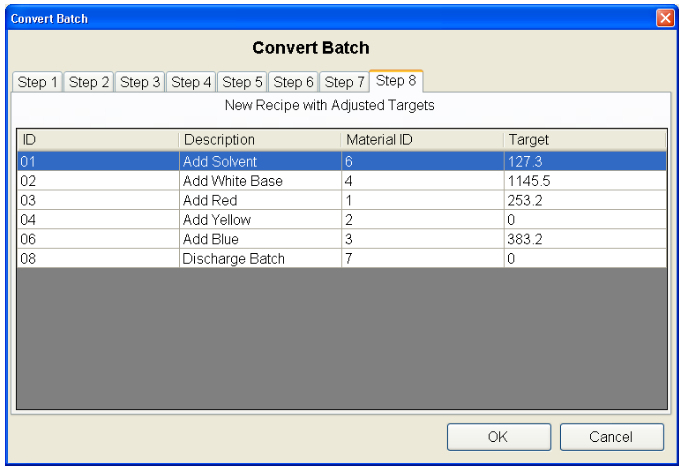


Figure 12-21: Recipe With Re-Scaled Target Values

Table 12-2 shows an example of how Convert arrived at these target values.

Table 12-2: Example of Conversion Calculations

Material	Olive Mist Target Wt (kg)	Royal Splendor Target Wt (kg)	Olive Mist Converted to Royal Splendor Target Wt (kg)
Solvent	100	100	127.3
White Base	900	900	1145.5
Red	190	195	253.2
Yellow	125	55	0
Blue	185	250	383.2

Convert took the original values for Royal Splendor – the 'target' recipe for the conversion – and multiplied them by the largest conversion difference. Here, this was for the Yellow material, calculated at 227.27%. This percentage was derived by taking the Yellow target in Olive Mist and dividing it by the amount of Yellow required by the Royal Splendor recipe:

$$\frac{125}{55} \times 100 = 227.27\%$$

The Convert feature calculates the target for each remaining ingredient as follows:

$$\left(\text{Original target value} \times \text{Conversion factor}\right) - \text{Original target value} = \textbf{Converted target value}$$

Therefore, applying the formula to the Blue pigment gives:

- (Original target amount x convert factor)- original recipe target = resultant target weight for converted recipe. So if we look at the Blue material and apply this formula we get:

$$\left(250\text{ kg} \times 227.27\%\right) - 185\text{ kg} = \mathbf{383.2\text{ kg}}$$

8. When **OK** is clicked in Figure 12-20, the system automatically creates a copy of the recipe with all the changes applied by Convert Batch. You can identify this recipe in BatchTool because the system assigns an extra **0** (zero) at the beginning of the recipe name.

9. This order can now be written to the terminal and executed.

- Note that for this example to work in reality, a batch of the Olive Mist paint must be on the scale.

12.3.2.2.4. Example 3: Re-make a batch – two examples, based on different criteria

Acme Paints inventory manager found 2 batches of the white base from which they make their colors, Olive Mist and Royal Splendor. The composition of the ingredients in these batches is listed on the side of each container and he decides to move these 2 batches to the production area to make a batch of Royal Splendor and Olive Mist.

One of the containers is 1200 kg and is comprised of 150 kg of solvent and 1050kg of white base. The manager wants to convert this batch into the Royal splendor color.

The second container is 600 kg and is comprised of 65 kg of solvent, and 535 kg of white base. The manager wants to convert this base into the Olive Mist color.

In the **first example**, the 1200 kg of white base is to be converted into a batch of Royal Splendor.

1. Start by creating an order based on the Royal Splendor master Recipe, then press the **Convert** button.

2. The Convert wizard asks (Figure 12-5) if a batch is to be converted from history. In this case, click on **Yes**, because the history data from the previous batch is available and its actual delivered amount can be used as the starting point for a conversion calculation. The delivered weights of the White base batch are shown in Table 12-3.

Table 12-3: White Base Calculations, 1

Material	White Base Target Wt (kg)	White Base Delivered Wt (kg)
Solvent	100	151.8
White Base	900	1051.4
Red	0	0
Yellow	0	0
Blue	0	0
Total	1000	1203.2

3. Next, from the list of history records (Figure 12-22) select the recipe to be converted. In the list below several batch history files are available. Select the first recipe in the list, which is the White Base stock recipe, and click **OK**.

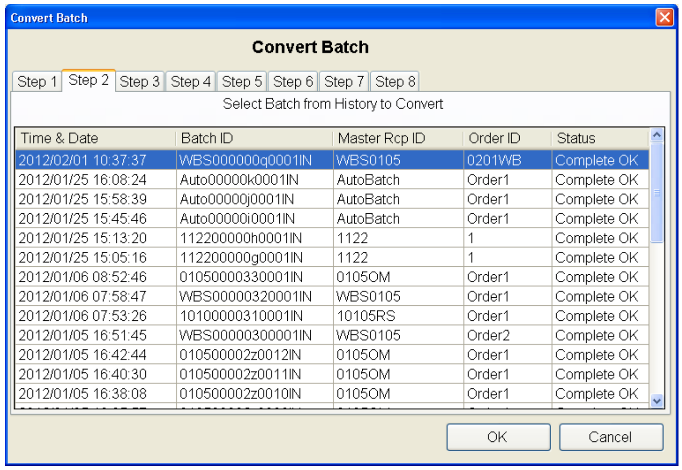


Figure 12-22: Convert Batch Source Recipe Selection Screen

4. The convert function will compare the target recipe selected in step 1 to the source recipe selected from the history screen, and calculate the re-scale amount required based on the largest difference. Click **OK**, and the next screen will display this value (Figure 12-23).

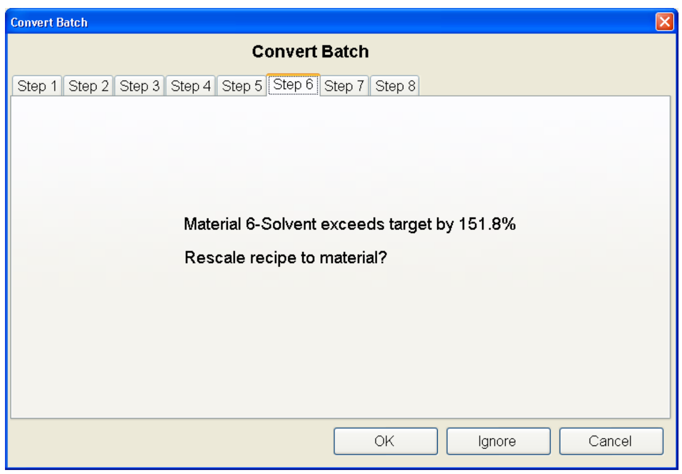


Figure 12-23: Largest Difference Calculation

5. Convert has calculated that the Solvent component exceeds the target amount by 151.8%. It did this by taking the delivered weight for Solvent in the White Base recipe and dividing it by the target weight for Solvent in the Royal Splendor recipe. In this case, the delivered amount of Solvent in the White Base recipe was 151.8 kg, and the Royal Splendor recipe calls for 100 kg.

$$\frac{151.8}{100} \quad x \quad 100 \quad = \quad 151.8\%$$

This amount is greater than the difference between the delivered and target weight for the white pigment, which is only 116.8%. Therefore, the other ingredients are rescaled based on the larger difference. Click on **OK** to continue.

6. Convert Batch displays the new target weights for each material (Figure 12-24), based on the re-scale factor of 151.8%.

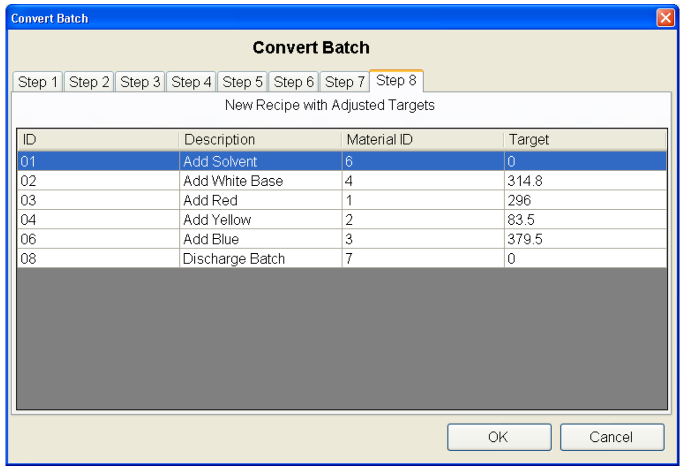


Figure 12-24: Values for Converted Batch

To calculate the new target, the Convert wizard takes the target for Royal Splendor – which is what the recipe is to be converted to – and multiplies the target values by the largest conversion difference,151.8%. This factor is then applied to the balance of the materials in the Royal Splendor recipe as follows:

(Original target value x Conversion factor) - Original target value = **Converted target value**

Therefore, applying the formula to the Red pigment gives:

- (Original target amount x convert factor)- original recipe target = resultant target weight for converted recipe. So if we look at the Blue material and apply this formula we get:

(195 kg x 151.8%) - 0 kg = **296.0 kg**

The same calculation is applied to each material in the Royal Splendor recipe.

7. When **OK** is clicked in Figure 12-24, the system automatically creates a copy of the recipe with all the changes applied by Convert Batch. This recipe can be identified in BatchTool because the system assigns an extra **0** (zero) at the beginning of the recipe name.

8. A Convert Batch Order has been created successfully, to convert 1200 kg of White Base Stock into Royal Splendor Paint. This order can now be written to the terminal and executed.

Note that for this example to work in reality, the delivered amount (1203.2 kg) of White Base Stock paint must be on the scale.

In the **second example**, 600 kg of white base is to be converted into a batch of Olive Mist.

1. Start by creating an order based on the Olive Mist master Recipe, and click on the **Convert** button (Figure 12-4).

2. The Convert wizard asks (Figure 12-5) if we want to convert a batch from history. Click on **Yes**, because history data from a previous batch is available, and the actual delivered amount can

be used as the starting point for the conversion calculation. The delivered weights of the White base batch are shown in Table 12-4.

Table 12-4: White Base Calculations, 2

Material	White Base Target Wt (kg)	White Base Delivered Wt (kg)
Solvent	65	67.8
White Base	535	535.2
Red	0	0
Yellow	0	0
Blue	0	0
Total	600	603.0

3. Next, select a source recipe from the list of history records. In the list shown in Figure 12-25, several batch history files are available. Select the first recipe in the list, which is the White Base stock recipe (WBS20105), and click **OK**.

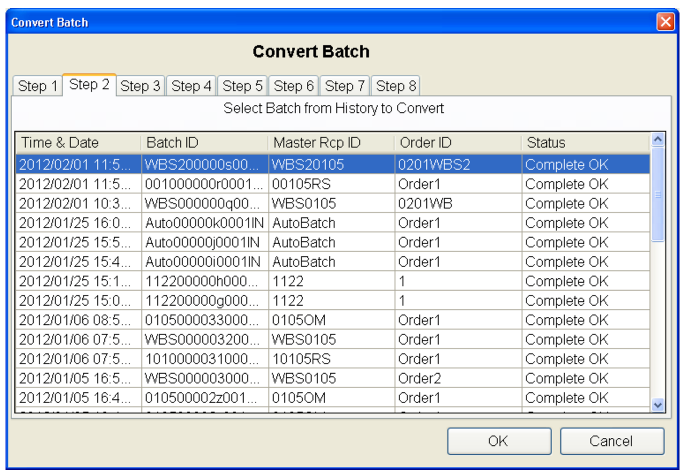


Figure 12-25: Convert Batch Source Recipe Selection Screen

4. The convert function compares the source recipe from history to the target recipe for Olive Mist Paint, and calculates the required additional amount for each ingredient (Figure 12-26).

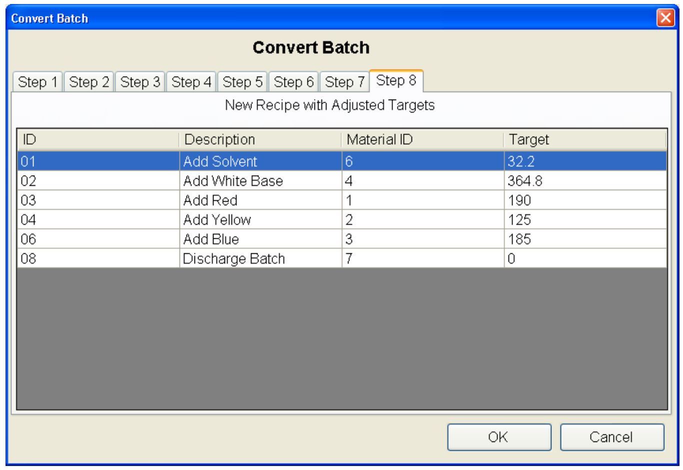


Figure 12-26: Values for Converted Batch

In this case, since the target weights for the Olive Mist recipe are all larger than the delivered amounts from the White Base, the system simply calculates the amount of material to be added to the target (Olive Mist) recipe. For instance, the delivered amount of Solvent in the White base recipe was 67.8 kg, and the Olive Mist recipe calls for 100kg, so the new target is calculated by subtracting 67.8 from 100, giving an addition quantity of 32.3 kg. This calculation is repeated for each material.

5. Figure 12-27 shows the final converted recipe for the Olive Mist batch.

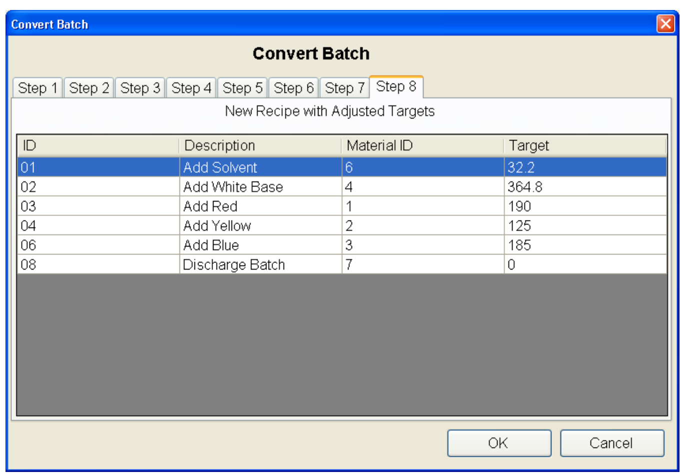


Figure 12-27: Converted Recipe

6. When OK is clicked in Figure 12-27, the system automatically creates a copy of the recipe with all of the changes applied by Convert Batch. This recipe can be identified in BatchTool because the system assigns an extra 0 (zero) at the beginning of the recipe name.

7. A Convert Batch Order has been created successfully, to convert 600 kg of White Base Stock into Olive Mist Paint. This order can now be written to the terminal and executed.

- Note that for this example to work in reality, the delivered amount (603 kg) of White Base Stock paint must be on the scale.

12.3.2.2.5. Example 4: Sheet Glass Manufacturing

Sheet glass is composed of the following ingredients:

- 75% Silica (sand)
- 15% Soda (Sodium Carbonate)
- 6% Lime (Calcium Oxide)
- 4% Magnesia (Magnesium Oxide)

Acme Glass Inc. wants to make a 1000 kg batch of sheet glass. The ingredients target weights and tolerances (-/+1.0%) are shown in Table 12-5.

Table 12-5: Sheet Glass Ingredients

Target	Material	-Tol	+Tol
750.0kg	Silica	7.5kg	7.5kg
150.0kg	Soda	1.5kg	1.5kg
60.0kg	Lime	0.6kg	0.6kg
40.0kg	Magnesia	0.4kg	0.4kg

Each ingredient is stored in large tank hopper scales and is weighed out onto a moving conveyor belt that delivers the ingredients to a mixer (Figure 12-28).

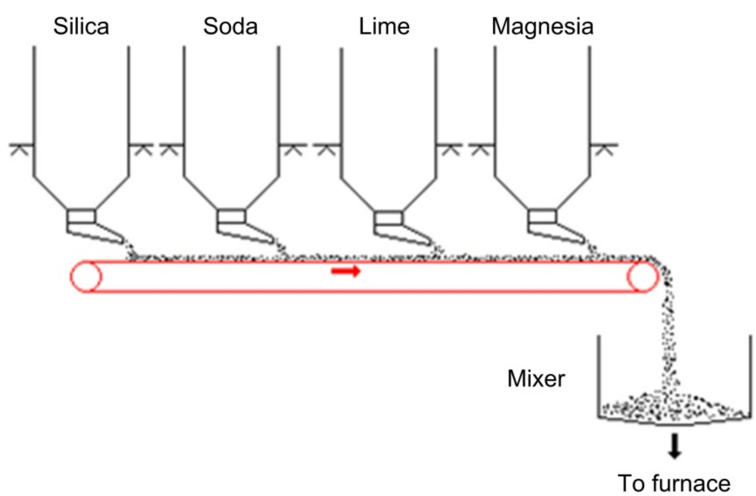


Figure 12-28: Sheet Glass Material Delivery System

In this example the objective is to re-calculate the batch after one of the materials has been overfed:

During production of a batch of sheet glass, the Lime feed gate got jammed and overfed the target by 14.6 kg, for a total delivery of 74.6 kg. The batch terminal was configured to abort the batch if a feed was out of tolerance, so this batch was aborted. The problem with the feed gate has now been corrected but the operator wishes to save the current batch. The previous two ingredients were delivered as follows:

- Silica = 755 kg
- Soda = 150.2 kg.

The batch should now be rescaled based on the delivered lime amount and material amounts reduced by the quantities already added.

To convert the aborted batch, the operator first creates a new order at the Batch terminal. The steps are as follows:

1. In the **Order View** screen, press the ADD ORDER softkey.

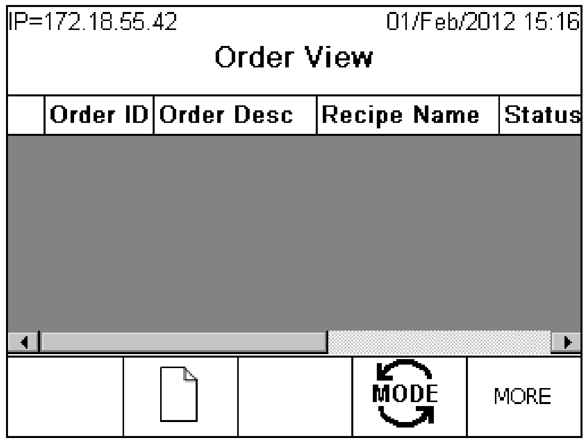


Figure 12-29: Adding an Order from the IND7870batch Order View Screen

2. In the **Add Order** screen, enter an **Order ID** and **Description**, and then select the original master recipe that was running when the batch aborted. In this case, this is a recipe with the ID **Glass Batch**. Figure 12-30 shows this information. Next, press the CONVERT BATCH softkey to start the Convert process from the batch terminal.

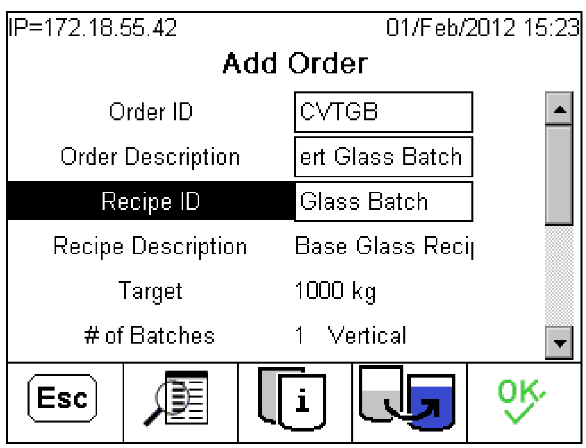


Figure 12-30: Add Order Screen

3. The **Convert Batch** screen (Figure 12-30) will open, which allows the batch for conversion to be specified. Press the TABLE SEARCH softkey to search for the Batch ID from the history records.

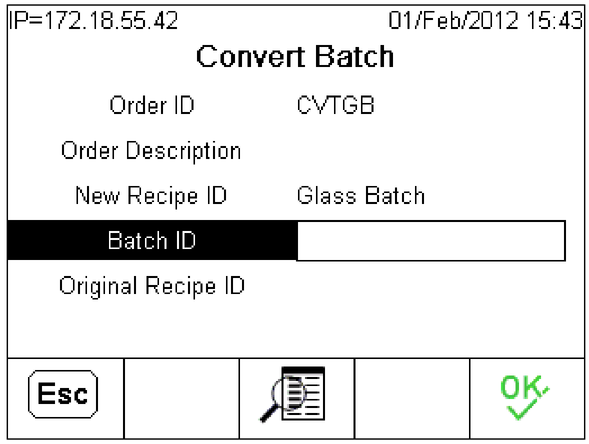


Figure 12-31: Convert Batch Screen

4. The BATCH ID SEARCH allows the search to be specified by certain criteria. Alternatively, simply press the SEARCH softkey to view a list of all Batch IDs in the history file.

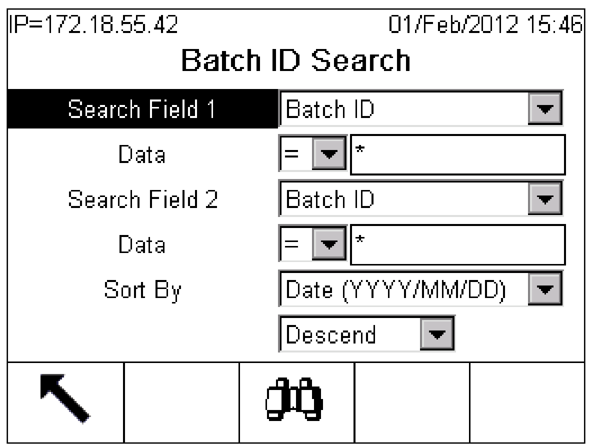


Figure 12-32: Batch ID Search Definition Screen

5. Figure 12-33 shows the list of Batch IDs. In this case, there was only one batch in the history file, which is the batch that aborted when the Lime material was fed out of tolerance. Select this Batch ID and press the **OK** softkey to confirm the selection.

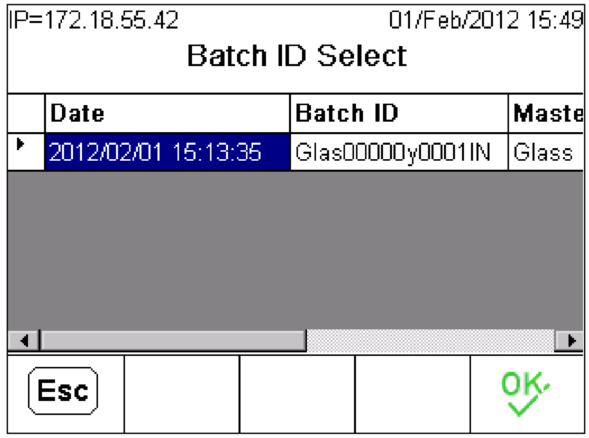


Figure 12-33: Batch ID Selection Screen

6. With the batch selected, the system displays the **Convert Batch** screen again. Verify all information to ensure it is correct before pressing **OK** to accept.

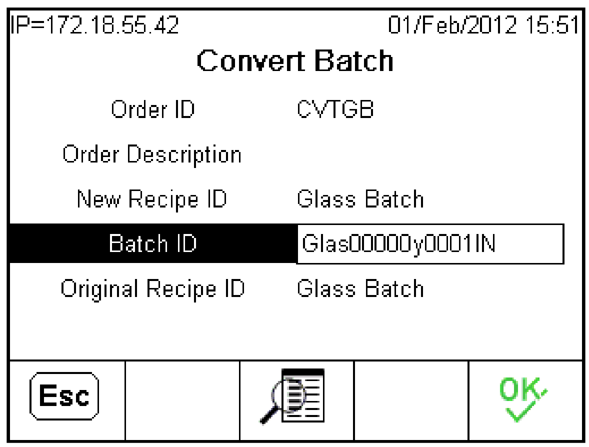


Figure 12-34: Data Verification Screen

7. The terminal will recalculate the recipe targets as follows:

$$\text{Lime overage} \quad = \quad \left(\frac{75\text{ kg}}{60\text{ kg}}\right) \quad \text{x} \quad 100\% \quad = \quad 125\%$$

Therefore, the required material additions are:

$$\begin{array}{rcccccc} \text{Silica} = & (750\text{ kg x }125\%) & - & 755\text{kg} & = & 182.5\text{ kg} \\ \text{Soda} = & (150\text{ kg x }125\%) & - & 150\text{kg} & = & 37.5\text{ kg} \\ \text{Lime} = & (60\text{ kg x }125\%) & - & 75\text{kg} & = & 0\text{ kg}^{*} \\ \text{Magnesium} = & (40\text{ kg x }125\%) & - & 0 & = & 50\text{ kg} \end{array}$$

* Note that this value doesn't change, since it is the basis for the rescaling calculation

8. Press OK in the **Convert Batch** screen. The **Order View** screen will appear again, and the converted batch can be run  to complete the aborted recipe.

13 Configuration Tool Guide: History

The History branch allows the user quick access to the history reports in the folder. In addition, a simple overview is shown to indicate how many records are contained in each history file.

- **In order to upload the history information, it may be necessary to disable your PC's wireless network connection.**

Figure 13-1 shows the History branch of the Batch Tool menu tree expanded to show the default reports available. Like the **Reports > Production** menu, any reports added to the reports folder will appear here. Reports are kept in a folder immediately under the BatchTool's executable folder – typically **C:\Program Files\Mettler Toledo\BatchTool 780\Reports**.

Figure 13-1: History Branch Expanded

When the History Branch is selected, an overview of records appears in the right pane, indicating that history data is present.

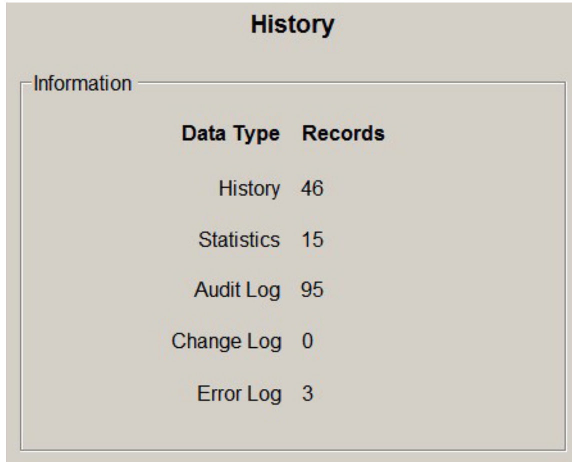


Figure 13-2: History Information Display

14 Configuration Tool Guide: Reports

14.1. Viewing and Printing Reports

When a report is selected from the Reports menu or the tree view, a window like the one shown Figure 14-1 in opens.

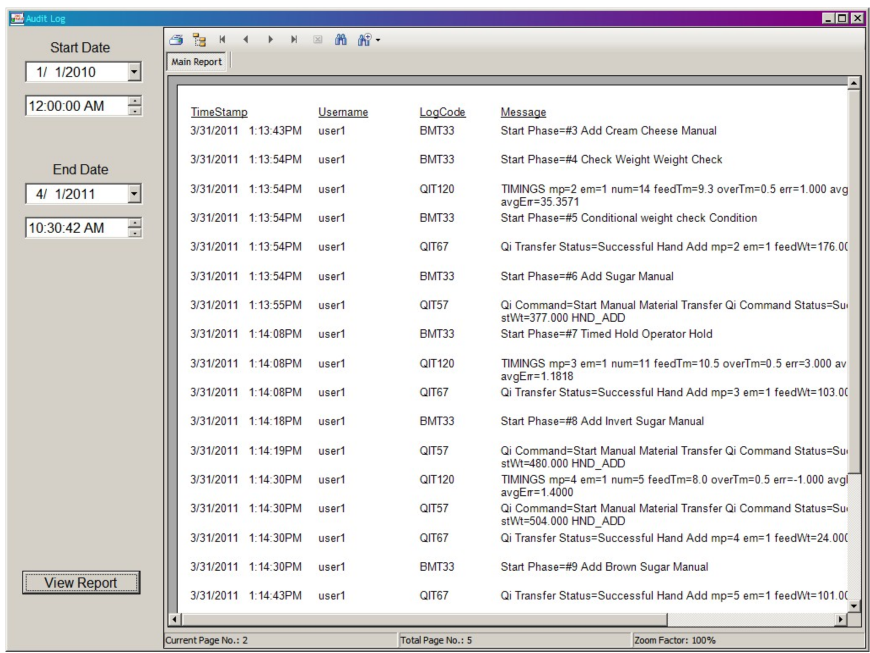


Figure 14-1: Typical Report Window – Audit Log

The status bar at bottom indicates how many pages the report contains. The arrow buttons at the top can be used to move through the report. The scroll bars can be used to control the view of the current page.

Audit Trail reports, such as the Audit Log display shown in Figure 14-1, and most Batch History reports also include a filter bar at left, which permits the selection of a range of dates, or other user input data appropriate for the selection of report information.

The Batch Details report requires the unique batch ID to be entered before the View Report button is clicked to see the report.

The upper left of each report window includes a series of tools:

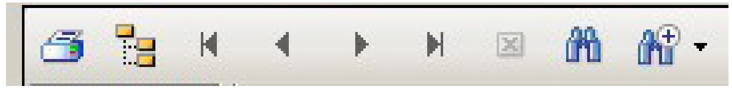


Figure 14-2: Report Tools

These tools function as follows:

Print  Opens a standard print dialog including any printer to which the PC is connected.

Bookmarks  The tree icon toggles a display of bookmarks at the left of the window. Click on a bookmark to display the numbered item. In the example in Figure 14-3, the first bookmarked has been selected, and EM 1 is displayed with its heading in a red box.

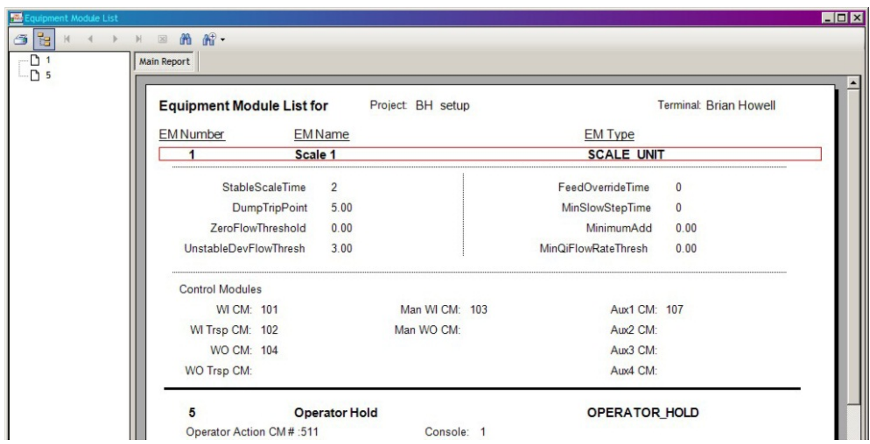
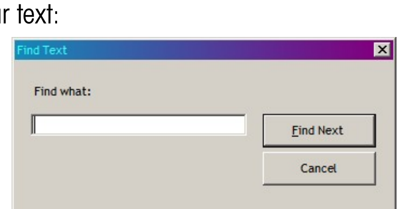


Figure 14-3: Report Bookmarks

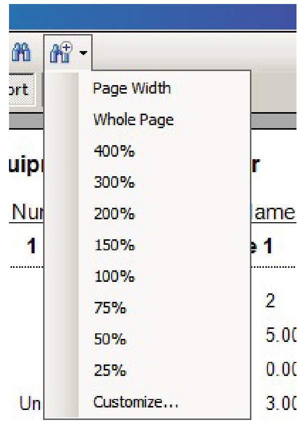
Navigate  In multi-page reports, use the arrow buttons to navigate rapidly to the start or end of the report, or to the previous or next page.

 Not used

Find Text  When clicked, opens a dialog used to search for particular text:



Zoom		Adjusts the magnification of the view, with the following options:



14.2. Configuration Reports

14.2.1. Overview

The six Configuration Report options produce lists of all the elements (terminals, EMs, CMs, MPs and Master Recipes) currently configured in the open project, as well as detailed account of the contents of the current master recipe.

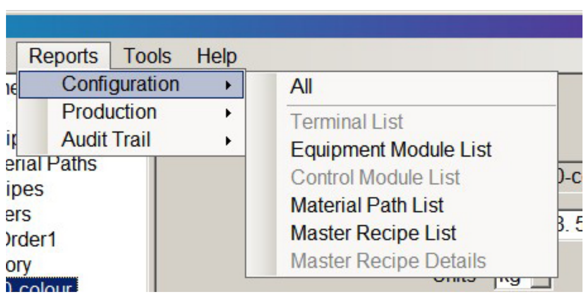


Figure 14-4: Configuration Report Options

14.2.2. Material Path Report

Figure 14-5 shows an example of a Material Path List Report. For each MP, the EM and CM are listed, together with information about feeds, maximum rates, etc.

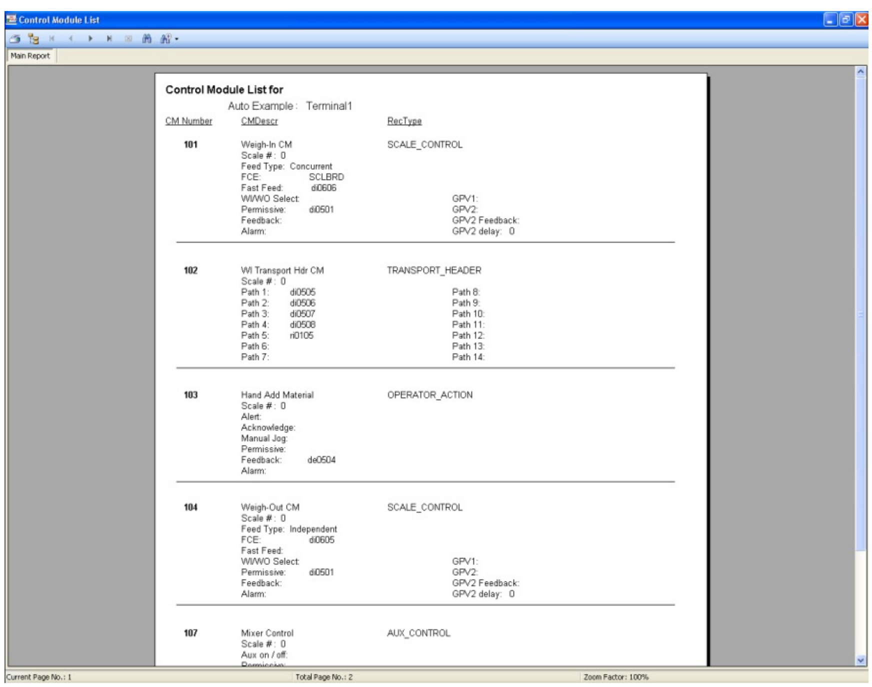
Material Path List Report for
MT001 : IND780Batch 1

MP Number	MP Name	Scale EM	TransHdr CM	FeedType	Fast Feed	Max Flow Rate	Slow Step	Min Open sec	Drain Settle sec
1	Water	1	1	0	100.00	0.00	0.00	0	0
2	Milk	1	5	0	25.00	0.00	0.00	2	1
3	Soy Oil	1	6	0	25.00	0.00	0.00	1	1
4	Wheat Flour	1	7	0	100.00	100.00	0.00	3	1
5	Vitamin Mix	2	0	0	0.00	0.00	0.00	0	0
6	Salt	2	0	0	0.00	0.00	0.00	0	0
7	Soy Milk	1	8	0	50.00	0.00	0.00	2	2
8	EW - Liquid	1	0	0	10.00	0.00	0.00	1	1
9	Flour Mix 11	1	10	0	50.00	100.00	0.00	2	4
10	Mix Storage	1	0	6	0.00	0.00	0.00	1	3
11	Preweigh Mix 1	1	0	7	0.00	0.00	0.00	0	0
12	Flour Mix 12AA	1	2	0	150.00	100.00	0.00	1	2
13	Preweigh Mix 2	1	0	7	0.00	0.00	0.00	0	0
14	Preweigh Mix 3	1	0	7	0.00	0.00	0.00	0	0
15	CS Oil 405	1	3	0	50.00	0.00	0.00	0	1
16	Syrup mix 5	1	4	0	50.00	0.00	0.00	1	2
17	Color 105.b	2	0	0	0.00	0.00	0.00	0	0
18	Color 105.d	2	0	0	0.00	0.00	0.00	0	0
19	Flavor Mix 1	2	0	0	0.00	0.00	0.00	0	0
20	Flavor Mix 2	2	0	0	0.00	0.00	0.00	0	0
21	Flavor Mix 3	2	0	0	0.00	0.00	0.00	0	0

Figure 14-5: Example of "Material Path List" Report

14.2.3. Control Module Report

Figure 14-6 shows an example of a Control Module report. Note that the CM Number column lists each scale-related Control Module with identifiers 101, 102, etc. This indicates that they refer to Scale 1. CMs associated with Scale 2 would be listed as 201, 202, etc. Operator Hold CMs are identified by numbers beginning in 5, to distinguish them from scale CMs.



Control Module List

Main Report

Control Module List for
Auto Example : Terminal1

CM Number	CMDescr	RecType	
101	Weigh-In CM Scale # : 0 Feed Type: Concurrent FCE: SCLBRD Fast Feed: di0606 WI/WO Select: Permissive: di0501 Feedback: Alarm:	SCALE_CONTROL	 GPV1: GPV2: GPV2 Feedback: GPV2 delay: 0
102	WI Transport Hdr CM Scale # : 0 Path 1: di0505 Path 2: di0506 Path 3: di0507 Path 4: di0508 Path 5: ri0105 Path 6: Path 7:	TRANSPORT_HEADER	 Path 8: Path 9: Path 10: Path 11: Path 12: Path 13: Path 14:
103	Hand Add Material Scale # : 0 Alert: Acknowledge: Manual Jog: Permissive: Feedback: de0504 Alarm:	OPERATOR_ACTION	
104	Weigh-Out CM Scale # : 0 Feed Type: Independent FCE: di0605 Fast Feed: WI/WO Select: Permissive: di0501 Feedback: Alarm:	SCALE_CONTROL	 GPV1: GPV2: GPV2 Feedback: GPV2 delay: 0
107	Mixer Control Scale # : 0 Aux on / off:	AUX_CONTROL	

Current Page No.: 1 Total Page No.: 2 Zoom Factor: 100%

Figure 14-6: Example of "Control Module" Report

14.2.4. Master Recipe Details Report

Figure 14-7 shows two pages of a Master Recipe Details report. Variables (see Figure 11-2) defined for this Master Recipe are listed at the head of the report, followed by a step-wise list of all phases included in the recipe. Unit Procedures are highlighted in yellow at the head of the list, while each Unit Procedure's phases appear at the end.

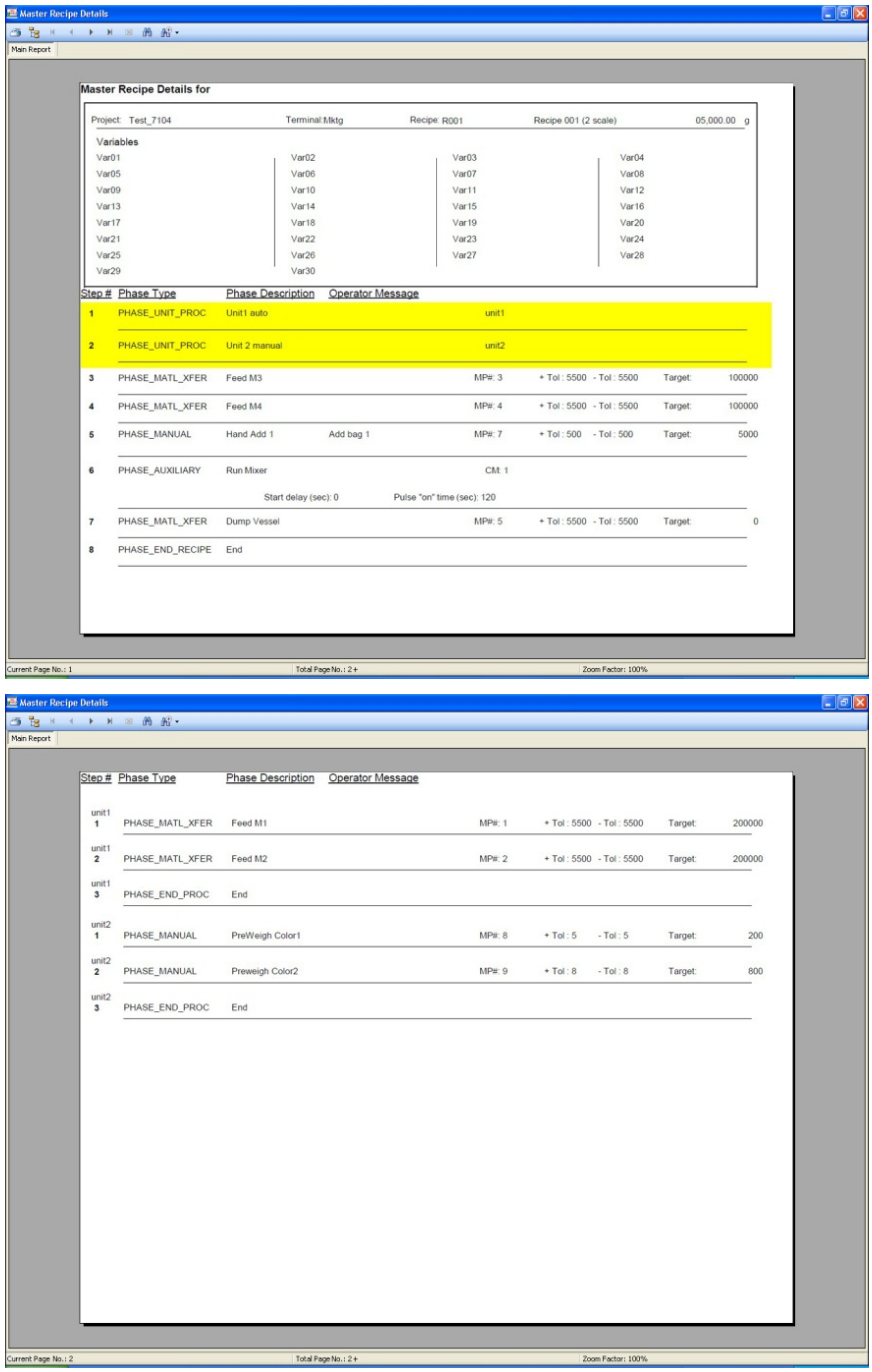


Figure 14-7: Example of "Master Recipe Details" Report

Reports

14.3. Production Reports

By default, the Production Report menu includes eight types of report.

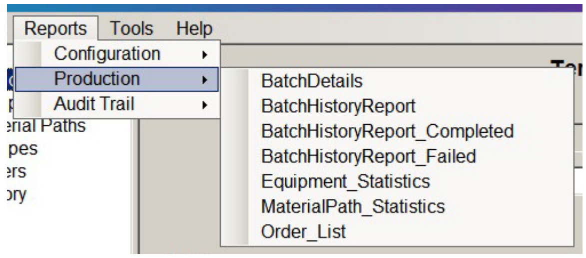
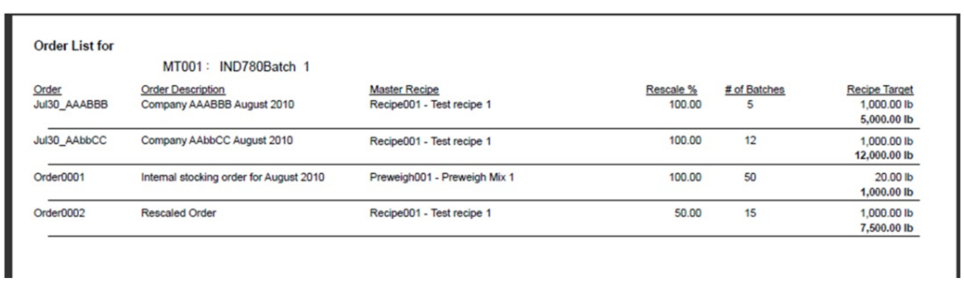


Figure 14-8: Production Report Options

File Name	Description
BatchDetails	A simple list of batches that have been completed
BatchHistoryReport	A list of the batch that includes detailed phase information.
BatchHistoryReport_Completed	A subset of the batch history report that contains only completed batches.
BatchHistoryReport_Failed	A subset of the batch history report that contains only batches that failed to complete.
BatchLotTrace Report	A report detailing material lot numbers used in each batch.
Orders_Completed	A list of all the completed reports included in the history table.
Equipment_Statistics	A statistical survey of equipment usage.
MaterialPath_Statistics	Simple statistics for the material paths defined in the terminal.
Order_List	A list of pending orders (i.e., those that have not yet been completed)

Additional report types can be defined and added to the reports folder. The default address for this folder is **C:\Program Files\Mettler Toledo\BatchTool 780\Reports\Production**. Each report's file name will appear in the BatchTool 780 **Reports > Production** menu.

Figure 14-9 shows an example of an Order List Report.



Order List for

MT001 : IND780Batch 1

Order	Order Description	Master Recipe	Rescale %	# of Batches	Recipe Target
Jul30_AAABBB	Company AAABBB August 2010	Recipe001 - Test recipe 1	100.00	5	1,000.00 lb 5,000.00 lb
Jul30_AAbbCC	Company AAbbCC August 2010	Recipe001 - Test recipe 1	100.00	12	1,000.00 lb 12,000.00 lb
Order0001	Internal stocking order for August 2010	Preweigh001 - Preweigh Mix 1	100.00	50	20.00 lb 1,000.00 lb
Order0002	Rescaled Order	Recipe001 - Test recipe 1	50.00	15	1,000.00 lb 7,500.00 lb

Figure 14-9: Sample Order List Report

Figure 14-10 shows a Batch History Report, displaying results for a specified range of dates.

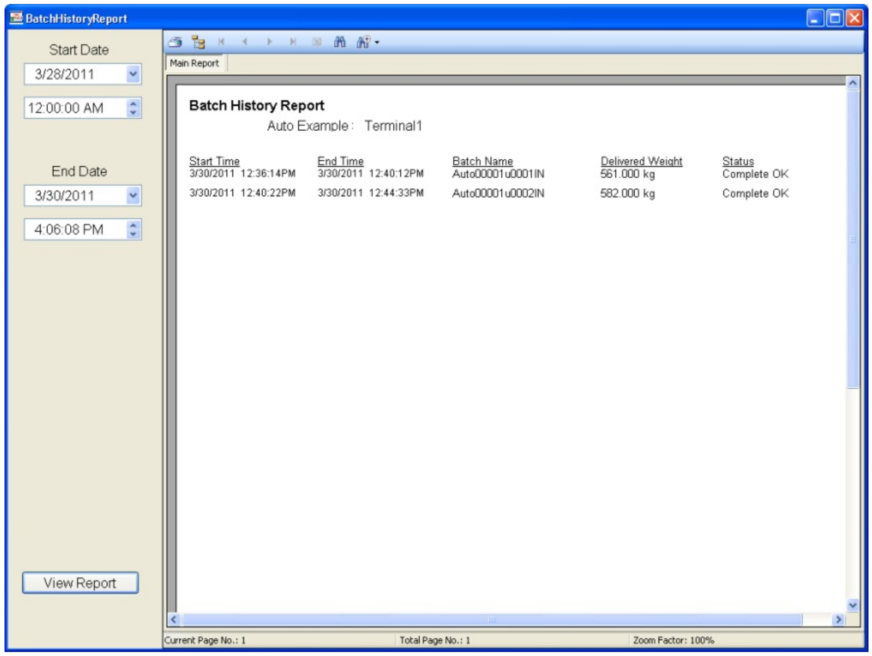


Figure 14-10: Example of "Batch History: Report

14.3.1.1. Batch Lot Trace Report

A Batch Lot Trace report is standard in BatchTool 780. It allows a user to search for a specific Lot number, and will create a report that includes a list of all unique Batch IDs that have a specific number sequence as part of a Lot number.

The example below (which is a screen capture from the "BatchLotTrace" report page in BatchTool 780) shows the BatchLotTrace report. Note that the search criterion was 123*. This returned any lot number starting with 123, and ending with any sequence of additional numbers.

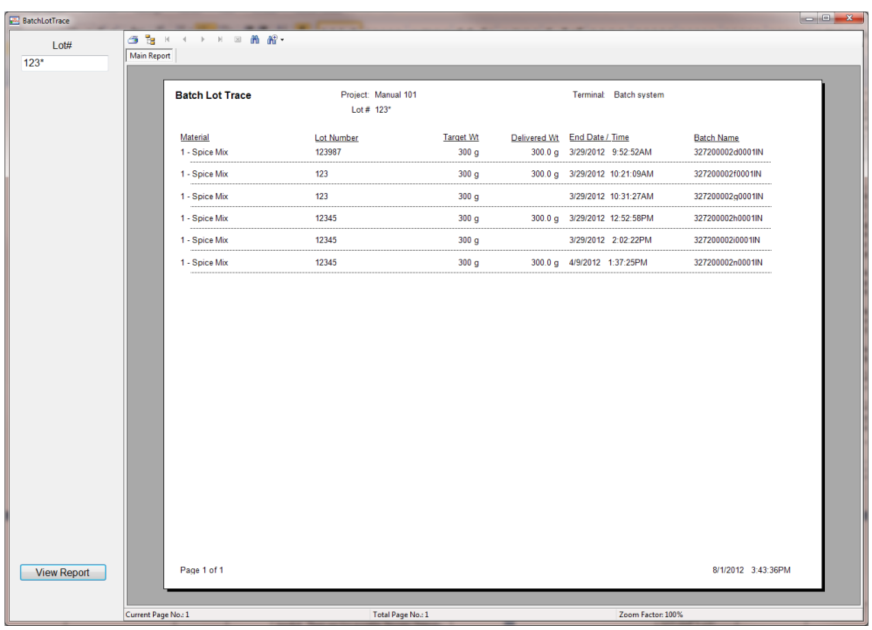


Figure 14-11: Example "Batch Lot Trace" Report

In this case, six different batches matched the criterion, starting with the numbers 123.

To store and associate a Lot number with a material, take the following steps:

1. Set up a batch variable in which to store the Lot number – in Figure 14-12, it is Variable 6:

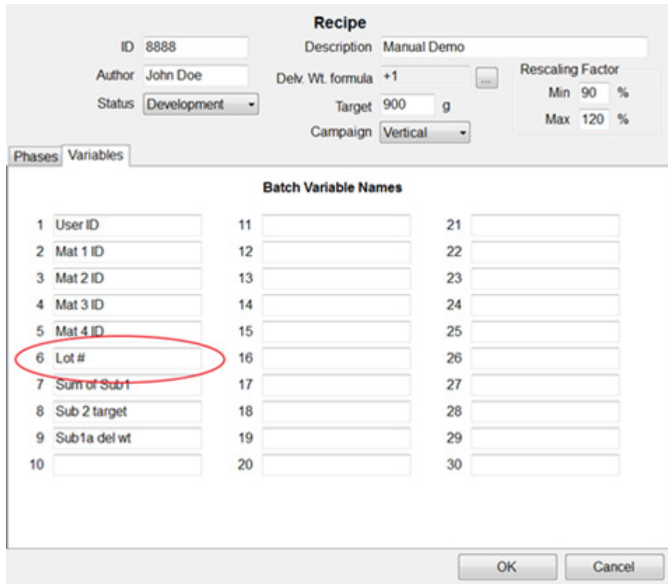


Figure 14-12: Naming a Batch Variable

2. Add an Operator Hold – Entry phase to the recipe to prompt the operator to enter the Lot number for the batch, or for a specific material. This entry will be stored in the Batch variable 6, "Lot #":

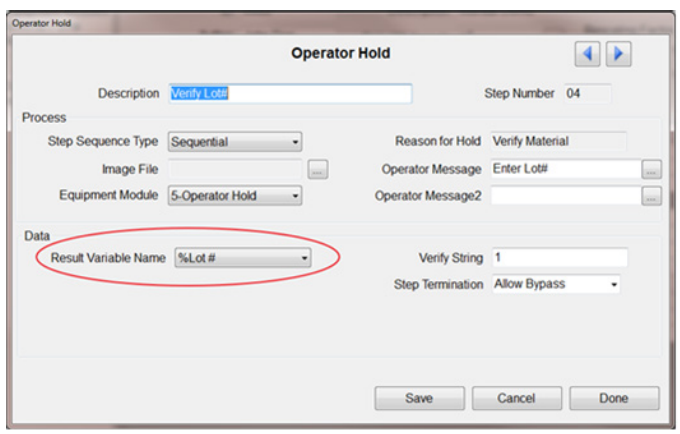


Figure 14-13: Operator Hold: Specifying a Batch Variable as a Result Variable

3. Once the Lot number is entered and stored in a Batch Variable, the variable must be associated with a specific material in the recipe. To do this, select the appropriate material transfer phase in the recipe, and click on the Advanced tab (Figure 14-14). In the Lot Number Variable Name field, select the name of the Batch Variable used to store the entered Lot number.

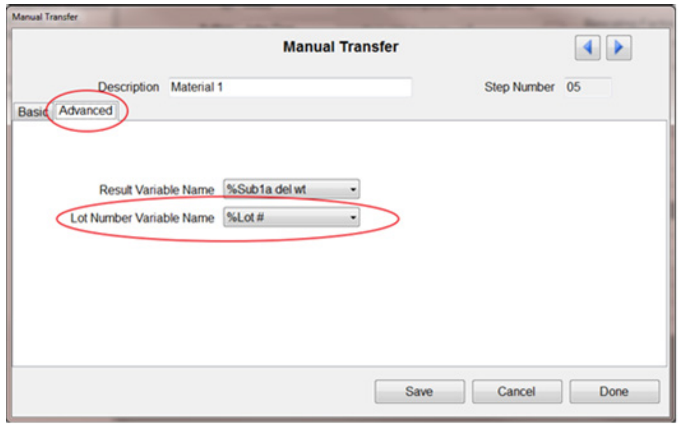


Figure 14-14: Associating the Batch Variable with a Material

4. The Lot number is now assigned to the material associated with this phase – in this case, a Manual Transfer.

- It is not possible to split a lot number during batch execution, as is possible in FormWeigh.Net®. This more advanced feature will not be implemented in IND780Batch.

14.3.1.2. Orders Completed Report

This report provides a list of all the completed orders included in the history data.

To generate the Orders completed Report, a start and end date/time range must be specified. Clicking on View Report will generate a report covering the period specified. Figure 14-15 shows a typical output for this type of report.

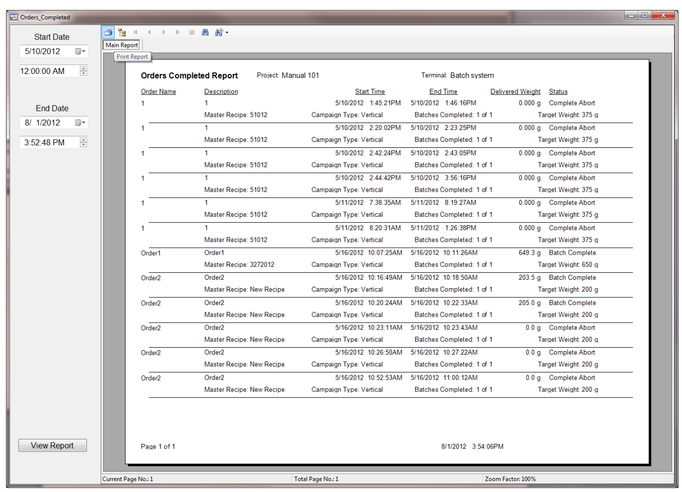


Figure 14-15: Example of "Orders Completed" Report

14.4. Audit Trail Reports

14.4.1. Audit Trail Report Types

The Audit Trail Report options include five types of report:

Audit Log	Stores a list of batch operations such as changes in mode, and commands issued (such as start, pause, etc.).
Change Log	Lists all changes to Shared Data variables in the IND780batch terminal, including a time/date stamp and the ID of the user logged in at the time the change was made.
Error Log	Lists all errors that have occurred, including a time/date stamp, the severity and source of the error, an error code and corresponding detail, and an additional description.
Tool Change Log	Lists all changes made in the BatchTool 780, including a time/date stamp, the ID of the user logged in at the time the change was made, the record type, and a detailed description of the change.

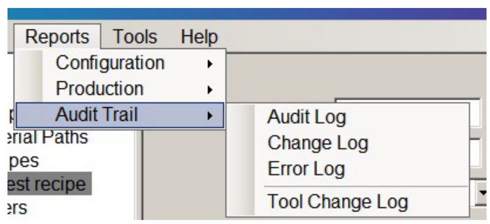


Figure 14-16: Audit Trail Report Options

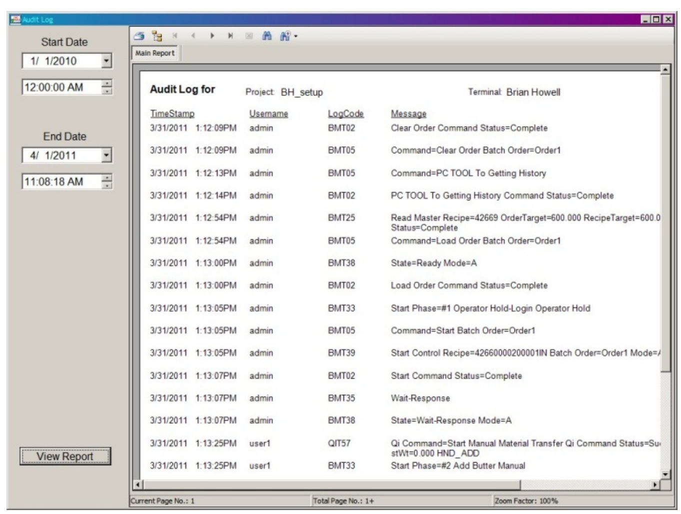


Figure 14-17: Example Audit Log Report

Audit Trail reports contain the following data:

Audit Log	TimeStamp	Date and time the record was created
	Username	User logged in when the record was created
	LogCode	Unique identifier for the log entry

	Message	Description of the logged event
Change Log	TimeStamp	Date and time the record was created
	Username	User logged in when the change was made
	SDName	Name Shared Data variable modified
	NewData	New content of named Shared Data variable
Error Log	TimeStamp	Date and time the record was created
	Severity	Code for the severity of the recorded error
	Source	Code for the system component that generated the error
	Error	Code for the error
	Detail	Further detail on the error
	Description	Outcome of the error

14.5. Reports Structure and Custom Report Configuration

This section provides the information necessary to understand the format of the Reports, and to enable users to create customized reports using data from the BatchTool 780.

14.5.1. Overview

Reports for the BatchTool 780 were created as non-embedded Crystal Reports files in Visual Studio 2008. These reports can be modified using this or the stand-alone version of Crystal Reports software. Connection to the PCBatch1 database tables is needed in order to reference table fields and test report results.

Reports in the tool are separated into three types: **configuration**, **production**, and **audit trail**. Each can be found in a separate subdirectory folder under the Reports subdirectory of the tool:

- The drive and file path location default for installation is C:\Program Files\Mettler Toledo\ … this can be changed by the user during the installation procedure.
    - Configuration reports … C:\Program Files\Mettler Toledo\BatchTool 780\Reports\Config
    - Production reports … C:\Program Files\Mettler Toledo\BatchTool 780\Reports\Production
    - Audit reports … C:\Program Files\Mettler Toledo\BatchTool 780\Reports\Audit
- Always back up original files before creating customized versions.

Typically, the configuration and audit trail reports do not require customization, so these sections of the tool do not support automatic menu additions to the tool. However, if it is necessary to customize the standard reports, they can be modified using either of the development applications, as long as the modified file has the same name and is kept in the same location. It is recommended that a back-up of the original file is kept before any changes are made.

The BatchTool report viewer code allows some flexibility with the use of parameters to pass dynamic information from the tool's user interface to the code within the report. Other than the hard-coded values sent for project and terminal parameters, the tool will display any other parameters it finds in a report in the left-hand frame of the viewer.

14.5.2. Configuration Reports

The configuration reports are used to document the project's and terminal's batch system configuration. These reports include: **All** (quick pick to run all of the configuration reports), **Terminal List**, **Equipment Module List**, **Control Module List**, **Material Path List**, **Master Recipe List**, and **Master Recipe Details**. Selections of these reports are context-sensitive and based on the current "focus" location in the tool. For example, Equipment Modules are assigned to specific terminals, so a terminal (or equipment module) must be selected in order to run the Equipment Module List report and document the equipment modules for the selected terminal.

14.5.2.1. Terminal List

The Terminal List is based on a project selection and documents the following elements from the Terminals table for each terminal configured in the project chosen:

- A report header with report name and project
- A page header with column labels for the reported fields
- A detail section with a single line repeated for each record selected that contains:
    - Terminal Name (TerminalName)
    - IP address (IPAddress)
    - System weight unit (Units)
    - Shared data login name (SDServerUserName)
    - FTP login name (ftpUserName)

Passwords are not shown for the shared data and FTP users.

The only parameter used in this report is Project, which is passed automatically by the BatchTool application based on the open project name. This parameter is used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{Terminals.ProjName} = {?Project}
```

14.5.2.2. Equipment Module List

The Equipment Module List is based on terminal selection. It will document the following from the EquipmentModules table for each scale or operator hold equipment module configured for the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields

- A group header section with a single line used to label each equipment module – this includes the equipment module number name and type. The Group Name field is configured to sort in ascending order by EMName
- Two details sections (**a** and **b**) that are selected based on equipment module type by using the suppress formatting formula and repeated for each record selected as needed
- **Details a** is used to report SCALE_UNIT equipment modules, and has two blocks of data. One block contains the parameters seen and configured from the Basic tab, while the other lists the control module references for that specific equipment module
- **Details b** is used to report OPERATOR_HOLD equipment modules, and has one block of data listing both the control module references and the console selection

The two parameters used in this report are **Project** and **Terminal**, which are passed automatically by the BatchTool application based on the open project name and the terminal selected. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{EquipmentModules.ProjName} = {?Project} and
{EquipmentModules.TerminalName} = {?Terminal}
```

The syntax for the suppression formatting formula used to make sure only scale equipment modules are reported in Details a section is:

```
{EquipmentModules.RecType} = "OPERATOR_HOLD"
```

The syntax for the suppression formatting formula used to make sure only operator hold equipment modules are reported in Details b section is:

```
{EquipmentModules.RecType} = "SCALE_UNIT"
```

14.5.2.3. Control Module List

The Control Module List is based on terminal selection. It will document the following from the ControlModules table for all control modules configured for all equipment modules in the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A group header section has no data but the Group Name field is configured to be grouped by CMName in ascending and is used in each detail section to list the control module number.
- Several details sections (**a** - **g**) that are selected based on control module type by using the suppress formatting formula and repeated for each record selected as needed
- **Details a**: reports AUX_CONTROL control modules
- **Details b**: reports SCALE_CONTROL control modules
- **Details c**: reports path 1 – 14 TRANSPORT_HEADER control modules
- **Details d**: reports path 15 -28 TRANSPORT_HEAD_1 control modules

- **Details e**: reports OPERATOR_ACTION control modules
- **Details f**: reports SUPERVISR_ACTION control modules
- **Details g**: reports SUPERVISR_STATUS control modules

The two parameters used in this report are **Project** and **Terminal**, which are passed automatically by the BatchTool application based on the open project name and the terminal selected. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{ControlModules.ProjName} = {?Project} and
{ControlModules.TerminalName} = {?Terminal}
```

Suppress Formatting Formulas:

Details a - `{ControlModules.RecType} <> "AUX_CONTROL"`

Details b - `{ControlModules.RecType} <> "SCALE_CONTROL"`

Details c - `{ControlModules.RecType} <> "TRANSPORT_HEADER"`

Details d - `{ControlModules.RecType} <> "TRANSPORT_HEAD_1"`

Details e - `{ControlModules.RecType} <> "OPERATOR_ACTION"`

Details f - `{ControlModules.RecType} <> "SUPERVISR_ACTION"`

Details g - `{ControlModules.RecType} <> "SUPERVISR_STATUS"`

14.5.2.4. Material Path List

The Material Path List is based on terminal selection. It will document the following from the MaterialPaths table for all material paths configured in the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A single details section with the following fields placed on a single line:
    - Material path number (MPName)
    - Material path description (MPDescr)
    - Scale EM (FlowCtlEM)
    - Transport Header CM (TransHdrPathNum)
    - Feed Type (FeedType)
    - Fine Feed Value (FastFeedCutoffWt)
    - Max Flow Rate (MaxFlwRateAlmVal)
    - Slow Step (SlowStepTmrFactor)
    - Min Open sec (MinOpenTime)
    - Drain Settle sec (DrainSettleTime)
- A page footer with a feed type key to explain the feed type values

The two parameters used in this report are **Project** and **Terminal**, which are passed automatically by the BatchTool application based on the open project name and the terminal selected. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{MaterialPaths.ProjName} = {?Project} and
{MaterialPaths.TerminalName} = {?Terminal}
```

14.5.2.5. Master Recipe List

The Master Recipe List is based on terminal selection. It will document the following from the MasterRecipes table for all recipes configured in the selected terminal:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A single details section with the following fields placed on a single line:
    - Recipe Name (RecipeName)
    - Recipe Description (RcpDescr)
    - Version (Version)
    - Recipe Author (Author)
    - Creation Date & Time (CreationDate / CreationTime)
    - Recipe Target Weight (TargetWeight / Units)

The two parameters used in this report are **Project** and **Terminal**, which are passed automatically by the BatchTool application based on the open project name and the terminal selected. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{MasterRecipes.ProjName} = {?Project} and
{MasterRecipes.TerminalName} = {?Terminal}
```

14.5.2.6. Master Recipe Details

The Master Recipe Details report is based on terminal and recipe selection. The main report (Master_Recipe_Details.rpt) makes use of two sub-reports in order to present the complex details of a recipe. First, it has a self-contained sub-report called Master_Recipe_Variables which lists the batch variables defined for the recipe. Then it also uses an external sub-report file, MR_Details_sub.rpt, to include the details of the steps within any defined unit procedures at the end of the main report. The complete report will document the following from the RecipePhases table for the selected recipe:

- A report header with self-contained sub-report (Master_Recipe_Variables)
    - Header section: project name, terminal, recipe name, recipe description, recipe target weight & unit

- Details section: a multi-column list of the batch variables

- A page header with column labels for the main fields for the details sections
- Several details sections (**a** – **i**), selected based on phase type by using the 'suppress formatting' formula and repeated for each record selected as needed. In addition, a background color formatting formula is used to change the color of parallel sequences to yellow:
- **Details a** section: reports manual material delivery phases ("PHASE_MANUAL")
- **Details b** section: reports automatic material delivery phases ("PHASE_MATL_XFER")
- **Details c** section: reports timed pulse auxiliary phases ("PHASE_AUXILIARY", type 1)
- **Details d** section: reports timed pulse based on weight auxiliary phases ("PHASE_AUXILIARY", type 2)
- **Details e** section: reports weight range auxiliary phases ("PHASE_AUXILIARY", type 3)
- **Details f** section: reports span phases auxiliary phases ("PHASE_AUXILIARY", type 4)
- **Details g** section: reports operator hold phases ("PHASE_OPER_HOLD")
- **Details h** section: reports communication phases ("PHASE_COMM")
- **Details i** section: reports all other types of phases
- A report footer that contains the MR_Details_sub.rpt
  - This sub-report contains only details sections similar to those in the main report (a – i) …, but these are formatted to include the unit procedure name above the step number

The three parameters used in this report are **Project**, **Terminal**, and **Recipe**, which are passed automatically by the BatchTool application based on the open project name, the terminal and recipe selected. These parameters are used in the record selection to report the correct records from the database for the details section of this report for this project. In addition, the last part of the record selection syntax insures that only the unit procedures for the selected recipe are shown in the sub-report.

Record selection syntax:

```
{RecipePhases.ProjName} = {?Project} and {RecipePhases.TerminalName}
= {?Terminal} and

{RecipePhases.RecipeName} = {?RecipeName} and

{RecipePhases.ParentRcpName} = {RecipePhases.RecipeName}
```

Suppress Formatting Formulas (in both the main and sub-report):

Details a – `{RecipePhases.RecType} <> "PHASE_MANUAL"`

Details b – `{RecipePhases.RecType} <> "PHASE_MATL_XFER"`

Details c – `{RecipePhases.RecType} <> "PHASE_AUXILIARY" OR {RecipePhases.TypeReason} <> "1"`

Details d – `{RecipePhases.RecType} <> "PHASE_AUXILIARY" OR {RecipePhases.TypeReason} <> "2"`

Details e –
```
{RecipePhases.RecType} <> “PHASE_AUXILIARY” OR
{RecipePhases.TypeReason} <> “3”
```

Details f –
```
{RecipePhases.RecType} <> “PHASE_AUXILIARY” OR
{RecipePhases.TypeReason} <> “4”
```

Details g –
```
{RecipePhases.RecType} <> “PHASE_OPER_HOLD”
```

Details h –
```
{RecipePhases.RecType} <> “PHASE_COMM”
```

Details i –
```
{RecipePhases.RecType} = “PHASE_MANUAL” OR
{RecipePhases.RecType} = “PHASE_OPER_HOLD” OR
{RecipePhases.RecType} = “PHASE_MATL_XFER” OR
{RecipePhases.RecType} = “PHASE_AUXILIARY” OR
{RecipePhases.RecType} = “PHASE_COMM”
```

Background Color Formatting Formula (for all detail sections):

```
If {RecipePhases.ParallelSeq} = “1” then crYellow else crNoColor
```

14.5.3. Production Reports

The production reports are used to provide production information for the day-to-day operations of the batch system. These reports are the ones most likely to require customization. The standard reports included are **BatchDetails**, **BatchHistoryReport**, **BatchHistoryReport_Completed**, **BatchHistoryReport_Failed**, **Equipment_Statistics**, **MaterialPath_Statistics**, and **Order_List**.

The user can create custom report files and place them in the appropriate sub-directory. The tool will then present them in its reports menus.

14.5.3.1. BatchDetails

The Batch Details report is based on terminal and unique batch ID selection (also referred to as control recipe ID). The complete report will document the following from the BatchHistory table for the selected batch ID:

- A report header with report name, project, terminal, batch, order and recipe information
- A page header with column labels for the common reported fields
- Several details sections (**a** – **g**) that are selected based on phase type by using the suppress formatting formula and repeated for each record selected as needed:
- **Details a**: reports the batch summary data (start time/date, end time/date, delivered weight, completion status)
- **Details b**: reports automatic material delivery phases (”PHASE_MATL_XFER”)
- **Details c**: reports manual material delivery phases (”PHASE_MANUAL”)
- **Details d**: reports auxiliary phases (”PHASE_AUXILIARY”)
- **Details e**: reports weight check phases (”PHASE_WT_CHECK”)
- **Details f**: reports operator hold phases (”PHASE_OPER_HOLD”)
- **Details g**: reports all other phase types

The three parameters used in this report are **Project**, **Terminal**, and **BatchID**, which are passed from the BatchTool application based on the open project name, the selected terminal, and the BatchID entered by the user. These parameters are used in the record selection to report the correct records from the database for the details section of this report for this project.

Record selection syntax:

```
{BatchHistory.ProjName} = {?Project} and
{BatchHistory.TerminalName} = {?Terminal} and
{BatchHistory.Name} = {?BatchID}
```

Suppress Formatting Formulas (in both the main and sub-report):

Details a - `{BatchHistory.RecType} <> "CONTROL_RECIPE"`

Details b - `{BatchHistory.RecType} <> "PHASE_MATL_XFER"`

Details c - `{BatchHistory.RecType} <> "PHASE_MANUAL"`

Details d - `{BatchHistory.RecType} <> "PHASE_AUXILIARY"`

Details e - `{BatchHistory.RecType} <> "PHASE_WT_CHECK"`

Details f - `{BatchHistory.RecType} <> "PHASE_OPER_HOLD"`

Details g - `{BatchHistory.RecType} = "CONTROL_RECIPE or`

```
{BatchHistory.RecType} = "PHASE_MATL_XFER" or
{BatchHistory.RecType} = "PHASE_MANUAL" or
{BatchHistory.RecType} = "PHASE_WT_CHECK" or
{BatchHistory.RecType} = "PHASE_AUXILIARY" or
{BatchHistory.RecType} = "PHASE_OPER_HOLD"
```

14.5.3.2. BatchHistoryReport

The Batch History reports are similar in structure but include or exclude specific batches based on completion status:

BatchHistoryReport: Includes all recorded batches except those with a status of process not run (36), recipe processing error (37), or with no status value ("").

BatchHistoryReport_Failed: Includes all batches with a status of aborted (13), failed completion due to abort (33), other failed completion (34), or batch campaign done failure (35).

BatchHistoryReport_Completed: Includes all batches with a status of successful completion (30), completed with under tolerance warning (31), or completed with over tolerance warning (32).

Each of these reports will document the following from the BatchHistory table based on the project, terminal, and date/time range selection by the user:

- A report header with report name, project, and terminal information
- A page header with column labels for the reported fields
- A single line details section for each record with the following –
    - Start time/date
    - End time/date

- BatchID (control recipe name)
- Delivered weight
- Completion status

Four parameters are used in this report: **Project**, **Terminal**, **Start** and **End**. The open project name and selected terminal are passed automatically from the BatchTool application. The Start and End date/time are entered by the user. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database. In addition, completion status values are checked for the different reports based on the desired status values.

Record selection syntax BatchHistoryReport:

```
{BatchHistory.ProjName} = {?Project} and
{BatchHistory.TerminalName} = {?Terminal} and
{BatchHistory.RecType} = "CONTROL_RECIPE" and
({BatchHistory.CompletionStatus} <> "36" and
{BatchHistory.CompletionStatus} <> "37" and
{BatchHistory.CompletionStatus} <> "") and
{BatchHistory.StartDateTime} >= {?Start} and
{BatchHistory.EndDateTime} <= {?End}
```

Record selection syntax BatchHistoryReport_Failed:

```
{BatchHistory.ProjName} = {?Project} and
{BatchHistory.TerminalName} = {?Terminal} and
{BatchHistory.RecType} = "CONTROL_RECIPE" and
{BatchHistory.StartDateTime} >= {?Start} and
{BatchHistory.EndDateTime} <= {?End} and
{BatchHistory.CompletionStatus} = "13" or
{BatchHistory.CompletionStatus} = "33" or
{BatchHistory.CompletionStatus} = "34" or
{BatchHistory.CompletionStatus} = "35"
```

Record selection syntax BatchHistoryReport_Completed:

```
{BatchHistory.ProjName} = {?Project} and
{BatchHistory.TerminalName} = {?Terminal} and
{BatchHistory.RecType} = "CONTROL_RECIPE" and
{BatchHistory.StartDateTime} >= {?Start} and
{BatchHistory.EndDateTime} <= {?End} and
{BatchHistory.CompletionStatus} = "30" or
{BatchHistory.CompletionStatus} = "31" or
{BatchHistory.CompletionStatus} = "32"
```

14.5.3.3. Equipment_Statistics

The Equipment_Statistics report is based on the project and terminal selection. It will document the following from the BatchStatistics table for all equipment modules configured in the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A single details section with the following fields placed on a single line:
  - Equipment module number (Name)
  - EM description (Descr)
  - Number of WI phases (TotalSclWghInPhases)
  - Number of WO phases (TotalSclWghOutPhases)
  - Number of Aux phases (TotalAuxPhases)
  - Number of DTE phases (TotalDumpPhases)
  - Late date/time EM was used (LastDateTime)
  - Total WI weight (TotalWghInWt)
  - Total WO weight (TotalWghOutWt)

Because the BatchStatistics table contains different record types for various statistics, this report has to include syntax to limit the record selections to equipment statistics in addition to the normal project and terminal parameters.

Record selection syntax:

```
{BatchStatistics.ProjName} = {?Project} and
{BatchStatistics.TerminalName} = {?Terminal} and
{BatchStatistics.RecType} = "EQUIP_STATISTICS"
```

14.5.3.4. MaterialPath_Statistics

The MaterialPath_Statistics report is based on the project and terminal selection. It will document the following from the BatchStatistics table for all material paths configured in the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A single details section with the following fields placed on a single line:
  - Material Path number (Name)
  - Material Path description (Descr)
  - Last weight (CurrentWt)
  - Late date/time MP was used (LastDateTime)
  - Total number of times MP was used (TotalNumber)

- Total weight (TotalWt)
- Average error (AverageError)

Because the BatchStatistics table contains different record types for various statistics, this report must include syntax to limit the record selections to equipment statistics in addition to the normal project and terminal parameters.

Record selection syntax:

```
{BatchStatistics.ProjName} = {?Project} and
{BatchStatistics.TerminalName} = {?Terminal} and
{BatchStatistics.RecType} = "RECIPE_STATISTICS"
```

Note that the RECIPE_STATISTICS record type actually reports the material path information!

14.5.3.5. Order List

The Order_List report is based on the project and terminal selection. It will document the following from the Orders and MasterRecipes tables for all orders configured in the terminal chosen:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A single details section with the following fields placed on two lines:
  - Line 1 –
    - Order ID (OrderName)
    - Order description (Description)
    - Master recipe name (RecipeName)
    - Master Recipe description (Description)
    - Order rescale amount (RescaleAmt)
    - Number of batches (NumBatches)
    - Recipe target & weight unit (TargetWeight, Units)
  - Line 2 –
    - Formula field for total amount of order & unit (@OrderTotal)

The Order_List report uses information from two tables: Orders and MasterRecipes. These tables are linked by the RecipeName field. Data from both tables are used in the report. A special formula field is used to calculate the total amount of material that will be made for the order. The two parameters used in this report are Project and Terminal, which are passed automatically by the BatchTool application based on the open project name and the terminal selected. These parameters are used in the record selection to report the correct records from the database for the details section of this report for this project.

Record selection syntax:

```
{Orders.ProjName} = {?Project} and
{Orders.TerminalName} = {?Terminal}
```

OrderTotal Formula:

```
{Orders.NumBatches} * {MaterRecipes.TargetWeight} *
{Orders.RescaleAmt} / 100
```

14.5.3.6. Audit Trail Reports

Audit Trail reports are used to provide audit or track and trace information for both the IND780batch terminal and BatchTool 780. These reports include change history, error and specific batch audit information. The Audit Trail reports include **Audit Log**, **Change Log**, **Error Log**, and the **Tool Change Log**. The first three reports are based on data from the terminal. The last report is based on data from the tool itself.

14.5.3.6.1. Audit Log

The Audit Log is based on a project and terminal selection. It will document the following from the IndAuditLog table for the chosen terminal:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A details section with the timestamp (TimeStamp), user (Username), the audit log code (LogCode), and code description (Message)

Four parameters are used in this report. Two of them, **Project** and **Terminal**, are passed automatically by the BatchTool application based on the open project name and the terminal selected. Two additional parameters – the start date and the end date – are passed to the operator via the report viewer. Both the Start Date ({?Start}) and End Date ({?End}) parameters are configured as DateTime values, so the tool presents them as such. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{IndAuditLog.ProjName} = {?Project} and
{IndAuditLog.TerminalName} = {?Terminal} and
{IndAuditLog.TimeStamp} >= {?Start} and
{IndAuditLog.TimeStamp} <= {?End}
```

14.5.3.6.2. Change Log

The Change Log is based on a project and terminal selection. It will document the following from the IndChangeLog table for the chosen terminal:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A details section with the timestamp (TimeStamp), user (Username), the shared data name (SDName), and new data value (NewData)

Four parameters are used in this report. Two of them, **Project** and **Terminal**, are passed automatically by the BatchTool application based on the open project name and the terminal selected. Two additional parameters – the start date and the end date - are passed to the operator via the report viewer. Both the Start Date ({?Start}) and End Date ({?End}) parameters are configured as DateTime values, so the tool presents them as such. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{IndChangeLog.ProjName} = {?Project} and
{IndChangeLog.TerminalName} = {?Terminal} and
{IndChangeLog.TimeStamp} >= {?Start} and
{IndChangeLog.TimeStamp} <= {?End}
```

14.5.3.6.3. Error Log

The Error Log is based on a project and terminal selection. It will document the following from the IndErrorLog table for the chosen terminal:

- A report header with report name, project, and terminal
- A page header with column labels for the reported fields
- A details section with the timestamp (TimeStamp), severity level (Severity), error source (Source), error type (Error), error details (Detail), and error description (Message)

Four parameters are used in this report. Two of them, **Project** and **Terminal**, are passed automatically by the BatchTool application based on the open project name and the terminal selected. Two additional parameters – the start date and the end date - are passed to the operator via the report viewer. Both the Start Date ({?Start}) and End Date ({?End}) parameters are configured as DateTime values so the tool presents them as such. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{IndErrorLog.ProjName} = {?Project} and
{IndErrorLog.TerminalName} = {?Terminal} and
{IndErrorLog.TimeStamp} >= {?Start} and
{IndErrorLog.TimeStamp} <= {?End}
```

14.5.3.6.4. Tool Change Log

The Tool Change Log is a report that does not require any project or terminal selection. It will document the following from the ChangeLog table:

- A report header with report name
- A page header with column labels for the reported fields
- A multi-line details section with the timestamp (DateTime), project name (ProjectName), terminal name (TerminalName), user (UserName), record type (RecType), and details (Detail)

Two parameters are used in this report - the start date and the end date. These are passed to the operator via the report viewer. Both the Start Date parameter ({?Start}) and End Date parameter ({?End}) are configured as DateTime values so the tool presents them as such. These parameters are used in the record selection to report the correct records for the details section of this report for this project from the database.

Record selection syntax:

```
{ChangeLog.TimeStamp} >= {?Start} and
{ChangeLog.TimeStamp} <= {?End}
```

15 Configuration Tool Guide: Batch Application Examples

15.1. Introduction

This chapter covers three examples of batch applications, to assist in the proper configuration of certain phase types. This section in divided into 3 parts:

- Packaged IND780batch, automatic
- Automatic Material transfer with Hand Adds
- Manual Formulation

Each example includes the system and software configuration, a recipe definition and a demonstration of the recipe's execution.

15.2. Packaged IND780batch Example

15.2.1. Overview of application

In this example, which uses a Packaged IND780batch, the system will automatically feed five materials (via a 2-speed feed system in which all materials are gravity fed) into the scale. The operator will be required to hand add (weigh-in) one (pre-weighed and packaged by its supplier) material to the scale. Operator hold phases are included, to allow the batch to rest and to force the operator to enter the amount of Hand add material to be put into the batch. There is also an Auxiliary phase, configured to run a piece of auxiliary equipment – in this example, a mixer. The operator will be prompted through each recipe step automatically (phase to phase).

Once the batch is complete, it will be discharged from the vessel by gravity feed. Figure 15-1 shows a diagram of the system, together with its I/O assignments.

A copy of this configuration is provided in the IND780batch section of the **IND780 Applications Resource CD**. From the IND780batch main page, click on the button next to **Manuals, Guides and Utilities**, then click on **Browse application examples and PLC files**. The configuration files will be found in the folder named **Packaged Example, 1 scale**. To examine how the system is built up, import this configuration into BatchTool 780.

15.2.2. System Overview

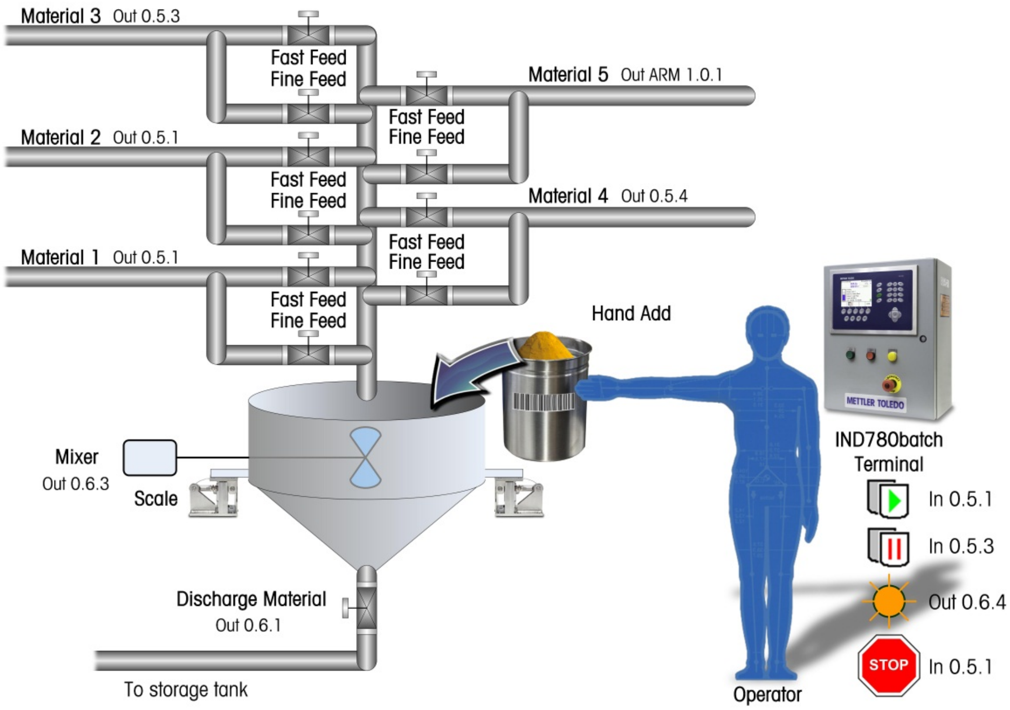


Figure 15-1: Packaged IND780batch System Diagram

15.2.3. Terminal Configuration

The IND780batch terminal used in this example is configured as follows:

- 78R1000BB0BA000, IND780 panel mount
- 1 analog scale card (slot 1)
- 2 discrete relay I/O cards (slots 5 & 6)
- **Batch 780 Auto-Spill only** application hardware key.
- The system also includes an ARM-100 module which provides 4 additional inputs and 6 additional outputs.

Note: This configuration will run **only** if an **Auto, Spill only** application hardware key is installed in the IND780batch terminal.

15.2.4. Terminal Settings

15.2.4.1. Execution

To configure the terminal for this example, first access **Setup > Application > Batch 780 > Recipe Operations > Execution Control**:

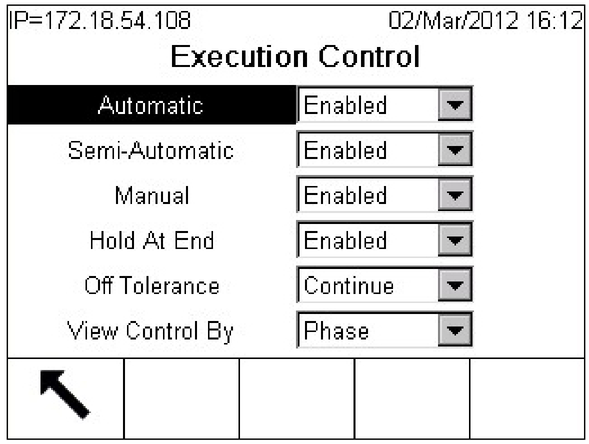


Figure 15-2: Execution Control Setup Screen

Automatic	**Enabled**. This will allow the recipe to execute from phase to phase without the need for operator intervention, unless a specific operator hold phase is contained within the recipe to cause the recipe to pause for an operator acknowledgement.
Semi-Automatic	**Disabled**. This will prevent the semi-automatic mode from being enabled during operation of the system.
Manual	**Disabled**. This will prevent the manual mode from being enabled during operation of the system.
Hold at End	**Enabled**. This allows the operator to pause a recipe using the HOLD AT END softkey on the terminal when the recipe completes, if the order is setup to loop continuously.
Off Tolerance	**Continue**. This will cause the recipe to continue even if a given material is outside of the specified tolerance limits.
View Control By	**Phase.** This will cause the terminal to display each step of the recipe as it progresses, minimizing the number of key presses require by the operator to access the appropriate view.

15.2.4.2. Batch Editing

Next, configure the terminal settings at **Setup > Application > Batch 780 > Recipe Operations > Batch Edit**:

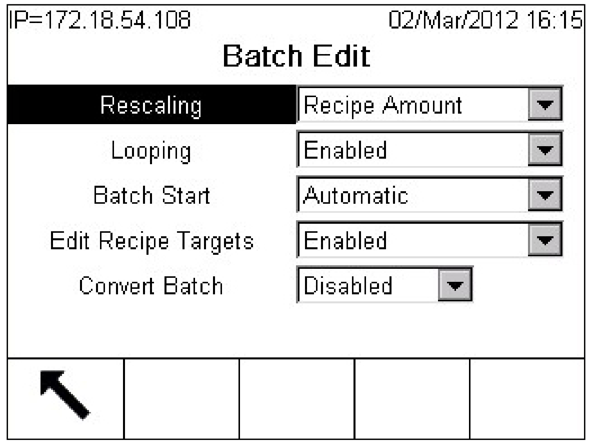


Figure 15-3: Batch Edit Setup Screen

Rescaling — **Recipe %**. This allows the operator to increase or decrease the batch size by percent, within the parameters established by the Rescaling Factor, Min and Max setting in the Recipe screen in the BatchTool 780 PC Configuration tool.

Looping — **Enabled**. This activates the Looping feature on the **Add Order** screen in the terminal. Looping will allow a recipe to repeat until the operator presses the HOLD AT END softkey ▶‖.

Loop Start — **Automatic**. When the order is set to Loop, and Looping is enabled, the recipe will automatically repeat.

Edit Recipe Targets — **Disabled**. The operator will not be permitted to re-scale individual targets within the recipe. When this feature is enabled, an operator is able to change the ratio of materials in a given recipe.

15.2.4.3. Auto Print & Log

Finally, configure the terminal settings at **Setup > Application > Batch 780 > Auto Print & Log**:

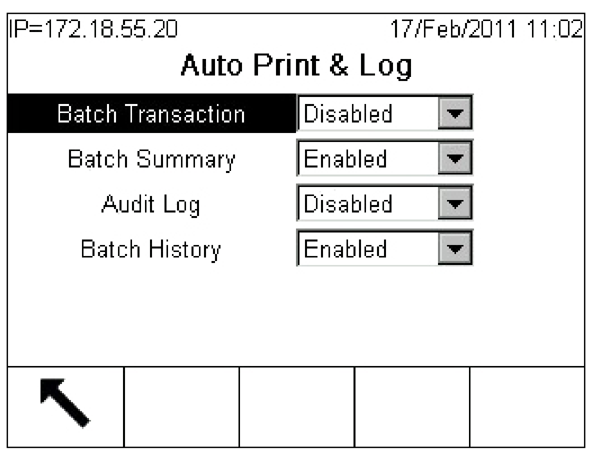


Figure 15-4: Auto Print & Log Setup Screen

Batch Transaction — **Disabled**. Batch data will not be printed after each phase is executed.

Batch Summary — **Enabled**. A batch summary report will be printed upon completion of the batch.

Note: The appropriate printer connections must be configured in setup at **Communication > Connections**, in order for the data to be directed correctly. Most importantly, set up a Demand Output connection using a serial or EPrint port with the print Trigger set to Batch. Refer to the **IND780 Technical Manual** for details on configuring the serial and EPrint connections.

Audit Log — **Enabled**. Data such as mode changes, recipe edits, and batch sequence results will be stored in a log file. The Audit Log can be viewed in the BatchTool 780.

Batch History — **Enabled**. Phase execution records will be logged. The Batch History report can be viewed in the BatchTool 780.

15.2.5. BatchTool 780 PC Configuration Tool Settings

With the IND780batch terminal configured correctly for the application, the batching system parameters can be set using the BatchTool 780.

15.2.5.1. Equipment Module Configuration

Scale 1

Operator Hold Equipment Module

15.2.5.2. Control I/O Modules

15.2.5.2.1. Scale EM

Control I/O assignments for five Control Modules are:

Weigh In CM

- Scale Fine Feed = ALC Card Final Control Element (FCE)
- Scale Fast Feed = Output 0.6.2

Weigh In Transport Header CM

- Path 1 = Output 0.5.1 (Material A selection)
- Path 2 = Output 0.5.2 (Material B selection)
- Path 3 = Output 0.5.3 (Material C selection)
- Path 4 = Output 0.5.4 (Material D selection)
- Path 5 = Output 1.0.1 (Material E selection)

Weigh In Manual Operator Action CM

- Manual Feed Operation or Hand Add (no I/O required, uses terminal softkey for acknowledgement)

Weigh Out CM

- Material discharge control = Output 0.6.1

Auxiliary Mixer Control

- Mixer control = Output 0.6.3

15.2.5.2.2. Operator Hold EM

Two control I/O assignments are:

Supervisor Action CM

- Start/Resume PB = Input 0.5.2
- Pause/Abort PB = Input 0.5.3
- Emergency Stop button = Input 0.5.1 (used for Batch Run Permissive and to disable all outputs)

Supervisor Status CM

- Attention Light = Output 0.6.4 (for operator acknowledge or action)

15.2.5.3. Material Paths

Six Material Paths (MPs) must be configured – one for each material, and one for discharging the completed batch:

Material A	Automatic Material addition, Spill only-GIW, scale 1, path 1 in transport header
Material B	Automatic Material addition, Spill only-GIW, scale 1, path 2 in transport header
Material C	Automatic Material addition, Spill only-GIW, scale 1, path 3 in transport header
Material D	Automatic Material addition, Spill only-GIW, scale 1, path 4 in transport header
Material E	Automatic Material addition, Spill only-GIW, scale 1, path 5 in transport header
Material F	Hand Add, manual material addition, Hand Add, scale 1
Discharge Material	Dump to Empty, from scale 1, destination out of system

15.2.6. Recipe Definition

This example can be used as a starting point in developing a functional batching system. However, note that the weight and time values used in this recipe are arbitrary, and it is provided as an illustrative example only. This recipe uses a scale configured for a maximum weight of 1,000 kg, in 0.2 kg increments.

Step	Phase type	Description	Phase Parameter Settings
1	Material Transfer	Auto add 100 kg of Material A, fast feed until within 30kg of target weight, then switch to fine feed	Target: 100 kg Fast Feed Cutoff: 30 kg (i.e. Fast feed ends when 70 kg has been fed)
2	Auxiliary Timed Pulse with Threshold	Turn on Aux 1 (Mixer) for 30 seconds when scale weight reaches150 kg. Set to run in parallel with step 3	Low Weight:150 kg Pulse On Time: 30 seconds
3	Material Transfer	Auto add 100 kg of Material B, fast feed until within 40 kg of target weight, then switch to fine feed	Target: 100 kg Fast Feed Cutoff: 40 kg
4	Material Transfer	Auto add 100 kg of Material C, fast feed until within 30 kg of target weight, then switch to fine feed	Target: 100kg Fast Feed Cutoff: 30 kg
5	Operator Hold Timed	Pause Recipe for 15 seconds	Hold Time: 15 seconds
6	Material Transfer	Auto add 100 kg of Material D, fast feed until within 40 kg of target weight, then switch to fine feed	Target: 100kg Fast Feed Cutoff: 40 kg
7	Auxiliary Span Phases	Turn on Aux 1 (mixer) when the next step starts; shut off after the Hand Add phase starts	Start Step: 8 Stop Step: 10
8	Material Transfer	Auto add 100 kg of Material E, fast feed until within 30 kg of target weight, then switch to fine feed	Target: 100kg Fast Feed Cutoff: 30 kg
9	Manual Material Transfer	Manually add pre-weighed Material F to the scale	In this step, the operator will be prompted to add the pre-weighed material to the scale. The scale weight will not be used in this step; the amount specified in the pre-weigh phase will be added to the batch delivered weight
10	Auxiliary Pulse with Delay	Wait 5 seconds, then turn on Aux 1 (mixer) for 30 seconds	Delay Time: 5 seconds Pulse On Time: 30 seconds
11	Discharge Batch	Auto Dump to Empty – empty the vessel	0 kg
12	End	Batch is complete	n/a

15.2.7. Recipe Execution Example, Packaged Terminal

The recipe above can be used to create an order (Figure 15-5) for a vertical campaign. The order and recipe must be downloaded to the IND780batch terminal. Table 15-1 illustrates the sequence of operation.

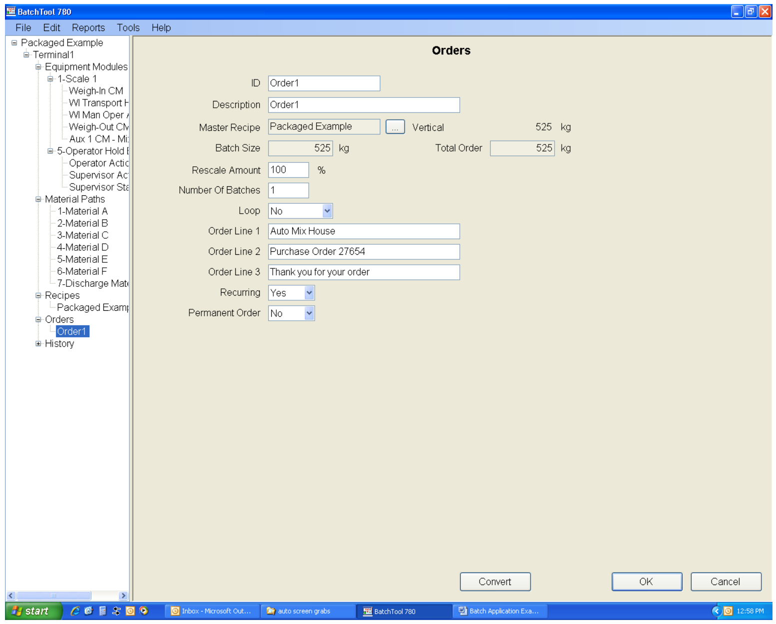
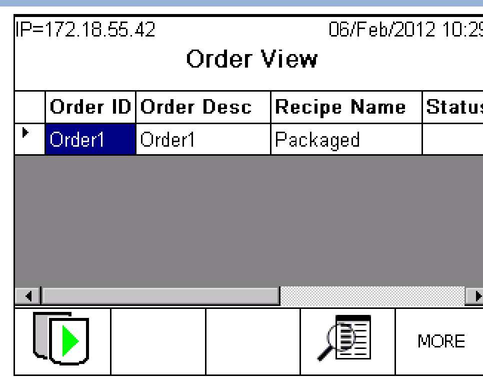
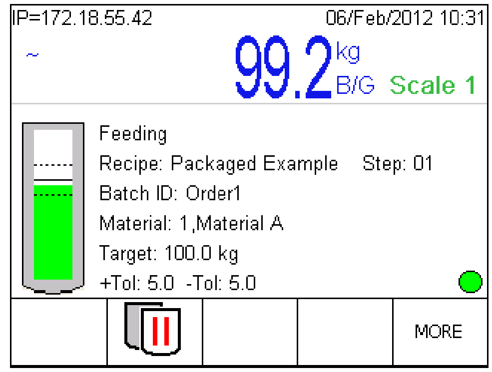
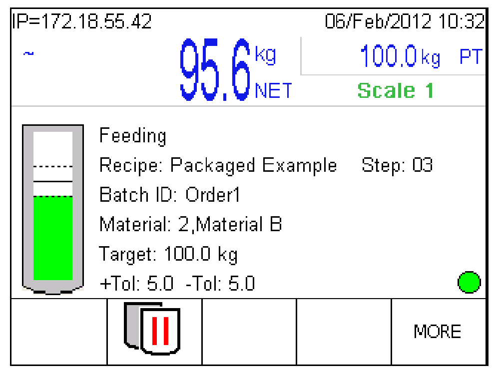
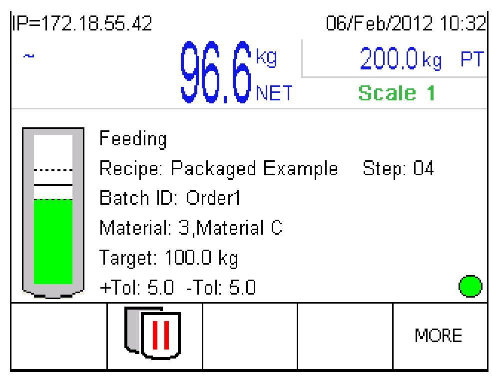
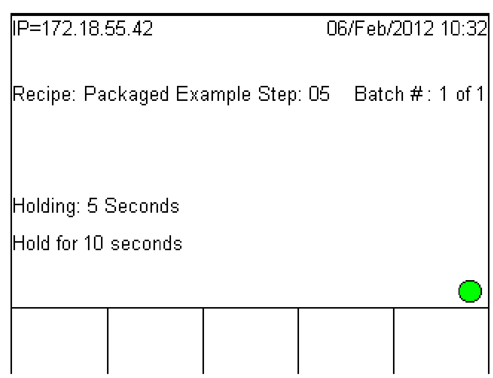
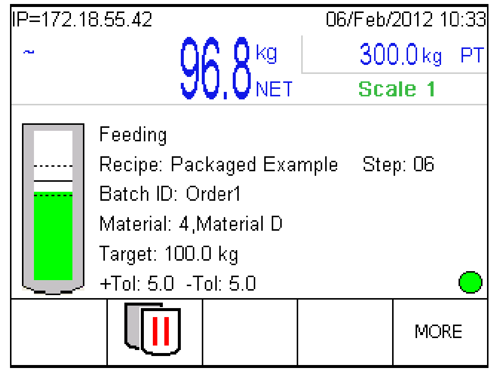
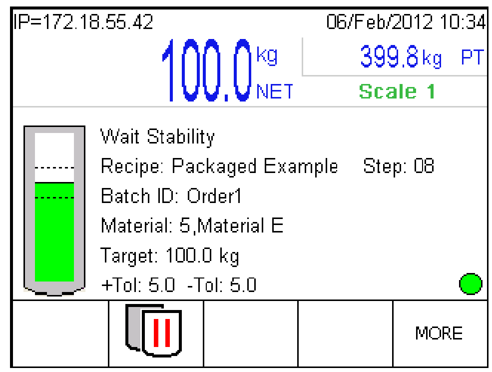
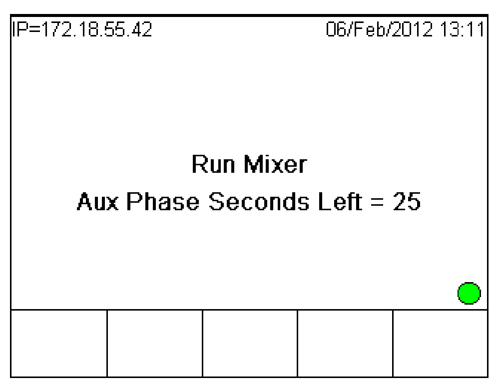


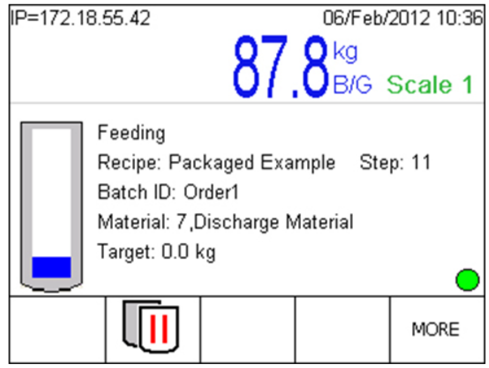
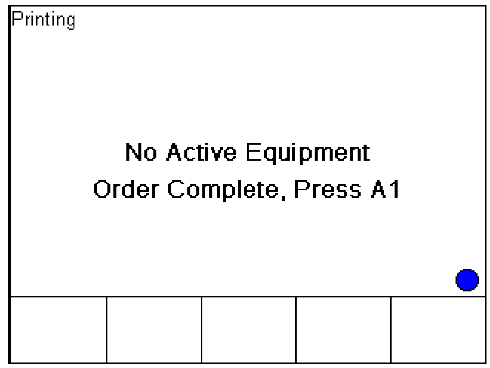
Figure 15-5: Creating the Order for the Packaged Batch Example

Table 15-1: Recipe Operation: Packaged IND780batch

Step	Action	Display
	Select the appropriate order and press the RUN softkey.	

Step	Action	Display
1	The first material transfer phase, for Material A, starts to run. The terminal displays the 100 kg target and tolerance range of + /- 5 kg, as well as a graphic representing the vessel. Since this is an automatic feed, the feed control algorithm will determine the final cut-off point. If the transfer is within tolerance, the algorithm will allow the recipe to proceed to the next phase.	
2	An Auxiliary phase starts a mixer when the weight on the scale exceeds 150 grams. This phase runs for 30 seconds, in parallel with step 3.	
3	The next phase begins, transferring Material B with the same target and tolerance values as Material A.	
4	Recipe step 4 is the material transfer phase for Material C.	
5	After Material C has been fed successfully, a Timed Operator Hold phase begins. The display shows the time remaining, and the total length of the hold, in seconds.	

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>6</td><td>Once the hold expires, the fourth material transfer phase, for Material D, begins.</td><td>
</td></tr>
<tr><td>7</td><td>An Auxiliary phase, spanning steps 8 to 10, starts a mixer.</td><td></td></tr>
<tr><td>8</td><td>The final material transfer phase is for Material E.</td><td>
</td></tr>
<tr><td>9</td><td>Once Material E has been fed successfully, a Pre-weighed hand-add phase begins, in which the operator is prompted to add 25 kg of pre-weighed material. In a pre-weigh hand-add, only the weight of added material is displayed; the actual scale weight is ignored. Once the correct weight has been added, the operator must press the OK softkey to continue.</td><td>
</td></tr>
<tr><td>7</td><td>The Auxiliary phase turns off the mixer.</td><td></td></tr>
<tr><td>10</td><td>An Auxiliary phase starts, in which the recipe activates the Auxiliary output which, in this example, runs a mixer in the vessel. The terminal displays the time remaining in the phase.</td><td>
</td></tr>
</table>

Step	Action	Display
11	The final phase is a dump-to-empty material transfer, which discharges material until zero weight is reached.	
12	When the discharge of material is complete, the recipe ends and an Order Complete message appears, prompting the operator to press the A1 application key to return to the terminal's Order View.	

15.2.7.1. Batch Summary Report

As the order described above is executed, a Batch Summary report is generated and printed. This report includes the information entered when the order was created (Figure 15-5)

```
Batch Summary Report=Order1

Auto Mix House
Purchase Order 27654
Thank you for your order
Pack00000j0001IN  ST=2012/02/06 13:06:32
Batch Order=Order1 1/1
Target=525 kg=100% Packaged Example
Pack00000j0001IN  ET=2012/02/06 13:12:20
Delivered Weight=524.600 kg %err=0.08
```

Figure 15-6: Batch Summary Report Example

15.3. Auto Example, IND780batch with Two Scales

15.3.1. Overview of application

In this example, an IND780batch system will use an air pump to feed two materials automatically into the scale, and the operator will be required to pre-weigh a material on a second scale and hand add (weigh-in) this material to the main scale.

The example also includes Operator Hold phases that allow the batch to rest, and an Auxiliary phase configured to run a piece of auxiliary equipment, in this case a mixer. The example illustrates how to control the air delivery pump using the GPV1 (gate pump valve 1) control associated with the main scale.

The operator will be prompted phase-to-phase through each recipe step. Once the Batch is complete it will be discharged from the vessel by gravity feed. The customer has mounted their IND780batch terminal into a control panel which includes a number of associated operator control devices such as pushbuttons and indicator lights, as detailed in Figure 1-2, which shows a diagram of the system along with its I/O assignments.

A copy of this configuration is provided in the IND780batch section of the **IND780 Applications Resource CD**. From the IND780batch main page, click on the button next to **Manuals, Guides and Utilities**, then click on **Browse application examples and PLC files**. The configuration files will be found in the folder named **Auto Example, 2 scales**. To examine how the system is built up, import this configuration into BatchTool 780.

15.3.2. Terminal Configuration

The IND780batch terminal used in this example is configured as follows:

- 78R1000BB0BA000, IND780 panel mount
- 2 analog scale cards (main scale slot 1, pre-weigh scale slot 2)
- 2 discrete relay I/O cards (slots 5 & 6)
- **Batch 780 Auto-Spill only** application hardware key.

Note: This configuration will run **only** if an **Auto, Spill only** application hardware key is installed in the IND780batch terminal.

15.3.3. System Overview

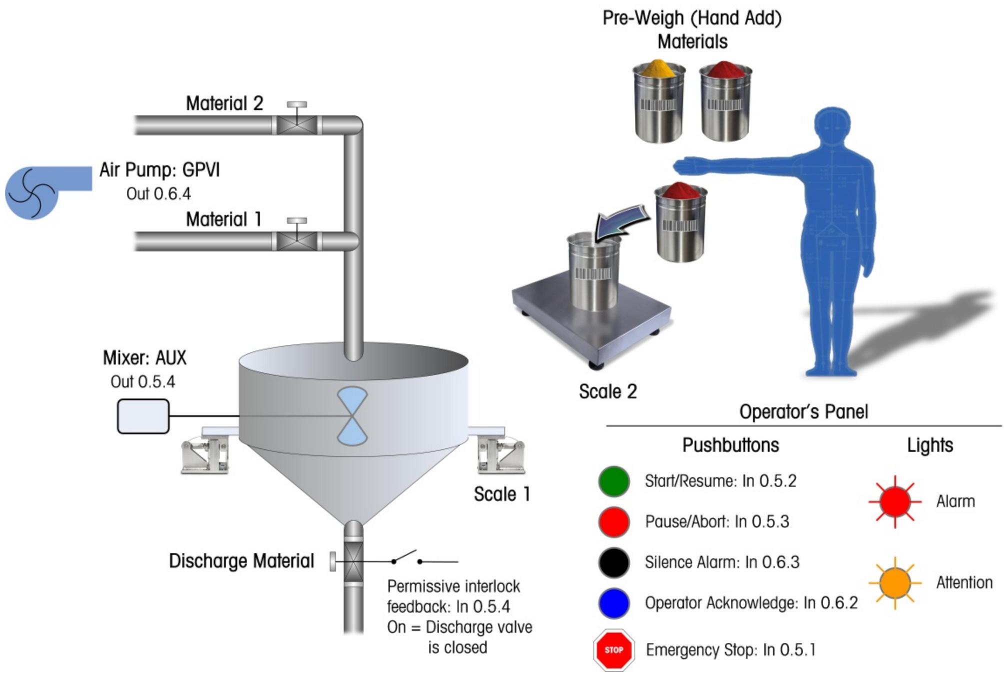


Figure 15-7: IND780batch Two-Scale System Diagram

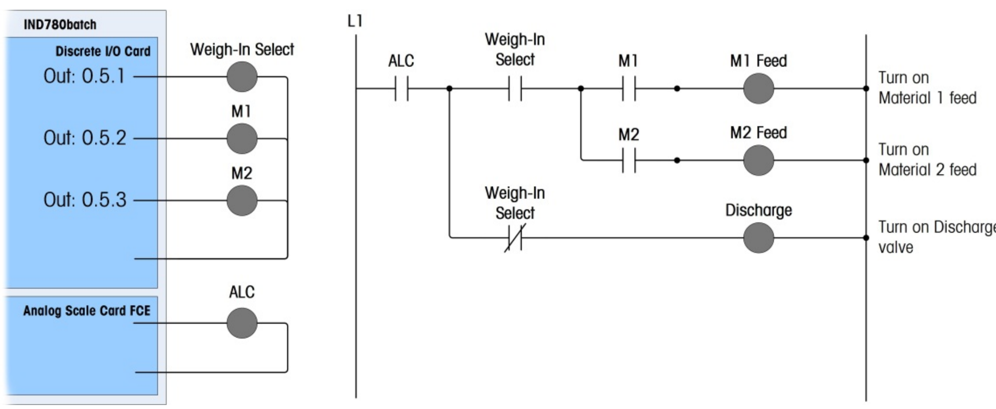


Figure 15-8: IND780batch Two-Scale System – Control Logic Diagram

15.3.4. Terminal Settings

15.3.4.1. Execution

To configure the terminal for this example, first access **Setup > Application > Batch 780 > Recipe Operations > Execution Control** (see Figure 15-2):

Automatic — **Enabled**. This will allow the recipe to execute from phase to phase without the need for operator intervention, unless a specific operator hold phase is contained within the recipe to cause the recipe to pause for an operator acknowledgement.

Semi-Automatic — **Enabled**. This will allow the operator to enable semi-automatic mode during operation.

Manual Disabled. This will prevent the manual mode from being enabled during operation of the system.

Hold at End Enabled. This allows the operator to pause a recipe using the HOLD AT END softkey ▶|| on the terminal when the recipe completes, if the order is setup to loop continuously.

Off Tolerance Pause. This will cause the recipe to pause when a material is outside of the specified tolerance limits. The operator can decide either to continue or to abort the batch.

View Control By Phase. This will cause the terminal to display each step of the recipe as it progresses, minimizing the number of key presses require by the operator to access the appropriate view.

15.3.4.2. Batch Editing

Next, configure the terminal settings at **Setup > Application > Batch 780 > Recipe Operations > Batch Edit** (see Figure 15-3):

Rescaling Recipe %. This allows the operator to increase or decrease the batch size by percent, within the parameters established by the Rescaling Factor, Min and Max setting in the Recipe screen in the BatchTool 780 PC Configuration tool.

Looping Enabled. This activates the Looping feature on the **Add Order** screen in the terminal. Looping will allow a recipe to repeat until the operator presses the HOLD AT END softkey ▶||.

Loop Start Manual. When the order is set to Loop, and Looping is enabled, the system will pause after each recipe completes, and the operator must pres the START/RESUME pushbutton to start the next batch.

Edit Recipe Targets Disabled. The operator will not be permitted to re-scale individual targets within the recipe. When this feature is enabled, an operator is able to change the ratio of materials in a given recipe.

15.3.4.3. Auto Print & Log

Finally, configure the terminal settings at **Setup > Application > Batch 780 > Auto Print & Log** (see Figure 15-4):

Batch Transaction Disabled. Prevents the printer from printing batch data after each phase is executed.

Batch Summary Enabled. A batch summary report will be printed upon completion of the batch.

Note: The appropriate printer connections must be configured in setup at **Communication > Connections**, in order for the data to be directed correctly. Most importantly, set up a Demand Output connection using a serial or EPrint port with the print Trigger set to Batch. Refer to the **IND780 Technical Manual** for details on configuring the serial and EPrint connections.

Print Audit Log Disabled. Data such as mode changes, recipe edits, and batch sequence results are not printed, but will be stored in a log file on the Compact Flash card. The Audit Log can be viewed in the BatchTool 780.

Batch History Enabled. Phase execution records will be logged. The Batch History report can be viewed in the BatchTool 780.

15.3.5. BatchTool 780 PC Configuration Tool Settings

With the IND780batch terminal configured correctly for the application, the batching system parameters can be set using the BatchTool 780.

15.3.5.1. Equipment Module Configuration

Scale 1

Scale 2

Operator Hold

15.3.5.2. Control I/O Modules

15.3.5.2.1. Scale 1 EM

Control I/O assignments for six Control Modules are:

Weigh-In CM [Basic tab]

- Scale Fine Feed = ALC Card Final Control Element (FCE) 0.1.1
- Weigh-In Select for GIW feeds = Output 0.5.1

Weigh-In CM [Advanced tab]

- GPV1 = 0.6.4 (turns on the air delivery pump before any Gain In Weight feed starts)
- Permissive Feedback Interlock = Input 0.5.4 (input from a limit switch on the discharge valve of the scale to ensure the valve is closed before any GIW feed is allowed to proceed)

Weigh-In Transport Hdr CM

- Path 1 = Output 0.5.2 (Material A selection)
- Path 2 = Output 0.5.3 (Material B selection)

Weigh-Out CM

- Discharge = controlled by scale card FCE output

Auxiliary CM #1

- Mixer Control = Output 0.5.4

15.3.5.2.2. Scale 2 EM

Control I/O assignments for two Control Modules are:

Weigh-In Manual Oper Action EM

- Alert = Output 0.6.3 (turns on an output when an operator needs to add material into the scale)

Weigh-Out Manual Oper Action CM

- Alert = Output 0.6.3 (turns on an output when the operator needs to remove material from the scale)

15.3.5.2.3. Operator Hold EM

Control I/O assignments for three Control Modules are:

Operator Acknowledge PB

- Operator Acknowledge pushbutton = Input 0.6.2

Supervisor Action CM

- Start/Resume pushbutton = Input 0.5.2
- Pause/Abort pushbutton = Input 0.5.3
- Emergency Stop pushbutton = Input 0.5.1 (Used for Batch Run Permissive and to disable all outputs.)
- Silence Alarm pushbutton = Input 0.6.3

Supervisor Status CM

- Alarm light = Output 0.6.2
- Attention light = Output 0.6.3

15.3.5.3. Material Paths

Six Material Paths (MPs) must be configured – one for each material, and one for discharging the completed batch:

Material A	Automatic Material addition, Spill only-GIW, scale 1, path 1 in transport header
Material B	Automatic Material addition, Spill only-GIW, scale 1, path 2 in transport header
Material C	Pre-Weigh Material, manual material addition, Hand Add, scale 2
Discharge Material D	Pre-Weigh Material, manual material addition, Hand Add, scale 2
Discharge Scale 1	Dump to Empty, from scale 1, destination out of system

15.3.6. Recipe Definition

This example can be used as a starting point in developing a functional batching system. However, note that the weight and time values used in this recipe are arbitrary, and are provided as illustrative examples only. This recipe uses a scale configured for a maximum weight of 1,000 kg, in 1 kg increments.

Step	Phase type	Description	Target
1	Auxiliary Span Phases	Turn on Aux 1 (mixer) when the step 2 starts; shut off at start of step 5	Start Step: 2 Stop Step: 5
2	Material Transfer	Auto add 100 kg of Material A to Scale 1	100 kg
3	Unit Procedure	Start Unit Procedure	

Step	Phase type	Description	Target
3-01	Manual Material Transfer	Pre-weigh 20 kg of Material C on Scale 2	20 kg
3-02	Manual Material Transfer	Pre-weigh 30 kg of Material D on Scale 2	30 kg
3-03	End Unit Procedure	End of Unit Procedure	
4	Operator Acknowledge	Operator Hold: the operator is prompted to transfer the contents of scale 2 to scale 1	Operator will acknowledge when this step is complete
5	Material Transfer	Auto add 100 kg of Material B to Scale 1	100 kg
6	Auxiliary Pulse with Delay	Wait 5 seconds, then turn on Aux 1 (mixer) for 30 seconds	Delay Time: 5 seconds Pulse On Time: 30 seconds
7	Discharge Batch	Auto Dump to Empty – empty the vessel	0 kg
8	End	Batch is complete	n/a

15.3.7. Recipe Execution

The recipe above can be used to create an order (Figure 15-9) for a vertical campaign. The order and recipe must be downloaded to the IND780batch terminal. Table 15-2 illustrates the sequence of operation.

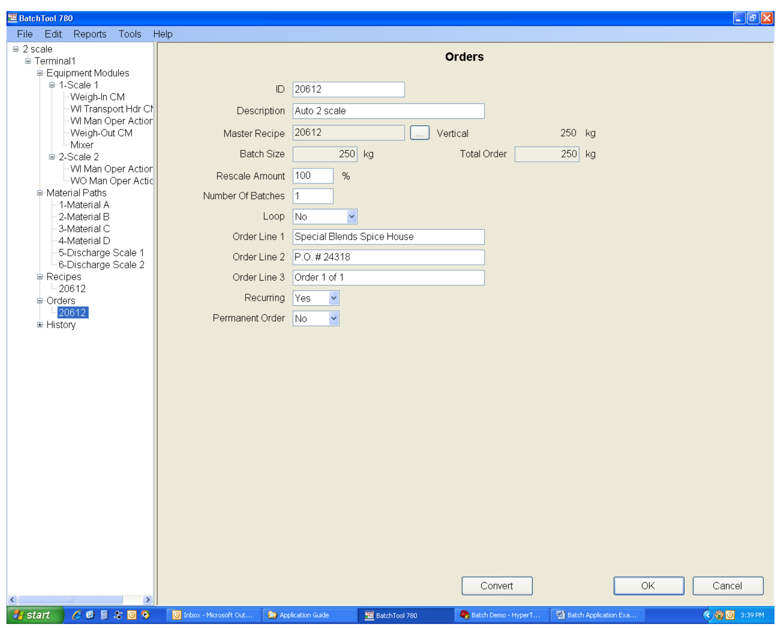
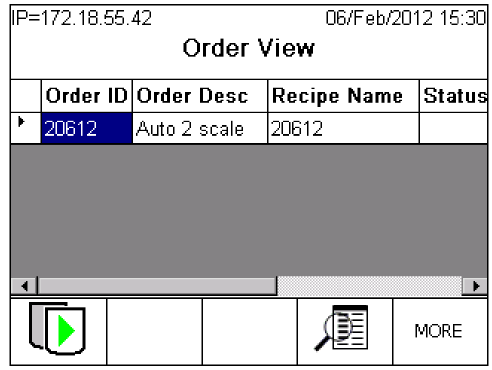
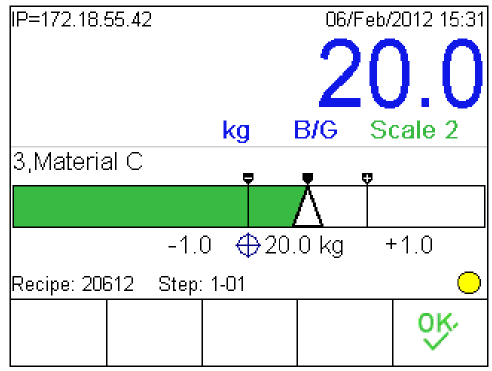
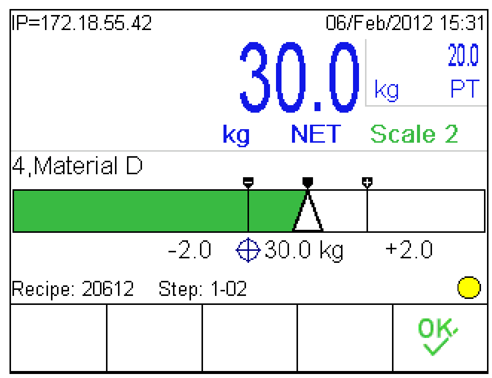
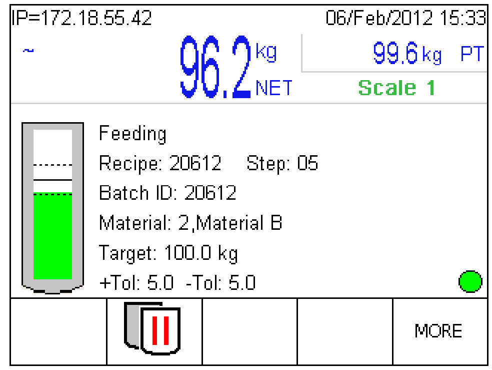
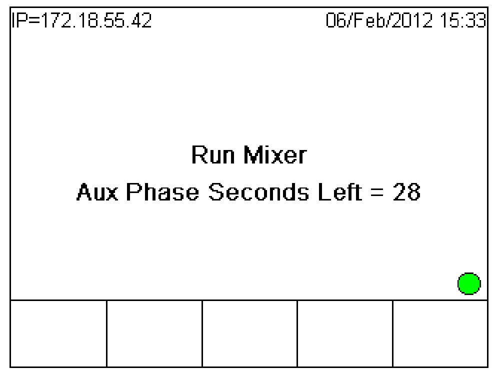
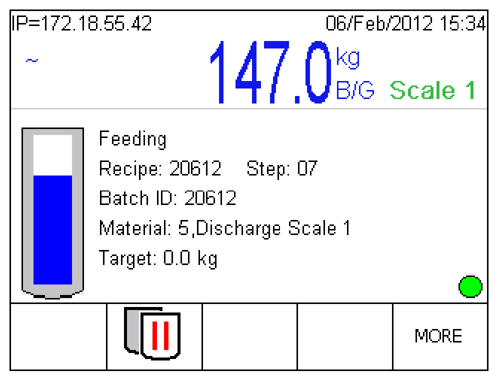
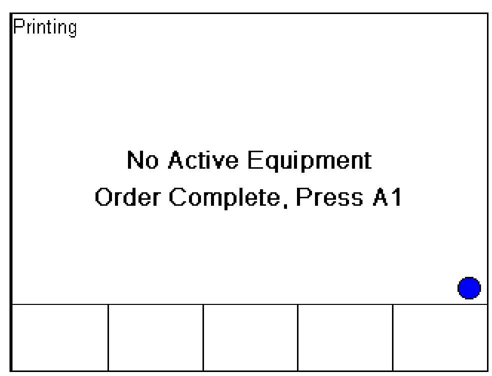


Figure 15-9: Creating the Two-Scale Order

Table 15-2: Recipe Operation: Auto, Two-Scale

Step	Action	Display
	Select the appropriate order and press the RUN softkey to start the batch.	
1	An Auxiliary phase starts a mixer when step 2 begins. This phase spans steps 2 to 5.	
2 3-01	Since the first Auto Material transfer to Scale 1 (step 2 of the recipe) and the Manual material transfer in step 2 run in parallel (step 3 of recipe), and **View Control By** is set to **Phase**, the system directs the operator to the scale that requires attention. In this case, Material C is to be added to Scale 2, manually. When the addition is complete, the operator presses the OK softkey.	
3-02	Next, the operator is prompted to pre-weigh Material D on Scale 2.	
3-03	The manual pre-weigh Unit Procedure ends.	
4	An Operator Hold phase directs the operator to transfer the contents of Scale 2 into Scale 1 and acknowledge this action.	

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>5</td><td>The recipe now feeds Material B to Scale 1, automatically.</td><td>
</td></tr>
<tr><td>2</td><td>The Auxiliary phase turns off the mixer.</td><td></td></tr>
<tr><td>6</td><td>Once Material B has been fed, an Auxiliary phase runs the mixer for 30 seconds.</td><td>
</td></tr>
<tr><td>7</td><td>After the mixing phase is complete, the batch is discharged from Scale 1.</td><td>
</td></tr>
<tr><td>8</td><td>When the scale weight is zero, the recipe ends and the operator is prompted to press the A1 application key to return to the Order View screen.</td><td>
</td></tr>
</table>

15.3.7.1. Batch Summary Report

As the order described above is executed, a Batch Summary report is generated and printed. This report includes the information entered when the order was created (Figure 15-10)

```
Batch Summary Report=20612

Special Blends Spice House
P.O. # 24318
Order 1 of 1
206100000w0001IN  ST=2012/02/06 16:36:16
Batch Order=20612 1/1
Target=250 kg=100% 20612
206100000w0001IN  ET=2012/02/06 16:40:17
Delivered Weight=249.800 kg %err=0.08
```

Figure 15-10: Batch Summary Report Example

15.4. Manual Formulation IND780batch Example

15.4.1. Overview of Application

In this Manual Formulation example, the operator is required to execute a recipe that will weigh three different materials into separate containers. Each of the materials must be weighed-in manually, using a platform scale. As a verification step, the operator will be prompted to scan the barcode for each material before it is weighed-in to ensure that the correct material is being weighed. This provides a higher level of quality and safety control. If for some reason the incorrect material is scanned, the operator will be alerted that the material scanned was incorrect and will not be allowed to continue to the next material until the correct material is entered. This prevents the operator from adding the wrong material to the batch.

The recipe is executed as a horizontal campaign in this application. This means that if we have 2 batches to run, we will fill material 1, then fill material 1 again before moving on to the next recipe step. A horizontal campaign example is shown in Figure 15-11. This campaign produces three identical batches.

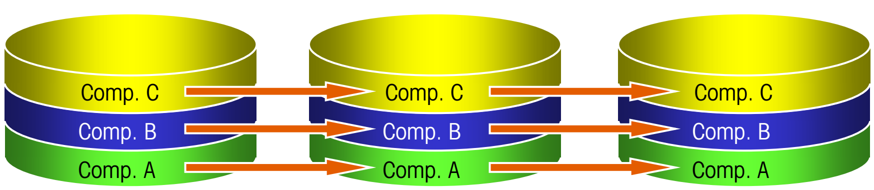


Figure 15-11: Horizontal Campaign

A copy of this configuration is provided in the IND780batch section of the **IND780 Applications Resource CD**. From the IND780batch main page, click on the button next to **Manuals, Guides and Utilities**, then click on **Browse application examples and PLC files**. The configuration files will be found in the folder named **Manual Formulation Example**. To examine how the system is built up, import this configuration into BatchTool 780.

15.4.2. Terminal Configuration

The IND780batch terminal used in this example is configured as follows:

- 78J1000000B0A00, IND780 desk/harsh model
- 1 analog scale card (slot 1)
- Batch-780 Manual software
- USB barcode scanner and keyboard connected to the IND780's USB port
- **Batch 780 Manual** or **Auto** application hardware key.

■ Note: This configuration will run **only** if a **Manual** or **Auto** application hardware key is installed in the IND780batch terminal.

15.4.3. System Overview

Figure 15-12: IND780batch Manual Formulation System Diagram

15.4.4. Terminal Settings

■ Make sure that the scale is set up with a capacity higher than the batch size specified in the example.

15.4.4.1. Execution

To configure the terminal for this example, first access **Setup > Application > Batch 780 > Recipe Operations > Execution Control** (see Figure 15-2):

Automatic — **Enabled**. This will allow the recipe to execute from phase to phase without the need for operator intervention, unless a specific operator hold phase is contained within the recipe to cause the recipe to pause for an operator acknowledgement.

Hold at End — **Enabled**. This allows the operator to pause a recipe using the HOLD AT END softkey ▶|| on the terminal when the recipe completes, if the order is setup to loop continuously.

Off Tolerance — **Pause**. This will cause the recipe to pause when a material is outside of the specified tolerance limits. The operator can decide either to continue or to abort the batch.

View Control By — **Phase.** This will cause the terminal to display each step of the recipe as it progresses, minimizing the number of key presses require by the operator to access the appropriate view.

15.4.4.2. Batch Editing

Next, configure the terminal settings at **Setup > Application > Batch 780 > Recipe Operations > Batch Edit** (see Figure 15-3):

Rescaling — **Recipe %**. This allows the operator to increase or decrease the batch size by percent, within the parameters established by the Rescaling Factor, Min and Max setting in the Recipe screen in the BatchTool 780 PC Configuration tool.

Looping — **Enabled**. This activates the Looping feature on the **Add Order** screen in the terminal. Looping will allow a recipe to repeat until the operator presses the HOLD AT END softkey ▶||.

Loop Start — **Automatic**. When the order is set to Loop, and Looping is enabled, the system will start the next batch automatically after each recipe completes.

Edit Recipe Targets — **Disabled**. The operator will not be permitted to re-scale individual targets within the recipe. When this feature is enabled, an operator is able to change the ratio of materials in a given recipe.

Convert Batch — **Enabled.** The operator will be able to convert a batch that was aborted due to an out-of-tolerance condition. This prevents the material in the aborted batch from being wasted.

15.4.4.3. Auto Print & Log

Finally, configure the terminal settings at **Setup > Application > Batch 780 > Auto Print & Log** (see Figure 15-4):

Batch Transaction — **Enabled**. Batch data will be sent to a connected printer after each phase is executed.

Batch Summary — **Disabled**. The recipe uses a Communication phase to print a batch summary report when each batch completes.

> **Note**: The appropriate printer connections must be configured in setup at **Communication > Connections**, in order for the data to be directed correctly. Most importantly, set up a Demand Output connection using a serial or EPrint port with the print Trigger set to Batch. Refer to the **IND780 Technical Manual** for details on configuring the serial and EPrint connections.

Print Audit Log — **Disabled**. Data such as mode changes, recipe edits, and batch sequence results are not printed, but will be stored in a log file. The Audit Log can be viewed in the BatchTool 780.

Batch History — **Enabled**. Phase execution records will be logged. The Batch History report can be viewed in the BatchTool 780.

The recipe includes a Communication phase that will print a batch summary report at the end of the batch. It will also print out user-defined text from fields in the Order (Figure 15-14).

- This application example will also require the setup of a Demand Output connection using the print Template 2, with custom print trigger 1. The contents of Template 2 must be created manually in setup by selecting Template 2 at **Communication > Templates > Output** (Figure 15-13) in order to use the batch variable shared data field ar0521, used to print the customer's name which is entered by the operator during the batch.

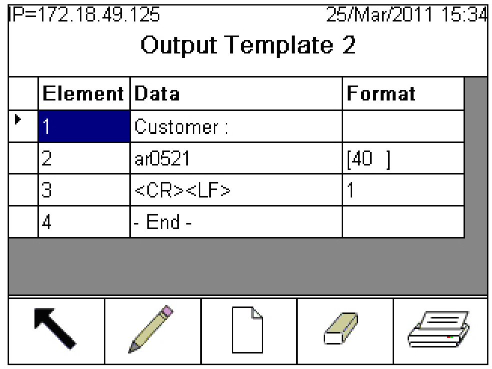


Figure 15-13: Output Template 2 Configuration Screen

15.4.5. BatchTool 780 PC Configuration Tool Settings

With the IND780batch terminal configured correctly for the application, the batching system parameters can be set using the BatchTool 780.

15.4.5.1. Equipment Modules

Scale 1	No flow rate threshold or advanced settings are required, since this is a manual weigh-in operation.
Operator Hold	Set to Console HMI, to allow the operator to acknowledge the recipe phases and data entry via the IND780batch terminal's front panel.

15.4.5.2. Control Modules

15.4.5.2.1. Scale EM

Weigh-In Manual Operator Action CM

No I/O connection assignments are necessary, since this example uses the IND780batch terminal's front panel as the operator interface.

15.4.5.2.2. Operator Hold EM

No additional CMs are required, unless further outputs are to be allocated for alerts and inputs for acknowledgement pushbuttons.

15.4.5.3. Material Paths

Material A Manual Material addition, Hand Add, Scale Equipment Module

Material B Manual Material addition, Hand Add, Scale Equipment Module

Material C Manual Material addition, Hand Add, Scale Equipment Module

15.4.6. Recipe Definition

This example can be used as a starting point in developing a functional batching system. However, note that the weight and time values used in this recipe are arbitrary, and are provided as illustrative examples only. This recipe has a target weight of 1,150 kg. The Delivered Weight formula (in the **Phases** tab of the BatchTool 780 **Recipe** setup screen) is set to +1, meaning that delivered weight should be calculated for all materials fed to Scale 1.

The following Batch Variables must be defined in the **Variables** tab of the **Recipe** setup screen:

- UserID
- Material A
- Material B
- Material C

Step	Phase type	Description	Phase Parameter Settings
1	Start Horizontal Block 1	A horizontal block allows a set of steps to be run sequentially in a horizontal campaign.	Set to run only on the first recipe, meaning that if more than 1 batch of material is run, this horizontal block will only execute during the first batch run.
2	Operator Hold - Entry	Operator prompted to enter ID #.	Operator must enter ID# Data Format Numeric, maximum value is 100; an attempt to enter a number larger than 100 will generate an error message indicating that the value if out of range. Operator's ID# will be stored in Batch Variable "User ID#"
3	End Horizontal Block 1	Ends the horizontal block sequence.	
4	Start Horizontal Block 2	A horizontal block allows a set of steps to be run sequentially in a horizontal campaign.	This horizontal block is set to execute on every recipe that is executed.
5	Verify & Place Container	Verify Container. Displays the container's estimated tare weight and capacity (entered by the creator of the recipe), and prompts the operator to place the container on the scale specified.	Container Tare = 10 g Container Capacity = 600 g

Step	Phase type	Description	Phase Parameter Settings
6	Verify Material A	Material Verify phase. The operator enters the material name; if the entered name does not match the verify string, a message will display indicating that the entered value is incorrect, and prompting the operator to re-enter the name. The operator must then re-enter the material name. When the correct value is entered, the recipe will move to the next step.	Result Variable = Material A Operator message = Scan Material A Verify String = AA Step Termination = Disable Bypass (the recipe will not continue until the operator scans the correct Material name).
7	Manual Transfer	Weigh Material A.	Material Path = Material A Weight = 500 g Negative Tol = 25 g Positive Tol = 25 g
8	Operator Hold – Acknowledge	Remove Container. The operator is prompted to remove the container from the scale, and must then press OK to acknowledge this action.	Operator message = Remove Container from scale
9	End Horizontal Block 2	This ends the horizontal block sequence	
10	Start Horizontal Block 3	A horizontal block allows a set of steps to be run sequentially in a horizontal campaign.	This horizontal block is set to execute on every recipe that is executed.
11	Verify & Place Container	Verify Container. Displays the container's estimated tare weight, and capacity (entered by the creator of the recipe), and prompts the operator to place the container on the scale specified.	Container Tare = 10 g Container Capacity = 300 g

Step	Phase type	Description	Phase Parameter Settings
12	Verify Material B	The operator enters the material name; if the entered name does not match the verify string, a message will display indicating that the entered value is incorrect, and prompting the operator to re-enter the name. The operator must then re-enter the material name. When the correct value is entered, the recipe will move to the next step.	Result Variable = Material B Operator message = Scan Material B Verify String = BB Step Termination = Disable Bypass (means that the recipe will not continue until the operator scans the correct Material name).
13	Manual Transfer	Weigh Material B.	Material Path = Material A Weight = 250 g Negative Tol = 12.5 g Positive Tol = 12.5 g
14	Operator Hold – Acknowledge	Remove Container. The operator is prompted to remove the container from the scale, and must then press OK to acknowledge this action.	Operator message = Remove Container from scale
15	End Horizontal Block 3	This ends the horizontal block sequence	
16	Start Horizontal Block 4	A horizontal block allows a set of steps to be run sequentially in a horizontal campaign..	This horizontal block is set to execute on every recipe that is executed.
17	Verify & Place Container	Verify Container. Displays the container's estimated tare weight, and capacity (entered by the recipe), and prompts the operator to place the container on the scale specified.	Container Tare = 10 g Container Capacity = 500 g

Step	Phase type	Description	Phase Parameter Settings
18	Verify Material C	Material Verify phase. The operator enters the material name; if the entered name does not match the verify string, a message will display indicating that the entered value is incorrect, and prompting the operator to re-enter the name. The operator must then re-enter the material name. When the correct value is entered, the recipe will move to the next step.	Result Variable = Material C Operator message = Scan Material C Verify String = CC Step Termination = Disable Bypass (means that the recipe will not continue until the operator scans the correct Material name).
19	Manual Transfer	Weigh Material C.	Material Path = Material C Weight = 400 g Negative Tol = 20 g Positive Tol = 20 g
20	Operator Hold – Acknowledge	Remove Container. The operator is prompted to remove the container from the scale, and must then press OK to acknowledge this action.	Operator message = Remove Container from scale
21	End Horizontal Block 4	This ends the horizontal block sequence	
22	Communication Phase	This phase is set to print the Batch summary report. The report will print out from the IND780batch terminal's Ethernet port.	
23	End	End Recipe	

15.4.7. Order Example

Figure 15-14 shows the BatchTool 780 Orders definition screen, set up to use the recipe described above. Two batches will be run. To execute this order, it and the recipe must be downloaded to the IND780batch terminal.

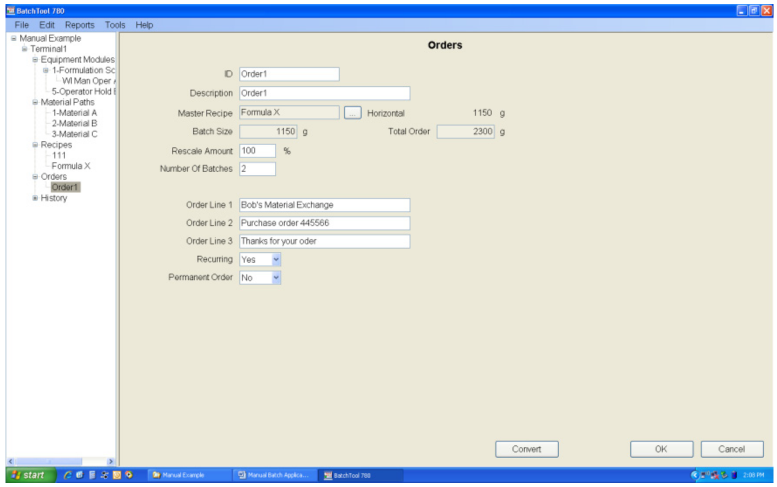
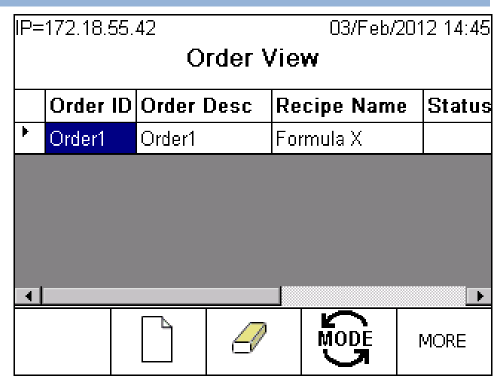


Figure 15-14: Creating a Manual Formulation Order

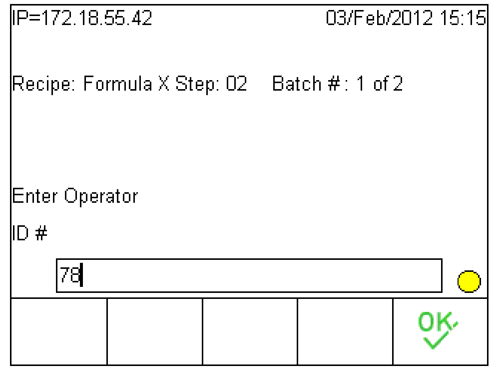
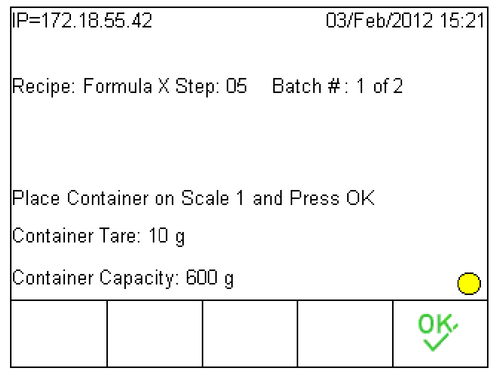
15.4.8. Recipe Execution

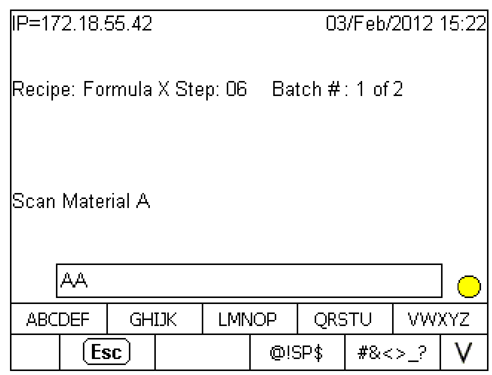
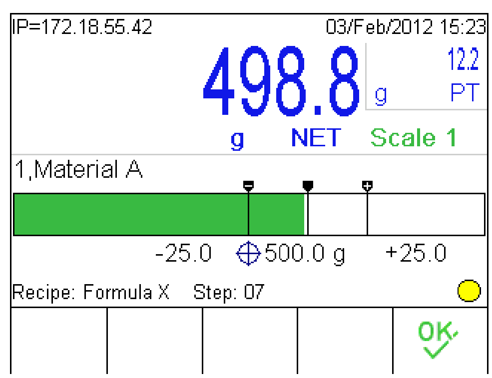
Table 15-3 illustrates the sequence of operation of the order created using the manual formulation recipe.

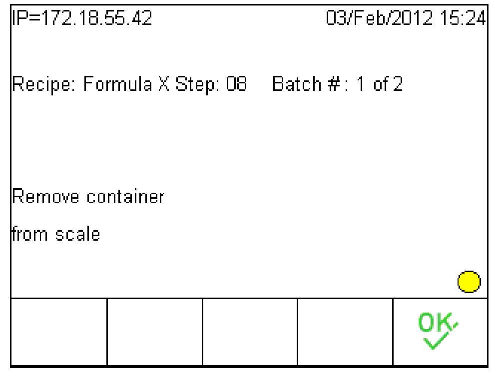
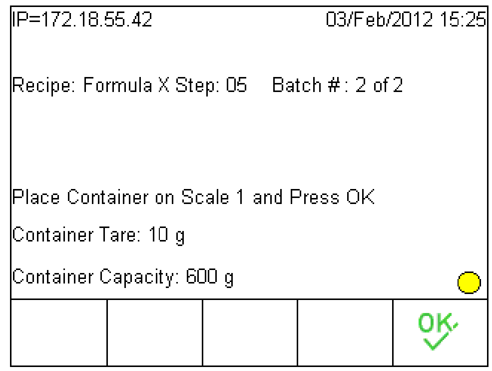
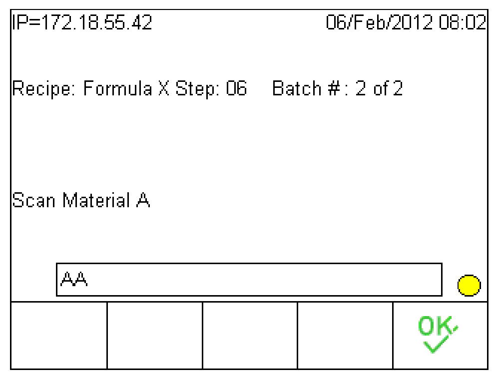
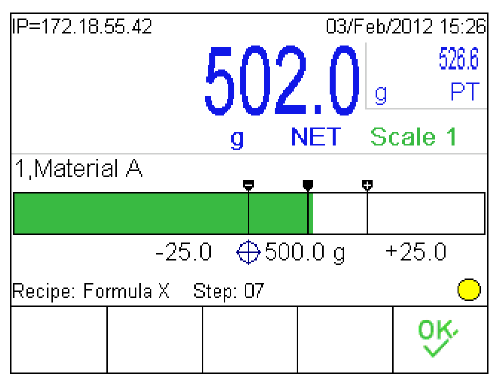
Table 15-3: Recipe Operation: Manual Formulation

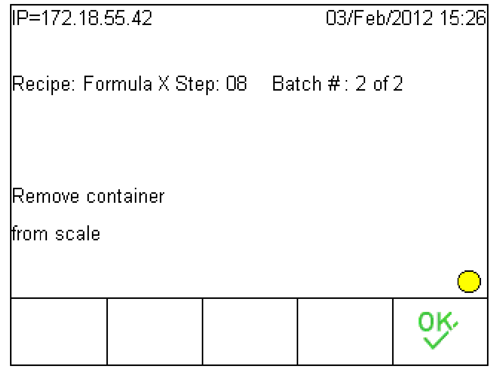
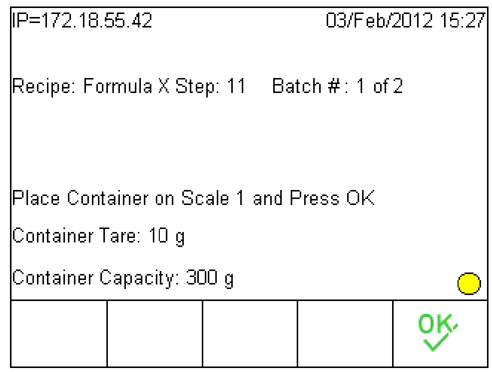
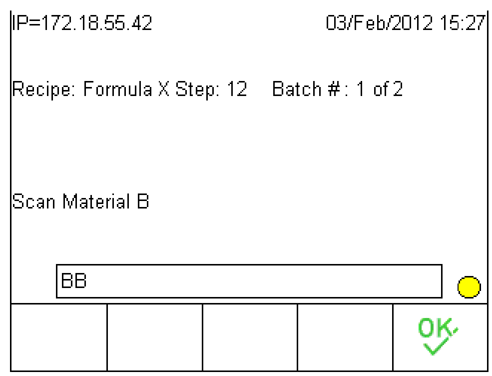
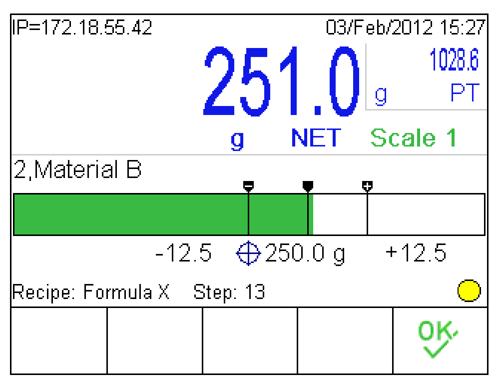
Step	Action	Display
	Select the appropriate order and press the MORE softkey to display the RUN softkey . Press RUN to start executing the order.	
1	The first Horizontal Block starts.	

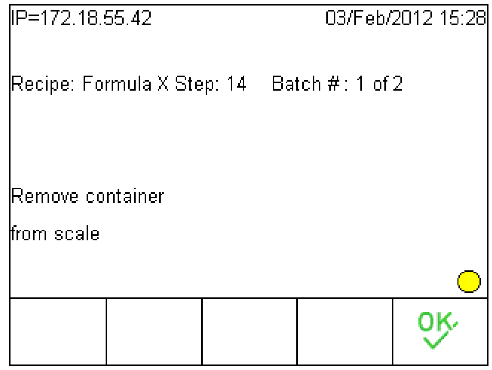
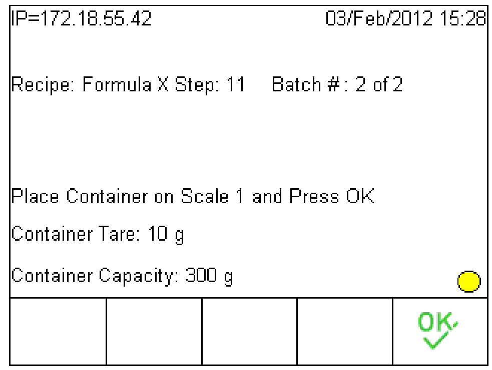
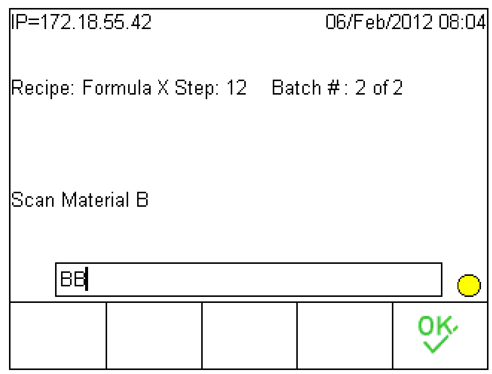
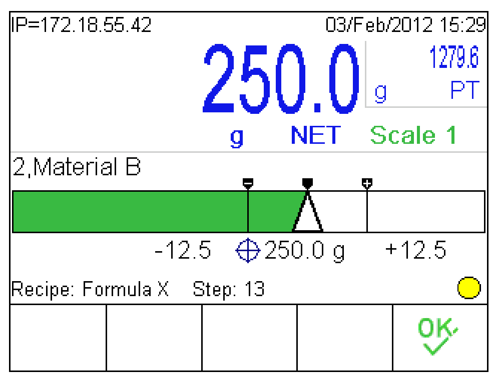
<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>2</td><td>The recipe prompts the operator to enter an ID #.

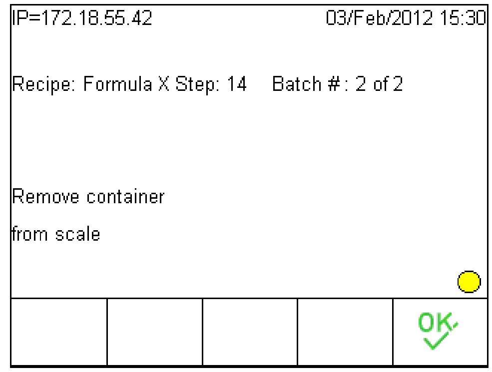
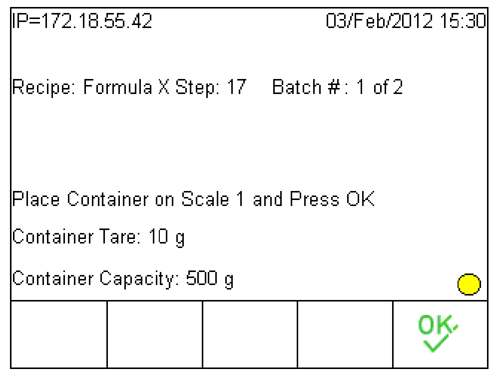
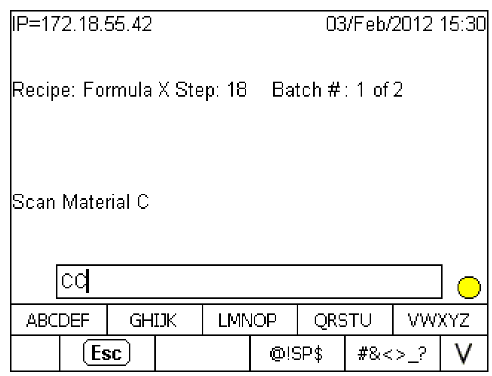
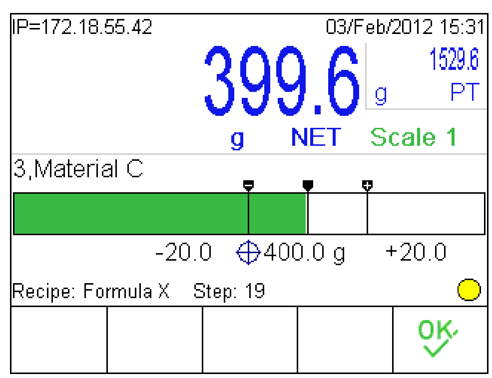
The recipe specifies this value as numeric, with a value between 0 and 100. If an invalid value is entered, an "entry out of range" message will appear, and the operator will be required to re-enter the ID #. Here, the operator has entered 78 as the ID #, and presses OK to continue.</td><td>
</td></tr>
<tr><td>3</td><td>The first Horizontal Block ends.</td><td></td></tr>
<tr><td>4</td><td>The second Horizontal Block starts.</td><td></td></tr>
<tr><td>5</td><td>The next step is the verify container phase for Material A, which prompts the operator with the estimated tare weight and capacity of the container to be used. This is for the first of two batches that will run horizontally.</td><td>
</td></tr>
<tr><td>6</td><td>In this step, the operator is prompted to scan the material barcode. Once the scan is made, the barcode data will appear in the entry box, as shown here.

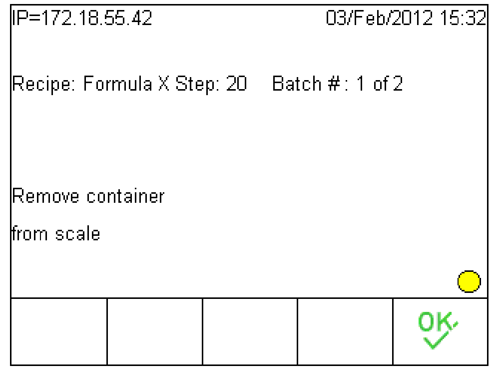
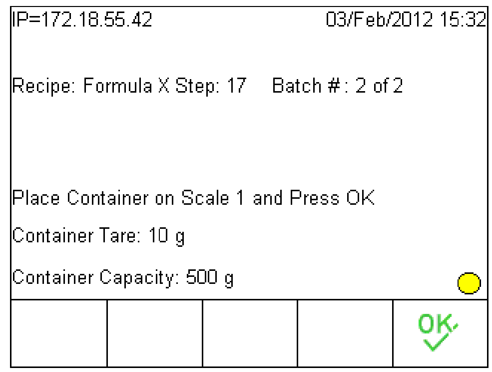
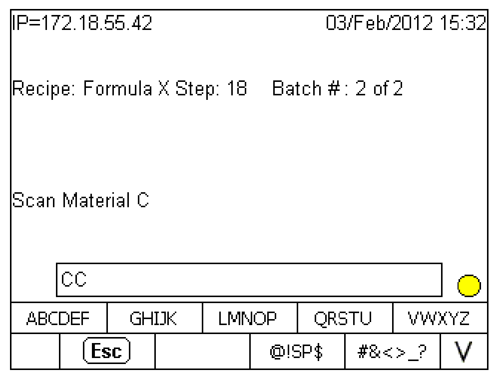
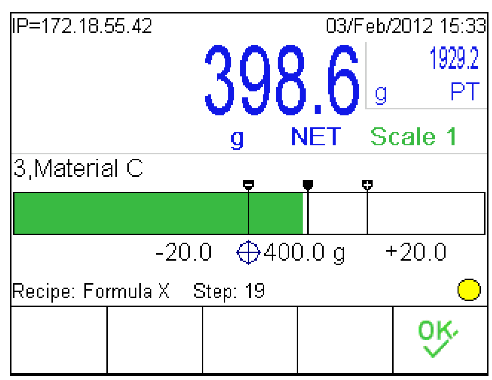
If a barcode scanner is not used, the operator can enter in the material ID via the keypad on the IND780 terminal. Press ENTER, then OK to complete this step.</td><td>
</td></tr>
<tr><td>7</td><td>Next, the manual transfer phase is performed. Here, the SmartTrac bar graph is displayed, together with the target weight of 500 grams and the tolerance of +/- 25 grams. Once the material is within the tolerance window and the bar graph turns green, pressing the OK softkey accepts the result.</td><td>
</td></tr>
</table>

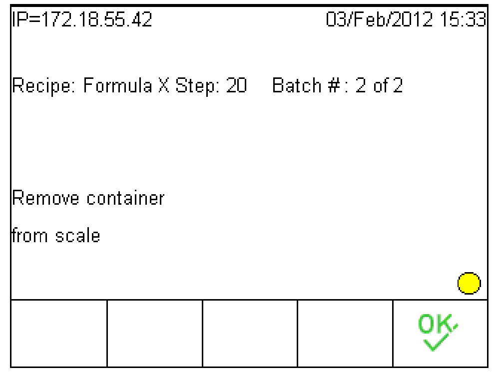
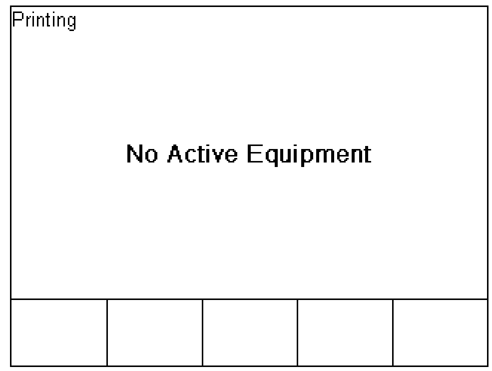
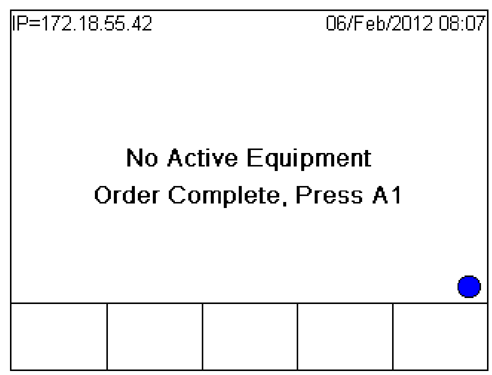
Step	Action	Display
8	After the weigh-in, the operator is prompted to remove the container. Pressing the OK softkey completes the fill process for Batch 1 of 2. The process for Material A is now repeated for the second of the two batches.	
5	The next step is the verify container phase for Batch 2 of 2 of Material A, which prompts the operator with the estimated tare weight of the container and the capacity of the container to be used.	
6	In this step, the operator is prompted to scan the material barcode. Once the scan is made, the barcode data will appear in the entry box, as shown here. If a barcode scanner is not used, the operator can enter in the material ID via the keypad on the IND780 terminal. Press ENTER, then OK to complete this step.	
7	Next, the manual transfer phase is performed. Here, the SmartTrac bar graph is displayed, together with the target weight of 500 grams and the tolerance of +/- 25 grams. Once the material is within the tolerance window and the bar graph turns green, pressing the OK softkey accepts the result.	

Step	Action	Display
8	After the weigh-in, the operator is prompted to remove the container. Pressing the OK softkey completes the fill process for Batch 2 of 2. The process is now repeated for Material B.	
9	The second Horizontal Block ends.	
10	The third Horizontal Block starts.	
11	First batch container verification for Material B.	
12	First batch barcode scan for Material B.	
13	Manual transfer phase of Material B for first batch.	

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>14</td><td>Batch 1 of 2 Material B, complete.</td><td>
</td></tr>
<tr><td>11</td><td>Second batch container verification for Material B.</td><td>
</td></tr>
<tr><td>12</td><td>Second batch barcode scan for Material B.</td><td>
</td></tr>
<tr><td>13</td><td>Manual transfer phase of Material B for second batch.</td><td>
</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>14</td><td>Batch 2 of 2 Material B, complete.
The process for is now repeated for Material C.</td><td>
</td></tr>
<tr><td>15</td><td>The third Horizontal Block ends.</td><td></td></tr>
<tr><td>16</td><td>The fourth Horizontal Block starts.</td><td></td></tr>
<tr><td>17</td><td>First batch container verification for Material C.</td><td>
</td></tr>
<tr><td>18</td><td>First batch barcode scan for Material C.</td><td>
</td></tr>
<tr><td>19</td><td>Manual transfer phase of Material C for first batch.</td><td>
</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>20</td><td>Batch 1 of 2 Material C, complete.</td><td>
</td></tr>
<tr><td>17</td><td>Second batch container verification for Material C.</td><td>
</td></tr>
<tr><td>18</td><td>Second batch barcode scan for Material C.</td><td>
</td></tr>
<tr><td>19</td><td>Manual transfer phase of Material C for second batch.</td><td>
</td></tr>
</table>

Step	Action	Display
20	Batch 2 of 2 Material C, complete.	
21	The fourth Horizontal Block ends.	
22	The Communication Phase does not have a display associated with it. The screen displays **No Active Equipment** during this phase, while the Batch Summary report is sent to the Eprint connection.	
23	The recipe is now complete, and the operator is prompted to press the A1 application key to return to the Order View screen.	

15.4.9. Batch Transaction and Summary Reports

15.4.9.1. Batch Transaction Report

This sample printout shows the Batch Transaction report created during the course of the order:

```
Enter Operator=78
Place empty bin=ACK
Scan Material A=
    Material A       500 g    498.8 g  1
Remove container=ACK
Place empty bin=ACK
Scan Material A=
    Material A       500 g    502.0 g  1
```

```
Remove container=ACK
Place empty bin=ACK
Scan Material B=
    Material B      250 g    251.0 g  1
Remove container=ACK
Place empty bin=ACK
Scan Material B=
    Material B      250 g    250.0 g  1
Remove container=ACK
Place empty bin=ACK
Scan Material C=
    Material C      400 g    399.6 g  1
Remove container=ACK
Place empty bin=ACK
Scan Material C=
    Material C      400 g    398.6 g  1
Remove container=ACK
```

15.4.9.2. Batch Summary Report

The sample printout, below, shows the Batch Summary report sent from the terminal during the Communication phase:

```
Form00000e0001IN  ST=2012/02/06 08:01:08
Form00000e0001IN  CT=2012/02/06 08:07:00
Form00000e0002IN  ST=2012/02/06 08:02:24
Form00000e0002IN  CT=2012/02/06 08:07:04
```

15.5. Custom TaskExpert Phase Examples

This section details an advanced feature in IND780batch, in which a Custom TaskExpert phase executes a TaskExpert program within a recipe. This feature allows IND780batch to perform custom actions and operations, making it possible to manage nearly any batch application process.

To use this phase:

- The programmer must be familiar with TaskExpert
- The TaskExpert files must be transferred to the IND780batch terminal

The two examples below provide a basic sense of how a Custom TaskExpert phase can be used within the recipe. The examples are intended to suggest some ideas about how the feature could be used, and do not cover every function made possible by this very flexible feature.

- Before the recipe can execute the TaskExpert program, it must be transferred to the IND780batch terminal. This transfer is accomplished using the **TaskExpert Development Tool**, which is provided to all programmers trained in TaskExpert. Tool versions 2.1.15 or higher include the Batch function blocks.

15.5.1. Example 1: Automatic calculation of target weight for an ingredient

In this example, the user wishes to create a batch of material using 3 components: Sugar, Sesame, and Oil. The sugar and sesame must be weighed in equal parts, and the oil is 2.5% of the total weight of sugar and sesame. To accomplish this, the recipe will include two Custom Phases.

The batching process is as follows:

1. A container is placed on the scale and its tare weight captured.
2. The initial amount of sesame is automatically transferred into the container on the scale.
3. The container is removed from the scale and taken to another room. Here, sugar is added to it, but without the use of scale. The amount of sugar added will therefore vary from batch to batch; since there must be equal amounts of sesame and sugar, a Custom TaskExpert phase is used to calculate the amount of sugar the operator added.
4. The TaskExpert program will calculate the amount of sugar added by deducting the weight of the sesame and the weight of the container, and calculating the amount of sesame to add to make the quantities equal.
5. The operator returns the container to the scale, and the Custom TaskExpert phase:
    a. Calculates the amount of sugar added by deducting the weight of the sesame and the weight of the container, and then
    b. Determines the amount of sesame required to make the two quantities equal, and finally
    c. Passes the resulting value to the IND780batch, which then uses a material transfer phase to add the required amount of sesame.
6. Now that the batch includes equal part of sesame and sugar, the operator needs to add the oil. The target weight for the oil is 2.5% of the total weight of the sesame and sugar combined. Once again, a Custom TaskExpert phase is used to perform this calculation.
7. The result of the TaskExpert calculation is passed to the IND780batch, which again uses a material transfer phase to add the oil to the container automatically. Once this phase is executed, the batch is complete.

15.5.1.1. Recipe Configuration

Figure 15-15 and Figure 15-16 show the recipe as configured in BatchTool 780. Note the five Batch Variables named in Figure 15-16.

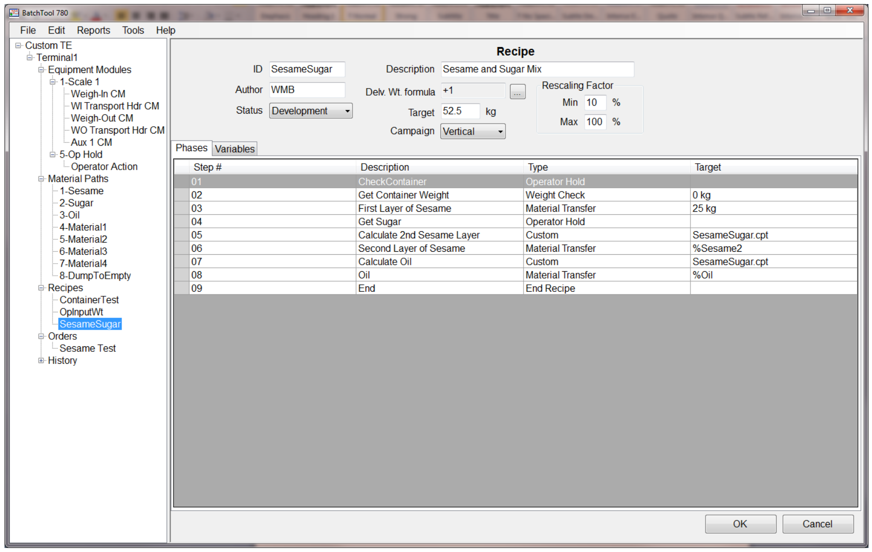


Figure 15-15: Sesame and Sugar Recipe, Phases Tab

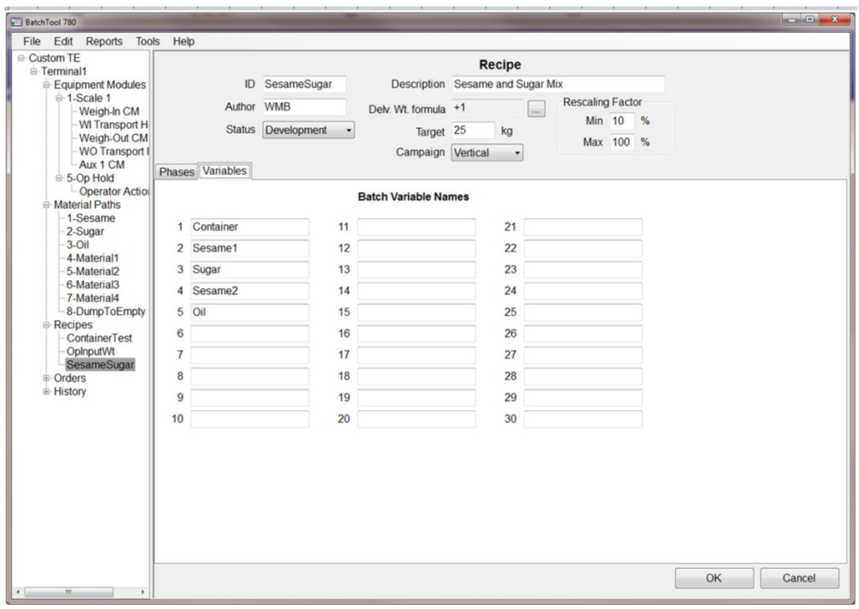


Figure 15-16: Sesame and Sugar Recipe, Variables Tab

15.5.1.2. Custom Phase: General Configuration

Custom Phase parameters must also be configured, in BatchTool at **Tools | Config Custom Phase** (Figure 15-17).

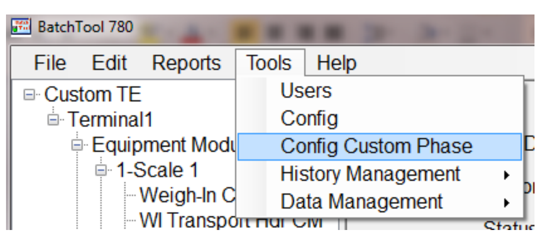


Figure 15-17: Accessing the Config Custom Phase Menu Item

The Custom Phase configuration window opens, listing all the custom phases that have been saved to the terminal. The user may choose an existing custom phase, edit one of them, or add a new one. In Figure 15-18, an existing phase called Sesame Sugar is selected.

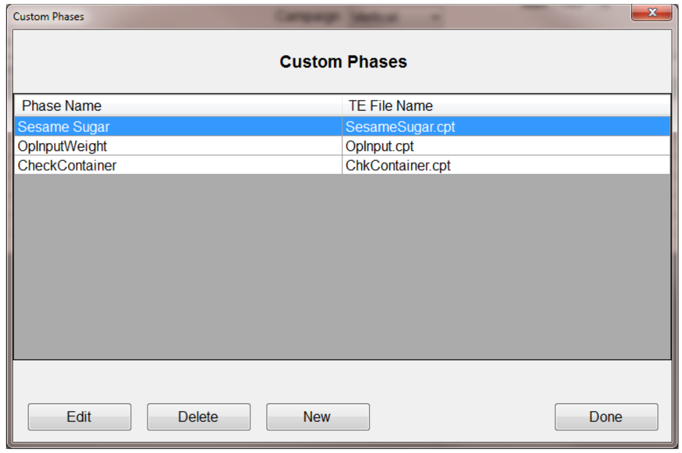


Figure 15-18: Custom Phase Selection Dialog

With the phase selected in the list, click on **Edit** to inspect the details of its configuration.

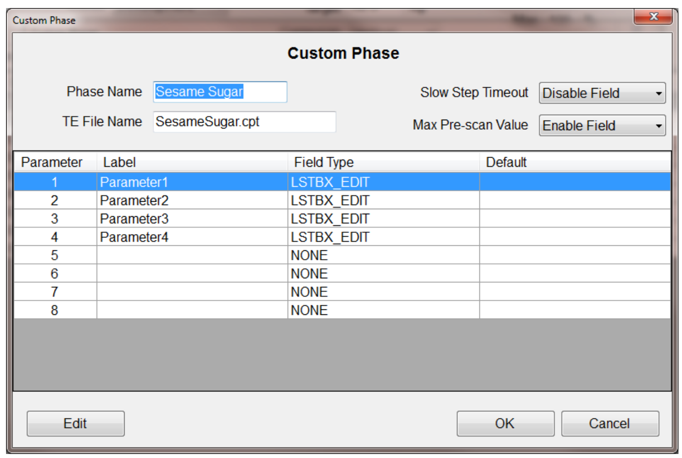


Figure 15-19: Custom Phase Edit Screen

This Custom Phase screen:

- Defines the Phase Name – **Sesame Sugar**
- Sets the TaskExpert program that will be used within the Recipe –**SesameSugar.cpt**
- Enables or disables the Slow Step Timeout field in the Custom Phase screen (Figure 15-19). In this case, since the phase involves only a calculation, a timeout is not necessary.
- Enables or disables the Max Pre-scan value field in the Custom Phase screen (Figure 15-19). This value can be used to prevent the result of the calculation causing an overload on the scale, or an overflow from the container. A Max Pre Scan value **must** be defined when a variable is used as a target weight, so this field is **Enabled**.

There are also eight parameters that can be used to pass data between the TaskExpert program and the recipe. This example uses four of these parameters. Each of the four uses the LSTBX_EDIT (List

Box Edit) Field Type. The screen displays the Batch Variables defined in the Variables tab of the Recipe configuration screen, which the Custom Phase can use to transfer data. The List Box Edit field allows the user to choose from a drop-down list of all the Batch Variables defined in the Master Recipe, or to enter their own text, either numeric or alphanumeric. This allows the user to pass information from a Batch Variable to the TaskExpert program so that it can perform calculations, and then return the resulting data to the recipe.

Figure 15-20 shows a Custom Phase parameter configuration screen.

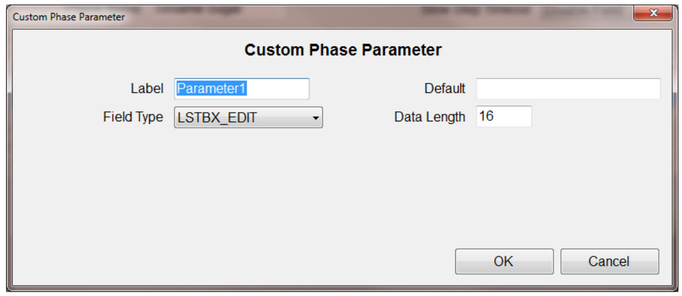


Figure 15-20: Custom Phase Parameter Setup Screen

Once all the required Custom Phase parameters have been added, click OK to close the Custom Phase edit screen (Figure 15-19).

15.5.1.3. First Custom Phase: Configuration in Recipe

Double-click on the first custom phase in the recipe (Figure 15-15) to display the window shown in Figure 15-21. This screen determines how the recipe will execute the TaskExpert program.

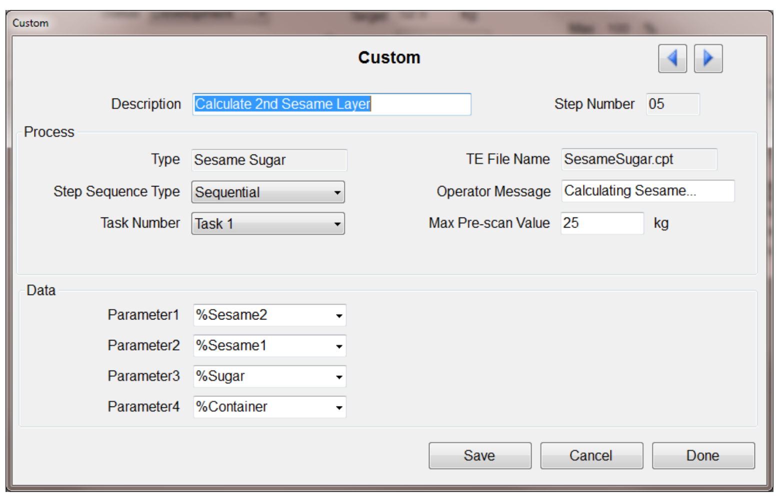


Figure 15-21: Recipe: Setting up the First Custom Phase

This phase starts the TaskExpert program. Using the four items of parameter data (in this case, Batch Variables, indicated by the leading **%**), the program calculates the amount of sugar added by the operator by subtracting from the current gross weight the delivered weight of sesame and the container's tare weight. This value will be used to determine how much additional sesame should be added to equal the weight of sugar.

15.5.1.4. Second Custom Phase: Configuration in Recipe

Step 7 of the recipe is the second custom phase, in which the TaskExpert program calculates the amount of oil to add. The program takes the total amount of sesame plus the total amount of sugar and multiply the sum of the two by 0.025 (2.5%) to calculate the target weight for the addition of oil.

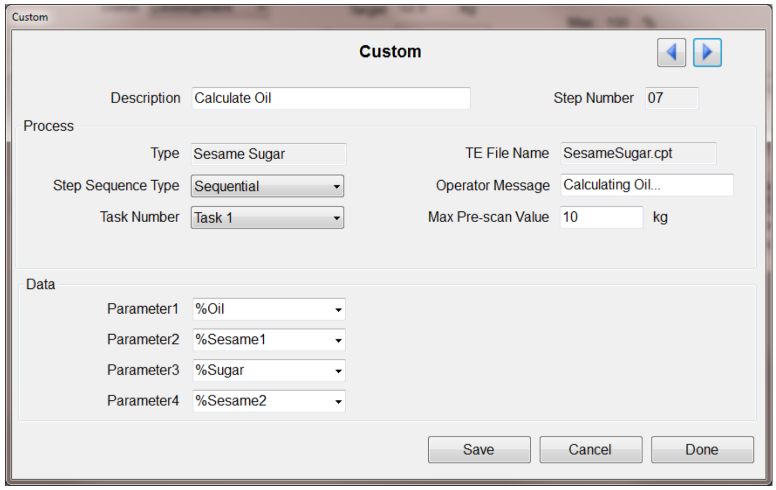


Figure 15-22: Recipe: Setting up the Second Custom Phase

Note that the data section now includes Batch Variables representing values for the first and second transfers of sesame, the calculated value for the addition of sugar, and the calculated value for the oil ingredient.

15.5.1.5. Recipe Execution

Table 15-4 provides a step-by-step account of this recipe as it is executed on an IND780batch terminal. Before the recipe can be used, an order (Figure 15-23) for the Sesame Sugar recipe must be created and downloaded to the terminal.

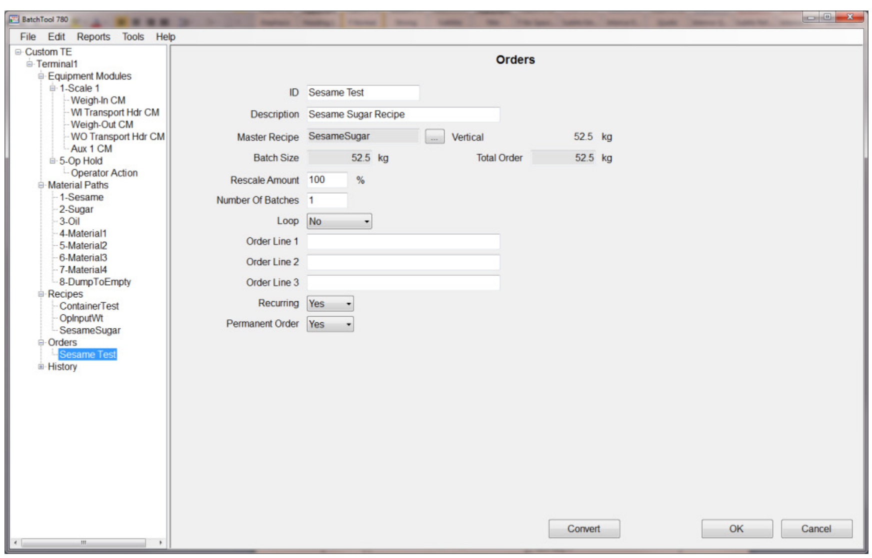
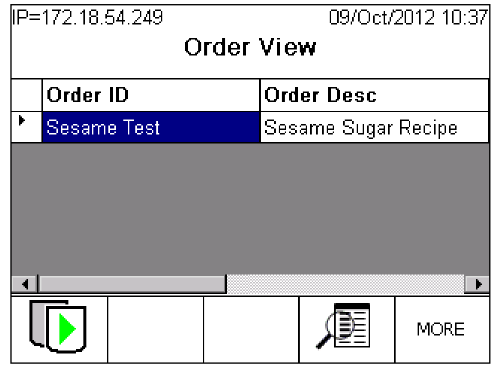
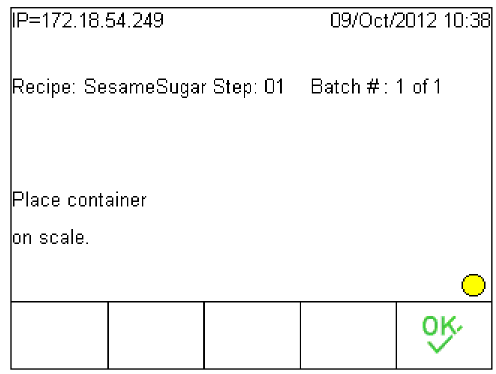
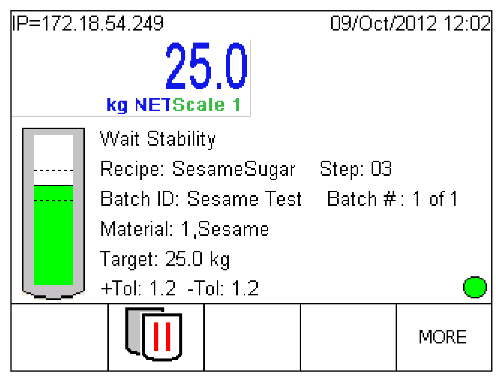
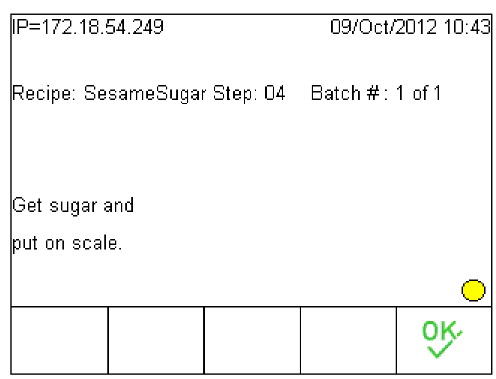
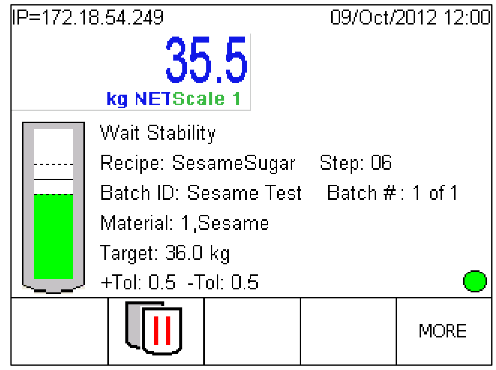
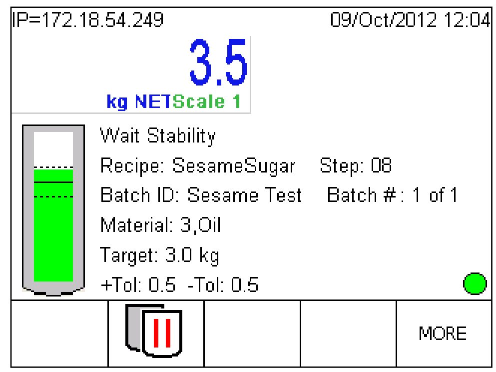
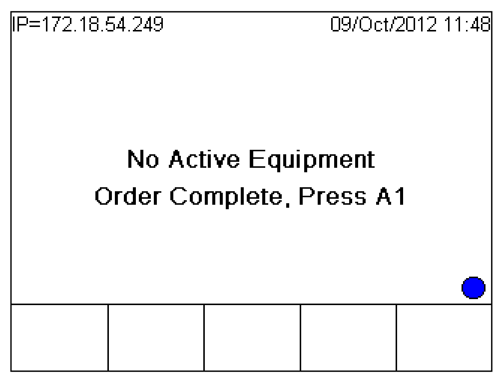


Figure 15-23: Creating the Order

Table 15-4: Recipe Execution: Custom Phase Example 1

Step	Action	Display
Start Order	In the IND780batch terminal, select the Order and press the RUN softkey.	
1	The first step is an Operator Hold phase, which prompts the operator to place the container on the scale. Once the container is on the scale, the Operator must press the OK softkey to continue.	
2	In this Weight Check phase, the recipe captures the current weight on the scale, which is the tare value for the container. This value is stored in a batch variable.	
3	Next, a Material Transfer phase automatically feeds 25 kg of sesame into the container on scale 1.	
4	A second Operator Hold phase prompts the operator to take the container to the room where the sugar is, add the sugar, and return the container to the scale. Once the container is returned to the scale the operator must press the OK softkey to continue.	

Step	Action	Display
5	Now, the first of the two Custom Phases determines how much sugar the operator added, and then calculates how much more sesame to add.	
6	The program then initiates a second Material Transfer in which the required amount of sesame is added. In this case, the target weight for addition is 36 kg.	
7	A second Custom Phase calculates the amount of oil to add to the batch – 2.5% of the total amount of sugar and sesame.	
8	The result of the calculation is passed to the Terminal and a Material Transfer phase transfers the correct amount of oil into the container. In this example, the target weight for oil was 0.25 * 122.5, or 3.0 kg.	
9	The recipe now terminates. Pressing the A1 Application Key returns the display to the Order View Screen.	

15.5.1.5.1. Important Note: Use of Batch Variables in this Recipe

Steps 6 and 8 use Batch Variables as target weight values. These variables contain the results of the TaskExpert program's calculation of target weights for the added sesame and the oil. Whenever a Batch Variable is used as a target weight, negative and positive tolerances **must** be specified for that material transfer. If the "Use Default" tolerance checkbox is left checked (Figure 15-24), your feed will use zero for both negative and positive tolerance values, because the system cannot calculate a tolerance based on a variable.

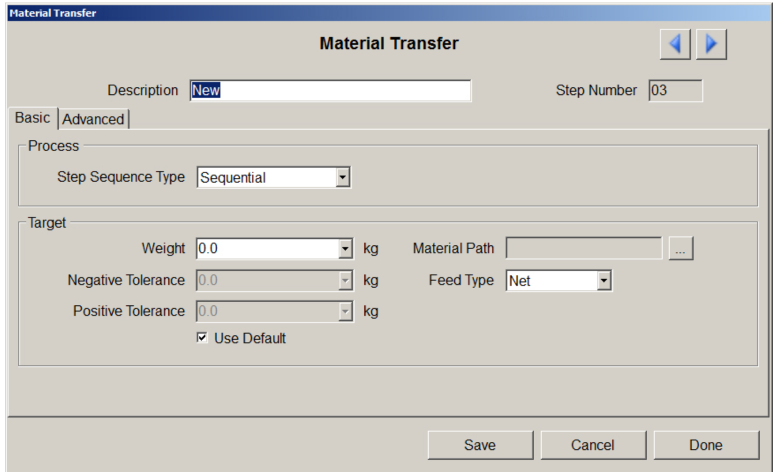


Figure 15-24: Material Transfer Setup Screen

15.5.2. Example 2: Target Weight Entry

In this example, the process automatically adds four materials to a batch, but the quantity of each material varies from batch to batch. Instead of creating a unique recipe for each of the variants, the user wishes to have the operator enter in the target weights for each material at the start of the recipe. Once the weights are entered the recipe continues to run until the batch is complete.

The batching process is as follows:

1. The operator starts the Order
2. A Custom TaskExpert program starts, prompting the operator to enter the target weights for each of the four materials.
3. When all the weights have been entered, the operator presses the OK softkey.
4. The TaskExpert program takes the entered value for material 1 and passes it to the recipe to use as the target weight for the automatic feed of material 1.
5. The recipe automatically fills material 1 to its target weight.
6. This process is repeated for materials 2, 3 and 4, until the recipe is complete.

15.5.2.1. Recipe Configuration

Figure 15-25 and Figure 15-26 show the recipe, as configured in BatchTool 780.

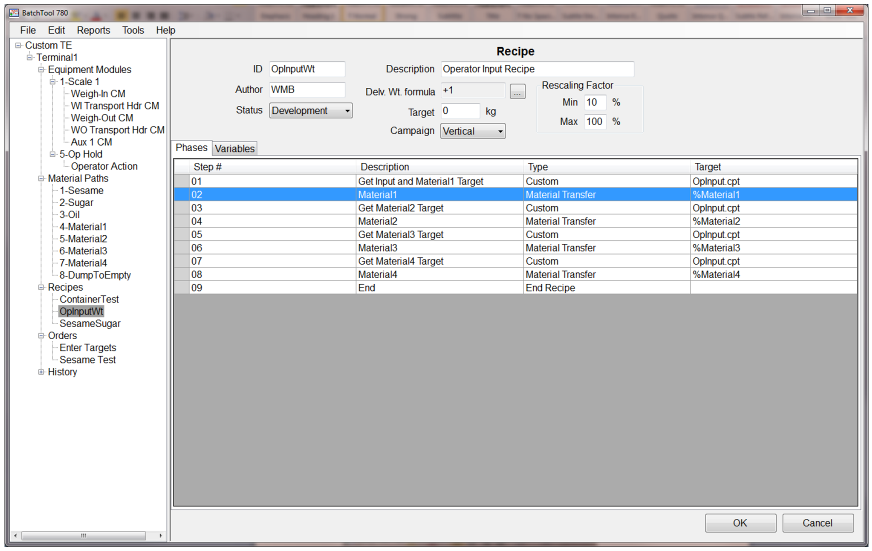


Figure 15-25: Weight Input Recipe, Phases Tab

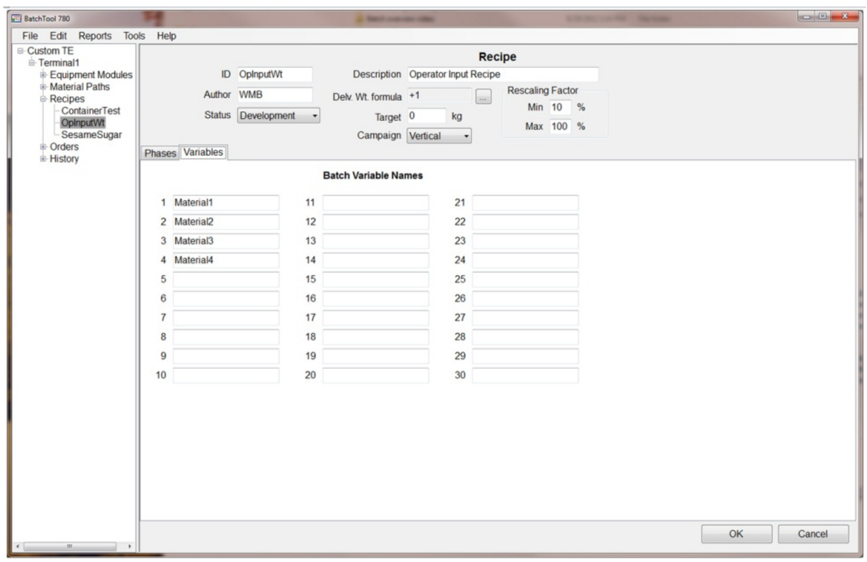


Figure 15-26: Weight Input Recipe, Variables Tab

15.5.2.2. Custom Phase: General Configuration

Custom Phase parameters must also be configured, in BatchTool at **Tools | Config Custom Phase** (Figure 15-17).

The Custom Phase configuration window opens, listing all the custom phases that have been saved to the terminal. The user may choose an existing custom phase, edit one of them, or add a new one. In Figure 15-27, an existing phase called OpInputWt is selected.

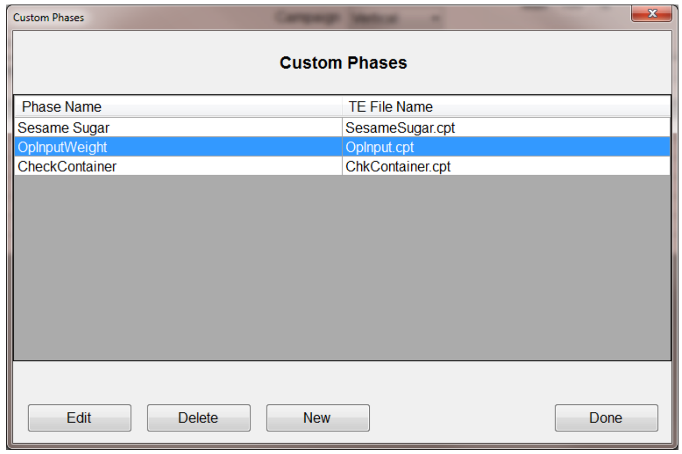


Figure 15-27: Custom Phase Selection Dialog

With the phase selected in the list, click on **Edit** to inspect the details of its configuration.

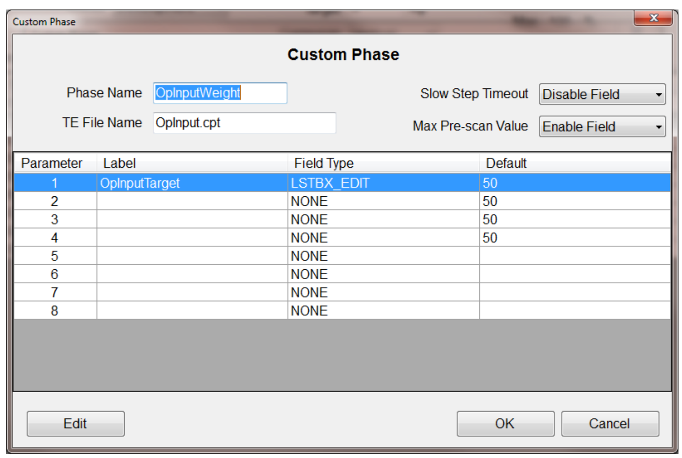


Figure 15-28: Custom Phase Edit Screen

This Custom Phase screen:

- Defines the Phase Name – **OpInputWeight**
- Sets the TaskExpert program that will be used within the Recipe –**OpInput.cpt**
- Enables or disables the Slow Step Timeout field in the Custom Phase screen (Figure 15-28)
- Enables or disables the Max Pre-scan value field in the Custom Phase screen (Figure 15-28). This value can be used to prevent the result of the calculation causing an overload on the

scale, or an overflow from the container. A Max Pre Scan value must be defined when a variable is used as a target weight, so this field is Enabled.

Figure 15-28 also shows a list of eight parameters that can be used to pass data between the TaskExpert program and the recipe. The recipe in the example will use one of these, set to the **LSTBX_EDIT** (List Box Edit) Field Type. The List Box displays the Batch Variables defined in the Variables tab of the Recipe configuration screen, which the Custom Phase uses to transfer data. The List Box Edit field also allows the user to enter their own numeric or alphanumeric text. The parameter allows the user to pass information from a Batch Variable to the TaskExpert program so that it can perform calculations, and then return the resulting data to the recipe.

Figure 15-20 shows the Custom Phase parameter configuration screen that appears when Edit is selected in Figure 15-20.

Once all the required Custom phase parameters have been added, click OK to close the Custom Phase configuration screen.

15.5.2.3. Four Custom Phases: Configuration in Recipe

In the recipe shown in Figure 15-25, Step 1 is the first of four Custom Phases. When the first phase executes, the TaskExpert program will present a screen (defined by the TE program) into which the operator enters a target value for each of the four materials.

Double-click on this phase to open the Custom screen for step 1 (Figure 15-29).

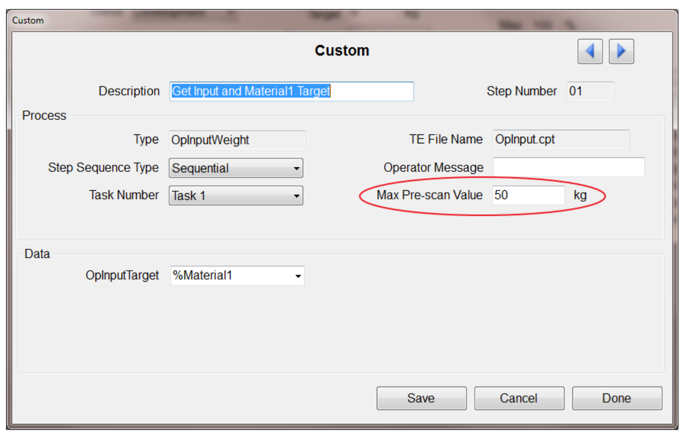


Figure 15-29: Recipe: Custom Phase Setup

The four target weights are stored in the Batch Variables named in the **Var** tab of the Recipe configuration screen (Figure 15-26). This custom phase is repeated in steps 3, 5 and 7, where the program configures the OpInputTarget data as each of the remaining three Batch Variables in sequence. This sets the target weights for the Material Transfer phases in steps 4, 6 and 8.

Before executing step 2, the first Material Transfer phase, the Custom Phase sets the OpInputTarget data variable to **%Material1**.

Note the **Max Pre-Scan** value highlighted in Figure 15-29. Since a Batch Variable is used as the target weight, this max value must be specified. When the recipe pre-scan runs, it checks the sum of all four material transfers to ensure that the scale capacity and vessel can handle the amount of material that will be added. If a pre-scan value is **not** set, the recipe pre-scan will fail and the batch will not execute.

15.5.2.4. Recipe Execution

Table 15-5 provides a step-by-step account of this recipe as it is executed on an IND780batch terminal. Before the recipe can be used, an order (Figure 15-30) for the OpInputWt recipe must be created and downloaded to the terminal.

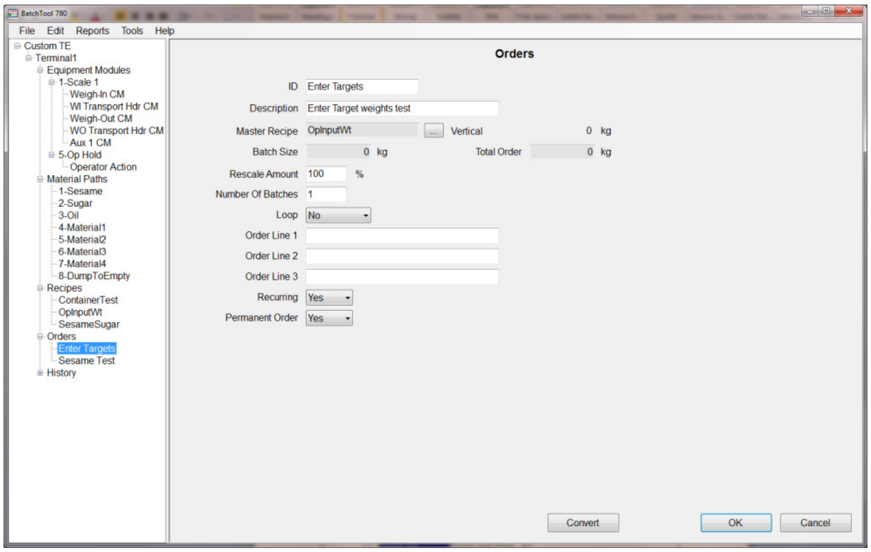
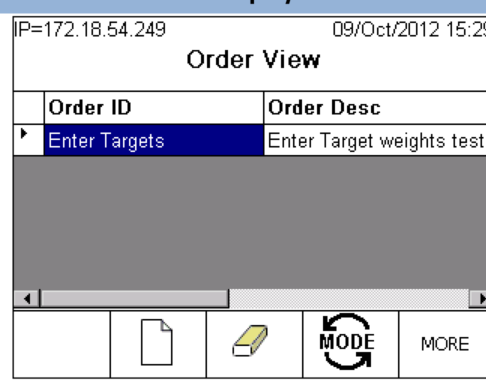
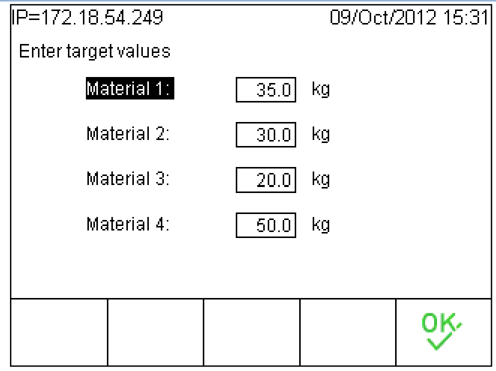
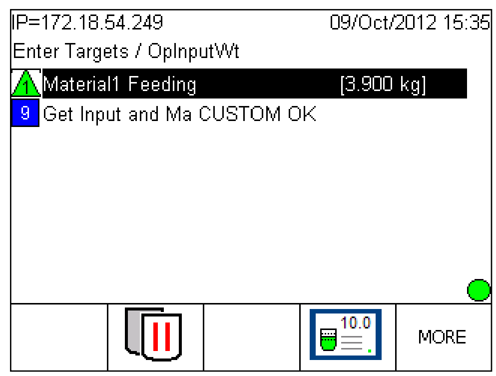
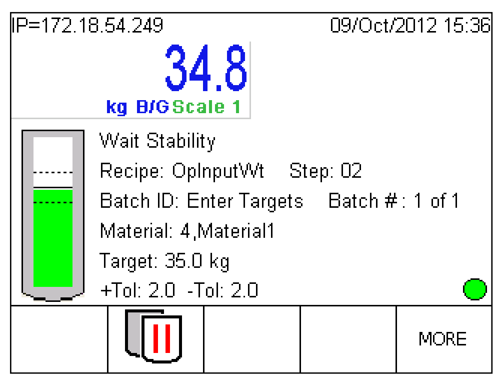
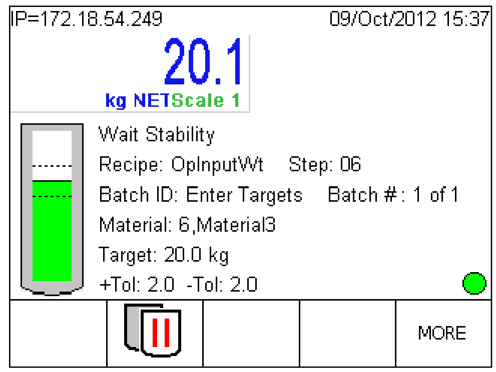
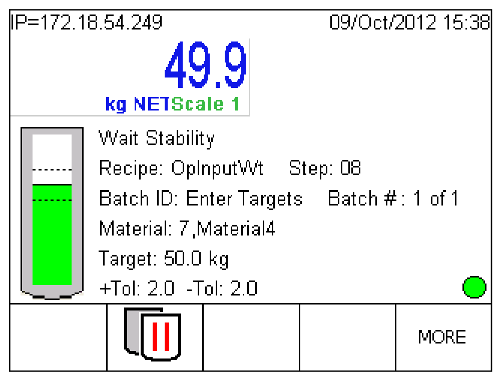


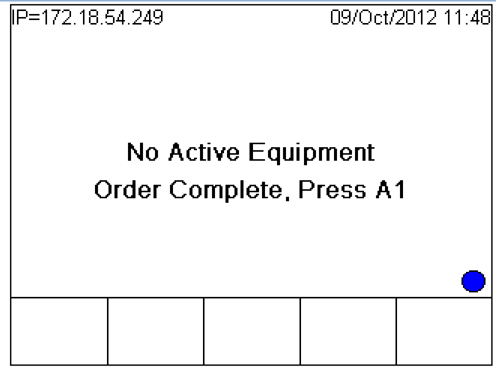
Figure 15-30: Creating the Order

Table 15-5: Recipe Execution: Custom Phase Example 2

Step	Action	Display
Start Order	In the IND780batch terminal, select the Order and press the RUN softkey.	

Step	Action	Display
1	In the first step, the TaskExpert programs runs, displaying a screen which prompts the operator to enter a target weight for each of the four materials. After entry, the operator presses the OK softkey to continue. At this point, the TaskExpert program uses the entered data to set the target value for Material 1. **Note**: If it is necessary to change one of the target weights after the order is started, the process can be paused by pressing the A4 Application Key. This will display the target value entry screen again. Here, the operator can change the target value for **any material which has not already been added to the scale**. Press OK to restart the execution of the order.	
2	The display changes to the A3 "Equipment View". Press the Equipment Details softkey  to see the details for each phase as it executes.	
	Here, the Equipment Details softkey has been pressed, and the status of the Material Transfer for material 1 is visible. The 35 kg feed has completed, and the scale is waiting for stability.	
3	The TaskExpert program uses Batch Variable %Material2 to set the target for the second Material Transfer phase.	

<table>
<tr><th>Step</th><th>Action</th><th>Display</th></tr>
<tr><td>4</td><td>The system carries out the material transfer for Material 2.</td><td>
</td></tr>
<tr><td>5</td><td colspan="2">The TaskExpert program uses Batch Variable %Material3 to set the target for the third Material Transfer phase.</td></tr>
<tr><td>6</td><td>The system carries out the material transfer for Material 3.</td><td>
</td></tr>
<tr><td>7</td><td colspan="2">The TaskExpert program uses Batch Variable %Material4 to set the target for the fourth Material Transfer phase.</td></tr>
<tr><td>8</td><td>The system carries out the material transfer for Material 4.</td><td>
</td></tr>
</table>

Step	Action	Display
9	The recipe now terminates. Pressing the A1 Application Key returns the display to the Order View Screen.	

A. Glossary

Term	Explanation
Abort	After a target comparison process has been paused, it can be totally stopped by pressing the Abort softkey  or by triggering a Target Pause/Abort discrete input. If abort is selected, the target comparison process is aborted.
Abort Drain Timer at Zero Flow	When selected the Drain Timer is ignored if the system detects a zero flow state.
Action (Operator Action CM)	Enables the operator to acknowledge the completion of an Operator Hold operation (assign through an input address).
Alarm (Auxiliary CM)	The Alarm output in the Auxiliary CM indicates that the terminal did not receive the Feedback signal after it turned on the Aux. Control.
Alarm (Weigh-In CM)	Output address for an alarm that is turned ON if scale data is lost during a feed.
Alert (Operator Action CM)	The Alert output in the Operator Action CM alerts the operator that the system requires attention.
Alert (Weigh-In Manual Operation Action CM)	Output to alert the operator to begin a manual weigh-in, or a manual weigh-out.
Algorithm Correction	This factor determines the degree of change when recalculating the control system's new operating parameters. A value of 0.6 would mean that a 40% change would be applied to the current material when the new parameters are calculated, based on the Material Feed just completed. The controller uses this value in calculating Average Flow Rate and Average Spill to control how quickly the system responds to a change in operating conditions. The range is usually 0.7 to 0.9 in material transfer processes that change slowly and infrequently. Use values from 0.1 to 0.4 for processes that change quickly or frequently.
Average Flow Rate	The average feed flow rate at cutoff in weight units per second.
Average Flow Rate Limits, High	The upper limit for the Average Flow Rate. No Control Algorithm updates will occur if the Flow rate at cutoff exceeds this value.
Average Flow Rate Limits, Low	The lower limit for the Average Flow Rate. No Control Algorithm updates will occur if the Flow rate at cutoff is less than this value.
Average Spill	The average spill, in weight, at cutoff. Derived from the average of the "Actual Spill" as calculated by the system after every feed. This field may also be used initially to set new seed values for the process.
Average Spill Limits, High / Average Spill Limits, Low	The upper and lower alarms limit for the Average Spill. No Control Algorithm updates will occur if the actual Spill value is outside the range defined by these parameters.

Term	Explanation
Batch	1. The material that is being produced or that has been produced by a single execution of a batch process. 2. The production of a material at any point in the process.
Batch-780	The IND780-based batching application.
Batch Control	Control activities and control functions that provide a means to process finite quantities of input materials by subjecting them to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.
Batch History	The operation and results of the batching runs used for batch, production, and material usage reports.
Batch Process	A process that leads to the production of finite quantities of material by subjecting quantities of input materials to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.
Batch Report	This is generally developed after a Unit and/or Cell completes all the operations specified by the recipe, or the recipe execution is aborted. The report is compiled from all the information collected during the execution of the **Control Recipe**.
Batching	Multiple movements of specified amounts of products from various locations into a single location, plus multiple additional process phases – heating, cooling, wait, mix, agitate, dump etc.
BatchTool 780	The PC-based utility used to configure a batching system that includes the IND780batch terminal.
Blending	Multiple movements of specified amounts of products from various locations into a single location, plus a single additional process phase – mixing.
Campaign	Either Vertical or Horizontal. Defines how the batch process will operate.
Change Log	The system provides two change logs. One captures all changes made to the IND780batch terminal setup, the other changes made in the BatchTool 780.
Channel	A measurement device. In the case of IND780batch, a channel is a scale. A maximum of four channels (scales) can be associated with each IND780batch.
Control Module	The properties associated with each EM, including discrete I/O, which comprise the lowest level grouping of equipment in the physical model that can carry out basic control. **Note**: This term applies to both the physical equipment and the equipment entity.
Control Recipe	The runtime definition of a **Master Recipe** which, by its execution, defines the manufacture of a single batch of a specific product.
Control Recipe Execution	Once a Batch Production starts, the instructions in the control recipe are executed. Interaction with the Control Recipe is sometimes required to address process issues. Aborting, advancing/skipping and repeating recipe instructions are all part of this function.
Dosing	Single movement of a specified amount of product from one location into a continuous process.
Drain Time (Process Time)	The time in seconds that the system will wait for material to drain into or from a vessel after the material transfer process has cut off the feed and before it tests the material delivery tolerance.

Term	Explanation
Drain time management	After the final control elements such as valve and/or pump are deactivated, the system typically must wait for a short period of time – the drain time, a few seconds, in most cases – before this material feed phase can be considered complete. It is the time that the system will wait at the end of the feed for the material to completely drain into or out of the vessel before testing the scale stability and feed tolerances.
Dump To Empty	Dump-To-Empty feeds are used to empty a scale hopper. The discharge valve on the scale hopper is closed when the scale hopper's net weight is less than or equal to zero.
Dump Trip Point	The level at which a controller starts the drain timer in a Dump-to-Empty operation. After expiration of the drain timer, the process shuts off the Dump-to-Empty operation when it detects zero flow.
Equipment Control	The equipment-specific functionality that provides the actual control capability for an equipment entity, including procedural, basic, and coordination control, and that is not part of the recipe.
Equipment Entity	A collection of physical processing and control equipment and equipment control grouped together to perform a certain control function or set of control functions.
Equipment Module (EM)	The physical configuration of the Batching equipment – a functional group that can carry out a finite number of specific minor processing activities, such as dosing or weighing. **Note:** An equipment module is typically centered around a piece of process equipment (a weigh tank, a process heater, a scrubber, etc.). This term applies to both the physical equipment and the equipment entity.
Fast Feed Cutoff	Fast Feed cutoff is set in the MP. It defines the absolute amount of material that will be fed at the slower rate, in a two-speed feed system. Fast feed is cut off when target weight minus delivered weight equals this value. E.g. if target is 100 kg and Fast Feed Cutoff is 10 kg, the fast feed will stop when 90 kg have been delivered.
Fast Feed Output	The physical output connection used for the faster feed in a two-speed feeding system. This output is not used in a single speed feeding system.
Feedback Switch (Auxiliary CM)	When the "Feedback" input is specified, the Auxiliary Control device must turn on the Feedback input within 100 ms after the terminal turns it on to indicate that the Aux control is now on.
Feedback Switch (Scale CM)	When there is Valve output specified to open a valve for a feed, the valve device must turn on the feedback switch input to indicate the valve is open.
Feed Output	This refers to the physical output connection that is used for the slower feed in a two-speed feeding system or the only feed output in a single speed feeding system.
Feed Override Time	The time in seconds before the completion of a material transfer when the controller's algorithm prohibits any Commands from disrupting the Feed. i.e. an "Abort" command issued during the "Feed Overide Time" will be ignored.
Feed Reporting	Information provided at the end of each feed pertaining to the feed.
Feed Source	Sets the source of the weigh-in feed, which may be from the scale board or from some other I/O element.

Term	Explanation
Feed Type	In two-speed systems, selects the fast feed as Concurrent (both fast and slow feeds ON) or Independent (only fast feed ON).
Filling	Single movement of a specified amount of product from one single location to another location
Final Control Element (FCE)	The valve, slide gate, or other actuated process device in a delivery system, which is used to stop flow of the material into the receiving vessel during a feed operation. The FCE is located as close to the receiving vessel as possible to minimize Spill.
Flow Rate Sample Period	Used by the Q.i algorithms to set the period of time in seconds (from 1 to 60) over which the flow rate is calculated. Smaller values allow the Controller to respond more quickly to changes in rate, while larger values permit the rate to change more smoothly. In most cases, lower values give better cutoff results. This value determines specifies the time, from 1 to 60 seconds, over which the IND780 calculates the rate. For lower values, Q.i responds more quickly to changes in rate. For larger values, the rate value changes more smoothly.
Formula	A category of recipe information that includes process inputs, process parameters, and process outputs.
Formulation	Multiple movements of specified amounts of products from various locations into a single location
GPV1 **GPV2**	Control gates/pumps/valves separately from the FCE, if needed. Two Discrete Outputs are available – GPV1 and GPV2. If the user specifies both controls, IND780batch turns GPV1 on first and GPV2 second, after a delay or feedback switch input if specified – refer to **GPV2 delay** and **GPV2 feedback**.
GPV2 Delay Time	Delay time after turning on GPV before the Scale Control turns on GPV2, in seconds. If the delay time is 0, the Scale Control does not delay before turning on GPV2. Used to ensure that a valve is open before a pump begins to work.
GPV2 Feedback	This feedback switch indicates to the Scale Control that the pump/valve has actuated. This input is used together with the **GPV2 Delay Time** to ensure proper sequencing of elements in the feed system.
Hand Add	Material added by hand. The amount added is included in the batch report. The operator signals when the addition is complete either by activating an input or by pressing a softkey on the terminal. Not the same as an **Operator** or **Manual Control**.
Header	Information about the purpose, source and version of the recipe such as recipe and product identification, creator, and issue date.
Horizontal Campaign	Batches run on parallel units, each recipe phase completing for each unit before the next phase is started. See also **Vertical Campaign**.
ID	A unique identifier for batches, lots, operators, technicians, and raw materials.
IND780batch	An IND780 weighing terminal configured with the **Batch-780** application.

Term	Explanation
Inputs / Outputs, Discrete	A Discrete I/O (DIO) subsystem performs a mapping of internal Boolean variables and external, real world signals. DIO may include level shifting circuitry, isolation, mis-wiring protection, and surge voltage protection. The DIO electronics and termination area may be mounted inside the IND780batch terminal ("local" DIO) or can be in a remote area ("remote" DIO), connected to the primary equipment via serial link.
K1 & K2 Limits	Limits specifying the maximum and minimum allowable values for the **K1** and **K2** factors in the Q.i algorithms. Prevents runaway calculations due to process upsets.
K1 Algorithm	The K1 algorithm is used to calculate the **Spill** value dynamically during the feed. A process which has a linear relationship between the Flow rate and the Spill value would use a K1 algorithm. The K1 algorithm feed is typically used with horizontal feeds that do not have any initial downward velocity, with slower flow rates or vertical feeds that have minimal initial downward velocity.
K2 Algorithm	The K2 algorithm is used to calculate the Spill value dynamically during a feed. A process which has a non-linear relationship between the Flow rate and the Spill value would use a K2 algorithm. Typically used where the initial downward velocity is significant.
Lot	A unique amount of material having a set of common traits. **Note:** Some examples of common traits are material source, the master recipe used to produce the material, and distinct physical properties.
Lot Tracking	Enables the identification of when and where a specific material was used and where it originated.
Low and High Flow Alarm Management	In-flight (**Spill**) is closely related to flow rate. A batch material feed may fail if the flow rate is too high or too low. An alarm management function tracks flow rate in material feeds and triggers an alarm if the rate is outside the normal range.
Manual Feed Control (Weigh-In Manual Operator CM)	Control that allows the operator to turn on the FCE on the scale card manually, via a discrete input.
Manual/Operator control	A very basic manual control is for the operator to activate or deactivate final control elements such as valves and pumps. Not the same as a **Hand Add**.
Master Recipe	The static definition of the recipe phases that determine how a product is to be made. Accounts for equipment capabilities and may include process cell-specific information. Once started, the recipe's procedural structure cannot be changed, though the formula can change if the recipe permits. When necessary, process actions can be skipped or repeated.
Material Feed Types	IND780batch processing involves two types of batch material feeds: **Gain-In-weight (GIW)** feed and **Loss-In-Weight (LIW)** feed. GIW is a scale-based feed system that adds material to a vessel by detecting the gain of weight of the destination vessel. LIW is a scale-based feed system that adds material to a vessel by detecting the loss of weight from the source vessel.

Term	Explanation
Material Path (MP)	A material path is the combination of a material, a channel (measurement device) and a final control element (e.g. valve , screw feeder etc); the material path defines how the material flows in the system. Each material path is managed by an EM.
Material Transfer Mode	The target comparison mode that provides control for delivering a measured amount of material from one container or vessel to another. The transfer can apply to material entering or leaving a container or vessel. It covers applications traditionally using terms such as weigh-in, weigh-out, filling, and dosing.
Material Usage Tracking	Identifies how much material has been reported consumed by production.
Maximum Flow Rate Alarm	Flow rates above this value generate an alarm and terminate the feed. Setting the value to 0 turns alarm checking off.
Maximum Pre-Scan Value	When a variable is used in place of an absolute value in a recipe for batching, its maximum value must be constrained. This is because, when the system scans the recipe before it is run, it will abort the recipe if it finds an unconstrained value that might overflow the vessel into which the batch is being mixed, for example, or exceed the scale's capacity. This value is a means for the recipe to indicate to the system that the value will never exceed the programmed, acceptable, value.
Minimum Add	A minimum target value can be set per instrument. Any Start Feed commands with a target value below this value will be ignored.
Minimum Flow Rate	Flow rates below this value generate an alarm and may terminate the feed. Setting the value to 0 turns alarm checking off.
Minimum Open Time	The period at the beginning of a material transfer the system waits before applying the feed algorithm. This allows the material flow to stabilize before the feed algorithm is applied, so that the algorithm does not have to account for surges in material flow rates when the feed starts.
Minimum Slow Step Time	The Automatic Material Transfer algorithm computes a Slow Step Time using the Target weight , Average Flow rate and Slow Step Timer Factor: $\text{Slow Step Time} = \text{Slow Step Timer Factor} * \frac{\text{Target Weight}}{\text{Avg Flow Rate}}$ (Slow Step Timer = Slow Step Timer Factor*(Target weight/Avg Flow Rate). The system compares the computed time and the time set by this parameter, and uses the larger of the two.
Order	A process order to produce a certain amount of a product. An order is generated based on the master recipe and defines which elements will be used. The order identifies the properties of the run, including the recipe, the number of batches, and any re-scaling factors.
Path	The sequence of equipment within a process cell that is used in the production of a specific batch. Also called **Stream**.
Pause	A pause function is provided in case processing must be temporarily halted. This can be done by pressing the Pause softkey or by triggering a discrete input programmed as Target Pause/Abort. When paused, power is removed from the Feed and Fast Feed (if used) discrete outputs. After a batch has been paused, the process can either be resumed or aborted.

<table>
<tr><th>Term</th><th colspan="2">Explanation</th></tr>
<tr><td>Permissive Feedback (Auxiliary Control Module)</td><td colspan="2">If the “Permissive” input is specified, external logic must turn on the permissive before the terminal will turn on the Aux.</td></tr>
<tr><td>Permissive Feedback (Scale Control Module)</td><td colspan="2">If the Scale Permissive input is specified an external logic must turn on the permissive to enable a feed to start.</td></tr>
<tr><td>Phase</td><td colspan="2">The lowest level of procedural element in the procedural control model. Also referred to as a step.</td></tr>
<tr><td>Post-feed check and report</td><td colspan="2">After a feed is complete, it is important to check the performance of the feed, and store historical data for analysis.</td></tr>
<tr><td>Potency Adjustment Factor</td><td colspan="2">A factor used in adjusting a recipe to account for variations in material due to different suppliers, environmental changes, etc.</td></tr>
<tr><td>Predictive Adaptive Control (PAC)</td><td colspan="2">The operational conditions of a material feed may change either during the feed, or from one feed to the next. Any feed condition variations almost always show up in the measured flow rate. Additionally any potential control variations or measurement anomalies can be predicted by the use of knowledge of the real time flow rate.</td></tr>
<tr><td>Pre-feed condition checks</td><td colspan="2">Before starting a scale-based feed, for example, pre-feed condition checks are performed – whether the scale is stable, that its capacity is sufficient to accommodate the feed, and so on.</td></tr>
<tr><td>Production Unit</td><td colspan="2">Set of production equipment that converts, separates, or reacts one or more feedstocks to produce intermediate or final products.</td></tr>
<tr><td>Recipe</td><td colspan="2">Refer to Master Recipe and Control Recipe.</td></tr>
<tr><td rowspan="12">Recipe Phases</td><td colspan="2">Steps that can accomplish unique, basic, and generally independent process-oriented tasks.</td></tr>
<tr><td>Unit Procedure</td><td>An ordered set of phases that a single scale unit carries to completion, like a subroutine. Multiple unit procedures can execute simultaneously.</td></tr>
<tr><td>Auxiliary Process</td><td>Step for controlling auxiliary equipment</td></tr>
<tr><td>Material Transfer</td><td>Step for controlling the automatic transfer of material</td></tr>
<tr><td>Manual Transfer</td><td>Step for controlling the operator transfer of material</td></tr>
<tr><td>Operator Hold</td><td>A temporary hold in the processing of the recipe. It may optionally require the operator to enter some process data, such as the lot number of the material in the next step, before continuing.</td></tr>
<tr><td>Weight Check</td><td>Verification that the appropriate gross weight is on a scale within a specified tolerance before continuing.</td></tr>
<tr><td>Conditional</td><td>Make a decision based on the value of a batch variable.</td></tr>
<tr><td>GOTO</td><td>Branch to a different step in the recipe.</td></tr>
<tr><td>Communication</td><td>Send communication messages (print, operator, email) during the running of the recipe.</td></tr>
<tr><td>End-of-Procedure</td><td>Identifies the final step of the Unit Procedure.</td></tr>
<tr><td>End-of-Recipe</td><td>Identifies the final step of the Recipe.</td></tr>
</table>

Term		Explanation
Reset PAC Variables		Determines whether the Predictive Adaptive Control algorithms developed during batch processing are re-set to their default values.
Resume		After the batch process (i.e., an Order) has been paused, it may be resumed by pressing the Resume softkey or by triggering a discrete input programmed as Resume. When a batch is resumed, it continues to use the original target values.
Scale Equipment Module		Equipment module associated with a scale. The controls (actions) relate to the I/O that can be associated with a Scale unit include:
	Automatic Weigh in	Controls the automatic weighing of a material into the scale.
	Weigh in Transport Header	Controls which material to feed when the Weigh-in scale has multiple material sources.
	Manual Weigh in	Controls the manual weighing of a material into the scale by the operator.
	Automatic Weigh out	Controls the automatic weighing of a material out of the scale.
	Weigh out Transport Header	Controls which path to feed to when the Weigh out scale has multiple destinations.
	Manual Weigh out	Controls the manual weighing of a material out of the scale by the operator.
	Auxiliary	Controls for up to 4 other devices such as mixers, heaters, etc.
	Auxiliary Operator action	Controls for up to 4 operator actions associated with the scale.
	Operator Hold (action)	Equipment module associated with an operator interface (discrete I/O or console).
Slow Step Timer		Monitors the progress of the material feed and triggers an alarm when the material has been feeding for much longer (such as 150%) than the expected feed time, as calculated from the material set-point and the average flow rate. The material feed can be halted or allowed to continue, if the slow step timer times out.
Slow Step Timer Factor		This is the Slow Step Timer calculation factor. $\text{Slow Step Timer} = \text{Factor} * \frac{\text{Target}}{\text{Average flow}}$ A factor of 1.5 would imply that the material feed can take up to 50% longer than expected before an alarm or abort is generated.
Spill		The amount of material that will be added (on a weigh-in) or removed (on a weigh-out) from the scale after the final feed (**FCE**) is turned off. In a weigh-in process, this is the material that will continue to be recorded after the FCE element was been deactivated. Typically this is material that was in suspension, in the piping, or continuing to pass through during the closing of a valve or stopping of a motor. Spill is either subtracted from (for a weigh-in) or added to (for a weigh-out) the target value to determine when to turn off the feed output.
Spill Only		In a **Spill Only** feed, the **Spill** value has been determined prior to the start of the feed and does not change during the feed. The Spill value could be identical to the previous feed or a modified version of the previous feed. This modification can be done according to some rule or algorithm.

Term	Explanation
Stable Device Wait Time	Length of time the controller will wait for the instrument to become stable, if at the start or end of a feed it is deemed to be "Unstable" or "In Motion".
Stream	Refer to **Path**.
Target	The weight value that is the goal of the material transfer process. If a container should be filled with 10 kg of material, the target value is 10 kg.
Tolerance	The weight range above and below the target value that will be acceptable as an "in tolerance" target comparison. The tolerance can either be entered as a weight deviation from the target or a percentage deviation from the target, depending upon setup.
Tracing	Provides an organized record of resource and product use from any point, forward or backward, using tracking information.
Tracking	Records attributes of resources and products through all steps of instantiation, use, change, and disposition.
Tracking and Traceability	Food and pharma manufacturers must document their process in order to allow full Tracking and Traceability. Upstream and downstream tracking must be ensured. In order to fulfill T&T, a producer must be able to determine and report which raw material batches are used for specific final product (upstream). They also need to be able to call up all final products' orders which have a specific raw material batch included (downstream). Thus, for example, if a quality problem is discovered with a specific raw material after shipment, an efficient product recall would be possible.
Unit Recipe	The part of a control recipe that uniquely defines the contiguous production requirements for a unit. **Note**: The unit recipe contains the unit procedure and its related formula, header, equipment requirements, and other information.
Unstable Flow Rate Threshold (Unstable Device, in Scale EM)	Sets the flow rate above which the scale will be considered unstable during the Stable Device Wait Time period. If the Stable Device Wait Time period times out and the measuring device flow rate exceeds the value set here, the feed will be flagged as failed, because the measuring device was very unstable. If the measuring device flow rate is below this value, the feed will be considered complete without error.
Vertical Campaign	A batch run on a single unit in recipe sequence. See also **Horizontal Campaign**.
Weigh In	The material transfer process where the container that will hold the material is placed on or is part of a scale, and material is weighed into the container. Also **GIW**.
Weigh In Select (Scale Control Module)	The Analog Scale Card has only one FCE to control both weigh –in and weigh-out feeds. The Weigh-in select allows the FCE to be used for both, by discriminating between the two types: ON = Weigh-in feed OFF = Weigh-out feed.
Weigh Out	The material transfer process where the container that will hold the material is placed on or is part of a scale, and material is weighed from / out of the container. Also **LIW**.

Term	Explanation
Zero Flow Rate Threshold	Sets the zero flow rate for the measuring device. A flow rate below this value will be considered OFF, and the measuring device will be considered stable.

B. Default Settings

B.1. IND780batch Terminal Parameter Defaults

Parameter	Default Value
Application > Batch-780 > Recipe Operations > Execution Control	
Automatic	Enabled
Semi-Automatic	Enabled
Manual	Enabled
Hold At End	Enabled
Off Tolerance	Continue
View Control By	Phase
Application > Batch-780 > Recipe Operations > Batch Edit	
Rescaling	Recipe Amount
Looping	Enabled
Batch Start	Automatic
Edit Recipe Targets	Enabled
Convert Batch	Disabled
Application > Batch-780 > Views > Order View	
Batch Control Softkeys	Enabled
Order Description	Enabled
Recipe Name	Enabled
Target	Enabled
Campaign	Enabled
Application > Batch-780 > Views > Recipe Views > Recipe Overview	
Recipe View	Enabled
Batch Control Softkeys	Enabled
Recipe Details Softkey	Enabled
Line 1	Order ID / Desc
Line 2	MR ID / Desc
Line 3	CR ID / Desc

Parameter	Default Value
Line 4	Target / Delivered
Line 5	Recipe Status
Line 6	Cycle Information
Line 7	% Complete
Application > Batch-780 > Views > Recipe Views > Recipe Details	
Batch Control Softkeys	Enabled
Equipment Details Softkey	Enabled
Scrolling Softkeys	Enabled
Key Parameter	Enabled
Result	Enabled
Message	Enabled
Application > Batch-780 > Views > System Views > Equipment View	
View	Enabled
Batch Control Softkeys	Enabled
Equipment Details Softkey	Enabled
Title	Order / Recipe
Key Parameter	Enabled
Application > Batch-780 > Views > System Views > Auto Material Transfer View	
Weight Display	Enabled
Tank Graphic	Enabled
Recipe / Order	Enabled
Material	Enabled
Target	Enabled
Batch #	Enabled
Application > Batch-780 > Views > System Views > Manual Material Transfer View	
Weight Display	Enabled
SmartTrac	Enabled
Recipe / Order	Enabled
Material	Enabled
Target	Enabled
Batch #	Enabled
Application > Batch-780 > Security	
Operator Login	Disabled
Login Timeout	999

Parameter	Default Value
Application > Batch-780 > Auto Print & Log	
Batch Transaction	Disabled
Batch Summary	Enabled
Print Audit Log	Disabled
Batch History	Enabled
Application > Batch-780 > System List > Equipment Module	
Equipment Module	[blank table]
Application > Batch-780 > System List > Control Module	
Control Module	[blank table]
Application > Batch-780 > System List > Material Path	
Material Path	[blank table]
Application > Batch-780 > System List > Recipe List	
Recipe List	[blank table]

B.2. BatchTool 780 Parameter Defaults

- The following tables indicate default values. In some cases, a suggested setting is also included; these items appear in a second column of values. The suggested values provide a starting point, and must be adjusted to match the process requirements of the particular application.
- The weight units displayed for default values will correspond to the units selected in the BatchTool 780 Terminal setup screen.

B.2.1. Config

Parameter	Default Value	Suggested Value
General		
Language	English	
Default Units	Kg	
Advanced Tab	Enabled	
Global Low Tol	5%	
Global High Tol.	5%	
Batch Edit		
Rescaling	Recipe %	
Looping	Enabled	
Horizontal	Enabled	

Parameter	Default Value	Suggested Value
Recipe Download	Manual	

B.2.2. Equipment Modules

Parameter	Default Value	Suggested Value
Scale Equipment Module		
Basic Tab, General		
Scale Number	1	
Description	New	
Stable Device Wait Time	0 Sec.	3 seconds
Dump Trip Point	0 kg	3% of scale capacity
Basic Tab, Flow Rate Thresholds		
Zero	0 kg/s	5 x scale increment value
Unstable Device	0 kg/s	2 x Zero flow rate threshold
Advanced Tab, Process Times		
Feed Override Time	0 Sec.	0 seconds
Min. Slow Step Time	0 Sec.	30 seconds
Advanced Tab, Other Parameters		
Minimum Add	0 kg	
Minimum Flow Rate	0 kg/s	0 units/second
Units	Terminal	
Operator Hold Equipment Module		
Description	New	
Flow Meter Equipment Module		
Basic Tab, General		
Description	New	
Stable Device Wait Time	0 Sec.	
Basic Tab, Flow Rate Thresholds		
Flow Rate Threshold, Zero	0 kg/sec.	
Unstable Device	0 kg/sec.	
Abort Drain Time at Zero Flow	Un-checked	
Advanced Tab, Process Times		
Feed Override Time	0 Sec.	

Parameter	Default Value	Suggested Value
Min. Slow Step Time	0 Sec.	
Advanced Tab, Other Parameters		
Minimum Add	0 kg	
Minimum Flow Rate	0 kg/sec.	
Units	Terminal	

B.2.3. Material Paths

Parameter	Default Value	Suggested Value
Basic Tab		
Material	1	
Description	New	
Measuring Device		
Scale EM	[blank]	
Feed Algorithm	Spill Only - GW	
Max. Flow Rate Alarm	0 kg/s	0 (disabled)
Fast Feed Cutoff	0 kg	
Transport Hdr Path #	None	
Process Times		
Slow Step Timer Factor	1	1.5
Drain Time	0 Sec.	6 seconds
Minimum Open Time	0 Sec.	2 seconds
Advanced Tab		
Include Average Flow Rate "A" and Average Spill "AA" with parameters to be saved	[checkbox clear]	
Average Flow Limits		
Low	-100 kg/s	
High	100 kg/s	
Average Spill Limits		
Low	-100 kg/s	
High	100 kg/s	
Jog		
Jog Mode	Disabled	
Other Parameters		
Algorithm Correction	50%	

Parameter	Default Value	Suggested Value
Flow Rate Sample Period	1 Sec.	
Reset PAC Variables	No	

B.2.4. Recipes

Parameter	Default Value
General Recipe settings	
Recipe Name	Recipe 1
Author	None1
Status	Development
Target	0 kg
Rescaling Factor, Min.	10%
Rescaling Factor, Max.	100%
Phase: Material Transfer	
Basic Tab	
Description	New
Process	
Step Sequence Type	Sequential
Target	
Weight	0.0 kg
Negative Tolerance	0.0 kg
Positive Tolerance	0.0 kg
Advanced Tab	
Operator Runtime Message	[blank]
Result Variable Name	None
Lot Number Variable Name	None
Rescaling Factor	100%
Potency Adj. Factor	100%
Phase: Manual Transfer	
Basic Tab	
Description	New
Process	
Step Sequence Type	Sequential
Target	
Weight	0.0 kg

Parameter	Default Value
Negative Tolerance	0.0 kg
Positive Tolerance	0.0 kg
Feed Type	Net
Advanced Tab	
Operator Runtime Message	[blank]
Result Variable Name	None
Lot Number Variable Name	None
Rescaling Factor	100%
Potency Adj. Factor	100%
Material Verify Variable Name	None
Phase: Operator Hold, Timed	
Description	New
Process	
Step Sequence Type	Sequential
Equipment Module	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Data	
Hold Time	1 Sec.
Phase: Operator Hold, Acknowledge	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Phase: Operator Hold, Entry	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]

Parameter	Default Value
Data	
Result Variable	None
Data Format	Alphanumeric
Num DPs	0
Minimum	0
Maximum	0
Default Value	[blank]
Data Length	0
Phase: Operator Hold, Selection	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Data	
Result Variable	None
Default Value	[blank]
Phase: Operator Hold, Login	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Phase: Operator Hold, Timed w/ Discrete	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Data	
Hold Time	1 Sec.

Parameter	Default Value
Phase: Operator Hold, Acknowledge w/ Discrete	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Operator Message	[blank]
Operator Message2	[blank]
Phase: Operator Hold, Verify Container	
Description	New
Process	
Step Sequence Type	Sequential
Phase: Operator Hold, Verify Material	
Description	New
Process	
Step Sequence Type	Sequential
Data	
Result Variable Name	None
Stop Termination	Disable Bypass
Phase: Operator Hold, Display Delivered Weight, Timed	
Description	New
Process	
Hold Time	1 sec.
Phase: Operator Hold, Display Delivered Weight, Acknowledge	
Description	New
Phase: Auxiliary, Timed Pulse w/ Delay	
Basic Tab	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Aux Control#	[blank]
Delay Time	[blank] Sec.
Pulse On Time	[blank] Sec.
Max Phase Time	0 Sec.

Parameter	Default Value
Advanced Tab	
Operator Runtime Message	[blank]
Rescale Factors	
Time Delay	1–%
Timed Pulse	100%
Phase: Auxiliary, Timed Pulse w/ Thresh	
Basic Tab	
Description	New
Process	
Step Sequence Type	Sequential
Equipment	[blank]
Aux Control#	[blank]
Delay Time	[blank] Sec.
Pulse On Time	[blank] Sec.
Low Weight	[blank] kg
Max Phase Time	0 Sec.
Advanced Tab	
Operator Runtime Message	[blank]
Rescale Factors	
Time Delay	1–%
Timed Pulse	100%
Phase: Auxiliary, Span Phases	
Basic Tab	
Description	New
Process	
Equipment	[blank]
Aux Control#	[blank]
Delay Time	[blank]
Pulse On Time	[blank]
Start Step	0
Stop Step	0
Max Phase Time	0 Sec.
Advanced Tab	
Operator Runtime Message	[blank]

Parameter	Default Value
Rescale Factors	
Time Delay	1–%
Timed Pulse	100%
Phase: Unit Procedure	
Description	New
Process	
Step Sequence Type	Sequential
Procedure Name	[blank]
Phase: Communication	
Description	New
Process	
Step Sequence Type	Sequential
Custom Print 1	Disabled
Custom Print 2	Disabled
Print Summary Report	Disabled
Operator Message	[blank]
Email	
Email Content	Disabled
Phase: Weight Check	
Description	New
Process	
Step Sequence Type	Sequential
Weight Tol. Variable Name	None
Result Variable Name	None
Operator Runtime Message	[blank]
Scale EM	[blank]
Target	
Weight	0.0
Rescaling Factor	0.0%
Negative Tolerance	0.0
Positive Tolerance	0.0
Phase: Conditional	
Description	New

Parameter	Default Value
Process	
Step Sequence Type	Sequential
Condition	
First Value	0.0
Condition	=
Step Number if True	0
Step Number if False	0
Second Value	0.0
Phase: GoTo	
Description	New
Process	
Step Sequence Type	Sequential
Goto Step Number	0
Phase: Horizontal Block	
Description	New
Process	
Group Name	New
Execution Type	All Recipes
Phase: Math	
Description	New
Process	
Step Sequence	Sequential
Type	Numeric
Operation	
First Value	0.0
Operation	+ Add
Second Value	0.0
Max Result	0
Phase: Custom	
Description	New
Process	
Step Sequence	Sequential

B.2.5. Orders

Parameter	Default Value
ID	Order1
Description	Order1
Rescale Amount	100%
Loop	No
Number of Batches	1
Recurring	No
Permanent Order	No

C. Table and Log File Structure

C.1. Tables: Introduction

The tables described in this section include information that user's may wish either to export for off-line use, or to import to the IND780batch terminal. These import and export functions can be carried out using the IND780batch PC Configuration Tool, but for cases where other software is used, it is important to understand the structure of the tables.

The Recipe and Batch Order Tables contain complex records of different types. Each type corresponds to a recipe phase type (which uses a particular EM/MP combination), and has a specific structure. Therefore, the same field may contain different data in a different format for each record type.

- For specific instructions on using the PC Configuration Tool to export and import data, please refer to the **IND780batch PC Configuration Tool User's Guide**.
- Many of the tables in this Appendix include a **Format** column. The number in this column indicates the maximum number of Unicode characters that can appear in the field.
- In interpreting records, be sure to count null fields, in order to make a correct correlation between record elements and their description in the appropriate table. Null fields are either reserved for future use, or serve to align records when they are output to the database created by the PC Configuration Tool. The standard table field names are included for reference.

C.1.1. Interpreting Exported Tables

When using the tables in this Appendix in order to understand the contents of an exported IND780batch table in comma separated value (.csv) format, note that the record type is always indicated in the third place, or column, of the file. Once the record type is established, refer to the appropriate table for an interpretation of each element.

For example, the following is a single row (record) from a Master Recipe table:

> "Auto_Run","Material One","PHASE_MATL_XFER","Auto_Run","2","0","0 0 0","","1","","1623 g","1","150 g","125 g","Addin Material One (1)","","","1",""

To interpret the contents of this record, refer to the third (Record Type) element. In this case, the record represents a Material Transfer phase. Each comma-separated item corresponds to a row in the Material Transfer Record Structure table (Table C-26, on page C-28). The elements of the record can be interpreted as shown in Table C-1.

Table C-1: Example of Record Interpretation: Batch History, Material Transfer Phase

Field	Description
"Auto_Run"	Name of Control Recipe
"Material One"	Description of this phase
"PHASE_MATL_XFER"	Type of record
"Auto_Run"	Name of Master Recipe or Unit Procedure
"2"	Step number in Master Recipe or Unit Procedure
"0"	Phase setup. Typically, the "0" value indicates that this is a sequential, not parallel, phase. However, if the recipe was stopped at this phase, and is now resumed (i.e., goes from a hold to a running state), the "0" would indicate that the recipe should advance to the next step.
"0 0 0"	Q.iMPACT values. The "0" values indicate that this is not an overlapping feed. Specifically: First 0 – Not an overlap field. Second 0 – Identifies the group of primary and secondary feeds. Third 0 – Number of overlapping secondary feeds.
""	Null field – reserved.
"1"	Material Path name – a pointer into the Material Path table.
""	A data variable name for the Material Transfer result. The delivered weight is recorded in this variable.
"1623 g"	The target weight and its units.
"1"	A rescaling factor used to adjust the target weight for this phase. This can be hard-coded in the Master Recipe, or – if the field starts with **%**, indicating a data variable name – adjusted by the user during an Operator Hold phase.
"150 g"	Respectively, the positive and negative tolerances, and their units. If this value were 9999, the tolerance check would be disabled. If the field begins with **%**, indicating a data variable name, the user can adjust the tolerance during an Operator Hold phase.
"125 g"	
"Adding Material One (1)"	An "Operator Runtime Message" that appears on-screen to tell the user what's happening during this phase. Alternatively, when the field begins with **/** (a forward slash), this record names a graphical image that will be displayed on-screen.
""	Any data in this field is placed in the batch record for this phase.
""	Null field – reserved.
"1"	A Potency Adjustment Factor, used to adjust the phase's target weight, in order to change the proportion of this material added to the batch. If the field begins with **%**, indicating a data variable name, the user can adjust the factor during an Operator Hold phase.

Field	Description
""	Lot number data. If the field begins with **%**, indicating a data variable name, the user can enter a value for the variable during an Operator Hold phase.

C.2. Equipment Module Tables (A4)

The Equipment Table has 9 record types, of which 4 are used currently.

1. EQUIP_HEADER record has the version number and the creation date for the Equipment Table and the Control Module Table.
2. SCALE_UNIT records define the Control Modules associated with the Scale Unit.
3. STORAGE_SCALE records define the Control Modules associated with a Storage Tank that has a scale capable of controlling a material transfer.*
4. STORAGE_TANK records define the Control Modules associated with a Storage Tank with no scale.*
5. FLOW_METER records define the Control Modules associated with the Flow Meter.*
6. CUSTOM_EQUIPMENT records define the I/O device and the Control Modules associated with a custom equipment interface.*
7. The DYNAMIC_WEIGHING records define the Q.i dynamic weighing parameters associated with the unit.*
8. The PLC_BRIDGE_SLOT Records setup the configuration of how the equipment modules accept commands and report their status to a PLC.*
9. The OPERATOR_HOLD records define the physical device to specify which Operator Console or Control Module Discrete IO the operator must use to operate on a PHASE_OPER_HOLD Recipe Phase.

   * Record types representing future Equipment Modules

The Equipment Module Name fields contain a number 1-198. Each Equipment Module must have a unique name containing a unique number.

C.2.1. Equipment Table Header Record

The EQUIP_HEADER record in the Equipment Table has the version number and the creation date for the Equipment Table and the Control Module Table. The Batch Tables Tool must change the version number and creation date whenever it changes any entries in the Equipment Module Table or the Control Module Table.

Table C-2: Equipment Table Header Record

Equipment Table Field	Std. Field	Field Format	Comment
Equipment Header Record ID	GUID	GUID	SQL creates unique global ID.
Equipment Name	KEY	16 UC	EQUIP_HEADER
Equipment Description	Description	40 UC	
Record Type	Data1	16 UC	EQUIP_HEADER
Version Number & Validation/Status	Data2	16 UC	Format "X Y" where X = Version Number 1- 999999 Y = Validation/Status 1=Released, 2=Testing, 3=Development
…			
Author	Data16	40 UC	
Creation Date & Time	Data17	40 UC	YYYY/MM/DD HH:MM:SS

C.2.2. Equipment Table Scale Unit Records (EQS)

The SCALE_UNIT records in the Equipment Table define the Control Modules associated with a Scale Unit. The Scale Unit is capable of transferring material and performing auxiliary batching operations.

Table C-3: Equipment Table Scale Unit Records

Equipment Table Field	Std. Field	Format	Comment
Scale Unit Record ID	GUID	GUID	SQL creates unique global ID.
Equipment Name	KEY	16 UC	1 - 198
Equipment Description	Description	40 UC	
Record Type	Data1	16 UC	SCALE_UNIT
Node Number	Data2	16 UC	Cluster Node Number 1-20
Scale Number	Data3	16 UC	Scale 1 – 5
Automatic Weigh-In Scale Control Module Name	Data4	16 UC	*Pointer into the Control Module Table
Transport Header Control Module Name for Weigh-In Scale	Data5	16 UC	*Pointer into the Control Module Table When the Weigh-In Scale has multiple material sources, the Transport Header Control Module selects which material to feed.
Automatic Weigh-Out Scale Control Module Name	Data6	16 UC	*Pointer into the Control Module Table
Transport Header Control Module Name for Weigh-Out	Data7	16 UC	*Pointer into the Control Module Table
Auxiliary Control Module Name 1	Data8	16 UC	*Pointer into the Control Module Table
Auxiliary Control Module Name 2	Data9	16 UC	*Pointer into the Control Module Table
Auxiliary Control Module Name 3	Data10	16 UC	*Pointer into the Control Module Table
Auxiliary Control Module Name 4	Data11	16 UC	*Pointer into the Control Module Table

Equipment Table Field	Std. Field	Format	Comment
Manual Weigh-In Operator Action Control Module Name	Data12	40 UC	*Pointer into the Control Module Table
Manual Weigh-Out Operator Action Control Module Name	Data13	40 UC	*Pointer into the Control Module Table
Auxiliary 1 Operator Action Control Module Name	Data14	40 UC	*Pointer into the Control Module Table
Auxiliary 2 Operator Action Control Module Name	Data15	40 UC	*Pointer into the Control Module Table
Auxiliary 3 Operator Action Control Module Name	Data16	40 UC	*Pointer into the Control Module Table
Auxiliary 4 Operator Action Control Module Name	Data17	40 UC	*Pointer into the Control Module Table

C.2.3. Equipment Table Q.i Dynamic Weighing Records (EQQ)

The Q.i Phase Logic uses the DYNAMIC_WEIGHING Records in the Equipment Table to help control the Material Transfers in the Scale Units and Flow Meters for more accurate feeds. Scale Units require all data fields in this record. The Data fields marked "*** Flow Meter also" are applicable to Flow Meters as well as scales.

Table C-4: Equipment Table Q.i Dynamic Weighing Records

Equipment Module Table Field	Std. Field	Format	Comment
Dynamic Weighing Record ID	GUID	GUID	SQL creates unique global ID.
Equipment Name	KEY	16 UC	1 - 198
Equipment Description	Description	40 UC	
Record Type	Data1	16 UC	DYNAMIC_WEIGHING *** Flow Meter also
Stable Scale Time	Data2	16 UC	This is the number of seconds to wait for a stable scale reading before returning an "Unstable Scale" failure status. Range is 5-10 seconds. *** Flow Meter also
Feed Override Time	Data3	16 UC	This time is in seconds. Q.i sets a status indicating that the Material Transfer is within the feed override time. Any external logic (such as Slow Stem Timer or an operator changing modes) must not remove the permissive on the enabling logic that is controlling the Final Control Element (FCE) during this time. It prevents something other than the Fast-Cut-Off from closing the FCE, which might cause the Q.i to develop erroneous data for subsequent update of its constants. Default = 20 seconds *** Flow Meter also
Minimum Slow Step Time	Data4	16 UC	The Q.i algorithm computes a "step slow" value. If the computed value is less than the minimum specified here, Q.i uses the minimum instead. Typical range is 30-60 seconds. *** Flow Meter also

Equipment Module Table Field	Std. Field	Format	Comment
Overlap Feed Alone Time	Data5	16 UC	An overlapped feed must feed alone this time before cutoff, in seconds. Typically, it is 10-20 seconds.
Overlap Time Tolerance	Data6	16 UC	Additional time in seconds that Q.i will wait before starting the Primary Feed beyond the (expected time to complete for the Secondary Feeds + the Overlap Feed Alone Time specified for the Primary Feed). This parameter allows the Q.i user to adjust the system for variations in the Secondary Feed times. A larger parameter value allows the system to account for larger variations in the Secondary Feed times, so that the Q.i will NOT generate an Overlap Feed error when a Secondary Feed takes a longer than expected time to complete.
Zero Flow Threshold	Data7	16 UC	Flow rate below which the system assumes zero flow. Typically, it is sized 0.001%-0.01% of Max Scale Capacity/second. When this value < 0, Q.i task uses absolute Value for zero flow and aborts Drain Timer at zero flow. This feature allows the user to set a long drain timer and the system to terminate a drain when the drain is complete but before the drain timer is expired. Proper use of this feature may allow the user to avoid prematurely terminating a batch due to and unstable scale or waiting too long for the drain to complete. *** Flow Meter also
Unstable Device Flow Threshold	Data8	16 UC	Flow rate above which Q.i generates a "Noisy Scale" condition when waiting for a stable scale reading. Typically, it is 0.005%-0.05% of Max Scale Capacity per second, but it Must be larger than Minimum Flow. *** Flow Meter also
Minimum Add	Data9	16 UC	The smallest amount of material the system will attempt to add. Typically, it is 0.01%-1% of Max Scale Capacity. *** Flow Meter also
Maximum Unit Size in Weight and Units	Data10	40 UC	This is the capacity size of a Scale Unit, e.g., 1000 kg
Dump Trip Point	Data11	40 UC	Q.i considers Dump To Empty complete below this level. Typically, it is 0.001%-0.01% of Max Unit Size, but it must be less than smallest batch size for the Unit. In a "dump to empty", the Q.i uses this value to determine when a "dump to empty" is complete. After this point, Q.i keeps the FCE energized until the "drain time" expires.
Min Q.i Flow Rate Threshold	Data12	40 UC	Q.i starts to apply the predictive algorithm when measured flow exceeds this value. Typically, it is 0.1% of Max Unit Size, but it must be larger than Minimum Flow. Q.i sets the setpoint target = SP – Spill until the flow rate reaches this value. *** Flow Meter also
Current Zero	Data13	40 UC	Q.i ONLY. Q.i calculates this value after a "Dump to Empty" operation; it sets the value to the actual scale weight when it algorithmically detects the zero. This helps

Equipment Module Table Field	Std. Field	Format	Comment
			track a "heel" buildup in the vessel.

C.2.4. Equipment Table Operator Console Records (EQO)

The OPERATOR_HOLD records in the Equipment Table define the physical device to specify which Operator Console or Control Module Discrete IO the operator must use to operate on a PHASE_OPER_HOLD Recipe Phase.

Table C-5: Equipment Table Operator Console Records

Equipment Module Table Field	Std. Field	Format	Comment
Operator Hold Module (EM) Record ID	GUID	GUID	SQL creates unique global ID.
EM Name	KEY	16 UC	1 - 198
EM Description	Description	40 UC	
Record Type	Data1	16 UC	OPERATOR_HOLD
Node Number	Data2		Cluster Node Number 1 – 20
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Operator Action Control Module Name	Data4	16 UC	*Pointer into the Control Module Table
Operator Console	Data5	16 UC	0 = No Console HMI 1 = Local Console HMI 2 = Master Console HMI
Supervisory Action Control Module Name	Data6	16 UC	*Pointer into the Control Module Table
Supervisory Status Control Module Name	Data7	16 UC	*Pointer into the Control Module Table

C.3. Control Module Tables (A5)

- In all the Control Module tables included here, fields marked "information only" are also in the Equipment Table, but provide helpful information to a user who is browsing these records.

C.3.1. Auxiliary Control Records (CMA)

The Auxiliary Control Records in the Control Module Table define the physical Discrete I/O for an Auxiliary Equipment Phase, such as mix, heat, cool or react.

The IND780batch uses the Scale Unit Equipment Records in the Equipment Table to select the appropriate Auxiliary Control Module.

Table C-6: Control Module Auxiliary Control Records

Control Module Table Field	Std. Field	Field Format	Comment
Auxiliary Control Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.

Control Module Table Field	Std. Field	Field Format	Comment
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	AUX_CONTROL
Node Number	Data2		Cluster Node Number 1 – 20 (information only; CM elements reside in same terminal as Equipment Module)
Scale Number	Data3		Scale Number 1– 5; 0 = None (information only)
Auxiliary Control On/Off	Data4	16 UC	Discrete Output Shared Data name enables an auxiliary function.
Permissive Interlock	Data5	16 UC	Discrete Input Shared Data name allows external logic to enable or disable the auxiliary control.
Feedback Switch	Data6	16 UC	Discrete Input Shared Data name provides Feedback to indicate when the auxiliary control is on.
Alarm	Data7	16 UC	Discrete Output Shared Data name turns on an alarm.
Feedback Switch Timer	Data8	16 UC	Length of time in milliseconds to wait for Feedback Switch input to come on after turning on the Auxiliary Control output. Default is 2000 milliseconds.

C.3.2. Scale Control Records (CMS)

The Scale Control Module Records in the Control Module Table define the Discrete I/O control parameters for a Scale Batching Unit or Scale Storage Tank.

When a Scale supports both Weigh-In and Weigh-Out, there is a separate Scale Control Module for each, which a Scale Unit Record in the Equipment Table must identify. For analog scales and PDX POWERCELL scales, there is a single high-speed Discrete Output on the Scale Option Board. The Data4 default value selects the high-speed Discrete Output on the Scale Option Board as the FCE, and Data11 defines a Discrete Output (weigh-in select) for switching the high-speed FCE between weigh-in and weigh-out operations. Both Scale Control Modules must define the common FCE and the switching control when sharing them.

Table C-7: Control Module Scale Control Records

Control Module Table Field	Std. Field	Field Format	Comment
Scale Control Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 -1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	SCALE_CONTROL
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only; CM elements reside in same terminal as Equipment Module)
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Final Control Element (FCE) for	Data4	16 UC	Discrete Output Shared Data name turns on and off

Control Module Table Field	Std. Field	Field Format	Comment
Fine Feed			feed control. For an Analog Scale, a default value of "SCLBRD" in this field selects the high-speed Discrete Output FCE located on the corresponding Analog Scale Board. The Analog Scale Board does the setpoint weight comparisons at 91.5 hertz for setting this Discrete Output FCE. This Discrete Output is an "open collector" where external hardware logic must supply the voltage. If you specify any other Discrete Output FCE, the setpoint weight comparison occurs at a much slower rate of 20 hertz. In order to use this high-speed FCE for both weigh-in and weigh-out operations, you must also specify the Discrete Output name in Data11. The "SCLBRD" value selects the Discrete Output on the PDX Option Board for the first logical PDX scale.
Feedback Switch	Data5	16 UC	Discrete Input Shared Data name provides Feedback to indicate when the valve is open.
Permissive Interlock	Data6	16 UC	Discrete Input Shared Data name enables external logic to enable or disable the feed.
Alarm	Data7	16 UC	Discrete Output Shared Data name turns on an alarm.
Fast-Feed Setpoint Control Element	Data8	16 UC	Discrete Output Shared Data name turns on and off two-speed fast feed control.
Gate/Pump/Valve Control #1 (GPV1)	Data9	16 UC	Discrete Output Shared Data name controls gate/pump/valve separately from the FCE, if needed. There are two possible Discrete Outputs, GPV1 and GPV2. If the user specifies both GPV1 and GPV2, IND780 turns on GPV1 first and GPV2 second, possibly after a specified delay or feedback switch input.
Concurrent or Independent Fast Feed Control	Data10	16 UC	"None", "Concurrent", or "Independent" Fast Feed Control
Weigh-In/Weigh-Out Selector (only valid when Data4 is set to default = SCLBRD)	Data11	16 UC	Discrete Output Shared Data name allows dynamic switching of the default high-speed FCE in Data4 so that it can work in either a weigh-in or weigh-out operation. A value of 1 in the Discrete Output selects a Weigh-In operation; a value of 0 selects a Weigh-Out operation. External hardware logic must "AND" the Scale Option Board Discrete Output and this Data11 Discrete Output to provide the FCE control for either the weigh-in or the weigh-out operation.
Gate/Pump/Valve Control #2 (GPV2)	Data12	40 UC	Discrete Output Shared Data name controls gate/pump/valve separately from the FCE, if needed. There are two possible Discrete Outputs, GPV1 and GPV2. If the user specifies both GPV1 and GPV2, IND780 turns on GPV1 first and GPV2 second, possibly after a specified delay or feedback switch input.

Control Module Table Field	Std. Field	Field Format	Comment
GPV2 delay time	Data13	40 UC	Delay time after turning on GPV1 before the Scale Control turns on GPV2 in milliseconds. If the delay time is 0, the Scale Control does not delay before turning on GPV2.
GPV2 feedback switch	Data14	40 UC	Discrete Output Shared Data name of a feedback switch that the Scale Control waits for after turning on GPV1 before turning on GPV2, if needed.

Many pump systems include a pump that must not be allowed to run dry, or that cannot be allowed to deadhead, because damage can occur to the pump and/or to the piping as a result. In other systems, there may be a flow meter or some other element that cannot be allowed to become un-immersed. The following options are provided for pump control:

Table C-8: GPV1 and GPV2, ON

	Standard Function	Keep Element Immersed	Prevent Deadhead or Dry Running Pump
Pump Output 1 - ON (GPV1)	Turn on Pump	Turn on Pump	Open Valve
Timer Complete or Enable Input - ON (Delay)		Allow pressure to build	Allow pressure to equalize
Pump Output 2 - ON (GPV2)		Open Valve	Turn on Pump

The same conditions are taken into account when shutting down the feed system:

Table C-9: GPV1 and GPV2, OFF

	Standard Function	Keep Element Immersed	Prevent Deadhead or Dry Running Pump
Pump Output 1 - OFF (GPV1)	Turn off Pump	Close Valve	Turn off Pump
Timer Complete or Enable Input - OFF (Delay)		Allow pressure to build	Allow pressure to equalize
Pump Output 2 - OFF (GPV2)		Turn off Pump	Close Valve

C.3.3. Transport Header Records (CMT)

A set of valves and pipes called a Transport Header may be required to distribute a measured amount of material to one of several Scale Equipment Units. A Transport Header may also be used to select a measured amount of material from one of several storage tanks for input to one Scale Equipment Unit.

The Transport Header records in the Control Module Table define the discrete I/O needed for selecting a Transport Header Path. One discrete I/O is required for each path.

The IND780batch uses the Scale Unit Equipment Records in the Equipment Table to select the appropriate Transport Header Control Module.

Table C-10: Control Module Transport Header Records

Control Module Table Field	Std. Field	Field Format	Comment
Transport Header Control	GUID	GUID	SQL creates unique global ID.

Control Module Table Field	Std. Field	Field Format	Comment
Module (CM) Record ID			
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	TRANSPORT_HEADER
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only; CM elements reside in same terminal as Equipment Module)
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Transport Header Path 1	Data4	16 UC	Discrete Output Shared Data name
Transport Header Path 2	Data5	16 UC	Discrete Output Shared Data name
Transport Header Path 3	Data6	16 UC	Discrete Output Shared Data name
Transport Header Path 4	Data7	16 UC	Discrete Output Shared Data name
Transport Header Path 5	Data8	16 UC	Discrete Output Shared Data name
Transport Header Path 6	Data9	16 UC	Discrete Output Shared Data name
Transport Header Path 7	Data10	16 UC	Discrete Output Shared Data name
Transport Header Path 8	Data11	16 UC	Discrete Output Shared Data name
Transport Header Path 9	Data12	40 UC	Discrete Output Shared Data name
Transport Header Path 10	Data13	40 UC	Discrete Output Shared Data name
Transport Header Path 11	Data14	40 UC	Discrete Output Shared Data name
Transport Header Path 12	Data15	40 UC	Discrete Output Shared Data name
Transport Header Path 13	Data16	40 UC	Discrete Output Shared Data name
Transport Header Path 14	Data17	40 UC	Discrete Output Shared Data name

C.3.4. Transport Header 1 Records (CMT1)

If a Transport Header needs to select more than 14 materials, the TRANSPORT_HEAD_1 is needed, to identify the Discrete I/O path for these additional materials.

Table C-11: Control Module Transport Header 1 Records

Control Module Table Field	Std. Field	Field Format	Comment
Transport Header Control Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	TRANSPORT_HEAD_1
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only; CM elements reside in same terminal as Equipment Module)
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Transport Header Path 15	Data4	16 UC	Discrete Output Shared Data name
Transport Header Path 16	Data5	16 UC	Discrete Output Shared Data name

Control Module Table Field	Std. Field	Field Format	Comment
Transport Header Path 17	Data6	16 UC	Discrete Output Shared Data name
Transport Header Path 18	Data7	16 UC	Discrete Output Shared Data name
Transport Header Path 19	Data8	16 UC	Discrete Output Shared Data name
Transport Header Path 20	Data9	16 UC	Discrete Output Shared Data name
Transport Header Path 21	Data10	16 UC	Discrete Output Shared Data name
Transport Header Path 22	Data11	16 UC	Discrete Output Shared Data name
Transport Header Path 23	Data12	40 UC	Discrete Output Shared Data name
Transport Header Path 24	Data13	40 UC	Discrete Output Shared Data name
Transport Header Path 25	Data14	40 UC	Discrete Output Shared Data name
Transport Header Path 26	Data15	40 UC	Discrete Output Shared Data name
Transport Header Path 27	Data16	40 UC	Discrete Output Shared Data name
Transport Header Path 28	Data17	40 UC	Discrete Output Shared Data name

C.3.5. Transport Header 2 Records (CMT2)

If a Transport Header needs to select more than 28 materials, the TRANSPORT_HEAD_2 is needed, to identify the Discrete I/O path for these additional materials.

Table C-12: Control Module Transport Header 2 Records

Control Module Table Field	Std. Field	Field Format	Comment
Transport Header Control Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	TRANSPORT_HEAD_2
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only; CM elements reside in same terminal as Equipment Module)
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Transport Header Path 29	Data4	16 UC	Discrete Output Shared Data name
Transport Header Path 30	Data5	16 UC	Discrete Output Shared Data name
Transport Header Path 31	Data6	16 UC	Discrete Output Shared Data name
Transport Header Path 32	Data7	16 UC	Discrete Output Shared Data name
Transport Header Path 33	Data8	16 UC	Discrete Output Shared Data name
Transport Header Path 34	Data9	16 UC	Discrete Output Shared Data name
Transport Header Path 35	Data10	16 UC	Discrete Output Shared Data name
Transport Header Path 36	Data11	16 UC	Discrete Output Shared Data name
Transport Header Path 37	Data12	40 UC	Discrete Output Shared Data name
Transport Header Path 38	Data13	40 UC	Discrete Output Shared Data name

Control Module Table Field	Std. Field	Field Format	Comment
Transport Header Path 39	Data14	40 UC	Discrete Output Shared Data name
Transport Header Path 40	Data15	40 UC	Discrete Output Shared Data name
Transport Header Path 41	Data16	40 UC	Discrete Output Shared Data name
Transport Header Path 42	Data17	40 UC	Discrete Output Shared Data name

C.3.6. Operator Action Records (CMO)

The OPERATOR_ACTION records in the Control Module Table define the physical Discrete I/O for the Batch Engine to communicate to an operator that the Recipe requires a manual operation. The operator can use a Discrete I/O to initiate the batching action. The operator can also use a Discrete I/O to indicate to the system that the manual operation is complete.

Table C-13: Control Module Operator Action Records

Control Module Table Field	Std. Field	Field Format	Comment
Operator Action Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	OPERATOR_ACTION
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only)
Scale Number	Data3	16 UC	Scale Number 1– 5; 0 = None (information only)
Operator Alert Light	Data4	16 UC	Output Discrete IO Shared Data name alerts Operator that the Recipe calls for a manual operation.
Operator Action Button	Data5	16 UC	Input Discrete IO Edge Trigger - Shared Data name executes the operator action in the Batch system; specifically, acknowledges Operator Hold Phase.
Operator Feedback Switch	Data6	16 UC	Input Discrete IO Edge Trigger - Shared Data name provides operator feedback to the system to indicate when the manual feed operation is complete. This trigger may also abort the Drain Timer at the completion of an automatic feed when you enable this feature in the Batch system. This allows the user to set a long drain timer and the operator to terminate a drain when the drain is complete but before the drain timer is expired. Proper use of this feature may allow the user to avoid prematurely terminating a batch due to and unstable scale or waiting too long for the drain to complete.
Alarm	Data7	16 UC	Output Discrete IO Shared Data name turns on an alarm when the system detects an error in the operator action.
Manual Jog Control	Data8	16 UC	Input Discrete IO Edge Trigger allows operator manually to enable FCE in order to enable manual control of the jogging in a weigh-in or weigh-out operation.
Manual Jog Complete	Data9	16 UC	Input Discrete IO Edge Trigger, indicating that Manual Jog is complete

Control Module Table Field	Std. Field	Field Format	Comment
Operator Action Console	Data10	16 UC	0 = No Console Display 1 = Local Console Custom Display 2 = Master Console Custom Display 3 = Local Console Small Bargraph 4 = Local Console Medium Bargraph 5 = Local Console Large Bargraph 6 = Local Console Small Cross-Hairs 7 = Local Console Medium Cross-Hairs 8 = Local Console Large Cross-Hairs
Off Tolerance	Data11	16 UC	Output Discrete IO indicating Feed Off Tolerance. Turned Off at beginning of feed. Turned on at end of feed.
Under Tolerance	Data12	16 UC	Output Discrete IO indicating Feed Under Tolerance. Turned Off at beginning of feed. Turned on at end of feed.
Over Tolerance	Data13	40 UC	Output Discrete IO indicating Feed Over Tolerance. Turned Off at beginning of feed. Turned on at end of feed.
Weigh-In Complete	Data14	40 UC	Output Discrete IO indicating Feed Weigh-In Complete. Turned Off at beginning of feed. Turned on at end of feed.
Weigh-Out Complete	Data15	40 UC	Output Discrete IO indicating Weigh-Out Complete. Turned Off at beginning of feed. Turned on at end of feed.
Reserved	Data16	40 UC	
Reserved	Data17	40 UC	

C.3.7. Supervisory Action Records (CMA)

The SUPERVISR_ACTION records in the Control Module Table define the physical Discrete Inputs to the Batch Engine for an operator to manually initiate a batching operation. The operator uses a Discrete Input to initiate the Batching Action.

Table C-14: Control Module Transport Supervisory Action Records

Control Module Table Field	Std. Field	Field Format	Comment
Supervisor Action Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	SUPERVISR_ACTION
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only)
Start/Resume Batch Button	Data3	16 UC	Discrete Input - Edge
Pause Batch Button	Data4	16 UC	Discrete Input - Edge
Abort Batch Button	Data5	16 UC	Discrete Input -Edge
Set Auto Mode Button	Data6	16 UC	Discrete Input - Edge
Set Semi-Auto Mode Button	Data7	16 UC	Discrete Input - Edge
Set Manual Mode Button	Data8	16 UC	Discrete Input - Edge

Control Module Table Field	Std. Field	Field Format	Comment
Acknowledge (Silence) Alarm	Data9	16 UC	Discrete Input - Edge
Batch Run Permissive	Data10	16 UC	Discrete Input - Level. If defined, do not start a batch if signal is low; if batch is running, pause batch.
Hold At End Button	Data11	16 UC	Discrete Input - Edge
	Data12		
	Data13		
	Data14		
	Data15		
	Data16		
	Data17		

C.3.8. Supervisory Status Records (CMS)

The SUPERVISR_STATUS records in the Control Module Table define the physical Discrete Outputs for the Batch Engine to use discrete status lights to communicate to an operator the status of the Batch Operation.

Table C-15: Control Module Supervisory Status Records

Control Module Table Field	Std. Field	Field Format	Comment
Supervisor Action Module (CM) Record ID	GUID	GUID	SQL creates unique global ID.
CM Name	KEY	16 UC	1 - 1999
CM Description	Description	40 UC	
Record Type	Data1	16 UC	SUPERVISR_STATUS
Node Number	Data2	16 UC	Cluster Node Number 1 – 20 (information only)
Batch Alarm Status Light	Data3	16 UC	Discrete Output
Batch Running Status Light	Data4	16 UC	Discrete Output
Batch Complete Status Light	Data5	16 UC	Discrete Output
Batch Ready Status Light	Data6	16 UC	Discrete Output
Batch Paused/Holding Status Light	Data7	16 UC	Discrete Output
Batch Aborting Status Light	Data8	16 UC	Discrete Output
Auto Mode Status Light	Data9	16 UC	Discrete Output
Semi-Auto Mode Status Light	Data10	16 UC	Discrete Output
Manual Mode Status Light	Data11	16 UC	Discrete Output
Operator Attention	Data12	16 UC	Discrete Output
	Data13		
	Data14		
	Data15		

Control Module Table Field	Std. Field	Field Format	Comment
	Data16		
	Data17		

C.4. Material Path Tables (A6)

C.4.1. Material Path Table Header Record

The MATPATH_HEADER record in the Material-Path Table has the version number and the creation date for the Material-Path Table.

Table C-16: Material Path Table Header Record

Material-Path Table Field	Std. Field	Format	Comment
Material-Path Header Record ID	GUID	GUID	SQL creates unique global ID.
Material-Path Name	KEY	16 UC	MATPATH_HEADER
Material-Path Description	Description	40 UC	
Record Type	Data1	16 UC	MATPATH_HEADER
Version Number & Validation/Status	Data2	16 UC	Format "X Y" where X = Version Number 1- 999999 Y = Validation/Status 1=Released, 2=Testing, 3=Development
…			
Author	Data16	40 UC	
Creation Date & Time	Data17	40 UC	YYYY/MM/DD HH:MM:SS

C.4.2. Material Path Q.i Setup Records (MPQ)

Table C-17: Material Path Q.i Setup Records

Material Path Table Field	Std. Field	Format	Comment
Material-Path Record ID	GUID	GUID	SQL creates unique global ID.
Material-Path Name	KEY	16 UC	1 - 999
Material-Path Description	Description	40 UC	
Record Type	Data1	16 UC	Q.I_SETUP

Material Path Table Field	Std. Field	Format	Comment
Q.i Feed Algorithm	Data2	16 UC	Q.i Spill Only, Gain In Weight = 0 Q.i Spill Only, Loss In Weight = 1 Q.i K1 algorithm, Gain In Weight = 2 Q.i K1 algorithm, Loss In Weight = 3 Q.i K2 algorithm, Gain In Weight = 4 Q.i K2 algorithm, Loss In Weight = 5 Q.i Automatic Dump to Empty = 6 Q.i Hand Add = 7 Q.i Hand Loss In Weight = 8 Q.i Hand Dump To Empty = 9 Q.i Hand Add Pre-weighed Material = 10
Destination Equipment Name in Equipment Table	Data3	16 UC	*Pointer into the Equipment Table = 1-198 The material goes to the Destination Equipment that is a Scale Unit. At beginning of the feed, the Q.i finds the weight in the Destination Scale Unit to determine if this Material Feed will cause an overflow in the destination channel. At the end of the feedings, the Q.i determines if the loss in weight in the source channel matches the gain in weight in the destination unit. If the Destination Equipment is not a Scale Unit, Q.i disables Unit Verification and Batch Count Checking. There may be multiple concurrent feeds into the destination channel. Destination Channel = "OUT_OF_CLUSTER" indicates that the Destination is outside of this cluster.
Equipment Name for material flow control	Data4	16 UC	*Pointer into the Equipment Table = 1 - 198 Equipment that physically controls feeding material this material. It could be a scale or a flow meter.
Path Number in Transport Header	Data5	16 UC	The Path Number in the Transport Header that the Equipment Module uses to select the flow path for the material, if required.
Slow Step Timer Factor	Data6	16 UC	For "Automatic" Feed Algorithms, Q.i calculates the Slow Step Time Timeout time as Factor*(target / average flow). The factor is typically set as 1.5, but is adjustable on a material basis. For "Hand" Feed Algorithms (types 7, 8, 9), the Slow Step Timer Factor is the number of minutes before the Slow Step Timeout occurs. If SST Factor< 0, Q.i uses the absolute value for SST Factor, but generates alarm only when SST expires.
Minimum Open Time	Data7	16 UC	Q.i does not apply the spill compensation for this time in seconds immediately following control device opening. If = 0, there is no minimum time. A feed must be active this minimum time in seconds before Q.i considers it "successful" and updates its Q.i feed parameters. This check guarantees that the flow rate is valid before Q.i updates the Q.i parameters for a Material Path.

Material Path Table Field	Std. Field	Format	Comment
Drain Time	Data8	16 UC	This is the time in seconds that the system will wait for material to drain into a vessel after feed is complete and before testing for material delivery tolerance.
Average Flow Rate Low Limit	Data9	16 UC	This is the lower alarm limit for the Average Flow Rate "A". It is typically set at 50% of the flow rate, in weight or volume units/second. Value may be negative.
Average Flow Rate High Limit	Data10	16 UC	This is the upper alarm limit for the Average Flow Rate "A". It is typically set at 150% of the Flow Rate, in weight or volume units/second.
Average Spill Low Limit	Data11	16 UC	This is the lower alarm limit for the Average Spill "AA". It is typically set at 50% of the average spill, in weight or volume units. Value may be negative.
Average Spill High Limit	Data12	40 UC	This is the upper alarm limit for the Average Spill "AA". It is typically set at 150% of the average spill, in weight or volume units.
Algorithm Update Parameter	Data13	40 UC	Q.i uses this value in calculation of Average Flow Rate "A", Average Spill "AA", and Cutoff Constants "B", "BB", and "C". It controls how quickly the system responds to a change in operating conditions. Range is 0.0–1.0. You use larger values (0.6-0.8) for systems that have run consistently batch after batch, while you should use smaller values (0.1-0.3) for systems whose material transfer flow characteristics change frequently. Default value is 0.2.
Flow Rate Filter Sample Period	Data14	40 UC	This value determines specifies the time, from 1 to 60 seconds, over which the IND780 calculates the rate. For lower values, Q.i responds more quickly to changes in rate. For larger values, the rate value changes more smoothly.
Max Flow Rate Alarm Value	Data15	40 UC	Flow rates above this value generate an alarm and terminate the feed. Value = 0 turns off alarm checking. Value < 0 generates alarm when flow rate reaches greater than absolute value of flow rate value but does not terminate feed.
Fast Feed Cutoff Weight	Data16	40 UC	In a two-speed feed system, this is the cutoff weight for the fast-feed. It is the "dribble" weight relative to the end of the feed where the fast-feed is cutoff. A value is 0 disables the two-speed feed and the entire feed proceeds at the slow feed. The weight value is a floating point number.
Auto-Jog Time Parameters	Data17	40 UC	Field 1: Mode 0=disabled, 1=Jog to Tolerance, 2=Jog To Target Field 2 : Jog On Time in milliseconds Field 3: Jog Off Time in milliseconds (three fields, separated by one or more blank spaces)

C.4.3. Material Path Fill Setup Records (MPF)

Table C-18: Material Path Table Fill Setup Records

Material Path Table Field	Std. Field	Format	Comment
Material-Path Record ID	GUID	GUID	SQL creates unique global ID.
Material-Path Name	KEY	16 UC	1 - 999
Material-Path Description	Description	40 UC	
Record Type	Data1	16 UC	FILL_SETUP
Feed Type	Data2		1=Weigh-In 2=Weigh-Out 3=Dump to Empty
Destination Equipment Name in Equipment Table	Data3	16 UC	*Pointer into the Equipment Table 1. The material goes to this Destination Equipment that is a Scale Unit. 2. Destination Channel = "OUT_OF_CLUSTER" indicates that the Destination is outside of this cluster.
Equipment Name for material flow control	Data4	16 UC	*Pointer into the Equipment Table Equipment that physically controls feeding material this material. It could be a scale or a flow meter.
Path Number in Transport Header	Data5	16 UC	The value is the Path Number in the Transport Header that the Equipment Module uses to select the flow path for the material, if required.
Feed Type	Data6	16 UC	1 = Single-Speed, 2 = Fast-Feed
Number Samples Averaged For Spill Auto-Adjust	Data7	16 UC	1-9; 0 = Auto-Spill Adjust Disabled
Spill Adjustment Factor	Data8	16 UC	Percent of spill weight to use in spill auto-adjust. Legal values are 1– 99%.
Learn Mode Enabled	Data9	16 UC	0 = disabled, 1 = auto-learn when spill and fast-feed weight=0, 2 = learn on every feed
Learn Test Point	Data10	16 UC	Percentage of target weight to start learn mode. Values allowed are 10 – 90% in increments of 10.
Learn Mode Time	Data11	16 UC	Time the fast feed and / or slow feed will be turned on before the fine feed and / or spill are calculated
Fast-feed cutoff weight	Data12	16 UC	Fast Feed Cutoff Weight in weight and units e.g., 1000 kg
Low Flow Rate	Data13	40 UC	When the rate of flow falls below the Low Flow Rate during a feed, generate an operator alarm.
…			
Jog On Time	Data15	40 UC	Time jog output is turned on in auto-jog and manual-jog
Jog Off Time	Data16	40 UC	Time jog output is turned off in auto-job and manual-jog
Settle/Drain Timer	Data17	40 UC	For Weigh-In/Weigh-Out feeds, this is the time delay after cutoff before feed or jog operation is checked for completion in milliseconds. For dump-to-empty feed, this value is the amount time after hitting the dump trigger weight to leave valve open. It allows vessel to drain.

C.5. Batch Order Table (A7)

Table C-19 lists the elements of a record in a Batch Order table. Each comma-separated field contains data as indicated in the format column. In some cases, such as the order type, the character position is an important element in interpreting the field's contents.

Table C-19: Batch Order Table Fields Definition

Batch Order Table Field	Std. Field	Format	Comment
Batch Order Record ID	GUID	GUID	SQL creates a unique global ID
Batch Order Name (ID)	KEY	16	User creates this field that can be a customer ID or a unique system ID
Batch Order Description	Description	40	User creates this Batch ID field
Record Type	Data1	16	BATCH_ORDER
Batch Sequence #	Data2	16	Batch Order Sequence # is a ten digit decimal number followed by a 2-character Terminal ID. The Terminal ID is the first two characters of xs0106. IND780batch generates this field in the order that the operator or host enters new orders into the system.
Master Recipe Name	Data3	16	Points to an item in the Master Recipe Table User enters this field.
Current Control Recipe Name (ID)	Data4	16	IND780batch generates this field.
The following two rows contain the current status of the batch order			
Completion Status	Data5	16	Refer to Table C-40
Current/Final Batch Order Delivered Weight in Weight and Units	Data6	16	IND780batch generates this field. e.g., 1000 kg

Batch Order Table Field	Std. Field	Format	Comment
The following four rows determine batch order size			
Order Type	Data7	16	**Character 1 =** Order Scaling Type "W"= User specifies order size by a target weight. IND780batch automatically calculates Recipe Target Weight and number of recipe cycles. "#" = User specifies order size by number of recipe cycles and recipe rescaling values. **Character 2 =** Recipe Rescale type where "A" = Amount of recipe / order target **%** = Percent of targets "N" = Do NOT Rescale **Character 3** = Batch Campaign Type "V" - Vertical Campaign "H" - Horizontal Campaign **Character 4 =** Park Recipe Processing Mode, Recipe Processing Mode when operator puts order in Park "A" - Vertical Auto Mode "S" - Vertical Semi-Auto Mode "M" - Vertical Manual Mode "R" - Horizontal Auto Mode "Z" - Horizontal Semi-Auto Mode "H" - Horizontal Manual Mode **Character 5 =** Park Order Processing Mode, Order Processing Mode when operator puts order in Park "A" - Auto Mode "S" - Semi-Auto Mode
In Order Scaling Type 'W", enter Order Target Weight and Units. If Order Scaling Type '#' **and** Recipe Rescale Type 'A', enter Recipe Target Weight and Units. If Order Scaling Type ' #' **and** Recipe Rescale Type '%', enter Recipe Target % of Master Recipe Weight	Data8	16	User enters Order target weight and units e.g., 1000 kg User enters Recipe target weight and units e.g., 500 g User enters a % of the Master Recipe Weight e.g., 85
User Number of Master Recipe Cycles	Data9	16	User specifies number of Recipe Cycles for scaling type '#'. -1 indicates endless cycles. The maximum number of batches for a Horizontal Recipe is 99. The maximum number of batches for Vertical Recipe is 9999. Endless Batches (-1) applies only to Vertical Recipes.
Order Target Weight and Units	Data10	16	In Order Scaling Type "**#**", IND780batch calculates this field from # of cycles and Recipe Scaling. In Order Scaling Type "**W**", IND780batch sets the Order Target Weight from user specified order target weight. e.g., 1000 kg
Permanent Order	Data11	16	'PERM' indicates a Permanent Order. The user may run the order many times on the IND780. The user must delete the order.

Batch Order Table Field	Std. Field	Format	Comment
The following three rows describe the current recipe cycle in the batch order			
Total Number of Control Recipe Cycles Needed to Complete Batch	Data12	16	IND780batch generates this field.
Current Control Recipe Cycle Number so far In Current Order	Data13	16	IND780batch generates this field.
Target Weight and Units for current Control Recipe	Data14	40	e.g., 1000 kg
Horizontal Group Name	Data15	40	Name of the Horizontal Group, if any.
Batch Start Date & Time	Data16	40	IND780batch generates this field. YYYY/MM/DD HH:MM:SS
Batch End Date & Time	Data17	40	IND780batch generates this field. YYYY/MM/DD HH:MM:SS
A Batch Order may contain the following second record that contains optional information describing the order			
Batch Order Record ID	GUID	GUID	SQL creates unique global ID.
Batch Order Name (ID)	KEY	16 UC	User creates this field that can be a customer ID or a unique system ID
Batch Order Description	Description	40 UC	User creates this Batch ID field
Record Type	Data1	16 UC	BATCH_ORDER_2
Batch Sequence #	Data2 To Data12	16 UC	Batch Order Sequence # is a ten digit decimal number followed by a 2-character Terminal ID. The Terminal ID is the first two characters of xs0106. IND780 Batch generates this field in the order that the operator or host enters new orders into the system.
User Data Line #1	Data13	40 UC	Text data line for free-form information that the user can enter to describe order.
User Data Line #2	Data14	40 UC	Second text data line
User Data Line #3	Data15	40 UC	Third text data line
	Data16	40 UC	
	Data17	40 UC	

C.6. Master Recipe Tables (A3)

C.6.1. Master Recipe Table Record Types

The Master Recipe Table contains sixteen types of record, listed in Table C-20. Each of these types is detailed in the following sections. Phases can be manual, automatic or semi-automatic.

Table C-20: Master Recipe Table Record Types

Record Type	Explanation
MR_TABLE_HEADER	The version number and the creation date for the entire Master Recipe Table.
RECIPE_HEADER	Administrative and summary information for an individual Master Recipe.
RECIPE_RESOURCES	Defines the recipe resources that the Recipe needs for its exclusive use during the recipe run.
PHASE_UNIT_PROC	Defines an ordered set of phases that a single unit carries to completion. Multiple Unit Procedures can run concurrently within a recipe.

Record Type	Explanation
PHASE_AUXILIARY	Describes the Auxiliary Process Phases.
PHASE_MATL_XFER	Describes Material Transfer Phases.
PHASE_MANUAL	Describes Manual Phases.
PHASE_OPER_HOLD	Temporarily holds the recipe processing and may require the operator to make a data entry.
PHASE_WT_CHECK	Phase record – verifies that specified weight is on a scale.
PHASE_CONDITION	Phase record – allows the recipe to test a batch variable and make a decision based on the value of the variable.
PHASE_GOTO	Allows the recipe to branch to a different step in the recipe.
PHASE_COMM	Phase record – generates communication messages that can give the status or state of the recipe processing.
PHASE_NOOP	An empty phase that is a placeholder in the recipe primarily to facilitate editing of the recipe.
PHASE_END_PROC	Phase record – marks the last record of a Unit Procedure.
PHASE_END_RECIPE	Phase record – marks the last record of the Recipe.
HORIZONTAL_START	Phase record – identifies the start of a Horizontal Group
HORIZONTAL_END	Phase record – identifies the end of a Horizontal Group

C.6.2. Recipe Table Record Structures

C.6.2.1. Important Note on Data Storage

When a recipe temporarily stores data from the Recipe to Shared Data, it is **strongly** recommended that the recipe use the ar0400 Shared Data block for data storage:

1. The ar0400 block resides in BRAM, so if there is a power cycle during the operation of the recipe, the system will protect the data from being destroyed. After power recovery, the recipe can safely access the data.
2. The ar0400 block format type is UNICODE string data, which is compatible with the format that the Batch system stores all its other data.
3. Storing the data in the one ar0400 block localizes the storage of data from the recipe.
4. The ar0400 block contains 50 string fields for storing data, which is more than enough for almost all recipes.

C.6.2.2. Important Note on Parking Recipes

If a running recipe is parked and later restarted, there is no guarantee that data temporarily stored in Shared Data will still be available, especially if another recipe has been run since the original recipe was parked. Therefore, if a recipe needs to Park and recover stored data, it should use the **Batch Variables.**

C.6.2.3. Master Recipe – Table Header

Table C-21: Master Recipe Table Header Record Structure

Record Field	Std. Field	Format	Comment
Master Recipe Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name for the Master Recipe
Description	Description	40	Description of the recipe – e.g., its function
Record Type	Data1	16	MT_TABLE_HEADER

Record Field	Std. Field	Format	Comment
Version Number & Validation/Status	Data2	16	Format "X Y" where X = Version Number 1- 999999 Y = Validation/Status 1=Released, 2=Testing, 3=Development
	Data3 – Data 15		12 null fields
Author	Data16	40	Name of the recipe's author.
Creation Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.6.2.4. Master Recipe – Recipe Header

Table C-22: Master Recipe Table Header Record Structure

Record Field	Std. Field	Format	Comment
Master Recipe Header Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name for the Master Recipe
Description	Description	40	Description of the recipe
Record Type	Data1	16	RECIPE_HEADER
Version Number & Validation/Status	Data2	16	Format "X Y" where X = Version Number 1- 999999 Y = Validation/Status 1=Released, 2=Testing, 3=Development
Recipe Target Weight	Data3	16	Weight of the material that the recipe produces when run at the 100% in Weight and Units e.g. 2500 g
			Before the recipe starts, Batch Processing tests to determine if the recipe will overflow any vessel, using the target weights in the material-transfer phase steps of the recipe. If there are Batch Variables defining the target weight for manual or automatic feeds in the Recipe, uses the default value for the Batch Variable.To get the default value for the Batch Variables, the Batch Processing scans all Operator Hold Phases in the recipe with Batch Variable names attempting to match the Target Weight Batch Variable names. If the Operator Hold Phase has a default-value assigned for the Batch Variable, Batch Processing uses the default value+2% as the target weight for the feed when making pre-recipe overflow check. If Batch Processing does not find a matching Operator Hold Phase with a default value, it aborts the recipe and flags an error.
Minimum Rescaling Factor	Data4		The smallest rescaling factor that IND780batch can apply when running this Recipe (1-100%)
Maximum Rescaling Factor	Data5		The largest rescaling factor that the IND780batch can apply when running this Master Recipe

Record Field	Std. Field	Format	Comment
Delivered Weight Calculation Formula	Data6	40	This field defines how to calculate the Delivered Weight for the Recipe. The IND780 reports the calculated weight and compares it to the Recipe Target Weight in Data3.
			The symbols "1", "2", "3", and "4" represent the Equipment Modules for Scales 1, 2, 3, 4, respectively. "+" represents material fed into the Equipment Module "-" represents material fed out of an Equipment Module. The Delivered Weight is a simple symbolic statement using these symbols. **Examples** "+1" indicates that all the material fed into Equipment Module 1 is the Delivered Weight for the Recipe; "-2" indicates that all of the material fed out of Equipment Module 2 is the Delivered Weight for the Recipe; "-2 3" indicates that all of the material fed out of Equipment Module 2 and Equipment Module 3 is the Delivered Weight for the Recipe; Use a space character to separate the Equipment Module numbers. "+1 2 3" Indicates that all of the material fed into Equipment Module 1, Equipment Module 2 , Equipment Module 3 is the is the Delivered Weight for the Recipe.
Recipe Campaign Type	Data7	16	V = Vertical H = Horizontal
Convert Batch Original Master Recipe	Data8	16	In a "converted" Master Recipe, this is the Original Master Recipe from which "Convert Batch" function derives the new converted recipe. If this field exists, it is a temporary converted Master Recipe created by the "Convert Batch" function; the Batch Engine deletes it at the end of the Batch.
Convert Batch Recipe Data Source	Data9	16	The data source that the "Convert Batch" function uses when creating the converted recipe. When the "Convert Batch" function on the IND780 creates the converted recipe, it is the Control Recipe ID from the Batch History table.
Previously Delivered Weight	Data 10	16	The weight that was delivered during the execution of a previous Control Recipe, and recorded in this converted recipe, which was created by the "Convert Batch" function.
Additional Setup Information			
Dynamic Refill Correction Ingredient / Batch Order Rescaling Ingredient	Data12	16	mm = The phase step number in the main recipe. mm-uu = If the step is in a unit procedure, 'mm' indicates the unit procedure phase step in the main recipe and the 'uu' indicates the phase step number in the unit procedure.
			This is the primary recipe ingredient. When the delivered recipe weight is out of tolerance, the Batch Engine uses this material transfer phase to adjust the amount of material to refill dynamically in order to reach the desired weight.The Batch Order Processing may also use this ingredient for rescaling the batch order according to the availability of this ingredient.

Record Field	Std. Field	Format	Comment
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase.
			Batch Application displays a Graphical Image pointed to by this Name. / (forward slash) as the first character indicates this is a name for a graphical image. NULL indicates there are no Runtime Messages and no Graphical Image.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the recipe. NULL indicates no message.
Reserved	Data15	40	Null field
Author	Data16	40	Creator of the Master Recipe
Creation Date & time	Data17	40	YYYY/MM/DD HH:MM:SS

C.6.2.5. Recipe Resources

Table C-23: Recipe Resources Record Structure

Record Field	Std. Field	Format	Comment
Resource Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Description	Description	40	Description of the recipe – e.g., its function
Record Type	Data1	16	RECIPE_RESOURCES
Equipment Needed for Exclusive Use during Recipe Run	Data2	16	Points to an item in the Equipment Table
	Data3 – Data16		Null field
	Data17	40	Points to an item in the Equipment Table

C.6.3. Unit Procedure Phase

Table C-24: Unit Procedure Record Structure

Record Field	Std. Field	Format	Comment
Unit Procedure Record ID	GUID		SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Unit Procedure Description	Description	40	Description of this Unit Procedure – e.g., its function
Record Type	Data1	16	PHASE_UNIT_PROC
Master Recipe Name	Data2	16	Name for the Master Recipe
Step # in Master Recipe	Data3	16	Number assigned to this phase by the recipe.
Parallel/Sequential	Data4	16	SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "Parallel".
Unit Procedure Name	Data5		Name of the Unit Procedure.
Equipment Module Name	Data6	16	Pointer into the Equipment Table to a Scale Unit. The Destination Equipment Module for all Material Transfer Phases in the unit procedure must be this Scale Unit, and the Equipment Module for all Auxiliary Phases must be this Scale Unit.

Record Field	Std. Field	Format	Comment
Unit Procedure Instance	Data7	16	Instance number (1-4) of this unit procedure in the main recipe.

C.6.4. Auxiliary Phase

Table C-25: Auxiliary Phase Record Structure

Record Field	Std. Field	Format	Comment
Auxiliary Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this Phase
Record Type	Data1	16	PHASE_AUXILIARY
Master Recipe Name **or** Unit Procedure Name	Data2	16	Field contains the Master Recipe Name if this phase is a step in the Master Recipe, or the Unit Procedure Name if it is a step in a Unit Procedure.
Step # in Master Recipe or Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup Sequential/Span Phases	Data4	16	SEQ=0, PAR=1, SPAN=2 SEQ: Phase must complete before batch engine proceeds to next step in this recipe procedure. SPAN: Control runs for multiple subsequent phases.
Advance/Reverse			ADV=0, REV=1 When moving from Hold to Running state, either Advance to next step or Reverse to this step
Aux Type	Data5	16	1 = Timed Pulse (Data9) with an optional delay (Data8) before pulse 2 = Timed Pulse (Data9) after reaching low threshold weight (Data16) Pulse between low threshold and high threshold weights In Span Phases mode only, pulse with an optional delay after the start of Start Phase until time after completion of the Stop Phase
Equipment Module Name	Data6	16	Points to a scale unit in the Equipment Table
Auxiliary Control #	Data7	16	Number of Auxiliary Control Module (1-4) used to execute this phase
Delay Time Before Pulse	Data8	16	Delay Time Before Turning On Output in quarter-seconds. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Pulse On Time	Data9	16	For Aux Type 1 & 2, this is the total Output On Time in quarter-seconds. For Aux Type 4, the Output is On for this additional time after start of the Stop Phase in quarter-seconds. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.

Record Field	Std. Field	Format	Comment
Recipe Target Rescaling Factor for Pulse Start Condition	Data10	16	Proportional amount to adjust pulse start for change in Recipe Quantity For Aux Type 1 & 4, rescaling factor for Time Delay For Aux Type 2 & 3, rescaling factor for Low Threshold Weight
Recipe Target Rescaling Factor for Pulse Stop Condition	Data11	16	Proportional amount to adjust pulse stop conditions for change in Recipe Quantity For Aux Type 1, 2 & 4, this is the rescaling factor for timed pulse For Aux Type 3, this is the rescaling factor for High Threshold Weight
Start and Stop Span Numbers	Data12	16	When in Span Phases mode, this phase starts at the start of the Start phase and runs in parallel with the phases up to and including the Stop phase. All Phase Types are possible. If this phase resides in a Unit Procedure, then the Start and Stop numbers are the step numbers in the Unit Procedure. A space character separates the Start and Stop Phase numbers. The Stop Phase Number must be greater than the Start Phase Number.
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase. Batch Application displays a Graphical Image pointed to by this name. /(forward slash) as the first character indicates this is a name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
Maximum Phase Time	Data15	40	When set, this is the maximum time that this phase will run when none of the starting or terminating conditions occur, in quarter-seconds.
Low Threshold Gross Weight	Data16	40	Low Threshold Gross Weight for turning on pulse When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
High Threshold Gross Weight	Data17	40	High Threshold Gross Weight for turning off pulse When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.

C.6.5. Material Transfer Phase

Table C-26: Material Transfer Record Structure

Record Field	Std. Field	Format	Comment
Material Transfer Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of Master Recipe
Phase Description	Description	40	Description of this phase

Record Field	Std. Field	Format	Comment
Record Type	Data1	16	PHASE_MATL_XFER
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup Parallel/Sequential Advance/Reverse	Data4	16	 SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel". ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.
Q.i Overlap Field Type	Data5	16	Primary = 1, Secondary =2 , Aggregate = 3, or NO = 0
Q.i Group Number			Identifies the group of Primary and Secondary feeds that make up an overlapping feed. A value of 0 indicates that this NOT a Q.i overlapped feed request.
Q.i Number of Overlapping Feeds			"Number of Overlapping Secondary Feeds" fed into a Unit simultaneously with THIS Q.i PRIMARY Feed. Ony meaningful in a Primary Feed for a Scale Unit. The Material Path Table must indicate this is a GIW feed. Q.i turns on the FCE for the Primary Feed when it determines there will be enough time after the overlap completes to run the Q.i algorithm with the scale. A value = 0 indicates that this NOT a Q.i overlapped feed request.
			The Primary Feed appears first sequentially in the Recipe Phase Table, followed by entries for the Secondary Feeds. The phase steps must be "parallel" steps.
Reserved	Data6	16	Null field
Material Path Name	Data7	16	*Pointer to an item in the Material Path table.
Material Transfer Result Batch Variable Name	Data8	16	This data field starts with a **%** to indicate it is a data variable name. The Equipment Phase puts delivered weight of the phase into this variable.
Target Weight and Units	Data9	16	e.g., 1000 kg When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Reserved	Data10	16	
Positive Tolerance and Units	Data11	16	e.g., 10 kg This is the positive tolerance for the material feed. A value of 9999 disables the tolerance check. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.

Record Field	Std. Field	Format	Comment
Negative Tolerance and Units	Data12	16	e.g., 10 kg This is the negative tolerance for the material feed. A value of 9999 disables the tolerance check. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase. OR Batch Application displays a Graphical Image pointed to by this Name. **/** (forward slash) as the first character indicates this is a Name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message. The "Convert Batch" function places the previous delivered weight from this phase in the original running of Master Recipe in this field in the converted recipe.
…	Data15	40	Null field
Potency Adjustment Factor	Data16	40	Proportional amount to adjust Phase Target Weight for change in Material Potency. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Lot Number Variable Name	Data17	40	This data field starts with a **%** that is data variable name. The operator can enter the value for the variable in an Operator Hold Phase. An empty field indicates that there is no Lot Number data.

C.6.6. Manual Phase

Table C-27: Manual Transfer Record Structure

Record Field	Std. Field	Format	Comment
Manual Transfer Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	Key	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_MANUAL
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	1, 2, 3… is the step number in the Master Recipe or the Unit Procedure.
Phase Setup	Data4	16	
Parallel/Sequential			SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel".
Advance/Reverse			ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.

Record Field	Std. Field	Format	Comment
Reserved	Data5	16	Null fields
Reserved	Data6	16	
Material Path Name	Data7	16	Pointer to an item in the Material Path table
		The Material Path Table entry contains a pointer into the Equipment Table to a Scale Unit. If the Control Module Operator Action record that the Equipment Table Phase Type points to specifies Discrete IO, the system uses Discrete IO to alert the operator that the Recipe calls for a manual operation, enables the operator to initiate the operation, and indicates that the operation is complete.If the Control Module Operator Action record specifies a local Console HMI, the Task Expert HMI Application provides this Operator Hold Interface at the local Console. If the Control Module Operator Action record points to a Master Console HMI, the Task Expert Operator Hold Application provides this Operator Hold Interface at the Master Console.	
Material Transfer Result Batch Variable Name	Data8	16	This data field starts with a **%** to indicate it is a data variable name. The Equipment Phase puts delivered weight of the phase into this variable.
Target Weight and Units	Data9	16	Hand Add Materials are Pre-Weighed e.g., 1000 kg When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Reserved	Data10	16	
Positive Tolerance and Units	Data11	16	e.g., 10 kg This is the positive tolerance for the material feed. A value of 9999 disables the tolerance check. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Negative Tolerance and Units	Data12	16	e.g., 10 kg This is the negative tolerance for the material feed. A value of 9999 disables the tolerance check. When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase.
			Batch Application displays a Graphical Image pointed to by this Name. / (forward slash) as the first character indicates this is a Name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message. The "Convert Batch" function places the previous delivered weight from this phase in the original running of Master Recipe in this field in the converted recipe.
Material Verification Variable Name	Data15	40	This data field starts with a **%** that is data variable name. The operator can enter the value for the variable in an Operator Hold Phase. An empty field indicates that there is no Material Verification data.

Record Field	Std. Field	Format	Comment
Potency Adjustment Factor	Data16	40	Proportional amount to adjust Phase Target Weight for change in Material Potency When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Lot Number Variable Name	Data17	40	This data field starts with a **%** that is data variable name. The operator can enter the value for the variable in an Operator Hold Phase. An empty field indicates that there is no Lot Number data.

C.6.7. Operator Hold Phase

Table C-28: Operator Hold Record Structure

Record Field	Std. Field	Format	Comment
Operator Hold Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	Key	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_OPER_HOLD
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup	Data4	16	
Parallel/Sequential			SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel".
Advance/Reverse			ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.

Record Field	Std. Field	Format	Comment
Reason for Hold	Data5	16	1 Display Operator Message and/or Graphical Image, Hold for Time, and Continue 2 Display Operator Message and/or Graphical Image, Wait for Operator to Acknowledge Hold, and Continue 3 Display Operator Message and/or Graphical Image, Wait for Operator to enter data, and Continue 4 Display Operator Message and/or Graphical Image, Wait for Operator to select from ComboBox, and Continue 5 Display Login Screen for Operator to Enter User Name and Password, and Validate the User Name and Password before Continuing. 6 Turn on Operator Alert Discrete IO in Equipment Module, Hold for Time, and Continue 7 Turn on Operator Alert Discrete IO in Equipment Module, Wait for Operator Acknowledge Discrete IO, and Continue 8 Verify Container - the operator hold phase stays in this step until operator enters (scans in) proper container identifier or terminates phase to ignore check 9 Verify Material - the operator hold phase stays in this step until operator enters (scans in) proper material identifier or terminates phase to ignore check 10 Display Net Delivered Weight for last Material Transfer for specified Equipment Module, Hold for Time, and Continue 11 Display Net Delivered Weight for last Material Transfer for specified Equipment Module, Wait for Operator to Acknowledge Hold, and Continue
Equipment Module Name	Data6	16	*Pointer to an Equipment Module Operator Action Record
			If the record specifies Discrete IO, the system to alerts the operator that the Recipe calls for a manual operation and enables the operator to initiate the operation and to indicate that the operation is complete using Discrete IO. If the record specifies a local Console HMI, the Task Expert HMI Application provides this Operator Hold Interface at the local Console. If this entry is NULL or if the record points to a Master Console HMI, the Task Expert Operator Hold Application provides this Operator Hold Interface at the Master Console.
Hold Time in milliseconds	Data7	16	Duration of the hold

Record Field	Std. Field	Format	Comment
Variable Name of data that operator must enter before recipe continues.	Data8	16	The variable name for the data must begin with a **%**. Some example variable names are %Lot1, %ToleranceA, %ABCDE, or %123456. Examples of entered data include: • Lot number of material in Manual Transfer Phase • Material Verification number for material in Manual Transfer Phase • Potency of material in Material Transfer or Manual Transfer Phase • Target weight for material • Positive tolerance for material • Negative tolerance for material • Rescaling factor for material • Pulse On Time for next Auxiliary Phase • Custom data
Minimum legal value for operator entry	Data9	16	Parameters defining appropriate operator entry values for this phase
Maximum legal value for operator entry	Data10	16	
Data Type and Format of Operator-Entered Data	Data11	16	The operator must enter data in this format. If phase specifies a numeric data format with a maximum number of digits and position of the decimal point, format is "#nn.dd", where nn is the max number of numeric digits and dd is the decimal point position. If phase specifies alphanumeric data format with a maximum number of characters for alphanumeric data, format is "!ss", where ss is the maximum number of alphanumeric characters.
Default Value	Data12	16	Default value for the variable data that the operator is to enter. The operator can accept the default value or enter a new value.
Operator Runtime Message Line 1	Data13	40	IND780batch application displays this Runtime Message to the operator. NULL indicates no message.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
Graphical Image Name	Data15	40	Name for a Graphical Image. IND780batch application displays this image. NULL indicates no image file.
Combo-Box Selection List	Data16	40	Asterisk separated list.
Operator Runtime Message Line 2	Data17	40	IND780batch application displays this Runtime Message to the operator. NULL indicates no message.

C.6.8. Weight Check Phase

Table C-29: Weight Check Phase Record Structure

Record Field	Std. Field	Format	Comment
Master Recipe Name	GUID	16	
Phase Description	Key	40	
Record Type	Description	16	PHASE_WT_CHECK

Record Field	Std. Field	Format	Comment
Master Recipe Name or Unit Procedure Name	Data1	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data2	16	Number assigned to this phase by the recipe.
Phase Setup	Data3	16	
Parallel/Sequential	Data4		SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel".
Advance/Reverse			ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.
First Comparison Value	Data5	16	When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase. Otherwise, it is a fixed value.
Equipment Module Name	Data6	16	Pointer to a Scale Unit in the Equipment table
Weight Tolerance Batch Variable Name	Data7	16	Starts with a **%** to indicate a data variable name. The Equipment Phase puts these values in the variable that are the result of the check: 1 = IN_TOLERANCE, NO MOTION 2 = BELOW_TOLERANCE, NO MOTION 3 = ABOVE_TOLERANCE, NO MOTION 11 = IN_TOLERANCE, MOTION 12 = BELOW_TOLERANCE, MOTION 13 = ABOVE_TOLERANCE, MOTION 99 = ERROR
Weight Result Batch Variable Name	Data8	16	Starts with a **%** to indicate a data variable name. The Equipment Phase puts delivered weight of the phase into this variable.
Target Check Gross Weight and Units	Data9	16	Amount of gross weight to verify is on the scale. e.g., 1000 kg When field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Recipe Target Rescaling Factor	Data10	16	Proportional amount IND780batch adjusts Target Check Weight for change in Recipe Target Weight. NULL disables rescaling.
Positive Tolerance and Units	Data11	16	e.g., 10 kg This is the positive tolerance for the weight check. NULL disables the tolerance check. When field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.

Record Field	Std. Field	Format	Comment
Negative Tolerance and Units	Data12	16	e.g., 10 kg This is the negative tolerance for the weight check. NULL disables the tolerance check. When field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase.
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase. Batch Application displays a Graphical Image pointed to by this Name. **/** (forward slash)as the first character indicates this is a Name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
…	Data15	40	Null fields
…	Data16	40	
…	Data17	40	

C.6.9. Conditional Phase

Table C-30: Conditional Phase Record Structure

Record Field	Std. Field	Format	Comment
Conditional Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	Key	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_CONDITION
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup Parallel/Sequential Advance/Reverse	Data4	16	SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel". ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.
First Comparison Value	Data5	16	When this data field starts with a **%**, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase. Otherwise, it is a fixed value.
Condition	Data6	16	=, !=, <, <=, >, >=

Record Field	Std. Field	Format	Comment
Second Comparison Value	Data7	16	When this data field starts with a %, it is a data variable name. The operator can adjust the value of the variable in an Operator Hold Phase. Otherwise, it is a fixed value.
Step Number if True	Data8	16	Next Recipe Step when condition is true. If this field is Null, fall through to the next step on the true condition.
Step Number if False	Data9	16	Next Recipe Step when condition is false. If this field is Null, fall through to the next step on the false condition.
	Data10	16	Null fields
	Data11	16	
	Data12	16	
	Data13	40	
Batch Phase Record Data		40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
…	Data14	16	Null fields
…	Data15	40	
…	Data16		

C.6.10. Goto Phase

A Goto phase could be used to branch the process to another step depending on the outcome of a Conditional phase.

Table C-31: Goto Record Structure

Record Field	Std. Field	Format	Comment
GOTO Phase Record ID	GUID	GUID	SQL creates unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_GO_TO
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Main Procedure or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup	Data4	16	
Parallel/Sequential			SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel".
Advance/Reverse			ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.
GOTO Step #	Data5	16	Number of next step to execute in this recipe procedure. The new Step Number must go forward in the recipe; it cannot go in reverse to execute a previously executed step.
			Null fields

Record Field	Std. Field	Format	Comment
Batch Phase Record Data	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
			Null field

C.6.11. Communication Phase

A Communication phase allows the recipe to send messages while the recipe is running. One Communication phase can initiate any or all of the options listed in this table.

Table C-32: Communication Record Structure

Record Field	Std. Field	Format	Comment
Communication Phase Record ID	GUID		
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_COMM
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	Number assigned to this phase by the recipe.
Phase Setup	Data4	16	
Parallel/Sequential			SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel".
Advance/Reverse			ADV=0, REV=1 Advance to next step or Reverse to this step when going from Hold to Running state.
First Custom Print Number	Data5	16	The Batch Engine triggers printing a Custom Print message (1 – 10) with this field. 0=Disabled
Second Custom Print Number	Data6	16	The Batch Engine can trigger a second Custom Print message (1-10) with this field. 0=Disabled
Print Batch Summary Report	Data7	16	Disabled=0, Enabled=1 The Batch Engine triggers printing a standard Batch Summary Report to the Reports connection.
First Print Value	Data8	16	When this data field starts with a **%**, it is a data variable name. Otherwise, it is a fixed value. Batch moves this value into Shared Data ak0555 for inclusion in a print template.*
Second Print Value	Data9	16	When this data field starts with a **%**, it is a data variable name. Otherwise, it is a fixed value. Batch moves this value into Shared Data ak0556 for inclusion in a print template.*

Record Field	Std. Field	Format	Comment
Third Print Value	Data10	16	When this data field starts with a %, it is a data variable name. Otherwise, it is a fixed value. Batch moves this value into Shared Data ak0557 for inclusion in a print template.*
Fourth Print Value	Data11	16	When this data field starts with a %, it is a data variable name. Otherwise, it is a fixed value. Batch moves this value into Shared Data ak0558 for inclusion in a print template.
Fifth Print Value	Data12	16	This is a Batch or Shared Data Variable (%@) or Fixed Data. Batch moves this value into Shared Data AK0559 for inclusion in a print template.
Operator Runtime Message *or* Graphical Image Name	Data13	40	Batch Application displays this Runtime Message to the operator at the start of this phase. Batch Application displays a Graphical Image pointed to by this Name. / (forward slash) as the first character indicates this is a Name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Batch Phase Record Data and Email Subject Line	Data14	40	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message. This also goes into the subject line of the email.
Send Email Message Address	Data15	40	DEFAULT or this Email Address The Batch Engine sends an email message to the default email address in the CP setup in bx0138 or to this email message. The "from" email address is xs0106
Send Email Message Contents	Data16	40	"0" = Disabled "1" to "20 " = CUSTOM PRINT (1-20) "21" = SUMMARY Batch Report "22 message" = Send Text Message from this data record.
Email Attachment File Name	Data17	40	File Name of . Email Attachment

* For shared data names, refer to Appendix F, the IND780batch **Shared Data Reference**.

C.6.12. Math Phase

The Math step is used to perform an operation on one or more values, and store a result.

Table C-33: Math Record Structure

Record Field	Std. Field	Format	Comment
Conditional Phase Record ID	GUID	GUID	SQL creates unique global ID.
Master Recipe Name	KEY	16 UC	
Phase Description	Description	40 UC	
Record Type	Data1	16 UC	PHASE_MATH
Master Recipe Name or Unit Procedure Name	Data2	16 UC	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.

Record Field	Std. Field	Format	Comment
Step # in Master Recipe or Step # in Unit Procedure	Data3	16 UC	1, 2, 3… is step number in the Master Recipe or the Unit Procedure.
Phase Setup Parallel/Sequential Advance/Reverse	Data4	16 UC	SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel". ADV=0, REV=1 Advance to next step or Reverse to this step when going from *Hold* to *Running* state.
Reserved	Data5	16 UC	
Operation	Data6	16 UC	**Numeric Operations:** Operands are numeric only and result is numeric. + **Add** has two operands - **Subtract** has two operands * **Multiply** has two operands / **Divide** has two operands **Logical Operations:** Operands are numeric only, and result is 1 or 0. & **AND** has two operands. Result is 1 when both operands are not 0, and is 1 otherwise. I **OR** has two operands. Result is 0 when both operands are 0, and is 1 otherwise. ! **NOT** has one operand. Result is 1 when operand is 0, and is 1 otherwise **String Operations:** Operands are string or numeric. = **Assignment** has one operand. First operand is moved to the result. ^ 1 **Concatenation 1** has two operands. It is strict string concatenation. ^2 **Concatenation 2** has two operands. It concatenates strings with a blank between the two strings. ^3 **Concatenation 3** has two operands. It concatenates, inserts a blank between the two strings, and inserts a LF CR at the end of the concatenated string. # **Insertion** has two operands. It inserts the second operand string into the first operand string at the point of the ### tag in the first operand string.
Reserved	Data7	16 UC	
Result Value	Data8	16 UC	This is a Batch or Shared Data Variable (%@).
	Data9		
	Data10	16 UC	
	Data11	16 UC	
	Data12	16 UC	
First Operand Value	Data13	40 UC	This is a Batch or Shared Data Variable (%@) or Fixed Data.

Record Field	Std. Field	Format	Comment
Batch Phase Record Data	Data14	40 UC	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
Second Operand Value	Data15	40 UC	This is a Batch or Shared Data Variable (%@) or Fixed Data.
Max Result	Data16	40 UC	Literal Weight Value, e.g., 100 kg When the recipe uses the Math Phase result variable as the target for the material or manual transfer phase, the Batch Engine recipe pre-scan uses the Max Result as a default value for checking for possible overflow conditions. During execution of the recipe, if the result of the Math Phase operation exceeds the Max Result, the Batch Engine aborts the recipe.
…	Data17	40 UC	

C.6.13. No Operation Phase

The "NOOP" step is typically used as a place-holder when editing a recipe, allowing for the addition of an operational step at a later time.

Table C-34: NOOP Record Structure

Record Field	Std. Field	Format	Comment
NOOP Phase Record ID	GUID	GUID	SQL assigns a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_NOOP
Master Recipe Name or Unit Procedure Name	Data2	16	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16	1, 2, 3… Step number in the Master Recipe or the Unit Procedure.
	Data4	16	Null fields
	Data5	16	
	Data6 – Data16		
Reserved	Data17	40	

C.6.14. Custom Phase

A Custom phase is used to execute a TaskExpert application while the recipe is running.

Custom Phase Record Field	Std. Field	Format	Comment
Custom Phase Record ID	GUID	GUID	SQL assigns unique global ID.
Master Recipe Name	KEY	16 UC	Name of the Master Recipe
Phase Description	Description	40 UC	Description of this phase
Record Type	Data1	16 UC	PHASE_CUSTOM

Custom Phase Record Field	Std. Field	Format	Comment
Master Recipe Name or Unit Procedure Name	Data2	16 UC	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16 UC	1, 2, 3… is step number in the Master Recipe or the Unit Procedure.
Phase Setup Parallel/Sequential TE Task Number	Data4	16 UC	SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel". TASK =1 - 4. This field specifies the TE task number. The Batch Engine checks to see if the TE task is already running; if it is not running, the Batch Engine starts the TE task. The Custom Phase may only use the Task Expert instances that the user has defined in the Custom Equipment Module records in the EM table.
TaskExpert Phase Logic	Data5	16 UC	Task Expert Program Name for executing Custom Phase Logic
Custom Parameter 1	Data6	16 UC	The following description applies to all Custom Parameters: The Custom Parameter is a Batch or Shared Data Variable (%@) or Fixed Data. A variable can be input and/or output. Fixed Data is input only. The Batch Engine saves and restores only the Batch Variables in case of a Park or Power recovery. The IND780 system preserves Shared Data Variables stored in BRAM across a power failure.
Max Recipe Pre-Scan Value	Data7	16 UC	Fixed Value. If Custom Parameter 1 is an Input Variable to a subsequent Material Transfer Phase, this is the maximum value for the Variable used by the Batch Engine in the Recipe Pre-Scan.
Slow Step Timeout Value	Data8	16 UC	Time, starting at the first character in the field, in seconds for the Custom Phase to complete. If the Slow Step Timeout is not 0, the IND780 Batch monitors for the timeout. If the tag "ALARM" follows in this field, IND780 Batch generates an alarm only. When the tag is absent, it aborts the Batch with an error. There should be a blank space between the time value and the tag.
Custom Parameter 2	Data9	16 UC	Refer to description of Custom Parameter 1.
Custom Parameter 3	Data10	16 UC	Refer to description of Custom Parameter 1.
Custom Parameter 4	Data11	16 UC	Refer to description of Custom Parameter 1.
Custom Parameter 5	Data12	16 UC	Refer to description of Custom Parameter 1.
Operator Runtime Message	Data13	40 UC	Batch Application displays this Runtime Message to the operator at the start of this phase.

Custom Phase Record Field	Std. Field	Format	Comment
or Graphical Image Name			Batch Application displays a Graphical Image pointed to by this Name. / (forward slash) as the first character indicates this is a Name for a Graphical image. NULL indicates there are no Runtime Message and no Graphical Image.
Custom Parameter 6	Data14	40 UC	Refer to description of Custom Parameter 1.
Custom Parameter 7	Data15	40 UC	Refer to description of Custom Parameter 1.
Custom Parameter 8	Data16	40 UC	Refer to description of Custom Parameter 1.
Reserved	Data17	40 UC	

C.6.15. End Procedure Phase

Table C-35: End-of-Procedure Record Structure

Record Field	Std. Field	Format	Comment
End of Recipe Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_END_PROC
Unit Procedure Name	Data2	16	Name of the Unit Procedure
Step # in Unit Procedure	Data3	16	1, 2, 3…
	Data4	16	Null fields
	Data5	16	
	Data6 – Data18		
	Data17	40	

C.6.16. End Recipe Phase

Table C-36: End-of-Recipe Record Structure

Record Field	Std. Field	Format	Comment
End of Recipe Phase Record ID	GUID		SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_END_RECIPE
Master Recipe Name	Data2	16	Name of the Master Recipe
Step # in Master Recipe	Data3	16	1, 2, 3…
	Data4	16	Null field
Chained Master Recipe Name	Data5	16	At its completion, the Master Recipe can automatically start another Master Recipe. This allows longer recipes that do not use the system overhead required when more steps are included in a single Master Recipe. When the IND780batch System completes the current Control Recipe, it records its completion in the Batch History Table and clears its execution data in memory. The IND780 then builds and begins execution of this chained Control Recipe.

Record Field	Std. Field	Format	Comment
			Null fields
	Data17	40	

C.6.17. Horizontal Start

The Horizontal Start record in a Master Recipe Table identifies the start of a group of phases that the IND780batch can run as a separate horizontal group. The operator can run the horizontal group repeatedly, without running the rest of the recipe, and may run the horizontal groups in a random order within the recipe.

Table C-37: Horizontal Start Record Structure

Record Field	Std. Field	Format	Comment
Horizontal Start Phase Record ID	GUID	GUID	SQL creates a unique global ID
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Descriptio n	40	Description of this phase
Record Type	Data1	16	PHASE_START_HORZ
Master Recipe Name	Data2	16	Name of the Master Recipe
Step # in Master Recipe	Data3	16	1, 2, 3…
Horizontal Group Name	Data4	16	Name of the Horizontal Group
	Data5	16	Null field
Instructions for Execution of Horizontal Group	Data6	16	Default - Execute this horizontal phase group in all horizontal recipe cycles. "First" - Only execute this horizontal phase group in the first horizontal Control Recipes cycle in the Order. This allows the operator to enter data such as Lot Number, through an Operator Hold phase in the first recipe cycle that applies to all subsequent recipe cycles in the Order.
		40	Null field
	Data17	40	

C.6.18. Horizontal End

The Horizontal End record in the Master Recipe Table identifies the end of a group of phases that IND780batch can run as a separate horizontal group. Every horizontal group must have a Horizontal End phase. The operator can the horizontal group repeatedly without running the rest of the recipe and may run the horizontal groups in a random order within the recipe.

Table C-38: Horizontal End Record Structure

Record Field	Std. Field	Format	Comment
Horizontal End Phase Record ID	GUID		
Master Recipe Name	KEY	16	Name of the Master Recipe
Phase Description	Descriptio n	40	Description of this phase
Record Type	Data1	16	PHASE_END_HORZ
Master Recipe Name	Data2	16	Name of the Master Recipe

Record Field	Std. Field	Format	Comment
Step # in Master Recipe	Data3	16	1, 2, 3…
Horizontal Group Name	Data4	16	Name of the Horizontal Group
	Data5	16	Null fields
	Data6	16	
	Data7 – Data16		
	Data17	40	

C.7. Batch History Table (A9)

C.7.1. Batch History Table Record Types

The Batch History Table contains various types of record, as listed in Table C-39. The structure of each type of record is detailed in the following sections.

Table C-39: Batch History Table Record Types

Record Type	Explanation
BATCH_ORDER	Summary data for the batch order.
CONTROL_RECIPE	Summary data from the running of the control recipe.
PHASE_MATL_XFER	Results of material transfer phases.
PHAS_MANUAL	Results of the manual phases
PHASE_AUXILIARY	Results of auxiliary phases.
WT_CHECK	Results of the weight check phases
COMM	Results of the communication phases
CONDITION	Results of the conditional phases
OPER_HOLD	Results of the operator hold phases
GO_TO	Results of the go-to phases
NOOP	Results of the no-op phases
END_PROC	Results of the end of procedure phases
ENC_RECIPE	Results of the end of recipe phase
HORIZONTAL_START	Results of the start and end of the horizontal phases
HORIZONTAL_END	

C.7.1.1. Processing State Values

Several of the tables in this Appendix include fields that refer to Processing State Values. Table C-40 provides an interpretation of each of these values.

Table C-40: Processing State Values

Value	Interpretation
0	No state / Not allocated
1	Pending / Not Started / Idle
2	Starting

Value	Interpretation
3	Running
4	Running in Parallel
5	Holding At End
6	Held At End
7	Restarting
8	Pausing
9	Paused
10	Parking
11	Parked
12	Aborting
13	Aborted
14	Waiting for Operator Hold Phase Response
15	Waiting for Operator to give Acknowledge to run next phase
16	Control Override FCE ON
17	Control Override FCE OFF
18	Horizontal Step Complete
10	Horizontal Group Complete - Go to same phase in next Control Recipe
20	Horizontal Group Complete - Await Operator instructions
21	Requested Phase Previously Completed
22	Batch Campaign Cycles Complete OK
23	Recipe Paused after Off Tolerance feed
24	Reserved 1
25	Reserved 2
26	Reserved 3
27	Reserved 4
28	Pause Recipe after Material Transfer Phase Completed with Under Tolerance Warning
29	Pause Recipe after Material Transfer Phase Completed with Over Tolerance Warning
30	Successful Completion
31	Completed with Under Tolerance Warning
32	Completed with Over Tolerance Warning
33	Failed Completion Due to Abort
34	Other Failed Completion
35	Batch Campaign Done Failure
36	Process Not Run
37	Recipe Processing Error

C.7.1.2. Batch History Table Record Structures

C.7.1.2.1. Batch Order

When a Batch Order completes, the IND780batch copies the BATCH_ORDER record, together with its status, from the Batch Order Table to the Batch History Table. The Batch History Table includes one BATCH_ORDER record for each batch order.

C.7.1.2.2. Control Recipe

This record in the Batch History table contains the summary data from the execution of this instance of the recipe.

Table C-41: Control Recipe Header Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates a unique global ID
Control Recipe Name	KEY	16	Refer to the section entitled "Generating Control Recipe Names".
History Description	Description	40	Order Description
Record Type	Data1	16	CONTROL_RECIPE
Batch Order Sequence #	Data2	16	Batch Order Sequence # is a 10-digit decimal number followed by a 2-character Terminal ID. The Terminal ID is the first two characters of xs0106.
Master Recipe Name	Data3	16	Points to the name field in the Master Recipe Table
Convert Batch Original Master Recipe	Data4	16 UC	In a "converted" Master Recipe, this is the Original Master Recipe from which "Convert Batch" function derives the new converted recipe.
Recipe State / Completion Status	Data5	16	Refer to Table C-40.
Composite % Error	Data6	16	Composite error of individual phase errors xx.xx %ERR
Number of Phases Currently Running	Data7		If phases are running in a horizontal campaign, this field indicates how many are currently running.
Control Recipe Target Weight and Units	Data8	16	e.g., 1000 kg
Current/Final Delivered Control Recipe Weight and Units	Data9	16	e.g., 1000 kg
Total Number of Phases Needed to complete Recipe	Data10	16	Number of phases required to complete the recipe, including any phases run in parallel during a horizontal group
Batch Order Name (ID)	Data11	16	The user creates this field, which can be a customer ID or a unique system ID
Convert Batch Recipe Data Source	Data12	16 UC	The data source used by the "Convert Batch" function when creating the converted recipe. When the "Convert Batch" function on the IND780 creates the converted recipe, this value is the Control Recipe ID from the Batch History table.
Description of Processing State in Recipe State/Completion status, above	Data13	40	Description of Processing State – refer to Table C-40
Master Recipe Description	Data14	40	Description of the Master Recipe
Previously Delivered Weight and User Name	Data15	40	P = Previously Delivered Weight from a previous Control Recipe and recorded in running of this converted recipe from a "Convert Batch" U = Login Name of user starting the recipe
Recipe Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Recipe End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.2. Material Transfer Phases

These records contain the results of individual material transfer phases. For currently running recipes, the records have run-time status information for the phase.

Table C-42: Material Transfer Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates a unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_MATL_XFER
Master Recipe Name or Unit Procedure Name	Data2	16	Name of Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
Starting Gross Weight and Units	Data5	16	e.g., 1000 kg
Target Phase Weight and Units	Data6	16	e.g., 1000 kg
Delivered Phase Weight and Units	Data7	16	e.g., 1000 kg
% Error	Data8		xx.xx %ERR
Positive Tolerance	Data9	16	Tolerance values for the Target Phase Weight.
Negative Tolerance	Data10	16	
Q.i Start Material Transfer Command Status & Q.i Material Transfer Completion Status	Data 11	16	Q.i Start Command Status Q.i Material Transfer Completion Status AutoJog indicator
Q.i Diagnostic Status	Data12	16	Q.i Diagnostic Status 1, Status 2, Status 3,in Unicode Hexadecimal format
Lot Number	Data 13	40	Entry generated by **Lot Number Variable Name** on the Advanced tab.
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
Reserved	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.3. Manual Phases

These records contain the results of individual material transfer phases. For currently running recipes, these records have run-time status information for the phase.

Table C-43: Manual Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates a unique global ID
Control Recipe Name	KEY	16	Control Recipe Name

Record Field	Std. Field	Format	Comment
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_MANUAL
Master Recipe Name or Unit Procedure Name	Data2	16	Name of Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
Starting Gross Weight and Units	Data5	16	e.g., 1000 kg
Target Phase Weight and Units	Data6	16	e.g., 1000 kg
Delivered Phase Weight and Units	Data7	16	e.g., 1000 kg
% Error	Data8		xx.xx %ERR
Positive Tolerance	Data9	16	Tolerance values for the Target Phase Weight.
Negative Tolerance	Data10	16	
Q.i Start Material Transfer Command Status & Q.i Material Transfer Completion Status	Data 11	16	Q.i Start Command Status Q.i Material Transfer Completion Status
Q.i Diagnostic Status	Data12	16	Q.i Diagnostic Status 1 Status 2 Status 3 in Unicode Hexadecimal format
Lot Number	Data13	40	Data entered by operator
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
Reserved for future use	Data15	40	
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.4. Auxiliary Phases

These records contain the run-time status and results of individual auxiliary phases.

Table C-44: Auxiliary Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates a unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_AUXILIARY
Master Recipe Name or Unit Procedure Name	Data2	16	Name of Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	

Record Field	Std. Field	Format	Comment
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.5. Weight Check Phases

These records contain the run-time status and results of individual weight check phases.

Table C-45: Weight Check Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_WT_CHECK
Master Recipe Name or Unit Procedure Name	Data2	16	Name of Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
Target Check Weight and Units	Data5	16	e.g., 1000 kg
Actual Check Weight and Units	Data6	16	e.g., 1000 kg
High Tolerance & Units	Data 9	16	Tolerance values for the Target Phase Weight.
Low Tolerance & Units	Data 10	16	
Tolerance Result	Data 11	16	1 = IN_TOLERANCE, NO MOTION 2 = BELOW_TOLERANCE, NO MOTION 3 = ABOVE_TOLERANCE, NO MOTION 11 = IN_TOLERANCE, MOTION 12 = BELOW_TOLERANCE, MOTION 13 = ABOVE_TOLERANCE, MOTION 99 = ERROR
	Data13	40	Null field
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.6. Communication Phases

These records contain the run-time status and results of individual communication phases.

Table C-46: Communication Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_COMM
Master Recipe Name or Unit Procedure Name	Data2	16	Name of Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.7. Conditional Phases

These records contain the information which determines the outcome of decisions made in a conditional phase, and the result of the phase's calculation.

Table C-47: Conditional Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_CONDITION
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
True/False Comparison Result	Data5	16	True or False result of conditional comparison made in this phase.
Step Number Result	Data6	16	Outcome of the conditional test – the next phase to carry out
	Data11	16	Null fields
	Data13	40	

Record Field	Std. Field	Format	Comment
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.8. Hold Phases

These records contain information about operator hold phases, including any data entered by the operator.

Table C-48: Operator Hold Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_OPER_HOLD
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	
	Data11	16	
Operator-entered Data	Data13	40	Data that the operator entered in this hold phase.
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.9. GOTO Phases

These records indicate the status and result of go-to phases.

Table C-49: Go-To Phase Record Structure

Record Field	Std. Record	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_GO_TO
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.

Record Field	Std. Record	Format	Comment
Phase State / Completion Status	Data4	16	Refer to Table C-40.
GOTO Step #	Data5	16	Number of next step to execute in this recipe procedure
	Data6	16	Null fields
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.10. NOOP Phases

These records contain the status of No-Operation phases, which typically are used as place-holders during recipe design, for later replacement with functional phases.

Table C-50: No-Operation Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_NOOP
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.11. Math Phases

These records contain the status and results of Math phases. The variable fields may be for either Shared Data or Batch Variables.

Table C-51: Math Phase Record Structure

Record Field	Std. Field	Format	Comment
Conditional Phase Record ID	GUID	GUID	SQL creates unique global ID.
Master Recipe Name	KEY	16 UC	
Phase Description	Description	40 UC	
Record Type	Data1	16 UC	PHASE_MATH
Master Recipe Name or Unit Procedure Name	Data2	16 UC	This field contains the Master Recipe Name if this phase is a step in the Master Recipe or the Unit Procedure Name if this phase is a step in a Unit Procedure.
Step # in Master Recipe or Step # in Unit Procedure	Data3	16 UC	1, 2, 3… is step number in the Master Recipe or the Unit Procedure.
Phase Setup Parallel/Sequential Advance/Reverse	Data4	16 UC	 SEQ=0, PAR=1 "Parallel" means that Batch Engine can run the phase in parallel with adjacent phases that are also marked "parallel". ADV=0, REV=1 Advance to next step or Reverse to this step when going from *Hold* to *Running* state.
Reserved	Data5	16 UC	

Record Field	Std. Field	Format	Comment
Operation	Data6	16 UC	**Numeric Operations** Operands are numeric only and result is numeric. + **Add** has two operands - **Subtract** has two operands * **Multiply** has two operands / **Divide** has two operands **Logical Operations** Operands are numeric only, and result is 1 or 0. & **AND** has two operands. Result is 1 when both operands are not 0, and is 1 otherwise. I **OR** has two operands. Result is 0 when both operands are 0, and is 1 otherwise. ! **NOT** has one operand. Result is 1 when operand is 0, and is 1 otherwise **String Operations** Operands are string or numeric. = **Assignment** has one operand. First operand is moved to the result. ^ 1 **Concatenation 1** has two operands. It is strict string concatenation. ^2 **Concatenation 2** has two operands. It concatenates strings with a blank between the two strings. ^3 **Concatenation 3** has two operands. It concatenates, inserts a blank between the two strings, and inserts a LF CR at the end of the concatenated string. # **Insertion** has two operands. It inserts the second operand string into the first operand string at the point of the ### tag in the first operand string.
Reserved	Data7	16 UC	
Result Value	Data8	16 UC	This is a Batch or Shared Data Variable (%@).
	Data9		
	Data10	16 UC	
	Data11	16 UC	
	Data12	16 UC	
First Operand Value	Data13	40 UC	This is a Batch or Shared Data Variable (%@) or Fixed Data.
Batch Phase Record Data	Data14	40 UC	Batch Engine places this data in the batch historical record for the phase. NULL indicates no message.
Second Operand Value	Data15	40 UC	This is a Batch or Shared Data Variable (%@) or Fixed Data.
Max Result	Data16	40 UC	Literal Weight Value, e.g., 100 kg When the recipe uses the Math Phase result variable as the target for the material or manual transfer phase, the Batch Engine recipe pre-scan uses the Max Result as a default value for checking for possible overflow conditions. During execution of the recipe, if the result of the Math Phase operation exceeds the Max Result, the Batch Engine aborts the recipe.
…	Data17	40 UC	

C.7.12. End Process Phases

These records contain the status and results of end process phases.

Table C-52: End Process Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_END_PROC
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.13. End Recipe Phases

These records contain the status and results of end recipe phases.

Table C-53: End Recipe Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
History Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_END_RECIPE
Master Recipe Name or Unit Procedure Name	Data2	16	Name of the Master Recipe or Unit Procedure
Step #	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
	Data5	16	Null fields
	Data6	16	
	Data11	16	
	Data13	40	
Message from Master Recipe Phase Record	Data14	40	Message defined in phase's **Operator Runtime Message** field.

Record Field	Std. Field	Format	Comment
	Data15	40	Null field
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.14. Horizontal Start Record

These records record the results of a horizontal start phase.

Table C-54: Horizontal Start Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_START_HORZ
Master Recipe Name	Data2	16	Name of the Master Recipoe
Step # in Master Recipe	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
Horizontal Group Name	Data5	16	Name of the Horizontal Group
Instructions for Execution of Horizontal Group	Data6	16	Message defined in phase's **Operator Runtime Message** field.
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.7.15. Horizontal End Record

These records record the results of a horizontal end phase.

Table C-55: Horizontal End Phase Record Structure

Record Field	Std. Field	Format	Comment
Batch History Record ID	GUID	GUID	SQL creates unique global ID
Control Recipe Name	KEY	16	Control Recipe Name
Phase Description	Description	40	Description of this phase
Record Type	Data1	16	PHASE_END_HORZ
Master Recipe Name	Data2	16	Name of the Master Recipe
Step # in Master Recipe	Data3	16	Number assigned to this phase by the recipe.
Phase State / Completion Status	Data4	16	Refer to Table C-40.
Horizontal Group Name	Data5	16	Name of the Horizontal Group
	Data6		
Phase Start Date & Time	Data16	40	YYYY/MM/DD HH:MM:SS
Phase End Date & Time	Data17	40	YYYY/MM/DD HH:MM:SS

C.8. Log Files

C.8.1. Batch Error Log

Table C-56 lists codes generated by errors in the batch system. All other errors are reported to the Audit Log.

Table C-56: Batch Error Log Codes

Error Code	Error Text
9005	ECM_CONFIG_ERROR ECM
9006	ECM_VESSEL_CONFIG_ERROR
9020	BATCH_LOCAL_TABLES_NOT_UPDATED
9021	MULTIPLE_BATCH_MASTER_TERMINALS
9022	ECM_UNSTABLE_SCALE
9023	ECM_OVERLAP_FEED_ERROR
9024	ECM_HIGH_FLOW_RATE_ERROR
9025	ECM_COMMUNICATION_ERROR
9026	ECM_INSTRUMENT_ERROR
9027	ECM_VESSEL_CAPACITY_ERROR
9028	ECM_TRANSFER_ABORTED_ERROR
9029	ECM_SLOW_STEP_TIMER_ERROR
9030	ECM_START_FAILED_UNSTABLE_DEVICE
9031	ECM_FEED_VALVE_NOT_OPEN
9037	TOO_MANY_BATCH_VARIABLES
9042	HISTORY_TABLES_NEARLY_FULL
9043	HISTORY_TABLES_FULL
9044	FLOATING_POINT_EXCEPTION
7029	STDDB_IS_75_PERCENT_FULL
7030	STDDB_IS_90_PERCENT_FULL
7031	STDDB_IS_FULL
7032	FLASH_FILE_MEM_LOW

C.8.2. Audit Trace File

The Audit Trace File is a flat text file that contains a record of each Batch operation. Each record begins with the current date and time and the name of the logged-in user. Table C-57 lists all the messages.

- In each message, the relevant values will appear in place of terms such as "OrderTarget=order size".

Table C-57: Audit Trace File Messages

Audit Trace File Messages
BMT12 BATCH_MSG_THREAD_RUNNING node = terminal node number SW = software ID
BMT45 NEW_CONFIG_TABLES_LOADED
BMT05 BATCH_COMMAND = command description BATCH_ORDER = batch order name
BMT02 BATCH_COMMAND_STATUS = command status description
BMT25 READ_MASTER_RECIPE = master recipe name OrderTarget = order size RecipeTarget = recipe size Cycles = number of recipe cycles BATCH_COMMAND_STATUS = description of status
BMT32 BATCH_COMPLETE, BATCH_ORDER = batch order name BATCH_STATE = description of batch state
BMT39 START_CONTROL_RECIPE control recipe name BATCH_ORDER = batch order name MODE = single character identifying mode
BMT18 CONTROL_RECIPE_COMPLETE = control recipe name BATCH_ORDER = batch order name DELIVERED_WEIGHT = delivered weight BATCH_STATE = description of recipe state
BMT50 Parking, BATCH_ORDER = batch order name CONTROL_RECIPE = control recipe name
BMT24 Power Recovery, Batch Order = order name Control Recipe = control recipe name, status
BMT24 Park Recovery, Batch Order = order name Control Recipe = control recipe name, status
BMT33 START_PHASE = #phase, description of phase, phase type
BMT40 FAILED_PHASE = #phase, description of phase, phase type
BMT48 REQUESTED_PHASE_PREVIOUSLY_COMPLETED = # phase, description of phase, phase type
BMT38 BATCH_STATE = description of state MODE = single character identifying mode
BMT35 description of operator wait-state
BMT43 FEED_ALARM = description of detailed feed status
BMT08 INVALID_PHASE_MP mp = material path
BMT08 INVALID_PHASE_ECM mp = material path
BMT47 INVALID_PHASE_ECM ecm = channel
BMT44 READ_RECIPE_INVALID_PHASE_STEP = phase number

Audit Trace File Messages
BMT44 MANUAL_LICENSE_VIOLATION_PHASE = phase number
BMT44 DUPLICATE_PHASE_STEP_NUMBER = phase number
BMT44 INVALID_PHASE_STEP = phase number
BMT44 INVALID_TARGET_AMOUNT_IN_PHASE = phase number
BMT46 HISTORY_TABLES_FULL = BATCH_AUDIT.log
BMT46 HISTORY_TABLES_NEARLY_FULL = BATCH_AUDIT.log
BMT46 HISTORY_TABLES_FULL = standard.sdf
BMT46 HISTORY_TABLES_NEARLY_FULL = standard.sdf
BMT49 CMD_MODIFY_PHASE_TARGET = procedure number,step number,new target value
Q.IT77 Q.I_COMMAND = Q.i command description mp = material path, em = channel
Q.IT57 Q.I_COMMAND_STATUS = Q.i command status description, Q.i command description mp = material path em = channel tgt = target
Q.IT67 Q.I_TRANSFER_STATUS = Q.i transfer status description mp = material path em = channel feedWt = delivered weight err = deviation from target

D. PLC Communications

D.1. Example Batch PLC Configuration

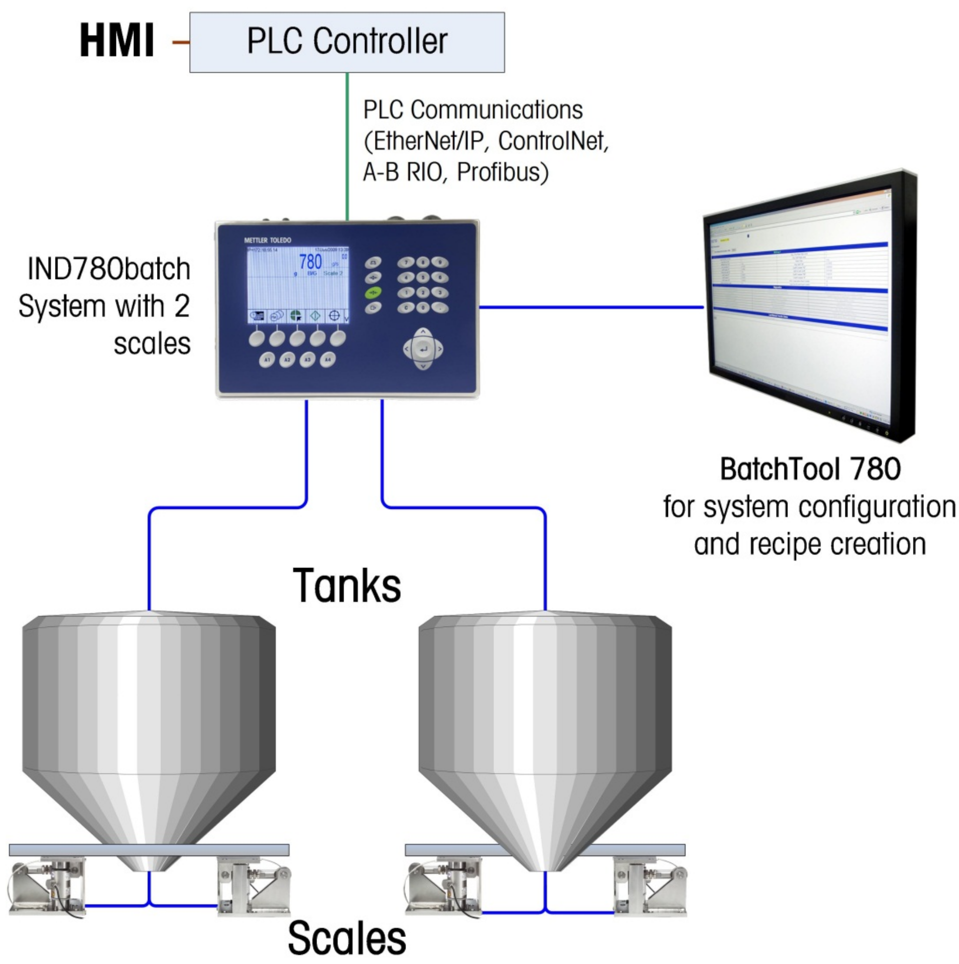


Figure D-1: Example of Batch PLC Configuration

D.2. PLC/DCS Communications

The IND780batch terminal is capable of communicating with a PLC/DCS system via certain communication protocols, including:

- EtherNet /IP
- ControlNet

- PROFIBUS
- Allen Bradley Remote IO (Discontinued, January 2021)

Basically, the remote PLC can create and initiate an Order in the batch system and collect weight and batch related process data back from the IND780batch terminal.

Sample PLC programs that can be used in conjunction with your Batch system are included on the **IND780batch Resource CD** delivered with your Batch system. These allow for quick interface using these pre-designed programs. Currently available examples include:

- EtherNet/IP communications with AB ControlLogix PLC
- ControlNet communication with AB ControlLogix PLC.

For more information about PLC communications and details of the specific PLC cards, please refer to the **IND780 PLC Interface Manual**, document no. 64057518, which is provided on the IND780 Resource CD, also included with your Batch system.

E. Flow Meter Interface

E.1. Overview

The Flow Meter Option Board is a two-channel isolated pulse counter/flow meter board available for use with the IND780 terminal. In the IND780batch, the board provides a flow meter totalizer target comparison to directly control on-board discrete outputs.

- Please note that open collector outputs require an external power source to switch on and off.

The board can count the input pulses up to 50 kHz on each of two isolated input channels simultaneously, as well as measuring the frequency of the input signal. Four-jumper selectable switching threshold for each input channel are available as well as a jumper selectable 15 kHz analog filter. The required peak input levels for the AC mode are 50mV to 50Vrms. The required peak input level for the DC mode are 2.5 volts to 42 volts at 1 Amp. The state of the input counter levels is also available to the processor, so that any channel can be used as a discrete input.

The control outputs are 7407 open-collector drivers. Each control O/P is capable of sinking 40 mA. The Max off state O/P voltage is 30V. This enables the control O/P to drive interposing relays such as those by Opto-22.

Each flow meter board in an IND780 has its own unique address, assigned automatically by the IND780. Each flow meter board has two isolated input channels. Each IND780 can accommodate up to two flow meter boards, for a total of 4 isolated input channels per terminal. The IND780batch terminal supports up to four channels in any combination of scales and flow meters.

Flow meter channel configuration is performed using the front panel of the IND780. Please refer to Chapter 3, **Configuration**, for detailed instructions.

E.1.1. Features

- Two individually isolated input channels
- Jumper selectable 15 kHz analog RC filter for each input
- Four jumper selectable input switching thresholds (0.0V, 2.3V, 6.0V, 8.0V)
- Input frequency: AC 50 kHz Max or DC
- Maximum count value: 4,294,967,295
- Channel update time of 5 msec/channel maximum
- Frequency output mode
- Two open-collector output switches
- Current limited 5V output power
- Input to backplane isolation of 750VDC

- Input channel to channel isolation of 750VDC
- Easy calibration using actual throughput or calculated settings
- Power supply: The digital circuitry runs off the system's +5V supply; the isolated input circuitry is powered by the system's 12V supply.

E.2. Terminal Blocks

The field connection on the Flow Meter Option Board consists of a single Phoenix Contact 10 pin socket connection block. It receives a single Phoenix Contact 10-pin plug connection block. Figure E-1 shows the Flow Meter Option Board with the location of pin number 1 indicated (adjacent to the corner of the board).

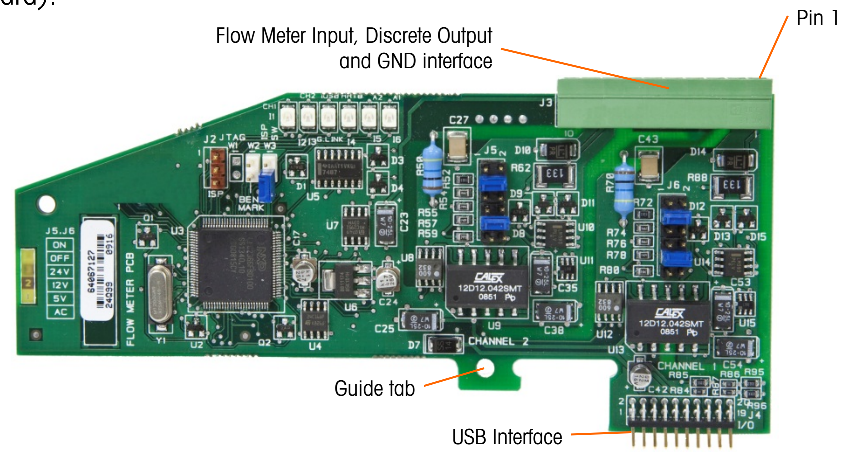


Figure E-1: Flow Meter

The Phoenix Contact 10-pin connector pin outs are as follows:

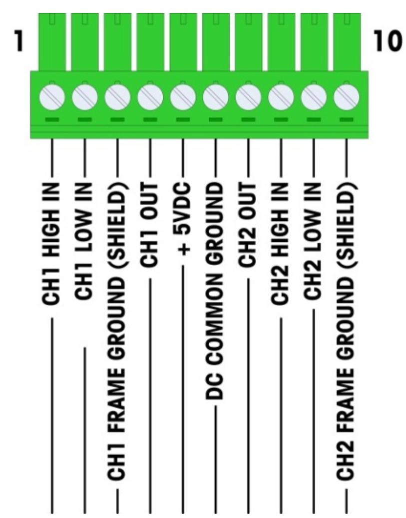


Figure E-2: Flow Meter Connector

Pins 3 and 10 (the frame grounds for Channels 1 and 2) provide floating grounds, and are the return lines for pins 1 and 8 (the high inputs for Channels 1 and 2). This maintains the isolation of the input circuitry from the rest of the board electronics.

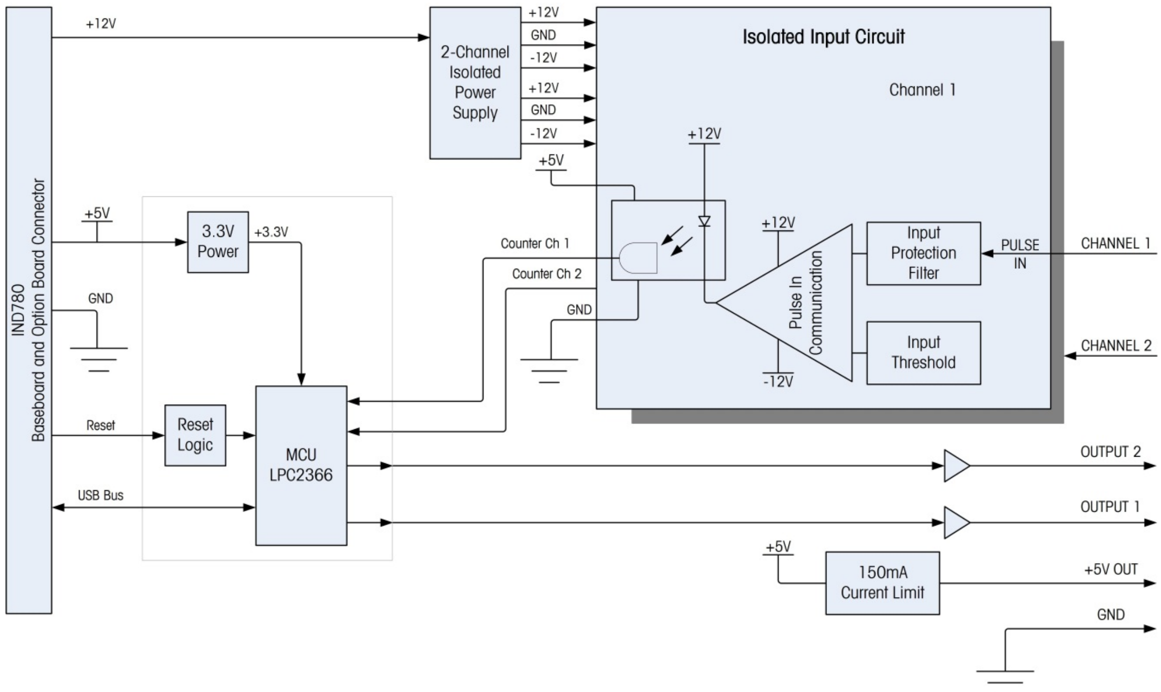


Figure E-3: Block Diagram, Channel 1 Shown

E.3. Board Components

The flow meter board consists of digital circuitry, two isolated analog input circuits, and two open-collector outputs with a 150mA, 5V power source.

E.3.1. Digital Circuitry

The digital circuitry consists of a micro-controller, EEPROM and glue logic. The micro-controller counts input pulses and measures flow rate for each isolated input circuit. It also does limit comparisons on the inputs and sets the outputs based on the results. The EEPROM is used to store configuration data that should not be lost at power-down. A USB version 1.0 communication links the Flow Meter Option Board to the IND780 main controller board.

E.3.2. Isolated Analog Input Circuits

Each isolated input circuit consists of a comparator, an optocoupler, one set of hardware jumpers and discrete resistors, capacitors, diodes, and a transient voltage suppressor. The comparator is used to compare the input voltage to the switching voltage. Each input section has a hardware jumper to select one of the four available input switching voltages. A second hardware jumper is provided to enable or disable a 15 kHz analog filter on each input. The optocoupler isolates the output of the comparator from the counter input of the microcontroller. The transient voltage suppressor provides ESD protection for each input. The diodes provide over-voltage protection of each input.

E.3.3. Open Collector Outputs

The output circuitry contains two non-isolated open collector 7407 drivers that can be used to drive the input to an Opto 22 output module. The board also provides a 150 mA, 5V power source that can be used to provide power to an Opto 22 output module.

Note: The IND780 Flow Meter Option Board may **only** be used with flow meter outputs that do not exceed Class 2 limits according to The National Electric Code.

The open collector outputs are TTL compatible and current-sinking, and can handle signals from 5 to 30 VDC at a maximum of 35 mA.

E.4. Hardware Jumper Settings

The flow meter board has four sets of hardware jumpers, indicated in Figure E-4.

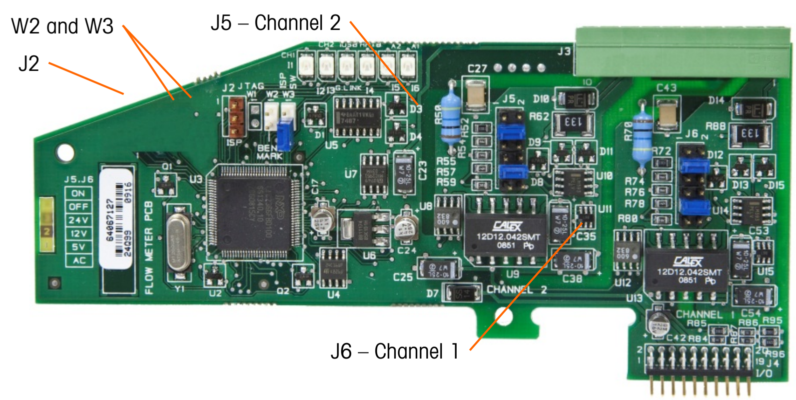
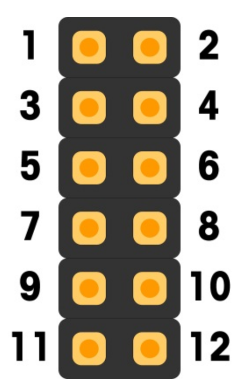


Figure E-4: Flow Meter Interface Board Jumper Locations

E.4.1. J5/J6 – Filter Enable

Each of the two input channels indicated in Figure E-4 has a set of six jumper settings, which function as shown in Table E-1. Jumper locations 1-2 (enable) and 3-4 (disable) control the 15kHz low-pass analog filter, which is used to filter noise on the input.

Table E-1: Settings for Jumpers J5 (Channel 2) and J6 (Channel 1)



Function	Jumper Location	
Analog Low-Pass Filter on	1	2
Analog Low-Pass Filter off	3	4
24V Range	5	6
12V Range	7	8
5V Range	9	10
AC Range	11	12

The analog filter should be enabled in the following cases:

- For flow meter frequencies below 15 kHz
- For all AC applications, regardless of frequency

E.4.2. J5/J6 – Input Switching Threshold

For each channel, this jumper has four possible positions (5/6, 7/8, 9/10, 11/12), which set the comparison voltage level for the input comparator. Voltage levels are:

- 0.0 VAC – use the AC jumper selection
- 2.3 VDC – use the 5 BDC jumper selection
- 6.0 VDC – use the 12 VDC jumper selection
- 8.0 VDC – use the 24 VDC jumper selection

- Please consult the documentation for the specific flow meter you intend to use.

E.4.3. Microprocessor setup and programming

Jumpers J2 and W2 are for factory use only, during board manufacturing, setup and programming. The operating position is open and no jumper is supplied.

Jumper W3 is a single on/off jumper used only by the factory during board manufacturing, setup and programming. The operating position is open.

E.5. Wiring a Flow Meter

An attached flow meter can be either isolated with respect to the Q.i output voltage, or it can be non-isolated and share a common output voltage. The circuits in Figure E-5 and Figure E-6 illustrate these two methods of connecting a flow meter's pulse outputs to a Q.i flow meter interface board.

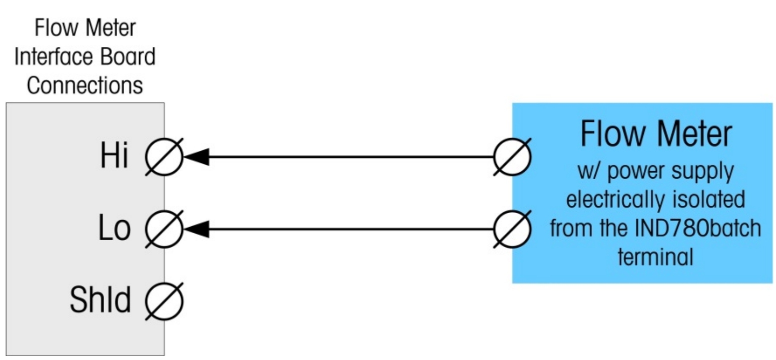


Figure E-5: Isolated Flow Meter Connections

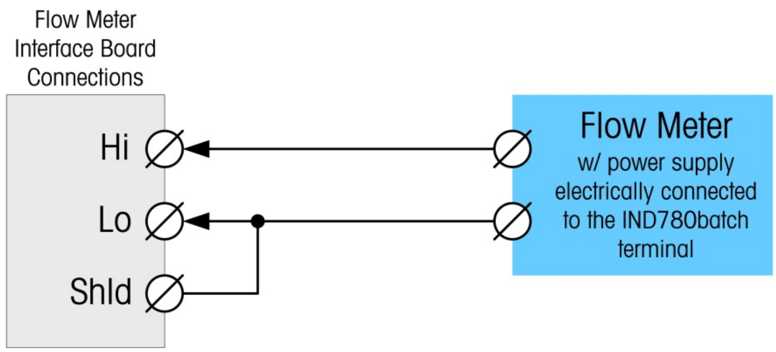


Figure E-6: Non-Isolated Flow Meter Connections

E.6. Electrical Specifications

Specification	Description				
Configuration	2 channels of differential flow meter inputs (uni-directional) or 1 channel of differential flow meter inputs (bi-directional); 2 open collector output switches				
Input Modes	AC or one of the 3 levels of DC inputs				
Voltage Range	AC (rms)	DC (5V)	DC (12V)	DC (24V)	
VIL*	-50mV	+1.4V	+3.0V	+4.0V	
VIH*	+50mV	+3.4V	+9.0V	+12.0V	
Vmax	+/-50V	+/-50V	+/-50V	+/-50V	
Maximum Input Voltage	42 VDC peak				
Maximum Input Current	1 A				
Minimum Input Impedance	11 KΩ				
Input Specifications					
Maximum Input Frequency	50 KHz				
Min. Input Frequency for Rate Measurement	1 Hz				
Duty Cycle	**Input Level**	**Frequency Max.**	**Duty Cycle**	**Max Duty Cycle**	**Min Pulse Width**
	5 VDC	50 kHz	35	55	7 μsec
	12 VDC	50 kHz	40	60	8 μsec
	24 VDC	50 kHz	40	60	8 μsec
	AC	50 kHz	40	50	8 μsec
Minimum Input Low Time	8 μsec (input filter off); 16 μsec (input filter on)				
Minimum Input High Time	8 μsec (input filter off); 16 μsec (input filter on)				
Channel Update Time					
Accumulated Flow Data	≤5 msec per channel maximum				
Rate Data					
Instantaneous	Larger of (2/FREQ) or channel update time.				

Specification	Description
Average	2 seconds
Accuracy	
1 Hz Averaging Mode	+/- 1 Hz
Instantaneous mode Analog Filter	+/- 1% @ 50KHz 15kHz software selectable for each channel
Maximum Count Value	4,294,967,295
Maximum Rate Value	65,535
Fault detection	Configuration error.
Isolation	
Input Channel to Backplane	750 VDC Continuous
Input Channel to Input Channel	750 VDC Continuous
Discrete Output	
Target latency time (turn off time)	200 μsec maximum
Preset to output on time	20 msec maximum
Power-up state	Off
Output Type	Open collector, TTL-compatible, current-sinking, negative true
Maximum Output Current Sink 35 mA Output Voltage 5-30 VDC	
Power Requirements	
Internal Supply +5V (no Output current)	230mA maximum
Internal Supply +5V (with 150mA Output current)	440mA maximum
Internal Supply +12V	150mA maximum
Aux Power Supply	
Output Power	5V @ 150 mA, current limited

F. IND780batch Shared Data Reference

F.1. System Setup

F.1.1. Batch System Setup (bx)

Access:	"Supervisor" default level is customizable by individual field. bx0103, bx0104, bx0112, bx0113, bx0120, bx0121, bx0122, bx0127,bx0128,bx0157 are "Administrative" access level
Class Code:	bx
ControlNet Class Code:	83 hex
Instances:	1

F.1.1.1. Attributes

Note: The last two digits of each shared data variable is its attribute.

bx0100	Composite bx block	Struct	na	Composite of entire block
Batch Access				
bx0101	Operator login	US	na	0 = Disabled, 1 =- Enabled
bx0102	Operator login timeout	US	na	In seconds
bx0103	Run reports security access	US	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
bx0104	Switch mode security access	US	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
Q.i Parameters				
bx0105	Q.i PAC XREF Status	By	na	PAC Database XREF Status 0= Needs to be built, 1= Built
bx0106	PAC Global Data Base	6S	na	"GLOBL" indicates that Web pages update Data Base globally. "LOCAL" indicates that web pages update data bases locally
bx0107	PAC Weight Entry Method	By	na	0 = Absolute Weight, 1=% of Capacity
bx0108	Q.i 365 Bridge Enable	By	na	1=Enable

bx0109	Q.I Trace Level	By	rt	0 = Minimum Trace to Ethernet LPRINT (default). This is the normal operation version. It contains only the feed history records and the command/status trace. 1 = Moderate Trace to Ethernet LPRINT 2 = Detailed Trace to Ethernet LPRINT 10 = Minimum Trace to Ethernet LPRINT and Compact Flash File 11= Moderate Trace to Ethernet LPRINT and Compact Flash File (debug only) 12 = Detailed Trace to Ethernet LPRINT and Compact Flash File (debug only) 255 = Timings information trace to Ethernet LPRINT (debug only) 254 = PLC trace data to Ethernet LPRINT (debug only) 253 = Batch Recipe Trace moderate filter for Ethernet LPRINT (debug only). 252 = Batch Recipe Trace details filter for Ethernet LPRINT (debug only). 245 = Timings information trace to Ethernet LPRINT and Compact Flash File (debug only) 244 = PLC trace data to Ethernet LPRINT and Compact Flash File (debug only) 243 = Batch Recipe Trace moderate filter for Ethernet LPRINT and Compact Flash file (debug only). 242 = Batch Recipe Trace details filter for Ethernet LPRINT and Compact Flash file (debug only).
System Configuration Parameters				
bx0110	Batch Configuration	By	na	0 = No Batch 1 = IND780 Batch Configuration 2 = Classic Q.i PLC Configuration supporting the Classic Q.i Message Interface. 3 = Enhanced Q.I PLC Configuration supporting the Enhanced Q.i PLC Message Interface See Method Description Below
bx0111	Master Terminal Node	By	na	Node number of Master terminal It has the master version of the Batch Database. In an IND780 Batch System, it does the batch and recipe processing.
Batch Access				
bx0112	Add Order Security Access	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
bx0113	Rescale Recipe Security Access	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
Batch History Configuration Parameters				
bx0120	Delete Order Security Access	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
bx0121	Abort Batch	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance,

	Security Access			4 = Administrator
bx0122	Clear History Log Security Access	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
bx0123	Enable Batch Transaction Log	By	na	0 = Disabled 1 = Print Batch Transaction Log record at completion of each material transfer phase and manual transfer phase using custom print trigger #20. Default = 1.
bx0124	Enable Batch Summary Report	By	na	0 = Disabled 1 = Print Batch Summary Report header and footer record at start and completion of each Control Recipe using custom print trigger #20. Default = 1.
bx0125	Max Size of Batch History Table	UL	na	Not Used. Maximum # of Bytes=100000000
bx0126	Max Size of Batch Audit Log File	UL	na	Not Used. Maximum # of Bytes=100000000
Batch Access				
bx0127	Accept Off Tolerance Security Acc.	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
bx0128	Adjust Recipe Security Access	By	na	0 = Disabled, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
PC Host Access Parameters				
bx0130	Database Server Agent	81S	na	The URL of the SQL Server CE Agent on the server computer
bx0131	Database Server Login	17S	na	Network login name
bx0132	Database Server Password	17S	na	Network login password
bx0133	SQL Server	41S	na	SQL Server Name
bx0134	SQL Catalog	41S	na	SQL Server Database containing table(s)
bx0135	SQL Login	17S	na	SQL Server Database login name
bx0136	SQL Password	17S	na	SQL Server Database login password
bx0137	Host IP Address	17S	na	IP Address of Batch System Host PC
Table Date and Version Numbers				
bx0140	Equipment Table Date/Time	AL2	na	Date/Time of last external change to Equipment Table
bx0141	Equipment Table Version Number	S11	na	Equipment Table Version Number. The remote terminals, in particular, use this value to determine if they need to download a new version of the table from the master terminal.
bx0142	Control Module Table Date/Time	AL2	na	Date/Time of last external change to Control ModuleTable
bx0143	Control Module	S11	na	Control Module Table Version Number The remote terminals, in

	Version Number			particular, use this value to determine if they need to download a new version of the table from the master terminal.
bx0144	Material Path Table Date/Time	AL2	na	Date/Time of last external change to Material Path Table
bx0145	Material-Path Table Version Num	S11	na	Material-Path Version Number. The remote terminals, in particular, use this value to determine if they need to download a new version of the table from the master terminal.
bx0146	Master Recipe Change Date/Time	AL2	na	Date/Time of last change to Master Recipe Table
Recipe Processing Parameters				
bx0150	Edit Recipe Targets Enabled	By	na	0 = disabled, 1 = enabled
bx0151	Recipe Rescaling Method	By	na	0 = Disable 1 = Recipe Amount 2 = % 3 = Ingredient Amount
bx0152	Endless Looping	By	na	0 = Disabled 1 = Enabled
bx0153	Starting Next Batch within Order	By	na	1 = Manually start next Batch within Order 2 = Automatically start next Batch within Order
bx0154	Starting Next Order	By	na	1 = Manually start next Order 2 = Automatically start next Order
bx0155	Horizontal Campaign	By	na	0 = Disabled 1 = Enabled
bx0156	Enable Audit Log	By	rt	0 = Disabled 1 = Write to Audit Log File on Compact Flash 2 = Write to Audit Log File on Compact Flash and to LPRINT device
bx0157	HA Block Security Access	By	na	0 = Disabed, 1 = Operator, 2 = Supervisor, 3 = Maintenance, 4 = Administrator
Miscellaneous Parameters				
bx0160	Batch Normalized Weight Units	By	na	The Batch Processing converts weights to this normalized weight unit index so that all Batch processed weights and displayed weights are in the same units. Pounds = 1 Kilograms = 2 (default) Grams = 3 Metric Tons = 4 Tons = 5 Troy Ounces = 6 Penny Weight = 7 Ounces = 8 Custom Unit = 9
bx0161	Batch Normalized Weight Unit	S4	na	lb pounds, kg kilograms, grams, oz ounces, oztroy, dwt pennyweights, metric tons, ton, or custom units name

	Name			
bx0162	Custom Units Conversion Factor	D	na	Number of grams in the custom units.
bx0163	Batch Jog Mode	By	na	0 = Disabled 1 = auto-jog to in tolerance 2 = auto-jog to target 3 = manual-jog to high tolerance
bx0164	Enable K1_K2 Limits	By	na	1 = Yes
bx0165	Disable Q.I Look-Back Time	By	na	1 = Disable
bx0166	Dump-to-Empty Comparison Factor	D	na	Q.i Phase uses this parameter to determine if the Dump-to-Empty weight is too small compared to the last Dump-to-Empty weight for this Material Path. If it is too small, the Q.i Phase cannot overlap this feed. The value can be between 0.0 and 1.0. The default is .75.
bx0167	Reserved	UL	na	
bx0168	Reserved	S17	na	
bx0169	Manual Mode	By	na	0 = Disabled, 1 = Enabled
bx0170	Q.I K1 Limit	D	na	Maximum Value for K1 Limits
bx0171	Q.I K2 Limit	D	na	Maximum Value for K2 Limits
bx0172	Reserved	D	na	
bx0173	Reserved	D	na	
bx0174	No. of Digits Right of the DP	UL	na	Number of digits to the right of the decimal point for displayed normalized weight values
bx0175	Out from PLC Assembly Length	UL	na	User can set this value when pl0130 = 3
bx0176	Out from PLC Assembly Instance #	By	na	User can set this value when pl0130 = 3
bx0177	Run to End	By	na	0 = Disabled, 1 = Enabled

F.1.1.2. Method

You must have an **I-Button** to enable the Batch and/or Q.i capabilities in the IND780.

F.1.2. Batch System View Setup (vx)

Access:	"Supervisor" default level is customizable by individual field.	
Class Code:	vx	
ControlNet Class Code:	__ hex	
Instances:	1	Batch List View
	2	Control Recipe Phase Overview
	3	Control Recipe Phase Overview

4	Equipment Table Overview
5	Auto Material Transfer View
6	Manual Material Transfer View
7	Control Report Print View

F.1.2.1. Attributes

vx--00	Composite vx block	Struct	na	Composite of entire block
vx--01	View	By	na	0 = disabled, 1 = enabled
vx--02	Display Soft Keys	By	na	0 = disabled, 1 = enabled
vx--03	Display Order Description	By	na	0 = disabled, 1 = enabled
vx--04	Display Master Recipe Name	By	na	0 = disabled, 1 = enabled
vx--05	Display Target Weight	By	na	0 = disabled, 1 = enabled
vx--06	Display Campaign	By	na	0 = disabled, 1 = enabled
vx--07	Display Title	By	na	0 = disabled, 1 = Order/Recipe/Cycle, 2 = Order/Cycle, 3 = Order/Recipe, 4 = Order only 5 = Recipe/Cycle, 6 = Recipe only, 7 = Recipe with Target
vx--08	Display Key Parameter	By	na	0 = disabled, 1 = enabled
vx--09	Display Details	By	na	0 = disabled, 1 = enabled
vx--10	Display Weight Display	By	na	0 = disabled, 1 = enabled
vx--11	Display Smart Trac	By	na	0 = disabled, 1 = enabled
vx--12	Display Recipe/Order	By	na	0 = disabled, 1 = enabled
vx--13	Display Material	By	na	0 = disabled, 1 = enabled
vx--14	Display Tank Graphic	By	na	0 = disabled, 1 = enabled
vx--15	Display Line 1	By	na	0 = disabled 1 = Order ID/Description 2 = Order ID 3 = Order Description 4 = Master Record ID/Description 5 = Master Record ID 6 = Master Record Description 7 = Control Record ID/Description

				8 = Control Record ID 9 = Control Record Description 10 = Target Weight 11 = Delivered Weight 12 = Target/Delivered Weight 13 = Recipe Status 14 = Cycle Info 15 = % Complete 16 = Start/End Time and Date
vx--16	Display Line 2	By	na	see vx--15
vx--17	Display Line 3	By	na	see vx--15
vx--18	Display Line 4	By	na	see vx--15
vx--19	Display Line 5	By	na	see vx--15
vx--20	Display Line 6	By	na	see vx--15
vx--21	Display Line 7	By	na	see vx--15
vx--22	Display Result	By	na	0 = disabled, 1 = enabled
vx--23	Display Message	By	na	0 = disabled, 1 =

F.1.3. Batch Application Process Setting (ca)

Access:	"Supervisor" default level is customizable by individual field. ca0111, ca0112 and ca0113 have "Administrative" access level
Class Code:	ca
Instances:	1

F.1.3.1. Attributes

ca0100	Composite ca block	Struct	na	Composite of entire block
ca0101	Reserved	D	na	
ca0102	Reserved	S41	rt	
ca0103	Equipment Details View	By	na	0 = Equipment Details View shows all phases 1 = Equipment Details View is shows only the eight equipment modules
ca0104	Reserved	US	rt	
ca0105	Reserved	D	rt	
ca0106	Reserved	US	rt	
ca0107	Enable Modify Step by Gross Wt	US	rt	0 = Disabled (default) 1 = Enabled This is a custom feature implemented for Sun Paint that allows the operator to decrement the Target weight for a selected phase by the gross weight on the scale.

ca0108	Enable Abort Drain Time IO	By	na	0 = Disabled, 1= Enabled
ca0109	Batch Off-Tolerance Processing	By	na	1 = Accept Off-Tolerance. Continue running batch after logging error 2 = Go to pause and await operator command 3=Abort order 4 = Do not complete feed, but allow operator to manually adjust feed into tolerance before completing feed. Operator completes feed using discrete IO or HMI input.
ca0110	Scrolling softkeys	By	na	0 = Disabled, 1 = Enabled
ca0111	Automatic Recipe Process Mode	By	na	0 = Disabled, 1 = Enabled
ca0112	Semiautomatic Recipe Mode	By	na	0 = Disabled, 1 = Enabled
ca0113	Cycle Count, Auto Matll Xfer	By	na	0 = Disabled, 1 = Enabled
ca0114	Cycle Count, Man Matl Xfer	By	na	0 = Disabled, 1 = Enabled
ca0115	Enable Convert Batch Function	By	na	0 = Disabled, 1 = Enabled

F.1.4. Batch Application Process Setting (cb)

Access:	"Supervisor" default level is customizable by individual field. cb0111, cb0112 and cb0113 have "Administrative" access level
Class Code:	cb
Instances:	1

F.1.4.1. Attributes

cb0100	Composite cb block	Struct	na	Composite of entire block
cb0113	Current Recipe Process Mode	By	Na	A = Automatic Mode S = SemiAutomatic Mode M = Manual Mode
cb0114	Campaign Type	By	na	H = Horizontal V = Vertical

F.1.5. Batch System Triggers (xg)

Access:	"Supervisor" default level is customizable by individual field. xg0109, xg0110, xg0111, and xg0112 have "Read Only" access level. xg0113, xg0114, xg0115, and xg0130 have operator security level
Class Code:	xg
ControlNet Class Code:	__ hex
Instances:	1

F.1.5.1. Attributes

xg0100	Composite xg block	Struct	na	Composite of entire block
xg0101	Resynchronize Q.i Batch Tables	By	rc	1= alert remote terminal to resynchronize Batch Tables from master & reset running Material Transfers; 0 = complete
xg0102	Execute Q.i Stored Commands	By	rt	1 = alert terminals to execute stored Material Transfer commands
xg0103	Resynchronize Q.i Shared Data	By	rt	1= alert remote terminal to resynchronize Q.i Shared Data from master; 0 = complete
xg0104	Q.i Batch Tables Initialization	By	rt	0 = in progress; 1 = Q.i initialization complete
xg0105	Reinitialize Q.i PLC Marshaling	By	rt	1 = reinitialize PLC Marshaling; 0 = complete
xg0106	Reinitialize Q.i Dynamic Weighing	By	rt	1 = reinitialize Q.i setup from DYNAMIC_WEIGHING records of Equipment table without resetting running Material Transfers.
xg0107	Batch Order Table Changed	By	rt	1=Alert to CP that Batch Order Table changed. CP sets flag back to 0 after processing the alert.
xg0108	Phase SD Changed	By	rt	1=RST Alert to CP that the Phase SD changed. CP sets flag back to 0 after processing the alert.
xg0109	Unit Procedure Phase failure	By	rt	1=Used internally to alert the Main Batch process that a phase in a Unit Procedure has failed.
xg0110	Unit Procedure Pause	By	rt	1=Used internally to alert the Main Batch process that a phase in a Unit Procedure has paused.
xg0111	Unit Procedure Pause	By	rt	1=Used internally to alert the Main Recipe process that Unit Procedure has progressed to next Phase Step.
xg0112	Internal Trigger to Reset Batch	By	rt	1= Used internally to Reset Batch Processing when Tables are reset.

xg0113	Disable SmartTrak MP Name	By	rt	1= Disable setting Material Path Name in SmartTrack Display.
xg0114	Enable SmartTrak Display	By	rt	Equipment Module Number = start SmartTrak for Q.i setpoint for this EM. CP sets this trigger to coordinate with RST setting of Q.i setpoint.
xg0115	Release SmartTrak Display	By	rt	Equipment Module Number = release SmartTrak display area for this EM. CP sets this trigger to coordinate with RSt setting of Q.i setpoint.
Batch Display Keyboard Triggers				
xg0116	TE Request Batch Display KB	By	rt	1=TE makes request; 0 = CP Acks request
xg0117	CP Take Batch Display KB	By	rt	1=CP gives TE KB; 0 = TE Acks gift
xg0118	CP Give Back Display KB	By	rt	1=CP requests KB; 0 = TE Acks request
xg0119	Te Release Display KB	By	rt	1=TE releases KB; 0=CP Acks release
xg0120	Start/Resume Batch Discrete IO	By	rt	1=Start/Resume Batch
xg0121	Turn Off Batch Alarm	By	rt	1=Turn off alarm SKM Keyhook in Batch system uses this trigger to turn off Batch alarm when operator hits left arrow key
xg0122	Number of AUX Controls ON	By	rt	Number of AUX Controls turned ON
xg0130	Switch to Batch Weight Display	By	rt	1= Switch to Batch Weight Display

F.1.5.2. Method

The IND780batch needs to synchronize certain Shared Data fields between the master and the remote terminals for reasons of ease-of-setup and cluster-setup-consistency. We cannot synchronize all fields because some fields may need to be different in the remote terminals.

From an architecture standpoint, it might be better if a remote terminal reads the fields it needs from the master at power up and stores them locally rather than the master downloading the values. We could add a "xg" trigger that the master could set in the remote terminals to force a resynchronization when the operator changes values at the master.

We need to keep a list of Shared Data fields that the IND780batch needs to synchronize between the Master and Remote terminals in a Compact Flash file.

F.2. Batch Order Processing

F.2.1. Batch Order Commands (od)

Access:	"Supervisor" default level is customizable by individual field. od0101, od0130, od0131, and od0135 are "Administrator" level have "Administrative" access level
Class Code:	od
ControlNet Class Code:	9E hex
Instances:	1

F.2.1.1. Attributes

od0100	Composite or block	Struct	na	Composite of entire block
od0101	Composite Command	By	rt	COMMANDS MOVED TO OC BLOCK! Batch writes command value here. 0 = command complete 1 = start currently-loaded batch order 2 = restart / resume currently-loaded batch order Please refer to the oc block.
od0102	Reserved	By	rt	
od0103	Reserved	By	rt	
od0120	Batch Order Name	S17	na	Must be set for create and load commands
od0121	Batch Order Description	S41	na	
od0122	Master Recipe ID	S17	na	Batch Engine uses this ID during a PLC Create Order command (oc0110) or a Convert Batch from an Existing Master Recipe to a new Master Recipe command (oc0138)
od0123	Order Scaling Type	By	na	'W'=User specifies the Target weight for order. IND780batch calculates the Recipe Rescale Value and Number of Cycles to best fit the Order Target Weight. #'=User specifes the number of recipe cycles, and the user specifies Recipe Rescale Type and Value. 0= Use value specified in Batch Order Table record.
od0124	Recipe Rescale Type	By	na	In order scaling type '#', user specifies: 'A'=Target Weight for recipe '%'=Percent of target for recipe, 'N'=Do not rescale 0=Use value specified in Batch Order Table record.
od0125	Recipe Rescale Value	S17	na	In order scaling type '#', user specifies the appropriate value based on the rescale type (target or percent). For the Modify Phase Target command (oc0116), this field contains the new target value.
od0126	Number of Recipe Cycles	By	na	In order scaling type '#', user specifies the number of Recipe Cycles in the Order. -1 = endless looping. 0=Use value specified in Batch Order Table record.

od0127	Procedure Number	By	na	0=Main recipe, 1-4=Unit procedure number
od0128	Phase Step Number	By	na	The user may specify a step number to run in Horizontal, Manual, or Override mode. 1-99 for Main Recipe 1-50 for Unit Procedure
od0129	Batch Campaign Type	By	na	'V' = Vertical Campaign 'H' = Horizontal Campaign Set by RST to indicate value specified in Master Recipe Header record.
od0130	Order Process Mode	By	na	Batch writes command value here. 'S'=Semi-auto, when a control recipe completes, the batch engine will hold for a start / resume to start the next control recipe. 'A'=Automatic, when a control recipe completes, the batch engine will automatically start the next control recipe.
od0131	Recipe Process Mode	By	na	Batch writes basic recipe value here. 'A'=Vertical Automatic, when a phase completes, automatically start the next phase. 'S'=Vertical Semi-auto, when a phase completes, the recipe will hold for a start / resume to start the next phase. 'M'=Vertical Manual, run a specified single phase to completion and stop.
od0132	Existing Master for Convert Batch	S17	na	Existing Master Recipe ID in Master Recipe Table that Convert Batch command (oc0138) uses to create a new Converted Master Recipe.
od0133	Existing Control for Convert Batch	S41	na	Existing Control Recipe ID in Batch History Table that Convert Batch command (oc0138) uses to create a new Converted Master Recipe.
od0134	Order Target Weight	S17	na	In scaling type 'W', the user specifies the target weight for the order.

F.2.1.2. Command Description

Start Start the currently loaded order per the order and recipe process mode.

Restart / Resume Resume processing the order from the current paused state or last step completed.

Pause Pause operation at the current step. The order can be resumed, aborted or parked.

Stop / Abort The order will be marked as aborted and will go into the history file.

Park The order status will be stored in the batch order and control recipe tables and marked as parked.

Hold at End Hold processing at the end of the current control recipe. The next control recipe is loaded ready to resume, stop / abort or modify.

Create Order Create an order in memory with one control recipe.

Save Order Save the order and it's control recipe(s) in memory to the database tables.

Load Order Load an existing order and control recipe from the database tables into memory. If there are no control recipes for the order they will be created per the criteria in the batch order record and saved to the tables.

Clear Order Clear the current order and control recipe from memory.

Delete Order Delete the order and control recipe(s) from the database tables and memory.

Modify Order Update the order in memory as specified by the batch and rescale type.

Modify Recipe Update a phase step of the current control recipe in memory.

Save Recipe Save current (and subsequent) control recipe.

FCE On Turn on final control element. The recipe must be started in the operator-override-control mode and then this command can be issued.

FCE Off Turn off final control element. The recipe must be started in the operator-override-control mode and then this command can be issued.

The following table shows the commands supported by this interface and the shared data that needs filled for them:

Field	sd	Create (10)	Load (12)	Modify Order (15)	Modify Recipe (16)	Start (1)	Save Recipe (17)
Order Name (ID)	od0120	1	1				
Order Description	od0121	1					
Master Recipe (ID)	od0122	1					
Batch Type	od0123	3		1			
Rescale Type	od0124	3		1			
Value	od0125	3		2	1		
Number of Cycles	od0126	3		2			
Procedure#	od0127				1	2	
Step#	od0128				1	2	
Current CR Only	od0129						1
Order Process Mode	od0130					1	
Recipe Process Mode	od0131					1	

Key:

1 Field must be loaded for the command.

2 Field may be loaded based on other fields.

3 Field that may optionally be loaded.

F.2.2. Current Batch Order Statues (ox)

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	ox
ControlNet Class Code:	9f hex
Instances:	1

F.2.2.1. Attributes

ox0100	Composite ox block	Struct	na	Composite of entire block
ox0101	Batch Order Command Status	By	rt	Status of last Batch Order command The RST Batch Engine sets this status byte before setting the command byte to zero to indicate that the command failed. 0 = Successful completion 1 = Command in progress 2 = Batch Order Processing already started 3-255 = Other Failure status
ox0102	Current Batch Order State	By	rt	Refer to "Processing_State_Values" Section
ox0103	Current Batch Order Mode	By	rt	Refer to od0130 for definition
ox0104	Current Control Recipe Mode	By	rt	Batch writes the extended recipe mode value here. 'A'=Vertical Automatic, when a phase completes, automatically start the next phase. 'S'=Vertical Semi-auto, when a phase completes, the recipe will hold for a start / resume to start the next phase. 'M'=Vertical Manual, run a specified single phase to completion and stop. 'R'= Horizontal Auto Mode 'Z'=Horizontal Semi-Auto Mode 'H'=Horizontal Manual Mode
ox0105	Batch Type	By	rt	Refer to od0123, as determined from Master Recipe and Batch Commands
ox0106	Rescale Type	By	rt	Refer to od0124, as determined from Master Recipe and Batch Commands

The RST Batch Order Processing maintains this SD image of its currently processing Batch Order and Control Recipe, or when it is in Idle or Hold state, the last processed order.

ox0111	Batch Order Name (ID)	S17	na	Current Batch Order Name (ID)
ox0112	Description	S41	na	
ox0113	Batch Sequence #	UL	na	
ox0114	Master Recipe Name	S17	na	
ox0115	Current Control Recipe Name	S17	na	Current Control Recipe Name
ox0116	Batch Order Delivered Weight	D	na	in normalized weighing units (bx0160), updated at end of each recipe cycle
ox0117	Batch Target Weight	D	na	in normalized weighing units (bx0160)
ox0118	Number of Control Recipe Cycles	L	na	Total number of Control Recipe cycles needed to complete Batch Order -1 = Endless Cycles
ox0119	Control Recipe Cycle #	UL	na	Current Control Recipe Cycle # in Current Batch Order
ox0120	Batch Start Date &	AL2	na	Batch Start Date & Time

	Time			
ox0121	Batch End Date & Time	AL2	na	Batch End Date & Time
ox0124	Horizontal Campaign	By	na	0 = Vertical Campaign, 1 = Horizontal
ox0125	Master Recipe Description	S41	na	
ox0130	Hold at End state	US	na	0 = disabled, 1 = enabled
ox0131	Current Main Procedure Step #	US	na	RST Batch sets this value, and uses it particularly in horizontal mode to control the phase execution in among Control Recipes.
ox0132	Current Unit Procedures Step #	ABy6	na	The first byte represents the Main Procedure and the next 4 bytes represent the Unit Procedures in Control Recipe. The last byte is reserved.
Batch Order Processing uses these two fields to Generate the Control Recipe Name.				
ox0140	Batch Order Sequence Number	UL	na	Batch Order Processing assigns this number to the next Batch Order
ox0141	Control Recipe Cycle Number	UL	na	Batch Order Processing assigns a Control Recipe sequence numbers to the Control Recipes (batch) within the Batch Order, starting with 0.

F.2.3. Batch Order Command/Status Light Triggers (oc)

The RST Batch Engine processes command triggers in the OC Block. It also sets certain Batch Status Light triggers in the OC Block.

The Control Panel processes the commands designated by "CP" in this block. The Control Panel accesses these commands in SD to determine if the logged-in system user has sufficiently high Security Access Level to initiate these commands.

Access:	"Supervisor" default level is customizable by individual field. The following fields have "operator" access-level: oc0101, oc0102, oc0103, oc0105, oc0106, oc0112, oc0113, oc0118, oc0123, oc0124, oc0125, oc0126, oc0127, oc0129
Class Code:	oc
ControlNet Class Code:	A2 hex
Instances:	1

F.2.3.1. Attributes

oc0100	Composite ox block	Struct	na	Composite of entire block
Order Commands				
oc0101	Start Batch Order Command	By	rt	1=start currently-loaded batch order
oc0102	Restart/Resume Batch Order	By	rt	1= restart / resume currently-loaded batch order
oc0103	Pause Batch Order	By	rt	1= pause batch order processing

	Processing			
oc0104	Stop/abort batch order processing	By	rt	1= abort the current order
oc0105	Park current batch order	By	rt	1= park the currently paused batch order
oc0106	Hold at End of Current Recipe	By	rt	1= hold batch order processing at end of the current control recipe
oc0107	Turn On FCE for Phase	By	rt	1= Turn on FCE in operator-override-control mode for Phase selected in od0128
oc0108	Turn Off FCE for Phase	By	rt	1= Turn off FCE in operator-override-control mode for Phase selected in od0128
oc0110	Create an order in the Batch Order Table, and load it	By	rt	1= create an order in the Batch Order Table (BOT) as directed in OD block and load the order into memory READY to run. A PLC can use this command to create an order in the BOT from Shared Data. This command requires od0120 and od0122 fields to be set and optionally uses the od0121 and od0126 fields if they are set. You cannot rescale a recipe with this command but, after it is complete, you can optionally use the oc0115 command to modify the size of the order. After this command is complete, you can use oc0101, oc0102, or oc0136 to start running the order.
oc0112	Load batch order from database	By	rt	1= load batch order from Database and generate Control Recipes for Batch Order in memory. Validate the currently-loaded Recipe will not overflow the capacity of the scales.
oc0113	Clear batch order	By	rt	1= The user must specify the order name in od0120. When there is no running Batch, delete the order's associated entries in the Batch Order Table and the Control Recipe Table.
oc0114	Delete batch order	By	rt	1= Delete currently loaded batch order from Batch Order Table and delete the Control Recipes associated with the order from the database. Clear the SD tables.
oc0115	Modify (Rescale) batch order	By	rt	1= modify (rescale) order in memory as directed in OD block
oc0116	Modify recipe phase target	By	rt	1= modify target of phase step in the current control recipe in memory as specified in the OD block. If the phase has already run or is currently running, you cannot modify the target. od0127 contains the procedure number, od0128 contains the step number, and od0125 contains the new target value.
oc0117	Save control recipes	By	rt	1= save the current and remaining control recipes
oc0118	Load Next Horizntal Control Recipe	By	rt	In Horizontal Mode, close current control recipe and load next control recipe in the order.
oc0119	Automatic Order Process Mode	By	rt	1= Go to Automatic Order processing mode. When a control recipe completes, the batch engine will automatically start the next control recipe
oc0120	Semi-Auto Order Process	By	rt	1= Go to SemiAuto Order processing mode.When a

	Mode			control recipe completes, the batch engine will hold for start/resume before starting the next control recipe.
oc0121	Automatic Recipe Process Mode	By	rt	1= Go to Automatic Recipe processing. When a recipe phase completes, the batch engine will automatically start next phase.
oc0122	Manual Recipe Process Mode	By	rt	1= Go to Manual Recipe processing. When in Manual Mode and Idle State and you may start a Batch using the oc0101 trigger. Before/after processing each recipe phase, the RST Batch Engine goes into the "Waiting for Operator Acknowledge" state. Upon receiving a resume "oc0102" command, the RST Batch Engine runs the single-phase step specified by the step number in od0128 and the procedure number in od0127 of the current Control Recipe; and upon completion of the phase, it returns to "Waiting for Operator Acknowledge" state. Upon executing the "Recipe End" phase, Batch Engine completes the Control Recipe.
oc0125	Don't complete Off Tolerance	By	rt	1 = Do NOT complete an off-tolerance feed, but allow the operator to manually adjust the feed into tolerance before completing the feed. Operator completes feed using discrete IO or HMI input.
oc0126	Accept Off Tolerance Feed	By	rt	1= Accept Off-Tolerance feed. Continue running after logging feed error.
oc0127	Pause after Off Tolerance Feed	By	rt	1= Pause Recipe Processing after Off-Tolerance feed and await operator command
oc0128	Abort after Off Tolerance Feed	By	rt	1= Abort Order Processing after Off-Tolerance feed
oc0129	Acknowledge Alarm	By	rt	1= Acknowledge (silence) alarm
oc0130	SemiAuto Recipe Process Mode	By	rt	1= Go to SemiAuto Recipe processing. When a recipe phase completes, the operator must provide the OK to start next phase.
oc0131	Restore BRAM Settings to Runtime	By	rt	1 = Restore BRAM Settings to Runtime
oc0132	Clear Batch History	By	rt	1 = Clear Records from Batch History Table
oc0133	End Phase but Continue Batch	By	rt	1 = Skip to the end of an in-progress phase and record feed results as a normal termination, and then continue processing the Control Recipe (batch). The purpose, for example, is to provide a way to handle an out-of-material condition or to end a long drain timer without aborting the feed. od0127 and od0128 must contain the phase and procedure numbers of the in-progress phase to skip to the end.
oc0135	Set Security Level for Commands	By	rt	1 = Set Security level for Batch Commands from SD

oc0136	Start/Resume Batch Command	By	rt	1 = If batch system is idle, load next batch from database, validate the loaded Recipe will not overflow the capacity of the scales, and start it. If batch system is in pause or hold state, resume the batch. Otherwise, ignore it.
oc0137	Enter Batch Inactive if not busy	By	rt	1= The PC Batch Tool sends this command to the IND780 to force the IN780 Batch into Setup if it is not busy. This allows the PC Batch Tool to extract history files while the IND780batch Processing is idle and cannot go active.
oc0138	Convert Batch	By	rt	1 = IND780 Convert Batch function runs in the IND780 Batch Engine. The Batch Engine creates a new Converted Master Recipe ID (od0122) in the Master Recipe Table from an existing Master Recipe (od0132) in the Master Recipe Table and a Control Recipe (od0133) in the Batch History Table. This function only works with Vertical Recipes. To create the Converted Master Recipe, the Batch Engine cycles through the Existing Master Recipe and subtracts out the content of the materials that the Batch Engine fed during the Control Recipe execution that is in the Batch History Table. The Batch Engine recalculates the formula to account for overfed material in the Historical Control Recipe. The Batch Engine adjusts the targets in the Converted Master Recipe so that they match proportionally the largest overfed material in the Control Recipe. It validates that the new targets will not overflow the vessel. Using the Converted Master Recipe, the Batch Engine then can run an Order to convert one existing batch to the new converted batch. Both the Control Panel and Batch PC Tool use this command.
Order Processing Status Lights				
oc0150	Batch Alarm Status Light	By	rt	1= yes
oc0151	Batch Running Status Light	By	rt	1= yes
oc0152	Batch Complete Status Light	By	rt	1= yes
oc0153	Batch Paused/Holding Status	By	rt	1= yes
oc0154	Batch Aborting Status Light	By	rt	1= yes
oc0155	Batch Auto Mode Status Light	By	rt	1= yes
oc0156	Batch Semi-Auto Mode Light	By	rt	1= yes
oc0157	Batch Manual Mode Status Light	By	rt	1= yes

F.3. Recipe Processing

F.3.1. Control Recipe Status (rs)

Access:	"Supervisor" default, level customizable by individual field. bx0103, bx0104, bx0112, bx0113, bx0120, bx0121, bx0122, bx0127,bx0128,bx0157 are "Administrative" access level	
Class Code:	rs	
ControlNet Class Code:	A3 hex	
Instances:	5	There are five instances of the Recipe Status block so potentially there could be 5 recipes running simultaneously. The application can only start the first instance, which refers to the Main Recipe. The Main Recipe starts the other 4 instances as Unit Procedures or sub-recipes

F.3.1.1. Attributes

rs--00	Composite rs block	Struct	na	Composite of entire block
rs--01	Reserved	By	rt	
rs--02	Current Procedure State	By	rt	Refer to "Processing_State_Values" Section
rs--03	Control Recipe Name	S17	na	*Pointer into the Control Recipe Table
rs--04	Master Recipe Name	S17	na	*Pointer into the Master Recipe Table
rs--05	Unit Procedure Name	S17	na	"Main Procedure" in Instance 1 or Unit Procedure Name in Instances 2 to 6
rs--06	Description	S41	na	Description of Control Recipe or Unit Procedure
rs--07	Recipe Start Date & Time	AL2	na	Start Time of Control Recipe or Unit Procedure
rs--08	Recipe End Date & Time	AL2	na	End Time of Control Recipe or Unit Procedure
rs--09	Recipe Target Weight	D	na	Target Weight of Control Recipe or Unit Procedure in normalized weight units (bx0160)
rs--10	Recipe Delivered Weight	D	na	Delivered Weight of Control Recipe or Unit Procedure in normalized weight units (bx0160)
rs--11	Composite Recipe % Error	US	na	Composite % Error in Control Recipe or Unit Procedure in hundredths of a percent
rs--12	Total # of Steps in Recipe	US	na	Total # Steps in Control Recipe or Unit Procedure
rs--13	Current Step # in Recipe	US	na	Current/Last Step # in Control Recipe or Unit Procedure
rs--14	Pending Step # in Semiauto Mode	US	na	In Semiautomatic Mode, this is the pendingstep number for which the Batch is waiting for the operator to give an OK before Batch runs it. Otherwise, the content is 0.
rs--15	Phase Active in Recipe	By	rt	This field is only in 0 instance of the block. 1 = phase active within main recipe, or in unit procedure of recipe
rs--16	Percent of Recipe Steps Complete	UL	rt	Number of overall recipe steps completed. Set in instance 0 only.

F.3.2. Batch Variables (vt)

The RST Batch Engine writes to this Shared Data block to store the name of the Batch Variables that the Operator can modify during the Batch run, under direction of the Recipe phases. The Batch Recipe Engine clears this table at the beginning of the each Recipe run. Each time it encounters a new variable, it adds the name and value to the Variable Table.

The IND780batch stores the 30 dynamic Batch Variables names in the VT Block.

It stores the 30 dynamic Batch Variables values in the AR05 Block in BRAM in fields 21 through 50. Any other fields in the AR Block are available for use by custom applications.

Access:	"Administrator" default, level customizable by individual field.
Class Code:	vt
ControlNet Class Code:	__ hex
Instances:	30 There can be 30 variables in a Batch Recipe

F.3.2.1. Attributes

vt--00	Composite vt block	Struct	na	Composite of entire block
vt--01	Batch Variable Name	S17	rt	
vt--02	Batch Variable Value	S41	rt	

F.3.3. Batch Working String Variables (ar)

Access:	"All Users" default, level customizable by individual field.
Class Code:	ar
ControlNet Class Code:	7F hex
Instances:	Use instance 5 only for Batch Variables

F.3.3.1. Attributes

ar0500	Composite ar block	Struct	na	Composite of entire block
ar0519	Batch Transaction Print String	S101	rt	Text for printing Batch transaction log
ar0520	Batch Abort Message	S101	rt	Text describing reason for aborting a batch.

F.3.4. Batch Print Template Fields (ak) (ar)

Access:	"All Users" default, level customizable by individual field.
Class Code:	ak
ControlNet Class Code:	6B hex
Instances:	Use instance 5 only for Batch Variables

F.3.4.1. Attributes

Runtime Print Template Values from the Batch Order Table

ak0551	Order User Information #1	S101	rt	Text Line #1 from Batch Order Table
ak0552	Order User Information #2	S101	rt	Text Line #2 from Batch Order Table
ak0553	Order User Information #3	S101	rt	Text Line #3 from Batch Order Table
ak0554	Control Panel Trace Buffer	S101	rt	Control Panel can put messages in trace.log using this buffer
Runtime Print Template Values from the last Comm Phase Record				
ak0555	Print Value Field	S101	rt	Batch moves this value from Data8 field in Comm phase record for inclusion in a print template.
ak0556	Print Value Field	S101	rt	Batch moves this value from Data9 field in Comm phase record for inclusion in a print template.
ak0557	Print Value Field	S101	rt	Batch moves this value from Data10 field in Comm phase record for inclusion in a print template.
ak0558	Print Value Field	S101	rt	Batch moves this value from Data11 field in Comm phase record for inclusion in a print template.
ak0559	Print Value Field	S101	rt	Batch moves this value from Data12 field in Comm phase record for inclusion in a print template.
Shared Data Fields Recommended for Temporarily Storing Data from Recipe				
ar0400	Composite ar block	Struct	na	Composite of entire block
ar0401 – ar0450	Unicode String 1-50	S101	rt	
Print Template Values stored from the last completed Batch Order				
ar0501	Reserved	S101	rt	
ar0502	Order User Information #1	S101	rt	Text Line #1 from Batch Order Table Batch moves this value from ak0552
ar0503	Order User Information #2	S101	rt	Text Line #2 from Batch Order Table Batch moves this value from ak0553
ar0504	Order User Information #3	S101	rt	Text Line #3 from Batch Order Table Batch moves this value from ak0554
ar0505	Last Batch Order Print Value Field	S101	rt	Batch moves this value from ak0555
ar0506	Last Batch Order Print Value Field	S101	rt	Batch moves this value from ak0556
ar0507	Last Batch Order Print Value Field	S101	rt	Batch moves this value from ak0557
ar0508	Last Batch Order Print Value Field	S101	rt	Batch moves this value from ak0558

ar0509	Last Batch Order Print Value Field	S101	rt	Batch moves this value from ak0559
ar0510	Reserved	S101	rt	
ar0511	Last Batch Order Name	S101	rt	Batch moves this value from ox0111
ar0512	Last Batch Order Description	S101	rt	Batch moves this value from ox0112
ar0513	Reserved	S101	rt	
ar0514	Last Batch Order Master Recipe	S101	rt	Batch moves this value from ox0114
ar0515	Last Batch Order Control Recipe	S101	rt	Batch moves this value from ox0115
ar0516	Last Batch Order Delivered Weight	S101	rt	Batch moves this value from ox0116
ar0517	Last Batch Order Start Time	S101	rt	Batch moves this value from ox0120
ar0518	Last Batch Order End Time	S101	rt	Batch moves this value from ox0121
ar0519	Batch Transaction Print String	S101	rt	Text for printing current Batch transaction log
ar0520	Batch Abort Message	S101	rt	Text describing reason for aborting current batch.

F.3.5. Main Recipe Phase Status (u0)

The RST Batch Engine writes to this Shared Data block to indicate the status of the Main Recipe phases. The CP Recipe View can read this block to display the status of all phases of the recipe.

Access:	"Supervisor" default level is customizable by individual field.	
Class Code:	u0	
ControlNet Class Code:	7F hex	
Instances:	99	One instance for each phase in a recipe. The instance number coincides with the step number in the recipe.

F.3.5.1. Attributes

u0--00	Composite u0 block	Struct	na	Composite of entire block
u0--01	Phase Description	S17	na	16 Character Phase Description
u0--02	Phase Type	By	na	Type of phase: 1 = Unit Procedure Phase 2 = Auxiliary Phase 3 = Material Transfer Phase 4 = Hand Add or Manual Add Phase 5 = Custom Phase 6 = Operator Hold Phase 7 = Weight Check Phase

				8 = Conditional Phase 9 = Goto Phase 10 = Communication Phase 11 = NOOP 13 = End Recipe Phase 14 = Start Horizontal Group 15 = End Horizontal Group 16 = Math Phase (Batch Phase 2)
u0--03	Current Processing State	By	na	Refer to "Processing_State_Values" Section
u0--04	Material Path Number	US	na	
u0--05	Detailed Completion Status	By	na	This status is dependent on the phase type. For Material Transfer commands, it is the Q.i Material Transfer completion status.
u0--06	Node Number	By	na	Node running the phase
u0--07	Equip Mod / Procedure Number	By	na	Procedure number if a unit procedure phase, Equipment module number for all others
u0--08	Q.i Start Command Status	By	na	
u0--09	Phase Start Time	AL2	na	
u0--10	Phase End Time	AL2	na	
u0--11	Target Weight	D	na	In normalized weight units (bx0160)
u0--12	Feed/Delivered Weight	D	na	Feed weight during Feed or Delivered weight at completion of feed in normalized weight units (bx0160)
u0--13	Percent error	US	na	In hundredths of a percent
u0--14	Estimated Time to complete	US	na	Material transfer time to complete, in seconds. May also contain an Auxiliary count-down, in seconds.

u0--15	Detailed Feed Status	US	n	IDLE	0
				WAITING_TO_START	1
				AUTO_FAST_FEEDING	2
				AUTO_SLOW_FEEDING	3
				AUTO_JOGGING	4
				MANUAL_FEEDING	5
				MANUAL_JOGGING	6
				CONTROL_OVERRIDE_FCE_ON	7
				CONTROL_OVERRIDE_FCE_OFF	8
				PAUSED_POWER_CYCLE	9
				PAUSED_OTHER	10
				WAITING_FOR_STABILITY_DRAIN	11
				SUCCESSFUL_IN_TOLERANCE	12
				BELOW_TOLERANCE	13
				ABOVE_TOLERANCE	14
				PAUSED_BELOW_TOLERANCE	15
				PAUSED_ABOVE_TOLERANCE	16
				ABORTED_Q.I_COMMAND	17
				ABORTED_Q.I_TRANSFER	18
				ABORTED_BY_OPERATOR	19
				AUXILIARY_PHASE_STARTING	20
				AUXILIARY_PHASE_RUNNING	21
				AUXILIARY_PHASE_COMPLETE	22
				AUXILIARY_PHASE_PAUSED	23
				FAST_FLOW_RATE_ALARM	24
				SLOW_STEP_ALARM	25
				PERMISSIVE_ALARM	26
				STABILITY_ALARM	27
				WEIGHT_CHECK_ALARM	28
				TARE_ALARM	29
				DUMP_TO_HEEL_ALARM	30
				VESSEL_OVERFLOW_ALARM	31
				AUX_PHASE_TIMEOUT	32
				AWAITING_TOL_OPER_ACK	33
				FEED_PHASE_STARTING	34
u0--16	Operator Runtime Message	S41	na	Message for Operator / Operator Entered Data in Operator Hold Phase	
u0--17	Starting Gross Weight	D	na	Gross weight at beginning of feed in normalized weight units (bx0160)	

F.3.6. Unit Procedures 1 – 4 Phase Status (u1, u2, u3, u4)

The RST Batch Engine writes to this Shared Data block to indicate the status of the phases for the first instance Unit Procedure. The CP Recipe View can read this block to display the status of all phases of the unit procedure.

Access:	"Supervisor" default level is customizable by individual field.	
Class Code:	u1, u2, u3, u4	
ControlNet Class Code:	83 hex	
Instances:	50	One instance for each phase in the Unit Procedure. The instance number corresponds to the step number in the Unit Procedure

F.3.6.1. Attributes

Only one table of attributes is included for the u*n* blocks; for u2, u3 and u4 substitute the appropriate number for the 1 in u1.

u1--00	Composite u0 block	Struct	na	Composite of entire block
u1--01	Phase Description	S17	na	16 Character Phase Description
u1--02	Phase Type	By	na	Type of phase: 2 = Auxiliary Phase 3 = Material Transfer Phase 4 = Hand Add or Manual Add Phase 5 = Custom Phase 6 = Operator Hold Phase 7 = Weight Check Phase 8 = Conditional Phase 9 = Goto Phase 10 = Communication Phase 11 = NOOP 12 = End Procedure Phase
u1--03	Current Control Recipe State	By	na	Refer to "Processing_State_Values" Section
u1--04	Material Path Number	US	na	
u1--05	Detailed Completion Status	By	na	This status is dependent on the phase type For Material Transfer commands, it is the Q.i Material Transfer completion status.
u1--06	Node Number	By	na	Node running the phase
u1--07	Equipment Module Number	By	na	
u1--08	Q.i Start Command Status	By	na	
u1--09	Phase Start Time	AL2	na	
u1--10	Phase End Time	AL2	na	

u1--11	Target Weight	D	na	In normalized weight units (bx0160)
u1--12	Feed/Delivered Weight	D	na	Feed weight during Feed or Delivered weight at completion of feed in normalized weight units (bx0160)
u1--13	Percent error	US	na	In hundredths of a percent
u1--14	Estimated Time to complete	US	na	In seconds
u1--15	Detailed Feed Status	US	na	see u0-15
u1--16	Operator Runtime Message	S41	na	
u1--17	Starting Gross Weight	D	na	Gross weight at beginning of feed in normalized weight units (bx0160)

F.3.7. Equipment View Details (ev)

Access:	Read only	
Class Code:	ev	
ControlNet Class Code:	__ hex	
Instances:	8	1 = Scale EM1 2 = Scale EM2 3 = Scale EM3 4 = scale EM4 5 = Operator EM5 6 = Operator EM6 7 = Operator EM7 8 = Operator EM8

F.3.7.1. Attributes

ev--00	Composite ev block	Struct	na	Composite of entire block
ev--01	Equipment Module state	By	rt	0 = not used, 1 = idle, 2 = running,3 = warning / operator attention, 4 = error, 5 = operator adjust off-tolerance feed, 99=this equipment module not in Equipment Module table
ev--02	Phase Description	S17	rt	Description of current phase, i.e. "WI-M1"
ev--03	Phase Status	S17	rt	Current phase statue, i.e. "Feeding"
ev--04	Phase Key Value	S17	rt	Key Value for phase type, i.e. "120.00 kg."
ev--05	Recipe Phase Status SD	S7	rt	Current recipe phase status shared data, i.e. "U20500", 5th step in Unit Procedure 2
ev--06	Feed Algorithm Type	By	rt	0 = Q.i Spill Only, Gain In Weight 1 = Q.i Spill Only, Loss In Weight 2 = Q.i K1 algorithm, Gain In Weight

				3 = Q.i K1 algorithm, Loss In Weight 4 = Q.i K2 algorithm, Gain In Weight 5 = Q.i K2 algorithm, Loss In Weight 6 = Q.i Dump to Empty 7 = Q.i Hand Add 8 = Q.i Hand Loss In Weight 9 = Q.i Hand Dump to Empty 99 = None
ev--07	Processing State for Current Phase	S17	rt	Refer to "Processing_State_Values" Section. State value is in text format.
ev--08	Alarm Message	S17	rt	When the phase is in PAUSED state and the cause of the PAUSE is a feed alarm, this field contains a message describing the cause of the feed alarm.

F.4. Equipment Phase Marshaling

F.4.1. Equipment Phase Marshaling Commands (mc)

The Recipe Processing or PLC Interface Logic use the MC block for starting an Equipment Phase. In an IND780batch System, the Recipe Processing in the Master Terminal dynamically assigns the block instances to phases that it is about to start.

In a PLC Batching System, the Batch Tables statically assign the block instances in the PLC Bridge Terminal to Equipment Modules. The block instances correspond to slots in the PLC cyclic assembly messages.

The Equipment Marshaling Task uses the data in the MC block for sending commands to the Equipment Phases.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	mc
ControlNet Class Code:	__ hex
Instances:	20 One instance for each concurrent phase.

F.4.1.1. Attributes

mc--00	Composite mc block	Struct	na	Composite of entire block
mc--01	Equipment Module Number	By	na	Equipment Module Number 1-198 0 indicates that this Phase Marshalling Block is not currently allocated to a Phase.
mc--02	Command Sequence Number	By	na	Equipment Marshaling uniquely identifies the command with a sequence number. The sequence number cycles from 0 to 7.
mc--03	Material Path Index	US	na	Material Path Index (Q.i)

mc--04	Composite Command	By	rt	0 = command complete 1 = start phase 2 = hold phase 3 = restart phase 4 = pause phase 5 = stop phase 6 = abort phase 7 = reset phase 8 = validate phase **The following are the Classic Q.i Commands + 10:** 11 = Start Material Transfer 12 = Start Material Transfer with Gross Weight Target for a scale device 13 = Start Hand Add 14 = Acknowledge Phase Complete 15 = Abort Phase 16 = Reset Slow Step Timer 17 = Start Control Override Mode 18 = Turn on FCE in Control Override Mode 19 = Turn off FCE in Control Override Mode 20 = Restart Auto Mode 21 = Complete Feed in Control Override Mode 22 = Master Reset – Equipment Module 23 = Report Last Status 24 = Master Reset – Cluster 25 = Validate Aggregate Secondary Feeds 26 = Reset Estimated Time to Complete Error 27 = Toggle Fast Feed in Control Override Mode **The following are the Classic Q.i Commands without an offset. The Equipment Phases do NOT process these commands** 31 = Reset PLC in Cluster
mc--05	Equipment Module Node Number	By	na	Node of Equipment Module 1-20
mc--06	Bridge Slot Number	By	na	MS Slot in Master Node or PLC Bridge node that receives the dynamic Equipment Phase Data 1-24. In IND780batch system, this field contains this instance number. In PLC Batch system, this field contains the configured Bridge Slot number for this Equipment Module.
mc--07	Master or Bridge Node Number	By	na	Node 1-20 sending commands to and receiving statuses from the Equipment Phase. In IND780batch system, it is the Master terminal. In PLC Batching system, it is the PLC Bridge Terminal.
mc--	Remote Slot Number	By	na	MR Slot in the Remote terminal that receives the dynamic Equipment Phase Data 1-13. In IND780batch system, this

08				field contains this instance number. In PLC Batch system, this field contains the configured Bridge Slot number for this Equipment Module.

The Master or PLC Bridge terminal must set the following data for the "Start Phase" and "Validate Phase" commands.

mc--18	Batch Order Name	S17	na	
mc--19	Control Recipe Name	S17	na	
mc--20	Phase Description	S41	na	
mc--21	Phase Record Type	S17	na	Phase Data From Control Recipe Table
mc--22	Phase Recipe Procedure Name	S17	na	Master Recipe Name or Unit Procedure Name
mc--23	Phase Step #	S17	na	Step # in Recipe Procedure
mc--24	Phase Data4	S17	na	Phase Data from Control Recipe Table
mc--25	Phase Data5	S17	na	Phase Data from Control Recipe Table
mc--26	Phase Data6	S17	na	Phase Data from Control Recipe Table
mc--27	Phase Data7	S17	na	Phase Data from Control Recipe Table
mc--28	Phase Data8	S17	na	Phase Data from Control Recipe Table
mc--29	Phase Data9	S17	na	Phase Data from Control Recipe Table
mc--30	Phase Data10	S17	na	Phase Data from Control Recipe Table
mc--31	Phase Data11	S17	na	Phase Data from Control Recipe Table
mc--32	Phase Data12	S17	na	Phase Data from Control Recipe Table
mc--33	Phase Data13 - Operator Message	S41	na	Phase Data from Control Recipe Table
mc--34	Phase Data14 - History Message	S41	na	Phase Data from Control Recipe Table
mc--35	Phase Data15	S41	na	Phase Data from Control Recipe Table
mc--36	Phase Data16	S41	na	Phase Data from Control Recipe Table

mc--37	Phase Data17	S41	na	Phase Data from Control Recipe Table
mc--40	Phase Type	By	rt	Type of phase: Q.i Equipment Phase Logic task Fill Equipment Phase Logic task Aux Equipment Phase Logic task Hand Add or Manual Add Equipment Phase Logic task Custom Equipment Phase Logic task Operator Hold Equipment Phase Logic task Weight Check Equipment Phase Logic Task Communication Phase Logic task

F.4.2. Equipment Phase Marshaling Statuses (mz)

The Recipe Equipment Phase Marshaling and the PLC Equipment Phase Marshaling use this block to hold the command status responses from the Equipment Phases.

The PLC Equipment Phase Marshaling uses Instance 1 to hold the response for the PLC in the Q.I Classic Command structure.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	mz
ControlNet Class Code:	85 hex
Instances:	20 One instance for each concurrent phase.

F.4.2.1. Attributes

mz--00	Composite mz block	Struct	na	Composite of entire block
mz--01	Equipment Module Number	By	rt	Equipment Module Number 1-198 0 indicates that this Phase Marshalling Block is not currently allocated to a Phase.
mz--02	Current Command Sequence Num	By	na	Sequence number of command being processed
mz--03	Material Path Index	US	na	Material Path Index of command (Q.i)
mz--04	Current Composite Command	By	rt	Command being processed
mz--05	User Command Status	By	rt	Status of last Equipment Phase command The RST Batch Engine sets this status byte before setting the command byte to zero to indicate that the command failed. 0 = Successful completion 255 = Command in progress 1-254 = Other status

The following fields typically are only applicable in the Q.i "Acknowledge Material Transfer Complete" Command Response. However, when a Start Material Transfer command fails immediately, these fields may

contain values indicating a Material Transfer failure.

mz--07	Last Material Transfer Status	US	na	Last Material Transfer Status
mz--08	Transfer Status Qualifier Bits	L	na	Transfer Status Qualifier Bits
mz--09	Delivered Weight	F	na	Delivered Weight
mz--10	Deviation from Target Weight	F	na	Deviation from Target Weight
mz--11	Reserved	US	na	

The following field is applicable for all commands.

mz--12	Current Equipment Phase State	By	rt	Refer to "Processing_State_Values" Section

F.4.3. Dynamic Phase Marshaling Process Data in Master (ms)

The Equipment Phase Logic Material Transfer and Auxiliary tasks need to update their status every second in this block. Each Material Transfer and Auxiliary Phase should send its status every second in its specific slot. The Phase Marshaling specifies the node and slot in the MS table for the Equipment Phase to use in the "Start Phase" command.

The Q.i Phase Logic tasks write the input-to-PLC Assembly data to the MS block in the PLV Bridge terminal for the Enhanced Q.i PLC Interface. The PLC Messaging reads the data from the MS block and writes it to the PLC adapter. The Q.i Phase Logic uses the first 17 Equipment Channels in the Enhanced Q.i PLC Interface because of the PLC's limitation in the length of its assembly data.

The CP in the Master Terminal or in a PLC Bridge Terminal can read this block every second to update the data in its Equipment View.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	ms
ControlNet Class Code:	86 hex
Instances:	1

F.4.3.1. Attributes

ms0100	Composite MS block	Struct	na	Composite of entire block
ms0101	Equipment Channel #1 Status	ABy36	rt	Channel #1 PLC Input-to-PLC Assembly. These arrays have the following fields: Bytes 0-27 have the Input Assembly Byte 28 has the Phase Type Bytes 29-31 are Reserved
ms0102	Equipment Channel #2 Status	ABy36	rt	Channel #2 PLC Input-to-PLC Assembly
ms0122	Equipment Channel #22	ABy36	rt	Channel #21 PLC Input-to-PLC Assembly

	Status			
ms0123	Equipment Channel #23 Status	ABy36	rt	Channel #22 PLC Input-to-PLC Assembly
ms0124	Equipment Channel #24 Status	ABy36	rt	Channel #23 PLC Input-to-PLC Assembly
ms0125	Reserved	ABy36	rt	
ms0131	Channel #1 Operator Message	S40	rt	Channel #1 Operator Hold Phase Message
ms0132	Channel #2 Operator Message	S40	rt	Channel #2 Operator Hold Phase Message
ms0151	Channel #21 Operator Message	S40	rt	Channel #21 Operator Hold Phase Message
ms0152	Channel #22 Operator Message	S40	rt	Channel #22 Operator Hold Phase Message
ms0153	Channel #23 Operator Message	S40	rt	Channel #23 Operator Hold Phase Message
ms0154	Channel #24 Operator Message	S40	rt	Channel #24 Operator Hold Phase Message

F.4.4. Dynamic Phase Marshaling Process Data in Remote (mr)

The Equipment Phase Logic Material Transfer and Auxiliary tasks also need to update their status periodically in this block in their local terminal. Each Material Transfer and Auxiliary Phase should send its status every second in its specific slot in this table. The Phase Marshaling specifies slot 1-13 in the MR table for the Equipment Phase in the "Start Phase" command.

The format of the data is the same as the data in the MS Block.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	mr
ControlNet Class Code:	__ hex
Instances:	1

F.4.4.1. Attributes

mr0100	Composite mr block	Struct	na	Composite of entire block
mr0101	Equipment Channel #1 Status	ABy36	rt	Channel #1 PLC Input-to-PLC Assembly. These arrays have the following fields: Bytes 0-27 have the Input Assembly Byte 28 has the Phase Type Bytes 29-31 are Reserved
mr0102	Equipment Channel #2 Status	ABy36	rt	
mr0103	Equipment Channel #3 Status	ABy36	rt	

mr0111	Equipment Channel #11 Status	ABy36	rt
mr0112	Equipment Channel #12 Status	ABy36	rt
mr0113	Equipment Channel #13 Status	ABy36	rt
mr0114	Reserved	ABy36	rt

F.4.5. Dynamic Phase Data in Remote BRAM (ed)

Each Equipment Phase Logic task in the local terminals must store its dynamic phase data in non-volatile memory so that it can recover from power failures. The following sections show the format of each of the fields for phase types.

Access:	"Supervisor" default level is customizable by individual field.	
Class Code:	ed	
ControlNet Class Code:	89 hex	
Instances:	13	Potentially, 13 Equipment Phases Logic tasks running simultaneously in each terminal.

F.4.5.1. Attributes

ed--00	Composite ed block	Struct	na	Composite of entire block
Each Material Transfer Equipment Phase Logic Task sends these first 16 fields to the Master terminal or PLC Bridge as regular updates.				
ed--01	Equipment Channel Number	By	na	1 - 198
ed--02	Real-Time Status 1	By	na	Runtime Status 1 Bit Assignment
ed--03	Real-Time Status 2	US	na	Runtime Status 2 Bit Assignment
ed--04	Feed Weight/Delivered Weight	F	na	
ed--05	Gross Weight	F	na	
ed--06	Rate	F	na	
ed--07	Slow-Step Timer	US	na	Time until Slow Step Timer Expires Seconds
ed--08	Estimated Time to Complete	US	na	Estimated Time to Complete in Seconds
ed--09	Real-Time Status 3	By	na	
ed--10	Current Sequence Number	By	na	Current Command Sequence Number
ed--11	Current Material Path	US	na	Current Material Path Index
ed--12	Current Command	By	na	Current Command
ed--13	Current Command Status	By	na	Current Command Status
ed--14	Material Transfer Status	By	na	Status of Current Material Transfer
ed--15	Material Transfer Qualifiers	By	na	Qualifiers to Status of Current Material Transfer

ed--16	Deviation from Target Weight	F	na	Deviation from Target Weight at End of Feed
ed--17	Reserved	F	na	
End of IND780batch Assembly message data				
Each Equipment Phase Logic task can use these SD fields according to their particular needs.				
ed--20	Reserved	UL	na	
ed--21	Reserved	D	na	
ed--22	Reserved	D	na	
ed--23	Reserved	UL	na	
ed--24	Reserved	By	na	
ed--25	Reserved	By	na	

F.5. Dynamic Marshaling Data for Recipe Phases

Notes pp. 141 – 151… (notes, section 9.8)

F.6. Equipment Phase Logic Tasks Processing Data

F.6.1. Batch Table Data Marshaling Commands (mt)

The Equipment Phase Logic tasks can share this block to access efficiently the Material Path table entries and the Equipment Module Dynamic table entries that the Phase Logic needs to run an Equipment Phase. It can also use this block to write the Batch History table entry at the end of the phase. The Phase Logic can only read or write one Database Table record at a time using this interface. That is, it cannot select and retrieve multiple table records. It provides an efficient method for remote terminals to access database records in the Master Terminal.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	mt
ControlNet Class Code:	__ hex
Instances:	1

F.6.1.1. Attributes

mt0100	Composite mt block	Struct	na	Composite of entire block
mt0101	Request Read Access	US	rt	Request read access to Batch Database Tables by writing Upper Byte = Equipment Module Number or CP = 235; and Lower Byte = Node Number
mt0102	Equipment Module # to Read	US	rt	Equipment Module that has read access to Batch Database. Upper Byte = Equipment Module Number or CP = 235; and Lower Byte = Node Number. 0 = Free to request use.
mt0103	Status of Last Read	By	rt	1 = In Progress,

	Request			2 = Success 3 = Batch Record Not Found 4 = Batch Tables Full 5 = Access Error 6-255 = Other Failure Status
mt0104	Request Write Access	US	rt	Request write access to Batch Database Tables by writing Upper Byte = Equipment Module Number, or CP = 235; and Lower Byte = Node Number
mt0105	Equipment Module # to Write	US	rt	Equipment Module that has write access to Batch Database. Upper Byte = Equipment Module Number or CP = 235; and Lower Byte = Node Number. 0 = Free to request use.
mt0106	Status of Last Write Request	By	rt	Refer to mt0103
mt0107	Request Master Recipe Access	By	rt	After reading 0 from *mt0108*, a program may request exclusive access to Master Recipe Table in the Batch Tables Database by writing its unique number into *mt0107*. The local RST writes a 1 to request exclusive access. The local CP writes a 2 to request exclusive access. A local TE App writes a 3. The Batch PC Tool writes a number from 4 to 255 to request exclusive access since there may be multiple Batch PC Tools requesting access concurrently. When a program with exclusive access is ready to release exclusive access, it writes a 0 to *mt0107* to release the access rights. There is a timeout that automatically forces a release of the access rights after the timeout period expires.
mt0108	Give Master Recipe Access	By	rt	The RST Database Tables Interface gives the requestor in *mt0107* exclusive access to the Master Recipe Table by writing its unique request number into *mt0108*. The requestor may not access the Master Recipe Table until it reads back from *mt0108* that it has permision to access the Master Recipe Table. A value of 0 in *mt0108* means that NO program has exclusive access to the Master Recipe table.

F.6.2. Batch Table Data Marshaling Data (md)

Equipment Phase Logic tasks use this block in conjunction with the MT block to access Database Records. It provides a quick method for remote terminals to access database records in the Master Terminal.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	md
ControlNet Class Code:	__ hex
Instances:	1

F.6.2.1. Attributes

md--00	Composite md block	Struct	na	Composite of entire block
md--01	GUID	S41	na	

md--02	Key	S17	na	
md--03	Description	S41	na	
md--04	Data1	S17	na	
md--05	Data2	S17	na	
md--06	Data3	S17	na	
md--07	Data4	S17	na	
md--08	Data5	S17	na	
md--09	Data6	S17	na	
md--10	Data7	S17	na	
md--11	Data8	S17	na	
md--12	Data9	S17	na	
md--13	Data10	S17	na	
md--14	Data11	S17	na	
md--15	Data12	S17	na	
md--16	Data13	S41	na	
md--17	Data14	S41	na	
md--18	Data15	S41	na	
md--19	Data16	S41	na	
md--20	Data17	S41	na	
md--30	Database Table #	By	rt	Database Table to Access 3 = Master Recipe Table 4 = Equipment Table 5 = Control Module Table 6 = Material-Path Table 7 = Batch Order Table 8 = Control Recipe Table 9 = Batch History Table

F.7. Q.i Phase Logic Shared Data

F.7.1. Q.i Phase Commands (cq)

A PLC Controller in a Bridge Terminal or the Equipment Phase Marshaling Task in the Master Terminal may send a Shared Data Request Message to the IND780batch to give a specific command to a specific equipment channel or Scale Unit.

To send the message, the PLC Ladder program in the PLC Controller executes a MESSAGE instruction to "Set All Attributes" in "ACM00" Object. A PLC Q.i Phase Marshaling Task in the Bridge terminal formats the PLC host command as Equipment Phase command and sends the PLC host command to the EP Shared Data field for the specific Q.i Equipment Phase Task.

The PLC Q.i Phase Marshaling Task directs the command to a specific Terminal and Process Identifier. When Q.i Process receives a command to begin moving material, the Q.i Equipment Phase Task uses the Material-Path Index field to find the appropriate Material-Path Table entry and the Equipment Table entry. The command includes the target amount of material and the required tolerances. The Q.i Equipment Phase Task retrieves the feed parameters from the Material-Path and Equipment Tables.

The Q.i Process initiates and controls the Material Transfer associated with the command. The Q.i Process operates once a second to update the Q.i cutoff values based on the current the scale or flow meter status information. The Q.i Process interacts with the Scale and Flow Meter tasks to get the current status and to set cutoff values.

Access:	"Operator" default level is customizable by individual field.
Class Code:	cq
ControlNet Class Code:	84 hex
Instances:	3

F.7.1.1. **Attributes**

cq--00	Composite CQ block	Struct	na	
cq--01	Equipment Channel Number	By	na	Equipment Channel Number for Command
cq--02	Message Sequence Number	By	na	Message Sequence Number of Command
cq--03	Material Path Index	US	na	Material Path Index
cq--04	Integer Command Number	By	rt	"Command" Number 0. None 1. Start Material Transfer 2. Start Material Transfer with Gross Weight Target. It is valid only for scale devices. 3. Start Hand Add 4. Acknowledge Material Transfer or Hand Add Complete 5. Abort Material Transfer 6. Reset Slow Step Timer 7. Start Control Override Mode 8. Turn on FCE in Control Override Mode. The target weight contains the number of ticks to keep the FCE on. 9. Turn off FCE in Control Override Mode 10. Restart Auto Mode 11. Complete Feed in Control Override Mode 12. Master Reset – Instrument Channel 13. Report Last Status 14. Master Reset – Cluster 15. Validate Aggregate Secondary Feeds 16. Reset Estimated Time To Complete Error

				17. Toggle Fast Feed in Control Override Mode. If the positive tolerance = 0.0, then set fast feed =off. If the positive tolerance = 1.0, turn the fast feed = on. The target weight contains the number of seconds to keep the fast feed on. 18. Abort Drain Timer 19. Store Material Transfer Command (enhanced mode) 20. Clear Material Transfer Commands (enhanced mode) 21. Not Used 22. Start Stored Material Transfer Commands (enhanced mode) 23. Store Gross Weight Material Transfer Command (enhanced mode) 31 Reset ControlNet Cluster.
cq--05	Overlapping Feed Group	By	na	Identifies which Primary and Secondary Feed requests belong to a group of feeds that make up an overlapping feed. A value = 0 indicates that this is not an overlapping feed.
cq--06	Number of Overlapping Feeds	US	na	Number of Secondary Overlapping Feeds that are simultaneously going into a Unit. This field is only meaningful in a Primary Overlapped Feed command for a scale instrument. The Material-Path must have a Gain-In-Weight feed. The PAC turns on the FCE when it determines there will be enough time after the overlap completes to run the PAC algorithm with the scale.
cq--07	Target Weight	F	na	Target Feed Weight
cq--08	Positive Tolerance	F	na	Positive Feed Tolerance
cq--09	Negative Tolerance	F	na	Negative Feed Tolerance
cq--10	Batch ID/ Display Message	ABy40	rt	Batch ID from Host Controller that is used for Data Collection Messages. If there is a "~" in the field, the data following the "~" is used as a Display Message for the Q.iMPACT display.
cq--11	Bit Commands	UL	rt	The bit commands have the same number values as the Integer Commands shown above, except they are single bits instead of integers.

F.7.2. Q.i Phase Responses (9.15.2 – Q.i use of es block)

The Q.iMPACT sends Q.i Command Status Shared Data to the Controller to give the immediate status for a command. To get the Command Status Object, the Controller Ladder program must execute a MESSAGE instruction to "Get All Attributes" of the PAC Command Status "ACS00" Object in the Q.iMPACT.

A PLC Q.i Phase Marshaling Task in the Q.iMPACT Bridge Terminal reads the status for the appropriate Q.iMPACT terminal and Q.i process and returns that status to the host. Each Q.i Process maintains its Command Status data in Shared Data.

The IND780batch uses the ES block to hold the Q.i Equipment Phase Response.

This table defines only the unique Q.i status values. For further details, refer to the es block in the **IND780 Shared Data Reference Manual**.

F.7.2.1. Attributes

es0105	Command Status	By	na	"Command Status". Q.i sets this immediately after processing a command. 0. SUCCESS – Start Gain In Weight Material Transfer Command Complete 1. SUCCESS – Start Loss In Weight Material Transfer Command Complete 2. SUCCESS – Start Flow Meter Material Transfer Complete 3. SUCCESS – Start Manual Control Material Transfer Complete 4. SUCCESS – Hand Add Command Complete 5. SUCCESS – Command Complete 6. Command Not Complete – Request status again after a short delay 7. ERROR – Communications Error 8. ERROR – Invalid Channel Number 9. ERROR – Invalid Command 10. ERROR – Invalid Material-Path Table Index Number 11. ERROR – Invalid Algorithm in Material-Path Table Entry 12. ERROR – Invalid Feed Type in Material-Path Table Entry 13. ERROR – Invalid Unit Table Index Number in Material-Path Table Entry 14. ERROR – Invalid Gain In Weight Feed and Dump to Empty Algorithm Combination in Material-Path Table Entry 15. ERROR – Source / Destination Mismatch in Material-Path Table Entry 16. ERROR – Other Invalid Data in Material-Path Table Entry 17. ERROR – Invalid Loss In Weight Feed in Material-Path Table Entry and Overlapping Feed Command 18. ERROR – Invalid Data in Measuring Device Table Entry 19. ERROR – Invalid Mode for Command, e.g. Controller is requesting start a new material transfer before last feed is complete or before the controller has acknowledged that the material transfer is complete. 20. ERROR – Requested add amount too small 21. ERROR – Requested add amount would bring unit over capacity 22. ERROR – Unit Currently over Capacity 23. ERROR – Unit Currently under Zero 24. ERROR – Instrument Malfunction 25. ERROR – Target Weight is Less Than Spill 26. ERROR – Response Timeout

27. ERROR – Too many overlapping feeds
28. WARNING – Delayed start to feed due to overlapping feed
29. WARNING – Abort ignored since time to complete was less than feed override time.
30. ERROR - Invalid overlap group number.
31. WARNING –Waiting For All Secondary Requests.
32. WARNING – Waiting For Measuring Device Stability.
33. ERROR – Not Enough Material.
34. ERROR – Device Not Calibrated Properly.

255 Command In Progress

The following fields typically are only applicable in the "Acknowledge Material Transfer Complete" Command Response. However, when a Start Material Transfer command fails immediately, these fields will contain values indicating a Material Transfer failure.

es0107	Last Material Transfer Status	US	na	Last Material Transfer Status. Q.i sets this at completion of feed. 0. Successful Material Transfer – K1, K2 parameters updated 1. Successful Material Transfer – Spill Only 2. Successful Material Transfer – Dump to Empty 3. Successful Hand Add 4. Material Transfer Complete – K1, K2 parameters NOT updated 5. Material Transfer Complete – Parameters Reset 6. Material Transfer Complete with Manual Operation 7. Failed – Unstable Measuring Device 8. Failed – Overlapping Feed Error Corrupted Flow 9. Failed – Erratic Flow Error 10. Failed – Low Flow Error 11. Failed – High Flow Rate Alarm Error 12. Failed – Communication Error 13. Failed – Instrument Error 14. Failed – Unit Capacity Error 15. Failed – Predictive Algorithm Error 16. Failed – Material Transfer with Manual Operation 17. Failed – Amount of material transferred did not match in source and destination 18. Failed – Controller Aborted Material Transfer 19. Failed – Controller Reset Channel 20. Failed – Controller Reset Unit 21. Failed – Controller Reset Cluster 22. Failed – Slow Step Timer Timeout 23. Failed – Secondary Requests Timeout 24. Failed – Power Failure During Feed 25. Failed – Command Failed, Transfer Not Started 26. Material Transfer In Progress

F.7.3. Q.i Phase Process Data (hq)

Access:	"Administratot" default level is customizable by individual field.	
Class Code:	hq	
ControlNet Class Code:	__ hex	
Instances:	13	One instance of the PAC Process Table Object exists for each of 13 Q.i processes.

F.7.3.1. Attributes

hq--01	Current Material Path Index	US	na	Current Material Path Number
hq--02	Current Command Number	By	na	Current Command Being Processed
hq--03	Current Overlap Group	By	na	Current Overlap Group
hq--04	Current # Overlapping Feeds	By	na	Current # Overlapping Feeds
hq--05	Current Target Weight	D	na	Current Target Feed Weight
hq--06	Current Positive Tolerance	D	na	Current Positive Feed Tolerance
hq--07	Current Negative Tolerance	D	na	Current Negative Feed Tolerance
hq--08	Batch ID message	40S	na	Batch ID message that IND780batch writes to the Batch History file
hq--09	Feed Time	UL	na	Feed time in seconds Q.i PAC sets the current value once a second during feed and sets total time at completion of feed.
hq--10	Weight Units	S3	na	Descriptor for weight units "lb", "kg", "g", or "t"
hq--11	Diagnostic Status	UL	na	PAC sets feed diagnostic status word during feed cycle. At completion of feed, the limits values reflect status of feed. Refer to Q.i_RUNTIME records in the Material Transfer Table for bit meaning assignments.
hq--12	Feed Start Time	AL2	na	Windows CE time representation
hq--13	Unit Weight at Start	D	na	
hq--14	Unit Weight at Completion	D	na	
hq--15	Reserved	D	na	
hq--16	Reserved	UL	na	
hq--17	Reserved	US	na	

F.7.4. Q.i Synchronization Message (hz)

Access:	"Administrator" default level is customizable by individual field.	
Class Code:	hz	
ControlNet Class Code:	__ hex	
Instances:	5	1-4: Scale Units use these instances to receive Synchronization Messages from remote Equipment Modules 5: Q.i Phase Logic uses this instance to receive response from Scale Units

F.7.4.1. Attributes

hz--00	Composite HZ block	Struct	na	Composite of entire block
hz--01	Synchronization command	US	na	0. IDLE 1. Start Material Transfer to Unit 2. Reset Unit 3. Complete Material Transfer to Unit 4. Get Current Expected Weight 5. Check Ready to Start Overlap Feed 6. Set Primary Stability Check Complete 7. Set Primary Stability Check Failed 8. Get Secondary Delivered Weight 9. Set Secondary Incremental Weight 10. Get Secondary Incremental Weight 11. Initial Weight OK 12. Initial Weight Too Low
hz--02	Destination equipment channel	By	na	
hz--03	Destination node	By	na	
hz--04	Source equipment channel	By	na	
hz--05	Source node	By	na	
hz--06	Sequence number	By	na	
hz--07	Overlapped feed type	By	na	
hz--08	Overlapped feed group	By	na	
hz--09	Number of secondary feeds	By	na	Number of secondary overlapping feeds
hz--10	Feed algorithm	By	na	
hz--11	Initial weight status	By	na	
hz--12	Expected time to complete	US	na	
hz--13	Reserved	US	na	
hz--14	Time to wait	US	na	
hz--15	Command status	US	na	

hz--16	Target weight	D	na	
hz--17	Spill or deviation from target	D	na	
hz--18	Returned weight	D	na	
hz--19	Overlap target sum	D	na	
hz--20	Reserved	D	na	
hz--21	Reserved	D	na	
hz--22	Reserved	US	na	
hz--23	Reserved	US	na	
hz--24	Overlap sequence	By	na	
hz--25	Weight units index	By	na	
hz--26	Feeder Type	By	na	
hz--27	Start Command Trigger	By	rt	1 = Start command

F.7.5. Q.i Classic History Data (hs)

Access:	Read only
Class Code:	hs
ControlNet Class Code:	91 hex

F.7.5.1. Attributes

hs0100	Composite HS block	Struct	na	Composite of entire block
hs0101	History Record 1	ABy400	na	Process History Record #1, Process #1. Contains the following fields in ASCII format Separated by '^' characters in the following order: sequenceNumber, channelNumber, materialPath, command, status, lastMaterialTransferStatus,statusQualifier, deliveredWeight, spill_deviationFromTarget, realtimeStatus1, realtimeStatus2, slowStepTimer, estimatedTimeComplete, overlapGroup, numSecondaryOverlappingFeeds, targetWeight, positiveTolerance, negativeTolerance, displayMessage, feedTime, weightUnits, startTime, startWeight, endWeight.
hs0102	History Record 2	ABy400	na	Process History Record #2, Process #1. Contains the measuring device table entry, material path table entry table fields in ASCII format separated by '^' characters in sequential order.
hs0103	History Record 3	ABy400	na	Process History Record #1, Process #2.
hs0104	History Record 4	ABy400	na	Process History Record #2, Process #2.
	. .	.	.	.
	. .	.	.	.
hs0123	History Record 23	ABy400	na	Process History Record #1, Process #12.

hs0124	History Record 25	ABy400	na	Process History Record #2, Process #12.
hs0125	History Record Sequence #	AL12	na	Sequence # for each Process.

F.7.6. Q.i Material Diagnostic Data (q1)

IND780 Q.i Batch builds the Q1 table dynamically at runtime in the Master Terminal to hold the Q.i Diagnostic Status Data for all active Material Paths in the cluster. Each field represents a Q.i Equipment Module. At runtime, each Q.i Equipment Phase writes its active Material Path Number and Diagnostic Data into the Equipment Module's associated field in the Master Terminal.

Access:	"Administrator" default level is customizable by individual field.	
Class Code:	q1	
ControlNet Class Code:		
Instances:	2	1: Equipment Modules 1-99 2: Equipment Modules 100-198

F.7.6.1. Attributes

q1--00	Composite Q1 block	Struct	na	Composite of entire block
q1--01	Material Path & Diagnostic Data	AL2	na	MP & Status for Equipment Module 1
q1--02	Material Path & Diagnostic Data	AL2	na	MP & Status for Equipment Module 2
q1--03	Material Path & Diagnostic Data	AL2	na	MP & Status for Equipment Module 3
q1--99	Material Path & Diagnostic Data	AL2	na	MP & Status for Equipment Module 99

F.8. Asynchronous Operator Alerts

F.8.1. Operator Alert Commands (ha)

The IND780 RST Batch Engine sometimes needs to initiate an interface to the operator through the terminal HMI. In some cases, the operator must take some action and make a response before the recipe can proceed. Other operator-interfaces are for information only, to provide a warning or display a message to the operator. Some of the reasons are:

- The RST Batch Engine has detected an error condition and needs to alert the operator to correct or respond to the error.
- The Phase Logic has detected an error with the equipment and needs to alert the operator.
- The Control Recipe Phase contains information messages to display on the operator display to the operator.

The Batch application needs to alert the operator upon receipt of the command from the RST Batch Engine.

Access:	"Supervisor" default level is customizable by individual field.
Class Code:	ha
ControlNet Class Code:	__ hex
Instances:	9 — 1: Scale 1 EM 2: Scale 2 EM 3: Scale 3 EM 4: Scale 4 EM 5: Operator Hold 1 EM 6: Operator Hold 2 EM 7: Operator Hold 3 EM 8: Operator Hold 4 EM 9: Common Alerts

F.8.1.1. Attributes

ha--00	Composite HA block	Struct	na	Composite of entire block
ha--01	Process Operator Alert	By	rt	0 = Idle 1 = HMI Task must process Display Operator Alert 2 = HMI Task Processing Complete
ha--02	Process Operator Hold Phase	By	rt	0 = Idle 1 = HMI Task must process the Operator Intervention task from current Operator Hold Recipe Phase 2 = HMI Task Processing Complete
ha--03	Operator Info Alert Codes	US	rt	See following section
ha--04	Processing State Value	By	na	Processing_State_Value of procedure generating this operator alert. Refer to "Processing_State_Values" Section
ha--05	Reserved	L	na	
ha--06	HMI Return Data	41S	na	
ha--07	Reserved	D	na	
ha--08	Remaining Hold Time	L	na	Remaining hold time for timed Operator Hold in quarter-seconds
ha--09	Reserved	41S	na	
ha--10	Reserved	41S	na	
ha--11	Net Delivered Weight	41S	na	Net delivered weight for the last material. Transfer in specified Equipment Module for Operator Hold types 10 and 11.
ha--12	Reserved	41S	na	
ha--13	Manual Transfer Start Alert	By	rt	RST sets this trigger after the Manual Transfer Phase is successfullly started.
ha--14	Manual Transfer Complete Alert	By	rt	CP HMI can set this trigger to alert the RST when the Manual Transfer is complete. (A Discrete IO may also be used for this purpose.)

ha--15	Material Transfer Start Alert	By	rt	RST sets this trigger after the Automatic Material Transfer Phase is successfully started.
ha--16	Material Transfer Complete Alert	By	rt	RST sets this trigger when Automatic Material Transfer is complete.
ha--17	Reserved	By	rt	
ha--18	Reserved	By	rt	
ha--19	Reserved	By	rt	

For Operator Hold Phase Alerts, the RST sets the following data contains from Operator Hold Phase PHASE_OPER_HOLD Record as defined in the Master Recipe Table when it sets the alert flag in ha0102.

For Automatic Material Transfer and Manual Transfer Phase Alerts, the following data contains from corresponding Phase Status Records as defined in the Batch History Table. The Phase Status Records includes material-transfer-control-data that may come from the dynamic Batch Variables as well as from the Phase Records. The RST sets this data when it sets the alert in ha0113 or ha0115.

ha--20	Key	S17	na	
ha--21	Descr	S41	na	
ha--22	Data 1	S17	na	
ha--23	Data 2	S17	na	
ha--24	Data 3	S17	na	
ha--25	Data 4	S17	na	
ha--26	Data 5	S17	na	
ha--27	Data 6	S17	na	
ha--28	Data 7	S17	na	
ha--29	Data 8	S17	na	
ha--30	Data 8	S17	na	
ha--31	Data 10	S17	na	
ha--32	Data 11	S17	na	
ha--33	Data 12	S17	na	
ha--34	Data 13	S41	na	
ha--35	Data 14	S41	na	
ha--36	Data 15	S41	na	
ha--37	Data 16	S41	na	
ha--38	Data 17	S41	na	

For Operator Hold Phase Alerts, the RST sets the following data contains from Operator Hold Phase PHASE_OPER_COMBO Record, when it exists, as defined in the Master Recipe Table when it sets the alert flag in ha0102.

ha--40	Key	S17	na	
ha--41	Descr	S41	na	
ha--42	Data 1	S17	na	
ha--43	Data 2	S17	na	

ha--44	Data 3	S17	na
ha--45	Data 4	S17	na
ha--46	Data 5	S17	na
ha--47	Data 6	S17	na
ha--48	Data 7	S17	na
ha--49	Data 8	S17	na
ha--50	Data 8	S17	na
ha--51	Data 10	S17	na
ha--52	Data 11	S17	na
ha--53	Data 12	S17	na
ha--54	Data 13	S41	na
ha--55	Data 14	S41	na
ha--56	Data 15	S41	na
ha--57	Data 16	S41	na
ha--58	Data 17	S41	na

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64065576 Rev. 04, 06/2021

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