METTLER TOLEDO

IND780
Q.iMPACT
Terminal
User's Guide

www.mt.com

64068651
(01/2010) R00

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 located on the documentation CD, part number 64057241.

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- The majority of our products fall within categories 8 and 9. Those categories currently do not fall within the scope of the Directive 2002/95/EG (RoHS) of January 27, 2003. If our products are intended for use in other products which themselves fall within the scope of the RoHS Directive, compliance requirements have to be separately negotiated contractually.
- Those products which fall within categories 1-7 and 10 will be in compliance with the EU RoHS Directive from no later than July 1, 2006.
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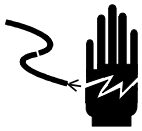
- READ this manual BEFORE operating or servicing this equipment and FOLLOW these instructions carefully.
- SAVE this manual for future reference.



WARNING!

FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.

WARNING!

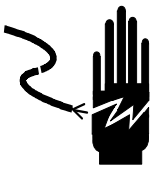
NOT ALL VERSIONS OF THE IND780 ARE DESIGNED FOR USE IN HAZARDOUS (EXPLOSIVE) AREAS. REFER TO THE DATA PLATE OF THE IND780 TO DETERMINE IF A SPECIFIC TERMINAL IS APPROVED FOR USE IN AN AREA CLASSIFIED AS HAZARDOUS BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES

WARNING!

IN ORDER TO INSTALL THE DIVISION 2 APPROVED IND780 TERMINAL UTILIZING THE U.S. APPROVAL, METTLER TOLEDO CONTROL DRAWING 174020R MUST BE FOLLOWED WITHOUT EXCEPTION. IN ORDER TO INSTALL THE CATEGORY 3 MARKED IND780 UTILIZING THE EUROPEAN APPROVAL, THE DEMKO APPROVAL CERTIFICATE 07ATEX0520819X AND ALL LOCAL REGULATIONS MUST BE FOLLOWED WITHOUT EXCEPTION. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE. REFER TO THE IND780 DIVISION 2 AND ZONE 2/22 INSTALLATION GUIDE 64063214 FOR ADDITIONAL INFORMATION.

WARNING!

IF THE KEYBOARD, DISPLAY LENS OR ENCLOSURE IS DAMAGED ON A DIVISION 2 APPROVED OR CATEGORY 3 MARKED IND780 TERMINAL THAT IS USED IN A DIVISION 2 OR ZONE 2/22 AREA, THE DEFECTIVE COMPONENT MUST BE REPAIRED IMMEDIATELY. REMOVE AC POWER IMMEDIATELY AND DO NOT REAPPLY AC POWER UNTIL THE DISPLAY LENS, KEYBOARD OR ENCLOSURE HAS BEEN REPAIRED OR REPLACED BY QUALIFIED SERVICE PERSONNEL. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.



WARNING!

WHEN THIS EQUIPMENT IS INCLUDED AS A COMPONENT PART OF A SYSTEM, THE RESULTING DESIGN MUST BE REVIEWED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL COMPONENTS IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT AND/OR BODILY HARM.

CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

IND780 Q.iMPACT Terminal

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Essential Services for Dependable Performance

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 ServiceXXL agreement tailored to your needs and budget. Further information is available at www.mt.com/serviceXXL.

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.

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Chapter 1.0

Introduction

IND780 Q.iMPACT

Overview

Congratulations and thank you for purchasing the IND780 Q.iMPACT terminal as your material transfer controller. Q.iMPACT is a unique and advanced application package for the IND780 terminal, engineered exclusively for:

- Feed measurement
- Feed management
- Feed cutoff control

The IND780 Q.iMPACT is a successor to the JAGXTREME®-based Q.iMPACT. The second generation Q.i combines years of material transfer application excellence with the processing power, user interface advances and TaskExpert™ programming flexibility found in the IND780 terminal.

This manual provides an overview of the IND780 Q.iMPACT terminal, and instructions for setup, maintenance and troubleshooting.

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

Terminology

As you proceed through this and other Q.iMPACT documentation, the following product terms will be used:

- **IND780** refers to the standard hardware terminal. You may be asked to reference the standard IND780 documentation if the subject matter applies directly.
- **Q.i780** refers to the Q.iMPACT software and firmware designed to function with the IND780 hardware terminal. This is also referred to as an application Pac for the IND780.
- **IND780 Q.iMPACT** refers to the combination of the IND780 hardware terminal with the Q.iMPACT software and firmware application.

Q.i is short for **Q.iMPACT**, which is short for **Quantum Impact**. Each of these has a similar meaning:

	Quality Product Improvement
+	Quicker Ingredient Addition
+	Quantifiable Results
=	**Quantum Impact**

"Material Transfer" is one of many terms used to describe the process phase, or manufacturing step, that moves a material from one location to another. The following processes are all types of material transfer, each of which can be optimized using the Q.i technology:

Filling — **Single** movement of a specified amount of product from one single location to another location

Dosing — **Single** movement of a specified amount of product from one location into a continuous process

Formulation — **Multiple** movements of specified amounts of products from various locations into a single location

Blending — **Multiple** movements of specified amounts of products from various locations into a single location, plus an additional mixing phase

Batching — **Multiple** movements of specified amounts of products from various locations into a single location plus multiple additional process phases, such as heating, cooling, waiting, mixing, agitating, dumping, etc.

Many additional terms and definitions can be found in the **Glossary** provided in Appendix F of the **IND780 Q.iMPACT Technical Manual**.

Process Variations

A critical manufacturing challenge is to compensate rapidly and accurately for dynamic variations that always exist in a material feed process. These process variations contribute to material waste, inconsistencies in quality, and reduced throughput. Q.i is able to respond in real time to many different process variations, including (but not limited to):

- Variability caused by raw material inconsistency:
    - Material variation between various suppliers or lots
    - Moisture content in the material
    - Material viscosity changes due to temperature
- Variability generated by pumps, valves and Control Systems, that result in flow rate changes and valve closure times
- Material head pressure variation

Role of Q.i in Process Control

Q.iMPACT works together with your PLC or DCS system to manage and control your process. Q.iMPACT is dedicated to time-critical material feed, material measurement, material management and material cut-off control functions, freeing the host system's processing power for other tasks.

Taking advantage of distributed control architecture, IND780 Q.iMPACT is engineered to orchestrate the entire material transfer control process. Q.i bundles and moves the time-critical material transfer functions into the IND780 terminal, which takes control of the material transfer closer to the actual process.

To accomplish this, each IND780 Q.iMPACT terminal monitors measurement information directly from field devices including scales, load cell systems or flow meters. Because Q.i has direct control of the final control element (FCE), it can time the feed cut-off to assure on-target accuracy.

Q.i Features

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

- K1 predictive adaptive control algorithm
- K2 predictive adaptive control algorithm
- Spill only algorithm
- Dump-to-Empty control algorithm
- Task Expert function block programming
- Material type (Gain-in-weight/Loss-in-weight)
- Control target management (fixed bias)
- Target type (absolute, additive)
- Tolerance check
- Pre-feed condition checks (stable scale, vessel overflow)
- Flow alarm management
- Drain time management
- Instrument zero shift management
- Interface driver for data communication between instrument and controller
- Abnormal situation management
- Reasonableness checking
- Hand add
- Slow Step Timer
- Command states (status, error handling)
- Material feed states (status, error handling, overflow)
- Weigh/flow digital filtering
- Diagnostics
- Multiple Modes (Setup, Manual, Automatic and Maintenance)
- Reset Capability
- Group feed
- Estimated time to complete
- Post-feed check and report (for accurate & reliable data)
- Overlapping feed management
- Enhanced 2 speed feed control
- Instrument cross check maintenance
- Standard and Enhanced communication modes
- Up to 999 material paths
- Clustering capability
  (up to 20 terminals, 198 channels maximum)

Q.i System Capabilities

The IND780 Q.iMPACT system can accommodate the following:

- 6 Option board slots in one IND780 Q.iMPACT Terminal:
  - 4 Scale or Load Cell interfaces per IND780 Q.iMPACT
  - 6 Flow Meter Interface Boards (for 12 flow meters) per IND780 Q.iMPACT
  - Combination of 4 Scale or Load Cells and 2 Flow Meter Interface Boards (4 flow meters)
- Space for 1 PLC/DCS interface board – select from EtherNet/IP™, ControlNet and PROFIBUS® DP; for limited connectivity, Modbus TCP, DeviceNet™ and Allen-Bradley RIO may also be used.
- 20 IND780 Q.iMPACT Terminals in one cluster, with remote console, data and interface sharing
- 198 Equipment Channel Modules
- 12 Equipment Channel Modules per Bridge Terminal using the Enhanced Q.i Message Interface
- 24 Equipment Modules per Bridge Terminal using the Classic Qi Message Interface
- 198 Concurrent Phases
- 999 Material Paths

IND780 Q.iMPACT Hardware

IND780 Terminal Models

The Q.i780 application is available in the IND780 IP69K harsh environment or panel mount IND780 enclosures with color display.

Figure 1-1: IND780 Harsh Environment Enclosure, Desktop or Wall-Mount

Creating a Q.iMPACT Terminal

The intrinsic hardware security key feature found within every IND780 enables the Q.i780 application.

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

There are two ways to create an IND780 Q.iMPACT terminal:

- The Q.i780 application can be purchased with a new IND780, installed, tested and labeled from the factory.
- The Q.i780 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 IND780 Q.iMPACT.

Determining the Terminal Type

The simplest way to determine the type of IND780 is to access its information recall screens:

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

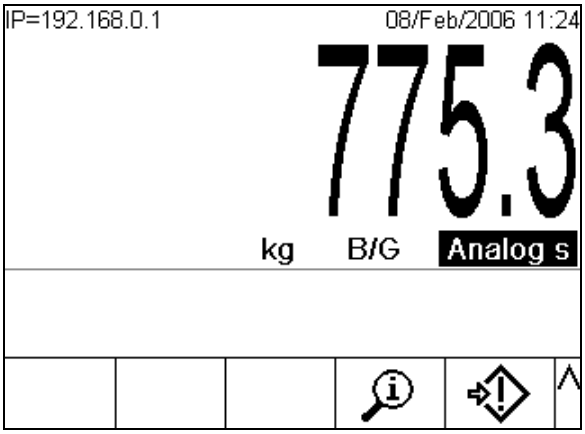

Figure 1-3: IND780 Home Screen Showing Information Recall Softkey

2. The information recall screen will display.

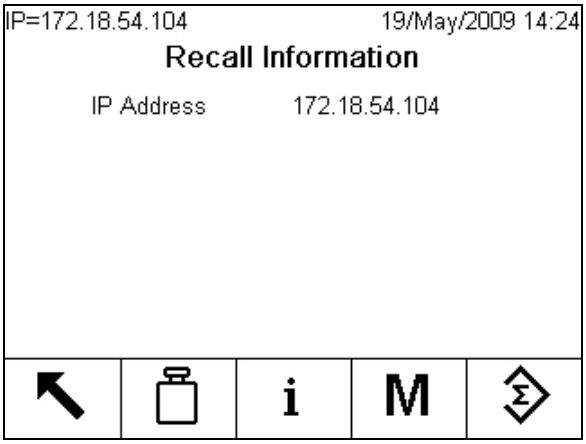

Figure 1-4: System Recall Information Screen

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 Q.iMPACT IND780:
   - 780Qi+*x*Lic (where x indicates the number of PAC Licenses, 1 to 12)

Upgrade Note

When upgrading to Q.i 780 from a standard IND780 terminal, check any installed option boards against the list of boards compatible with Q.i780, provided in the **Options** section on page 1-13. Once the IND780 is transformed into an IND780 Q.iMPACT, only the option boards listed will be recognized by the Q.i780 application.

Also, please refer to Figure 1-5 for the appropriate slot locations for option boards in an IND780 Q.iMPACT terminal.

IND780 Q.iMPACT Model Identification

The IND780 model number is located on the data plate on the back of the terminal along with the serial number. Refer to this data plate to verify the IND780 Q.iMPACT that was ordered.

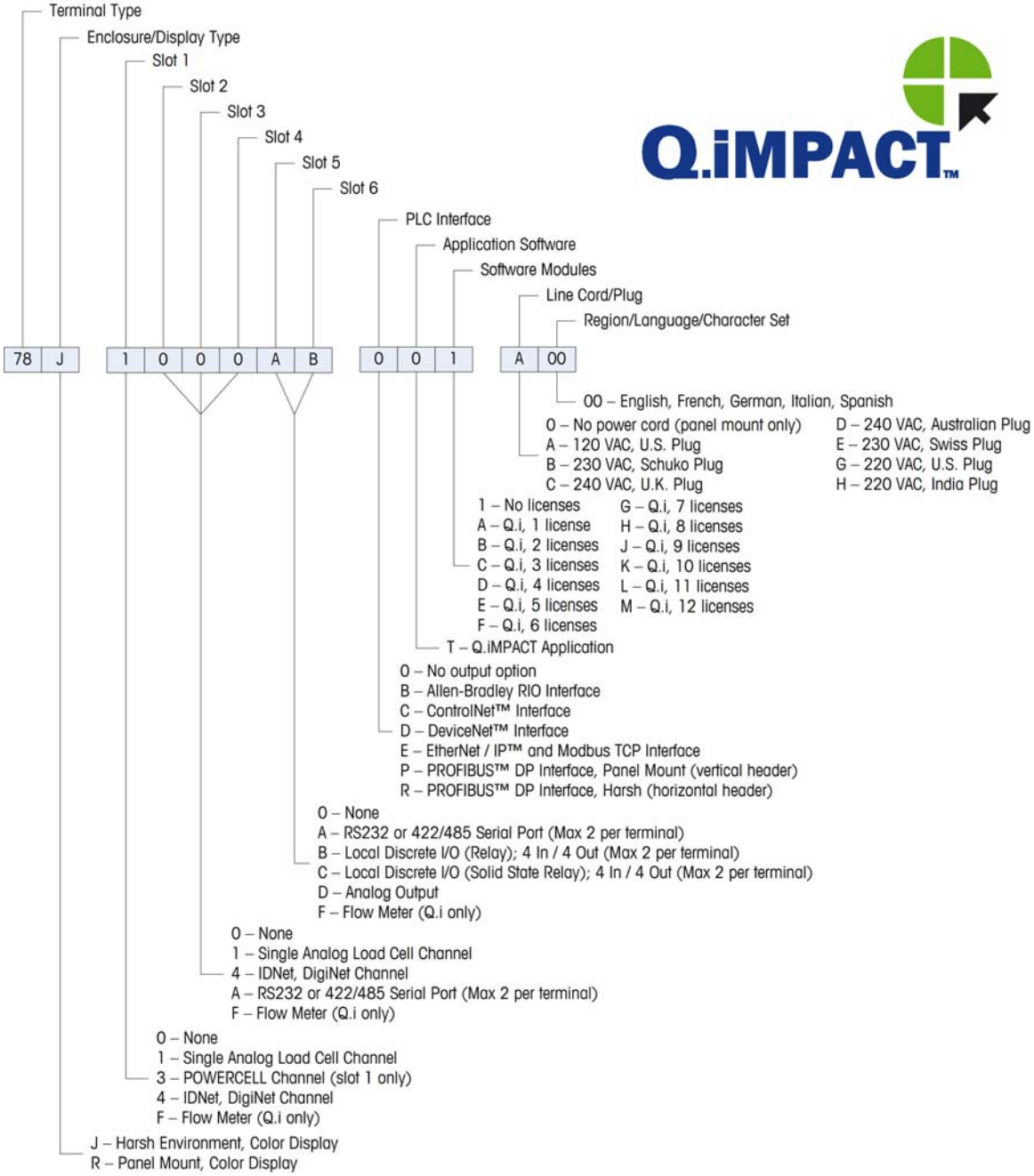

Figure 1-5: IND780 Q.iMPACT Configurations

IND780 Q.iMPACT Terminal Specifications

Physical Dimensions

The physical dimensions of the panel mount and harsh environment IND780 terminals are shown in Figure 1-6, Figure 1-7 and Figure 1-8. All measurements are given in inches and [mm].

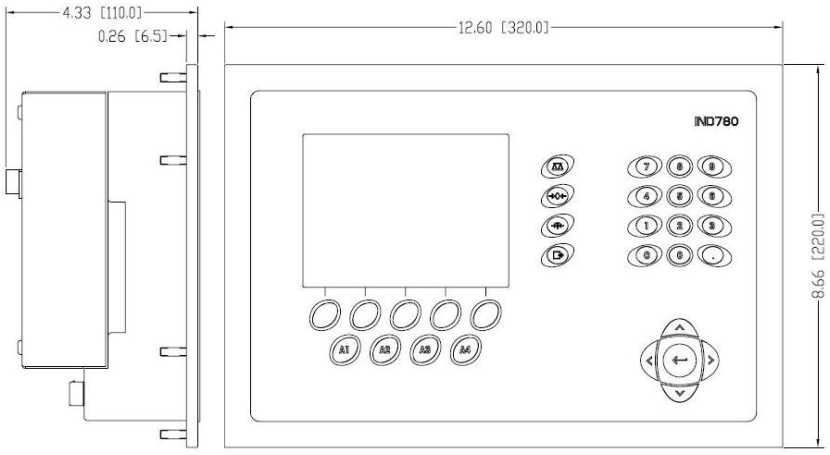

Figure 1-6: IND780 Panel Mount Terminal Dimensions

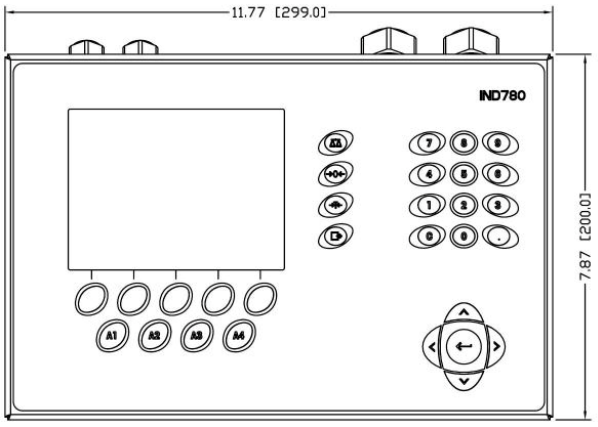

Figure 1-7: IND780 Harsh Enclosure Terminal Dimensions, Front

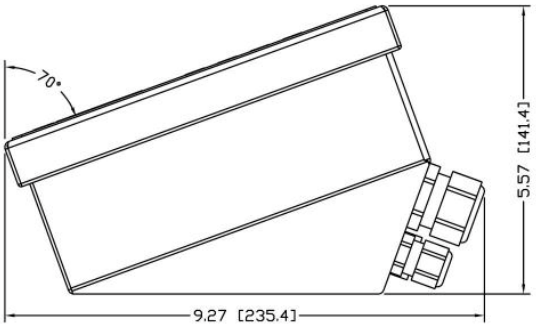

Figure 1-8: IND780 Harsh Enclosure Terminal Dimensions, Side

Specification table

The IND780 terminal conforms to the specifications listed in Table 1-1.

Table 1-1: IND780 Specifications

IND780 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
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 graphic backlit monochrome LCD or 320 x 240 pixel 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

IND780 Specifications	
Number of Scales	Interface for up to four scale channels plus a sum
Number of Flow Meters	Interface up to twelve flow meters
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
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 **Product Safety** UL, cUL, CE

System Hardware

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.

Scale Bases

The IND780 Q.iMPACT supports Analog, IDNet, SICS and POWERCELL PDX bases.

Analog Load Cell Scale Base

The IND780 Q.iMPACT 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.

IDNet™ Scale Base

The IND780 Q.iMPACT 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.

SICS Scale Base

The IND780 Q.iMPACT supports Mettler Toledo high precision scales and balances that utilize the SICS communications protocol. These scales and balances are branded as the Mettler Toledo Excellence balances, X-bases/platforms, WM/WMH and 4-series scales (BBx4xx, IND4xx). The SICS scales are connected to the IND780 via the serial interfaces. Four SICS scales can be supported per terminal, when optional Serial boards are installed. Depending on the type of SICS scale connected, different configuration settings will be available in the IND780 terminal setup screens.

POWERCELL® PDX® Scale Base

The IND780 Q.iMPACT 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.

Flow Meter Interface Board

The Flow Meter Interface Board is a two-channel isolated Counter/Flow Meter board for use in the IND780 Q.iMPACT 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. Up to six flow meter cards can be installed

in a single Q.iMPACT terminal, so that each terminal can connect to as many as 12 flow meters.

PLC/DCS Interfaces

IND780 Q.iMPACT PLC/DCS interface options include :

- PROFIBUS® DP
- ControlNet™
- EtherNet/IP®
- Modbus TCP *
- DeviceNet™*
- Allen-Bradley RIO*

* Due to the limited amount of data that can be transmitted per message, or in a given amount of time, these three interfaces will not provide the same level of integration as PROFIBUS DP, ControlNet or EtherNet/IP. Please consult your METTLER TOLEDO Q.iMPACT representative for more information.

- The PLC/DCS option board mounts in a dedicated socket on the IND780 main board, and does not occupy one of the "option board" slots described in **Q.I System Capabilities** on page 1-4.

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.

PROFIBUS DP

The IND780 Q.iMPACT 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.

ControlNet and EtherNet IP

The IND780 Q.iMPACT supports ControlNet communications or EtherNet / IP interface options and the appropriate driver software.

Modbus TCP

Modbus TCP is used to establish master-slave/client-server communication between intelligent devices. It is an open standard network protocol, widely used in the industrial manufacturing environment. The Modbus TCP protocol takes the Modbus instruction set and wraps TCP/IP around it. The Modbus TCP protocol is supported by the Ethernet / IP interface board, version 1.32 or higher.

DeviceNet™

DeviceNet is an RS-485 based network using CAN chip technology. This network was created for bit- and byte-level devices. The network can be configured to run up to 500kbits per second depending on cabling and distances. Messages are

limited to 8 unfragmented bytes. The network can include up to 64 nodes including the master, which is commonly called the scanner.

Allen-Bradley RIO

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.

Options

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

- Predictive Adaptive Control (PAC) algorithms
- Discrete I/O
- Serial Communications
- 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.

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 IND780 Q.iMPACT terminal when you select the appropriate software module along with the Q.i application module.

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.

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.

Mounting Hardware

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

TaskExpert™

TaskExpert is included with the Q.iMPACT application. TaskExpert is the custom programming language for the IND780 and IND780 Q.iMPACT terminals. Enabled by selecting the appropriate software module, TaskExpert allows for custom application specific programming to reside in the IND780 Q.iMPACT terminal to meet your needs.

Q.i Material Transfer Control Strategy

Before setting up and using the IND780 Q.iMPACT 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

Overview

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 Q.iMPACT terminal for a particular scale or flow meter feed. The Q.iMPACT 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.

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".

Components of an IND780 Q.iMPACT System, and Terminal Clustering

Each IND780 Q.iMPACT terminal can support up to four scales or twelve flow meters, or a combination of these. Each scale or flow meter is referred to as an Equipment Channel Module. If more scales or flow meters are required, more terminals can be added. To create a single manageable system, as many as twenty IND780 Q.iMPACT terminals may be connected via an Ethernet network, to create a "cluster".

All members of a cluster share a single common database, maintained in an IND780 Q.iMPACT terminal assigned to be the master. All other terminals in the cluster are configured as remote. The master terminal is responsible for distributing the database variables to all remote terminals in the cluster.

For each instrument (scale, load cell system or flow meter,) the sequence of events occurs in parallel. For example, if a Q.iMPACT terminal has two scale inputs and three flow meter inputs, then it can control five material transfers simultaneously.

Not all of the IND780 Q.iMPACT terminals in a cluster require a direct communications link (ControlNet, for example) to a Host system. Depending on system configuration, in a cluster of three Q.iMPACT terminals only one terminal

may require the ControlNet interface board. The Q.iMPACT terminal with the interface board is referred to as containing a "bridge".

Any IND780 Q.i terminal in a cluster, whether master or remote, can serve as a bridge terminal to the host PLC or DCS system. Please use best practices when configuring your cluster to distribute the processing load evenly between the master database and your equipment channel modules, I/O and communications.

Material Paths

Each control valve, feed conveyor, etc. is assigned a Material Path (MP) number. This number identifies a unique path that a material will take from a source container to its destination container.

Example A

A scale with two valves controls the addition of materials A and B. The scale also has a discharge valve. This system has a single equipment channel (the scale) and three material paths – two for addition to the scale, one for discharge from the scale. Each is a unique path that the material must follow, and each has its own characteristics, such as flow rate. These three material paths can be referred to as MP1, MP2 and MP3.

Equipment Channel Module	Material Path	Function
1 (scale)	MP1	Addition of material A
1 (scale)	MP2	Addition of material B
1 (scale)	MP3	Discharge from scale

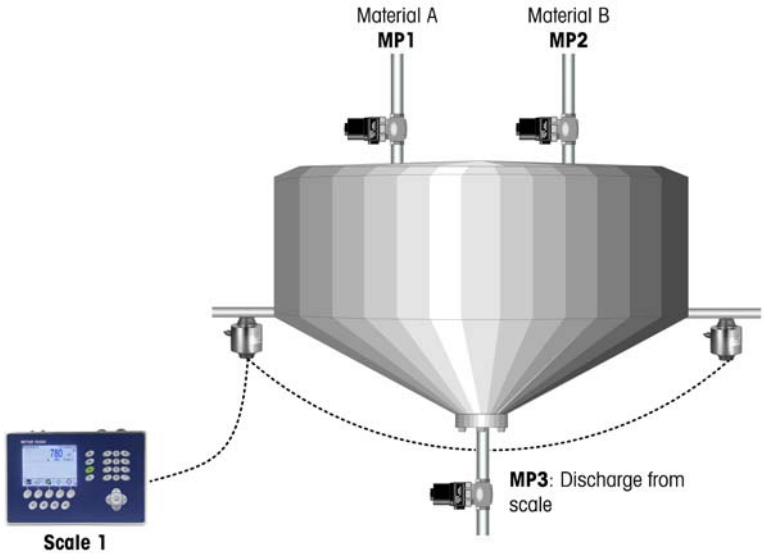

Figure 1-9: Example A

Example B

Suppose that demand for the product being manufactured in this operation has increased, and now exceeds the capacity of the system in Example A. To increase production, a second scale is added. It uses the same raw materials from the same bulk storage container, and discharges the resulting mixture into the same bulk storage tank. However, it has its own control valves, allowing throughput to be doubled. This means that, even though it uses the same sources of raw materials, three new unique material paths associated with the second scale have been added to the system:

Equipment Channel Module	Material Path	Function
1 (scale 1)	MP1	Addition of material A
1 (scale 1)	MP2	Addition of material B
1 (scale 1)	MP3	Discharge from scale 1
2 (scale 2)	MP4	Addition of material A
2 (scale 2)	MP5	Addition of material B
2 (scale 2)	MP6	Discharge from scale 2

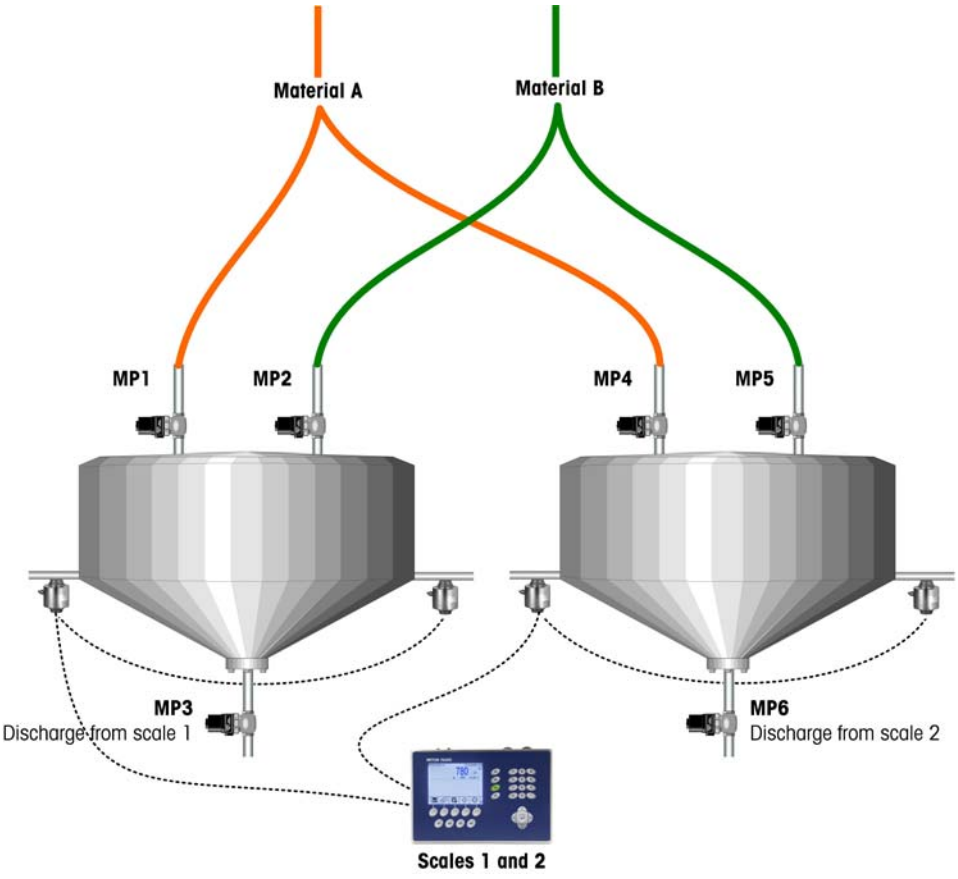

Figure 1-10: Example B

Example C

Colorant is now added to the system described in Example B above, using a flow meter to control the addition for each scale. This system includes two more channels (flow meters 1 and 2) and two more material paths (one for each flow meter). It is important not to increase the batch cycle time, so the Q.i strategy's advanced overlapping feed capabilities can be used to add the colorant at the same time as material A. Batch cycle time is not increased, and the system now looks like this:

Equipment Channel Module	Material Path	Function
1 (scale 1)	MP1	Addition of material A
1 (scale 1)	MP2	Addition of material B
1 (scale 1)	MP3	Discharge from scale 1
2 (scale 2)	MP4	Addition of material A
2 (scale 2)	MP5	Addition of material B
2 (scale 2)	MP6	Discharge from scale 2
3 (Flow meter 1)	MP7	Addition of colorant
4 (Flow meter 2)	MP8	Addition of colorant

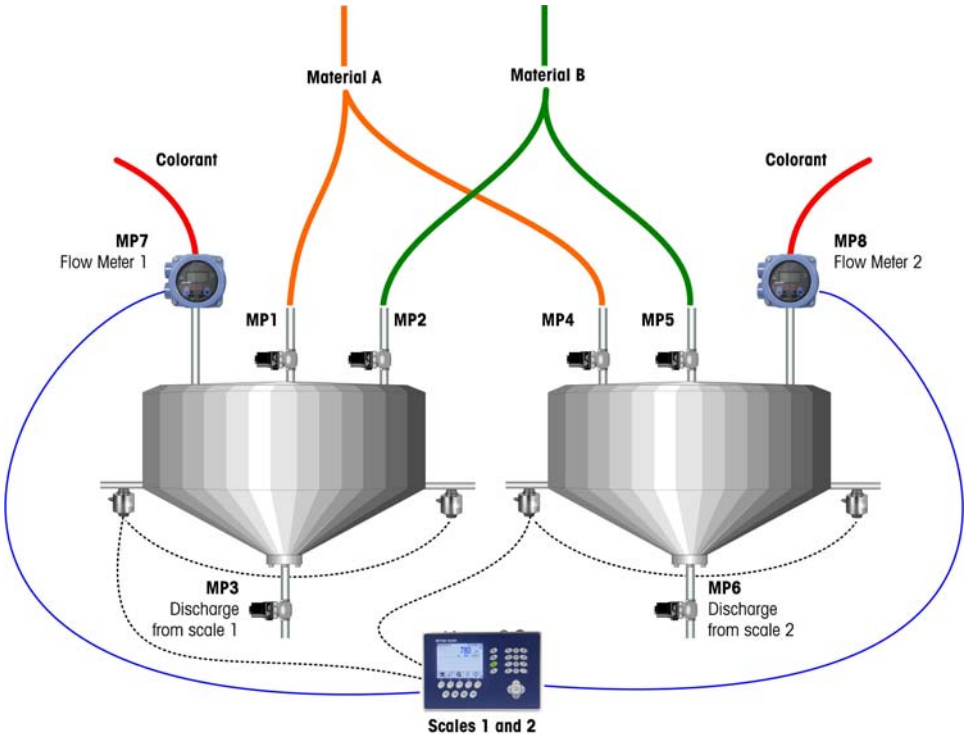

Figure 1-11: Example C

Examples of IND780 Q.i Systems

One Q.iMPACT terminal can be used for systems requiring up to four scale or load cell measurement channels, twelve flow meter measurement channels, or some combination of these. Larger systems, with up to one hundred ninety eight measurement channels, can take advantage of the Q.i clustering capability. Figure 1-12, Figure 1-13 and Figure 1-14 give three examples of Q.iMPACT systems.

IND780-based Q.iMPACT Systems

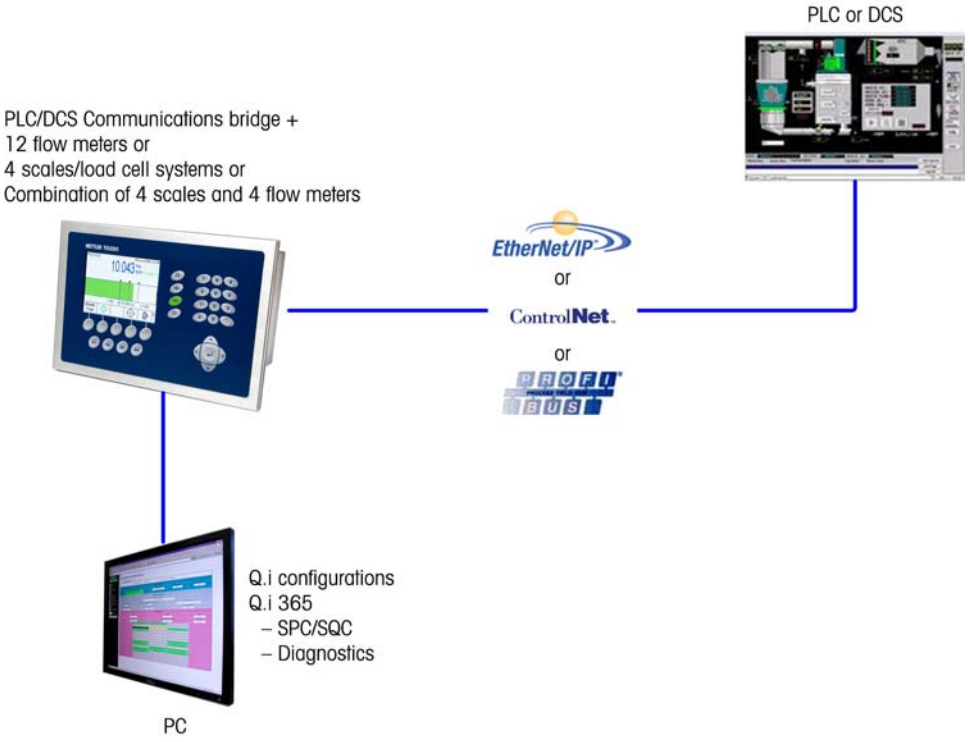

Figure 1-12: Single Terminal System

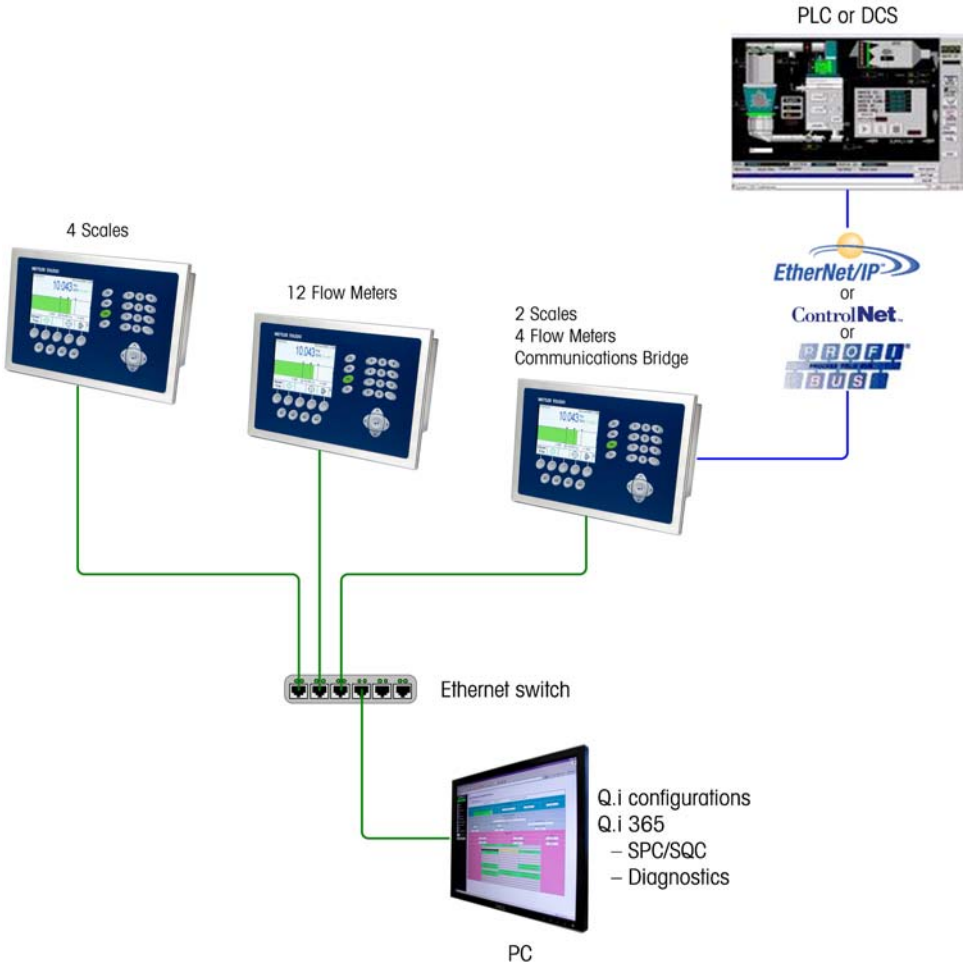

Figure 1-13: Multi-Terminal System

Using IND780- and JagXtreme-based Q.iMPACT Terminals in the Same System

It is not necessary to replace existing JagXtreme Q.i matrollers in order to use the greater functionality of the IND780 Q.iMPACT.

However, the JagXtreme-based Q.i and IND780-based Q.i can share the same PLC and the same process, as shown in Figure 1-14.

- The JagXtreme-based Q.i and the IND780-based Q.i cluster in similar ways, but they cannot share a cluster. This is because the newer IND780 platform communicates over the Ethernet using multi-cast, which is more open and has better reliability than the discrete messaging protocol used by the JagXtreme.

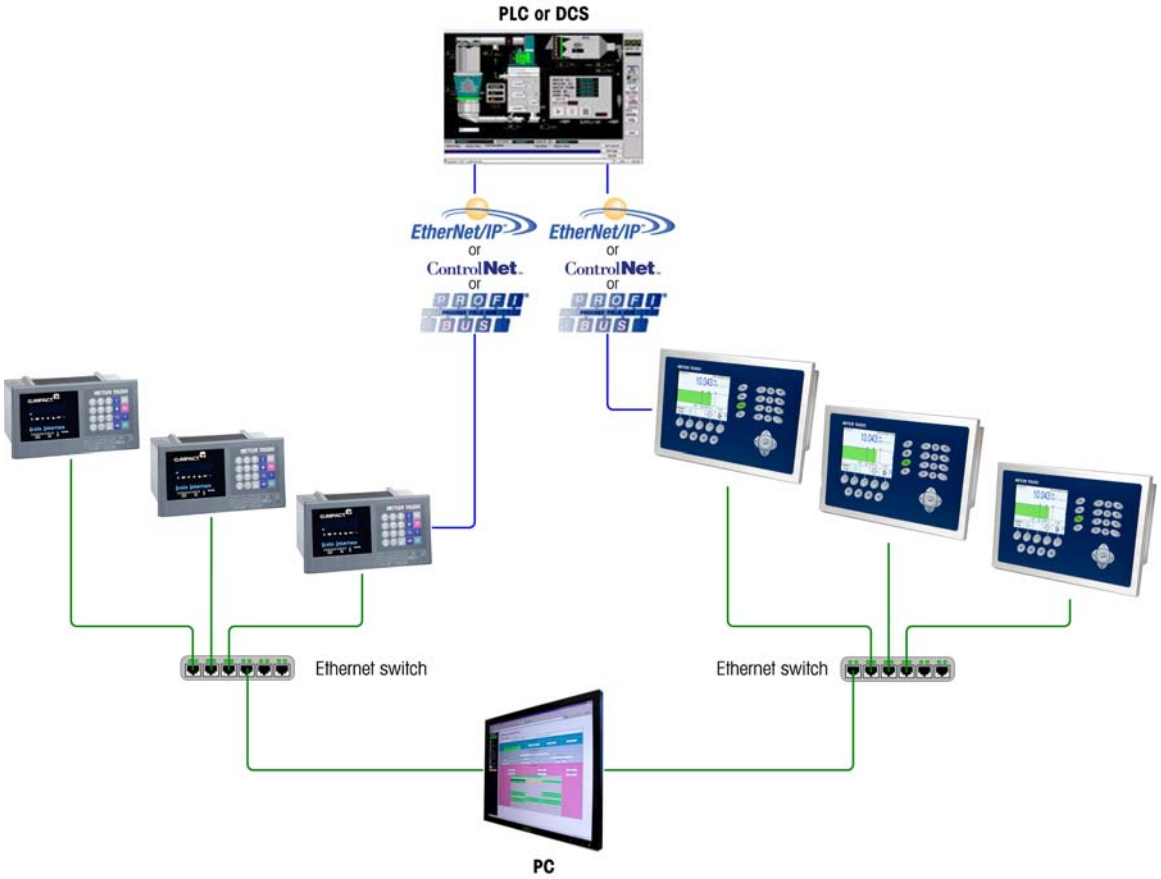

Figure 1-14: Multi-Terminal System Including JAGXTREME and IND780 Q.iMPACT Terminals

Components of an IND780 Q.iMPACT System

Figure 1-15 illustrates the relationship between components of an IND780 Q.iMPACT system that includes one equipment channel (scale) input and one final control element (FCE) output.

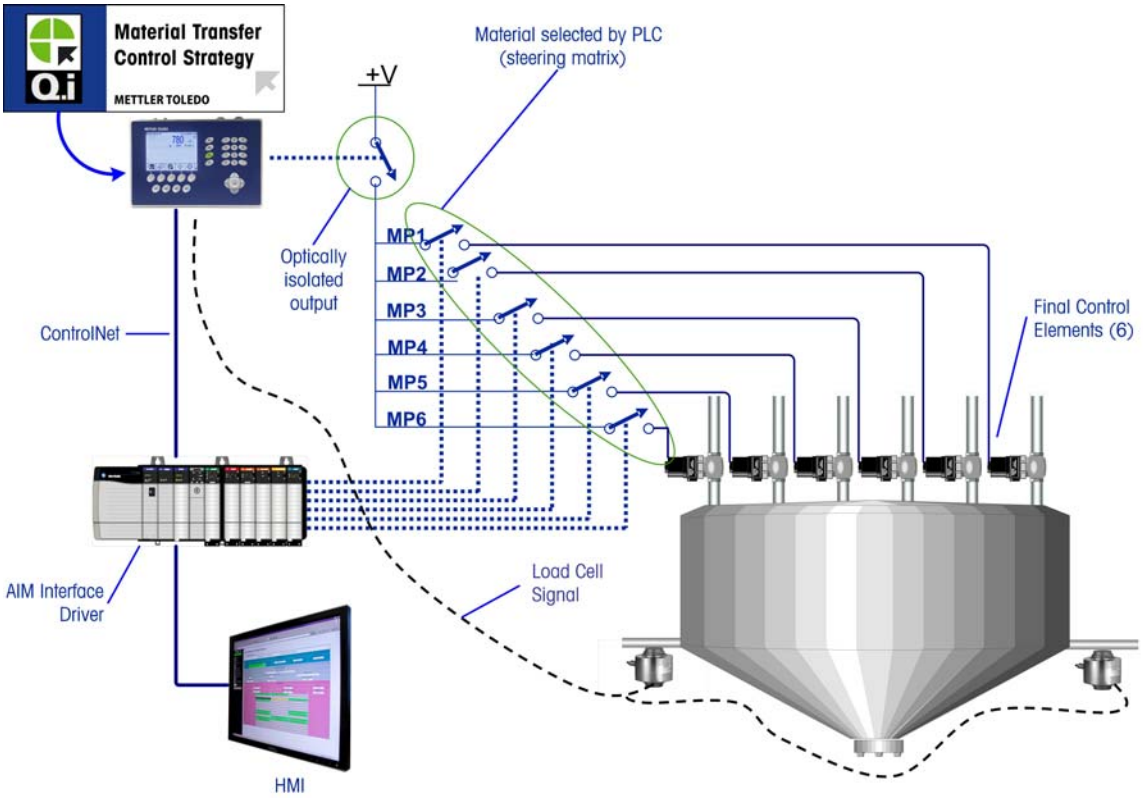

Figure 1-15: Wiring Example – Q.i with 6 Material Paths and One Measurement Channel

Communicating with the IND780 Q.iMPACT Terminal

There are three ways to communicate with the IND780 Q.iMPACT:

- The IND780 terminal control panel
- The PC-based Q.i Configuration Tool
- The IND780's web-based server

The elements of each communication type are detailed in Chapter 3 of this manual, **Configuration**.

Terminal Control Panel

Q.iMPACT parameters can be viewed, set up and modified from the IND780 Q.iMPACT terminal's front panel. The setup menu tree is shown in Figure 1-16, with the **Q.i Configuration** branch expanded.

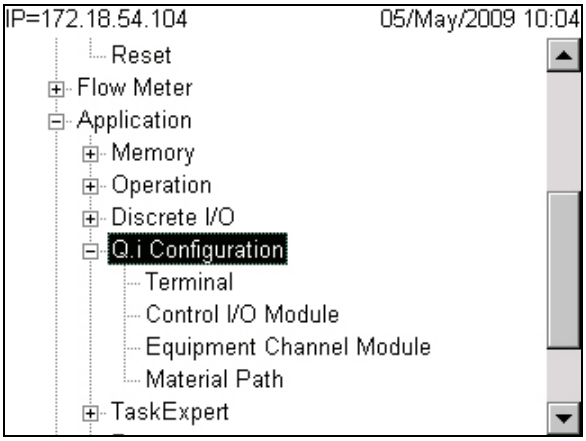

Figure 1-16: Setup Menu Tree, Q.i Configuration Branch Expanded

Q.i Configuration Tool

The Q.i Configuration tool is a PC-based HMI utility developed exclusively for the IND780 Q.iMPACT 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 IND780 Q.iMPACT terminal must be known

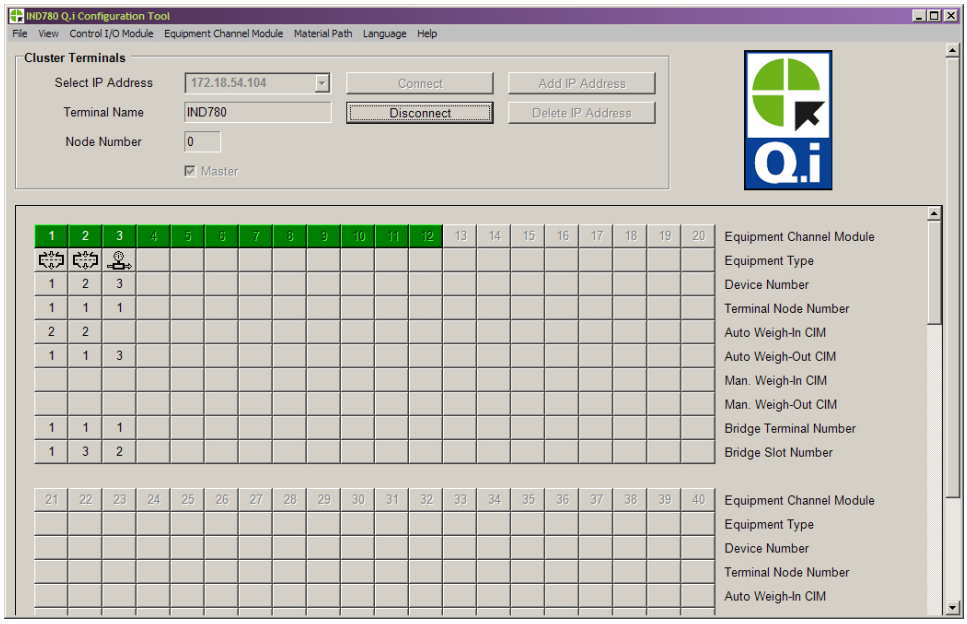

Figure 1-17: Q.i Configuration Tool Main Page

Web Pages

A standard Ethernet connection to the IDN780 Q.iMPACT terminal allows access to its external diagnostics feature, a series of web pages that permit the current configuration to be viewed and, in some cases, modified. To access the web pages:

- The PC must be equipped with a standard Ethernet connection
- The IP address of the IND780 Q.iMPACT terminal must be known

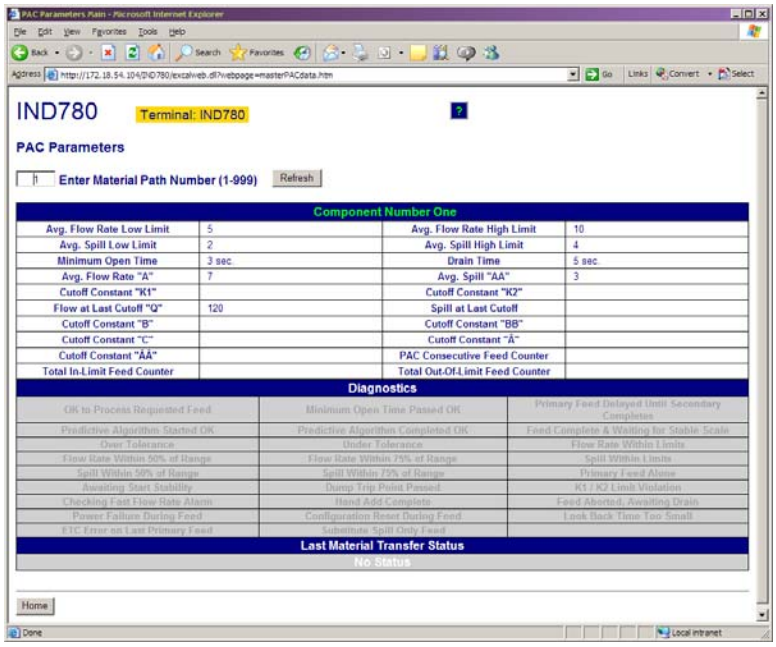

Figure 1-18: IND780 External Diagnostics, PAC Parameters Page

IND780 Q.iMPACT/Host Controller Communications

Fieldbus Types

Three forms of Fieldbus communications provide **full** connectivity with the Q.iMPACT terminal:

- ControlNet
- EtherNet/IP
- Profibus DP

In addition, three types of Fieldbus provide **limited** connectivity with the Q.iMPACT terminal:

- Modbus TCP
- Allen-Bradley RIO
- DeviceNet

Communication Modes

Two types of communication modes are available for the Q.iMPACT terminal. This selection is made in the **Q.i Configuration** section of setup.

Classic Communication Mode

This was the only communication mode available with the first generation Q.iMPACT application on the JAGXTREME®-based terminal. This form of communication uses Explicit Shared Data messages over ControlNet or Ethernet IP communications protocol.

New users can choose to use this mode of communication. Q.i customers upgrading from the JAGXTREME-based Q.i platform may select this mode to avoid or minimize modifications to communication between the Q.i terminal and the Host Controller.

Enhanced Communication Mode

The Enhanced Communication Mode is new for the IND780 Q.iMPACT terminal. This mode uses only cyclic messaging to communicate between the Host Controller and the Q.iMPACT terminal.

For further details on communications modes, refer to Appendix D, **Communications**, in the **IND780 Q.iMPACT Technical Manual**.

Chapter 2.0

Configuration and Operation

There are two HMI options for configuring IND780 Q.i – from the Q.i PC-based configuration tool unique to Q.iMPACT, and from the IND780's operator interface. This chapter will review both options, starting with the PC-based Q.i configuration tool.

Note: Default values are listed in Appendix B of the **IND780 Q.iMPACT Technical Manual**.

The Operation section (2-37) includes information on the IND780 web pages specific to the Q.i application.

Q.i Power-Up Configuration

When power is applied to the IND780 Q.iMPACT, or when power is cycled, the system starts in **automatic feed** and **classic communication** mode.

Q.i Configuration Tool

Introduction

The PC-based configuration tool is a Q.i-specific utility used exclusively to set up and configure the IND780 Q.iMPACT system. The tool can interface with a single terminal or with a cluster of up to twenty terminals. When the tool is used with a cluster of terminals, maximum flexibility is available when communicating with the Master terminal, rather than with a Remote terminal.

- The configuration tool is a true HMI, and has no database of its own. Changes made and saved using the Save button at the bottom left (Figure 2-1) of each configuration screen are saved **only** to the connected Master Terminal. To propagate changes to other terminals in a cluster, a Synchronize process (refer to **File** on page 2-4) must be run **while the system is off-line**.

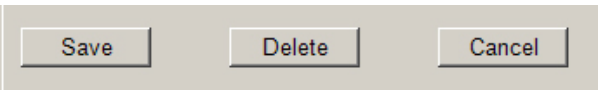

Figure 2-1: Save, Delete and Cancel Buttons

The Q.i configuration tool was built and tested on a Microsoft Windows XP operating system. When it is installed, a shortcut is automatically placed on the PC's desktop:

Click on this shortcut to run the tool. The main screen (Figure 2-2) displays.

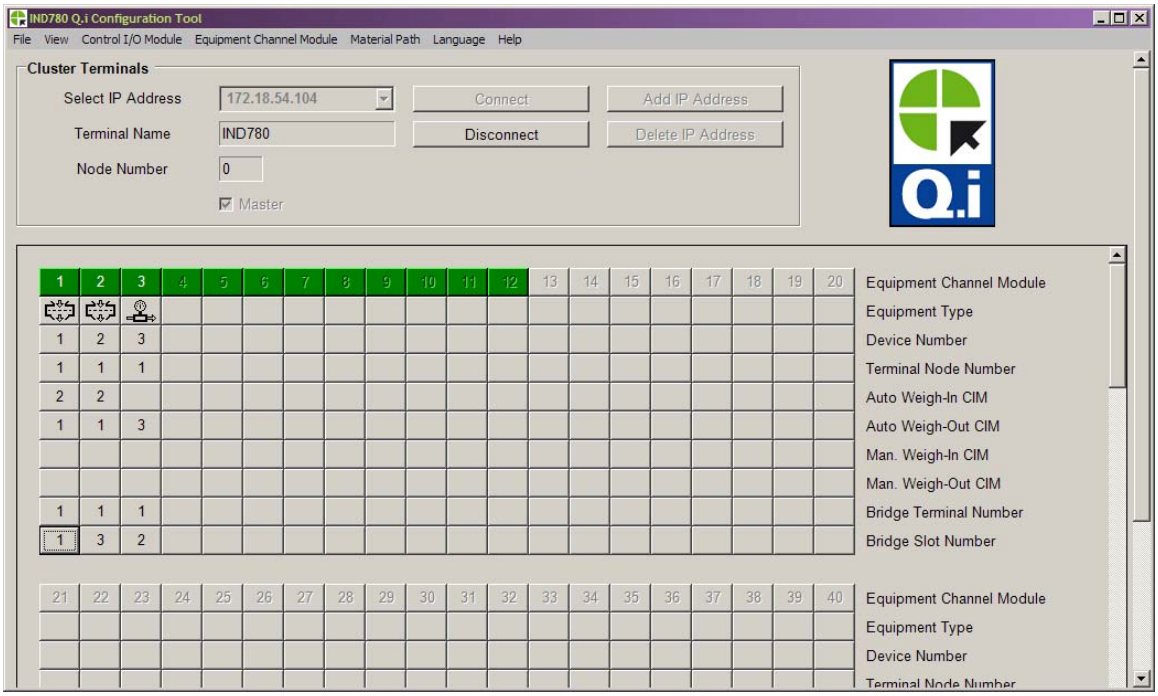

Figure 2-2: Q.i Configuration Tool Main Screen, No Connection

This screen is organized into three main areas:

- The **menu** bar at the top
- The **Cluster Terminals** connection area below the menu bar
- The array of **Equipment Channel Modules** (ECMs) in the scrolling area that occupies the rest of the screen. In the example shown, ECMs 1 and 2 show the scale icon, while ECM 3 shows a flow meter icon.

Connecting

To make a connection to an IND780 Q.i terminal, the PC must be connected directly to the Ethernet port of the IND780 (Figure 2-3) or to a network to which the IND780 Q.i is also connected.

Figure 2-3: IND780 Ethernet Port

To connect to the terminal:

1. **Either** enter the terminal's IP address in the **Select IP Address** field at top left of the screen **or**, if a previous connection has been made to the terminal and saved, select the IP address from the drop-down list.
2. With the IP address entered, and before making the connection, click on the **Add IP Address** button to store the address for future use.

- Addresses can be deleted from the list by selecting them in the drop-down list and then clicking the **Delete IP Address** button.

3. Click on the **Connect** button to establish communication with the terminal. Once the terminal is connected, the Configuration tool's screen will update and resemble the screen shown in Figure 2-4. All menu bar items will now be active and the Terminal Name and Node Number will now be displayed. Each configured Equipment Channel Module (ECM) column is populated with module numbers.

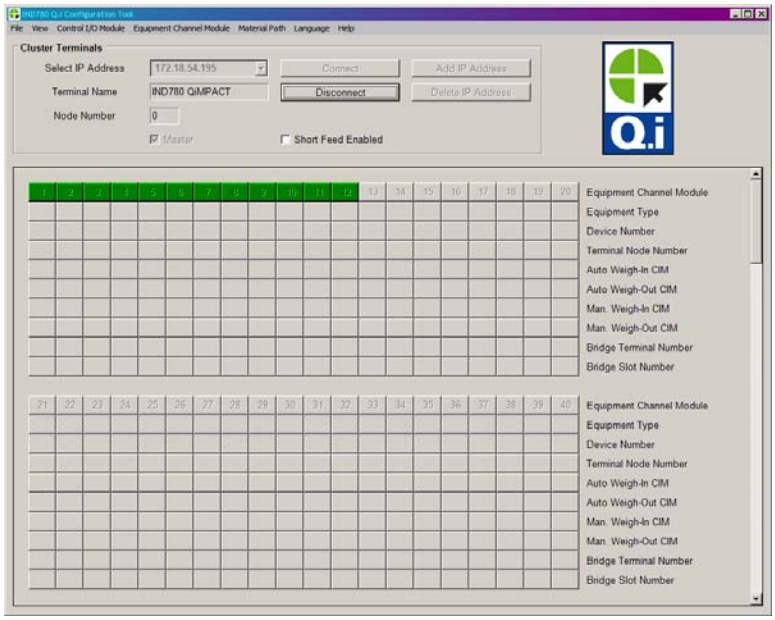

Figure 2-4: Q.i Configuration Tool Main Screen, Connected

Table 2-1 explains the main components of this screen. Detailed descriptions of each row are provided in the following (**Menus**) section.

Table 2-1: Elements of the Configuration Tool Screen

Element	Explanation
Menu bar	The menu bar is arranged in a sequence from left to right that reflects the logic of configuring your IND780 Q.i system. Each menu is detailed in the sections that follow.
Terminal Name	This is read from the connected terminal, where it is configured in setup.

Element	Explanation
Short Feed Enabled	If **any** of the materials have a feed time that is 5 seconds or less, this option should be enabled. The PAC algorithms need 5 seconds or more feed time with the flow rate within limits, in order to predict the cut-off with a high degree of accuracy.
Green boxes	The green boxes – 1 to 12 in this case – represent ECMs for which the optional Predictive Adaptive Control (PAC) algorithms are available.
ECM Array	198 columns in scrolling blocks of 20, each column representing an Equipment Channel Module. A number appears in each currently configured item. Each row is labeled at right. For each ECM, only those rows that are relevant to it are populated (indicated by a number)

Menus

Note: The **File** and **View** menus are useful once the various Control I/O Modules, Equipment Channel Modules and Material Paths are configured.

File

The file menu (Figure 2-5) offers three options.

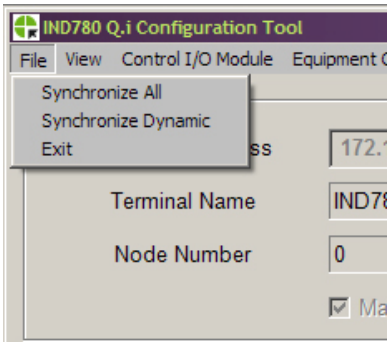

Figure 2-5: File Menu

Synchronize actions should be performed when the system is off-line.

Synchronize All	Updates all configuration data for the currently connected cluster. This process make take some time to complete. Do this while the system is off-line.
Synchronize Dynamic	Updates only dynamic data for the currently connected cluster. This procedure takes less time than **Synchronize All**, as less data is transferred. Do this while the system is off-line.
Exit	Closes the configuration tool

View

The View menu includes three elements – View Control I/O Module List, View Equipment Channel Module List and **View Material Path List**. Selecting one of these items displays a window like the Material Path List shown in Figure 2-6. In this example two material paths have been defined.

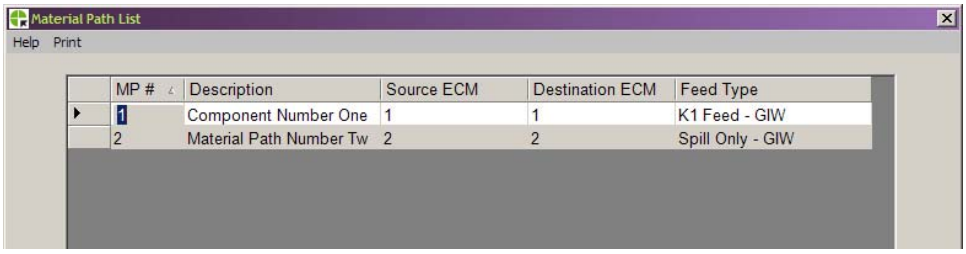

Figure 2-6: Material Path List Display

The list for all three elements shows the all the configured information for each element. If nothing has been configured, nothing will be displayed. You can double click on any configured item to open the associated configuration page.

Control I/O Module

The Control I/O Module menu includes three elements, representing the three types of Control I/O Modules that can be configured, Scale Control I/O Module, Flow Meter Control I/O Module and Hand Add I/O Module. The Control I/O Module defines the I/O that controls the material flow if a flow path. Click on the element to open a configuration display, in which a previously configured Control I/O Module number can recalled (Figure 2-7) to view that module's details or a new, unused number entered to create a new element.

Scale Control I/O Module

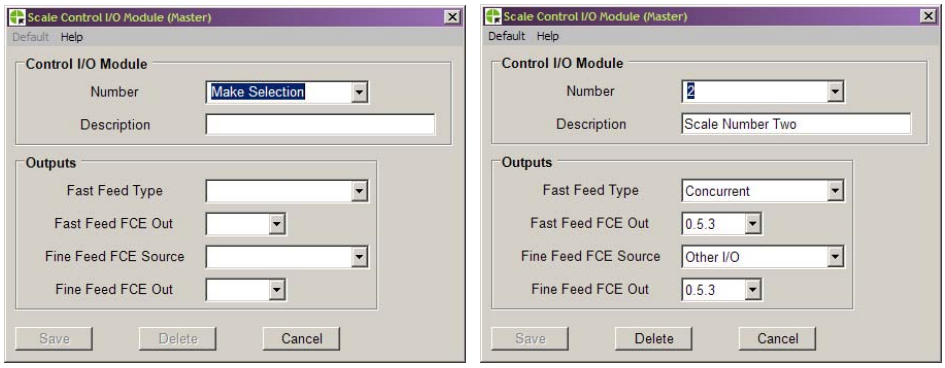

Figure 2-7: Scale Control I/O Module, Initial View (left), Module Selected (right)

Control I/O Module		
Number		The Control I/O Module number assigned to the fast feed and fine feed discrete outputs that are the Final Control Elements (FCE) for turning on or off the material flow into or out of a scale vessel. Assign a unique number to each Control I/O Module from 1 to 297.
Description		Name or details of the control I/O module, 40 characters maximum
Outputs		
Fast Feed Type	None	Only fine feed is used
	Independent	Fast and fine feeds are used sequentially, and independent of one another

	Concurrent	Fast and fine feeds are used simultaneously, until near the end of the feed when fast feed is turned off, and fine feed continues till cut-off.
Fast Feed FCE Out	The discrete output assigned to the fast feed. This output can be either from an internal discrete I/O PCB or from a remote ARM100 communication module. Internal discrete I/O addresses start with a zero (e.g. 0.5.1) and remote I/O addresses start with the port number (e.g. 3.0.1)	
Fine Feed FCE Source	**Scale Board**	The discrete output on the scale PCB is used to control the fine feed
	Other I/O	Either an internal discrete I/O PCB output or a remote ARM100 module output is used to control the fine feed (refer to **Fine Feed FCE Out**, below)
GIW/LIW Selector Out	If the Scale Board is selected to control the fine feed, this output is used to route the fine feed of material into (GIW) or out of (LIW) a scale, or to the scale through a switching matrix in the PLC/DCS system.	
Fine Feed FCE Out	The discrete output assigned to the fine feed.	
Buttons		
Save	Saves changes to the Master Terminal	
Delete	Deletes this I/O module	
Cancel	Ignores changes and exits to the Configuration Tool's main screen	
Default	**Save**	Saves the settings of this control I/O module as a default Control I/O module template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After a control I/O module number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Control I/O Module data (if no new template has been **Saved**), *or* to load the values saved in a Control I/O template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Flow Meter Control I/O Module

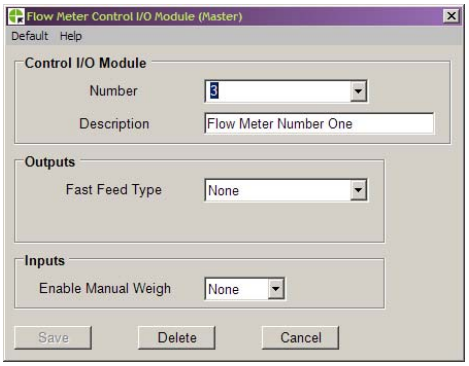

Figure 2-8: Flow Meter Control I/O Module

Control I/O Module		
Number	The Control I/O Module number assigned to the discrete output that is the Final Control Elements (FCE) for turning on or off the fast feed material flow in a flow meter path. The fine feed output is automatically assigned to one of the discrete outputs on the flow meter PCB. Assign a unique number to each Control I/O Module from 1 to 297.	
Description	Name or details of the control I/O module, 40 characters maximum	
Outputs		
Fast Feed Type	None	Only fine feed is used
	Independent	Fast and fine feeds are used sequentially, and independent of one another
	Concurrent	Fast and fine feeds are used simultaneously, until near the end of the feed when fast feed is turned off, and fine feed continues till cut-off.
Inputs		
Enable Manual Weigh	This discrete input enables a flow meter manual weigh operation	
Buttons		
Save	Saves changes to the Master Terminal	
Delete	Deletes this I/O module	
Cancel	Ignores changes and exits to the Configuration Tool's main screen	
Default	Save	Saves the settings of this control I/O module as a default Control I/O module template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After a control I/O module number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Control I/O Module data (if no new template has been **Saved**), *or* to load the values saved in a Control I/O template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Hand Add Control I/O Module

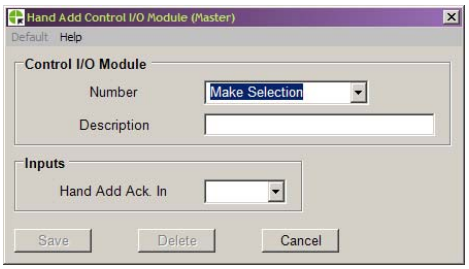

Figure 2-9: Hand Add Control I/O Module

Control I/O Module		
Number		The Control I/O Module number assigned to the input used to acknowledge the addition of a hand add material.
Description		Name or details of the control I/O module, 40 characters maximum
Inputs		
Hand Add Ack. In		A discrete input assigned to the hand add acknowledge operation
Buttons		
Save		Saves changes to the Master Terminal
Delete		Deletes this I/O module
Cancel		Ignores changes and exits to the Configuration Tool's main screen
Default	**Save**	Saves the settings of this control I/O module as a default Control I/O module template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After a control I/O module number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Control I/O Module data (if no new template has been **Saved**), *or* to load the values saved in a Control I/O template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Equipment Channel Module

The Equipment Channel Module menu includes three elements, representing the three types of hardware that may be included in a Material Path, Scale Equipment Channel Module, Storage Scale Equipment Channel Module and Flow Meter Equipment Channel Module.

Click on the element to open a configuration display, in which a previously configured Equipment Channel Module number can recalled (Figure 2-7) to view that module's details, or a new, unused number entered to create a new element.

Scale Equipment Channel Module

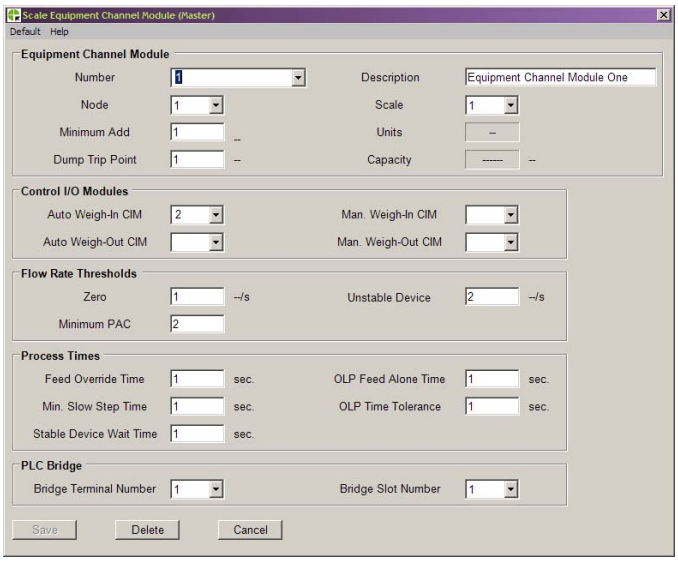

Figure 2-10: Scale ECM View, Scale 1 Selected

Equipment Channel Module	
Number	The equipment channel module number assigned to the scale unit device
Description	Name or details of the equipment channel module, 40 characters maximum
Node	Terminal node number where the scale interface/PCB resides
Scale	Scale number 1 to 4
Minimum Add	Sets the smallest amount of material that the system can attempt to transfer with this scale
Units	Primary units of this scale configured in scale setup – field is not editable
Dump Trip Point	Sets the level at which the PAC process starts the drain timer in a dump-to-empty operation. After the drain timer expires, the PAC process shuts off the dump-to-empty operation with it detects zero flow
Capacity	Calibrated capacity of the scale unit configured in scale setup – field is not editable
Control I/O Modules	
Auto Weigh-In CIM	Number of the control I/O module assigned to automatically control the flow of material into the scale unit
Man Weigh-In CIM	Number of the control I/O module assigned to manually control the flow of material into the scale unit
Auto Weigh-Out CIM	Number of the control I/O module assigned to automatically control the flow of material out of the scale unit
Man Weigh-Out CIM	Number of the control I/O module assigned to manually control the flow of material out of the scale unit

Flow Rate Thresholds	
Zero	Sets the flow rate below which the system assumes a zero flow. The PAC process uses this value to determine when material transfer operations are ready to start and when they are complete
Unstable Device	Sets the flow rate threshold above which the PAC process generates a "noisy measuring device" condition while waiting for a stable scale reading for the "Stable Device Wait Time"
Minimum PAC	Sets the flow rate above which the PAC process begins to apply the predictive algorithm
Process Times	
Feed Override Time	Time, in seconds, before completion of a material transfer when the PAC process inhibits the external logic from removing the permissive on the enabling logic for the Final Control Element (FCE). Examples of this type of external logic are slow step timers or an operator changing operational modes
Overlap Feed Alone Time	The controller can issue commands to start concurrent overlapped feeds to a single scale. There is always one primary overlapped feed. There may be one or more secondary overlapped feeds. The scale controls the primary overlapped feed. In order for the PAC process to have time to accurately predict the cutoff, this time must be set to allow the primary overlapped feed to feed alone before cutoff. Typical feed alone time before cutoff is 10 seconds
Minimum Slow Step Time	The PAC process uses this value when its computed slow step time value is less than this minimum value. The slow step time is the timeout value for the material transfer
Overlap Time Tolerance	The additional time tolerance allowed for a primary overlapping feed to complete. May be used to compensate for time variations that may occur when completing secondary feeds
Stable Device Wait Time	The number of seconds to wait after the drain timer has expired for a stable scale reading before returning an unstable measuring device failure status. If the flow rate is above the "Unstable Device" threshold, the PAC process returns a failure status at the completion of this wait time. If the flow rate is between the "Zero" flow threshold and the "Unstable Device" threshold, the PAC process returns a success status at the completion of this wait time
PLC/DCS Bridge	
Bridge Terminal Number	The terminal node number of the IND780 terminal that contains the PLC/DCS interface board
Bridge Slot Number	The number assigned to the assembly data packet that contains input data for this equipment channel module. There are a maximum of 24 assembly slot numbers for **Q.i Classic mode** and a maximum of 12 assembly slot numbers for **Q.i Enhanced mode**. Only available slot numbers are listed. Once a slot number is assigned, it will not be available in another equipment channel module
Buttons	
Save	Saves changes to the Master Terminal

Delete		Deletes this I/O module
Cancel		Ignores changes and exits to the Configuration Tool's main screen
Default	**Save**	Saves the settings of this Equipment Channel Module as a default ECM template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After an ECM number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Equipment Channel Module data (if no new template has been **Saved**), *or* to load the values saved in an ECM template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Storage Scale Equipment Channel Module

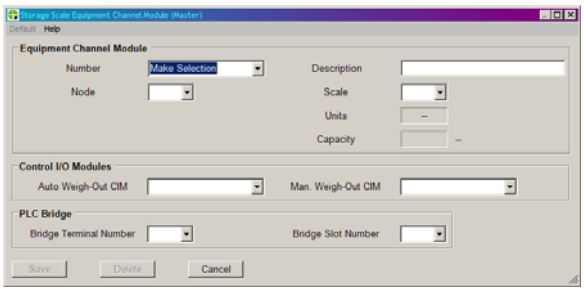

Figure 2-11: Storage Scale ECM View

Equipment Channel Module	
Number	The equipment channel module number assigned to the storage scale device
Description	Name or details of the equipment channel module, 40 characters maximum
Node	Terminal node number where the scale interface/PCB resides
Scale	Scale number 1 to 4
Units	Primary units of this scale – field is not editable
Capacity	Calibrated capacity of the scale unit – field is not editable
Control I/O Modules	
Auto Weigh-Out CIM	Number of the control I/O module assigned to automatically control the flow of material out of the scale unit
Man Weigh-Out CIM	Number of the control I/O module assigned to manually control the flow of material out of the scale unit
PLC Bridge	
Bridge Terminal Number	The terminal node number of the IND780 terminal that contains the PLC interface

Bridge Slot Number	The number assigned to the assembly data packet that contains input data for this equipment channel module. There are a maximum of 24 assembly slot numbers for **Q.i Classic mode** and a maximum of 12 assembly slot numbers for **Q.i Enhanced mode**. Only available slot numbers are listed. Once a slot number is assigned, it will not be available in another equipment channel module

Buttons		
Save		Saves changes to the Master Terminal
Delete		Deletes this I/O module
Cancel		Ignores changes and exits to the Configuration Tool's main screen
Default	**Save**	Saves the settings of this control I/O module as a default Control I/O module template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After a control I/O module number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Control I/O Module data (if no new template has been **Saved**), *or* to load the values saved in a Control I/O template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Flow Meter Equipment Channel Module

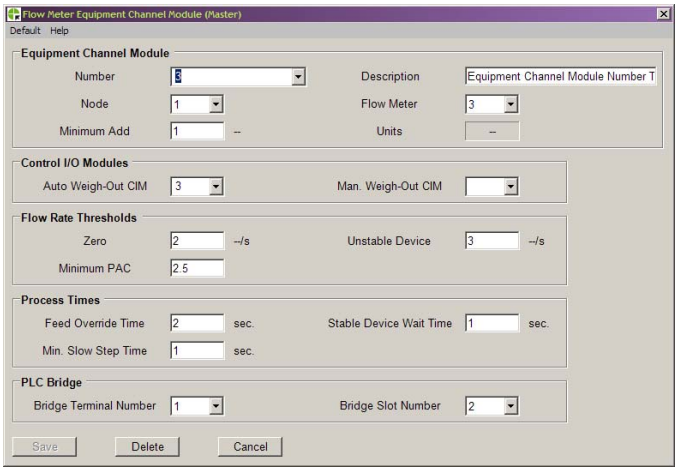

Figure 2-12: Flow Meter ECM View, Flow Meter 3 Selected

Equipment Channel Module	
Number	The equipment channel module number assigned to the flow meter device
Description	Name or details of the equipment channel module, 40 characters maximum
Node	Terminal node number where the scale interface/PCB resides

Flow Meter	Flow Meter number 1 to 12
Minimum Add	Sets the smallest amount of material that the system can attempt to transfer with this flow meter
Units	Measurement units of this flow meter – field is not editable
Control I/O Modules	
Auto Weigh-Out CIM	Number of the control I/O module assigned to automatically control the flow of material out of the scale unit
Man Weigh-Out CIM	Number of the control I/O module assigned to manually control the flow of material out of the scale unit
Flow Rate Thresholds	
Zero	Sets the flow rate below which the system assumes a zero flow. The PAC process uses this value to determine when material transfer operations are ready to start and when they are complete
Unstable Device	Sets the flow rate threshold above which the PAC process generates a "noisy measuring device" condition while waiting for a stable scale reading for the "Stable Device Wait Time"
Minimum PAC	Sets the flow rate above which the PAC process begins to apply the predictive algorithm
Process Times	
Feed Override Time	Time, in seconds, before completion of a material transfer when the PAC process inhibits the external logic from removing the permissive on the enabling logic for the Final Control Element (FCE). Examples of this type of external logic are slow step timers or an operator changing operational modes
Overlap Feed Alone Time	The controller can issue commands to start concurrent overlapped feeds to a single scale. There is always one primary overlapped feed. There may be one or more secondary overlapped feeds. The scale controls the primary overlapped feed. In order for the PAC process to have time to accurately predict the cutoff, this time must be set to allow the primary overlapped feed to feed alone before cutoff. Typical feed alone time before cutoff is 10 seconds
Minimum Slow Step Time	The PAC process uses this value when its computed slow step time value is less than this minimum value. The slow step time is the timeout value for the material transfer
Overlap Time Tolerance	The additional time tolerance allowed for a primary overlapping feed to complete. May be used to compensate for time variations that may occur when completing secondary feeds
Stable Device Wait Time	The number of seconds to wait after the drain timer has expired for a stable scale reading before returning an unstable measuring device failure status. If the flow rate is above the "Unstable Device" threshold, the PAC process returns a failure status at the completion of this wait time. If the flow rate is between the "Zero" flow threshold and the "Unstable Device" threshold, the PAC process returns a success status at the completion of this wait time
PLC Bridge	
Bridge Terminal Number	The terminal node number of the IND780 terminal that contains the PLC interface

Bridge Slot Number		The number assigned to the assembly data packet that contains input data for this equipment channel module. There are a maximum of 24 assembly slot numbers for **Q.i Classic mode** and a maximum of 12 assembly slot numbers for **Q.i Enhanced mode**. Only available slot numbers are listed. Once a slot number is assigned, it will not be available in another equipment channel module
Buttons		
Save		Saves changes to the Master Terminal
Delete		Deletes this I/O module
Cancel		Ignores changes and exits to the Configuration Tool's main screen
Default	**Save**	Saves the settings of this Equipment Channel Module as a default ECM template. Note that performing this action over-writes the factory defaults for this type of module.
	Recall	After an ECM number is entered or selected, use **Recall** *either* to load the factory default parameters with the default Equipment Channel Module data (if no new template has been **Saved**), *or* to load the values saved in an ECM template. To restore the factory defaults after they have been over-written by creating and saving a template, backup all terminal data and settings, then perform a Master Reset. Refer to the **IND780 Technical Manual** for details on these procedures.

Material Path

This menu includes a single item – Material Path. Click on the element to open a configuration display, in which a previously configured Material Path number can recalled (Figure 2-7) to view that module's details, or a new, unused number entered to create a new element.

This opens a screen where a Material Path number can be selected in order to display configuration information specific to that material path.

From this screen, parameters (such as the Feed Algorithm associated with the Material Path) can be modified. Changes can be saved (**Save** button) or discarded (**Cancel** button), and the Material Path can be deleted (**Delete** button). Note that the Delete operation is ***not*** preceded by a warning or confirmation.

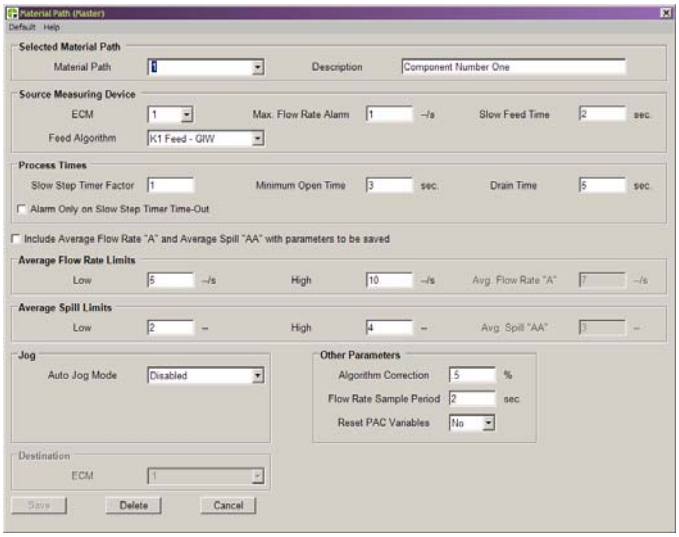

Figure 2-13: Material Path Configuration View

Selected Material Path		
Material Path	Number assigned to this material path	
Description	Name or details of the material path, 40 characters maximum	
Source Measuring Device		
ECM	The equipment channel number assigned to the source measuring device, scale or flow meter	
Feed Algorithm	Spill Only - GIW	Simple Gain-In-Weight feed to cutoff. No predictive algorithm applied. Use for very slow feeds or feeds with very erratic, unpredictable flow rates
	Spill Only – LIW	Simple Loss-In-Weight feed to cutoff. No predictive algorithm applied. Use for very slow feeds or feeds with very erratic, unpredictable flow rates
	K1 Feed – GIW	A Gain-In-Weight feed that predicts the cutoff for feeds that have constant, very predictable flow rates. For example, use it with horizontal feeds that do not have any initial downward velocity
	K1 Feed – LIW	A Loss-In-Weight feed that predicts the cutoff for feeds that have constant, very predictable flow rates
	K2 Feed – GIW	A Gain-In-Weight feed that predicts the cutoff for feeds that are variable but predictable. For example, use it with vertical feeds through valves where the variation in head pressure can cause variable flow rates
	K2 Feed – LIW	A Loss-In-Weight feed that predicts the cutoff for feeds that are variable but predictable
	Dump to Empty	An algorithm to completely empty a tank or vessel
Max. Flow Rate Alarm	Sets the flow rate at which the PAC process terminates the feed and sets an alarm. If this value is set to zero, the PAC process will not check the maximum flow rate	

Slow Feed Time	In a two-speed feed, this is the amount of time needed for the slow feed. A value of 0 disables the two-speed feed and the entire feed proceeds at slow feed
Process Times	
Slow Step Timer Factor	Sets the Slow Step Timer calculation factor. For automatic feeds, the Slow Step Timer is the Factor * target / average flow. The Slow Step Timer measures when a material transfer is taking too long and aborts the process when the process exceeds the timer value. Typical factor values are 1.5 - 2.0. For hand add feeds, the Slow Step Timer is Factor * 60 seconds
Minimum Open Time	Time in seconds during which the PAC process does NOT apply spill compensation immediately following the start of the feed. It allows the material flow to come up to speed before beginning to apply the predictive algorithm. A feed must be active for this length of time before the PAC process considers it successful and automatically updates the PAC parameters
Drain Time	This sets the time in seconds that the system will wait for material to drain into or from a vessel after the PAC process has cutoff the feed and before it tests the material delivery tolerance
Alarm Only on Slow Step Timer Time-Out	Normally when the Slow Step Timer expires, the PAC process terminates the feed. Checking this box will cause the PAC process to generate an alarm when the Slow Step Timer expires **without** terminating the feed. The Controller application must then decide how to process the alarm
Average Flow Rate Limits	
Include Average Flow Rate "A" and Average Spill Rate "AA" with parameters to be saved	When this box is checked, Average Flow Rate "A" and Average Spill "AA" editing is enabled, and values entered for the Average Flow Rate "A" and "Average Spill "AA" will be saved when the **Save** button is pressed
Low	Sets the lower limit for the Average Flow Rate
High	Sets the upper limit for the Average Flow Rate
Avg. Flow Rate "A"	Typically, displays the average flow rate at cutoff in weight per second. Optionally, this field may also be used initially for setting new seed values for the PAC process
Average Spill Limits	
Low	Sets the lower alarm limit for the Average Spill
High	Sets the upper alarm limit for the Average Spill
Avg. Spill "AA"	Typically, displays the average spill in weight at cutoff. Optionally, this field may also be used initially for setting new seed values for the PAC process
Jog	
Auto Jog Mode	Controls the auto jog operation
	Disabled Auto Jog is disabled
	Jog to Tolerance Jog the feed until it reaches the tolerance value
	Jog to Target Jog the feed until it reaches the target value
Jog On Time	Time in fractional seconds the feeder is ON during a jog cycle

Jog Off Time	Time in fractional seconds the feeder is OFF during a jog cycle
Auto Jog Mode	Controls the auto jog operation
Other Parameters	
Algorithm Correction	Value used by the PAC process in calculating the Average Flow Rate and the Average Spill, to control how quickly the system responds to a change in operating conditions. The range is usually 10% to 40% in material transfer processes that change slowly and infrequently. Use values from 70% to 90% for processes that change quickly or frequently
Flow Rate Sample Period	Set this value to specify the period of time in seconds (from 1 to 60) over which the rate is calculated. Smaller values allow the PAC process 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
Reset PAC Variables	Resets the PAC variables to a default state when the Save button is pressed
Destination	
ECM	The equipment channel module number of the scale device for the destination vessel to which material is being fed. Selct Out-of-Cluster if the destination is not in the cluster
Buttons	
Save	Saves changes to the Master Terminal
Delete	Deletes this I/O module
Cancel	Ignores changes and exits to the Configuration Tool's main screen

Language

The Language menu provides a list of languages from which to select:

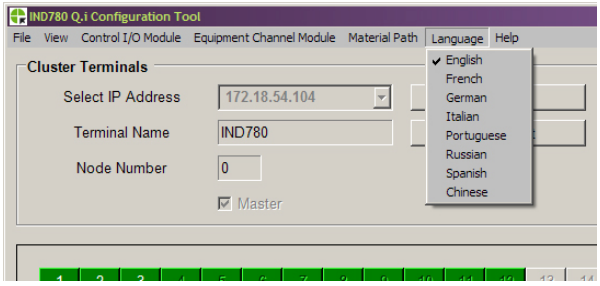

Figure 2-14: Language Options

Help

The help menu offers a choice of two items – access to the browser-based Help system (Figure 2-15), and an "About" screen (Figure 2-16) that shows version information.

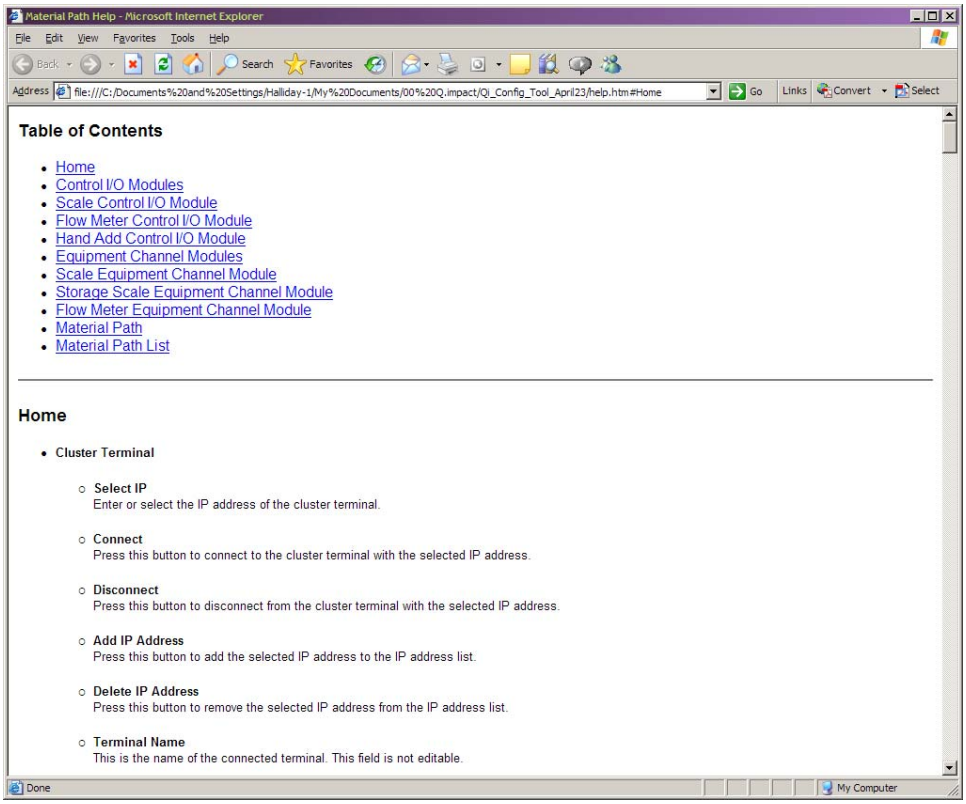

Figure 2-15: Help System, Initial Page

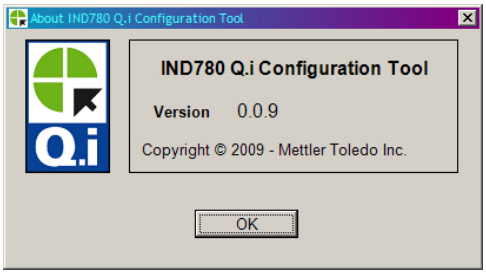

Figure 2-16: Help System, IND780 Q.i Configuration Tool "About" Screen

IND780 Operator Interface

Figure 2-17 shows the standard IND780 home page, indicating that the terminal is on-line in control mode. Note that, in this case, the Q.iMPACT softkey , has been assigned to the fourth position at the bottom of the screen. Refer to Appendix E, **Softkey Mapping and Application Key Configuration**, in the **IND780 Technical Manual**, for information on how to assign softkeys.

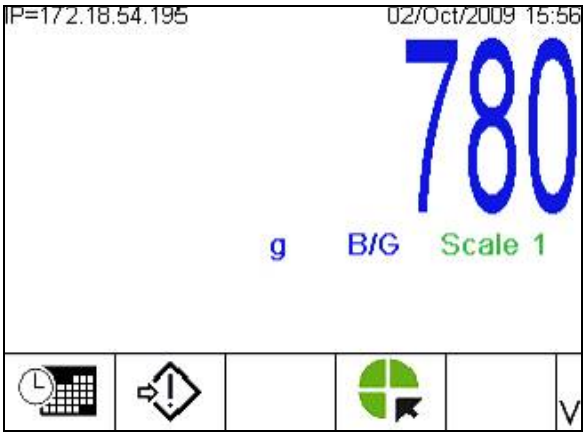

Figure 2-17: IND780 Main Screen with Q.iMPACT Softkey

Press the SETUP softkey to display the setup menu tree, shown below in Figure 2-17. If prompted enter a valid user name and password to access setup.

Viewing Q.i Configuration Information from the Home Screen

To see the current configuration of any module or path without accessing setup, press the VIEW Q.i CONFIG softkey . (This procedure assumes that the softkey has been assigned to the home screen. Refer to Appendix E, **Softkey Mapping and Application Key Configuration**, in the **IND780 Technical Manual**.) The screen shown in Figure 2-18 will display. In this illustration, the View list box has been selected, to show the options.

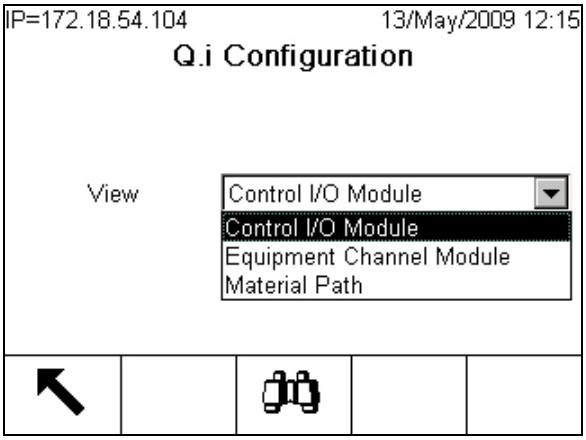

Figure 2-18: Q.i Configuration View Selection Screen

Use the UP and DOWN arrows to highlight the desired selection, then press ENTER to confirm it.

Press the VIEW softkey to open the view screen. A screen like the one shown in Figure 2-19 will display.

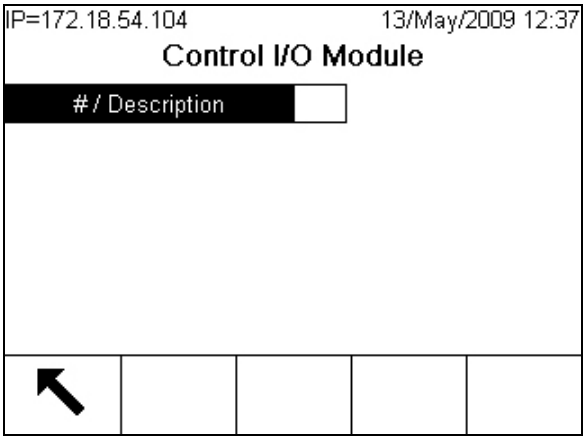

Figure 2-19: Module Number Selection Screen

- Press the EXIT softkey to return to the home screen.
- Press ENTER to select the module number entry field, type the desired module number, and press ENTER again. The requested information will display, but cannot be edited.

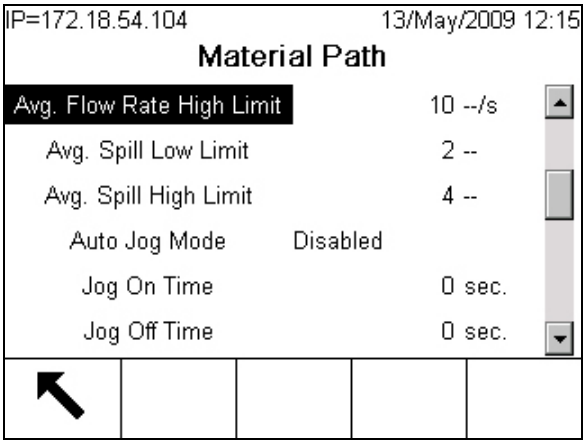

Figure 2-20: Typical Configuration Display Screen

IND780 Q.i Menu Trees

Once in setup, the setup menu tree displays. Use the terminal's front panel UP and DOWN arrow keys to scroll through the tree, and use the RIGHT arrow to expand a branch. To enter a configuration screen at the end of a branch (a leaf node), press the terminal's ENTER key. In Figure 2-17, note the **Flow Meter** and **Q.i Configuration** branches, which are unique to Q.iMPACT.

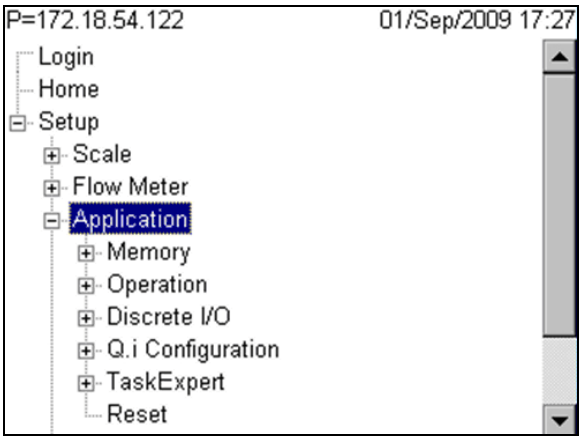

Figure 2-21: Application Branch of Setup Menu Tree, Expanded

Select the **Q.i configuration** branch and expand it:

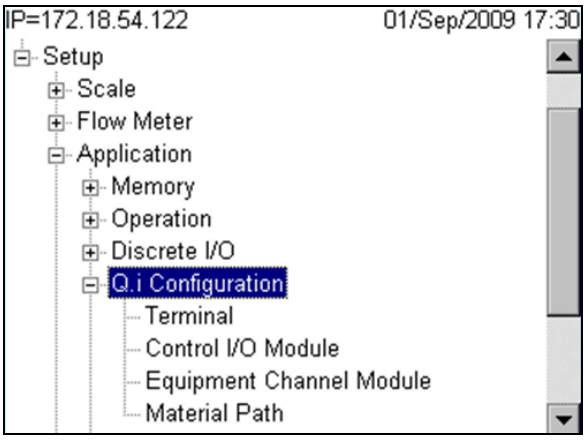

Figure 2-22: Q.i Configuration Branch of Application Menu Tree, Expanded

The following sections detail the information and settings available in the **Q.i Configuration** branch of the setup menu tree.

Application: Q.i Configuration

Terminal

This section covers the Q.iMPACT-specific menus that are added to the standard IND780 control panel setup menu tree. All other IND780 menu items that are not unique to the Q.i application pac on the IND780 terminal are detailed in Chapter 3, **Configuration**, of the **IND780 Technical Manual**

Move the highlight to select the first item on the list – **Terminal**:

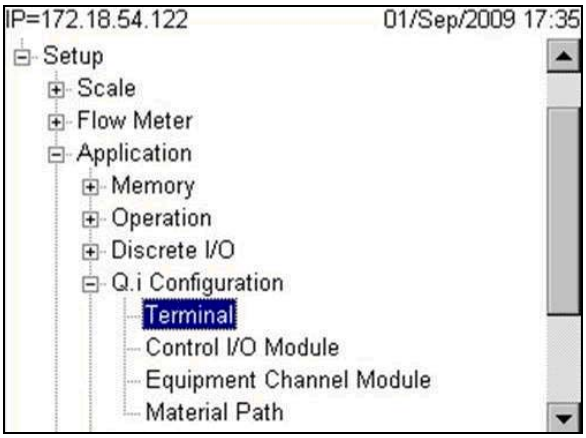

Figure 2-23: Q.i Configuration | Terminal Branch Expanded

With **Terminal** selected, press the ENTER key. The following screen will appear, indicating that the terminal's node has been identified, and offering the option of defining this terminal as the master:

Figure 2-24: Q.i Configuration | Terminal Setup Screen

If Master Terminal is set to **No**, to create a Remote Terminal, this screen displays the Master Terminal's name, and shows the **Q.i Configuration** and **Short Feed** settings defined in the master. These cannot be changed from a remote terminal. For the master terminal itself, the **Master Terminal** field reads "This Terminal."

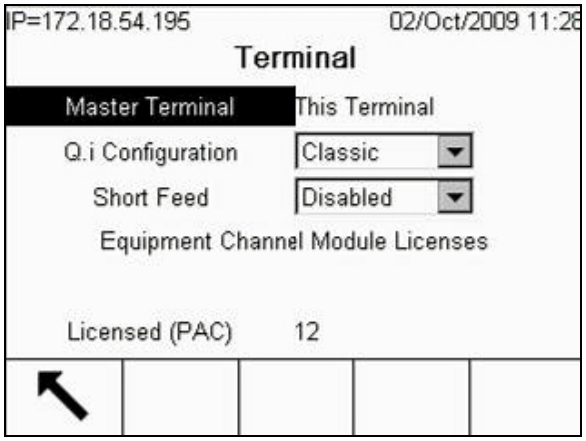

Figure 2-25: Master Terminal - This Terminal Screen

In Q.i systems that contain a single terminal, the terminal is the master by default. In Q.i systems consisting of more than one terminal (a cluster of one master terminal with up to nineteen remote terminals) then the terminal currently accessed could be the master ("This Terminal") or one of the remote terminals.

Note: The Control I/O Modules, Equipment Channel Modules and Material Paths can all be **configured** and **edited** using the Master Terminal setup screens, but they can only be **viewed** in the setup menus of a remote terminal.

Table 2-2: Elements of the Control I/O Module Configuration Screen

Field	Description
Master Terminal	Determines if this terminal will be a Master Terminal or a Remote Terminal. Select **Yes** if this is a single IND780 Q.i system. The Master Terminal is where the system configuration database is located. **Note**: Node numbers are assigned in setup at **Communication > Network > Cluster > This Terminal**.
Q.i Configuration	Q.i configuration options refer to the type of PLC communication you wish to use – **classic mode** or **enhanced mode**. Classic mode is the default. **Classic Mode**: PLC or DCS communications which use explicit shared data messages over ControlNet or Ethernet IP communications protocol, similar to the first generation Q.i application on the JAGXTREME terminal platform. **Enhanced Mode**: This mode of PLC or DCS communications is new for the Q.i application in the IND780 terminal and uses only cyclic messaging to communicate between the host controller and the Q.iMPACT terminal.
Short Feed	The Mettler-Toledo Q.i PAC algorithms require at least 5 seconds of fill time in order to build an accurate model of the feed and adjust the FCE cutoff point appropriately. Short feed options are include: **Enabled**: Select if any of your material feeds are less than 5 seconds **Disabled**: Select if none of your material feeds are less than 5 seconds
Equipment Channel Module Licenses	The number next to the **Licensed (PAC)** label indicates how many equipment channel modules are licensed to use the patented Predictive Adaptive Control (PAC) algorithms. This value is read from a bit on the hardware security key, indicating how many licenses were purchased and enabled on this terminal (or in the cluster, if viewing the master terminal control panel).

Control I/O Module (Master)

Use the arrow key to return to the main menu tree and move to the next item on the list, the Control I/O Module:

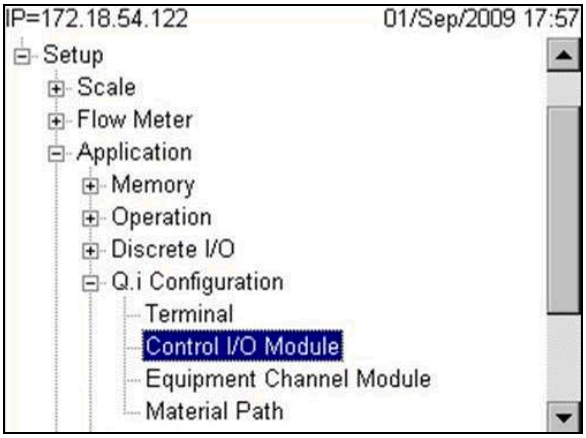

Figure 2-26: Control I/O Module Node of Setup Menu Tree

Select the Control I/O Module branch and press ENTER to display a screen like the one shown in Figure 2-27.

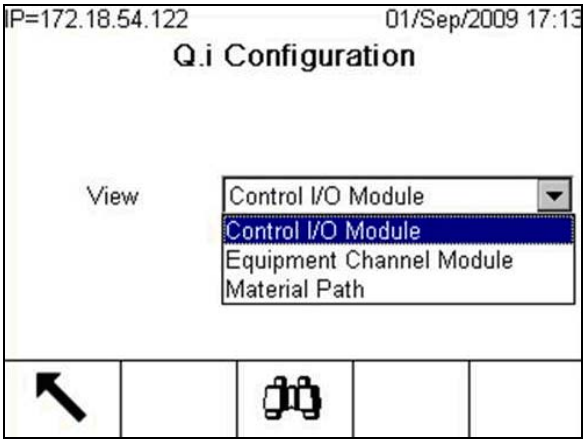

Figure 2-27: Q.i Configuration View Selection Screen

Generally, Control I/O Modules should be configured first, then Equipment Channel Modules. Finally, the Material Paths can be constructed. For further details on the logic of Q.iMPACT function and configuration, please refer to Chapter 1 (**Introduction**) of this manual for further details.

Select Control I/O Module from the Q.i Configuration page, and the following screen shown in Figure 2-28 will appear.

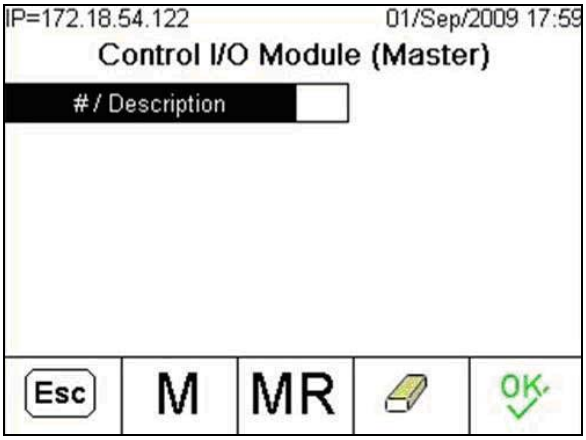

Figure 2-28: Control I/O Module Screen

Enter a Control I/O Module number in the **# / Description** field. If the module number is already assigned, the values for that module will appear in fields on the screen. If the number has **not** been assigned, **Description** and **Equipment Type** fields will appear. Once a selection is made in the **Equipment Type** drop-down, a variety of other fields appear on the screen.

Table 2-3 describes the options available for each field in these screens.

Table 2-3: Elements of the Control I/O Module Configuration Screen

Field	Description
# / Description	1-297 Enter the number of an existing Control I/O Module, or define a new one. When the Description field is selected, the softkeys become alphanumeric entry keys.
Type	Scale, Flow Meter, Hand Add This selection determines the type of module you wish to configure.
Fast Feed Type [If Type ≠ Hand Add]	Concurrent, Independent, None **None**: Only fine feed is used **Independent**: Fast and fine feeds are used sequentially, and independent of one another **Concurrent**: Fast and fine feeds are used simultaneously, until near the end of the feed when fast feed is turned off, and fine feed continues till cut-off.
Fast Feed FCE Out [If Type = Flow Meter and Fast Feed Type ≠ None]	0.0.0 Sets the address for the fast feed discrete output to be controlled using this output. This will only be visable/configurable if you choose independent or concurrent fast feed type above.

Field		Description
Fine Feed FCE Source [If Source = Scale]		Other I/O, Scale Board Determines the source of the Fine Feed control element that controls the Fine Feed.
Enable Manual Weigh [If Type = Flow Meter]		0.0.0 Sets an address for the discrete input used to enable manual weighing.
Fine Feed FCE Out [If Type = Scale]		0.0.0 Sets a discrete output address to be used by the fine feed device to be controlled.
GIW / LIW Selector Out [If Type = Scale and Fine Feed FCE Source = Scale Board]		0.0.0 Sets a discrete output address for the Gain/Loss In Weight selector. If the Scale Board is selected as the Fine Feed FCE Source, then this output is used to route the fine feed of material into (GIW) or out of (LIW) of a scale
Hand Add Ack.In [If Type = Hand Add]		0.0.0 Sets a discrete input address for the device used by the operator to acknowledge manual addition of material.
Esc	ESCAPE	Exits the menu and returns to the setup tree.
M	Memory	Saves the currently displayed values to memory.
MR	Memory Recall	Populates fields for new or existing module with factory defaults (if no custom configuration has been performed) or with values most recently saved to memory (if custom configuration has been performed).
	DELETE	Deletes the selected record.
	OK	Confirms the entry and returns to the menu tree.

As you complete the fields on this screen, it will resemble Figure 2-29.

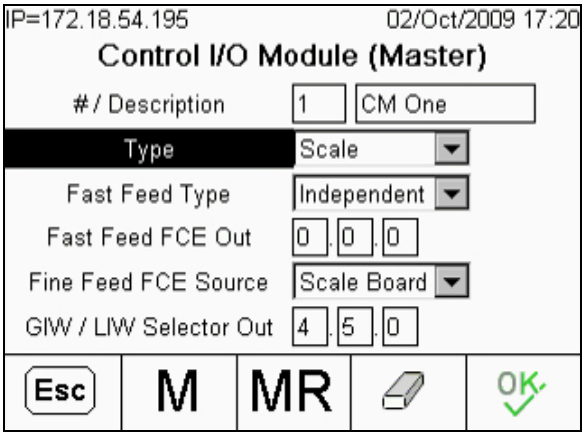

Figure 2-29: Control I/O Module Screen, Parameters Set

Equipment Channel Module (Master)

To access the Equipment Channel Module screen, expand the Q.i Configuration branch of the setup menu and select the appropriate node (Figure 2-30).

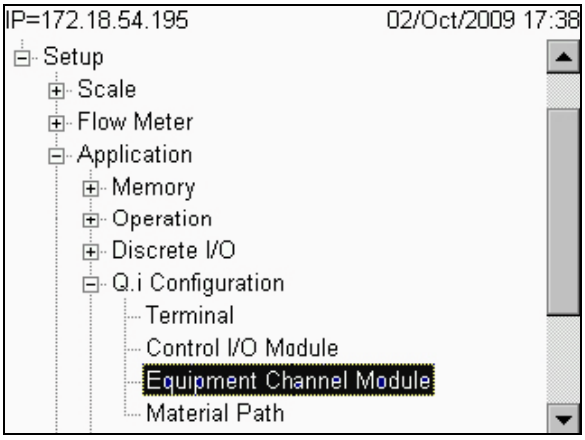

Figure 2-30: Setup Menu, Equipment Channel Module Branch Selected

Press ENTER to open the Equipment Channel Module configuration screen (Figure 2-31).

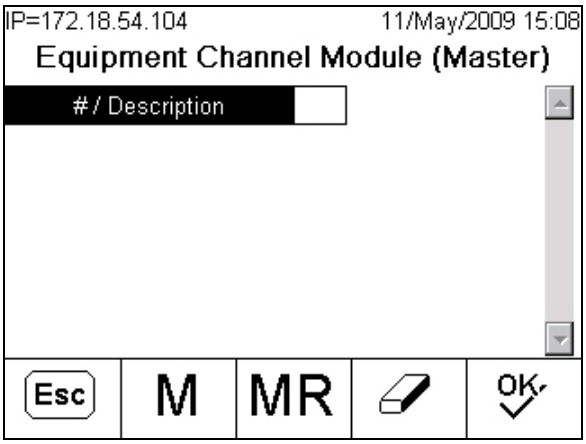

Figure 2-31: Equipment Channel Module, Default View

Enter an Equipment Channel Module number in the **# / Description** field. If the module number is already assigned, the values for that module will appear in fields on the screen. If the number has **not** been assigned, **Description** and **Equipment Type** fields will appear, as in Figure 2-32. In this figure, the **Description** field is selected, and the softkey alphanumeric entry fields are displayed at the bottom of the screen.

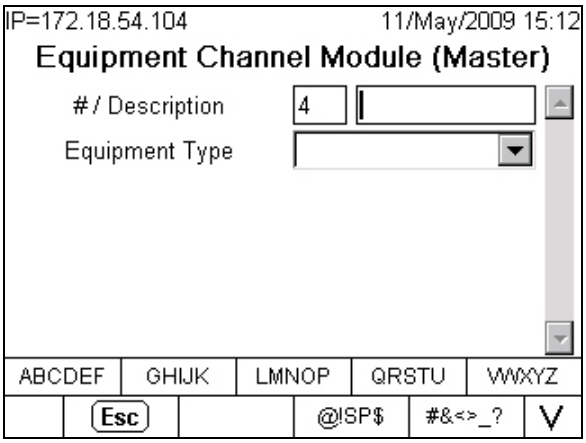

Figure 2-32: Creating a New Equipment Channel Module

Once a selection is made in the **Equipment Type** drop-down, a variety of other fields appear on the screen (Figure 2-33). The display of fields depends on the type of equipment selected. Note the scroll bars at right, indicating additional fields that can be accessed by scrolling down

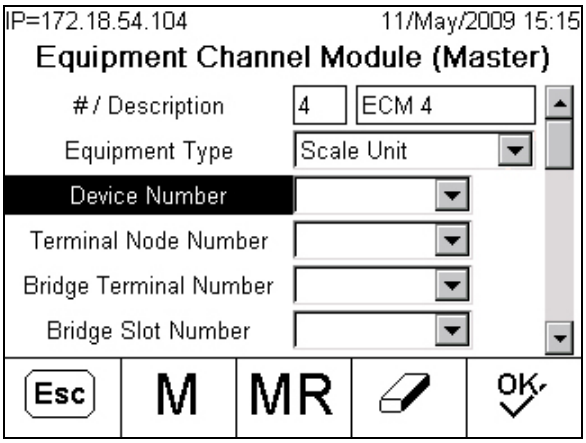

Figure 2-33: Equipment Channel Module, Page1, Scale Unit Selected as Type

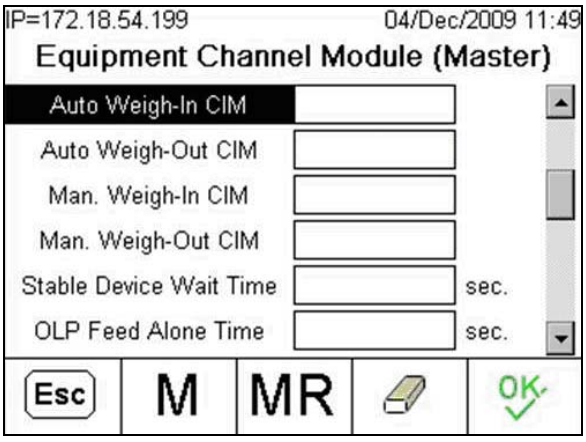

Figure 2-34: Equipment Channel Module, Page 2

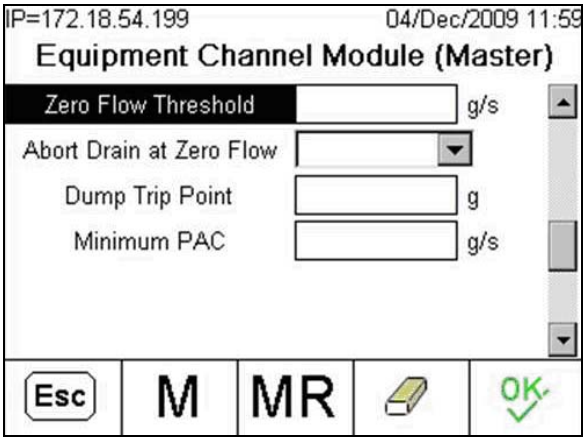

Figure 2-35: Equipment Channel Module, Page 3

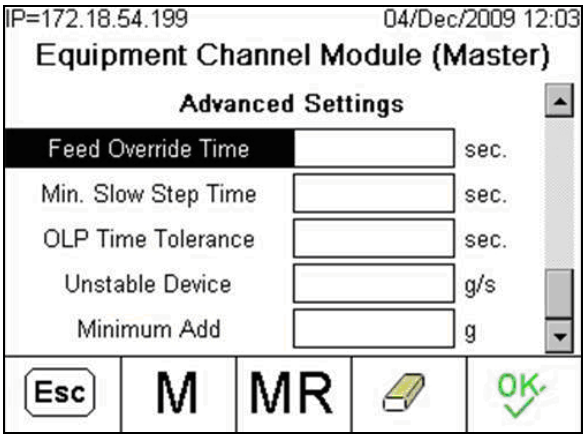

Figure 2-36: Equipment Channel Module, Page 4

Table 2-4 describes the options available for each field in these screens.

Table 2-4: Elements of the Control I/O Module Configuration Screen

Field	Description
# / Description	1-198 Enter the number of an existing Equipment Channel Module, or define a new one. When the Description field is selected, the soft keys become alphanumeric entry keys.
Equipment Type	Scale Unit, Storage Scale, Flow Meter This selection determines the type of module you wish to configure
Device Number	1 – 4 or 1-12 Choose 1-4 for Scale Unit and Storage Scale. Choose 1-12 for Flow Meter
Terminal Node Number	1-20 Identify which terminal corresponds to this Equipment Channel Module number/description
Bridge Terminal Number	1-20 Identify which bridge terminal corresponds to this Equipment Channel Module number/description
Bridge Slot Number	1-24 or 1-12 Identify 1-24 for Classic Communications Mode Identify 1-12 for Enhanced Communications Mode
Auto Weigh-In CIM [Only if Equipment Type = Scale Unit]	1-297 The number of the Control I/O Module assigned to automatically control the flow of material into the scale unit
Auto Weigh-Out CIM	1-297 The number of the Control I/O Module assigned to automatically control the flow of material out of the scale unit
Man. Weigh-In CIM [Only if Equipment Type = Scale Unit]	1-297 The number of the Control I/O Module assigned to manually control the flow of material into the scale unit
Man. Weigh-Out CIM	1-297 The number of the Control I/O Module assigned to manually control the flow of material out of the scale unit
Stable Device Weight Time [Only if Equipment Type = Scale Unit or Flow Meter]	Seconds Sets the amount of time, in seconds, that the device will wait for a stable weight value
OLP Feed Alone Time [Only if Equipment Type = Scale Unit]	Seconds Time that primary overlapping feed is feeding alone, without **any** secondary feeds
Zero Flow Threshold	Units/second Flow rate below which the system assumes zero flow

Field	Description
Abort Drain at Zero Flow	Enabled or Disabled Enable this feature to stop the drain when the system detects zero flow
Dump Trip Point [Only if Equipment Type = Scale Unit]	Units The level that the PAC process starts the drain timer in a dump-to-empty operation
Minimum PAC [Only if Equipment Type = Scale Unit] or Flow Meter	Units/second Sets the flow rate above which the PAC process begins to apply the Predictive Adaptive Control algorithm
Advanced Settings	
Feed Override Time	Seconds The time before the completion of a material transfer when the PAC process inhibits the external logic from removing the permissive on the enabling logic for the final control element (FCE).
Min Slow Step Time	Seconds The timeout value for the material transfer
OLP Time Tolerance	Seconds The additional time tolerance allowed for a primary overlapping feed to complete
Unstable Device	Units/Second The flow rate threshold below which the PAC process generates a "noisy measuring device" condition while waiting for a stable scale reading for the "Stable Device Wait Time"
Minimum Add	Units The smallest amount of material that the system can attempt to transfer with this Equipment Channel Module

These screens display five softkeys, which function as follows:

Esc	ESCAPE	Exits the menu and returns to the setup tree.
M	Memory	Saves the currently displayed values to memory.
MR	Memory Recall	Populates fields for new or existing module with factory defaults (if no custom configuration has been performed) or with values most recently saved to memory (if custom configuration has been performed).
	DELETE	Deletes the selected record.
OK	OK	Confirms the entry and returns to the menu tree.

Material Path (Master)

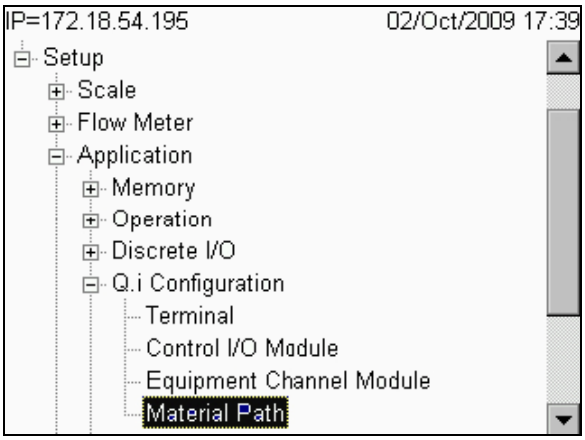

Figure 2-37: Setup Menu, Material Path Branch Selected

The Material Path screen allows a logical feed structure to be assembled, using the equipment channel modules and control I/O modules configured in the previous sections of the Q.i configuration branch of setup.

Figure 2-38 through Figure 2-41 show the four views of the Material Path (Master) configuration screen. The views show the factory default settings that can be obtained by selecting the MR soft key (unless you have previously saved over the factory default settings. If the number of an existing Material Path is entered in the # screen, the Description and various parameter values for that path appear in the remaining fields. If the number entered is not already an existing Material Path, then the cursor will mover to the Description field and allow you to proceed. Note the scroll bars at right, indicating additional fields that can be accessed by scrolling down.

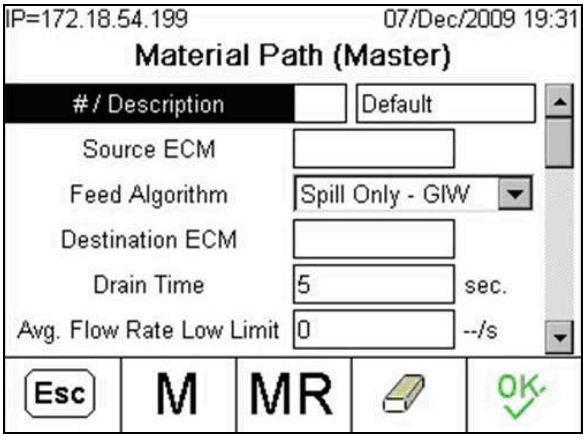

Figure 2-38: Material Path Configuration Screen 1, Basic Settings

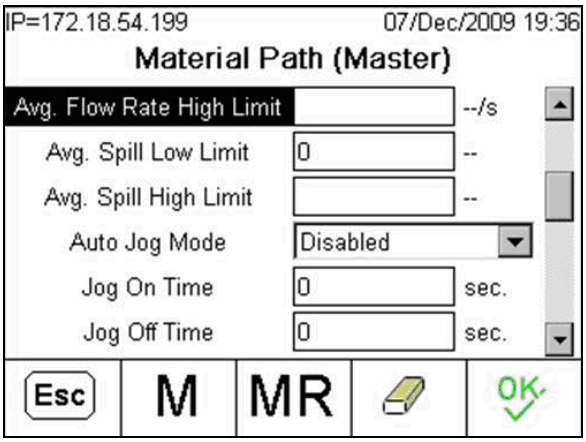

Figure 2-39: Material Path Configuration Screen 2, Basic Settings

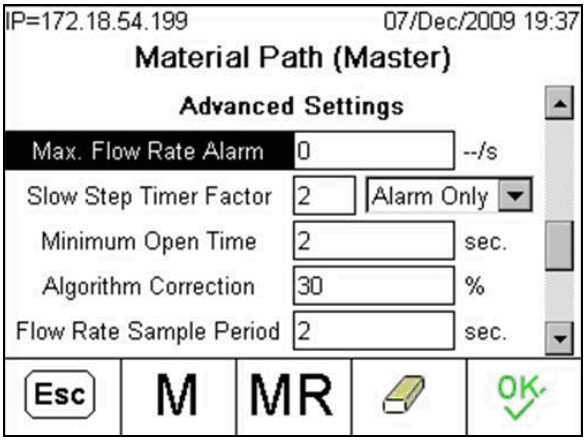

Figure 2-40: Material Path Configuration Screen 3, Advanced Settings

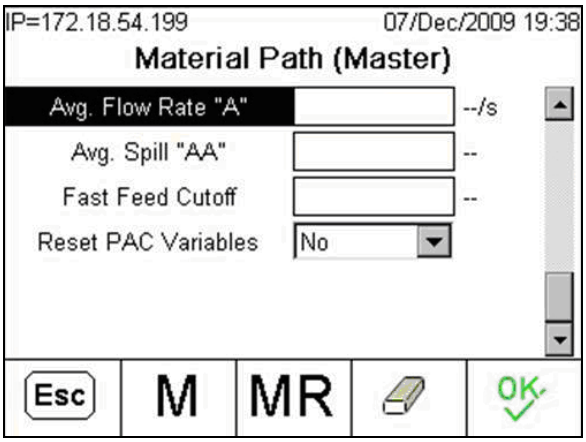

Figure 2-41: Material Path Configuration Screen 4, Advanced Settings

Table 2-5 describes the options available for each field in these screens.

Table 2-5: Elements of the Material Path Configuration Screen

Field	Description
# / Description	1-999 Enter the number of an existing Material Path, or define a new one. When the Description field is selected, the softkeys become alphanumeric entry keys. The description can be a maximum of 40 characters
Source ECM	1-198 Specifies, by number, the Equipment Channel Module to be used with this Material Path as the source measuring device, scale or flow meter..
Feed Algorithm	Spill Only GIW, Spill Only - LIW, K1 Feed - GIW, K1 Feed - LIW, K2 Feed - GIW, K2 Feed - LIW, Dump to Empty, Hand Add Selects the algorithm to use for this Material Path, depending on the function the path will perform.
Destination ECM	1-198 Specifies, by number, the Equipment Channel Module to be used with this Material Path as the destination measuring device, scale or flow meter.
Drain Time	Seconds Sets the time in seconds that the system will wait for a material to drain into or from a vessel after the PAC process has cutoff the feed and before it tests the material delivery tolerance
Avg. Flow Rate Low Limit	Units/Second Rate, in primary weight units per second, that defines the lowest acceptable average flow weight for the material.
Avg. Flow Rate High Limit	Units/Second Rate, in primary weight units per second, that defines the highest acceptable average flow weight for the material.
Avg. Spill Low Limit	Units Sets the alarm limit for the minimum acceptable Average Spill
Avg. Spill High Limit	Units Sets the alarm limit for the maximum acceptable Average Spill
Auto Jog Mode	Disabled, Jog to Tolerance, Jog to Target Selects the mode that controls the Auto Jog operation
Jog On Time	Tenths of Seconds Time that the feeder is ON during a jog cycle
Jog Off Time	Tenths of Seconds Time, that the feeder is OFF during a jog cycle

Field	Description
Advanced Settings	
Max Flow Rate Alarm	Units/Second Sets the flow rate at which the PAC process terminates the feed and sets an alarm. Setting this value at 0 will disable this alarm
Slow Step Timer Factor	Tenths of Seconds, Alarm Only, Alarm and Abort Sets the Slow Step Timer calculation. For automatic feeds, the Slow Step Timer is the Factor *Target/Average Flow. The Slow Step Timer measures when a material transfer is taking too long and aborts the process when the material transfer exceeds the timer value. Typical factor values are 1.5-2.0. For hand add feeds, the Slow Step Timer is a Factor * 60 seconds.
Minimum Open Time	Seconds Time in which the PAC process does NOT apply spill compensation immediately following the start of a feed. It allows the material flow to come up to speed before beginning to apply the PAC process. A feed must be active for this length of time before the PAC process considers it successful and automatically updates the PAC parameters
Algorithm Correction	Percent The PAC process uses this value in calculating the Average Flow Rate and Average Spill to control how quickly the system responds to a change in operating conditions. The range is usually 10% - 40% in material transfer processes that change slowly or infrequently. Use values from 70% to 90% fir processes that change quickly or frenquently.
Flow Rate Sample Period	1-60 Seconds Specifies the time over which the Flow Rate is calculated. Smaller values allow the PAC process 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.
Avg. Flow Rate "A"	Units/Second This displays the average flow rate at cutoff. As an option, you may elect to use this field initially for setting new seed values for the PAC process.
Avg. Spill "AA"	Units This displays the average spill at cutoff. As an option, you may elect to use this field initially for setting new seed values for the PAC process.
Fast Feed Cutoff	Units In a two-speed feed, the Fast Feed Cutoff is the weight at which Qi terminates the fast feed and begins the slow feed. The fast feed cutoff weight must be large enough value to allow the PAC algorithm to have time to adjust the spill before ending of the feed. Typically, (the fast feed cutoff weight / the average slow feed flow rate) must be six seconds or more. In the two-speed feed, the min open time is the time it takes to switch over from the fast feed to the slow feed rate calculation, typically, two seconds or more.

Field	Description
Reset PAC Variables	No, Yes Reset PAC Variables resets the Qi algorithm runtime variables to zero in the Q.i algorithm tables (not the Average Flow Rate "A" and the Average Spill "AA").

The five softkeys visible in these screens function as follows:

Esc	ESCAPE	Exits the menu and returns to the setup tree.
M	Memory	Saves the currently displayed values to memory.
MR	Memory Recall	Populates fields for new or existing module with factory defaults (if no custom configuration has been performed) or with values most recently saved to memory (if custom configuration has been performed).
	DELETE	Deletes the selected record.
OK	OK	Confirms the entry and returns to the menu tree.

PLC Configuration

For the configuration of an installed PLC option board, please refer to the **IND780 Technical Manual**, Chapter 3, **Configuration** and Appendix E **Communications**, of the **IND780 Q.iMPACT Technical Manual**.

Note that, while Allen-Bradley RIO and DeviceNet options are available, due to their restricted message size they do not provide true fieldbus integration capability.

ControlNet, Ethernet/IP and PROFIBUS all provide full fieldbus integration. The only Q.i-specific setting that must be configured for these PLC/DCS interfaces is the selection of Classic or Enhanced mode, in Setup at **Application > Q.i Configuration > Terminal** (Figure 2-42).

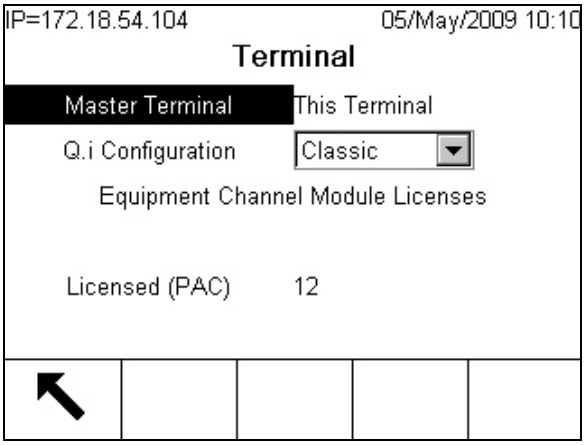

Figure 2-42: Q.i Terminal Configuration – Classic/Enhanced

Operation

The IND780 Q.i terminal is a material transfer controller engineered to function as an integrated part of your control system. There are two basic ways to operate an IND780 Q.i terminal:

- Control the operation of the Q.i terminal from your PLC or DCS system
- Control the operation of the Q.i terminal from an internal TaskExpert program

These two options make it possible to take advantage of the powerful Predictive Adaptive Control (PAC) algorithms, regardless of the size and complexity of the material transfer system.

PAC Web Pages

Overview

The figures in the following sections show web pages from the web server embedded in the IND780. These pages are available only when the Q.i application is active in the IND780 terminal. For all other standard IND780 Web Page descriptions, please refer to the External Diagnostics section of the **IND780 Technical Manual**.

Specify the IP address (for example, http://172.18.55.136) of the IND780 Q.iMPACT terminal in your URL browser window and press ENTER to connect. Make sure the Q.iMPACT terminal has a unique IP address. Once the IP address of the IND780 Q.i terminal is entered in the web browser, the IND780 index page will appear (Figure 2-43). Select PAC from the View menu – the selection will be highlighted in green, as shown in the example below.

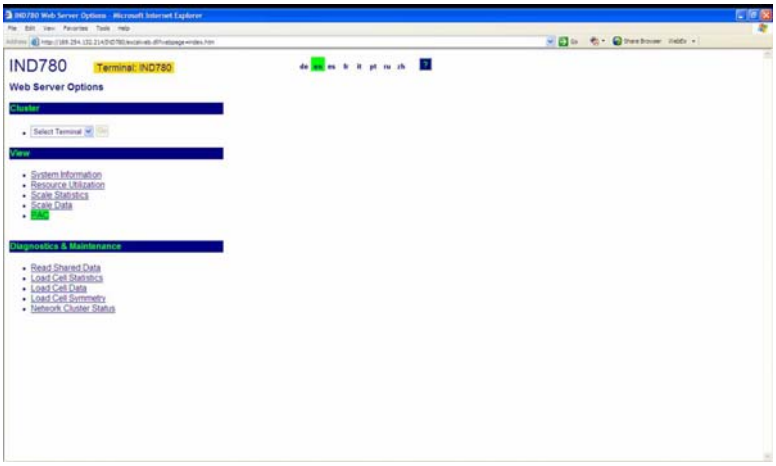

Figure 2-43: IND780 Web Server, Index Page

PAC Parameters

The first option under the PAC selection (Figure 2-44) is called PAC Parameters.

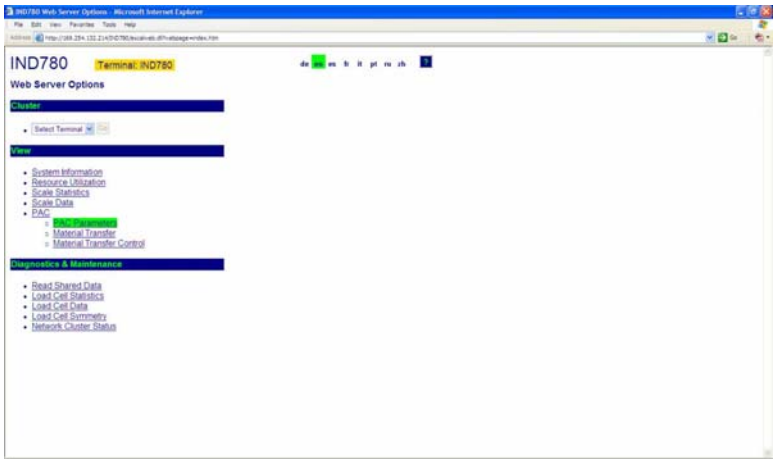

Figure 2-44: PAC View Options

Click on PAC Parameters to open the screen shown in Figure 2-45.

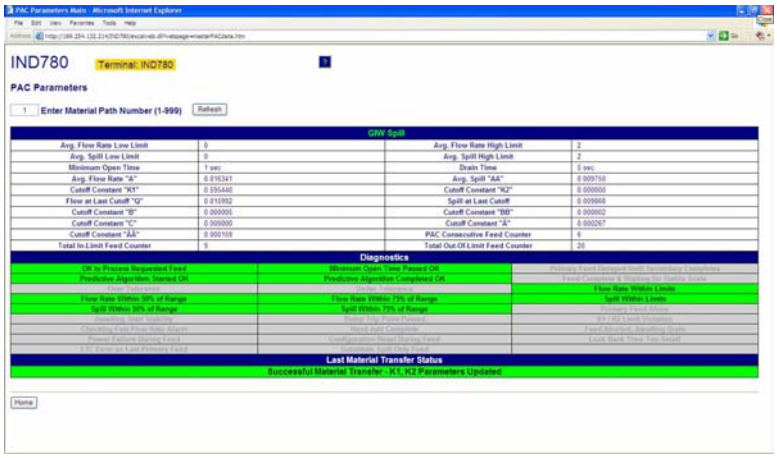

Figure 2-45: PAC Parameters

The PAC Parameters page is separated into three sections:

- Top section: Displays configured parameters and calculated values associated with the specific material path entered in the control field at the top left of the page. Only configured material paths will appear when entered. To enter a new material path, please use the Q.i Configuration Tool, or access the IND780 setup menu from the terminal's front panel interface.

- Diagnostics: A diagnostics summary of the material transfer process. It identifies parameters and values that are within programmed tolerances, and those that are outside of programmed tolerances.

- Last Material Transfer Status: Shows an update of the last material transfer, indicating whether it was successful (i.e., was within the

acceptable limits and tolerances) and whether the PAC parameters updated as a result of this successful material transfer.

Please note that this page is for updated parameter and feed algorithm information only. Please use the Q.i Configuration Tool or the IND780 setup menu for modification or configuration. The only user-modifiable field on this Web Page is the selection of the Material Path number to view. Click on the Refresh button, immediately to the right of the Material Path selection box, to update the values. Click on the Home button at bottom left to return to the index page.

Material Transfer View

The next Q.iMPACT web page option is the Material Transfer view (Figure 2-46). In the field at top left, enter the Equipment Channel Module (Scale, Flow Meter or Storage Scale) to view. Like the PAC Parameters page, the Material Transfer page displays status and results for the selected Equipment Channel Module (ECM). Access the Material Transfer Control view (Figure 2-47) by clicking the button to the right of the ECM entry field, or return to the Index view by clicking the Home button at bottom left.

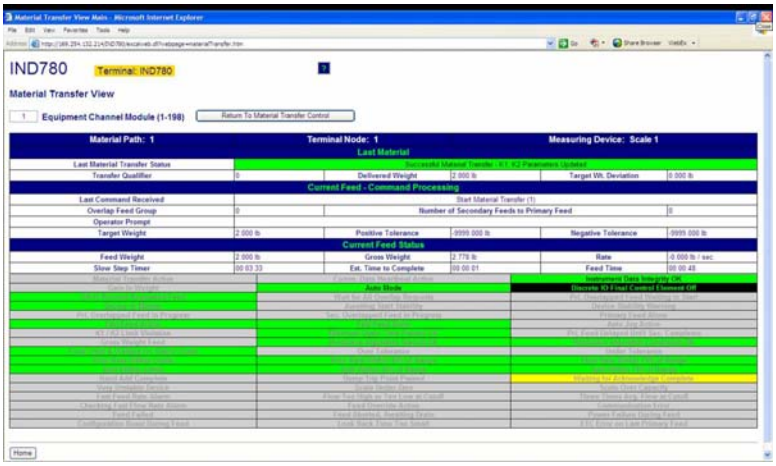

Figure 2-46: Material Transfer View

Material Transfer Control

The final web page unique to the Q.i application on the IND780 Terminal is the Material Transfer Control view (Figure 2-47).

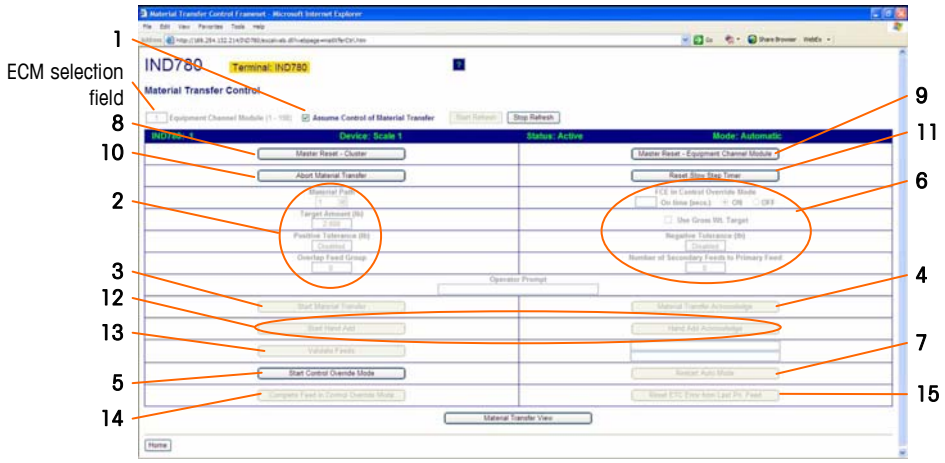

Figure 2-47: Material Transfer Control

Material Transfer Check, Automatic Mode

Figure 2-47 shows the system in Automatic Mode. This view is particularly useful during startup and commissioning. From here, it is possible to perform a material transfer independent of the host PLC or DCS control system. All the necessary parameters can be entered and the transfer started.

- The host PLC or DCS control system will normally have an interlock in series with the IND780 Q.i final control element (FCE). In order to perform a material transfer from this view, this associated output in the host PLC or DCS system probably will have to be turned on.

Enter the Equipment Channel Module (ECM) number for the material transfer. The ECM can be a Scale, a Flow Meter or Storage Scale. Next, check the **Assume Control of Material Transfer** box (# 1, in Figure 2-47). Enter the desired Material Path, target amount and, optionally, the tolerances (2).

Once the minimum amount of parameters necessary for a material transfer have been entered, the **Start Material Transfer** button (3) will become active. Click on this button to start the transfer.

When a material transfer is completed successfully, the **Material Transfer Acknowledge** button (4) will become active. This button must be clicked in order to complete the process.

Material Transfer Check, Manual Mode

When **Start Control Override Mode** (5) is selected, it is possible to perform a material transfer in manual mode. The Equipment Channel Module Final Control Element (FCE) can be turned on for a preset number of minutes – enter the desired value in the control field and then select ON (6). No Material Acknowledge commands are required during or after this process, and it can be repeated as desired. The **Material Transfer Acknowledge** button (4 must be clicked in order to complete the process.

It is advisable to return the controller to the Auto mode (7) upon completion.

- The state of the buttons corresponds to the state of the material transfer. If either **Material Transfer Acknowledge** or **Hand Add Acknowledge** fields are active (not grayed out), they must be clicked before continuing.

Further elements of the Material Transfer Control page

#	Label	Function
8	Master Reset - Cluster	Use to recover from errors and inconsistencies – stops any active feeds and resets all Equipment Channels to automatic/ready mode. Does **not** re-set configured parameters for channels in the cluster.
9	Master Reset - Equipment Channel Module	Same as **Master Reset - Cluster**, but only affects currently selected ECM.
10	Abort Material Transfer	Stops current material transfer.
11	Reset Slow Step Timer	Refer to the Equipment Channel Module and Material Path sections earlier in this chapter.
12	Start Hand Add Hand Add Acknowledge	**Start Hand Add** button is available in Control Override (manual) Mode. Once hand-addition of material is complete, it must be acknowledged clicking the **Hand Add Acknowledge** button.
13	Validate Feeds	Used only during system validation. Crosschecks the accuracy of Flow Meters with a Scale. The Flow meters must feed into the scale which is doing the validating.
14	Complete Feed in Control Override Mode	When an automatic feed is aborted, click this button to complete the feed in Control Override (manual) mode.
15	Reset ETC Error from Last Pri. Feed	When a primary feed exceeds the Estimated Time to Complete (ETC), click this button to clear the error.

Chapter 3.0

Service and Maintenance

This chapter contains information to assist in troubleshooting, and in interpreting error codes and messages that may appear on the IND780 Q.i terminal's screen and in its Error and Maintenance logs.

Troubleshooting

Power-Up State

When power is applied to the IND780 Q.iMPACT, or when power is cycled, unless otherwise configured (e.g., in PLC/DCS setup) the system starts in **automatic feed** and **classic communication** mode.

Error Log File and Error Code Structure

The IND780 error log can be viewed in setup at **Maintenance > Configure > Error Log**. The IND780 Error Log is Enabled by default. For further details about this log file, refer to Appendix C, **Table and Log File Structure**, in the **IND780 Technical Manual**.

Table 3-1 uses a typical record to show the structure of the Error Log file. The commas used to separate fields are not shown in this example.

Table 3-1: Error Log File Record Structure

Timestamp	Severity	Source	Error Code	Message
2006/08/29 08:35:57	E	A	0018	COMMUNICATION_TIMEOUT

Severity

Table 3-2 explains the Severity codes used in a log entry. These codes do not appear in the Error Log Search View.

Table 3-2: Error Log File Record Structure

Severity Code	Explanation
F	**Fatal error** requiring system halt. On detection, an "F" error will immediately initiate a flush of the memory buffers to their associated log files.

Severity Code	Explanation
C	**Critical error** signaling a serious condition that will affect overall performance or functionality of the system. An example would be loss of an option card.
E	**Error** that in general is recoverable, or which the system is able to handle. Note: It is likely that a persistent error condition may result in a critical error.
I	**Message** that is intended to provide information to help service personnel resolve issues.

Critical errors (F, C) generate a message box that must be dismissed by pressing ENTER. The message indicates corrective action that must be taken to restore the Terminal to normal operation. Non-critical errors (E, I) are displayed, typically for 10 seconds, in the System Line at the top of the home screen. Some errors stay on the System Line for 3-5 seconds and then reappear periodically if the error is not resolved – for example, POWERCELL No Response errors. The System Line View settings do not affect the display of these errors.

Source

Error sources by device type are detailed in Table 3-3, together with their formats – refer to the following section.

Table 3-3: Error Log Source and Format, by Device Type

Source Code	Device Type	Format
A	Measurement Adapter (scale, flow meter, temperature)	PCCx
C	COM port Adapter	xxxx
D	Discrete I/O Adapter	Cxxx
E	Main CPU / Baseboard	xxxx
F	Template errors	xxxx
H	HMI (display, keypad, keyboard) Adapter	xxxx
I	Interpreter (Task Expert)	xxxx
N	Network Adapter (Ethernet, USB, PLC)	xxxx
P	PLC or PC – a network partner	xxxx
S	Shared Data	xxxx
T	Terminal – a network partner	xxxx
U	Application software	xxxx

Format of Error Code

Error codes are device-specific, and each code is associated with an explanatory message. Error codes are constructed as follows:

X	X	X	X
If more than one instance is possible, the first digit identifies it.	If there is more than one instance, and it has 'children', these two digits identify the child, in hexadecimal notation.		Error number. Corresponds to the Message that appears in the Error Log and the System Message Line.
Example			
2xxx = Scale Channel 2	x**03**x = error affecting load cell at address 3		xxx**8** = no response from POWERCELL

Thus, an error code will have one of the following configurations:

xxxx One instance, all digits represent the error

Pxxx Multiple instances; first digit (**P**) represents instance to which the error applies

PCCx Multiple instances with subordinate items; first digit (**P**) represents the parent instance, next two digits (**CC**) identify the child

Interpretation of Errors

The error message only gives a general indication of source, so to interpret errors arising from sources with multiple instances it is useful to know the structure of the four-digit code. In the example used above – **2038** – the error message displayed in the system message line and recorded in the error log would be

POWER_CELL_NO_RESPONSE

The code comprises a parent (the scale channel or network of POWERCELLS), a 2-digit child (the specific POWERCELL affected) and an error number, but only the information from the final digit is reflected in the error message. The error log, however, will include all four digits. Thus, the structure of the code (Table 3-3) allows the channel and cell affected to be determined.

Q.i-Specific Errors

Table 3-4 lists error messages specific to the Q.i 780 system. The terminal puts these messages in the System Line of the Operator Display and saves them in the error log.

Table 3-4: Q.iMPACT Error Messages

Error Message	Source	Description	Probable Cause/s	Remedy
CALIBRATION_ERROR	A	The flow meter driver detected a problem with the flow meter calibration parameters.	One likely cause is that the increment size is too small for the number of counts per weight unit (or K-factor) of the flow meter device. The Flow Meter must have at least one count per weight increment.	Increase the increment size in flow meter calibration.

Error Message	Source	Description	Probable Cause/s	Remedy
FLOW_METER_RESPONSE_ERROR	A	The flow meter driver detected an error in accessing a flow meter board.	The flow meter configured in the CP Setup is not responding; it probably does not exist.	Correct error in flow meter setup.
NETWORK_ERROR	N	Qi has detected a problem communicating between Q.i terminals in Ethernet cluster network.	An Ethernet network problem.	Check Ethernet network connections and wiring.
			A problem with the network node setup.	Check the node setup definition in the Qi tables and the CP Setup.
BATCH_LOCAL_TABLES_NOT_UPDATED	U	Upon power up or reset, each Qi terminal attempts to refresh its tables from the Master terminal. This error alerts the operator that this operation failed.	Too much Ethernet cluster network traffic.	Cycle power at the failed Qi terminal.
MULTIPLE_BATCH_MASTER_TERMINALS	U	More than one terminal is configured as the Qi master terminal.		Correct the setup.
PLC_NOT_COMMUNICATING	P	The IND780 terminal is not communicating with the Host PLC.	Problem with physical connection between the Qi bridge terminal and the PLC	Check the physical wiring and connections.
			Problem with communications definition at the Qi bridge terminal or the PLC.	Check the definition of the communications at the IND780 and the PLC.
ECM_CONFIG_ERROR	U	Error in the ECM configuration. Message contains the ECM number.		Correct the identified entry in the ECM table.
ECM_SCALE_ERROR				
ECM_FLOW_METER_ERROR				
ECM_VESSEL_CONFIG_ERROR	U	Error in configuring a scale vessel in the ECM configuration. Message contains the ECM number.		Correct the identified entry in the ECM table.
ECM_UNSTABLE_SCALE	U	Qi has aborted a feed attempt because the scale remained unstable after the feed completed. Message contains the ECM number.	Problem with the hardware operation, such as a leaky valve.	Check valves and piping.
ECM_OVERLAP_FEED_ERROR	U	Qi has aborted a feed attempt because it detected in an error in an overlapping feed request. Message contains the ECM number.	Incorrect Material Path definition.	Check Material Path table definition.
ECM_HIGH_FLOW_RATE_ERROR	U	Qi has aborted a feed attempt because the Qi detected a feed that was flowing too fast. Message contains the ECM number.	Problem with the hardware operation.	Check valves and piping.
ECM_COMMUNICATION_ERROR	U	Qi has aborted a feed attempt because Qi detected an error communicating between terminals. Message contains the ECM number.	Ethernet network problem.	Check Ethernet network connections and wiring.
ECM_INSTRUMENT_ERROR	U	Qi has aborted a feed attempt because Qi detected a scale or flow meter error. Message contains the ECM number.	Operational problem with a scale or flow meter device.	Check the hardware instrument.
ECM_VESSEL_CAPACITY_ERROR	U	Qi has aborted a feed attempt because the feed would exceed the capacity of the vessel. Message contains the ECM number.	Too much material already in the vessel.	Drain some material from the vessel. Run a smaller feed.

Error Message	Source	Description	Probable Cause/s	Remedy
ECM_TRANSFER_ABORTED_ERROR	U	Qi has aborted a feed attempt because the operator aborted the feed. Message contains the ECM number.	Operator aborted the feed.	
ECM_SLOW_STEP_TIMER_ERROR	U	Qi has aborted a feed attempt because the feed was taking too long. Message contains the ECM number.	Not enough material in the source vessel to complete the feed.	Check material quantity in the source vessel.
			Problem with the hardware operation or the instrument.	Check valves, piping, and instruments.
ECM_START_FAILED_UNSTABLE_DEVICE	U	Qi did not start a feed attempt because the scale was unstable before the feed started. Message contains the ECM number.	Problem with the hardware operation, such as a leaky valve.	Check valves and piping.

Maintenance Log File Structure

The IND780 maintenance log can be viewed in setup at **Maintenance > Configure > Maintenance Log**. For further details about this log file, refer to Appendix C, **Table and Log File Structure**, in the **IND780 Technical Manual**.

The IND780 Maintenance Log is Disabled by default. To enable the log, and start recording maintenance event codes for each attached scale, access **Maintenance > Configure > Error Log** (Figure 3-1).

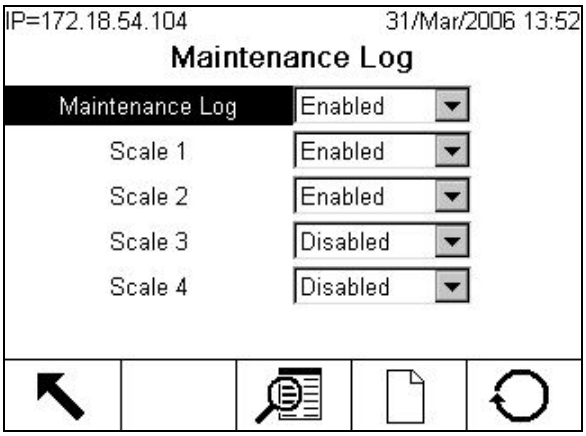

Figure 3-1: Maintenance Log Configuration Screen

The Maintenance Log file is available as a comma-delimited file that can be exported to the InSite program or any FTP client PC. Table 3-5 shows the structure of a maintenance log record, together with an example record showing that Zero Calibration has been performed successfully. The commas used to separate fields are not shown in this example.

Table 3-5: Maintenance Log File Record Structure.

Timestamp	Username	Channel	Cell	Event Code	Status
2006/02/16 11:48:52	System	01	027	02	SUCCESS

The value in the Channel column refers to the source of the maintenance log information. Sources include scales and option boards. Cell refers to the load cell for which the log entry is generated; if the channel does not represent a cell, the value is left blank.

Table 3-6 lists all maintenance event and status codes the IND780 terminal may display.

Table 3-6: Maintenance Log Events and Status Codes

Device	Event	Description	Status Code(s)
Scale	1	Calibration test failed	STEP # 1-N
Scale	2	Zero Calibration	1=SUCCESS; 0=FAILED; 2=MOTION
Scale	3	Span Calibration	1=SUCCESS; 0=FAILED; 2=MOTION
Scale	4	CALFree Calibration	1=SUCCESS; 0=FAILED
Scale	5	POWERCELL Shift Adjust	1=SUCCESS; 0=FAILED
Cell	6	POWERCELL (re)addressed	1=SUCCESS; 0=FAILED
Terminal	7	File Defragmentation	1=SUCCESS
Terminal	8	Log File FTP export	1=Maintenance, 2=Change, 3=Error, 4=Alibi
Terminal	9	Shared Data Setup FTP export	1=Flash, 2=BRAM, 3=MEEPROM, 4=Cal Test Base File Name + scale instance
Terminal	10	Metrology switch / electronic seal broken	1=SUCCESS
Scale	11	Calibration Expiration *	1=DAYS, 2=WEIGHOPS
Scale	12	Run flat operation manual start	SUCCESS
Scale	13	Run flat operation stopped	SUCCESS
Scale	14	Run flat operation autostart *	SUCCESS
Varies	15	Option Component Added	Manually-entered text
Varies	16	Option Component Removed	Manually-entered text
Varies	17	Option Component Replaced	Manually-entered text
Terminal	18	Log Initialized	MAINT, CHANGE, ERROR, ALIBI
Scale	19	Cal Edit Manual	SUCCESS
Scale	20	Shift Edit Manual	SUCCESS
Terminal	21	Date & Time Set	SUCCESS
Varies	22	Table Exported	A0, A2,.....A9
Varies	23	Calibration Test Passed	SUCCESS
Varies	24	Table Imported	A0, A2.....A9
Terminal	25	Replace Battery	Manually-entered text
Scale	26	Monitor Scale Overload	Overload weight, in cell counts
Scale	27	Monitor Weighment	Weight
Scale	28	Monitor Successful Zero Command	None

Device	Event	Description	Status Code(s)
Scale	29	Monitor Zero Failure	None
Scale, Cell	30	Monitor Cell Overload	None
Scale, Cell	31	Monitor Zero Drift Success	Current cell zero
Scale, Cell	32	Monitor Zero Drift Failure	Current cell zero
Scale, Cell	34	Monitor Symmetry Drift Failure	Deviation
Scale, Cell	35	Monitor Symmetry Comm Success	None
Scale, Cell	36	Monitor Symmetry Comm Failure	None
Scale, Cell	37	Monitor Symmetry Check Success	None
Scale	39	Monitor Cal Complete	Calibration counter
Scale	40	Standard Calibration	1=SUCCESS, 0=FAILED, 2=MOTION
Scale,Cell	41	Monitor PDX Enclosure Break	None

* These are automatic operations logged by the IND780 terminal.

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