METTLER TOLEDO

IND780

Terminal

Shared Data Reference

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Introduction and Overview

The Shared Data (SD) Object is the central repository for all "system" data in the IND780. It is also the primary interface for sending commands and exchanging data between local or remote Applications and the IND780.

IND780 Shared Data Design

The Shared Data concept is a very powerful and flexible tool that provides mechanisms both for storing system data and for providing interfaces among Local Applications, Remote Applications, and the Resident Scale Task.

Shared Data Design Concepts

The following are some important Shared Data design concepts:

- Shared Data provides Local and Remote Applications very fast access to the permanently stored data. Shared Data access time is less than 350 microseconds.
- Local and Remote Applications access a Shared Data field using a six-character UNICODE name. Names provide consistency to Applications in accessing Shared Data fields in successive versions of Shared Data. The names for existing fields will remain the same even when new fields are added or when new physical storage locations are assigned to existing data.
- Shared Data supports "callbacks" that alert a task when a Shared Data field is updated or changes. An application can "Register a Callback Routine" for a particular Shared Data field. Then, when a task writes a new value to a Shared Data field that has a registered callback, Shared Data calls the registered callback routine.
- Shared Data supports both "native" and "string representation" access to data fields. However, Shared Data always stores the data fields in their native format. When an Application accesses a Shared Data field in its native data format, such as binary floating point or integer number representations, Shared Data simply copies the data between its storage and the application interface. When Applications access the Shared Data using a string data format, Shared Data automatically makes the data conversion between the native and the string data format.
- Shared Data provides access to an entire Shared Data block with a single read or write command. Applications can access the block of data in either native format or string format. When the application accesses the data in native format, Shared Data returns a "C-style structure" that matches the native format of the data. When the application accesses the data in string format, Shared Data converts each individual field to its string format, separating fields with a caret ('^').
- Shared Data provides access to a list of Shared Data fields. Applications can read a list of fields in either native format or string format. If the application accesses the data in native format, Shared Data returns a "C structure" that matches the native format of the data. If the application accesses the data in string format, Shared Data converts each individual field to its string format, separating each field with a caret ('^').
- Shared Data provides a checksum on each protected Shared Data field. It verifies the checksum on power-up and on each read access. It recalculates and stores the new checksum on each write access. When Shared Data detects a checksum failure, it reports a system failure.

Shared Data Name Structure

Each Share Data name contains three pieces of information -- the shared data class (group), instance and attribute (item). The name is constructed as follows:

sp = Class = Full Target Process Data

01 = Instance = Scale #1

06 = Attribute = Target Latching Type

Shared Data Storage Types

There are four types of IND780 Shared Data. The letters below are used throughout this document to identify the type of each variable:

D	Dynamic (Dynamic RAM) Shared Data
PP	Protected Process (BRAM) Shared Data
PS	Protected Setup (FLASH) Shared Data
PC	Protected Scale Calibration (EEPROM) Shared Data

Dynamic Shared Data

Dynamic Shared Data is process data that is created dynamically within the IND780. The terminal writes and reads these fields very frequently. The IND780 does not save this Shared Data across a power-failure, but re-initializes it to zero at power-up. The best example of Dynamic Shared Data is the Dynamic Scale Weight data (WT).

Protected Process Shared Data

Protected Process Shared Data is persistent data that may be written and read many times. However, in case of a power-failure the IND780 must save the data so the process can continue after power-up. The terminal writes this Shared Data to battery-backed RAM (BRAM) to save it across a power failure.

An example of Protected Process Shared Data is the state of a Material Transfer process, where you cannot afford to throw out an incomplete batch of material after a power-failure. The IND780 must save its state so the Material Transfer can continue after a power-up.

Writing BRAM Shared Data During Power-Down

A critical event occurs when the IND780 attempts to write to BRAM Shared Data just as the power goes down. The IND780 writes part of a Shared Data field successfully, and then power drops below a valid-power threshold before the IND780 can complete the write, causing a corrupted BRAM. Since writes to BRAM can occur frequently in a process control environment, it is probable that this will happen at some point when the terminal is running.

To protect against this potential problem, the IND780 does a two-stage write procedure whenever it writes to BRAM:

- The terminal first writes a write-in-progress flag, the new Shared Data field, its SD field index, and its checksum to a temporary location in BRAM. When this write is successfully completed, the IND780 then writes the SD field and its checksum to its actual location in BRAM. When this write is successfully completed, the terminal clears the write-in-progress flag.
- At power-up, the IND780 checks the write-in-progress flag. If it is set, the IND780 writes the original SD field from the temporary field and clears the write-in-progress field.

Protected Setup Shared Data

Protected Setup Shared Data is the persistent data that stores the unique configuration of the IND780. The IND780 Setup Procedure typically writes this data once during the Setup procedure and then never writes it again. Other processes may read it many times. The IND780 writes this Shared Data to Flash Memory to save it permanently across a power-failure.

Writing Flash Shared Data During Power-Down

A critical window occurs when the IND780 attempts to write to Flash Shared Data just as the power goes down, causing corrupted Flash Shared Data. The IND780 writes part of a Shared Data field successfully, and then power drops below a valid-power threshold before the IND780 can complete the write.

The IND780 writes to FLASH Shared Data using the Windows CE O/S FLASH File System. It is a multi-stage operation involving many writes to Flash to update the file system directory as well as the file. Writing to the Flash itself is relatively slow.

To reduce the likelihood of this corruption, the IND780 only writes to the Flash during Setup. **The IND780 never writes to Flash Shared Data during normal operation.** The time the IND780 spends in Setup is extremely small when compared to the time it spends in normal operation. Typically, the service technician sets up the IND780 once and never accesses Setup again.

To protect against the potential corruption problem, the IND780 does a multi-stage write procedure whenever it writes to FLASH:

- When the IND780 first writes the new Shared Data field data, it writes the SD field index and sets a write-in-progress flag to temporary locations in BRAM.
- After successfully completing this write, the IND780 then writes the SD field to its actual location in FLASH, in the FLASH.bin file.
- It records the change in the change history log file.
- After successfully completing the write to flash, the IND780 clears the write-in-progress flag. Upon exiting setup, the IND780 creates a backup copy of the FLASH.bin file.
- At power-up, the IND780 reads the FLASH.bin file into memory. If this fails, the IND780 checks for the presence of a FLASH backup file. If it exists, it copies the flash backup and restores any additional entries from the change history log file. The IND780 then checks the write-in-progress flag. If it is set, the IND780 writes the original SD field from the temporary field and clears the write-in-progress flag.

Protected Scale Calibration Shared Data

Protected Scale Calibration Data is the persistent scale calibration data. The IND780 writes this Shared Data to the EEPROM on the Scale boards to protect it across a power-failure. On power-up, it reads an image of the EEPROM into the Protected Process BRAM Shared Data. **The IND780 only writes the EEPROM after a successful scale calibration.**

Writing EEPROM Shared Data During Power-Down

A critical event occurs when the IND780 attempts to write to EEPROM Shared Data just as the power goes down. The IND780 writes part of the EEPROM successfully, and then power drops below a valid-power threshold before the IND780 can complete the write, causing a corrupted EEPROM.

To protect against this potential problem, the IND780 does a two-stage write procedure whenever it writes to EEPROM:

- The IND780 first writes a write-in-progress flag and the new EEPROM data into a temporary location in BRAM. When this write is successfully completed, the IND780 then writes the data and its checksum to the EEPROM. When this second write is successfully completed, the IND780 clears the write-in-progress flag.
- At power-up, the IND780 checks the write-in-progress flag. If it is set, the IND780 writes the EEPROM from the temporary field and clears the write-in-progress field.

Shared Data Callbacks

The client application can request callbacks on lists of Shared Data fields so that the Shared Data Server calls back the client when the data is updated or changes. The application does not have to repeatedly poll for new data, but the Shared Data Server alerts the application when the data is updated or changes by sending a message with the value of the new data.

The IND780 designates the special Shared Data fields that can use callbacks as "real-time" fields. In this document, "rt" designates real-time fields, while "na" designates non-real-time fields that do NOT support callbacks. Edge-Sensitive commands are also real-time fields, but the IND780 only makes a callback to process these commands when the field transitions from zero to a non-zero value. In this document, "rc" designates edge sensitive command fields. Certain dynamic SDV (eg. wt--, wx--, etc) is updated continuously and will generate a callback message periodically eventhough the value of the variable is unchanged.

Data Format Types

IND780 Shared Data supports the following data types:

Mnemonic	Data Type	Description
BI	I1	Boolean fields are one-byte integers, but can only take a value of 0 or 1.
By	I1	One byte integer
US	UI2	Two byte unsigned integer
UL	UI4	Four byte unsigned integer
F	R4	Single precision floating point
D	R8	Double precision floating point
ABy nn[1] ABI nn[1]	Array I1 Array I1	Array of I1 Array of I1 Boolean
S mm[2]	Array UI2	A Unicode String. NULL terminated. Array of UI2.
AL nn[1]	Array UI4	Array of UI4
Struct	Struct	Composite structure of entire block

1. "nn" represents the length of the array
2. "mm" represents the maximum length of the Unicode String, including the null terminator.

Change History Log

The IND780 maintains a history of all changes to the Setup and Calibration Shared Data in a resident Flash Memory file. There is a separate record for each changed field. The record contains the field name, date and time, user ID, and the new contents of the field. It also maintains a history log of all Shared Data backups and restores.

The Change History file serves the following purposes:

- It provides traceability of changes to Setup and Calibration data. It allows the customer or service technician to find and view the changes to Shared Data. They can validate that the system has been setup properly and that Shared Data contains only the authorized settings.
- It satisfies the FDA CFR 21 Part 11 regulations for the U.S. food and pharmaceutical industries for maintaining strict control over the safety of their processes and for documenting any changes to their processes.
- In case of a catastrophic system failure, you can use an archived Change History file to reconstruct Shared Data. To recover the system, you must first reset the system to the factory defaults and then use a utility to apply the changes from the Change History file one at a time.

The Unicode format of each history record is:

"SSSSSS DDDDDD TTTTTT AUTHOR L VALUE"

Where:

- SSSSSS is the six-letter Shared Data Name;
- DDDDDD is the date of change from xd0103;
- TTTTTT is the time of change from xd0104;
- AUTHOR is the name of the user who made the change from xd0125, xd0127, or xd0129;
- L is the security-level of the user who made the change from xd0126, xd0128, or xd0130;
- VALUE is a Unicode representation of the new value written to the Shared Data variable.

The Change History is a maximum of 250,000 bytes long.

When the file is 75% full, the IND780 SD issues a warning to the user that the file is becoming full. Then, the user can offload it to a PC using FTP and reset the resident log file.

When the file becomes 90% full, the IND780 SD issues a severe warning to the user. Again, the user can offload the log file to a PC and reset the resident log file.

When the file becomes 100% full, the IND780 SD issues an "error alert" to the operator and halts any further updates to Setup until the user takes the appropriate action to save and reset the resident log file.

Shared Data Access Control

Generally, anyone can read any Shared Data field. The notable exceptions are password fields, which only the IND780 system may read. Hard-coding in Shared Data restricts read-access to the password fields. The user access level for the shared data server connection must match (or exceed) the level expected for the shared data field (currently assigned based on block type) to permit a shared data write.

There are four classes of user – Administrator, Maintenance, Supervisor, and Operator. The Administrator class always has the maximum possible write-access capability. However, not even an Administrator can write into "Read Only" fields. Typical "Read Only" fields are real-time data fields that contain the weight data for the scale.

To satisfy legal metrology regulations or customers' security concerns, it is often necessary to limit terminal write-access after the customer has installed the terminal. For example, no user of any class may change metrological setup parameters after a government inspector has certified and sealed the terminal.

The IND780 has a Security Switch on its main PCB. The service technician can mechanically seal the IND780 to prevent tampering with the Security Switch. When in the UNSECURED position, authorized users may write to Shared Data fields according to the "access privilege". In the SECURED position, NO users have write-access to Shared Data fields that previously had Administrator-only level, write privileges.

Validating Setup Data

IND780 Shared Data validates changes to Protected Setup and Calibration EEPROM fields. It compares the new value with the range of legal values stored in the Shared Data Dictionary. If Shared Data finds the new value is not legal, it does not update the field and returns an error status to the application.

Shared Data does not validate all fields. It only validates those that it can validate using a table of values. It does not validate fields that require special programming logic to validate.

Shared Data supports an application command that returns the validation criteria for a particular field to the application so the application can display the list of legal values.

The Shared Data Dictionary has different validation criteria based on the type of validation required. Some of the validation types include:

- **Boolean validation**. Only zero or one are legal values.
- **Range validation**. Only values within a range are valid. The Data Dictionary contains the minimum and maximum legal values. For example, integer values from one to five are valid, or floating-point values from 0.0 to 9.9 are valid.
- **List validation**. Only values in a list of values are valid. For example, values 'N', 'S', 'M', and 'H' are valid.
- **No validation**.

Shared Data Server Commands

After connecting to the Shared Data Server in the IND780, several commands are available for use by the client. All commands can be given in either upper- or lower-case letters. The quotation marks shown are for clarity only and should not be transmitted. Valid commands are described in the following sections.

- **Response Format**: "Read", "write", and "callback" message responses have a formatted header. The first two characters indicate the status. "00" is the success status. "99" is a failure status. The next character is the type of message, "R", "W", or "C". The next three characters are a sequence number, which cycles from 001 to 999, and then starts over again.

"user" Command

A client must login to the SDSV using the "user" command before accessing Shared Data. The server validates the username and sends a response message back to the user. The SDSV responds with [Access OK] if no password is required or [Enter password] if a password is required.

A client can use only the "user", "pass", "help" and "quit" commands before successfully logging on.

Format: user username

Response 1: 12 Access OK

Response 2: 51 Enter Password

"pass" Command

The user enters a password using the "pass" command. If the password is valid, the server displays the [Access OK] message. If not valid, the server displays the [No access] message.

Format: pass password

Response: 12 Access OK

"help" Command

The "help" command returns the list of the valid commands for the IND780.

Format: help

Response: 02 USER PASS QUIT READ R WRITE W SYSTEM CALLBACK XCALLBACK GROUP RGROUP XGROUP CTIMER LOAD SAVE HELP NOOP CONTOUT XCOUNTOUT PRINTOUT XPRINTOUT

"quit" Command

The "quit" command terminates the TCP/IP connection.

Format: quit

Response: 52 Closing connection

"read" Command

The "read" command allows the client to read a list of one or more Shared Data fields. An individual field or an entire block can be read. If more than one field is requested, the fields should be separated by a space. If successful, the server responds with a separated list of values in ASCII format. The server separates individually requested fields with a "~"; and Shared Data separates items within a block with a "^". If an error is detected, the server responds with an error message. The maximum length of the reply message is 1,024 characters.

Format: read SDV#1 SDV#2

Example 1: read wt0101 wt0103

Response 1: 00R003~ 17.08~lb~

Example 2: read sp0100 (reads entire block)

Response 2: 00R012~XP/0163M^1^^78^20.500000^0^0^0^1.200000^3.500000^0.150000^0.050000^0^0.000000^0.000000^0^0^0^0^0^0^1^0.000000^0.000000^0.000000^0.000000^0.000000^~

- The "read" command can be abbreviated to the letter "r" if desired.

"write" Command

The "write" command allows the client to write a list of one or more Shared Data fields. A single field or an entire block can be written. The maximum length of the write message is 1,024 characters. Items within a list of writes must be separated with a "~". You must separate items within a block with a "^".

Format: write SDVblock#1=value1^value2^ value3 write SDV#1=value1~SDV#2=value2~SDV#3=value3

Example1: write ak0100=abc^def^hij^lmn (writes fields into a block)

Response 2: 00W006~OK

Example 2: write aj0101=12.56~aj0150=987.653 (writes fields within a list)

Response 2: 00W007~OK

- The "write" command can be abbreviated to the letter "w" if desired.

"system" Command

The "system" command returns a description of the IND780 terminal. This is the same information that is shown on the Recall System Information screen of the IND780.

Format: system

Response: 0S005~ SYSTEM INFO RECALL

Model: IND780
S/N:
ID1: IND780
ID2: METTLER_TOLEDO
ID3:
Software
Boot: L1.00 181348
Standard: L1.00 181349
Hardware
Analog L/C
Opt: E-Net

"noop" Command

The "noop" command performs no task; it checks communication and returns an [OK] response message.

Format: noop

Response: 00OK

"callback" Command

The "callback" command allows the client to define one or more fields for which the Shared Data Server sends a message to the client when the value of the callback field is updated or changes. Only certain SDV may be included in a callback command. These SDV are noted by an "rc" or "rf" status in the column after the structure column in the Shared Data document. Mainly, these are triggers that are used in the terminal. SDV with a status of "na" are not real-time SDV and cannot be used in callbacks. Certain dynamic SDV (eg. wt--, wx--, etc) is updated continuously and will generate a callback message periodically eventhough the value of the variable is unchanged.

The callback message contains one or more changed field names and the new value for each field. A maximum of twelve callback fields can be specified. The "ctimer" command specifies the minimum time between repeated callback messages.

Format: callback SDV#1 SDV#2

Example: callback st0102 st0103 st0104

Response 1: 00B001~OK

Response 2: 00C005~st0102=0^st0103=1^st0104=1 (sent when all of the SDV change)

Response 3: 00C006~st0104=0 (sent when only st0104 changes)

"xcallback" Command

The "xcallback" command allows the client to remove one or more callback fields from the list of current SDV.

Format: xcallback SDV#1 SDV#2 or xcallback all (removes all callbacks)

Example: xcallback st0102 (removes st0102 SDV from callback)

Response: 00X008~OK

"group" Command

The "group" command allows the client to define a group of callback fields. The Shared Data Server sends a message to the client when the value of any field in the group changes. The group callback message contains the group number and the values of all fields in the group in the defined order. The "ctimer" command specifies the minimum time between repeated callback messages. The maximum number of groups is six, and the maximum number of fields in a group is twelve.

Format: group n SDV#1 SDV#2 SDV#3 (where n = the number of the group 1–6)

Example: group 5 st0103 st0104 st0107 (groups target feeding and tolerance SDV into one group)

Response 1: 00B019~OK

Response 2: 00C026~group5=0^1^0 (indicates status of all 3 SDV in group 5 whenever any one of them changes)

"rgroup" Command

The "rgroup" command allows the client to define a group of fields. The client can use the group number to read the entire group at once using the READ command. The maximum number of groups is six, and the maximum number of fields in a group is twelve.

Format: rgroup n SDV#1 SDV#2 (where n = the number of the group 1–6)

Example: rgroup 3 di0101 di0102 di0103 di0104 (groups all discrete inputs into one group that can be read with a single read command)

Response: 0G008~group=3, number fields=4

Read Example: r 3

Response: 00R009~1~0~1~0~

"xgroup" Command

The "xgroup" command allows the client to remove one or all groups.

Format: xgroup n (where n = the group number 1 - 6) or XGROUP all (removes all groups, including "contout" and "printout")

Example: xgroup 5 (cancels group 5)

Response: 00X011~group=5

"contout" Command

The "contout" command allows the client to define the continuous output string as a callback field. The Console Print Server sends a message to the client at each continuous output. The continuous output message is either in the Standard METTLER TOLEDO Continuous Output format or in a continuous template format. The "ctimer" command specifies the minimum time between repeated callback messages. The "xcontout" command removes the registration from the terminal and the communication will stop.

Format: contout

Response: 00G008~number CONTOUT streams=1

When a continuous output occurs to the Ethernet port, the data will be sent to the client formatted as selected in setup.

Data: 00C004 4! 354 236
00C005 4! 354 236

"xcontout" Command

The "xcontout" command allows the client to remove the continuous output callback, thus ending the registration so no further continuous outputs will be available.

Format: xcontout

Response: 00X070~CONTOUT

"printout 1" Command

The "printout" command allows the client to define a Demand Print Stream as a callback field. The Demand Print Streams include demand print (triggered by the scale) and custom triggers (triggers 1, 2, and 3). The console print server sends a message to the client at each print output. Since print messages can span multiple message blocks (depending upon size), the start of the print message has a <dprint> tag and the end of the message has a </dprint > tag. After registering for the demand

output, the client will receive the appropriate data stream. The "ctimer" command specifies the minimum time between repeated callback messages. The "xprintout" command removes the registration from the terminal and the communication will stop.

Format: printout 1

Response: 00G008~number PRINTOUT streams=1

When a demand output occurs to the Ethernet port, the data will be sent to the client formatted by the selected template. There will be <dprint> and </dprint> delimiters for the string.

Data: 00P004 <dprint> 22.08 lb
17.06 lb T
5.02 lb N
</dprint>

"xprintout" Command

The "xprintout" command allows the client to remove the print output callback, thus ending the registration so no further demand outputs will be available.

Format: xprintout

Response: 00X070~PRINTOUT

"ctimer" Command

The "ctimer" command allows the client to set the minimum time between repeated callback messages in milliseconds. The minimum allowable setting is 50 milliseconds and the maximum is 60 seconds. The default value is 500 milliseconds.

Format: ctimer n (where n is the number of milliseconds)

Example: ctimer 1000 (set the callback timing to 1 second)

Response: 00T862~new timeout=1000

"csave" Command

The "csave" command saves the current callback and group settings into Shared Data for use later with the "cload" command.

Format: csave

Response: 00L004~OK

"cload" Command

The "cload" command loads the callback and group settings from Shared Data into the shared data server. The terminal will begin to service the loaded callback and group commands.

Format: cload

Response: 00L001~OK

I. Scale Data

Scale Functionality

Dynamic Scale Weight (WT)

Access:	"Read Only." Access level is not customizable.	
Class Code:	wt	Data Type: D
ControlNet Class Code:	68 hex	
Instances:	5	Instance 1- 4 = Scale platforms 1 – 4 Instance 5 = Sum scale.

Attributes:

wt--00	Composite wt block	Struct	na	Composite of entire block
wt--01	Displayed Gross Weight	S13	rt	
wt--02	Displayed Net Weight	S13	rt	When user has enabled MinWeigh, the first character contains an '*' when the MinWeigh conditions are not met.
wt--03	Weight Units	S4	rt	**lb** pounds, **kg** kilograms, **g**rams, **oz** ounces, **ozt**roy, **dwt** pennyweights, metric **t**ons, **ton**, or custom units name
wt--04	Displayed Aux Gross Weight	S13	rt	
wt--05	Displayed Aux Net Weight	S13	rt	
wt--06	Aux Weight Units	S7	rt	**lb** pounds, **kg** kilograms, **g**rams, **oz** ounces, **lb-oz** pounds & ounces, **ozt**roy, ounces, **dwt** pennyweights, metric **t**ons, **ton**, or custom units name
wt--07	Rate Period	S2	rt	**N**o, **S**ec, **M**in, **H**our
wt--08	Displayed Rate	S13	rt	
wt--09	Diagnostic Weight	S13	rt	Diagnostic Weight Counts
wt--10	Rounded Gross Weight	D	rt	
wt--11	Rounded Net Weight	D	rt	
wt--12	Auxiliary Gross Weight	D	rt	
wt--13	Auxiliary Net Weight	D	rt	
wt--14	Rate of Change of Weight	D	rt	
wt--15	Scale Processing State	By	rt	0 = disabled 1 = normal weight processing 2 = diagnostic 3 = calibration 4 = shift adjust 5 = error.
wt--16	Continuous Output Status A	By	rt	Standard Mettler-Toledo Continuous
wt--17	Fine Gross Weight	D	rt	
wt--18	Fine Net Weight	D	rt	
wt--19	Weight Range	By	rt	0, 1, 2, or 3
wt--20	Reserved	D	rt	
wt--21	Update Scale Display	By	rc	Command to Weight Display and SmartTrac Visualization task indicating new weight is ready for display.
wt--22	Reserved	D	rt	
wt--23	Reserved	D	rt	
wt--24	IDNet Restart/Reset	S13	rt	"F MR" Message specific to IDNet base
wt--25	IDNet Approval code	S13	rt	" A " Message Approval code for IDnet base, for example, "USA N"

wt--26	Standard Continuous Output String	S20	rt	StandardMettler-Toledo Continuous Output
wt--27	Template Continuous Output String	S200	rt	Template Continuous Output Format
wt--34	IDNet Scale Update Rate	S25	na	"F MF" Message specific to IDNet base
wt--35	IDNet Scale Vibration Adapter	S25	na	"F MI" Message specific to IDNet base
wt--36	IDNet Weighing Process Adapter	S25	na	"F ML" Message specific to IDNet base
wt--37	IDNet Automatic Stability Detection	S25	na	"F MS" Message specific to IDNet base
wt--38	IDNet Auto-Zero Setting	S25	na	"F MZ" Message specific to IDNet base
wt--39	IDNet Software Part Number	S12	na	"P" Msg xxxx-x-xxxx string from IDNet base
wt--40	IDNet Calibration Ident Code	S3	na	"I" Msg 00 to 99 calibration count from IDNet
wt--41	Peak Loading Since Power Up	D	na	Peak load since power up
wt--42	Reserved	US	na	
wt--43	Reserved	US	na	
wt--44	Reserved	S13	rt	
wt--45	Reserved	S13	rt	
wt--46	Reserved	S13	rt	
wt--47	Reserved	D	rt	
wt--48	Reserved	D	rt	

Method:

The Resident Scale Task updates the Dynamic Weight Shared Data at every weight update, whenever the weight changes. Typically, this occurs up to 20 times per second, but can vary depending on the load cell type and the application-type setting in cs--21. The RST converts the weight from the raw filtered counts it receives from the scale boards to the Legal-For-Trade weight.

The RST signals the Weight Display and SmartTrac Visualization task or an Application Task indicating that new weight is ready, using field wt--21. The RST sets this signal whenever weight changes, up to a maximum rate of 10 times per second. If the weight does not change for an extended time, the RST will set the trigger just to refresh the weight display. When displaying the weight for a single scale, the Weight Display and SmartTrac Visualization task may register a callback on the wt--21 field.

When the Weight Display and SmartTrac Visualization task or Application Task is using the Sum Weight as well as the individual platform weights, it must get the weight from the Consolidated Weight Stream, xd0115. The CWS guarantees that the Sum is metrologically consistent.

When the display task is using weight from multiple scales, it needs to register its weight-update callback on the consolidated weight trigger, xd0118.

The RST periodically re-writes the Shared Data weight fields every few seconds even when there is no change to the weight data.

Scale Process Data (WS)

Access:	"Read Only," access level is not customizable.		
Class Code:	ws	Data Type:	PP
ControlNet Class Code:	66 hex		
Instances:	5		

Attributes:

ws--00	Composite ws block	Struct	na	Composite of entire block
ws--01	Current Scale Mode	By	na	'G'=Gross, 'N'=Net
ws--02	Rounded Tare Weight	D	na	
ws--03	Fine Tare Weight	D	na	
ws--04	Auxiliary Tare Weight	D	na	
ws--05	Current Units	By	na	1=Primary 2=Secondary

ws--06	Tare Source	By	na	1=Pushbutton 2=Keyboard 3=Autotare
ws--07	Current Zero Counts	D	na	Power up zeroing, Pushbutton zeroing, & Auto-zero maintenance can modify the current zero. The "reset to factory" value is -999999.0, which tells the RST to initially set the current zero to the calibrated zero.
ws--08	Stored Weight	D	na	Initial weight for Net-Sign Correction.
ws--09	Tare Source String	S2	na	"PT" = keyboard tare, else "T "
ws--10	Displayed Tare Weight	S13	na	
ws--11	Displayed Aux Tare Weight	S13	na	
ws--12	Last Demand Print Message	S1001	na	Last Demand Print Message for Scale.
ws--13	Reserved	D	na	
ws--14	Displayed Stored Weight	S13	na	
ws--15	Reserved	US	na	
ws--20	Tare table row ID	US	na	RST sets this fielda to identify the row ID in Tare Table of the tare value in ws--02. Zero indicates the value is NOT from Tare Table. RST uses this SD field to update Totalization field in the Tare Database record.
ws--21	Reserved	US	na	Reserved
ws--22	Reserved	D	na	
ws--23	Reserved	S13	na	
ws--24	Reserved	US	na	
ws--25	Reserved	D	na	
ws--26	Reserved	S13	na	

Method:

The Resident Scale Task maintains its scale process data in this block. This scale process data may change frequently but must be stored permanently. The Scale Tare Setup section describes how the RST uses the tare process data in this block.

A Truck In/Out facility uses the Net Sign Correction to handle two situations:

- Weigh a full truck first and, after emptying the truck, to take the tare weight of the empty truck to find the net weight of the contents.
- Take the tare weight of an empty truck first and, after loading the truck, to take the full weight of the truck to find the net weight of the contents.

Net Sign Correction delays the decision of which weighment is the gross weight and which weighment is the tare weight until the operator prints the ticket. At that time, the IND780 compares the two weighments and takes the lower weight as the tare weight. Then, the net weight is always a positive value.

Scale Commands (WC)

Access:	"Operator" wc--24 and wc--25 have "Maintenance" access	
Class Code:	wc	Data Type: D
ControlNet Class Code:	76 hex	
Instances:	6	Instance 1- 4 = Scale platforms 1 – 4 Instance 5 = Sum scale Instance 6 = Selected scale

Attributes:

wc--00	Composite wc block	Struct	na	Composite of entire block
wc--01	Pushbutton Tare Scale	BI	rc	Appl. sets from 0 to 1 to trigger command
wc--02	Clear Scale	BI	rc	
wc--03	Print Scale	BI	rc	
wc--04	Pushbutton Zero Scale	BI	rc	

wc--05	Switch to Primary Units	BI	rc	
wc--06	Switch to Secondary Units	BI	rc	
wc--07	Toggle Primary/Secondary units	BI	rc	
wc--08	Apply Setup	BI	rc	
wc--09	Restart Rate	BI	rc	
wc--10	Reset Target Coincidence	BI	rc	
wc--11	Restart Target	BI	rc	
wc--12	Restart Filtering	BI	rc	
wc--13	Disable Scale	BI	rc	
wc--14	Capture Raw Counts	BI	rc	Toggle raw counts capturing on/off
wc--15	Write Calibration to EEPROM	BI	rc	
wc--16	Reset Predictive Failures	BI	rc	
wc--17	Toggle High-precision weight	BI	rc	Toggle high precision weight display & calculation setting to on/off. In legal-for-trade mode, high-precision weight display automatically switches back to normal display mode after 5 seconds
wc--18	Switch to Display of Aux Units	BI	rc	
wc--19	Reset Current Zero to Cal Zero	BI	rc	Reset the current zero to calibrated zero
wc--20	PLC Pushbutton Tare Scale	BI	rc	PLC command by-passes controls for operator pushbutton tare
wc--21	PLC Clear Scale	BI	rc	PLC command by-passes controls for operator pushbutton tare
wc--22	PLC Zero Scale	BI	rc	PLC command by-passes limits for controls operator pushbutton zeroing
wc--23	Restart Tare	BI	rc	1= restart tare to use new tare settings
wc--24	Reserved	BI	rc	
wc--25	Reserved	BI	rc	
wc--26	Reserved	BI	rc	
wc--27	Reserved	BI	rc	
wc--28	Reserved	BI	rc	
wc--29	Reserved	BI	rc	

Methods:

For example, to issue a Tare Command to Scale A, the application sets Shared Data field wc0101=1.

After receiving the callback, the Resident Scale Task sets wx0101=1 to indicate the command is in progress. When the command is complete, the Resident Scale Task sets wx0101=0 to indicate the command is successful or wx0101=2 to 255 for a specific error code. It sets wc0101=0 so the application can trigger the command again later. The application can register a callback on wx0101 to monitor when the command is complete and to get the completion status of the command.

Scale Statuses (WX)

Access:	"Read Only." Access level is not customizable.	
Class Code:	wx	Data Type: D
ControlNet Class Code:	75 hex	
Instances:	6	Instance 1- 4 = Scale platforms 1 – 4 Instance 5 = Sum scale Instance 6 = Selected scale

Attributes:

wx--00	Composite wx block	Struct	na	Composite of entire block
wx--01	Tare Scale Status	By	rt	**General Command Completion Statuses:** 0 = Success 1 = Command in Progress 2-255 = Specific error code 97 = Scale in invalid mode 98 = Invalid function parameter 99 = No SD access 0 = Tare completed successfully 1 = Tare in progress 2 = Scale in motion during tare = 2 3 = Pushbutton tare not ebabled 4 = Programmable tare not enabled 5 = Chain tare not permitted 6 = Only incremental chain tare permitted 7 = Tare not in rounded increment value 8 = Tare value too small 9 = Tareing when powerup zero not captured 10 = Tareing over capacity 11 = Tareing under zero 12 = Tare value exceeds limit 13 = Must clear tare at gross zero 14 = Scale in wrong mode during tare 15 = IDNET scale error
wx--02	Clear Tare Status	By	rt	Same as tare statuses
wx--03	Print Scale Status	By	rt	0 = Printing completed successfully 1 = Printing in progress 2 = Print connection not found 3 = Printing busy 4 = Printing error 5 = Printing not ready to print 6 = Printing scale in motion 7 = Printing scale overcapacity 8 = Printing scale under zero 11 = Printing not allowed 12 = Printing not enabled 13 = No demand print, but continuous print completed OK 14 = Scale below minimum print weight

wx--04	Zero Scale Status	By	rt	0 = Zero completed successfully 1 = Zero in progress 2 = Scale in motion during zero 3 = Illegal scale mode during zero 4 = Scale out of zeroing range 5 = IDNET zero command timeout 6 = Pushbutton zero disabled 7 = Command timeout error 8 = Scale communications disabled
wx--05	Switch to Primary Units Status	By	rt	
wx--06	Switch to Secondary Units Status	By	rt	
wx--07	Toggle primary/secondary status	By	rt	
wx--08	Apply Setup Status	By	rt	
wx--09	Restart Rate Status	By	rt	
wx--10	Reset Target Coincidence Status	By	rt	
wx--11	Restart Target Status	By	rt	
wx--12	Restart Filtering Status	By	rt	
wx--13	Disable Scale Status	By	rt	
wx--14	Capture Raw Counts Status	By	rt	
wx--15	Write to EEPROM Status	By	rt	
wx--16	Reset Predictive Failure Status	By	rt	
wx--17	Toggle High-precision wt Status	By	rt	
wx--18	Switch to Display of Aux Units Stat	By	rt	
wx--19	Reset Current Zero to Cal Zero St	By	rt	
wx--20	PLC Pushbutton Tare Scale Status	By	rt	
wx--21	PLC Clear Scale Status	By	rt	
wx--22	PLC Zero Scale Status	By	rt	
wx--23	PLC Restart Tare Status	By	rt	
wx--24	Update Cal Date Status	By	rt	
wx--25	Update Cal Expiration Status	By	rt	
wx--26	Set Cal Failed Status	By	rt	
wx--27	Reserved	By	rt	
wx--28	Reserved	BI	rt	
wx--29	Reserved	BI	rt	
wx--31	Motion	BI	rt	Scale Processing Statuses
wx--32	Center of Zero	BI	rt	0=no, 1=yes
wx--33	Over Capacity	BI	rt	
wx--34	Under Zero	BI	rt	
wx--35	Net Mode	BI	rt	
wx--36	Printing in Progress	BI	rt	
wx--37	Estimated Weight	BI	rt	
wx--38	Weight Data OK	BI	rt	0 = error on scale, underload, overload,or system in setup.
wx--39	IDNET in Motion Error	BI	rt	
wx--40	Critical Scale Error	BI	rt	
wx--41	Stored Weight Mode	BI	rt	
wx--42	Rate OK	BI	rt	
wx--43	Target Installed for Scale	BI	rt	
wx--44	Selected Scale	BI	rt	

wx--45	High-Precision Weight	BI	rt	Weight display temporarily in high-precision weight mode. In legal-for-trade mode, the high-precision weight display automatically switches back to normal display mode in 5 seconds.
wx--46	MinWeigh LOW indication	BI	rt	1 = Net Weight below MinWeigh Threshold
wx--47	Weight OK, but system in setup	BI	rt	
wx--48	Reserved	BI	rt	
wx--49	Reserved	BI	rt	
wx--50	Reserved	BI	rt	
wx--51	Reserved	BI	rt	
wx--52	Reserved	BI	rt	
wx--53	Reserved	BI	rt	
wx--98	Composite Process Status	BI	rt	Bitwise status, attributes 31 – 38
wx--99	Composite Process Status	By	rt	Bitwise status, attributes 39 – 46

Methods:

The Resident Scale Task sets the first set of statuses to reflect the status of commands to the scale. The second set of statuses to show the dynamic run-time status of the scale weight.

An Application or PLC can get the multiple scale status bits with a single read of the Composite Status fields.

Working Scale Setup Data (WK)

Access:	"Supervisor"		
Class Code:	wk	Data Type:	PP
Instances:	5		

Attributes:

wk--00	Composite wk block	Struct	na	Composite of entire block
wk--01	Auto-Tare Threshold	D	rt	
wk--02	Auto-Tare Reset Threshold	D	rt	Enabled by ct--05
wk--03	Auto-Clear Tare Threshold	D	rt	Enabled by ct--06
wk--04	Programmable Tare	D	rt	Application can set this value to initiate a programmable tare command
wk--05	Rate Measurement Interval	By	na	0 = every second 1 = every five seconds 2 = every half-second.
wk--06	Rate Sample Time	By	na	Number of intervals in sliding window over which the IND780 averages the rate.1 to 60 intervals
wk--13	Reserved	BI	rt	
wk--14	Programmable Tare in Increments	D	rt	Application can set this value to initiate a programmable tare in # of increments
wk--15	Reserved	By	rt	
wk--16	MinWeigh measure uncertainty	D	na	Accuracy uncertainty entered as weight value in primary units. This can be a value with at least 2 additional decimal positions beyond the displayed increment.
wk--17	MinWeigh tolerance	D	na	Values from 0.1 to 99.9 as a percentage
wk--18	MinWeigh safety factor	By	na	Value from 1 to 10
wk--19	MinWeigh weight value	D	na	Weight result of direct entry or calculation. The division and decimal location of this value must match the display resolution.
wk--20	Tare table row ID	US	na	CP sets this field to Identify the Row ID of the tare value in wk--04 or wk—14 in Tare Table. Zero indicates value is NOT from Tare Table.
wk--21	Target table row ID	US	na	CP sets this field to identify the Row ID of the target value in the SP block. Zero indicates the Target is NOT from Target Table.

wk--22	Reserved	US	rt	
wk--23	Reserved	US	rt	
wk--24	PLC Programmable Tare	D	rt	programmable tare command
wk--25	Reserved	D	rt	

Method:

This block contains Scale Setup Data that may change during run-time. Rate settings, particularly, may change in a process control environment. In some systems, however, these fields are static setup data that never changes.

RATE is the rate of change of weight normalized to the selected weight and rate units.

- cs--08 defines the rate weight units. cs--07 defines the rate time units in either seconds, minute, or hours.
- The Rate Calculation Interval in wk--05 specifies how often the IND780 calculates a new rate value. The permissible selections are 1 second, 5 seconds, and ½ second.
- The Rate Sample Time is in wk--06. It is length of the sampling period used for the IND780's rate calculation. Permissible values are from 1 to 60 seconds. RATE calculates the "delta weight" or change in weight from the previous interval. RATE stores this new delta weight in an array of delta weights. It calculates the rate as an average delta weight over all intervals in most recent sample time. For example, if the sample time is set to 10 seconds and interval time is set to one second, the rate is the normalized average of the 10 most recent delta weights. Shorter sample times reflect more accurately the instantaneous changes in the rate, but often have much greater fluctuations in rate values. With longer sample times, the rate changes more slowly and smoothly because the rate is calculated over a longer time.
- The IND780 calculates the delta weights using the fine gross weight. It stores the calculated rate in wt--14 in the "fine" resolution. RATE rounds the displayed rate to the x10 resolution of the scale's division size. For example, if the scale weight resolution is xxx.x, then displayed rate resolution is xxx.xx. It stores the displayed rate as a Unicode string in the wt--08.

Scale Setup (CS)

Access:	"Administrator" The following fields have "Maintenance" level: cs--01, cs--04, cs--07, cs--08, cs--14, cs--15, cs--16, cs--18, cs--43, cs--44. The following fields have "Supervisor" level: cs--29 & cs--30.		
Class Code:	cs	Data Type:	PS
ControlNet Class Code:	67 hex		
Instances:	5		

Attributes:

cs--00	Composite cs block	Struct	na	Composite of entire block	
cs--01	Scale Type	By	na	**A**nalog Scale, **POWERCELL** DigiTOL Scale, **I**Dnet High-Precision Scale, **D**igiNet High-Precision Scale, **S**ICS Lab Balance, **U**=Summing, **N**one.	
cs--02	Scale Location	By	na	For IDnet, DigiNet, and Analog scale bases, legal values are 1, 2, 3, 4, 5, and 6 indicating the Option Card Slot of the scale card. For SICS Lab Balances, legal values are 1-6 indicating COM1 – COM6.	
cs--03	Scale ID	S21	na	Text Identifier name for scale	
cs--04	Auxiliary Weight Units	By	na	0=none 1=pounds 2=kilograms 3=grams 4=metric tons	5=tons 6=troy ounces 7=penny weights 8=ounces 9=custom units
cs--05	Enable Pushbutton High Prec. Wt.	Bl	na	1=Enable high-precision weight display to include an additional decimal digit beyond the specified division size for temporary display when the operator toggles wc—17 on/off.	
cs--06	Reserved	Bl	na	Reserved	
cs--07	Rate Time Units	S2	na	**N**o, **S**ec, **M**in, **H**our	

cs--08	Rate Weight Units	By	na	1=pounds 2=kilograms 3=grams	4=metric tons 5=tons
cs--10	Display Auxiliary Units	Bl	na	1=yes	
cs--11	Display Rate	Bl	na	1=yes	
cs--12	Custom Units Name	S13	na	Name of Custom Unit. First three characters are siginificant.	
cs--13	Custom Units Conversion Factor	D	na	Multiplier to convert custom units to primary units.	
cs--14	Low-Pass Filter Corner Frequency	D	na	0.1 to 9.9 Hz; 0 Hz disables filter. The filtering routines select the closest available filtering setting to your selection and write it back into this field.	
cs--15	Low-Pass Filter Poles	By	na	2, 4, 6, 8, or 10	
cs--16	Notch Filter Frequency	D	na	For Analog Scale Bases only, 1 to 366 Hz The filtering routines select the closest available filtering setting to your selection and write it back into this field.	
cs--17	Notch Filter Type	By	na	0=none 1=comb 2=averager	
cs--18	Ultra-Stability Filter Enable	Bl	na	1=yes.	
cs--19	Add this Scale to Summing Scale	Bl	na	1=yes	
cs--20	Units Switch Enable	Bl	na	1=yes	
cs--21	Application Process Type	By	na	1=high update rate for process control apps. 2= mid speed update rate. 3=low update rate for transaction apps.	
cs--23	Custom Continuous Output Freq	D	na	Frequency in hertz for custom continuous messages using Print Templates.	
cs--24	WIM Mode	By	na	Enable WIM mode	
cs--25	Custom Units Increment Size	D	na	Custom Units Increment Size	
cs--26	SICS Lab Scale Calibration Units	By	na	0=none, 1=pounds, 2=kilograms, 3=grams	
cs--27	Reserved	D	na		
cs--28	Reserved	UL	na		
cs--29	MinWeigh feature	By	na	0=disabled, 1=enabled	
cs--30	MinWeigh entry mode	By	na	0=calculated, 1=direct	
cs--31	Auto-Calibration for SICS Scale	By	na	1 = enable auto-calibration of SICS scale	
cs--32	Reserved	By	na	Reserved	
cs--33	SICS External Calibration Weight	D	na	The RST sets this field to the calibration weight value that the SICS Lab Balance requests when performing an external calibration. Each Lab Balance has a fixed external calibration weight that cannot change.	
cs--34	Reserved	D	na		
cs--35	Reserved	D	na		
cs--36	SICS Balance Description Data	S30	na	RST sets this field using data from base	
cs--37	SICS Software Description & Type	S30	na	RST sets this field using data from base	
cs--38	SICS Balance Serial Number	S30	na	RST sets this field using data from base	
cs--39	SICS Software Ident. Number	S30	na	RST sets this field using data from base	
cs--40	IDNet Restart/Reset	S13	rt	"F MR" Message specific to IDNet base	
cs--41	IDNet Approval code	S13	rt	" A " Message Approval code for IDnet base, for example, "USA N"	
cs--42	IDNet Scale Update Rate	S25	na	"F MF" Message specific to IDNet base	
cs--43	IDNet Scale Vibration Adapter	S25	na	"F MI" Message specific to IDNet base	
cs--44	IDNet Weighing Process Adapter	S25	na	"F ML" Message specific to IDNet base	
cs--45	IDNet Automatic Stability Detection	S25	na	"F MS" Message specific to IDNet base	
cs--46	IDNet Auto-Zero Setting	S25	na	"F MZ" Message specific to IDNet base	
cs--47	IDNet Software Part Number	S12	na	"P" Msg xxxx-x-xxxx string from IDNet base	
cs--48	IDNet Calibration Ident Code	S3	na	"I" Msg 00 to 99 calibration count from IDNet	

Methods:

SUMMING scale provides an arithmetic sum of the displayed values for the configured scale channels. It provides all metrological display elements provided for the individual scale channels. The Center of Zero, Motion, Over Range, and Under Range are the logical OR of these same conditions for all summed scale channels. The IND780 sends a Zero command for the Summing scale to all of the scale channels for individual action. A Tare or Clear Tare command to the Summing scale only affects the summation. A Tare or Clear Tare command to the component scale channels affects only component scale. The Summing scale is also a data source for printing and data transmission. The Weights and Measures seal protects the Summing scale configuration.

FILTERING

The goal of filtering the weight counts is to remove the internal and external noise from the weight signal. Ideally, users of weight indication would like instant response to a weight input (settling time = 0), and immunity from all signal disturbances. In practice, in selecting a filter, you must trade off settling time and disturbance rejection to find an acceptable compromise.

There are two major classes of weighing applications: transaction and process weighing. In transaction weighing, a load to the scale base is more or less a step input, and the user only wants the actual static weight value of the load. Most shipping, vehicle, food, and service scales fall into this category. Settling time requirements typically range from 0.5 seconds in service scales to several seconds in vehicle or livestock scales. Disturbance rejection requirements vary widely within this weighing classification, but usually there is a need for a very stable final weight reading.

In process weighing, automation equipment or humans continuously add the load over some time. Even though only the final weight reading may be preserved, knowledge of the time varying weight reading is important during the weighing process. Batching, filling, and in-motion weighing fall into this category. Settling time requirements are usually more relaxed because the "final" settling time for a ramp input is less than that of the same load applied as a step input. Disturbance rejection is important since many types of automation equipment introduce vibrations. Stability of the "final" value is somewhat less important.

IND780 filtering has a large range of adjustment for both disturbance rejection and settling time to meet all application requirements. Since these two parameters are dependent, some experimentation is usually required to find the best fit for the application.

The following describes the Analog Load Cell Interface filtering. The IND780 Analog Scale Interface provides a 366 Hz A/D sampling rate, which permits highly effective digital filtering. Since most of the filtering is digital, it is easily adjusted over a wide range of selections via soft switch setup to meet specific site needs. IND780 has three types of configurable digital filters:

1. Low Pass Filter

All weighing applications use the low pass filter. The user can specify the corner frequency of the pass band and the slope of the transition band. The pass band extends from DC (0 Hz) to the corner frequency. The low pass filter accepts the frequencies within this low-pass range with little or no attenuation, but attenuates frequencies above the pass band according to the slope of the transition band.

The scale is measuring the DC signal (static weight), so it is tempting to make the corner frequency very low to reject all "noise". However, the narrower the pass band, the longer the delay or settling time before we get the final value. As the corner frequency is increased, the scale will settle faster, but will also allow more noise through.

The transition slope describes the rate of change of the attenuation once outside the pass band. The steeper the slope, the more effective a filter is at rejecting a disturbance that is near the corner frequency. Making the slope infinite will cut off all frequencies above the corner. Again the price is delay; the steeper the slope, the longer the settling time.

The IND780 provides a multi-pole Infinite Impulse Response (IIR) low pass digital filter, with Service Technician control over both the filter corner frequency and the sharpness of the transition band slope. The corner frequency is defined in Hz; its adjustment range is 0.2 through 10 Hz. The number of filter poles defines the band slope; there can be from 2 to 10 poles, providing cutoff slopes of -40 through -200 dB/decade. This large range of adjustability provides effective filtering for almost any situation.

2. Notch Filter

An ideal notch filter provides infinite attenuation at a single frequency, and little or no attenuation at other frequencies. This type of filter is useful in special cases where there is a single noise frequency near or below the corner frequency of the low pass filter. In such cases, use of the notch filter can provide additional attenuation for a troublesome noise source and may permit opening the pass band of the low pass filter for a faster step response. The IND780 implements the notch filter as a Finite Impulse Response (FIR) filter, and provides the fundamental notch plus additional notches at multiples of the fundamental notch frequency. Specifying the notch frequency in Hz adjusts the notch filter. The notch filter is applicable to all weighing applications, but only to the Analog Load Cell scale.

3. Ultra-Stability Filter

Ultra-Stability Filtering algorithm is for use in transaction applications where it is very difficult to achieve stable weight readings due to excessive motion on the scales. Examples are truck scales in very windy locations and livestock weighing scales. The Ultra-Stability filtering algorithm uses the standard low-pass filtering as long as there is a rapid motion on the scale so that the operator can also observe the weight changing. When the motion begins to die down, this algorithm switches to a very stiff filter that strongly dampens any noise on the scale. Then, the operator can record a stable weight reading. Process weighing applications cannot use

the ultra-stability filter, since the non-linear action of the filter switching may cause inaccurate cutoffs in batching or filling applications.

Scale Tare Setup (CT)

Access:	"Administrator" ct--01, ct--02, ct--03, ct--04, ct--06, ct--07, ct--08, ct--13, ct--18, ct--19 have "Maintenance" access level.
Class Code:	ct Data Type: PS
ControlNet Class Code:	B7 hex
Instances:	5

Attributes:

ct--00	Composite ct block	Struct	na	Composite of entire block
ct--01	Tare Enabled	Bl	na	1=enable Tare feature.
ct--02	Pushbutton Tare Enabled	Bl	na	
ct--03	Keyboard Tare Enabled	Bl	na	
ct--04	Auto-Tare Enabled	Bl	na	
ct--05	Re-arm Autotare No Motion	Bl	na	1 = re-arm autotare only when there is no motion after weight falls below re-arm threshold (wk--02)
ct--06	Auto-Clear Tare Enabled	Bl	na	1 = automatically clear tare when weight falls below auto-clear weight threshold (wk--03)
ct--07	Auto-Clear Tare after Print	Bl	na	
ct--08	Auto-Clear Tare Motion	Bl	na	
ct--09	Clear Tare Only at Gross Zero	Bl	na	
ct--10	Incremental Chain Tare Only	Bl	na	
ct--11	Display Tare Enabled	Bl	na	
ct--12	Weights & Measures Interlock	Bl	na	
ct--13	Net-Sign Correction Enabled	Bl	na	
ct--14	Do IDNET Tare in IND780	Bl	na	
ct--15	Additive Tare Enabled	Bl	na	
ct--16	Multiplicative Tare Enabled	Bl	na	
ct--17	Sandwich Tare Enabled	Bl	na	
ct--18	Reset tare on power-up	Bl	na	0=Restart with current tare 1=Reset the tare to zero on power-up.
ct--19	Clear Tare on Zero	Bl	na	1= Clear Tare when scale is zeroed
ct--20	Reserved	Bl	na	
ct--21	Reserved	Bl	na	

Methods:

Tare is the weight of an empty container. The IND780 can mathematically eliminate this weight from the gross weight and show only the contents, or net weight. The IND780 always displays the gross, net, and tare weights using the same display resolution and units. The IND780 always has tare weight available for recall and display, and it always identifies the tare weight. A tare weight of zero is illegal.

There are several methods for capturing tare:

- Pushbutton Tare captures current weight reading as the tare weight upon operator command, at highest internal weight resolution available. There must be no motion on the scale for 3 seconds.
- Auto-Tare captures the current weight as the tare weight when the current weight exceeds the upscale threshold weight, wk--01, and the scale reaches a "no motion" state. The IND780 resets the auto-tare trigger when the weight falls below a downscale threshold, wk--02, and the scale is in an optional stable weight condition. There must be no motion on the scale for 3 seconds.

- The IND780 accepts a Keyboard Tare or a Programmable Tare at either display resolution or full internal resolution. The operator may recall tare on demand. Application specific software packages can set the Programmable Tare weight in wk--04. The IND780 rounds the Tare to the scale display resolution before using it in calculations. Canadian W&M requires keyboard tare to be entered at the scale display resolution.

Auto-Clear Tare operates in conjunction with Auto-Tare. It automatically clears the tare after the weight exceeds an upscale weight threshold, a stable reading achieved, followed by the weight returning below Auto-Clear Tare threshold, wk--03. You may also set the IND780 to automatically clear tare after the IND780 prints.

Net Sign Correction delays the decision of which weighment is the gross weight and which weighment is the tare weight until the operator prints the ticket. At that time, the IND780 compares the two weighments and takes the lower weight as the tare weight, so the net weight is always a positive value. It resolves this dilemma:

- weigh a full truck first and, after emptying the truck, take the tare weight of the empty truck to find the net weight of the contents.
- take the tare weight of an empty truck first and, after loading the truck, take the full weight of the truck to find the net weight of the contents.

When you enable the **Additive Tare** Option, the operator may enter a keyboard value that the IND780 adds to the current tare value to generate a new tare value

When you enable the **Multiplicative Tare** Option, the operator may enter a keyboard value that the IND780 uses to multiply the current tare value. The resulting product becomes the new tare value.

When you enable the **Sandwich Tare** Option, the operator may place an additional weight on the scale. The IND780 adds the additional weight to the tare weight and the net weight remains the same.

Weights & Measures Compliance

Tare Interlock, which is the only tare configuration field the Weights & Measures seal protects, enforces the following operations:

- In Europe & Australia, you may do incremental chain tares only.
- In USA, you cannot do chain tares.
- You only capture tare in first range of a multi-range or multi-interval scale.
- You must capture Power-Up zero before capturing a Tare weight.
- You may clear tare only at Gross zero.

IDNET Tare Option. The IND780 enforces taking tare through the high precision base when the Legal-for-Trade switch is ON. The Legal for Trade switch option takes precedence over the setup selection to manage IDENT Tare within the IND780 rather than within the high-precision base.

In **Multi-Interval** weighing, in Europe and Australia, you may take Pushbutton and AutoTare in any interval. In legal for trade mode, Preset Tare entries must be within the lowest interval. The IND780 generates an error message when the entry is too large. If not in legal for trade mode, Preset Tare entries may be in any interval. In the U.S. legal-for-trade mode, all tare entries must be in the lowest weighing range.

Scale Zero Setup (ZR)

Access:	"Administrator"		
Class Code:	zr	Data Type:	PC
Instances:	5	The first 4 instances are in EEPROM. The fifth instance for the Summing Scale is in BRAM.	

Attributes:

zr--00	Composite zr block	Struct	na	Composite of entire block
zr--01	Power-Up Zero Capture Pos Range	By	na	percent of capacity (0-100)
zr--02	Power-Up Zero Capture Neg Range	By	na	percent of capacity (0-100)
zr--03	Pushbutton Zero Positive Range	By	na	percent of capacity (0-100)
zr--04	Pushbutton Zero Negative Range	By	na	percent of capacity (0-100)

zr--05	Auto-Zero Maintenance Window	US	na	Number of 1/10 divisions for AZM Window. Legal values are 0 – 99 (1/10) divisions.
zr--06	Under-Zero Divisions	By	na	0-99 divisions. "99" disables the under-zero display.
zr--07	Pushbutton Zero	By	na	0=disabled, 1=enabled
zr--08	Auto-Zero in Gross Mode	By	na	0=disabled, 1=enabled
zr--09	Auto-Zero in Gross & Net Mode	By	na	0=disabled, 1=enabled
zr--10	Zero-Indication in Gross Mode	By	na	0=disabled, 1=enabled
zr--11	Zero-Indication in Gross&Net Mode	By	na	0=disabled, 1=enabled
zr--12	Reset to Calibrated 0 on Power-Up	BI	na	0=restart with current zero 1=reset to calibrated zero
zr--99	EEPROM Block Checksum	US	na	

Methods:

Zero is the interval between –0.5d and +0.5d, where "d" is a division or display increment.

Center of Zero is the interval between –0.25d and +0.25d in most market regions. In Canada, Center of Zero is the interval between -0.20d and +0.20d. Center of Zero is a Boolean system output, TRUE when the display reading is in the center of zero range. IND780 evaluates Center of Zero at each new weight update. Metrology regulations usually require that the scale must show a Center of Zero status indication to the user at the primary weight display. Some jurisdictions require that the indication be present only while in gross weight mode, others require it in both gross and net mode.

When the service technician calibrates the scale, the IND780 records the Calibrated Zero reading internally. The IND780 also maintains a separate Current Zero reading that compensates for conditions that may change the scale so that it no longer indicates zero when the platform is empty. Such conditions include thermal effects and the accumulation of matter on the scale. The Center of Zero output is an indication of the quality of the Current Zero. There are several methods available to establish a new Current Zero reading. In each case, there are limits applied to the acceptance of this command by the scale.

On system power up, the IND780 automatically attempts to establish a new Current Zero. The Power-up- Zero logic establishes a Current Zero when the present scale reading is stable and falls within the allowed tolerance from Calibrated Zero. This Power-up-Zero tolerance is the percentage of the scale capacity, specified for (+) and (–) tolerance limits. The service technician can disable Power-up-Zero.

Either the operator or a remote device can also attempt a Pushbutton Zero command. This command succeeds if the scale reading is stable and falls within its allowed tolerance from the Calibrated Zero. The Pushbutton Zero tolerance limits are a percentage of scale capacity, specified for (+) and (–) tolerance limits. The service technician can disable Pushbutton Zero.

The IND780 also provides **Automatic Zero Maintenance** or AZM. Within the AZM operating range, the IND780 makes small adjustments to the Current Zero reading to drive the weight reading toward true numeric zero. This feature operates only within a small range around true zero. The AZM moves toward zero at a rate of correction (correction amount per unit time) of 0.07 increments per second. "zr--05" configures the operating range of this feature in number of scale increments. Setting "zr--05" to 0 disables Automatic Zero Maintenance.

Under-Zero Divisions are the maximum number of display increments below zero that the scale will operate. When the weight falls below the Under-Zero Divisions, the weight display shows only an error display, the Under Zero logical status output is TRUE, and IND780 indicates that the weight transmitted is invalid. Setting the Under-Zero Divisions to 99 disables the under-zero check.

IDNET Power-Up Restart sets the power up operation of the IDNET base. When Restart = disabled, the IND780/high precision base clears the current tare and enforces a re-zeroing of the base after a restart of the base. When Restart = enabled, the IND780 terminal/high precision base preserves the current zero and tare values after a restart of the base.

The IND780 protects the Zero Configuration Settings when the Weights and Measures seal is in place.

Scale Totalization Process Data (TZ)

Access:	"Supervisor"		
Class Code:	tz	Data Type:	PP
Instances:	5		

Attributes:

tz--00	Composite tz block	Struct	na	Composite of entire block
tz--01	Grand Total Weight	D	na	Grand Total Weight
tz--02	Grand Total Transaction Counter	UL	na	Grand Total Transaction Counter
tz--03	Subtotal Weight	D	na	Subtotal Weight
tz--04	Subtotal Transaction Counter	UL	na	Subtotal Transaction Counter
tz--05	Sequential Number	UL	na	Scale Transaction Counter maintained separately for each scale (similar function to TERMINAL Consecutive Number)
tz--06	Reserved	D	na	
tz--07	Reserved	UL	na	

Method:

Each time a demand print transaction occurs, the IND780 adds the weight value to the totalization for each scale, according to the setup selections in the TS block. The IND780 saves totals in primary units only.

The Sequential Number is a Transaction Number that the IND780 keeps separately for each scale.

Totalization Setup (TS)

Access:	"Supervisor" ts--01, ts--02, ts--03, ts--04, and ts--05 have "Maintenance" access level.		
Class Code:	ts	Data Type:	PS
Instances:	5 One per scale.		

Attributes:

ts--00	Composite ts block	Struct	na	Composite of entire block
ts--01	Grand Total Enable	By	na	Automatically add Demand Print weight to Grand Total weight: 0=no 1=Gross Weight 2 = Net Weight.
ts--02	Clear Grand Total on Totals Print	BI	na	0=no, 1=Clear the Grand Total after printing the Grand Totals.
ts--03	Subtotal Enable	By	na	Automatically add Demand Print weight to Subtotal weight: 0=no 1=Gross Weight 2 = Net Weight.
ts--04	Clear Subtotal on Totals Print	BI	na	0=no, 1=Clear the Subtotal after printing the Subtotals.
ts--05	Units for Adding to Totals	By	na	Only add Demand Print weight to totals under the following conditions: 0 = Printing weight in Primary Units Only 1 = Printing weight in Secondary Units Only 2 = Printing weight in any units. The IND780 stores totals in primary units only so it may have to make a weight conversion.
ts--06	Enable Sequential Number	By	na	0=no, 1 = yes
ts--07	Sequential Number Preset Enable	BI	na	0=no, 1=yes
ts--08	Sequential Number Preset	L	na	Preset value to reset the sequential counter

ts--09	Sequential Number Reset Enable	Bl	na	0=no, 1=yes
ts--10	Reserved	L	na	
ts--11	Reserved	Bl	na	

Method:

Each time a demand print transaction occurs, the IND780 adds the weight value to the totalization for each scale, according to the setup selections in this block. The IND780 saves totals in primary units only.

Scale Grand Totals, SubTotals, and Sequential Numbers are stored in the TZ block in process data.

The Sequential Number is a Transaction Number that the IND780 keeps separately for each scale.

System Process Data (XT)

Access:	"Read Only" access, level is not customizable.		
Class Code:	xt	Data Type:	PP
ControlNet Class Code:	7C hex		
Instances:	1		

Attributes:

xt0100	Composite xt block	Struct	na	Composite of entire block
xt0101	Currently Selected Scale	By	rt	RST maintains this field
xt0102	Currently Selected Flow Meter	By	rt	RST maintains this field
xt0103	Currently Selected Node	By	rt	RST maintains this field
xt0104	Reserved	US	rt	
xt0105	Reserved	US	rt	
xt0106	Reserved	D	rt	
xt0107	Reserved	D	rt	
xt0108	Reserved	S40	rt	
xt0109	Reserved	S40	rt	

Calibration and Monitoring

Calibration Parameters (QP)

Access:	"Operator"		
Class Code:	qp	Data Type:	D
Instances:	1, referring to the Selected Scale		

Attributes:

qp0100	Composite qp block	Struct	na	Composite of entire block
qp0101	Primary Units Type	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons, 6=troy ounces, 7=pennyweights, 8=ounces
qp0102	Secondary Units Type	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons, 6=troy ounces, 7=pennyweights, 8=ounces, 9=custom units
qp0103	Cal Units	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons
qp0104	Number Ranges	By	na	
qp0105	Low Increment Size	D	na	
qp0106	Mid Increment Size	D	na	
qp0107	High Increment Size	D	na	
qp0108	Low Mid Threshold	D	na	
qp0109	Mid Hi Threshold	D	na	
qp0110	Scale Capacity	D	na	

qp0111	Number UpScale test points	By	na	1, 2, 3, or 4
qp0112	Low Cal Weight	D	na	for 3 or 4 Upscale test points
qp0113	Mid Cal Weight;	D	na	for 2, 3 or 4 Upscale test points
qp0114	High Cal Weight	D	na	for 1, 2, 3, or 4 Upscale test points
qp0115	CALFREE Load Cell Capacity	D	na	Load Cell Sensor Capacity, e.g., 5000 kg
qp0116	CALFREE Load Cell Capacity Units	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons
qp0117	CALFREE Rated Load Cell Output	D	na	Sensor output at the rated capacity, e.g., 2.0 mV/V
qp0118	CALFREE Gain Jumper	By	na	2=default 2mv/V, 3=3mV/V
qp0119	CALFREE Estimated Preload	D	na	Estimated preload is optional. If entered, the system can check for saturation of the A/D input.
qp0120	CALFREE Estimated Preload Units	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons. 0=No estimated preload
qp0121	XLow Cal Weight	D	na	for 4 Upscale test points
qp0122	Number of POWERCELLs	By	na	
qp0123	Shift adjust mode	By	na	0 = cell, 1 = pair
qp0124	CALFREE Gravity Geo Code	By	na	Gravity "Geo" code of factory that calibrated load cell. Value is 0 – 31.

Method:

Application must set these user-entered calibration parameters to begin scale calibration.

Cell Calibration (CC)

Access:	"Read Only" access level is not customizable.		
Class Code:	cc	Data Type:	PC
ControlNet Class Code:	74 hex		
Instances:	4		

Attributes:

cc--00	Composite cc block	Struct	na	Composite of entire block
cc--01	Calibrated Zero Counts 1 – 24	AL24	na	Contains one long integer for each cell.
cc--02	Calibrated Span Counts 1 – 24	AL24	na	Contains one long integer for each cell.
cc--99	EEPROM Block Checksum	US	na	

Method:

This block records the zero and span counts for individual cells during calibration. Scale Monitoring uses these values for validating the health of a POWERCELL Scale.

Scale Calibration (CE)

Access:	"Administrator"
Class Code:	ce Data Type: PC
ControlNet Class Code:	72 hex
Instances:	5
	The first 4 instances are in EEPROM. The fifth instance for the Summing Scale is in BRAM

Attributes:

ce--00	Composite ce block	Struct	na	Composite of entire block	
ce--01	Address of First Load Cell	By	na	For POWERCELL Scale	
ce--02	Number Load Cells	By	na	For POWERCELL Scale	
ce--03	Primary Units	By	na	0=none 1=pounds 2=kilograms 3=grams 4=metric tons	5=tons 6=troy ounces 7=penny weights 8=ounces.
Multi-Ranging Parameters					
ce--04	Number Ranges	By	na	1, 2, or 3	
ce--05	Low Range Increment Size	D	na	Increment size is in Calibration units	
ce--06	Mid Range Increment Size	D	na	Multi-ranging parameters are in Cal units	
ce--07	High Range Increment Size	D	na	"	
ce--08	Low-Mid Range Threshold	D	na	"	
ce--09	Mid-High Range Threshold	D	na	"	
ce--10	Scale Capacity	D	na	Scale capacity is in Calibration units	
ce--11	Secondary Units	By	na	0=none 1=pounds 2=kilograms 3=grams 4=metric tons	5=tons 6=troy ounces 7=penny weights 8=ounces 9=custom units.
Calibration Parameters					
ce--19	Calibration Units	By	na	0=none 1=pounds 2=kilograms	3=grams 4=metric tons 5=tons
AccessTable					
ce--20	Zero Calibration Counts	L	na	Zero calibration point for all scales	
ce--21	High Calibration Counts	L	na	High calibration point for all calibrated scale	
ce--22	High Calibration Weight	D	na	bases. Weight is in calibration units.	
First Point of Calibration for Non-Linearity					
ce--23	Mid Calibration Counts	L	na	Calibration point for non-linear scale bases	
ce--24	Mid Calibration Weight	D	na	with 1, 2, or 3 points of non-linearity. Weight is in calibration units.	

ce--25	Calibration Gravity "Geo" Code	By	na	Value 0 – 31 This value represents the gravitational acceleration depending on the latitude and altitude of the specific location where you last calibrated the IND780. The IND780 uses it to adjust the calculated weight value when you calibrate the IND780 in one location and operate it in a different region of the world. Any value other than 0-31 disables this feature.
ce--26	Motion Stability Sensitivity	US	na	Sensitivity in tenths of divisions
ce--27	Motion Stability Time Period	US	na	Time in tenths of seconds
ce--29	Zero Adjust Calibration Counter	By	na	Zero Adjust Calibration counter
ce--30	Span Adjust Calibration Counter	By	na	Span Adjust Calibration counter
ce--32	Over Capacity Divisions	By	na	Refer to ce--34
ce--33	# of upscale test points	By	na	1, 2, 3, or 4. Typically, there is only one upscale calibration point. For non-linear scale bases, two additional calibration points can help correct for the non-linearity. You may also use these additional "non-linearity" points to see more weight resolution in the higher ranges of a multi-ranging scale.
ce--34	Over Capacity Blanking	Bl	na	0 = Blank scale display when weight exceeds scale capacity by 5 weight divisions. 1 = Blank the scale display when weight exceeds the capacity of the scale plus the over capacity divisions stored in ce--34.
ce--36	Shift Adjust Mode	By	na	0=cell, 1=pair For POWERCELL scales, shift-adjustment corrects for differences in the weight loading on different load cells or pairs of load cells.
ce--37	Last Calibration Date & Time	AL2	na	In 100 nanoseconds intervals since 1601
ce--38	Base Serial Number	ABy14	na	Serial Number of Scale Base
Second Point of Calibration for Non-Linearity				
ce--39	Low Calibration Counts	L	na	Additional Calibration point for non-linear
ce--40	Low Calibration Weight	D	na	scale bases with 2 or 3 points of non-linearity. Weight is in calibration units.
CALFREE Calibration Parameters				
ce--41	Use CALFREE Calibration	Bl	na	0 = no, 1 = yes
ce--42	CALFREE Load Cell Capacity	D	na	Load Cell Sensor Capacity, e.g., 5000 kg
ce--43	CALFREE Load Cell Capacity Units	By	na	1=pounds 2=kilograms 3=grams 4=metric tons 5=tons
ce--44	CALFREE Rated Load Cell Output	D	na	Sensor output at the rated capacity weight, in mV/V, e.g. 2.0 mv/V
ce--45	ALC Board Gain Jumper Setting	By	na	2=default 2mv/V, 3=3mV/V
ce--46	CALFREE Estimated Preload	D	na	Estimated preload is optional. If entered, the system can check for saturation of the A/D input.
ce--47	CALFREE Estimated Preload Units	By	na	1=pounds 2=kilograms 3=grams 4=metric tons 5=tons
ce--48	CALFREE Gravity "Geo" Code	By	na	Gravity "Geo" code of factory that calibrated load cell. Value is 0 – 31.

Third Point of Calibration for Non-Linearity

ce--50	XLow Calibration Counts	L	na	Additional Calibration point for non-linear
ce--51	XLow Calibration Weight	D	na	scale bases with 3 points of non-linearity. Weight is in calibration units.
ce--60	Valid Board Calibration	By	na	1 = ALC Board had valid board calibration during last scale calibration. If RST subsequently detects an invalid board calibration, RST will alert operator to a scale error.
ce--61	Reserved	L	na	
ce--62	Reserved	D	na	
ce--99	EEPROM Block Checksum	US	na	

Methods:

Motion/Stability is a measure of whether the weight has settled on the scale. Metrology regulations generally prohibit a weighing system from recording a measurement before the system has settled. The RST uses the Scale Motion/Stability status as an interlock for triggering a Pushbutton Tare command or for triggering a Print command. The IND780 examines the weight readings over a period of time to determine Motion/Stability of a scale. The weight readings over a chosen interval of time T must not differ from one another by more than the tolerance value V. The Service Technician can set the level for motion detection.

Over-Capacity Divisions are the number of display increments beyond the nominal scale capacity that the scale will operate. When the weight display exceeds the Over-Capacity Divisions, the weight display shows only an error display, the Over-Capacity logical status output is TRUE, and IND780 indicates that the weight transmitted is invalid. The Service Technician cannot disable the Over-Capacity checking.

The **Units of Measure** that the IND780 fully supports are:

- MKS – metric tons (t), kilograms (kg), grams (g)
- Avoirdupois – tons (ton), pounds (lb)
- troy ounces (toz), pennyweights (dwt), ounces (oz), custom units as secondary units only

The IND780 uses these fully supported units, as follows:

- Calibration Units define the units of calibration test weights.
- Primary Units are the preferred units of measure.
- Secondary Units are the alternate units when using units switching function. The IND780 can also display the Secondary units on the main display

With **Multiple Range** weighing, there can be up to three weighing ranges and each has a threshold. Each weighing range extends from zero to its range threshold. Each range has an associated increment size. The increment size and threshold value are larger for each successive weighing range from the lowest to highest ranges. The difference between the largest and smallest increment size is at most one decimal place. You manually set the increment sizes and thresholds in setup.

The IND780 only supports automatic selection of the "current weighing range". When weight is increasing, the current weighing range proceeds from the lower range to the next higher range once the weight exceeds the range threshold. Switchover to the next higher range occurs at the range threshold. When weight is decreasing, the current weighing range returns from the current weighing range to the lowest range only when the weight falls within half-a-division of zero.

The IND780 weight display must clearly indicate the current weighing range. The terminal indicates weighing ranges 1, 2, and 3 respectively. The terminal maintains the same decimal point position in the Displayed Weight even when the current weighing range changes. There is at most one trailing, non-significant "0". When right of the decimal point, the non-significant "0" must be in the third place to the right of the decimal point. You may take a Tare in any weighing range. The Displayed Weight and Printed Weight are always the same.

In Gross Mode, the IND780 determines the current weighing range by comparing the Fine Gross Weight to the range thresholds. If scale is within half-a-division of zero, the terminal returns to the lowest weighing range as the current weighing range. The IND780 calculates the Displayed Gross Weight by rounding the Fine Gross Weight to the nearest weight increment for the current weighing range.

In Net Mode, the terminal determines current weighing range by comparing the Fine Gross Weight to the range thresholds. If the scale is within half-a-division of zero for gross mode: the terminal returns to the lowest weighing range as the current weighing range. The IND780 terminal calculates the Displayed Net Weight by rounding the Fine Net Weight to the nearest weight increment for the current weighing range. The IND780 calculates the Displayed Tare Weight by rounding the Fine Tare Weight to the nearest weight increment for the current weighing range. Displayed Gross Weight = Displayed Tare Weight + Displayed Net Weight.

Multi-Interval weighing rules only apply when the scale base is a high precision base. There can be up to three weighing intervals. Each weighing interval has a threshold. Each weighing interval extends from the threshold of the next lower interval to its threshold. Each interval has an associated increment size. The increment size and threshold value are larger for each successive weighing

interval from the lowest to highest intervals. The high precision base sets the increment sizes and thresholds. The terminal only supports automatic selection of the "current weighing interval". The IND780 display must clearly display the current weighing range. Displayed Weight and Printed Weight are always the same.

In Gross Mode, the IND780 determines the current weighing interval by comparing the Fine Gross Weight to the interval thresholds. The terminal calculates the Displayed Gross Weight by rounding the Fine Gross Weight to the nearest weight increment for the current weighing interval.

In Net Mode, the IND780 determines the "net weight current weighing interval" by comparing the Fine Net Weight to the interval thresholds. It calculates the Displayed Net Weight by rounding the Fine Net Weight to the nearest weight increment for the "net weight current weighing interval". The terminal determines the "tare weight current weighing interval" by comparing the Fine Tare Weight to the interval thresholds. It calculates the Displayed Tare Weight by rounding the Fine Net Weight to the nearest weight increment for the "tare weight current weighing interval". Displayed Gross Weight = Displayed Tare Weight + Displayed Net Weight.

Weights & Measures Compliance

Automatic Multi-Ranging is not compliant with the U.S. and Canadian regulations for Legal for Trade operation.

Calibration

The IND780 supports seven modes of scale calibration. These are:

1. Standard, Two-Point Linear Calibration is the standard mode for calibrating the large majority of scales. You measure the scale counts at the zero weight and at a span weight of the scale.
2. Three Point Calibration enables calibration of a scale with one intermediate point of non-linearity.
3. Four Point Calibration enables calibration of a scale with two intermediate points of scale non-linearity.
4. Five Point Calibration enables calibration of a scale with three intermediate points of scale non-linearity.
5. Calculated Calibartion measures to zero weight of the scale and calculates the span value of the scale based on the weighing parameters of the load cell and the analog A-to-D circuitry.
6. Zero Adjust Calibration adjusts only the zero value of the scale. It is valid for use with all modes of calibration.
7. Span Adjust Calibration adjusts only the span value of the scale in a standard, two-point linear calibration.

Calculated Calibration for Analog Load Cell Weighing Systems

Calibration using test weights is difficult or even impossible for large tank or hopper scales used in process weighing applications. Establishing a zero balance is easy, but it is frequently difficult to place a significant amount of calibrated test load on the scale. Service technicians routinely calibrate such scales in the field with test loads of less than 5% of scale capacity. Then, they use a "step test" using water or some other cheap material as a rough check of linearity performance. This type of span calibration is often less accurate than a mathematically calculated field calibration. When service technicians cannot apply test weights to a tank scale, they must use calculated field calibration as the only recourse.

Method. Calculated calibration requires that both the sensor(s) and the A/D converter be independently calibrated and their output gains known. As an added benefit, if the factory calibrates both the A/D converter and sensors with sufficient accuracy, service technicians can replace either device in the field with another device of the same type without performing a new field calibration.

The factory must calibrate the A/D converter to a common and known gain and offset for all devices of its type. The factory calibrates all IND780 Terminal A/D converters at two points:

Load Cell Input	Terminal Output
0 mV/V	0 counts
2 mV/V	1,000,000 counts

After factory calibration, all such devices have an A/D gain = 500,000 counts / mV/V. The factory must calibrate the A/D converter for each jumper setting of 2 mv/V and 3 mv/V. Refer to "bc" block definition.

The second requirement is that the factory calibrates the sensor device(s) and publishes the output gain. We express the load cell sensor gain as electrical output in mV/V at the rated mechanical input, typically in units of mass in pounds or kilograms. When you mount multiple identical load cells mechanically in parallel, the total sensor gain is the same as the gain for any one cell. This is typical for most multi-cell scales.

Example: The customer constructs a hopper scale using three load cells, each rated at 2 mV/V output, 10,000 lb capacity. The service technical usually trims the load cells for zero output balance at no load, so:

Sensor gain = electrical output / mechanical input

= (0.0002 mV/V) / lb

Finally, the service technician must know the desired system capacity and units of measure.

Example: The desired system capacity is 5,000 kg.

System gain = (A/D gain) x (Sensor gain) x (Units Conversion)

= 500,000 counts/mV/V x 0.0002 mV/V/lb x 2.20462 lb/kg

= 220.462 counts/kg

While performing this computation, also the IND780 can also check for A/D saturation at full capacity. In order to perform this test, the service technician must provide the excitation voltage and an estimated preload weight. In actual operation, the weighing indicator replaces the estimated preload with an accurate field zero adjustment.

The IND780 excitation voltage is 10V. Assume that the hopper preload is 4500 kg. Very large preloads are common in process weighing.

Full output = (preload + capacity) x (Sensor gain) x (Units Conversion) x (excitation voltage)

= 9,500 kg x 2.20462 lb/kg x 0.0002 mV/V/lb x 10V

= 41.9 mV

IND780 will accept ~21 mV before saturation. This scale will not work properly for loads above 10% capacity!

Shortcomings and Warnings. In some cases computed calibration is ineffective or can operate in undesired ways:

1. If the A/D converter provides multiple field selectable gain settings, such as a jumper to select 2mV/V or 3 mV/V load cells, the service technician must know the actual field gain selection. The weighing indicator must account for the differences in the calculations. Further, since such gain adjustment is not perfect, the factory must calibrate the A/D converter for each setting.
2. Some junction boxes include potentiometers in each load cell's excitation or output wiring to allow field adjustment for corner errors. Since these resisters destroy all hope for accurate computed calibration, the service technician must disable them. There is little point to corner shift adjustment capability if the service technician cannot place test loads on the scale.
3. A barrier device placed in the load cell wiring will usually cause severe gain and offset changes. For example, this often occurs when the load receiver is in a hazardous area. If the barrier is well characterized, we can include these factors in the calculations. However, since this is almost never the case, we must revert to revert to field calibration with test loads.
4. Since A/D factory calibration is numeric only, results are highly accurate and repeatable. System accuracy remains virtually unaffected when swapping like A/D devices in the field without field calibration. Load cell calibration is analog in nature and difficult to perform with perfect accuracy. Maintaining system accuracy is correspondingly less certain when the service technician replaces a load cell. You must consult the vendor specifications for load cell trim to determine the system accuracy impact.

The IND780 protects the Calibration Settings when the Weights and Measures seal is in place.

Cell Shift Adjust (CX)

Access:	"Maintenance"		
Class Code:	cx	Data Type:	PC
ControlNet Class Code	73 hex		
Instances:	4		

Attributes:

cx--00	Composite cx block			
cx--01	Shift Constants 1 – 24	AL24	na	Contains one normalized long integer for each cell.
cx--99	EEPROM Block Checksum	US	na	

Method:

The RST calculates the shift constants during the Shift Adjustment of a POWERCELL Scale, by solving a set of simultaneous equations. The Power Scale board multiplies a shift adjustment factor to the raw counts for each cell on each weighment. The shift adjustment accounts for differences between individual cells in reporting weight when the same load is applied to the different cells. The RST uses the shift adjustment factor as a floating point number. When storing the shift adjustment factor as a LONG in Shared Data, the RST multiplies the floating point value by 1000000Hex.

POWERCELL Network Dynamic Data (PW)

Access:	"Read Only." Access level is not customizable.
Class Code:	pw Data Type: D
ControlNet Class Code:	71 hex
Instances:	1

Attributes:

pw0100	Composite pw block	Struct	na	Composite of entire block
pw0101	POWERCELL Scan Table	ABy 24	na	Ordered list of POWERCELL addresses used in polling the POWERCELLs.
pw0102	POWERCELL Cell Counts	AL24	rt	Array of longs containing the current shift-adjusted counts for each cell. The TERMINAL updates the field approximately every 5 seconds or the application can command an immediate update.
pw0103	POWERCELL Overload State	ABy 24	na	There is one entry each for up to 24 POWERCELLs. 0 = Cell not assigned 1 = Cell OK 2 = Cell in Overload condition.
pw0104	POWERCELL Zero Drift State	ABy 24	na	There is one entry each for up to 24 POWERCELLs. 0 = Cell not assigned 1 = Cell OK 2 = Cell in Zero-Drift-Threshold-Exceeded state.
pw0105	POWERCELL Error Status	ABy 24	na	There is one entry each for up to 24 POWERCELLs. It contains the last error status for each cell.

Method:

The Resident Scale Task automatically updates the POWERCELL Counts every 5 seconds. The application can issue a command trigger to cause an immediate update.

The Scale Monitoring in the Resident Scale Task maintains the overload state and zero drift state for the individual POWERCELLs.

POWERCELL Monitoring Process Data (PC)

Access:	"Read Only" access level is not customizable.
Class Code:	pc Data Type: PP
Instances:	1

Attributes:

pc0100	Composite pc block	Struct	na	Composite of entire block
pc0101	Number IO Errors - Cell 1-24	AL24	na	Total counts for each POWERCELL.
pc0102	Current Zero Counts - Cell 1-24	AL24	na	
pc0103	Number Cell Overloads - Cell 1-24	AL24	na	
pc0104	Num Symmetry Failures - Cell 1-24	AL24	na	
pc0105	Num Zero Drift Failures - Cell 1-24	AL24	na	

Method:

Scale Monitoring counts the number of events for each individual POWERCELL. The Service Technician can display these counts to help isolate problems with individual cells.

Scale Monitoring & Service Data (WM)

Access:	"Read Only," access level is not customizable.		
Class Code:	wm	Data Type:	PP
Instances:	5		

Attributes:

wm--00	Composite wm block	Struct	na	Composite of entire block
wm--01	Last Scale Error	S40	na	Date, time & text describing last scale error Factory reset value is "----".
wm--02	Number Scale IO Errors	UL	na	
wm--03	Num Transactions since Calibration	UL	na	
wm--04	Number of Platform Overloads	UL	na	
wm--05	Total Accumulated Weight	D	na	Total Accumulated transaction weight since calibration, when weighment monitoring is on
wm--06	Number of Zero Commands OK	UL	na	Number of Zero Commands Successes
wm--07	Number of Zero Command Failures	UL	na	Number of Zeor Command Failures
wm--08	Current Symmetry Monitoring State	By	na	Power Cell Symmetry Monitoring reports its current state in this field for Power Cell scales only: o If the user has enabled both Run Flat and Symmetry Checking, Symmetry Monitoring can report all possible states. o If the user has disabled Run Flat but enabled Symmetry Checking, the Symmetry Monitoring only reports states 0, 3, 4, and 6. o If the user has disabled both Run Flat and Symmetry Monitoring, Symmetry Monitoring only reports states 0 and 4. o Symmetry Monitoring only reports a single failure. If there are multiple failures, Symmetry Monitoring only reports the first failure that it detects. o These are the possible states: 0=No Failure detected 1= Estimate-able Symmetry Failure 2= Estimate-able Comm Failure 3= UnCorrectable Symmetry Failure 4= UnCorrectable Comm Failure 5= Estimate-able Zero Drift Failure 6= UnCorrectable Zero Drift Failure
wm--09	Run Flat Detected Bad Cell	By	na	POWERCELL that was detected bad in symmetry check. If run flat is enabled, this cell is replaced using weight counts from replacement cell (0-23).
wm--10	Run Flat Replacement Cell	By	na	POWERCELL that is used as replacement cell in run flat operation (0-23).
wm--11	Calibration Check Failure	By	na	0 = None 1 = Latest calibration check failed 2 = Latest cal test passed 3 = latest cal test failed & has been reported in Maintenance log 4 = latest cal test passed & has been reported in Maintenance log
wm--12	Number of Platform Underloads	UL	na	
wm--13	Scale Accumulation Total	D	na	Transaction Weight Accumulation Total for Scale Base.
wm--14	Reserved	D	na	Reserved
wm--15	Scale Transaction Total	UL	na	Total Number of Print Transactions for Scale Base.
wm--16	Total Number of Weighments	UL	na	Total Number of Weighments

wm--17	Scale Transaction Days Total	UL	na	Total Number of Days when the Scale Base ran at least one Print Transaction.
wm--18	Transaction Days Subtotal	UL	na	Subtotal Number of Days when the IND780 ran at least one Transaction.
wm--19	Last Transaction Day	AL2	na	Last Day that Scale Base ran at least one Transaction.
wm--20	Total Transactions Per Day	AL7	na	Total Number of Print Transactions in each of the last 7 days when the Scale Base ran at least one Transaction.
wm--21	Transaction Day Pointer	By	na	Pointer to the next Transaction day entry that the IND780 will update, 1-7.
wm--22	Last Usage Cycle Day	AL2	na	Last Day that Scale Base ran at least one Usage Cycle.
wm--23	Usage Cycles Per Day	AL7	na	Usage Cycle counter It contains the number of times that the scale base exceeds 1% of the capacity of the base in each of the last 7 days when the Scale Base had at least one cycle.
wm--24	Usage Cycle Day Pointer	By	na	Pointer to the next usage cycle day entry that the IND780 will update, 1-7.
wm--25	Average Peak Load	D	na	Running average of daily peak loading IND780 stores value in primary scale weight.
wm--26	Usage Time Counter	UL	na	Cumulative Usage Time counter in minutes; It contains the cumulative minutes that the scale base weight is above 1% of the scale capacity.
wm--27	Peak Load Per Day	D	na	Peak Load on the Scale Base for each of the last 7 days when the Scale Base ran at least one Usage Cycle. IND780 stores values in primary scale weight.
wm--28	Peak Load Per Day	D	na	
wm--29	Peak Load Per Day	D	na	
wm--30	Peak Load Per Day	D	na	
wm--31	Peak Load Per Day	D	na	
wm--32	Peak Load Per Day	D	na	
wm--33	Peak Load Per Day	D	na	
wm--34	Peak Load Since Master Reset	D	na	Peak load on scale since last Master Reset
wm--35	Reserved	D	na	Reserved
wm--36	Reserved	UL	na	Reserved
wm--37	Reserved	UL	na	Reserved
wm--38	Cal Days Expiration Logged	US	na	0 = No, 1 = Yes "Calibration Days" Expiration Logged in Monitor Log.
wm--39	Cal Weighments Expiration Logged	US	na	0 = No, 1 = Yes "Number of Weighments since Calibration" Expiration Logged in Monitor Log
wm--40	Reserved	D	na	Reserved

Method:

The Scale Monitor counts significant processing events and errors for each scale platform. The Scale Monitoring Setup Block, cm, defines what events the Scale Monitor watches.

The FTP Shared Data transfer saves these usage counters but does not restore them.

Scale Monitoring Setup (CM)

Access:	"Maintenance"		
Class Code:	cm	Data Type:	PS
Instances:	5		

Attributes:

cm--00	Composite cm block	Struct	na	Composite of entire block
cm--01	Next Scheduled Calibration Date	AL2	na	In 100 nanoseconds intervals since 1601

cm--02	Last Calibration/Service Date	AL2	na	In 100 nanoseconds intervals since 1601. For Analog, POWERCELLs, and SICS scales, this is the last calibration or calibration test date. For IDNet and DigiNet bases, this is the last date to enter service mode or last calibration test date.	
cm--03	Calibration Interval in Days	US	na	Max number of days between calibrations	
cm--04	Calibration Interval in Weighments	L	na	Number of weighments between calibrations	
cm--05	Calibration Check Tolerance	D	na	Weight tolerance in primary units	
cm--06	Number Calibration Check-Points	By	na	Number of calibration check points	
cm--07	Cal Expired Announcement	By	na	1= log only 2=disable scale & alarm	3=email alert & alarm 4=alarm only
cm--08	Cal Check Failed Announcement	By	na	1= log only 2=disable scale & alarm	3=email alert & alarm 4=alarm only
cm--09	Monitor Cell Overloads	By	na	0=No, 1=Count, 2=Count and Log	
cm--10	Monitor Platform Overload	By	na	0=No, 1=Count, 2=Count and Log	
cm--11	Monitor Platform Underload	By	na	0=No, 1=Count, 2=Count and Log	
cm--12	Monitor Weighments	By	na	0=No, 1=Count, 2=Count and Log	
cm--13	Monitor Zero Commands	By	na	0=No, 1=Count, 2=Count and Log	
cm--14	Monitor Zero Command Failures	By	na	0=No, 1=Count, 2=Count and Log	
cm--15	Monitor Scale IO Errors	By	na	0=No, 1=Count, 2=Count and Log	
cm--16	Cell Overload Threshold	D	na	Cell overload threshold in units in cm--17, including preload	
cm--17	Cell Overload Units	By	na	1=counts, 2=primary units, 3=estimated internally in primary units	
cm--23	Cell Symmetry Check	By	na	0=Off, 1=Count, 2=Count & Log	
cm--24	Cell Zero Drift Check	By	na	0=Off, 1=Count, 2=Count & Log	
cm--25	Cell Zero Drift Check Threshold	D	na	Zero drift threshold in percent of span	
cm--26	Cell Symmetry Type	D	na	0=No, 1=Radial, 2=Axial	
cm--27	Cell Symmetry Threshold	D	na	Percent difference (0-99) between symmetric cells that triggers symmetry error.	
cm--28	Predictive Failure Announcement	By	na	1= log only 2=disable scale & alarm 3=email alert & alarm 4=alarm only	
cm--29	Run Flat This Specific Cell	By	na	Use run flat on this specific cell. Allows user to specify a known bad cell for run-flatting.	
cm--30	Enable Run Flat Weight Estimation	BI	na	0=No, 1=Yes	
cm--31	Threshold to begin Symmetry Chek	US	na	% of scale capacity to begin symmetry check	
cm--32	Span Adjust for Radial Symmetry	By	na	Span-Adjust State for Radial Symmetry checking: 0 = Span-Adjust needs to be done to activate radial symmetry checking. 1 = Span-Adjust has been performed, cell percent loading is now being stored. 2 = Cell percent loading has been stored. N = all other values default to 0 above.	
cm--33	Reserved	US	na		
cm--34	Reserved	By	na		
cm--35	Reserved	D	na		

Methods:

Calibration Checking. The IND780 can enforce Calibration Checking within a certain interval. The Service Technician specifies the interval either in number of days or weighments. Calibration Checking helps the Service Technician test and certify the accuracy of

the scale. The scale must weigh test weights within a specified tolerance in the specified number of locations on the scale platform. The Service Technician can certify the scale "as found" if he knows that the scale is weighing accurately. The IND780 prints a receipt of the Calibration Check procedure, and saves the results in the Calibration Check Log. The IND780 can disable the scale, issue a local alert, or email a general alert when the calibration check fails.

Scale Monitoring. The IND780 can monitor the usage of a scale and record statistics of its use. The Service Technician can set the IND780 to record every occurrence in the Monitor Log File or simply to keep a count of the specific usages. The Monitor Log is a circular file that records the latest occurrences. These records can give the Service Technician knowledge about the health of the scale system. The IND780 can record the weighments, the errors, the zero attempts, and the overloads.

Predictive Failure. The IND780 can automatically confirm the fitness of the load cells in POWERCELL scales. To do this, it compares the current load cell readings to the readings established when the Scale Technician last calibrated the scale. A significant shift in the load cell output may indicate either current or impending load cell failure. The IND780 has selectable levels of alerting the scale operator or scale technician when it detects a potential fault. The IND780 Display and Web Pages enable you to view the zero, span, and current counts for individual cells attached to the IND780 indicator.

Cell Zero-Drift Checking. If a scale periodically returns to zero, the IND780 automatically tests the individual load cell readings when the scale is at zero. If the current zero reading does not match the calibrated zero values within a tolerance, it is likely there is a fault condition. However, the IND780 cannot verify zero for many scales. For example, hopper scales may accumulate material on the hopper surfaces; In storage tanks, the scale may never be at zero.

Cell Symmetry Checking. If a POWERCELL Scale has individual load cells arranged in a logical symmetry, the Scale Monitoring can periodically cross-check the fitness of the individual load cells. The IND780 determines the likely reading for an individual cell by using the readings from one or more cells that are symmetrical to it. If the readings do not match within a tolerance, a fault condition is likely. Here are the possible types of symmetry:

- Left-right symmetry. A railroad track scale or vehicle scale is an example of left-right pair symmetry. The scale has two or more pairs of load cells. Since each cell of a pair usually sees the same loading pattern, the Scale Monitoring can cross-check individual readings from the pair.
- Radial symmetry. Cylindrical tank or hopper scales often have identical net weight loading on all load cells, though they may have an off center dead load due to the mounting of the discharge feeder machinery. This symmetry is especially strong if the scale is weighing liquid or powder materials. The IND780 can cross check-readings from all the individual cells. The user must perform a Span-Adjust with a load to enable the radial symmetry checking. The load should be at least 10% of the tank capacity. The Span-Adjust enables the Radial Symmetry checking to calculate load percentages on each load cell.
- No symmetry. A floor scale or an overhead monorail scale is a good example. A load could be placed at any location, and any single cell could see all, some, or none of the load. The IND780 Scale Monitoring cannot cross check readings from the individual cells in these scales.

Run Flat. Run Flat is an emergency technique for weighing after a load cell in a POWERCELL Scale has failed. The IND780 estimates the weight on a platform by using the weight from other load cells that are in a symmetrical relationship with the failed cell. The control panel clearly displays the weight as an estimated weight.

II. Application Data

Application Dynamic Commands and Events (AC)

Access:	"All Users"		
Class Code:	ac	Data Type:	D
ControlNet Class Code:	70 hex		
Instances:	5		

Attributes:

ac--00	Composite ac block	Struct	na	Composite of entire block
ac--01 ac--40	Commands 1-40	BI	rt	Commands destined for the Application.

Methods:

Applications may use this block of Shared Data for receiving Dynamic commands. One use is communicating command data with remote tasks over PLC or TCP/IP communications.

Multiple Task Expert Applications Objects use these fields for implementing events that communicate between the Task Expert Application Objects.

System Inputs

ac0501	E-Stop In	BI	rc

Application Dynamic Statuses (AS)

Access:	"All Users"		
Class Code:	as	Data Type:	D
ControlNet Class Code:	79 hex		
Instances:	5		

Attributes:

as--00	Composite as block	Struct	na	Composite of entire block
as--01 as--40	Statuses 1-40	By	rt	Statuses for Application to respond to Command

Methods:

Applications may use this block of Shared Data for setting Dynamic statuses. One use is communicating status data with remote tasks over PLC or TCP/IP communications.

The PLC Task reports as--01 and as--02 as *one-bit* Custom Statuses for each scale in the Floating Point Input-to-PLC Assembly. If PLC Task reports a 1 value if the entry is non-zero, and reports a 0 value if the entry is zero.

Application Dynamic Integer Fields (AI)

Access:	"All Users"		
Class Code:	ai	Data Type:	D
ControlNet Class Code:	6E hex		
Instances:	5		

Attributes:

ai--00	Composite ai block	Struct	na	Composite of entire block
ai--01 ai--20	Integer Fields 1-20	US	rt	Application may use these fields to exchange dynamic data

Methods:

Applications may use this block of Shared Data for storing Dynamic integer fields. One use is exchanging integer data with remote tasks over PLC or TCP/IP communications.

Application Dynamic Floating Point Fields (AJ)

Access:	"All Users"		
Class Code:	aj	Data Type:	D
ControlNet Class Code:	6D hex		
Instances:	5		

Attributes:

aj--00	Composite aj block	Struct	na	Composite of entire block
aj--01 aj--20	Floating Point Fields 1-20	D	rt	Application may use these fields to exchange dynamic data

Methods:

Applications may use this block of Shared Data for storing Dynamic floating point fields. One use is exchanging floating point data with remote tasks over PLC or TCP/IP communications.

Application Dynamic Unicode String Fields (AK)

Access:	"All Users"		
Class Code:	ak	Data Type:	D
ControlNet Class Code:	6B hex		
Instances:	5		

Attributes:

ak--00	Composite ak block	Struct	na	Composite of entire block
ak--01 ak--60	Unicode String Fields 1-60	S101	rt	Application may use these fields to exchange dynamic data

Methods:

Applications may use this block of Shared Data for storing Dynamic string fields. One use is for exchanging string data with remote tasks over PLC or TCP/IP communications.

Application Dynamic Character Arrays (AL)

Access:	"All Users"		
Class Code:	al	Data Type:	D
ControlNet Class Code:	6C hex		
Instances:	5		

Attributes:

al--00	Composite al block	Struct	na	Composite of entire block
al--01 al--20	Character Array Fields 1-20	ABy50	rt	Application may use these fields to exchange dynamic data

Methods:

Applications may use this block of Shared Data for storing Dynamic string fields. One use is exchanging an array of binary data with remote tasks over PLC or TCP/IP communications.

PLC Task reports al--01 and al--02 as custom *4-byte* inputs for each scale in the Floating Point Input-to-PLC Assembly. The PLC Task reports the first 4 bytes of the entry.

Application Floating Point Process Data (AF)

Access:	"All Users"		
Class Code:	af	Data Type:	PP
ControlNet Class Code:	7E hex		
Instances:	5		

Attributes:

af--00	Composite af block	Struct	na	Composite of entire block
af--01 af--80	Floating Point Fields 1-80	D	rt	

Application Integer Process Data (AP)

Access:	"All Users"		
Class Code:	ap	Data Type:	PP
ControlNet Class Code:	7D hex		
Instances:	5		

Attributes:

ap--00	Composite ap block	Struct	na	Composite of entire block
ap--01 ap--50	Integer Fields 1-50	US	rt	

Application Unicode String Process Data (AR)

Access:	"All Users"		
Class Code:	ar	Data Type:	PP
ControlNet Class Code:	7F hex		
Instances:	5		

Attributes:

ar--00	Composite ar block	Struct	na	Composite of entire block
ar--01 ar--50	Unicode String 1-50	S101	rt	

Application Installation Information (AQ)

Access:	"Administrator" default, level is not customizable.	
Class Code:	aq	Data Type: PS
Instances:	20	Instances 1–12 - TaskExpert Applications Instance 13 – TaskExpert Application called from Setup Tree Instance 18 - Upgrade Instance 19 - Resident Scale Task Instance 20 - Control Panel

Attributes:

aq--00	Composite aq block	Struct	na	Composite of entire block	
aq--01	Application Type	By	na	0 = None 1= Control Panel 2 = Reserved 3 = Custom.Net	4 = Task Expert 5 = RST 6 = Upgrade
aq--02	Application Name	S21	na	Application File Name	
aq--03	Part Number	S14	na		
aq--04	Software Number	S14	na		
aq--05	Setup Application Name	S30	na	CP displays this application name in Setup Tree/Menu	
aq--06	Security Code	S14	na	Each application must have a valid security code that authorizes its execution on this IND780	
aq--07	Enable Auto-Start	BI	na	1 = Enable Auto-Start of Application	
aq--08	Enable Manual Start	BI	na	1 = Enable Manual-Start of Appl from SKM	
aq--09	Enable Manual Stop	BI	na	1 = Enable Manual-Stop of Appl from SKM	
aq--10	Enable Console for App	By	na	1=Enable Front Console for this application	
aq--11	Virtual Console Instance	By	na	0 = None, 1, 2, or 3. am--00 instance that is the Virtual Console for this application	
aq--12	Reserved	By	na		

Method:

This block contains identification, security, and location information for each application pack or Task Expert application installed in the IND780. The IND780 will only start the applications identified in this list. Each application must have a valid security code.

Instance 1 is the Main application for Task Expert applications.

Instance 2 is the Custom Setup application for the Task Expert applications. The name of the application is CustomSetup.bas or CustomSetup.cpt.

Application Message Table (AW)

Access:	"All Users"	
Class Code:	aw	Data Type: PS
Instances:	1	

Attributes:

aw--00	Composite aw block	Struct	na	Composite of entire block

aw--01 aw--99	String Setup Fields 1-99	S101	

Application Integer Setup (AX)

Access:	"All Users"		
Class Code:	ax	Data Type:	PS
Instances:	5		

Attributes:

ax--00	Composite ax block	Struct	na	Composite of entire block
ax--01 ax--80	Integer Setup Fields 1-80	US		

Application Floating Point Setup (AY)

Access:	"All Users"		
Class Code:	ay	Data Type:	PS
Instances:	5		

Attributes:

ay--00	Composite ay block	Struct	na	Composite of entire block
ay--01 ay--50	Floating Point Fields 1-50	D		

Application Unicode String Field Setup (AZ)

Access:	"All Users"		
Class Code:	az	Data Type:	PS
Instances:	5		

Attributes:

az--00	Composite az block	Struct	na	Composite of entire block
az--01 az--25	String Setup Fields 1-25	S101		

TaskExpert Application Start and Stop Triggers (AT)

Access:	"All Users"		
Class Code:	at	Data Type:	D
ControlNet Class Code:	97 hex		
Instances:	20	1 instance for each application corresponding to the applications instances defined in AQ block	

Attributes:

at--00	Composite at block	Struct	na	Composite of entire block
at--01	Start Application	BI	rc	1 = start the application defined in the corresponding entry of the AQ block
at--02	Stop Application	BI	rc	1 = stop corresponding AQ application
at--03	Suspend Application	BI	rc	1 = suspend corresponding AQ application
at--04	Resume Application	BI	rc	1 = resume corresponding AQ application

at--05	Application Run Status	By	rc	0 = application thread not running 1 = application stopped 2 = application running 3 = application suspended
at--06	Reserved	By	rt	
at--07	Reserved	By	rt	

Methods:

Setting trigger = 1 signals the corresponding application defined in the AQ block.

Application Timers (TM)

Access:	"Operator"		
Class Code:	tm	Data Type:	D
Instances:	10		

Attributes:

tm--00	Composite tm block	Struct	na	Composite of entire block
tm--01	Timer Command	By	rc	Application issues command: 1= Start Timer 2 = Abort Timer
tm--02	Timer Length value	L	na	Application must set Timer Value in milliseconds before issuing start command.
tm--03	Timer State	By	rt	RST sets timer state: 0=idle 1= running 2=expired

Task Expert Data Entry Unicode String Fields (TX)

Access:	"All Users"		
Class Code:	tx	Data Type:	D
Instances:	1		

Attributes:

tx0100	Composite tx block	Struct	na	Composite of entire block
tx0101 tx0150	Unicode String Fields 1-50	S40	rt	Task Expert Application use these fields to retrieve operator-entered data.
tx0151	DataGrid edited field data	S40	rt	DataGrid returns edited field data to app
tx0152	DataGrid edited field row shortID$	S40	rt	DataGrid returns edited field row shortID$ to application.
tx0153	DataGrid edited field column num	S40	rt	DataGrid returns edited field column number to application
tx0154	DataGrid edited field row index	S40	rt	DataGrid returns edited field row index to application
tx0155	Task Expert Data Grid Response	S40	rt	The Task Expert application sets this field to "Accept" message to accept the edited data in the field. Otherwise, It sets the field to an Error message to reject the newly edited value.
tx0156	Current Focus Element	US	rt	Task Expert indicates the application object that currently has the focus. Task Expert writes this field whenever there is a change of focus for the application object.
tx0157	Lost Focus Element	US	rt	Task Expert indicates the application object that has just lost the focus. Task Expert writes this field whenever there is a change of focus for the application object.

tx0158	Reserved	S40	rt	
tx0159	Reserved	S40	rt	
tx0160	Reserved	S40	rt	
tx0161	Reserved	S40	rt	
tx0162	Reserved	S40	rt	
tx0164	Reserved	US	rt	
tx0165	Reserved	US	rt	
tx0166	Reserved	US	rt	

Methods:

Task Expert applications use these fields to retrieve data that the operator enters through the TEXTBOX, COMBOBOX, or DATAGRID objects displayed in the custom application window. The field attribute number corresponds to the object number coded in the TEXTBOX or COMBOBOX commands.

Counting Application Process – Reserved (CA)

Access:	"Supervisor"		
Class Code:	ca	Data Type:	PP
Instances:	1		

Attributes:

ca0100	Composite ca block	Struct	na	Composite of entire block	
ca0101	Total Pieces	D	na	Total number of pieces	
ca0102	Displayed Total Piece Counts	S13	rt		
ca0103	Reference Wt Units	By	na	1=pounds, 2=kilograms, 3=grams, 4=metric tons, 5=tons	
ca0104	Current Reference Pieces	US	rt	Current # sample pieces on sample scale	
ca0105	Average Piece Weight	D	rt		
ca0106	Standard Reference Pieces	US	rt	Standard # sample pieces on sample scale	
ca0107	Minimum Reference Pieces	US	rt	Minimum # sample pieces on sample scale	
ca0108	Preferred Counting Scale	By	na	A, B, C, D, E	
ca0109	Preferred Sample Scale	By	na	A, B, C, D, E	
ca0110	Counting Sequence	By	na	0 = Independent 1 = Sample/Count	2 = Tare/Sample/Count 3 = Sample/Tare/Count
ca0111	SmartTrac Appearance	By	na	0 = None 1 = Bar Graph	2 = Cross Hairs 3 = 3 Zones
ca0112	Enable Enhancement of Piece Wt	BI	na	0=no, 1=yes	
ca0113	Enable Sample Add Mode	BI	na	0=no, 1=yes	
ca0114	Include Sample Pieces in Total	BI	na	0=no, 1=yes	

Methods:

Compute Average Piece Weight automatically starts after the application sets a new Sample Pieces. The Average Piece Weight Enhancement algorithm also calls it.

IF (Sample Pieces) <> 0

THEN Average Piece Weight = Sample Net Weight / Sample Pieces

END Compute Average Piece Weight

Compute Pieces automatically starts whenever:

- A new net weight value is available from the Counting Scale
- The application selects a new Counting Scale.
- The application or Average Piece Weight Enhancement algorithm loads a new Average Piece Weight.

IF (Average Piece Weight) = = 0 THEN TotalPieces = 0

ELSE

Total Pieces = (long) ROUND(Counting Net Weight / Average Piece Weight)
IF (Include Sample Pieces)
IF (Sample Scale <> Counting Scale)
THEN Total Pieces = Total Pieces + Sample Pieces
END ELSE
END Compute Pieces

Average Piece Weight Enhancement starts when stable weight for the sample scale changes.

IF (Enhancement Enabled)
IF (Sample Scale Stable)
IF (Sample Net Weight > Last Sample Weight + (0.7*Average Piece Weight))
IF (Sample Net Weight <= 2.0 * Last Sample Weight)
THEN
Last Sample Weight = Sample Net Weight
Sample Pieces = (long) ROUND(Sample Net Weight / Average Piece Weight)
Compute Average Piece Weight
END THEN
END Average Piece Weight Enhancement

III. Target Data

Complex Target Data

Full Target Commands (SC)

Access:	"Supervisor"		
Class Code:	sc	Data Type:	D
ControlNet Class Code:	92 hex		
Instances:	23	Instance 1-22 = Primary Targets Instance 23 = Image of first Target for selected scale	

Attributes:

sc--00	Composite sc block	Struct	na	Composite of entire block
sc--01	Restart Target	Bl	rc	Appl. sets from 0 to 1 to trigger command. This command updates the active copy of the Target from SP Shared Data resets the Target latch, and enables Target.
sc--02	Abort Target	Bl	rc	This command turns off all ST statuses associated with Target, and disables Target
sc--03	Apply New Target Coincidence	Bl	rc	This command only updates the active Target target value weight from Shared Data. It does not change any other active Target fields.
sc--04	Reset Latch	Bl	rc	This command resets the Target latch in SP Shared Data and active Target
sc--05	Start Calibrate Jog Timer	Bl	rc	The command initiates calibration of the jog timer
sc--06	Pause Target	Bl	rc	Puts Target in a pause state, turns off feed status, and turns on pause status
sc--07	Resume Target	Bl	rc	Resumes Target from pause state, turns off pause status, and turns on feed status if applicable
sc--08	Reset Auto Spill Adjust	Bl	rc	Reset Auto-Spill FIFO to initiate new cycle
sc--09	Reserved	Bl	rc	In manual jog mode, initiate a manual jog sequence.
sc--10	Reserved	Bl	rc	In manual jog mode, complete manual jog sequence.
sc--11	Reserved	Bl	rc	
sc--12	Reserved	Bl	rc	

Full Target Statuses (ST)

Access:	"Read Only" access level is not customizable.		
Class Code:	st	Data Type:	D
ControlNet Class Code:	93 hex		
Instances:	23	Instance 1-22 = Primary Targets Instance 23 = Image of first Target for selected scale	

Attributes:

st--00	Composite st block	Struct	na	Composite of entire block
st--01	Command Completion Status	By	rt	Command Completion Status: 0 = Success 1 = Command In Progress 2-255 = Specific error code.
st--02	Latched	Bl	rt	0=no, 1=yes
st--03	Feeding	Bl	rt	0=no, 1= In Progress

st--04	Fast Feeding	Bl	rt	0=no, 1= In Progress
st--05	Below Low Tolerance Weight	Bl	rt	0 = Over Low Tolerance Weight 1 = Under Low Tolerance Weight
st--06	Above High Tolerance Weight	Bl	rt	0 = Under High Tolerance Weight 1 = Over High Tolerance Weight,
st--07	In Tolerance	Bl	rt	0 = Out of Tolerance, 1 = In Tolerance
st--08	Weigh-In Feeding	Bl	rt	0=Weigh-Out Feeding, 1= Weigh-In Feeding
st--09	Dump to Empty Feeding	Bl	rt	0=no, 1= In Progress
st--10	Dump to Empty Draining	Bl	rt	0=no, 1= In Progress
st--11	Pause	Bl	rt	1 = Pause state
st--12	In Progress	Bl	rt	1 = feed in progress. This bit is an "or" combination of bits 3, 4, 9, & 10, 13, 14, 15
st--13	Coarse Feeding	Bl	rt	0 = no, 1 = In Progress
st--14	Learn Mode	Bl	rt	0 = no, 1 = In Progress
st--15	Settling	Bl	rt	0 = no, 1 = In Progress
st--16	Jog Mode	Bl	rt	0=no, 1=In Progress
st--17	Reserved	Bl	rt	
st--18	Reserved	Bl	rt	
st--19	Reserved	Bl	rt	
st--20	Sensitivity	Bl	rt	0 = Sensitive, 1 = Normal
st--21	Cycle Complete	Bl	rt	1 = Cycle Complete State
Cycle Complete Data				
st--30	Final Weight	D	rt	Material transfer final weight. RST sets this field at the end of a material transfer cycle.
st--31	Final Fine Feed	D	rt	Material transfer final Fine Feed value. RST sets this field at the end of a material transfer cycle.
st--32	Final Spill	D	rt	Material transfer final spill value. RST sets this field at the end of a material transfer cycle.
st--99	Composite Feed Status	US	rt	Bitwise status st--2 to st--17

Method:

Please read the method description in the Target Process for the Full Target Process Data Block," sp". Here, the application can read the status of the Full Target operation.

Full Target Process Data (SP)

Access:	"Supervisor"	
Class Code:	sp	Data Type: PP
ControlNet Class Code:	69 hex	
Instances:	22	Instances 1-5: Basic operation - Scales 1 – 5 Instances 5-10: Basic operation – Reserved Instances 11-22: Fill Pac

Attributes:

sp--00	Composite sp block	Struct	na	Composite of entire block
sp--01	Name Descriptor	S21	na	Text name describing the Target
sp--02	Target is Active	By	na	0=Target Disabled 1-17 Device enabling Target The RST sets this field from sp--22 when the Target is re-started.
sp--03	Shared Data field source	S7	na	Shared Data field for containing source value to be compared in Target.

sp--04	Target Data Stream Type	By	na	N = Displayed (Net) Weight G = Gross Weight R = Rate P = Piece Count X = Source Shared Data Field in sp--03
sp--05	Target Coincidence Value	D	na	For weight and jog Target targets, this field has a weight value. For rate Targets, this field contains the max value that can trigger a rate alarm. For Piece Count Targets, this field contains number of pieces. For LearnJog Targets, this field contains a time value. For a Dump to Empty Target, this field contains the dump-completion-trigger weight.
sp--06	Latching-Type Target	Bl	na	0=non-latching-type, 1= latching-type. Applications must set this field to enable "latching". When latching is set, the Target will not re-enable the feed after the device first reaches Target coincidence until the application resets the "latched" bit.
sp--07	Target Is Latched	Bl	na	If latching is set, the Target sets this field to 1 when it first encounters the Target coincidence. After power recovery or scale error, an active latching Target comes up in latched state. An application must issue restart command to continue. The application must reset this bit to 0 to start next Target processing.
sp--08	Target Action	By	na	1 = 1-speed fill (weigh-in) 2 = 2-speed fill (weigh-in) 3 = 1-speed dose (discharge) 4 = 2-speed dose (discharge) 5 = dump to empty 6 = classify 7 = 1-speed absolute weight 8 = 2-speed absolute weight
Ancillary Target Values				
sp--09	Spill Weight Value	D	na	For weight Target targets, this field is a cutoff spill value. When this field is set, the Target turns off the feed when the weight = (sp--04) – (sp--09).
sp--10	Fine Feed Weight Value	D	na	For two-speed feeds, this field is a feed Fine Feed value. When this field is set, the Target turns off the fast feed when the weight = (sp--04) – (sp--09) – (sp—10)
sp--11	Upper Tolerance Value	D	na	The Target uses this field to determine if the actual cutoff weight falls within this specified upper tolerance. This is the last OK weight when transitioning from "in tolerance" to "over tolerance". Value is in ablsolute weight or deviation from target depending on sp--13.
sp--12	Lower Tolerance Value	D	na	The Target uses this field to determine if the actual cutoff weight falls within this specified lower tolerance. This is the first OK weight when transitioning from "under tolerance" to "in tolerance". Value is in ablsolute weight or deviation from target depending on sp--13.
sp--13	Tolerance Operation	By	na	Target tolerance operation: 0 = Weight Deviation from Target, 1 = Absolute Weight Value, 2 = % Deviation from Target
sp--14	Upper Tolerance Percent	D	na	If sp--13 = 2, the Target uses this field to calculate the upper tolerance value as a percent of the coincidence value.
sp--15	Lower Tolerance Percent	D	na	If sp--13 = 2, the Target uses this field to calculate the lower tolerance value as a percent of the coincidence value.
sp--16	Drain Timer	D	na	For dump-to-empty Targets This value is the amount time after hitting the dump trigger weight to leave valve open. It allows vessel to drain.
sp--17	Skip Drain Timer at No Motion	Bl	na	For dump-to-empty Targets, stop the drain timer at no motion
Visualization				
sp--18	Tolerance Motion Check	Bl	na	For dump-to-empty setponts, stop the drain timer at not motion.
sp--19	Override Default Appearance	By	na	SmartTrac Visualization Appearance: 0 = Use default in xa0115 & xb0115, 1 = Bar Graph 2 = Cross Hairs, 3 = 3 Zones

Misc

sp--20	Target Weight Units	By	na	0=primary units 1=secondary units
sp--21	Target Is Paused	By	na	0=running 1=paused RST sets this field upon command from the application.
sp--22	Assigned Scale or Flow Meter	By	na	0=Target Disabled 1-17 Device enabling Target. This field is copied to sp—02 when the Target is enabled.
sp--23	Output Mode Override	BI	na	Output mode setting source to use for the selected material. 0 = Default (type specified by ds0112) 1 = Override (type specified by fd--26)
sp--24	Output Mode Override Value	By	na	0 = concurrent 1 = independent 2 = regulated.
sp--25	Sensitivity Zones	By	na	Specifies vibration sensitivity zones: 0 = None 1 = Settling only 2 = Slow feed and Settling.
sp--26	Timer Start Time	AL2	na	Timer Start Time
sp--27	Target State	By	rt	Target State

Auto-Spill Targets Mutually exclusive with Spill and Fine Feed; Only the Formulation Pack supports the Auto-Spill Targets.

sp--30	Auto-Spill Time 1 in Seconds	D	na	Auto-Spill time in rate range 1. For time-based auto-spill Targets, the Target turns off the feed when the current weight=(coincidence weight – rate*auto Spill Time. There are up to 3 auto-spill ranges, each operating within a particular rate range. The ranges are in ascending order of rate values.
sp--31	Auto-Spill Time 2 in Seconds	D	na	Auto-Spill time in rate range 2
sp--32	Auto-Spill Time 3 in Seconds	D	na	Auto-Spill time in rate range 3
sp--33	Auto-Spill Threshold 1	D	na	Threshold rate to switch from Auto-Spill time 1 to Auto-Spill time 2. When the rate exceeds the threshold value, Target automatically switches to next ascending auto-spill-time.
sp--34	Auto-Spill Threshold 2	D	na	"

Coarse Feed: Mutually exclusive with Spill and Fine Feed

sp--35	Coarse Feed Mode	By	na	Only the Formulation Pack supports the Coarse feed cutoff mode for the selected material. 0 = Disabled 1 = Weight Cutoff 2 = Timed Cutoff.
sp--36	Coarse Feed Weight Cutoff	D	na	Coarse feed weight cutoff for the selected material.
sp--37	Coarse Feed Timed Cutoff	D	na	Coarse feed timed cutoff for the selected material

Spill & Fine Feed Adjust: Mutually exclusive with Spill and Fine Feed

sp--40	Auto Spill Adjustment Enable	BI	na	Only the Formulation Pack supports the Auto-Spill Targets. 0 = Disabled, 1 = Enabled.
sp--41	Cycles Averaged	By	na	Number of samples to keep in rolling average for auto spill adjustment. Values allowed (1 - 9).
sp--42	Adjustment Factor	By	na	% of spill weight to use in auto spill adj. Values allowed: 1 - 99.
sp--43	Learn Mode Enable	By	na	0 = Disabled 1 = Auto 2 = On
sp--44	Test Point	By	na	Percentage of target weight to first learn mode cutoff.

sp--45	Spill FIFO	AL11	na	Array of 9 Spill values in tenths of weight divisions for last 9 material transfers, which are maintained circularly in the array. Entry 1 is the number of values in the array. Entry 2 is the last entry into the array.
sp--46	Jog Mode	By	na	0-disabled 1=auto in tol 2 = auto to target 3=manual to high tol
sp--47	Learn Feed Time	D	na	Time the fast feed and / or slow feed will be turned on before the fine feed and / or spill are calculated.
sp--48	Jog On Time	D	na	Time the jog output is turned on in auto or manual modes (msec).
sp--50	OK to Weigh	S7	na	SD name else null = OK Fill control selects the function now
sp--51	Manual Complete Input	S7	na	SD name else null = OK
sp--52	Manual Jog Input	S7	na	Source Shared Data field for the manual jog feed input.
sp--60	Fast Feed Done Time	D	na	Time the feed outputs are off after the fast feed cutoff is reached and before slow feed starts (msec).
sp--61	Feed Extension Time	D	na	Additional time slow feed output stays on after reaching cutoff (msec).
sp--63	Settle Time	D	na	Time the jog output is turned off in auto or manual modes (msec).
sp--70	Reserved	D	na	
sp--71	Reserved	D	na	
sp--72	Reserved	US	na	
sp--73	Reserved	US	na	

Simple Target Data

Simple Target Commands (SK)

Access:	"Supervisor"		
Class Code:	sk	Data Type:	D
Instances:	20		

Attributes:

sk--00	Composite sk block	Struct	na	Composite of entire block
sk--01	Restart Target	BI	rc	Appl. sets from 0 to 1 to trigger command
sk--02	Abort Target	BI	rc	
sk--03	Apply New Target Coincidence	BI	rc	
sk--04	Reset Latch	BI	rc	
sk--05	Reserved	BI	rc	
sk--06	Pause Target	BI	rc	Puts Target in a pause state, turns off feed status, and turns on pause status
sk--07	Resume Target	BI	rc	Resumes Target from pause state, turns off pause status, and turns on feed status if applicable
sk--08	Reserved	BI	rc	
sk--09	Reserved	BI	rc	

Simple Target Statuses (SS)

Access:	"Read Only" access level is not customizable.		
Class Code:	ss	Data Type:	D
Instances:	20		

Attributes:

ss--00	Composite ss block	Struct	na	Composite of entire block
ss--01	Command Completion Status	By	rt	Command Completion Status. 0=Success, 1-255=Specific error code.
ss--02	Latched	Bl	rt	0=no, 1=yes
ss--03	Feeding	Bl	rt	0=no, 1= In Progress
ss--04	Timing	Bl	rt	0=no, 1= In Progress
ss--05	Pause	Bl	rt	1 = Pause state
ss--06	In Progress	Bl	rt	1 = In Progress state.
ss--07	Cycle Complete	Bl	rt	1 = Cycle Complete State
ss--08	Reserved	Bl	rt	
ss--09	Reserved	Bl	rt	
ss--99	Composite Feed Status	US	rt	Bitwise status ss--02 to ss--07

Method:

Please read the method description in the simple Target Process for the Simple Target Process Data Block," sd. Here, the application can set commands and read the status of the Simple Target operation.

Simple Target Process Data (SD)

Access:	"Supervisor"		
Class Code:	sd	Data Type:	PP
Instances:	20		

Attributes:

sd--00	Composite sc block	Struct	na	Composite of entire block	
sd--01	Name Descriptor	S21	na	Text name describing the Target	
sd--02	Target is Active	By	na	RST sets = 1 when the Target is active, = 0 when Target is disabled.	
sd--03	Shared Data source field	S7	na	Shared Data field to be compared to target.	
sd--04	Mode	By	na	0 = Unlatched 1 = Immediate 2 = Timed Pulse 3 = Time Delay	4 = Weight 5 = Timed Pulse After Weight 6 = Time Delay After Weight 7 = Weight Range.
sd--05	Target Coincidence Value	D	na	Units must be the same as sd--03.	
sd--06	Latching Type Target	Bl	na	0 = non-latching type, 1 = latching type Used in weight-only modes.	
sd--07	Target Is Latched	Bl	na	If latching is set, the Target sets this field to 1 when it first encounters the Target coincidence. After power recovery or a scale error, an active latching Target comes up in pause state. An application must issue a restart command to continue. The application must reset this bit to 0 to start next Target processing.	
sd--08	Target Comparison Operator	By	na	1 = ` < ` 2 = ` <= ` 3 = ` = `	4 = ` <> ` 5 = ` > ` 6 = ` >= `
sd--09	Upper Weight Range Value	D	na	Used only with Weight Range mode. Units must be the same as sd--03.	

sd--10	Upper Weight Comparison Operator	By	na	1 = ` < ` 2 = ` <= ` 3 = ` = `	4 = ` <> ` 5 = ` > ` 6 = ` >= `
sd--11	Timer	D	na	Timer has 0.01 second precision.	
sd--12	Time Units	By	na	Time units 0 = Seconds, 1 = Minutes	
	Permissives				
sd--13	Okay to Feed Permissive	S7	na	Points to Shared Data source field for "OK to feed" permissive. If SD source field value = 1, then it is OK to Feed. When this field is empty, there is no OK to Feed permissive defined, which implies that it is always OK to Feed.	
sd--14	"Immediate Mode" Output State	BI	na	0 = Turn Output On, 1 = Turn Output Off	
sd--21	Target Is Paused	By	na	0=running 1=paused RST sets this field upon command from the application.	
sd--26	Timer Start Time	AL2	na	Timer Start Time	
sd--27	Target State	By	na	Target State	
sd--28	Reserved	D	na		
sd--29	Reserved	US	na		
sd--30	CP Source for Comparator	By	na	CP uses this field to determine SD field that is the source comparator: 0 = none, 1 = displayed, 2 = gross, 3 = rate, 4 = application	
sd--31	Application Source Units	S7	na	Text string that is the units descriptor when the user selected "Application" as the source. The Setup HMI would display this text string when it is editing the comparator value or when it is setting up limits inside setup.	

Auto-Jog Target Process Data (SJ)

Access:	"Supervisor"		
Class Code:	sj	Data Type:	PP
Instances:	5	One per scale.	

Attributes:

sj--00	Composite sj block	Struct	na	Composite of entire block
sj--01	Number of Auto-Jog Table Entries	By	na	Number of Table Entries Used
sj--02	Auto-Jog Weight Table	AL10	na	The Target uses the Auto-Jog Tables when the weight of the feed comes up short. Jog-feeds are time-based. The Weight table contains the amount of weight to jog in weight increments.
sj--03	Auto-Jog Time Table	AL10	na	The Time table contains the length of time to keep the feed open in milliseconds. The two Auto-Jog tables are in ascending order and correlate with each other.

Method:

In its simplest form, a Target is a comparator having two numeric data inputs and one binary output. One of the two numeric data inputs is a Coincidence (or Target) Value, which an outside agency may update at any time. The other numeric data input is an available data stream from a device channel. The data stream choices include gross weight, net weight, piece count, or rate of flow. The Target also provides a direction specification of either Fill or Discharge. A simple Target output truth table is as follows:

Inputs		Output
Enable = FALSE		FALSE
Enable = TRUE Direction = WEIGH-IN	IDataStreamI > = ITargetI	FALSE
	IDataStreamI < ITargetI	TRUE
Enable = TRUE	IDataStreamI < = ITargetI	FALSE

Direction = WEIGH-OUT	IDataStreamI > ITargetI	TRUE

You may associate the logical output of a Target with a physical Discrete Output or may use as an internal status. Typically, you select this during IND780 configuration.

An application can set up and run feeds using a Target Instance and can monitor for its completion using the Target Commands and Statuses. The application must first setup a Target Instance to use it. At minimum, it must setup the Assigned Device, the Target Data Stream Type, the Coincidence Value, and the Target Action within the Target Instance. To start the feed, the application then sets the Restart Target command, sc--01=1. This triggers a callback to the Resident Scale Task (RST) to process the Target Instance. When it is ready to begin feeding, the Resident Scale Task turns on the Target in Progress status, st--12=1. When the feed is complete, the RST turns off the Target in Progress bit. The RST maintains the Target status in the ST block.

The application can monitor the Feeding in Progress bit for the Target Instance to see when the feed starts and when the feed completes.

The application can also set the Target Instance to be a Latching-Type Target. The advantage of the Latching-Type Target is that once the feed control goes off, it stays off. It will not toggle on and off when weight fluctuates around the coincidence weight, possibly causing damage to the feed control equipment. When the Resident Scale Task first detects the Target coincidence for a "Latching-Type Target", it also sets the Target-Is-Latched=1 when it sets the Feeding in Progress=0. Then, the Resident Scale Task will never change the Target Feeding=0 condition again until the application resets the Target-Is-Latched=0. That is, the application must reset Target-Is-Latched=0 before starting a new Target feed.

The Targets also support two-speed Fine Feed feeds, weight-based spills, and rate-based spills. Spills anticipate a cut-off in advance of the actual Coincidence weight to account for material in suspension, which the feeder has already fed, but which the scale has not yet reported in its weight. There is always some propagation delay in reporting the actual weight because of time for material to hit the scale base and inherent weight filtering delays. The two-speed Fine Feed feeds also compensate for this weight-reporting delay by switching to a slow feed as the weight approaches the Coincidence weight.

Jog Targets use time rather than weight to control the material feed time. Applications typically use them when adding a very small amount of material, in cases where the spill value is greater than the amount of material. An example is at the end of a previous feed that came up short and the application needs to add a very small amount of material to bring the feed weight into tolerance.

The Weights and Measures seal does not protect the Target configuration data.

Processing Tolerance Values

1. The CP edits the Active Record in Target Database Table. The CP displays tolerance values as selected in ds0113.
2. When the CP exits the Edit Active Record leaf node, it must store the tolerance values in the correct SP variables based on tolerance mode setting ds0113.
    a. If ds0113 = 0, move deviation tolerance values to sp--11 and sp--12
    b. If ds0113 = 1, move absolute weight tolerance values to sp--11 and sp--12
    c. if ds0113 = 2, move tolerance values to sp--14 and sp--15
3. After the CP moves the data into the BRAM Shared data, it triggers sc--03 to move the values into the RST's active SP object.
4. SP object reads sp--13 to determine how to interpret the tolerance values in SP object.
    a. sp--13 = 0 indicates a weight deviation tolerance
        i. Subtract the Lower Tolerance value in sp--12 from the target to get the weight value to first turn on the In Tolerance output.
        ii. Add the Upper Tolerance value from sp--11 to the target to get the last weight value for which the In Tolerance output is on.
    b. sp--13 = 1 indicates absolute weight tolerance
        i. Get the Lower Tolerance absolute weight value in sp--12 to first turn on the "In Tolerance" output.
        ii. Get the Upper Tolerance absolute weight value from sp--11 to last leave on the "In Tolerance" output.
    c. sp--13 = 2 indicates % deviation tolerance
        i. Multiply the Lower Tolerance value from sp--15 (as a %) times the target to find the deviation in weight. Subtract this value from the target to get the weight value to first turn on the In Tolerance output.
        ii. Multiply the Upper Tolerance value from sp--14 (as a %) times the target to find the deviation in weight. Add this value to the target to get the last weight value for which the In Tolerance output is on.

Example for tolerance programmed as weight deviation.

sp--05 (Target) = 200 kg

sp--12 (-Tol) = 5 kg

sp--11 (+Tol) = 10 kg

Low "In Tolerance" weight = 200kg - 5kg = 195kg

High "In Tolerance" weight = 200kg + 10kg = 210kg

Example for tolerance programmed as % deviation.

sp--05 (Target) = 200 kg

sp--15 (-Tol) = 5 %

sp--14 (+Tol) = 10 %

Low "In Tolerance" weight = 200kg - (5% X 200kg) = 190kg

High "In Tolerance" weight = 200kg + (10% X 200kg) = 220kg

IV. Discrete I/O Data

Discrete Input/Output Status (DI)

Access:	Discrete outputs have a "Supervisor" default level that is customizable by individual field. Discrete inputs have "Read Only" access that is not customizable.
Class Code:	di Data Type: D
ControlNet Class Code:	78 hex
Instances:	6
	Option Board Slots 1 - 6

Attributes:

di--00	Composite di block	Struct	na	Composite of entire block
di--01	Input Status 1	BI	rt	0=off, 1=on
di--02	Input Status 2	BI	rt	0=off, 1=on
di--03	Input Status 3	BI	rt	0=off, 1=on
di--04	Input Status 4	BI	rt	0=off, 1=on
di--05	Output Status 1	BI	rt	0=off, 1=on
di--06	Output Status 2	BI	rt	0=off, 1=on
di--07	Output Status 3	BI	rt	0=off, 1=on
di--08	Output Status 4	BI	rt	0=off, 1=on
di--09	Output Status 5	BI	rt	0=off, 1=on (IND560 only)
di--10	Output Status 6	BI	rt	0=off, 1=on (IND560 only)

Method:

The Resident Scale Task records the state of the physical discrete inputs and outputs in Shared Data. The Discrete Inputs and Outputs may reside on the Discrete IO Option Boards. The Application can read the individual statuses or composite block to access all eight in IND780 (or ten in IND560) statuses at once. The Application can read or write the Discrete Output Statuses. It can only read the Discrete input statuses.

The Application or Ladder Logic can read or write these status bits to read or write the corresponding physical discrete inputs and outputs.

The IND780 has four Discrete Outputs on its Discrete IO option boards.

The Analog Load Cell board on the IND780 has one Discrete Output and no Discrete Inputs. This Discrete Out controls Target Feeds.

Discrete Input Edges (DE)

Access:	"Supervisor"
Class Code:	de Data Type: D
Instances:	6
	Option Board Slots 1 - 6

Attributes:

de--00	Composite de block	Struct	na	Composite of entire block
de--01	Rising Input Edge 1	BI	rc	1=Transition from 0 to 1 detected
de--02	Rising Input Edge 2	BI	rc	1=Transition from 0 to 1 detected
de--03	Rising Input Edge 3	BI	rc	1=Transition from 0 to 1 detected
de--04	Rising Input Edge 4	BI	rc	1=Transition from 0 to 1 detected
de--05	Falling Input Edge 1	BI	rc	1=Transition from 1 to 0 detected

de--06	Falling Input Edge 2	Bl	rc	1=Transition from 1 to 0 detected
de--07	Falling Input Edge 3	Bl	rc	1=Transition from 1 to 0 detected
de--08	Falling Input Edge 4	Bl	rc	1=Transition from 1 to 0 detected

Method:

The Resident Scale Task sets the associated command = 1 when it detects a rising or falling edge on a discrete input. The Application can trigger on this change of state. After receiving the trigger, the Application must reset the command = 0 in order to receive the next trigger.

Remote Discrete Input Edges (RE)

Access:	"Supervisor"		
Class Code:	re	Data Type:	D
ControlNet Class Code:	77 hex		
Instances:	8	There are up to 8 "nodes" in a remote IO unit	

Attributes:

re--00	Composite de block	Struct	na	Composite of entire block
re--01 re--04	Rising Input Edge 1 - 4	Bl	rc	1=Transition from 0 to 1 detected
re--05 re--08	Falling Input Edge 1 - 4	Bl	rc	1=Transition from 1 to 0 detected

Method:

The Resident Scale Task sets the associated command = 1 when it detects a rising or falling edge on a discrete input. The Application can trigger on this change of state. After receiving the trigger, the Application must reset the command = 0 in order to receive the next trigger.

Remote Discrete Input/Output Status (RI)

Access:	Discrete outputs have a "Supervisor" default level that is customizable by individual field. Discrete inputs have "Read Only" access that is not customizable.		
Class Code:	ri	Data Type:	D
ControlNet Class Code:	95 hex		
Instances:	8 There are up to 8 "nodes" in a remote IO unit		

Attributes:

ri--00	Composite ri block	Struct	na	Composite of entire block
ri--01 ri--04	Input Status 1 - 4	Bl	rt	0=off, 1=on
ri--05 ri--10	Output Status 1 - 6	Bl	rt	0=off, 1=on
ri--21	ARM100 Remote Unit Status	By	rt	

Method:

The D100 Remote Discrete IO Unit attaches to the IND780 through a Serial port. It can have up to 8 nodes. Each node has 4 Discrete Inputs and 6 Discrete Outputs. The IND780 monitors the state of the Discrete IO using a unique Serial IO protocol that talks to the Remote IO unit.

The Resident Scale Task records the state of the physical discrete inputs and outputs in Shared Data. The Application can read the individual statuses or composite block to access all 10 statuses at once. The Application can read or write the Discrete Output Statuses. It can only read the Discrete input statuses.

The Application or Ladder Logic can read or write these status bits to read or write the corresponding physical discrete inputs and outputs.

Internal Ladder Logic Program Setup (LL)

Access:	"Maintenance"		
Class Code:	II	Data Type:	PS
Instances:	1		

Attributes:

II0100	Composite II block	Struct	na	Composite of entire block
II0101	Number of Ladder Rungs	By	na	Number of rungs in the ladder program
II0102 II0199	Ladder Logic Rungs 1-98	S32	na	Each attribute is a Ladder Logic Rung

Method:

The IND780 has a simple Ladder Logic Interpreter that runs in the background monitor continuously Discrete I/O and Shared Data commands. The Ladder Logic Program executes these tasks efficiently to minimize CPU utilization and to respond quickly to "real-time" changes in Discrete I/O or Shared Data commands.

The Ladder Logic Interpreter runs in conjunction with Visual Basic or Task Expert Programs. Visual Basic and Task Expert are the custom application programming languages for the IND780. They handle sophisticated application tasks and operator interfaces. The Ladder Logic Interpreter efficiently handles the very simple, repetitive task of monitoring Discrete IO and Shared Data commands. Using the Interpreter, you eliminate the significant processing overhead and logic in custom Visual Basic applications required to accomplish these repetitive tasks. Visual Basic applications and the Ladder Logic programs communicate to each other through Shared Data.

The Control Panel Setup application and other application programs must build the Ladder Logic program for their application. The Ladder Logic commands provide flexibility for different applications to select what signals the Interpreter monitors and how it acts on the signals. The Ladder Logic Interpreter loads the program code from this Shared Data block. Each attribute is a Ladder Logic Rung.

Ladder Rung Commands

There are six rung commands. Each rung takes one or two inputs, and has one output. The rung inputs and outputs are physical Discrete IO or Shared Data commands.

RUNGAND input1, input2, output takes two inputs, "AND's" them together, and outputs the result. For example, take a physical discrete input "permissive" signal and "AND" it with "Target 1 feeding" to generate a physical discrete output.

RUNGANDNT ri0101,st0103,di0105

RUNGANDNT input1, input2, output takes two inputs, "AND's" them together, and outputs the inverse value. For example, take two physical inputs and generate a physical discrete output.

RUNGANDNT di0101,di0102,di0105

RUNGMOV input, output takes an input and generates an output with the same value. For example, take a tare on Scale 2 when a physical discrete input goes on.

RUNGMOV di0103,wc0201

RUNGMVNOT input, output moves the inverse of the input to the output. For example, turn on a physical discrete output when the data from Scale 1 is invalid.

RUNGMVNOT wx0138,di0108

RUNGOR input1, input2, output takes two inputs, OR's them together, and outputs the result. For example, turn on a physical discrete output if Scale 1 or Scale 2 is in motion.

RUNGOR wx0131,wx0231,di0508

RUNGORNOT input1, input2, output takes two inputs, OR's them together, and outputs the inverse value.

For example, turn on a physical discrete output when either the custom application turns off an application status or a physical discrete input is off.

RUNGORNOT as0101,di0103,di0505

V. Database and Table Data

Database Table Description (DD)

Access:	"All Users"		
Class Code:	dd	Data Type:	PP
Instances:	10	One entry for each of the A0 – A9 Standard tables.	

Attributes:

dd--00	Composite dd block			
Active Record				
dd--01	Entry number of current record	S8	na	Column 1 - Entry number of the current database record
dd--02	Alphanumeric Key	S16	na	Column 2 - Alphanumeric Key
dd--03	Description field of current record	S40	na	Column 3 - Description field of the current record
dd--04	Data 1 field of current record	S16	na	Column 4
dd--05	Data 2 field of current record	S16	na	Column 5
dd--06	Data 3 field of current record	S16	na	Column 6
dd--07	Data 4 field of current record	S16	na	Column 7
dd--08	Data 5 field of current record	S16	na	Column 8
dd--09	Data 6 field of current record	S16	na	Column 9
dd--10	Data 7 field of current record	S16	na	Column 10
dd--11	Data 8 field of current record	S16	na	Column 11
dd--12	Data 9 field of current record	S16	na	Column 12
dd--13	Data 10 field of current record	S16	na	Column 13
dd--14	Data 11 field of current record	S16	na	Column 14
dd--15	Data 12 field of current record	S16	na	Column 15
dd--16	Data 13 field of current record	S16	na	Column 16
dd--17	Data 14 field of current record	S16	na	Column 17
dd--18	Data 15 field of current record	S16	na	Column 18
dd--19	Data 16 field of current record	S16	na	Column 19
dd--20	Data 17 field of current record	S16	na	Column 20
Database Usage				
dd--31	Joined Table	Bl	na	1=yes
dd--32	Database Table Usage	By	na	0=None, 1=Target Targets Table, 2=Tare Table
dd--33	Database Table Security	By	na	NO VALUE; This is a dummy entry that defines within the Shared Data dictionary the security level for write access to the physical SQL CE table
dd--34	Database Table # Columns	By	na	Number of Columns used in table
Report Format				
dd--41	Table Descriptive Name	S40	na	Descriptive Name for the table, such as, CUSTOMER, PRODUCT, TARGET, or TARE TOTALIZATION
dd--42	Report Header Print Template	By	na	Template Number 0 = None, 1 -10
dd--43	Report Body Print Template	By	na	Template Number 0 = None, 1 -10
dd--44	Report Footer Print Template	By	na	Template Number 0 = None, 1 -10
dd--45	Reserved	By	na	
dd--46	Reserved	By	na	
dd--47	Reserved	By	na	

Statistics

dd--51	Number of Entries in Table	US	na	The maximum is 999
dd--52	Number of Reads from Table	UL	na	Running read count
dd--53	Number of Writes to Table	UL	na	Running write count
dd--54	Average Read Access Time	US	na	In milliseconds
dd--55	Average Write Access Time	US	na	In milliseconds
dd--56	Last Read Access Time	AL2	na	In 100 nanosecond intervals since 1601

Column Names

dd--61	Name for Column 1	S16	na	Corresponds to dd--01 entry
dd--62	Name for Column 2	S16	na	Corresponds to dd--02 entry
dd--63	Name for Column 3	S16	na	Corresponds to dd--03 entry
dd--64	Name for Column 4	S16	na	Corresponds to dd--04 entry
dd--65	Name for Column 5	S16	na	Corresponds to dd--05 entry
dd--66	Name for Column 6	S16	na	Corresponds to dd--06 entry
dd--67	Name for Column 7	S16	na	Corresponds to dd--07 entry
dd--68	Name for Column 8	S16	na	Corresponds to dd--08 entry
dd--69	Name for Column 9	S16	na	Corresponds to dd--09 entry
dd--70	Name for Column 10	S16	na	Corresponds to dd--10 entry
dd--71	Name for Column 11	S16	na	Corresponds to dd--11 entry
dd--72	Name for Column 12	S16	na	Corresponds to dd--12 entry
dd--73	Name for Column 13	S16	na	Corresponds to dd--13 entry
dd--74	Name for Column 14	S16	na	Corresponds to dd--14 entry
dd--75	Name for Column 15	S16	na	Corresponds to dd--15 entry
dd--76	Name for Column 16	S16	na	Corresponds to dd--16 entry
dd--77	Name for Column 17	S16	na	Corresponds to dd--17 entry
dd--78	Name for Column 18	S16	na	Corresponds to dd--18 entry
dd--79	Name for Column 19	S16	na	Corresponds to dd--19 entry
dd--80	Name for Column 20	S16	na	Corresponds to dd--20 entry

Methods:

The IND780 Standard Database Tables reside in a SQL CE database. These standard tables have the following physical characteristics:

- They reside in Compact Flash.
- There are ten tables, A0 - A9.
- We conceptually associate with the A1 – A4 tables with the four application keys on the keypad.
- Each table has up to 999 entry rows. You can access the field by the entry number. The Entry ID # is the primary key for each table. SQL CE automatically increments the primary key # when you insert a new entry in the table. If you delete a row, its primary key # becomes unused. This way, SQL CE ensures that the primary key for each row is unique.
- Each entry has one description key field that belongs to a table column. You can also access the field by the description key.
- Each row entry has 17 data fields that are in separate table columns
- Each data field has Unicode string data. The description key field is 40 Unicode characters long, each data field 16 Unicode characters long. The Task Expert Interpreter has routines that convert between the string data and numeric data, so the applications can store numeric data in the data fields. To retrieve the data from the tables using SQL numerical comparison operators on these numerical data fields, you must insure that the digits align within the Unicode string.

- The Task Expert records the current active entry for each Standard Database table in Shared Data. The Shared Data field name is dd--01 through dd--20; the instance number that is the table number is 00 through 09. You can use these Shared Data fields for print templates or for remote access.

Entry ID # Integer	Key 16 Unicode Characters	Description 40 Unicode Characters	Data1 16 Unicode Characters	Data2 16 Unicode Characters	.....	Data17 16 Unicode Characters
1						
2						
…						
999						

Applications may use the A4 table as an index directory into the other three tables. In this case, the three data fields in each A4 entry become pointers to entries in the other three tables, instead of holding application data. When you access a specific A4 entry, then you can access data from the other three tables. A Boolean field in Database Description block in Shared Data indicates whether the application is using the A4 table as a data table or as an index directory. When A4 is an index table, it has the following format:

Entry ID # Integer	Description 40 Unicode Characters	A1ID Integer Index to A1	A2ID Integer Index to A2	A3ID Integer Index to A3
1				
2				
…				
999				

A Database Description block in Shared Data describes the use and the status of the Standard Database tables. It has the following fields for each table:

- Descriptive name, such as CUSTOMER, PRODUCT, TARGET, or TARE TOTALIZATION
- Current table entries, which the application can use in Print Templates

The Control Panel has operator menus that allow the operator to build, edit and display the Standard Database tables.

A host processor may build the Standard database for the application and download it to the IND780 using a Special Remote Database Access Utility. The host may also periodically retrieve the SQL CE database from the IND780.

Database Table Setup (DS)

Access:	"Maintenance"		
Class Code:	ds	Data Type:	PS
Instances:	1		

Attributes:

ds0100	Composite ds block	Struct	na	Composite of entire block
ds0101	Reserved	By	na	Moved to dd0232
ds0102	Reserved	By	na	Moved to dd0332
ds0103	Reserved	By	na	Moved to dd0432
ds0104	Reserved	By	na	Moved to dd0532
Target Target Table Settings				
ds0111	Target Target Comparison Mode	By	na	0=None, 1=Material Transfer, 2=Over/Under
ds0112	Target Target Output Mode	By	na	0 = Concurrent Target Outputs (during fast feed cycle, feed and fast feed are on together) 1 = Independent Target Outputs (during feed cycle, feed and fast feed are on separately,
ds0113	Target Tolerance Entry	By	na	The operator enters Target tolerance values: 0 = Weight Deviation from Target 1 = Absolute Weight Value 2 = % Deviation from Target
ds0114	Target Description In Report	BI	na	1 = enabled

ds0115	Target Value In Report	Bl	na	1 = enabled
ds0116	Target Tolerances In Report	Bl	na	1 = enabled
ds0117	Target Spill Value In Report	Bl	na	1 = enabled
ds0118	Target Fine Feed Value In Report	Bl	na	1 = enabled
ds0119	Reserved	By	na	

Tare Totalization Table Settings

ds0121	Tare Totalization Weight	By	na	0 = none 1 = Gross Weight 2 = Net (Displayed) Weight
ds0122	Tare Description Enabled	Bl	na	1 = enabled
ds0123	Tare Clear Totals on Print	Bl	na	1 = enabled
ds0124	Tare Value In Report	Bl	na	1 = enabled
ds0125	Tare Description In Report	Bl	na	1 = enabled
ds0126	Tare N Value In Report	Bl	na	1 = enabled
ds0127	Tare Total In Report	Bl	na	1 = enabled
ds0128	Reserved	By	na	
ds0129	Reserved	By	na	
ds0130	Reserved	By	na	
ds0131	Reserved	By	na	
ds0132	Reserved	By	na	
ds0133	Reserved	By	na	
ds0134	Reserved	By	na	
ds0151	Reserved	By	na	Moved to dd0233
ds0152	Reserved	By	na	Moved to dd0333
ds0153	Reserved	By	na	Moved to dd0433
ds0154	Reserved	By	na	Moved to dd0533
ds0161	Reserved	By	na	Moved to dd0234
ds0162	Reserved	By	na	Moved to dd0334
ds0163	Reserved	By	na	Moved to dd0434
ds0164	Reserved	By	na	Moved to dd0534

Method:

The Control Panel uses the Target Target Settings for building a table of Target Targets.

The Control Panel uses the Global TareTotalization Settings for building a Tare Settings Table. The Formatted Output Server (FOS) in the Resident Scale Task adds the weight for each completed transaction to the Tare Totalization totals.

The IND780 has four Standard Database tables that the user can assign for specific purposes, such as Target Targets and Tare Totalization. Please refer to the description of the Standard Database Tables in the Data Description (DD) Section.

Temporary Database Table Description (TD)

Access:	"All Users"		
Class Code:	dd	Data Type:	PP
Instances:	5	One entry for each scale.	

Attributes:

td--00	Composite td block			

Tare Table Record

td--01	Entry number of current tare record	S8	na	Column 1 - Entry number of the current database record
td--02	Alphanumeric Key	S16	na	Column 2 - Alphanumeric Key
td--03	Description field of current record	S40	na	Column 3 - Description field of the current record

td--04	Data 1 field of current tare record	S16	na	Column 4
td--05	Data 2 field of current tare record	S16	na	Column 5
td--06	Data 3 field of current tare record	S16	na	Column 6
td--07	Data 4 field of current tare record	S16	na	Column 7
td--08	Data 5 field of current tare record	S16	na	Column 8
td--09	Data 6 field of current tare record	S16	na	Column 9
td--10	Data 7 field of current tare record	S16	na	Column 10
td--11	Data 8 field of current tare record	S16	na	Column 11
td--12	Data 9 field of current tare record	S16	na	Column 12
td--13	Data 10 field of current tare record	S16	na	Column 13
td--14	Data 11 field of current tare record	S16	na	Column 14
td--15	Data 12 field of current tare record	S16	na	Column 15
td--16	Data 13 field of current tare record	S16	na	Column 16
td--17	Data 14 field of current tare record	S16	na	Column 17
td--18	Data 15 field of current tare record	S16	na	Column 18
td--19	Data 16 field of current tare record	S16	na	Column 19
td--20	Data 17 field of current tare record	S16	na	Column 20

Target Table Record

td--21	Entry number of current record	S8	na	Column 1 - Entry number of the current database record
td--22	Alphanumeric Key	S16	na	Column 2 - Alphanumeric Key
td--23	Description field of current record	S40	na	Column 3 - Description field of the current record
td--24	Data 1 field of current target record	S16	na	Column 4
td--25	Data 2 field of current target record	S16	na	Column 5
td--26	Data 3 field of current target record	S16	na	Column 6
td--27	Data 4 field of current target record	S16	na	Column 7
td--28	Data 5 field of current target record	S16	na	Column 8
td--29	Data 6 field of current target record	S16	na	Column 9
td--30	Data 7 field of current target record	S16	na	Column 10
td--31	Data 8 field of current target record	S16	na	Column 11
td--32	Data 9 field of current target record	S16	na	Column 12
td--33	Data 10 field of current target rec	S16	na	Column 13
td--34	Data 11 field of current target rec	S16	na	Column 14
td--35	Data 12 field of current target rec	S16	na	Column 15
td--36	Data 13 field of current target rec	S16	na	Column 16
td--37	Data 14 field of current target rec	S16	na	Column 17
td--38	Data 15 field of current target rec	S16	na	Column 18
td--39	Data 16 field of current target rec	S16	na	Column 19
td--40	Data 17 field of current target rec	S16	na	Column 20

Miscellaneous Table Record

td--41	Entry number of current misc record	S8	na	Column 1 - Entry number of the current database record
td--42	Alphanumeric Key	S16	na	Column 2 - Alphanumeric Key
td--43	Description field of current record	S40	na	Column 3 - Description field of the current record
td--44	Data 1 field of current misc record	S16	na	Column 4
td--45	Data 2 field of current misc record	S16	na	Column 5
td--46	Data 3 field of current misc record	S16	na	Column 6
td--47	Data 4 field of current misc record	S16	na	Column 7
td--48	Data 5 field of current misc record	S16	na	Column 8
td--49	Data 6 field of current misc record	S16	na	Column 9
td--50	Data 7 field of current misc record	S16	na	Column 10
td--51	Data 8 field of current misc record	S16	na	Column 11
td--52	Data 9 field of current misc record	S16	na	Column 12

td--53	Data 10 field of current misc record	S16	na	Column 13
td--54	Data 11 field of current misc record	S16	na	Column 14
td--55	Data 12 field of current misc record	S16	na	Column 15
td--56	Data 13 field of current misc record	S16	na	Column 16
td--57	Data 14 field of current misc record	S16	na	Column 17
td--58	Data 15 field of current misc record	S16	na	Column 18
td--59	Data 16 field of current misc record	S16	na	Column 19
td--60	Data 17 field of current misc record	S16	na	Column 20

Method:

The CP uses the Tare Table and Target Table fields for maintaining the current Tare and Target Database records for each each scale.

A Task Expert application can use the Miscellaneous fields in this block maintaining Database Table records on a per scale basis. The application can set these fields in a print template for printing by the RST.

VI. Communication and PLC Data

Web and Network Data

Dynamic System Console Data (XW)

Access:	"All Users"		
Class Code:	xw	Data Type:	D
Instances:	1		

Attributes:

xw0100	Composite xw block	Struct	na	Composite of entire block
xw0101	SICS Level 1 Display Messages	S121	rt	When an SICS-Master protocol sends display messages to the IND780, the RST stores them here
xw0102	SICS Level 1 Display Messages	S121	rt	SICS-Master 2
xw0103	PLC Display Messages	S121	rt	When a PLC sends a display messages to the IND780, the RST stores them here.
xw0104	PLC Display Messages	S121	rt	When a PLC sends a display messages to the IND780 the RST stores them here.

Web Page Process Data (HT)

Access:	"Maintenance"		
Class Code:	ht	Data Type:	PP
Instances:	1		

Attributes:

ht0100	Composite ht block	Struct	na	Composite of entire block	
ht0101 ht0120	SD Indirect Access Pointer 1-20	S6	na	These fields contain the name of other Shared Data fields. The Web Pages may set this field to point to another Shared Data field in order to access the other fields through the Web Server Side Includes.	
ht0121	Enable Web Server	BI	na	0=no, 1=yes.	
ht0122	Home Page location	S81	na		
ht0123	Documentation Page location	S81	na		
ht0124	Help Page location	S81	na		
ht0125	Web Page Language	By	na	0=English 1=French 2=German 3=Spanish	4=Chinese 5=Dutch 6=Italian
ht0130	Shared Data Server Save Area	AL240	na	Saves Shared Data Socket Server callbacks and group settings	

Method:

The Web Pages can use Alias Names for accessing Shared Data names. It provides one level of indirection for reading Shared Data. This mechanism allows the Web Pages to store names of the Shared Data fields it is monitoring in Shared Data fields ht0101 through ht0120. Then, it can read the fields indirectly by reading the Alias names, hc0101 through hc0120.

Network Node Status (NS)

Access:	"Read Only." Access level is not customizable.
Class Code:	ns Data Type: D
ControlNet Class Code:	6F hex
Instances:	1

Attributes:

ns0100	Composite ns block	Struct	na	Composite of entire block
ns0101 ns0120	Cluster Nodes Online 1–20	Bl	rt	0=offline, 1=online
ns0121 ns0123	Host Nodes Online 1 – 3	Bl	rt	
ns0124	PLC Online	Bl		
ns0125	FTP Currently Active	Bl	rt	1=FTP connection currently active
ns0126	Email Server Online	Bl	rt	0=offline, 1=online
ns0127	Gateway Server Online	Bl	rt	0=offline, 1=online
ns0128	Reserved	Bl	rt	
ns0129	Reserved	Bl	rt	
ns0130	Reserved	Bl	rt	

Method:

The Resident Scale Task maintains the online/offine status for all nodes in its local cluster, using the TCP/IP IGMP protocol. Refer to the Section entitled "Clustering Services Task".

The RST maintains the Email Server and Gateway Server status using the standard ping protocol.

The Application can read theses statuses.

Cluster IP Addresses (NC)

Access:	"Maintenance"
Class Code:	nc Data Type: PP
Instances:	1

Attributes:

nc0100	Composite nc block	Struct	na	Composite of entire block
nc0101 nc0120	Cluster Node IP Address 1 – 20	S40	na	If no cluster, nc0101 contains IP address of this node. Otherwise, this group contains IP addresses of all nodes in a cluster.
nc0121	Cluster Nodes Disable 1 – 20	ABl 20	na	0=no, 1=yes for each cluster node
nc0122	Remote Cluster Node Count	By	na	
nc0123	Network Console Enable	Bl	na	1=This terminal may act as a remote console for other cluster nodes.
nc0124	Cluster Node Number of This Node	By	na	1 – 20, 0 = no cluster
nc0131 nc0150	Terminal Names 1 – 20	S21	na	Terminal names of all nodes in a cluster.

Method:

The RST supports up to 20 terminals in an IND780 cluster. The RST:

- Automatically establishes the TCP/IP connections with remote terminals,
- Acts as a client to the Shared Data Server in other terminals in a cluster,

- Automatically detects online/offline state by periodically "pinging" remote terminals in cluster.

To find the IP Address of the local IND780 Terminal, follow this procedure:

- Read nc0124. It provides an index into nc0101 through nc0120 for accessing the local IP address in a cluster.
- If nc0124 = 0, then nc0101 contains the local IP address in a standalone IND780.

Data Connections Setup (DC)

Access:	"Maintenance"		
Class Code:	dc	Data Type:	PS
Instances:	20		

Attributes:

dc--00	Composite dc block	Struct	na	Composite of entire block
dc--01	Output Connection Type	By	na	0=none 1=scale transaction and custom demand print 2=continuous print 3=multi-continuous print 1 4=multi-continuous print 2 5=reports 6=totals reports
dc--02	Input Connection Type	By	na	0=none, 1=scale commands, CTPZ-style 2=scale commands, SICS Slave Level 0 & 1, 3=bar codes, 4= remote keyboard, 5= ComPac 8142, 6= ComPac 8530, 7= ComPac PT6S3, 8= ComPac SMA
dc--03	LPRINT Device	By	na	0=none, 1= Virtual Console Instance 1 (am0100), 2= Virtual Console Instance 2 (am0200), 3= Virtual Console Instance 3 (am0300) Only the first LPRINT connection definition for each Virtual Console in the Data Connections is valid. It is only valid in conjunction with a demand print type connection.
dc--04	Output Trigger	By	na	Entity that triggers output: 0: None 1 – 5: Scales 1 - 5 6 – 25: Custom Print 1 – 20 26 -37: Flow Meter 1 – 12 If this connection is a SICS Slave Connection in dc--02, this field indicates which scale the SICS Connection controls.
dc--05	Print Template(s)	ABI 11	na	An array with one element for each template Entry 1: 1= use default template. Entry 2-11: 1=Connection uses this template 1-10.
dc--06	Address	By	na	Address for ComPac 8412 / 8530 Host '2' - '9' or 'A' - 'Z'. Address for extended continuous '1' - '9'.
dc--07	IO Port	ABy 3	na	There are up to 3 IO ports for an output data connection. There can be only one local IO port for an input connection. The IO port numbers are as follows: 1-6 are Serial Ports 1-6 7-12 are USB Ports 1-6 13-15 are TCP/IP Demand Print Message streams 1-3 for remote data connections. An IND780 client or PC client application must connect to the Shared Data Server to receive data from this output connection. 16 is TCP/IP message stream for continuous output 17 is the TCP/IP "EPRINT" connection for the second Shared Data Server port. This connection supports the legacy JagX Console Print server connection for continuous output and demand print. 20 is a "no connection" output connection that enables totalization and alibi memory processing without generating an output message to a device.

dc--08	Add Checksum	BI	na	1=Add checksum to end of output string
dc--09	Default Demand Print Template	By	na	0=Single-Line, 1=Multi-Line
dc--10	Default Demand Print Control Chars	By	na	0 = None, 1 = STX, 2 = SO-SI, 3 = STX & SO-SI

Method:

You can establish Data Connections to Serial Ports, USB Ports, and TCP/IP Connection Ports. There is a separate instance of the DC class for each data connection. You may only specify a single output type OR a single input type in each connection instance – not both. An SICS command connection is an exception; it is both and input and an output connection.

Here are some rules for configuring data connections:

- Demand print and Continuous print connections CANNOT share the same IO port.
- An input connection CANNOT share the same IO port with another input connection.
- Multiple demand print and custom print connections CAN share the same IO port.
- Demand OR Continuous print connections CAN share an IO port with a single Input-only connection, such as CTPZ-command connection or a bar-code reader connection.
- A SICS-connection must have exclusive use of its IO port since it does bi-directional IO.
- Multiple ComPac 8142 or 8530 hosts (not both) may share the same port if their addresses are unique.
- Scales and Remote Discrete IO devices must have exclusive use of their IO port.
- You can configure multiple continuous print connections to a single IO port. However, the RST only sends the data from a single "selected" scale at a time.
- Custom applications must have exclusive use of their IO ports for communicating bi-directionally with a custom device. However, they CAN share a port with demand print and custom print connections when the application is doing output-only operations.
- Only the first LPRINT connection definition is valid.
- Only the first Continuous Standard connection for each scale is valid.
- Only the first Continuous Template connection for each scale is valid. The maximum length of Template Continuous Output string is 200 characters.
- Only the first Continuous Multiplexed connection is valid.

The RST uses the "Output Trigger" parameter for determining which device or command can trigger the print operations for the connection. Shared Data commands for each device initiate the demand or continuous print operations. Shared Data commands trigger the custom print operations.

The **TCP/IP Console Print Server** enables one or more remote client programs to receive print data from the IND780. The remote clients can be WINDOWS PC Visual Basic applications or other TCP/IP host programs. You must first enable the TCP/IP Console Print Server Print Connection. Then, whenever a remote client establishes a TCP/IP connection, the Console Print Server sends the LPRINT data, the demand and custom print data, and the console log data to the client across the TCP/IP connection to the remote client. The Console Print Server uses TCP/IP port 1701 for establishing connections.

The IND780 Console Print Server sends only the specific output selected by the Output Connection and LPRINT device parameters in the TCP/IP data connection instances.

In order to route print connection data to a remote IND780 terminal IO port, you must setup locally an output connection to a TCP/IP port. In the remote IND780 terminal, you must configure a "Network Print Client" to fetch the data and route it to the proper IO port.

The TCP/IP Console Print Server routes input data that it receives, as keystrokes to the SoftKey Manager/Keyboard Routing. Then, using this connection, a remote client can submit keystrokes to the IND780.

Each demand print, custom print, or lprint message have a <dprint> and </dprint> delimiter tags to denote the beginning and end of the message, and they may span multiple messages. The Print Client and destination Serial Services task must print the data within the beginning and ending tags sequentially and consecutively so that messages from different terminals do not become intermixed.

Email Alert Setup (NA)

Access:	"Maintenance"		
Class Code:	na	Data Type:	PS
Instances:	1		

Attributes:

na0100	Composite na block	Struct	na	Composite of entire block
na0101	Enable Email Alert	BI	na	0=no, 1=yes
na0102	SMTP Server IP Address	S40	na	
na0103	SMTP Sending Machine Name	S21	na	
na0104	SMTP Sender E-mail Address	S40	na	
na0105	SMTP Subject	S81	na	
na0106	SMTP Domain	S40	na	
na0107	SMTP Server TCP Port	US	na	
na0108 na0113	E-mail Recipient Address 1 – 6	S40	na	
na0114	E-mail On Calibration Checks	ABy 6	no	0=no, 1=yes (all), 2=failures only for corresponding E-mail recipient
na0120	E-mail On Warnings	ABy 6	na	0=no, 1=yes (all) for corresponding E-mail recipient
na0121	E-mail On Failures	ABy 6	na	0=no, 1=yes (all) for corresponding E-mail recipient
na0122	E-mail On Application Trigger	ABy 6	na	0=no, 1=yes (all) for corresponding E-mail recipient. Note: Resident Scale Task ignores this element. This is intended to provide a convenient location for email address configuration. Use of this element would be exclusive to TaskExpert functionality in which the Task Expert program/application reads this element to determine if a "Task Expert" Email command should be invoked / called.
na0123	Reserved	ABy 6		
na0124	Reserved	ABy 6		
na0125	Reserved	ABy 6		
na0126	Reserved	ABy 6		

Method:

The RST Emailer sends email messages in the following format:

ALERT!:IND780:11:MONITOR SCALE ERRORS,01,000,exp 04/05,2005/04/27 15:00:03

where the fields are: na0105:na0103:error number:translated error string,channel,cell,status,date & time

Possible additional alerts suggested in 4/25/05 discussion with Doug Bliss, John Moorman, Venus Simmons:

- Calibration Test Success/Fail
- Loadcell Failure
- Calibration Expiration
- Battery Expiration
- Log File exceeding limits
- Perhaps compact flash storage below a limit

FTP Server Setup (NF)

Access:	"Maintenance"		
Class Code:	nf	Data Type:	PS
Instances:	1		

Attributes:

nf0100	Composite nf block	Struct	na	Composite of entire block
nf0101	Enable FTP Server	BI	na	0=no, 1=yes

nf0102 nf0107	FTP login names 1- 6	S13	na		
nf0108 nf0113	FTP passwords 1- 6	S13	na		
nf0114 nf0119	Write Access Level 1-6	By	na	1=Operator 2=Supervisor	3=Service 4=Administrator

Method:

The FTP Server listens on a TCP/IP port for a remote FTP client to initiate a connection with the FTP Server. Once the Cient and Server establish the connection, the FTP client initiates the file transfers to and from the Server, using standard FTP Protocol commands.

The IND780 restricts access to the files on the IND780 based on the access privilege level of the user.

Users with "Administrator" rights can write the entire FLASH file system ("\Storage Card"). Only Administrators have write access to the following Files/directories:

\Documents and Settings\

\IND780\

\Startup\

\AutoCE.ini

\NK.BIN

All users have read only access by default. Users with an access level of at least the "Supervisor" access level have write access to all files & directories except those restricted to administrator write access only listed above. The "anonymous" user has read only access.

IND780 Shared Data is accessible in the \IND780\SD directory. Files available are BRAM.dmt, FLASH.dmt and EEPROM.dmt. Users with the "Administrator" access level have read and write access to these files. All other users have read only access to these files, except only "Administrators" have read access to the Terminal Access Security Setup (xu) block and the FTP Server Setup (nf) Access block.

Network Print Client Setup (NK)

Access:	"Maintenance"		
Class Code:	nk	Data Type:	PS
Instances:	1		

Attributes:

nk0100	Composite nk block	Struct	na	Composite of entire block
nk0101 nk0120	Print Server Address 1 – 20	ABy3	na	Identifies the Remote Print Servers to which the Print Client on this IND780 connects. Byte 0 is the Server node number, 1 to 20, to which the Print Client must establish the connection to the Print Server. 0 indicates no connection. Byte 1 is the Print Stream Number on the Server node: 1-3 = TCP/IP Demand Print Stream 1-3 4-8 = TCP/IP Continuous Output Stream for Scale 1-5 9 = TCP/IP Continuous Output Stream for the Selected Scale 10 = TCP/IP Multiplexed Continuous Output Stream Byte 2 is the IO Port Number to route the data from the remote Print Server. 1-6 are Serial Ports 1-6 7-12 are USB Ports 1-6

Method:

The Print Client attempts to establish a TCP/IP connection with the Print Server on the remote cluster nodes as identified by this Shared Data block. The Print Client accepts the output data from the Remote Print Server and routes it to the selected local output port. Refer to the Data Connections (DC) Setup block.

TCP/IP/Ethernet Network Setup (NT)

Access:	"Maintenance"		
Class Code:	nt	Data Type:	PS
Instances:	1		

Attributes:

nt0100	Composite nt block	Struct	na	Composite of entire block
nt0101	Ethernet MAC Address	S13	na	Read from Ethernet Adapter.
nt0102	Ethernet IP Address	S40	na	Default: 192.168.001.000. Used only IP address is fixed – NO DHCP
nt0103	Ethernet IP Address Subnet Mask	S40	na	Default: 255.255.255.000
nt0104	Ethernet Gateway IP Address	S40	na	Default: 000.000.000.000
nt0105	Enable Ethernet DHCP Client	By	na	0=no, 1=yes
nt0106	Cluster Multicast Address	S40	na	IGMP protocol uses multicast address to acquire cluster addresses. Default: 227.227.000.001
nt0107	Reserved	S40	na	
nt0108	Reserved	S40	na	
nt0109	Reserved	By	na	
nt0110	Reserved	By	na	
nt0111	Reserved	S40	na	
nt0112	Reserved	S40	na	
nt0113	Reserved	By	na	
nt0114	Reserved	By	na	

Serial Port Setup (RP)

Access:	"Maintenance"		
Class Code:	rp	Data Type:	PS
Instances:	4	Instance 1 & 2 are ComPorts 1 & 2 on baseboard. Instance 3 & 4 are ComPorts on Serial IO Option boards	

Attributes:

rp--00	Composite rp block	Struct	na	Composite of entire block	
rp--01	Interface Type	By	na	0=RS232, 1=RS422, 2=RS485	
rp--02	Baud Rate	By	na	0=300 1=600 2=1200 3=2400 4=4800	5=9600 6=19200 8=38400 9=57600 10=115200
rp--03	Parity	By	na	0=none, 1=odd, 2=even	
rp--04	Flow Control	By	na	0=none, 1=Xon/Xoff	
rp--05	Data Bits	By	na	1=7 bits, 2=8 bits	
rp--06	Stop Bits	By	na	1=1, 2=2	
rp--07	Data Format	By	na	0=ASCII (default), 1=Unicode	
rp--08	Assigned Usage for Port	By	rt	0 = None 1 = SICS Scale 2 = Remote Discrete IO	3 = Data Connection 4 = Task Expert Application
rp--09	Option Board Slot Number	By	na	0 = None 1 – 6 = Slot Number	

Print and Templates Data

Demand Print Setup (DP)

Access:	"Maintenance" dp--02 has "Administrator" default level.
Class Code:	dp Data Type: PS
Instances:	17 (Scales 1 - 5, Flowmeters 1 - 12)

Attributes:

dp--00	Composite dp block	Struct	na	Composite of entire block
dp--01	Enable Auto-Print	BI	na	1=yes
dp--02	Ensure No Motion before Printing	BI	na	1=yes
dp--03	Print Threshold	D	na	Weight threshold for Auto-Print and Scale Weighment Monitoring in primary weight units.
dp--04	Print Reset Threshold	D	na	Weight threshold for resetting Auto-Print and scale weighment monitoring in primary weight units.
dp--05	Minimum Print Threshold	D	na	Minimum print threshold for demand print
dp--06	Weighment Trigger	By	na	0=None 1=Print Command 2=Upscale Gross Weight Threshold to start Auto-Print or to record a weighment 3=Downscale Gross Weight Threshold to start Auto-Print, or to record a weighment 4=Upscale Net Weight Threshold to start Auto-Print or to record a weighment 5=Downscale Net Weight Threshold to start Auto-Print or to record a weighment.
dp--07	Print Interlock Enabled	BI	na	1=enable print checks 0=disabled
dp--08	Weight Deviation Print Threshold	D	na	Auto-Print when this absolute weight deviation occurs from the last printed weight.
dp--09	Last "Reset On" Menu Selection	By	na	0 = Return, 1 = Deviation
dp--10	Reserved	By	na	
dp--11	Reserved	D	na	

Method:

The **Demand Print** command is a "transaction" print command. A local operator, an external operator, or a remote device can generate a print command. When the Resident Scale Task receives a Print command, it formats and stores weight and other data as a transaction record for the scale or flow meter channel. It forwards the transaction record to one or more destinations, which could include a printer, Alibi (transaction) memory, or a remote device. The Resident Scale Task rejects Print command when:

- The scale weight is less than the Minimum Print Weight.
- The scale is in motion, when dp--02 is enabled.
- After generating a print, the Resident Scale Task has not reset the print trigger because the weight has not gone below the print reset threshold, when dp--01 selects auto-printing.

Auto-Print is Demand Print command that operates in conjunction with the Print Threshold and the Reset Print Threshold. When the scale weight goes above the Print Threshold and there is no motion the scale, the Resident Scale Task automatically generates a demand print. When the scale goes below the Print Reset Threshold, the Resident Scale Task re-enables the next print.

Print Connections Table associates a logical print command with one or more physical print devices and print messages. The Print Template Setup specifies the format of the print messages.

Scale Monitoring uses these settings to count the number and size of the scales' weighments.

The Weights and Measures seal protects the print configuration.

Custom Print Commands & Statuses (CP)

Access:	"All Users"		
Class Code:	cp	Data Type:	D
ControlNet Class Code:	94 hex		
Instances:	1		

Attributes:

cp0100	Composite cp block	Struct	na	Composite of entire block
cp0101 cp0110	Custom Print 1–10	BI	rc	Application sets from 0 to 1=command to start custom print.
cp0111 cp0120	Custom Print 1–10 status	By	rt	Command Completion Statuses: 0=Success, 1-255=Specific error code.
cp0121 cp0130	Custom print 11–20	BI	rc	Application sets from 0 to 1=command to start custom print.
cp0131 cp0140	Custom print 11-20 status	By	rt	Command Completion Statuses: 0=Success, 1-255=Specific error code.

Method:

The Application uses this Shared Data block to trigger custom prints and to monitor their completion status.

Print Templates Setup (PT)

Data Type:	PS
Access:	"Maintenance"
Class Code:	pt
Instances:	1

Attributes:

pt0100	Composite pt block	Struct	na	Composite of entire block
pt0101 pt0110	Print Templates 1–10	S1001	na	Printer Template
pt0111 pt0130	Print Literals 1 – 20	S51	na	Fixed Text Messages used in Templates
pt0131	Custom Transaction Template	S100	na	Custom Application Template that defines custom transaction data. The RST Logger adds transaction data to the Alibi Memory Log.
pt0141 pt0150	Print Template Names 1–10	S21	na	Logical names for Printer Templates pt0101 through pt0110

Method:

Templates are a method to configure both data content and data format in print messages. A Template is a user specific "program" that the RST Template Interpreter executes to build a print message. A Template defines a serial data stream that the IND780 transmits to a printer, sends to a host computer, or writes to a data file. The IND780 supports template nesting. Templates make use of the encapsulation of related data fields, e.g., weight data is not a composed of 10 isolated fields but is instead a single object having many highly correlated attributes, such as gross, tare, net, units, and tare mode. These attributes remain internally consistent at all times. The Weights and Measures seal does not protect Template editing.

A Template Editor that runs in the IND780 Control Panel, the IND780 Web Pages, or in a remote PC Setup program enable the user to build the Template. Appendix B (Default Settings) of the IND780 Technical Manual describes the Template Format, and Chapter 3 (Configuration) of the Technical Manual details template editing.

Report Print Templates Setup (RT)

Access:	"Maintenance"		
Class Code:	rt	Data Type:	PS
Instances:	1		

Attributes:

rt0100	Composite bi block				
rt0101	Report Width	BI	na	0=wide (132 chars), 1 = narrow (40 chars)	
rt0102	Blank Header Lines	By	na	# blank lines in header	
rt0103	Print Standard Title	BI	na	0 = no, 1 = yes	
rt0104	Record Separator	By	na	0 = none 1 = '*' 2 = '-'	3 = '=' 4 = 'CR/LF'
rt0105	Blank Footer Lines	By	na	# blank lines in footer	

Method:

RST uses the Report Template settings for printing the Standard Terminal reports.

PLC Data

PLC Setup (PL)

Access:	"Maintenance"		
Class Code:	pl	Data Type:	PS
Instances:	1		

Attributes:

pl0100	Composite pl block	Struct	na	Composite of entire block	
pl0101	PLC Node Address	By	na	Allen-Bradley Rack Address 0-59 Profibus station ID 1-127 ControlNet MacID 1-99	
pl0102	PLC Type	By	na	0=None 1=ControlNet 2=Profibus The RST automatically determines the PLC Type by reading the installed hardware board.	3=Ethernet IP 4=Device Net 5=AB RIO
pl0103	Number of Message Slots Used	By	na	Slots used in PLC Message – up to 12	
pl0104	Device Assignment Table	ABy 12	na	Source Device associated with each PLC Message Slot. Scale 1-5, Flow Meter K-V.	
pl0105	Node Assignment Table	ABy 12	na	Source Node associated with each PLC Message Slot.	
pl0106	Data Format	By	na	1=Integer Weight 2= Integer Increments 3=Extended Integer Weight	4=Floating Point 5=Assembly Template 6=Application Processing
pl0107	Enable Explicit Messaging	BI	na	1=Yes. AB RIO Block Transfer supports explicit messaging to read and write Shared Data. For Profibus, this field also enables explicit messaging for Shared Data IO blocks appended to the cyclic data messages. ControlNet contains explicit message as part of its standard protocol.	
pl0108	Timer Interval for Cyclic Outputs	US	na	In Assembly Template Data format only, number of milliseconds between cyclic outputs to PLC.	

plI0109	Reserved	BI	na	
plI0110	AB RIO Data Rate	By	na	0 = 57.6K 1 = 115.2K 2 = 230.4K
plI0111	AB RIO Starting Quarter	By	na	1 – 4
plI0112	AB RIO Last Rack	BI	na	1 = Yes, 0 = No
plI0113	Byte-Ordering of PLC Data	By	na	0=Little Endian, 1=Big Endian, 2=JagABRIO Endian. Please refer to the method description below for the definition of the byte-ordering.
plI0114	Input Rotation	ABy 10	na	The PLC can set up a rotation of input fields to the PLC within one assembly slot. This feature is applicable only in floating point data format.
plI0115	App Cyclic Input To PLC size	US	na	In "Application Processing" Data Format mode, the application must set the exact size of the input assemblies.
plI0116	App Cyclic Output From PLC size	US	na	In "Application Processing" Data Format mode, the application must set the exact size of the output assemblies.
plI0120	Size of Input to PLC Assembly	US	na	RST sets this field after calculating the size in bytes of the Input to PLC Assembly. The user needs to make sure that the host PLC is set up to accept this assembly size.
plI0121	Size of Output from PLC Assembly	US	na	RST sets this field after calculating the size in bytes of the Output from PLC Assembly. The user needs to make sure that the host PLC is set up to accept this assembly size.
plI0122	Reserved	US	na	
plI0123	Reserved	US	na	
plI0125	Ethernet/IP IP Address	S40	na	IP Address for Ethernet IP
plI0126	Ethernet/IP Subnet Mask	S40	na	Subnet Mask for Ethernet IP
plI0127	Ethernet/IP Global Address	S40	na	Subnet Mask for Global Address
plI0128	Reserved	By	na	

Method:

The IND780 RST supports three general methods for building PLC output messages and processing PLC Input Messages:

1. The RST uses Internally-Defined PLC input and output messages. These messages have a fixed format. The RST builds the output messages and processes the input messages based on this fixed format.
2. The RST uses assembly templates. The user can build templates defining the specific format of the input and output PLC messages. The templates consist of a list of Shared Data field names and some minimum formatting definitions. The RST processes the PLC messages based on these templates.
3. The Application processes the PLC messages. The RST sends the Output-to-PLC messages from the Dynamic PLC IO Shared Data Block. It writes the Input-from-PLC messages to the same block and alerts the Application that there is a new message.

For the Internally-Defined PLC messages, the RST can support up to 12 device "slots" in the messages. That is, there can be up to 12 devices reporting weight and accepting commands. The devices can be either scales or flow meters. The devices may reside in the local IND780, or they may reside in a remote IND780 within the cluster.

PLC Data Byte-Ordering – plI0113

			JagABRIO Endian	
	Big Endian	**Little Endian**	**Cyclic**	**Block Transfer**
Integer	1 2	2 1	2 1	1 2 (in string field)
Float	1 2 3 4	4 3 2 1	2 1 4 3	2 1 4 3
String	A B C D	ABCD	N/A	A B C D
ControlNet	Yes	Yes	No	No
Profibus	Yes	Yes	No	No
ABRIO	Yes	Yes	Yes	Yes

Dynamic PLC IO Data (PD)

Access:	"All Users"		
Class Code:	pd	Data Type:	D
Instances:	1		

Attributes:

pd0100	Composite pd block	Struct	na	Composite of entire block
pd0101	App Cyclic Input to PLC Buffer	ABy500	rt	Task Expert Application sets Cyclic Input to PLC buffer.
pd0102	App Cyclic Input to PLC Length	US	rt	Task Expert Application sets input buffer length. RST transfers data length from setting in pl0115
pd0103	App Cyclic Output from PLC Buffer	ABy500	rt	RST sets Cyclic Output data from PLC in buffer for Task Expert application
pd0104	App Cyclic Output from PLC Length	US	rt	RST sets data length for pl0116
pd0105	App Explicit Out from PLC Buffer	ABy500	rt	RST sets Explicit Output sent from PLC in in this buffer for Task Expert application. This capability is available for ControlNet explicit messaging and for ABRIO Block Transfer messaging only.
pd0106	App Explicit Out from PLC Length	US	rt	RST sets length of Explicit Output data length for Task Expert Application.
pd0107	App Explicit Input to PLC Buffer	ABy500	rt	Task Expert Application sets the Explicit Input buffer to send to PLC. The RST sends to PLC upon read request by PLC. This capability is available for ControlNet explicit messaging and for ABRIO Block Transfer messaging only.
pd0108	App Explicit Input from PLC Length	US	rt	Task Expert Application set this field to indicate length of data in the Explicit Input to PLC buffer.
pd0110	App Send Cyclic Output Command	Bl	rc	Application sets from 0 to 1 to send new cyclic data to PLC.
pd0111	Reserved	Bl	rc	
pd0112	Received New Cyclic Input Status	Bl	rc	Resident Scale Task sets from 0 to 1to alert application for new data cyclic received.
pd0113	Reserved		Bl	rc
pd0114	Analog Output Value for Channel 1	D	rt	Application uses these two values to control Analog Output values.
pd0115	Analog Output Value for Channel 2	D	rt	
pd0116	Analog Out Error Signal Channel 1	Bl	rt	Application uses these two values to control Analog Output Discrete Error.
pd0117	Analog Out Error Signal Channel 2	Bl	rt	
pd0118	Display Data Output from PLC	S20	rt	RST sets when PLC sends new display data.
pd0119	Display Command Byte from PLC	By	rt	RST sets new display command

Method:

The IND780 allows the Application to control directly the PLC Messaging. The Service Technician can select this option in Setup. Other options allow the Resident Scale Task to process the PLC messages. When controlling the PLC messaging, the Application must be keenly aware of the capabilities and limitations of the particular PLC protocol.

The Application uses the "pd" block to affect its direct control over the PLC message data. Using this block, the Application can directly access the PLC message data. This block also has triggers that the Resident Scale Task and Application use to signal each other when another buffer is ready.

The Resident Scale Task maintains "cyclic" and "explicit" message buffers for both input and output messages. Cyclic messages are scheduled messages that occur on a periodic basis, for example, once every 50 milliseconds. All PLC protocols support cyclic messaging. Cyclic messages typically contain dynamic data, such as weight data or weight status, which is continuously changing.

Explicit messages are unscheduled messages that occur on demand by the PLC. They are typically request-response message exchanges that the PLC initiates. In a good system design, they should occur much less frequently than the cyclic messages. One good use for explicit messages in IND780 systems is in reading and writing Shared Data. For example, explicit messages can set a

Target coincidence value. Not all PLC protocols support the concept of explicit messages; in which case, the Application must embed the explicit message capability inside the cyclic messaging.

The IND780 allows the Application to control directly the Analog Output signal level. The Service Technician can select this option in Setup. Other options allow the Resident Scale Task to control the signal level. When in control, the Application writes to Shared Data fields in the pd block to control the signal.

PLC Network Data (PN)

Access:	"All Users"		
Class Code:	pn	Data Type:	D
Instances:	1		

Attributes:

pn0100	Composite pd block	Struct	na	Composite of entire block
pn0101	Device Input to PLC Buffer Slot 1	ABy 200	rt	Cyclic iput to PLC
pn0102	Device Input to PLC Buffer Slot 2	ABy 200	rt	
pn0112	Device Input to PLC Buffer Slot 12	ABy 200	rt	

Method:

Scale and Flow Meter devices format and write cyclic data for input to the PLC for the selected slot, based on the setup of the PB block.

PLC Bridge Process Data (PB)

Access:	"Read Only" access, level is not customizable.		
Class Code:	pb	Data Type:	PP
Instances:	17		
	One for each scale and flow meter.		

Attributes:

pb--00	Composite pb block	Struct	na	Composite of entire block
pb--01	Bridge Node #	By	rt	Cluster node # of IND780 terminal containing PLC adapter = 1 – 20; 0 = this node
pb--02	Slot # within PLC Assembly	By	rt	Slot Number within PLC Assembly for this scale = 1 – 12
pb--03	Data Format	By	rt	Assembly Format : 1=Integer Weight 2= Integer Increments 4=Floating Point
pb--04	Reserved	By	rt	

Method:

PLC Thread of Bridge Terminal automatically sets up this data for each of the assembly slots in its assembly structure. Bridge Terminal is the IND780 terminal containing the PLC adapter. It can provide PLC assembly slots for both local and remote scales and flow meters.

Cyclic Output-to-PLC Assembly Template Setup (PO)

Access:	"Maintenance"		
Class Code:	po	Data Type:	PS
ControlNet Class Code:	7B hex		
Instances:	1		

Attributes:

po0100	Composite po block	Struct	na	Composite of entire block
po0101	Number of fields	By	na	# of Shared Data fields in message
po0102	Special length formatting	ABy 25	na	This is an array with one entry for each field. It specifies the length of corresponding string and array fields in the message:
po0103 po0104 po0105 po0126 po0127	1st SD field name 2nd SD field name 3rd SD field name 24th SD field name 25th SD field name	S9	na	Names of Local Shared Data fields

Method:

The IND780 PLC logic builds a cyclic output buffer from the Shared Data in specified fields. It concatenates the fields together into an assembly buffer. It writes the messages to the PLC Cyclic message buffer on a regular interval time basis.

The IND780 converts its internal Shared Data to the fields in the messages, according to these rules:

1. All fields in the message begin on an even-byte boundary within the message.
2. All fields in the message, except composite block structures, have Big Endian or Little Endian byte-ordering as specified in pl0109. Composite block structures have the native byte ordering of the IND780.
3. String fields in the message must have a specified length. If the internal string data is shorter than the message fields, the IND780 pads the end of the message fields with nulls. If internal data is longer, it truncates the end of the data. The IND780 converts strings from Unicode internally to ASCII data format in the message.
4. The IND780 converts double float internal data to single floating point fields in the message.
5. The IND780 converts Byte and Boolean internal data to word (2-byte) fields in the message.
6. Array fields must have a specified length. If internal data is shorter than the message field, the IND780 pads the end of the message field with nulls. If internal data is longer, it truncates the end of the data. The IND780 does not reformat "Arrays of Bytes and Booleans", but copies them directly to the template buffer. However, in "Arrays of Long", each "long" is adjusted to the appropriate Endian.
7. All other fields take the IND780 native formats and lengths.

For Profibus PLC cyclic messages only, the IND780 concatenates explicit messages for reading and writing Shared to the end of the cyclic message. AB RIO and ControlNet use other mechanisms for explicit messaging.

Cyclic Input-From-PLC Assembly Template Setup (PI)

Access:	"Maintenance"		
Class Code:	pi	Data Type:	PS
ControlNet Class Code:	7A hex		
Instances:	1		

Attributes:

pi0100	Composite pi block	Struct	na	Composite of entire block
pi0101	Number of fields	By	na	# of Shared Data fields in message
pi0102	Special length formatting	ABy 25	na	This is an array with one entry for each field. It specifies the length of corresponding string and array fields in the message:
pi0103	1st SD field name	S9	na	Names of Local Shared Data fields

pi0104	2nd SD field name	S9	na
pi0105	3rd SD field name	S9	na
pi0126	24th SD field name	S9	na
pi0127	25th SD field name	S9	na

Method:

The IND780 PLC decodes the cyclic input buffer using this format data. It writes the data to the specified SD fields ONLY IF the data has changed from the last cyclic input message.

Conversion from message data to IND780 internal Shared Data follows the same rules as described in the immediately preceding section.

For Profibus PLC cyclic messages only, the IND780 interprets explicit messages for reading and writing Shared from the end of the cyclic message. AB RIO and ControlNet use other mechanisms for explicit messaging.

Barcode Data

Barcode Input Message (MB)

Access:	"All Users"		
Class Code:	mb	Data Type:	D
Instances:	1		

Attributes:

mb0100	Composite mb block	Struct	na	Composite of entire block
mb0101	barcode message	S100	na	Resident Serial Services decomposes the message into message blocks according to the Input Message Template
mb0102	Clear message block	BI	rc	The application must set this command when it is done processing the current message.
mb0103	New message received	BI	rt	Trigger to application indicating that a new input message is ready for the application to begin processing.

Method:

Resident Serial Services parses a Barcode Input string based on the message definition in the Barcode Template BT Setup fields and stores the parsed mesage in the Shared Data Message Block. The Data Connections DC Setup fields assign the BT input message to a Serial or USB input port.

The Serial Services buffers serial port input data. The Serial Services copies the next message from its buffer into the mb0101 Shared Data field, and sets the mb0103 trigger to alert the application that a new message is ready. When the application has completed processing the current message block, it must set the mb0102 trigger to the clear the message block. Then, the Serial Services can again copy the next message from its buffer to the message block.

Barcode Input Templates Setup (BT)

Access:	"Maintenance"		
Class Code:	bt	Data Type:	PS
Instances:	1		

Attributes:

bt0100	Composite bi block			
bt0101	Preamble length	By	na	Length of data ignored at beginning of message
bt0102	Max data length	By	na	Maximum input data length
bt0103	Postamble length	By	na	Length of data ignored at end of message before the termination character
bt0104	Termination character	By	na	Teminate input whenever this character is encountered
bt0105	Application Use	By	na	0=application, 1=tare value, 2=tare ID, 3=target ID

Method:

Resident Serial Services parses a Barcode Input string based on the message definition in the Barcode Template BT Setup fields and stores the message in the Shared Data Message Block. The Data Connections DC Setup fields assign the BT template processing to a Serial or USB input port.

VII. Other Data

Display and Keyboard Data

Power-Up Weight Display (XA)

Access:	"Maintenance"	
Class Code:	xa	Data Type: PS
Instances:	2	Instance 1 has commands for local weight display, Instance 2 for remote weight display

Attributes:

xa--00	Composite xa block	Struct	na	Composite of entire block
xa--01	Set Weight Display Visible	By	rt	1 = Set Visible (default) 2 = Set Invisible.
xa--02	Set SmartTrac Display Visible	By	rt	1 = Set Visible. 2 = Set Invisible, Release Screen (default) 3 = Set Invisible, Reserve Screen Area
xa--08	Compress Weight Height	By	rt	1 = Use Standard Weight size (default) 2 = Compress size of digital weight display to minimum size. This command = 1 overrides the following commands to set the height and width of the weight displays.
xa--09	Set Sum Weight Height	By	rt	Set Height of Sum Weight 1 = Small (6.1 mm) 2 =Medium (11.2 mm) (default) 3 = Large (16.9 mm) 4 = Larger (25.6 mm) 5 = Huge (37.1 mm)
xa--10	Set Sum Weight Width	By	rt	1 = Full (default) 2 = Half This field applies only to medium and large heights.
xa--11	Set Scale Platform Weight Height	By	rt	Set Height of ScalePlatform Weight display 1 = Small (6.1 mm) 2 =Medium (11.2 mm) (default) 3 = Large (16.9 mm) 4 = Larger (25.6 mm) 5 = Huge (37.1 mm)
xa--12	Set Scale Platform Weight Width	By	rt	1 = Full (default) 2 = Half This field applies only to medium and large heights.
xa--13	Set Default # Scales Display	By	rt	1 = All Scales(default) 2 = One Selected Scale
xa--14	Set Default Tare Wt. Display	By	rt	1 = Never 2 = When Tare Active (default) 3 = Tare Always 4 = Rate Always
xa--15	Set SmartTrac Appearance	By	rt	1 = Bar Graph (default) 2 = Cross Hairs 3 = Three Zone.

xa--16	Set SmartTrac Height	By	rt	SmartTrac Display Height 1 = Small 2 = Medium (default) 3 = Large
xa--17	Target for SmartTrac Display	By	rt	Default Target driving SmartTrac Display
xa--18	Reserved	By	rt	
xa--19	Reserved	By	rt	

Method:

This block contains the power-up settings for the Weight and SmartTrac Display. Changes to these settings only take effect on power-up. To change the weight display appearance dynamically, make settings in the XB block.

Dynamic Weight Display Commands (XB)

Access:	"All Users"	
Class Code:	xb	Data Type: D
Instances:	2	Instance 1 has commands for local weight display, Instance 2 for remote weight display

Attributes:

xb--00	Composite xb block	Struct	na	Composite of entire block
xb--01	Set Weight Display Visible	By	rt	0 = Use Default in xa0101, 1 = Set Visible, 2 = Set Invisible.
xb--02	Set SmartTrac Display Visible	By	rt	0 = Use Default in xa0102 1 = Set Visible 2 = Set Invisible Release Screen Area 3 = Set Invisible, Reserve Screen Area
xb--08	Compress Weight Height	By	rt	0 = Use Default in xa0108. 1 = Standard Weight size. 2 = Compress size of digital weight display to minimum size. This command = 1 overrides the following commands to set the height and width of the weight displays.
xb--09	Set Sum Weight Height	By	rt	Set Height of Sum Weight 0 = Use default in xa0109 1 = Small (6.1 mm) 2 =Medium (11.2 mm) 3 = Large (16.9 mm) 4 = Larger (25.6 mm) 5 = Huge (37.1 mm)
xb--10	Set Sum Weight Width	By	rt	0 = Use default in xa0110 1 = Full 2 = Half This field applies only to medium and large heights.
xb--11	Set Scale Platform Weight Height	By	rt	Set Height of ScalePlatform Weight display 0 = Use default in xa0111 1 = Small (6.1 mm) 2 =Medium (11.2 mm) 3 = Large (16.9 mm) 4 = Larger (25.6 mm) 5 = Huge (37.1 mm)
xb--12	Set Scale Platform Weight Width	By	rt	0 = Use default in xa0112 1 = Full 2 = Half This field applies only to Medium and Large Heights.

xb--13	Set Default # Scales Display	By	rt	0 = Use default in xa0113 1 = All Scales 2 = One Selected Scale,
xb--14	Set Default Tare Wt. Display	By	rt	0 = Use default in xa0114 1 = Never 2 = When Tare Active 3 = Tare Always 4= Rate Always
xb--15	Set SmartTrac Appearance	By	rt	0 = Use default in Target 1 = Bar Graph 2 = Cross Hairs 3 = Three Zone.
xb--16	Set SmartTrac Height	By	rt	SmartTrac Display Height 0 = Use default in xa0116 1 = Small 2 =Medium 3 = Large
xb--17	Target for SmartTrac Display	By	rt	Target driving SmartTrac Display, 0 = Use default in xa0117
xb--18	Reserved	By	rt	
xb--19	Reserved	By	rt	

Method:

The Control Panel or custom application can application can set this block to set parameters for the display.

Dynamic Display Positions (XY)

Access: "All Users." Default access is customizable.

Class Code: xy Data Type: D

Instances: 7
Instance 1 = System Message Display
Instance 2 = Digital Weight and SmartTrac Visualization Display
Instance 3 = SoftKey Display
Instance 4 = Control Panel Display
Instance 5 = Reserved
Instance 6 = Custom.Net Display
Instance 7 = Task Expert Display

Attributes:

xy--00	Composite xy block	Struct	na	Composite of entire block
xy--01	Visible	BI	rt	0=no, 1=yes
xy--02	Starting X coordinate	US	rt	Starting horizontal pixel position for the display area. Legal values = 1 or 161.
xy--03	Starting Y coordinate	US	rt	Starting vertical pixel position for the display area = 1 to 240.
xy--04	Width	US	rt	Horizontal width in pixels = 160 or 320.
xy--05	Height	US	rt	Vertical height in pixels

Method:

Tasks associated with each instance of the display area must maintain the position data describing their display windows. Other tasks use this data to configure their own display positions and window sizes.

- The System Error task maintains Instance 1.
- The Weight Display and SmartTrac Visualization task maintains the Instance 2.
- The Control Panel maintains Instance 3.
- The SoftKey Manager maintains Instance 4.
- Instance 5 is reserved.

- A special Display Manager for Custom.Net Applications maintains Instance 6.
- The Task Expert Language Interpreter maintains Instance 7.

Only one of instances 4, 5, 6, and 7 is visible at a time. The Custom applications regulate which instance is visible by setting xb commands.

Static Home SoftKey Page (KH)

Access:	"Maintenance" default level		
Class Code:	hp	Data Type:	PS
Instances:	1 Instance 1 is the home page.		

Attributes:

kh0100	composite hp block	Struct	na	Composite of entire block
kh0101	application key 1	S50	rt	A multi-part string containing: "Application Index, SoftKey Identifier, Text Message Index, Graphics file name, Exe file name". A NULL String entry in this field indicates that there is no "application key" or "soft key" associated with this entry.
kh0102	application key 2	S50	rt	See description in 'kp' block
kh0103	application key 3	S50	rt	"
kh0104	application key 4	S50	rt	"
kh0105	soft key 1	S50	rt	"
kh0119	soft key 15	S50	rt	"

Method:

The SoftKey Manager uses this Static Home Page from permanently stored flash memory to initialize the Dynamic SoftKey Home Page, kp0100, to begin processing the SoftKeys. The Control Panel application configures the Home Page.

Dynamic SoftKey Page Stack (KP)

Access:	"Operator" default level		
Class Code:	kp	Data Type:	D
Instances:	19	Instance 1 is the current page. Instances 2 – 10 are the Softkey processing stack. Instance 11 is the application-working page. Instances 12 – 19 Task Expert application working pages	

Attributes:

kp--00	composite kp block	Struct	na	Composite of entire block
kp--01	application key 1	S50	rt	A multi-part string containing: "Application Index, SoftKey Identifier, Text Message Index, Graphics file name, program name", where • Application index points to the application that processes the key. 1 = Control Panel 2 = Reserved 3 = Custom.Net application 4 = Task Expert application defined in the AQ table • The Application must define an integer "SoftKey identifier" for each SoftKey in the SoftKey stack. The SoftKey Manager (SKM) sends this identifier in each SoftKey message that it sends to a destination application when the operator selects this SoftKey. • Text Message. The SoftKey Manager (SKM) displays this text in the SoftKey display when there is no Graphics File. If text = "&nnnn", then the SKM looks up the text string in LangTran DLL in to get the appropriate language translation before displaying the text. "&nnnn" is a numeric string preceded by an ampersand. • Text Message index is the text displayed in the SoftKey display by the SoftKey Manager (SKM) when there is no Graphics File. • Graphics file name is a bit-map file used to draw the icon for the SoftKey. • If the application is the Control Panel, the Softkey Manager starts the Control Panel.exe when the operator presses the Softkey. This field contains the Control Panel.exe name. If the Control Panel is already running, SKM sends a custom message to the Control Panel Message Window. If the application is a Task Expert application, the Softkey Manager validates the application in the AQ table contains and triggers Task Expert Interpreter. This field contains the following commands: "START nn" to start application "STOP nn" to stop application "SUSPEND nn" to suspend application "RESUME nn" to resume the application, where "nn" is the index into the AQ table. If the Task Expert application is already running, the SKM sends the key to the Task Expert Message Window. • A NULL String entry in this field indicates that there is no "application key" or "soft key" associated with this entry.
kp--02	application key 2	S50	rt	Same as for kp--01
kp--03	application key 3	S50	rt	
kp--04	application key 4	S50	rt	
kp--05	soft key 1	S50	rt	
kp--06-18	soft keys 2-14	S50	rt	
kp--19	soft key 15	S50	rt	

Method:

The SoftKey Manager uses the Dynamic SoftKey page stack to manage the display and to control the processing of the IND780 SoftKeys and Application keys. Each page instance represents all the SoftKeys and Application keys used at one time. The SoftKey Manager displays the keys within an instance in the order the application writes them to Shared Data.

Applications control page instances up and down the stack in order to change the usage of the SoftKeys. To do this, applications use the "kc" commands and the application-working page. The application first writes the application-working page to send its new instance of SoftKeys to the SoftKey Manager. Then, it writes the "kc0122" command to push the page onto the stack. The SoftKey Manager then begins processing the new page. When it completes using this instance, the application writes "kc0123" to pop the current top page off the stack. The SoftKey Manager returns to processing the new current top page.

Alternatively, you can design your application to run so that the SoftKey Manager only processes the Home Page and the Current Page – not the stack. For example, every Application Form loads a new SoftKey image each time a new Application Form loads. The

Application Form writes its SoftKey image to the working image. Then, it issues the command kc0109 to replace the current page with the working page. After Form A starts Form B, Form A "closes" itself so that it is reloaded each time it restarts.

Custom applications can re-write the Dynamic Home Page to insert or remove their own SoftKeys. When the IND780 first starts up, the SoftKey Manager initializes the dynamic Home Page, kp0100, from the Static Home Page, kh0100, defined in setup. The custom application reads the Dynamic Home Page, inserts its own SoftKeys in any order into the SoftKey page, and re-writes the the Dynamic Home Page into Shared Data. The SoftKey Manager rewrites the SoftKey image on the display from the Dynamic Home Page. A custom application must never modify the Static Home Page.

The SoftKey Manager uses the current SoftKey Page Table in Shared Data for sending the SoftKey Messages to the specific application identified in the table. The SoftKey Manager does the centralized control of the key message routing. The contents of Windows SoftKey Messages, as follows:

- SoftKey Message Number = 500 hex
- Wparam = application-defined SoftKey identifier
- Lparam = empty for now

System Status and Setup Data

System State (XD)

Access:	"Read Only." Access level is not customizable.		
Class Code:	xd	Data Type:	D
ControlNet Class Code:	65 hex		
Instances:	1		

Attributes:

xd0100	Composite xd block	Struct	na	Composite of entire block
xd0101	Julian Date	S9	na	yyddd, where ddd is the number of days in the yy year.
xd0102	Julian Time	S9	na	fractional part of day that is past =.dddddd
xd0103	Current Date	S12	na	Format defined in xs0110.
xd0104	Time of Day	S12	na	Format defined is xs0111.
xd0105	Week Day	S11	na	
xd0106	Quarter-Second Ticks	UL	rt	Number of quarter-seconds since power-up.
xd0107	Second Ticks	UL	rt	Number of seconds since power-up.
xd0108	Number of Scales	By	na	
xd0109	Number of Flow Meters	By	na	RST initializes these 4 fields on power-up based on the hardware configuration it detects.
xd0110	Number of Discrete Inputs	By	na	
xd0111	Number of Discrete Outputs	By	na	
xd0112	Reserved	By	rt	moved to xt0101
xd0113	Reserved	By	rt	
xd0114	Reserved	By	rt	moved to xt0103
xd0115	Consolidated Weight String	S270	rt	Consolidated weight stream - up to 5 scales.
xd0116	Alarm Message String	S121	rt	System Alarm Message
xd0117	System Alarm Output	Bl	rt	RST is generating a System Alarm. The operator resets the alarm by setting xk0110.
xd0118	Update Multi-Weight Display	By	rc	Command to Weight Display and SmartTrac Visualization task indicating new weight is ready for display.
xd0119	Multi-Continuous Print Stream	S100	rt	Mettler-Toledo Continuous Output Stream for multiple scales.
xd0120	Selected Standard Continuous Out	S20	rt	Standard Continuous Output Stream for Selected Scale.
xd0121	Selected Template Continuous Out	S200	rt	Template Continuous Output Stream for Selected Scale.
xd0125	Reserved	S13	na	

xd0126	Display Contrast Adjust Setting	By	na	Contrast setting value returned from the Display Contrast Adjust Controller. Values are from -32 to +31. 0 is the reset value.
xd0127	Reserved	S13	na	
xd0128	Reserved	By	na	
xd0129	Reserved	S13	na	
xd0130	Reserved	By	na	
xd0131	System Setup State	By	rt	0=Startup State 1=Normal Run State 2=Setup State
xd0139	Baseboard Switch settings	By	na	Settings of the 2 toggle switches on the baseboard: Bit 0 = Master Reset Pushbutton Bit 1 = switch 1 (Security Switch) Bit 2 = switch 2 (Test Switch)
xd0140	Current CPU utilization	By	na	Percent CPU utilization averaged over the last one minute.
xd0141	Peak CPU utilization	By	na	Peak percent CPU utilization averaged once a minute over the last 24 hours.
xd0142	Compact Flash Memory Capacity	UL	na	Compact Flash memory capacity in bytes
xd0143	Compact Flash Memory Used	UL	na	Compact Flash memory used in bytes
xd0144	BRAM Capacity	UL	na	BRAM capacity in bytes
xd0145	BRAM Used	UL	na	Amount of BRAM used in bytes
xd0146	Dynamic Program RAM Capacity	UL	na	Dynamic Program RAM capacity in bytes
xd0147	Dynamic Program RAM Used	UL	na	Dynamic Program RAM used in bytes
xd0148	RAM Storage Memory Capacity	UL	na	RAM File Memory capacity in bytes
xd0149	RAM Storage Memory Used	UL	na	RAM File Memory used in bytes
xd0150	Windows CE Version	S13	na	Windows CE Version string
xd0151	I-Button EEPROM Read Image	ABy48	na	
xd0152	Last Raw Keystroke Entered	US	rt	SKM sets the last keystroke here
xd0153	Current Error Display	S81	rt	
xd0154	Reserved	S40	rt	
xd0155	Reserved	S40	rt	
xd0156	Reserved	UL	rt	
xd0157	Reserved	UL	rt	
xd0158	Reserved	US	rt	
xd0159	Reserved	US	rt	
xd0160	Reserved	D	rt	
xd0161	Reserved	D	rt	
xd0162	Remote DIO Network Error Status	By	rt	0 = OK, 1 = Error
xd0163	I-Button Target Product	By	rt	
xd0164	Reserved	By	rt	
xd0165	Reserved	By	rt	
xd0166	Reserved	By	rt	
xd0167	Reserved	By	rt	
xd0168	Reserved	By	rt	
xd0170	Reserved	S81	rt	
xd0171	Reserved	S81	rt	

Methods:

This block shows the current state of the IND780 system.

The IND780 only updates date and time fields when an Application or RST attempts to access these fields. The IND780 updates the clock tick fields regularly so an application may use these fields for periodic callbacks. xs0110 and xs0111 contain the format specification for the date and time.

The **Consolidated Weight Stream (CWS)** is a Unicode string that contains the weight for up to five scales on a single IND780 terminal. When an application is displaying the weight for multiple scales including the sum scale, it should read the weight from this Shared Data field for these reasons:

- Within this field, the weight is metrologically consistent among all scales and among gross, net, and tare weights. We cannot guarantee this when the application does individual reads because they occur at different times.
- It is more efficient to get all the data in one access instead of multiple accesses.
- An application can access the CWS either locally or remotely.

When the Weight Display and SmartTrac Visualization task is displaying weight from multiple scales, it needs to register its weight-update callback on the consolidated weight trigger, xd0118. The RST sets this signal whenever weight changes, up to a maximum rate of 10 times per second. If the weight does not change for an extended time, the RST will set the trigger just to refresh the weight display.

The IND780 sets data in the CWS according to field xp0102, where application subscribes to the fields it wants reported. The format of xp0102 is S<ABCDE>T where ABCDE represents the scales, S represents the selected scale and T is the Time. "S" is mutually exclusive from ABCDE.

The Consolidated Weight Stream has the following format: stream 1><US><stream 2><US><stream n>, and it may contain time, display, and application messages inserted in the output stream, with <US> separating the fields. Each weight stream has the following contents:

<Node ID>	1N	Range: 1 to 20	
<Scale ID>	1A	Range: A to E. If selected scale, range is in lower case <a to e>.	
<Status>	1C	Bit 7: Always 0	
		Bit 6: Always 1	
		Bit 5: = Scale in Motion	
		Bit 4	1 = Center of Zero
		Bit 3-2	00 = single range
			01 = weight range 1
			02 = weight range 2
			03 = weight range 3
		Bit 1	1 = Net Mode
		Bit 0	1 = Preset Tare
<Tare Source>	1C	'M'=memory tare,'P'=Preset tare,' '=Gross tare,'T'=Pushbutton tare	
<Units>	1N	0=None, 1=lb, 2=kg, 3=g, 4=t, 5=ton, 6=toz, 7=dwt, 8=oz, 9 =custom	
<Net Wt>	10N	8 digits plus possible "-" and "." "^^^^^^^^^^" indicates the gross weight on scale is over capacity. "vvvvvvvvv" indicates the gross weight is under zero. "----------" indicates an indeterminate weight.	
<Tare Wt>	10N	8 digits plus possible "-" and "."	

Remote Console is an application operating as remote keyboard and display for an IND780. The Remote Console should access the CWS for displaying weight from the IND780 since the weight is always metrologically consistent. The "xd" and "xw" blocks also contains other fields that the Control Panel and Applications can use for building messages for access by a remote console.

System Logs Setup Data (XR)

Access:	"Maintenance"	
Class Code:	xr	Data Type: PS
Instances:	6	Instance 1 = Maintenance Log Instance 2 = Alibi Memory Log Instance 3 = Error Log Instance 4 = Change History Log Instance 5 = Future Transaction Log expansion to Alibi Memory Instance 6 = Reserved

Attributes:

xr--00	Composite xr block	Struct	na	Composite of entire block
xr--01	Number of Bytes in Log File	UL	na	Number of Bytes in Log File
xr--02	Enable logging	BI	rt	0 = logging is disabled (default) 1 = logging is enabled

Method:

The IND780 currently maintains four log files. IND780 Control Panel Setup can view, search, and print the information in these files. FTP transfers a comma-separated version (CSV) of these files to a remote PC, transmitting the records in newest to oldest order. Since the IND780 RST may add records to the Maintenance, Alibi Memory, and Error log files frequently, the RST Loggers buffers the records in BRAM before writing them Compact Flash. When the buffer is full, the RST Logger writes the entire buffer to the Compact Flash and clears the buffer. This buffering technique prevents excessive writing to the Compact Flash that could drastically reduce the useful life of the Compact Flash. Since the IND780 only writes to the Change log infrequently, the RST Logger writes directly to the Compact Flash.

When the operator enables any of the log files in Compact Flash, the RST Logger clears buffer and Compact Flash file. There is no warning to the user even if the Logger deletes a previously existing file (per Venus Simmons).

When the user enables a log file, IND780 FTP Server creates a phantom file with a .csv extension on the in the /Terminal/HIS directory on the Compact Flash. When a remote FTP Client requests the .csv file, the FTP Server reads the log file through the RST logger. The RST Logger expands the internal log into the .csv ASCII file, and orders the .csv file with the most recent records first. The RST logger separates the field values by commas and encloses the strings by double quotes.

The **"Error Log"** is a circular log file that contains a record of the significant errors that occurred on the IND780. The Error Log also contains Scale Monitoring data. It aids the Service Technician in resolving problems and in deciding what service he needs to perform on the IND780.

The **"Alibi Memory Log"** is circular log file that contains historical record of all the transactions performed on the IND780. The Demand Print operation defines a transaction on the IND780; the Demand Print Setup block specifies the requirements for legal Demand Print operations. Each Alibi Memory record has a fixed format field containing the date, time, scale identifier, net weight, tare weight, tare source, and consecutive number for each transaction. The user may specify a special Print Template for additional data that the IND780 adds to each record.

The **"Maintenance Log"** tracks service operations that an Operator or Service Technician performs with the IND780.

The **"Change Log"** contains a record of the changes made to Shared Data Setup, Calibration fields, and Standard Tables. It provides an audit trail of all the changes that the Service Technician has made to the IND780 since its initial installation. This historical record is a requirement in the pharmaceutical and food industries, where companies must prove their compliance with governmental regulations. The IND780 provides warnings to the operator when this file is becoming full and prevents further changes when this file is finally full. Then, the Service Technician must use FTP to save the log file to a remote PC and reset the file before the IND780 will continue.

A **future** extension to the System Logs provides an extension to the Alibi Memory Log file, known as the **"Transaction Log"**. A custom application defines transaction data that the RST Logger stores with the Alibi Memory data, thus increasing the Alibi Memory Log record size. The Transaction extensions are a fixed length. Multiples of the extended transaction log record must fit evenly into the log buffer. The custom application defines a template in pt0131 Shared Data field, which specifies the contents of the Transaction data. The RST logger uses its BRAM buffering technique with the Transaction Log to extend the Compact Flash's useful life. When the user enables the Transaction Log extension, the Setup view, search, print functions, and the FTP functions related to the Alibi Memory log would include the Transaction extensions.

Please refer to the Section entitled **"Compact Flash Files"** for a definition of the Log File formats.

Design Comments

- Each sector in the Compact Flash has a maximum of 300,000 writes. Each time the IND780 writes to the Compact Flash, the Compact Flash re-writes an entire sector. There are typically multiple records per sector. In logging, we need to minimize the number of writes to the Compact Flash to prevent premature wear-out of the Compact Flash.
- This is a potential problem with three logs – Error Log, Maintenance Log, and Transaction Log.
- The Change Log does not change frequently.
- The Log Files reside in Compact Flash in the \Storage Card\IND780\HIS directory.
- The Logger creates Log Files that are static files of fixed file size, fixed record size, and a fixed number of records. This prevents re-writing the file directory each time that we write to the Log File. We can set the fixed record size to 16 bytes.
- The Log Files may be circular files where the IND780 over-writes the oldest record.
- However, we do not overwrite the oldest record in the Change Log until the user clears the log.
- The Logger buffers 64 log records (1K bytes) in BRAM Shared Data until the buffer becomes full. When the buffer is full, the Logger should write the entire 1K block to the Log File at once, and clear the BRAM buffer.
- The Logger allocates the Log File sizes in 1K byte increments only.
- Fields in BRAM Shared Data point to the current position in the Log File.
- The Logger must support a "flush" command where it writes the current contents of the BRAM buffer to the Log File, even if it is not full.
- Since multiple records always end evenly in the BRAM buffer, the Logger does not need to take into account the end-of-file, wrap-around conditions where a BRAM buffer may be split between the end and beginning of the file. – Note item above makes this unnecessary
- The Service Technician can use FTP to read the Log Files through FTP.
- When the Service Technician reads the Log Files through FTP, FTP issues a command to the Logger to flush the BRAM buffer to Compact Flash Log File before transmitting the Log File to the host.
- FTP Server provides READ-ONLY access to these log files as newest-to-oldest, comma-separated value (CSV) files. These files have the most recent record at the beginning of the file and the oldest at the end. These files are named "filename.csv"; for example, Alibi.csv, Error.csv, Maintenance.csv, and Change.csv.

System Log Process Data (XM)

Access:	"Read Only" access, level is not customizable.		
Class Code:	xm	Data Type:	PP
Instances:	6	Instance 1 = Maintenance Log Instance 2 = Alibi Memory Log Instance 3 = Error Log Instance 4 = Change History Log Instance 5 = Future Transaction Log expansion to Alibi Memory Instance 6 = Reserved	

Attributes:

xm--00	Composite xm block				
xm--01	Counts Reset Time	S20	na	Date & time, where applicable	
xm--02	File Last Reset Time	S20	na	Date & time	
xm--03	File Last Save Time	S20	na	Date & time when last sent to host via FTP	
xm--04	File Next Byte Pointer	UL	na	Pointer to next byte in log file that IND780 will write, typically in fixed size records, ref XR for record size	
xm--05	File Status	By	na	0 = less than 75% full 1 = 75 to 90% full	2 = 90 to 99% full 3 = 100% full
xm--06	Buffer Next Byte Pointer	US	na	Position for next written byte to the buffer	
xm--07	Internal Buffer	By1024	na	Buffer for temporary records, the size of this element is dependent upon the flash in use and should match the sector size of the flash or be some multiple of the sector size	

Note: Only instances 1, 2, and 3 utilize these shared data elements. [xm0407 & xm0507 are large buffers available for use in BRAM space.]

Method:

The Logger maintains pointers to these circular files that record system activity. Please refer to the method description in the XR block that more fully describes the Logger operation.

Transaction Number Setup (XN)

Access:	"Maintenance"		
Class Code:	xn	Data Type:	PS
Instances:	1		

Attributes:

xn0100	Composite xn block	Struct	na	Composite of entire block
xn0101	Transaction Number Enable	BI	na	0=no, 1=yes
xn0102	Transaction Number Preset Enable	BI	na	0=no, 1=yes
xn0103	Transaction Number Preset	L	na	Preset value to reset the transaction counter
xn0104	Transaction Number Destination	By	na	Only increment transaction number on Demand Print to this destination. 0: All Demand Print operations 1-6: Serial Ports 1-4 7-12: USB Ports 1-3 13-15: TCP/IP Printer/Console Connection
xn0105	Transaction Number Reset Enable	BI	na	0=no, 1=yes
xn0106	Reserved	L	na	
xn0107	Reserved	By	na	

Method:

The Resident Scale Task increments the Transaction Number (TN) each time the IND780 receives a "Demand Print" request for the specified print destination. Range is 1-999,999,999. The user may specify starting value for the TN register in the "Preset". The Weights and Measures seal does not protect the TN configuration.

System Setup (XS)

Access:	"Maintenance" The following fields have "Administrator" level security: xs0101, xs0102, and xs0122. The following fields have "Read Only" level security: xs0103, xs0104, xs0105, xs0109, xs0124, xs0125, xs0126, xs0127, xs0131, xs0151 and xs0152.		
Class Code:	xs	Data Type:	PS
ControlNet Class Code:	6A hex		
Instances:	1		

Attributes:

Xs0100	Composite xs block	Struct	na	Composite of entire block
xs0101	Market	By	na	0 = USA, 1 = European Community, 2 = Australia, 3 = Canada
xs0102	Legal for Trade	By	na	0=no, 1=yes
xs0103	Software ID	S21	na	Textual Description of the Installed Software
xs0104	Software Part Number	S14	na	Part #'s are 13 digits + null terminator
xs0105	IND780 Serial #	S14	na	Serial #'s are 13 digits + null terminator
xs0106	IND780 ID	S21	na	Terminal ID

xs0107	IND780 Project ID	S21	na	Project ID	
xs0108	IND780 Terminal ID	S161	na	User Textual Description of the IND780	
xs0109	Shared Data Version Number	S14	na	Year, Month, Day	
xs0110	Date Format	By	na	1 = MM_DD_YY 2 = MMM_DD_YYYY 3 = DD_MM_YY 4 = DD_MMM_YYYY	5 = YY_MM_DD 6 = YYYY_MMM_DD 7= YYYY_MM_DD 0 = none
xs0111	Time Format	By	na	1 = 24_MM 2 = 12_MM	3 =24_MM_SS 4 = 12_MM_SS
xs0112	Date Separator	S2	na	"/" = slash "-" = hyphen "." = period	" " = space 0 = none
xs0113	Time Separator	S2	na	":" = colon "-" = hyphen "." = period	" " = space 0 = none
x00114	Printer Language Set	By	na	0=USA 1=France 2=England 3=Germany 4=Denmark-I 5=Sweden 6=Italy	7=Spain-I 8=Japan 9=Norway 10=Denmark-II 11=Spain-II 12=Latin America 13=Chinese
xs0115	Operator Message Language	By	rt	0=English 1=French 2=German 3=Spanish	4=Chinese 5=Dutch 6=Italian
xs0116	Keyboard Nationality	By	rt	0=English 1=French 2=German	3=Spanish 4=Italian 5=Chinese
xs0117	Disable Key Beeper	By	na	1=disable	
xs0118	Disable Alarm Beeper	By	na	1=disable	
xs0119	Auto Configure Devices Done	By	na	0=no, 1=yes	
xs0120	Battery Replacement Text	S81	na	Date, time & service text message that the Service Technician enters when he replaces the battery.	
xs0121	Backlight Timeout Minutes	US	na	The RST turns off the backlight when there is no TERMINAL activity for these minutes. The RST does not turn off the backlight based on this timeout if its value is 0.	
xs0122	Local Gravity "Geo" Code	By	na	Value from 0-31. This value represents the gravitational acceleration depending on the latitude and altitude at this specific location where the IND780 is now operating. The IND780 uses it to adjust the weight value when you calibrate it in one location and use it in a different region of the world. Any value other than 0-31 disables this feature.	
xs0123	Time Zone	S4	na	Local Time Zone	

Hardware Configuration

xs0124	Number Of Scales	By	na	RST automatically sets during system installation, and reverifies at power up.	
xs0125	Number Of Flow Meters	By	na	RST automatically sets during system installation, and reverifies at power up.	
xs0126	Number of Discrete IO Boards	By	na	RST automatically sets during system installation, and reverifies at power up.	
xs0127	# Nodes in Remote Discrete IO Unit	By	na	1-8 nodes. RST automatically sets during system installation, and reverifies at power up.	

xs0128	Restart/Reset Units at Power Up	By	na	0 = start up at scale 1 primary units 1 = restart with current scale & current units
xs0129	Weight Display Update Rate	By	na	Maximum rate in hertz that IND780 updates the weight display
xs0130	Keypad Language	By	rt	1=English 2=Dutch 3=French/German 4=Nordic/German 5=Spanish/Italian.
xs0131	Display Type	By	na	0=Black&White, 1=Color
xs0132	Reserved	By	na	
xs0133	Reserved	S40	na	
xs0134	Reserved	S40	na	
xs0135	Screen Saver	L	na	# of minutes inactivity before turning off display. 0 = turn off screen saver.
xs0136	Metrology Control Number	L	na	
xs0137	Reserved	By	na	
xs0138	Shared Data Server Port	L	na	Default = 0. Values of 0 and 1701 disable the second port. No validation for the entry value is performed by the terminal.
xs0139	Last Battery Change Date & Time	AL2	na	The date & time that the service technician or factory last installed a new BRAM battery. After two calendar years, the IND780 prompts the operator to install a new battery once each hour on the system message line. Time is in 100 nanosecond intervals since 1601.
xs0140	Reserved	By	na	
xs0141	Reserved	S40	na	
xs0142	Reserved	L	na	
xs0151	I-Button EEPROM Option Image	ABy48	na	Permanent I-button image
xs0152	I-Button Target Product	By	na	

System Commands (XK)

Access:	"Operator" xk0111 and xk0112 have "Supervisor" access level.		
Class Code:	xk	Data Type:	D
Instances:	1		

Attributes:

xk0100	Composite xk block	Struct	na	Composite of entire block
Fields for Applications to Search and Filter Alibi Memory, Error Log, Monitor Log & SD History Log for Printing and Display				
xk0101	Log File Search String	S64	na	Application sets search string that IND780 RST uses to search for a particular record or set of records in a log file
xk0102	Begin Specific Log File Search	By	rc	Application sets value to begin search of specific log file: 1 = Alibi Memory 2 = Error Log 3 = Maintenance Log 4 = SD Change History Log
xk0103	Control Panel Lock	By	rt	Control Panel sets this flag to 1 to indicate a log search is in progress. The RST supports only one search at a time, so this flag helps prevent two different Control Panels from initiating two concurrent searches. Any local or remote Control Panel that wants to initiate a search must verify this field is 0 before initiating a new search. The Control Panel must set this field to 0 upon completing its log search.
xk0104	Begin Print of Log File	Bl	rc	When application sets = 1, RST begins printing log file based on current search parameters.
xk0105	Reserved	Bl	rc	
xk0106	Log File Search Complete	Bl	rc	RST sets this flag = 1 when it completes the current search
xk0107	Log File Search Result	S100	rt	Buffer containing Log File search results. Format is specific to each log

		0		file.
xk0110	Operator Acknowledges Alarm	Bl	rt	Acknowledges System Alarm xd0117
xk0111	Set Current Time of Day	S12	rt	Set current time of day
xk0112	Set Current Date	S12	rt	Set current date
Fields for Applications to Report Errors for Alerting Operator and Writing to Error Log				
xk0114	Reserved	S6	na	Error Code
xk0115	Additional Error Text	S64	na	Additional Error Text
xk0116	Alert Operator	Bl	na	0 = write to log only 1 = alert operator in system message line and write to log
xk0117	Error Message ID	L	rt	Write the Error Message ID after writing the previous three fields. The Error Logger triggers on the application writing this field. The Error Logger sets this field to zero after completing the processing of the error. The Error Logger also uses this field for indexing into the Language Table for selecting the error message in the currently selected language. If the error message is not in the Language Table, set the Message ID to 999999. The Error Logger then only writes and displays the Error Code and the Additional Error Text.
Fields for Applications to Report Monitoring Events				
xk0118	Monitor Code String	S6	na	Monitor Code
xk0119	Additional Monitor Text	S40	na	Additional Monitor Text
xk0120	Monitor Message ID	L	rt	Write the Monitor Message ID after writing the previous two fields. The Monitor Logger triggers on the application writing this field. The Monitor Logger sets this field to zero after completing the write to the Monitor Log. The Monitor Logger also uses this field for indexing into the Language Table for selecting the message in the currently selected language. If the Monitor message is not in the Language Table, set the Message ID to 999999. The Monitor Logger then only writes the Monitor Code and the Additional Monitor Text fields to the Monitor Log. The Monitor Logger sets the monitoring category to "Application".
Control Panel Buffer Fields				
xk0121	Reserved	S6	na	
xk0122	Control Panel buffer	S40	na	Reserved for use by CP
xk0123	Reserved	Bl	na	
xk0124	Reserved	L	rt	
xk0125	Control Panel buffer	S40	na	Reserved for use by CP
xk0126	Reserved	S40	na	
xk0127	Reserved	Bl	na	
xk0128	Reserved	L	rt	
xk0129	Backup/Restore File Path Name	S40	na	CP uses this field to communicate the file path information to the RST for the Backup/Restore operation.
xk0130	Reserved	S40	na	
xk0131	Reserved	S40	na	
xk0132	Reserved	S40	na	

Method:

The Alibi Memory file search string format is: TNumber[,<Expression>[,<Expression>]]

Where:

TNumber :== number, maximum of 8 digits, denoting the beginning transaction number of interest, a value of 0 (zero) represents an unspecified transaction number. This is the expected value for the first search.

<Expression> :== Field + Operator + Value

Field :== 1 character denoting the search field:

- T – Time & Date

- D – Date
- C – Transaction counter.

Operator :== 2 character field Boolean operator: { "<>", "<=", ">=", "= ", "> ", "< "}

Value :== Field specific value:

- YYMMDD if "D" Date field
- YYMMDDHHMMSS if "T" Time & Date field
- N :== 0 through 99999999 – transaction number

The Error log file search string format is: YYMMDDHHMMSS,N[,<Expression>[,<Expression>]]

Where:

YYMMDDHHMMSS :== Date of the beginning record of interest, a value of 0 (zero) represents an unspecified date & time number. This is the expected value for the first search.

N :== 0 to 999, Number of records, matching all the criteria, to skip before returning result records

<Expression> :== Field + Operator + Value

Field :== 1 character denoting the search field:

- T – Time & Date
- D – Date
- S – Source identifier, defined elsewhere

Operator :== 2 character field Boolean operator: { "<>", "<=", ">=", "= ", "> ", "< "}

Value :== Field specific value:

- YYMMDD if "D" Date field
- YYMMDDHHMMSS if "T" Time & Date field
- N :== 0 through ? – Source id

The Maintenance log file search string format is: YYMMDDHHMMSS,N[,<Expression>[,<Expression>]]

Where:

YYMMDDHHMMSS :== Date of the beginning record of interest, a value of 0 (zero) represents an unspecified date & time number. This is the expected value for the first search.

N :== 0 to 999, Number of records, matching all the criteria, to skip before returning result

<Expression> :== Field + Operator + Value

Field :== 1 character denoting the search field:

- T – Time & Date
- D – Date
- U – User Id
- E – Event Id, defined elsewhere

Operator :== 2 character field Boolean operator: { "<>", "<=", ">=", "= ", "> ", "< "}

Value :== Field specific value:

- YYMMDD if "D" Date field
- YYMMDDHHMMSS if "T" Time & Date field
- N :== 0 through ? – User Id
- N :== 0 through ? – Event Id

System Monitoring & Service Data (XP)

Access:	"Maintenance"		
Class Code:	xp	Data Type:	PP
Instances:	1		

Attributes:

xp0100	Composite xp block	Struct	na	Composite of entire block
xp0101	Transaction Counter	UL	na	Transaction counter incremented according to the Transaction Counter Setup. FTP does not restore this field.
xp0102	Scale Subscription String	S10	rt	The string contains a subset of <ABCDESJLT>, where ABCDE represents the scales, S represents the selected scale, L represents the Message Display, J is the Application Message Field, and T is time. See description of xd0115.
xp0103	Terminal Accumulation Total	D	na	Transaction Weight Accumulation Total for terminal.
xp0104	Terminal Accumulation SubTotal	D	na	Transaction Weight Accumulation SubTotal for terminal.
xp0105	Terminal Transaction Total	UL	na	Total Number of Print Transactions for terminal.
xp0106	Terminal Transaction SubTotal	UL	na	SubTotal Number of Print Transactions for terminal.
xp0107	Terminal Transaction Days Total	UL	na	Total Number of Days when the terminal ran at least one Transaction.
xp0108	Terminal Transaction Days SubTotal	UL	na	SubTotal Number of days when the terminal ran at least one Transaction
xp0109	Last Transaction Day	AL2	na	Last Day that IND780 ran at least one Transaction.
xp0110	Last Print Message	S1001	na	Last print message for IND780
xp0111	Last Error Message	S81	rt	Date, time & error message Factory reset value is "----".
xp0112	Power Cycle Counter	UL	na	Number of times power has cycled since installation of this IND780
xp0113	Current Power On Time Counter	UL	na	Current Power On Time counter in minutes. It contains the number of minutes that the IND780 power has been on since it last powered up.
xp0114	Usage Time Counter	UL	na	Cumulative Usage Time counter in minutes. It contains the cumulative minutes that any scale base weight is above 1% of the scale capacity.
xp0115	Total Transactions Per Day	AL7	na	Total Number of Print Transactions in each of the last 7 days when the IND780 ran at least one transaction.
xp0116	Transaction Day Pointer	By	na	Pointer to the next transaction day entry that the IND780 will update, 1-7.
xp0117	Total Power On Time Counter	UL	na	Cumulative Power On Time counter in minutes. It contains the cumulative minutes that the IND780 power has been on.
xp0118	Reserved	D	na	
xp0119	Reserved	D	na	
xp0120	Reserved	UL	na	
xp0121	Reserved	UL	na	
xp0122	Reserved	UL	na	

Method:

The System Monitor maintains the system usage counters. The FTP Shared Data transfer saves these usage counters but does not restore them. "xp0102", which FTP restores, is the only exception.

Setup Sequencing Control (QC)

Access:	"Service." The default level is customizable by individual field. The following fields have "Administrator" security: qc0101, qc0102, qc0103, qc0104, qc0105, qc0107, qc0108, qc0110, qc0111, qc0112, qc0152, qc0162, qc0163, qc0164, qc0173. qc0174 has "Operator" default security level.
Class Code:	qc Data Type: D
ControlNet ClassCode:	75 hex
Instances:	1, referring to the Selected Scale

Attributes:

qc0100	Composite qc block	Struct	na	Composite of entire block
qc0101	Do Calibration Sequence	By	rt	Application sets this field to initiate a sequence. Resident Scale Task (RST) sets field back to 0 when sequence is complete. 0. Null Calibration 1. Adjust Zero-Point for all Calibration Types 2. Span Adjust High-Point for Linear Two-Point Calibration 3. Adjust Zero-Point & High-Point Linear Two-Point Calibration 4. Adjust Mid-Point & High-Point in Non-Linear Three-Point Calibration 5. Adjust Low-Point, Mid-Point, & High-Point in Non-Linear Four-Point Calibration 6. Adjust Xlow-Point, Low-Point, Mid-Point, & High-Point in Non-Linear Five-Point Calibration
qc0102	Do Auto-tune Sequence	By	rt	
qc0103	Do Shift Adjust Sequence	By	rt	0xff = Full Shift-Adjust Sequence 1 to 24 = Single Cell Shift Adjust for this cell or pair of cells.
qc0104	Do Address POWERCELL Sequence	By	rt	address in qc0151. If command > 1, then perform multicell readdressing starting with cell in qc0151.
qc0105	Do Reset POWERCELL Addresses	By	rt	Reset all cell addresses to 240
qc0106	Do POWERCELL Diagnostic Seq	By	rt	Run diagnostic test on specified cell 0xff = scan for first attached cell and diagnose it. Otherwise, the diagnose specified address
qc0107	Do IDNET Master Mode Sequence	By	rt	IDNET Master Mode Dialog
qc0108	Do Shift Adjust Reset Sequence	By	rt	Reset Shift Adjust Parameters to 1.0
qc0109	Do Serial Port Diagnostic Sequence	By	rt	Perform loopback test on Serial Port. Command contains serial port number 1 – 6.
qc0110	Set Adjustable IDNet Setup Values	By	rt	1 = Set Vibration Adapter 2 = Weighing Process Adapter 3 = Automatic Stability Detection 4 = AutoZero On/Off 5 = Restart/Reset 6 = Return to Defaults Refer to wt0135 – wt0139 for current values and possible selections for parameter values.
qc0111	Do CalFree Calibration	By	rt	1= Begin CalFree
qc0112	Do SICS Lab Scale Calibration	By	rt	1 = Zero Calibration 2 = Internal Calibration 3 = External Calibration

qc0118	Abort the Current Sequence	Bl	rc	Application sets this command from 0 to 1 to abort the current sequence at the RST.
qc0119	Current Sequence Complete	By	rt	RST sets this field from 0 to non-zero to indicate an error abort of the current sequence. 1=Successful completion. 2-255 indicates an error status.
qc0120	Text describing the completion	S41	rt	RST writes this text describing successful completion or the error condition
qc0121	Operator Intervention Required	By	rc	Command from Resident Scale Task (RST) to application indicating that the sequence requires an operator intervention step. 1 = last operation complete successfully; operator intervention required 2 = calibration step completed with excessive motion; operator must make decision to abort or continue with calibration. To abort the calibration, hit trigger qc0118. To continue the calibration, hit trigger qc0123
qc0122	Operator Message	S41	rt	RST sets text message describing state of the sequence and the operator intervention required. For IDNet Master Mode command, the operator message contains the text of the operator message from the base,
qc0123	Operation Intervention Complete	By	rc	Command from application to Resident Scale Task indicating that Operator Input is complete. For IDNet Master Mode sequence: 1 = Yes, 2 = No
qc0124	Operator Input Data	S41	rt	Application sets data that the operator entered here. For the IDNet Setup Values command, the format of the operator input is a string value '1' to '9' indicating the value to set the parameter. Refer to wt0135 – wt0139 for current values and possible selections.
qc0130	Selected Scale Node Number	By	na	Node number of selected scale or flow meter. You must set this field before setting one of the following commands to select a scale or flow meter. Node number = 0 selects this local node.
qc0131 qc0135	Select Scale 1 - 5	Bl	rc	Command to Resident Scale task (RST) to select a scale or flow meter
qc0136 qc0147	Select Flow Meter 1-12	Bl	rc	
qc0148	Enter Setup Mode Command	Bl	rc	Command to CP and RST.
qc0149	Exit Setup Mode Command	Bl	rc	
qc0150	Sequencer State	By	rt	The RST sets this field to indicate the current state of the calibration sequence: 0. No sequencing state 1. Starting calibration sequence 2. Wait for operator to zero scale 3. Getting zero counts 4. Wait for operator to set Xlow weight 5. Getting Xlow weight counts 6. Wait for operator to set low weight 7. Getting low weight counts 8. Wait for operator to set mid weight 9. Getting mid weight counts 10. Wait for operator to set high weight 11. Getting high weight counts 12. Calibration writing EEPROM 13. Calibration completed successfully 14. Reserved 15. Wait for Operator to accept Excessive Motion 20. Starting shift adjust 21. Wait for operator to set SA weight 22. Getting shift adjust counts

23. Shift adjust sequence step OK
24. Shift adjust sequence completed OK
25. Shift adjust writing EEPROM
30. Starting POWERCELL addressing Sequence
31. Starting reset POWERCELL addresses sequence
32. Starting POWERCELL diagnostic sequence
33. Cell addressing sequence completed OK
34. Turning cell power off
35. Turning cell power on
36. Cell power off - attach next POWERCELL
37. Adressing cell
38. Operator must end cell diagnostic
39. Cell diagnostic sequence completed OK
40. Cell power off - connect cells(s)
41. Not used
42. Finding first cell
43. Resetting POWERCELL addresses
44. Cell power off – reconnect cell(s)
45. Starting IDNet Master Mode
46. Wait for Operator IDNet Setup Reply
47. Sending NO reply to IDNet base
48. Sending YES reply to IDNet base
49. IDNet Master Mode completed OK
50. Startiing IDNet Setup Values
51. Wait for operator IDNet setup reply
52. IDNet setup values completed OK
53. Calibration complete with excessive motion
54. Reserved
55. Writing ALC Board Calibration EEPROM
56. Write ALC Board Calibration Completed OK
57. Read I-Button EEPROM Completed OK
58. Starting SICS Internal Cal Sequence
59. Executing SICS External Cal Sequence
60. SICS CAL Completed Successfully
61. Wait for SICS Calibration Operator Reply
62. Starting SICS Zero Cal Sequence
63. Reserved
64. Reserved
65. Reserved
66. Reserved
67. Reserved
68. Reserved
69. Reserved
70. Reserved
71. Reserved
72. Reserved
73. Reserved
74. Sequence Failed
80. Cal failed aborted by operator
81. Cal failed sequence already in progress
82. Cal failed invalid selected scale
83. Cal failed system not in setup
84. Cal failed invalid cal type
85. Cal failed invalid parameter settings
86. Cal failed too few span counts
87. Cal failed low weight invalid
88. Cal failed mid weight invalid
89. Cal failed high weight invalid
90. Cal failed sequence error
91. Cal failed write to EEPROM error
92. Seq failed scale IO error

				93. Shift adjust calculation failed 94. Cell addressing could not find old address 95. Cell addressing could not change cell address 96. Cell already at new address 97. Cell addressing invalid response 98. Cal failed Xlow weight invalid 99. Cal Failed Invalid Board Calibration 100. Cal Failed Too large Capacity 101. Cal Failed Legal For Trade State
qc0151	New POWERCELL Address	By	na	Used with qc0104 command
qc0152	Reset Scale Shared Data	By	rc	Scale number to reset or 99 to reset all
qc0153	Reset Application Shared Data	By	rc	99 = reset
qc0154	Reset Terminal Shared Data	By	rc	99 = reset
qc0155	Refresh Display	By	rt	1=RST display forces itself to the background so CP display is in forground.
qc0156	Reset Communication SD	By	rc	99 = reset
qc0157	Reset Maintenance SD	By	rc	99 = reset
qc0158	Write ALC Board Calib. EEPROM	By	rt	Factory Test. Trigger = ALC Scale Slot 1- 4. Write ALC Board Calibration EEPROM from Shared Data bw0100. After power-up, read the results from the associated bc--00 slot.
qc0159	Reserved	By	rc	
qc0160	Reset Data Connections	BI	rc	1=Reset data connections setup
qc0161	Restart IND780	BI	rc	1=Do a soft restart of the IND780
qc0162	Reset Setup Shared Data	BI	rc	1=Reset Setup Shared Data to factory settings
qc0163	Reset All Calibration Data	BI	rc	1=Reset Calibration Data to factory settings for all scales
qc0164	Reset Process Shared Data	BI	rc	1=Reset Process Shared Data to factory settings
qc0165	Serial Port Diagnostic Send Buffer	S20	rt	Output buffer for serial port diagnostic <LF>Testing COM1 NN<CR>
qc0166	Serial Port Diagnostic Recv Buffer	S20	rt	Input buffer for serial port diagnostic
qc0167	Run BRAM Memory Test	By	rt	1 = start, 0 = success, 99 = failure
qc0168	Reconfigure PLC Thread	By	rc	1 = start, 0 = done
qc0169	Backup BRAM to flash	By	rc	1 = start, 0 = done. Application sets this trigger to cause RST to write the current contents of BRAM to a backup file in the Compact Flash. This is necessary before replacing the battery. On power up, SD automatically recovers the BRAM from the flash backup file.
qc0170	New battery installed trigger	By	rc	1 = start, 0 = done. Application sets this trigger to indicate the service technician or factory has installed a new battery. RST records the new date in xs0139.
qc0171	Reset Network Config	By	rc	1 = start, 0 = done
qc0172	Control Panel Running	By	rt	CP start-up is complete & CP is running
qc0173	Adding Power Scale	By	rt	CP must trigger adding a new POWERCELL scale.
qc0174	CP Using Display Screen	By	rt	0=no, 1=yes
qc0175	Reserved	By	rt	
qc0176	Reserved	By	rt	
qc0177	Backup/Restore Operation	By	rt	1=Backup DMT Files 2=Backup Tables 3=Backup Logs 0=Backup Operation Complete
qc0178	Active Remote Viewer	By	rt	0=Deactivate, 1=Activate Node Number
qc0179	Reserved	By	rt	

qc0180	Reserved	By	rt
qc0181	Reserved	By	rt
qc0182	Reserved	By	rt
qc0183	Reserved	By	rt

Method:

The Setup Sequence Control Object in the Resident Scale Task (RST) manages the sequencing of the Scale Setup operations that take multiple steps and require operator intervention. Examples of such sequences are Scale Calibration, Calibration Check, Auto-Tune Filtering, and POWERCELLs Addressing. This object leads the sequencing of the operations and the application must supply the required operator interfaces.

The Application sets the Shared Data command to start the sequence and then monitors the state of the sequence. When the sequence requires an operator interaction, the RST sets a command to the application. The application must display a message to the operator and wait for the operator response. After the operator responds, the application sets the response field and sets a command to the RST indicating that the operator interaction is complete. The RST sets a command to the application indicating that the sequence is complete and a success or failure status.

Board Identifications (BD)

Access: "Read Only" access, level is not customizable.

Class Code: bd Data Type: PS

Instances: 16
Instance 1 = IND780 Model Description
Instance 2 = HMI Interface Board
Instance 3 = Baseboard
Instance 4 = MSC ETX Board
Instance 5 = Reserved
Instance 6 = Reserved
Instance 7 – 12 = Option Board Slots 1 – 6, respectively
Instance 13 = PLC Interface Board
Instance 14 = Remote Discrete IO Unit

Attributes:

bd--00	Composite bd block	Struct	na	Composite of entire block
bd--01	Board Installed This Slot	Bl	na	0 = no, 1 = yes
bd--02	Board Name	S21	na	Textual Description: For an Ethernet IP PLC board, this field contains "ETHIP" + Ethernet MAC Address.
bd--03	Board Serial Number	S14	na	Serial #'s are 13 digits + null terminator
bd--04	Board Part Number	S14	na	Part #'s are 13 digits + null terminator
bd--05	Board Type	By	na	0 = None 1 = B/W Display Interface Board 2 = Color Display Interface Board 3 = Baseboard 4 = ETX Board 5 = CMOS RAM Board 6 = Keyboard Interface Board 7 = Analog LC Option Board 8 = Discrete IO Option Board – relay outputs 9 = Serial Option Board 10 = IDNET/DigiNet Option Board 11 = POWERCELL Option Board 12 = Flow Meter Board 13 = Analog Output PLC Interface Board 14 = IND780 Model Description 15 = AB-RIO PLC Interface Board 16 = Profibus PLC Interface Board 17 = ControlNet PLC Interface Board

				18 = DeviceNet (future) PLC Interface Board 19 = Remote Discrete IO Unit 20 = Discrete IO Option Boad – photoMOS outputs 21 = Analog LC Option Board – HAP version 22 = High-Speed Analog LC Option Board 23 = Ethernet/IP PLC Interface Board
bd--06	Number of Channels	By	na	
bd--08	Board Software Part Number	S14	na	Part #'s are 13 digits + null terminator

Method:

At power-up, the Resident Scale Task reads the hardware boards and writes their identification to Shared Data. If there are any changes from the previously recorded hardware configuration, Shared Data will automatically record them in the Change Log.

Option Board ID & Calibration EEPROM (BC)

Access:	"Read Only" access level is not customizable.	
Class Code:	bc	Data Type: PS
Instances:	6	One instance for each Option board slot.

Attributes:

bc--00	Composite bc block	Struct	na	Composite of entire block
bc--01	Calibration Data Length	US	na	A length != 0 indicates factory has programmed calibration data in the EEPROM. The factory must also set a valid checksum.
bc--02	Board Serial Number	S14	na	Serial #'s are 13 digits + null terminator
bc--03	Board Part Number	S14	na	Part #'s are 13 digits + null terminator
bc--04	Checksum	US	na	for(i=sum=0;i<len;sum+=((char *)start)[i++]);

Analog Board Calibration Fields Required Are Only Set for Analog Boards

bc--05	Zero Counts with 2mv/V jumper	UL	na	A/D Counts at 0mv/V input w 2mv/V jumper
bc--06	Span Counts with 2mv/V jumper	UL	na	A/D Counts at 2mv/V input w 2mv/V jumper
bc--07	Zero Counts with 3 mv/V jumper	UL	na	A/D Counts at 0mv/V input w 3mv/V jumper
bc--08	Span Counts with 3 mv/V jumper	UL	na	A/D Counts at 2mv/V input w 3mv/V jumper
bc--09	Targeted Output Counts In Span	UL	na	Targeted output counts in span calibration
bc--10	Reduced Excitation Version	US	na	1=Yes; 0=No

Method:

During manufacturing of the Analog Scale Boards, the factory sets minor adjustments in a soldered "board calibration" EEPROM that account for differences in the electronics between the boards. The objective is to be able to move the load cells and the socket-ed "scale calibration" EEPROM between Analog scale boards in order to get different boards to report the same weight. The Analog Scale Board applies the factory calibration adjustment after performing its on-board filtering. The adjustment is: y = mx+z, where y=adjusted counts, x=raw counts, m=(span counts – zero counts) / range counts, z=zero counts.

The Analog Board calibration EEPROM is 256x16 bits. The first 128 words are for the first channel. The second 128 words are for the second channel.

Other boards provide the length, Board Serial #, Board Part #, and checksum in the short format. These boards do not provide the Analog Board Calibration data fields.

System Feature Triggers & Controls (XC)

Access:	"Supervisor"		
Class Code:	xc	Data Type:	D
ControlNet Class Code:	96 hex		
Instances:	1		

Attributes:

xc0100	Composite xc block	Struct	na	Composite of entire block
Triggers to disable features through a Discrete Input Keyswitch				
xc0101	Disable PLC	Bl	rt	0=enable, 1=disable feature.
xc0102	Disable Error Display	Bl	rt	
xc0103	Disable SmartTrac/Weight DisplayBl	rt		
xc0104	Disable Setup	Bl	rt	
xc0105	Disable Maintenance	Bl	rt	
xc0106	Disable Keypad & Keyboard	Bl	rt	
xc0107	Reserved	Bl	rt	
xc0108	Disable Run Flat	Bl	rt	
xc0109	Disable Alarms	Bl	rt	
xc0110	Disable Application	Bl	rt	
xc0111	Disable Select Key	Bl	rt	
Triggers to activate/deactivate Ladder Logic				
xc0112	Master Control Relay	Bl	rt	Master switch for turning on/off discrete outputs. 1 = discrete outputs enabled, 0 = all discrete outputs disabled.
xc0113	Run Ladder Logic	Bl	rc	Run ladder logic
xc0114	Stop Ladder Logic	Bl	rc	Stop ladder logic
Triggers to turn on/off display				
xc0115	Disable LCD Display	Bl	rt	1=disable, 0 = enable
xc0116	Disable Backlight	Bl	rt	1=disable, 0 = enable
xc0117	Contrast Adjustment	By	rc	# number of steps to increase (+) or decrease (-) contrast adjustment
Triggers to Initiate Miscellaneous Functions from Discrete Inputs				
xc0118	Reload + Templates	Bl	rc	Trigger to cause PLC messaging to reload the latest assembly message templates.
xc0130	Enter Key Trigger	Bl	rc	Trigger to simulate the Enter Key
xc0131	Next Local Scale Trigger	Bl	rc	Trigger to select the next local scale
xc0132	Run Calibration Test	Bl	rc	
xc0133	Disable FTP	Bl	rc	1 = Temporarily disable FTP transfers while critical file operations are in progress
xc0134	Sound Key Click Beeper	Bl	rc	1 = trigger key click beeper
xc0135	Sound Alarm Beeper	Bl	rc	1 = trigger alarm beeper
xc0136	Operator Struck Enter Key	Bl	rc	SKM sets this trigger = 1 whenever the operator strikes the Enter Key. The Application initiates the callback by setting trigger = 0;
xc0137	Toggle SmartTrac Display	Bl	rc	1 = toggle display
xc0138	Reserved	Bl	rc	
xc0139	Reserved	Bl	rc	
xc0140	Reserved	Bl	rc	
xc0141	Reserved	Bl	rc	
xc0142	Remote I/O Error Action	By	rt	0=pause Targets only 1=pause Targets & turn of all Discrete IO until Remote IO OK.

xc0143	Reserved	By	rt
xc0144	Reserved	By	rt
xc0145	Reserved	By	rt
xc0146	Reserved	By	rt
xc0147	Reserved	By	rt
xc0148	Reserved	By	rt

Methods:

These system triggers enable, disable, or activate IND780 functions through Discrete Inputs. You must setup Ladder Logic rungs to tie the Discrete Inputs to these triggers. Applications may also access these features by writing to these Shared Data triggers.

Users and Security Data

Logged-In Users (XL)

Access:	"Read Only."		
Class Code:	xl	Data Type:	D
Instances:	25	Up to 25 users logged in simultaneously.	

Attributes:

xl--00	Composite xl block	Struct	na	Composite of entire block
xl--01	Logged-On User Name	S13	na	Name of user currently logged-on
xl--02	Access Privilege Level of User	By	na	1=Operator, 2=Supervisor, 3=Service, 4=Administrator

Access Security Setup (XU)

Access:	"Maintenance" (Not customizable.)		
Class Code:	xu	Data Type:	PS
Instances:	20		

Attributes:

xu--00	Composite xu block	Struct	na	Composite of entire block
xu--01	User Name	S13	na	
xu--02	Password	S13	na	
xu--03	Access Level	By	na	1=Operator, 2=Supervisor, 3=Service, 4=Administrator

Application Virtual Console Messages (AM)

Access:	"All Users"		
Class Code:	am	Data Type:	D
Instances:	3	The Control Panel uses instance 1, Applications use instances 2 and 3.	

Attributes:

am--00	Composite am block	Struct	na	Composite of entire block
am--01	Unicode LPRINT Message	S1000	na	
am--02	Trigger to begin LPRINT	By	rc	1=start LPRINT command
am--03	LPRINT complete status	By	rt	1= LPRINT command complete
am--04	LPRINT debug data override	By	na	1=Print debug data on LPRINT printer
am--05	Application Console Out Message	S200	rt	Application Output Messages for display on Virtual Console display

am--06	Application Console In Message	S100	rt	Application Console Messages that are input from a Virtual Console keyboard
am--07	Trigger to begin Console Print	By	rc	1=start Console Print
am--08	Console Print Complete Status	By	rt	1=Console Print Complete
am--09	Keyboard Data Ready Trigger	By	rc	1=Keyboard Data Ready
am--10	Reserved	By	rt	

Methods:

An application can use this structure to send and receive messages from a Virtual Console. The Virtual Console consists of input messages from a Virtual Console keyboard, a Virtual Console display, and a Virtual Console LPRINT device.

When LPRINT messages can span multiple blocks, the start of the print message must contain the <dprint> tag and the end of the message must contain the </dprint > tag. The application begins the LPRINT by setting 1 in the "begin print" trigger. It must wait until it sees the print complete status before setting another LPRINT block into Shared Data.

Use a <LFCR> token to embed a "line feed/carriage return" control character within the am--05 and am--06 fields. The Shared Data Server automatically converts the <LFCR> token to the print control characters.

Keyboard Routing Commands (KC)

Access:	"Operator" default level		
Class Code:	kc	Data Type:	D
Instances:	1		

Attributes:

kc0100	Composite kc block	Struct	na	Composite of entire block
Keyboard Routing Tables				
kc0101	Control Panel Message Window	UL	rt	Control Panel Message Window Handle Application must set its Message Window field on entry and and clear it on exit.
kc0102	Error Display Window	UL	rt	Error Display Message Window Handle
kc0103	Custom.Net Message Window	UL	rt	Custom.Net Message Window Handle
kc0104	Task Expert Message Window	UL	rt	Task Expert Message Window Handle
kc0105	SoftKey Manager Message Window	UL	rt	SoftKey Manager Message Window Handle
kc0110	Route Keypad Numeric Keys to	By	rt	1 = Control Panel 2 = reserved 3 = Custom.Net 4 = Task Expert 5 = SoftKey Manager 6 = Disabled Default = 0 (none).
kc0111	Route Keyboard AlphaNumerics to	By	rt	Same as for kc0110
kc0112	Route Enter Key to	By	rt	
kc0113	Route Navigation Keys to	By	rt	
kc0114	Route Scale Keys to	By	rt	
kc0115	Route Clear Key to	By	rt	
kc0116	Route Function Keys to	By	rt	
kc0117	Route Application Keys to	By	rt	
SoftKey Processing Commands				
kc0119	Disable SoftKey Display	By	rt	Command from Application to SoftKey Manager to disable and turn-off SoftKey display.
kc0120	Go to Home SoftKey page	By	rc	Command from Application to SoftKey Manager. Reset SoftKey Stack, display Home page, and begin processing it.
kc0121	Reserved	By	rc	
kc0122	Push working page onto stack	By	rc	Command from Application to SoftKey Manager. Push working page onto page top of stack , display it, and begin processing it.
kc0123	Pop current top page off stack	By	rc	Command from Application to SoftKey Manager. Pop the top page off

				the page stack and return to processing the new top.
kc0124	Replace current top page	By	rc	Command from Application to SoftKey Manager. Replace the current top page with the working page and begin to processing the new top.
kc0125	Current top page	By	na	SoftKey Manager maintains this field with the index of the current top page on page stack.
kc0126	Current processing page	By	na	SoftKey Manager maintains this field with the index of the page on the stack it is currently processing – either the home page or the current top page.
kc0127	Enable KeyPad Alphabetic Mode	By	rt	Command from Application to SoftKey Manager. 0 = Interpret SoftKeys as function keys. 1 = Interpret SoftKeys as alphabetic keys
kc0128	Enable Clear as Backspace Erase	By	rt	Command from Application to SoftKey Manager: 0 = Interpret Clear Key as Clear Tare 1 = Interpret Clear Key as Backspace Erase key.
Data Entry Line Commands				
kc0130	Enable Data Entry Line	By	rt	Command from Application to SoftKey Manager. 0 = Disable 1 = Enable with prompt in pre-entry mode 2 = Enable with no prompt in pre-entry mode 3 = Enable with prompt in specific entry mode 4 = Enable with no prompt in specific entry mode
kc0131	Font for Data Entry Line	By	rc	font size * 2 (+1 for Bold)
kc0132	Pre-Entry Prompt for Data Entry	S21	rt	The application can specify a prompt message that SoftKey manager displays at the beginning of the data entry line in pre-entry mode.
kc0133	Specific Prompt for Data Entry	S21	rt	message that SoftKey manager displays at the beginning of the data entry line in specific-entry mode.
kc0134	Format for a Specific Data Entry	S8	rt	The application can specify a numeric data format with a maximum number of digits and position of the decimal point. The format is "#nn.dd" where nn is the max number of numeric digits and dd is the decimal point position. Or the application can specify an alphanumeric data format with a maximum number of characters for alphanumeric data. The format is "!ss" where ss is the maximum number of alphanumeric characters.
kc0135	Format for Pre-Entry Data	S8	rt	The application can specify a numeric data or alphanumeric data format for data the operator enters in "pre-entry" mode. The format is the same as kc0134.
kc0136	Data Entry Line Data	S40	rt	The SoftKey Manager records data here that the operator entered on the data entry line. The last character of the buffer contains the termination character.
kc0137	Send Key Code to CP	By	rt	Send Key Code from Task Expert to Control Panel, as follows: 1 = Select Scale 2 = Zero 3 = Tare 4 = Print 8 = Clear 11 = Enter Setup
kc0138	Reserved	By	rt	
kc0139	Reserved	S40	rt	
kc0140	Reserved	S40	rt	

Method:

The SoftKey Manager sends a custom message containing the SoftKeys to the Message Window of the appropriate application. Each application must write its Message Window handle to Shared Data in order to receive the messages. Before an application terminates, it must clear its Message Window handle.

Other fields are commands from the applications to the SoftKey Manager to control processing of the SoftKey pages.

Revision History

Document Revision	Firmware Version	Date	Changes
01	4.14	20070628	Comparator and host additions and modifications
00	3.xx	20061005	[Initial release]

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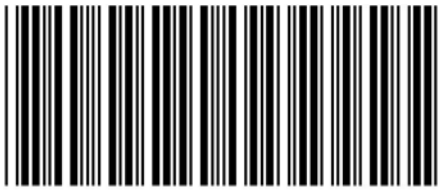

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