3750 - DEM
SLC Platform Honeywell Smart Transmitter Interface Module
Revision 1.2

USER MANUAL

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Please Read This Notice

Successful application of the DEM module requires a reasonable working knowledge of the Allen-Bradley SLC hardware and the application in which the combination is to be used. For this reason, it is important that those responsible for implementing the DEM satisfy themselves that the combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

This manual is provided to assist the user. Every attempt has been made to assure that the information provided is accurate and a true reflection of the product's installation requirements. In order to assure a complete understanding of the operation of the product, the user should read all applicable Allen-Bradley documentation on the operation of the A-B hardware.

Under no conditions will ProSoft Technology, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of the product.

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Quick Start Implementation Guide

Integration of the 3750-DEM module into an SLC application is easier if a series of steps are followed. In order to assist the first time users of our products in getting operational quickly, we have come up with this step-by-step implementation guide.

First Time Users

Although the following steps are to assist you in implementing the module, we recommend that you attempt to experiment with the example logic provided on disk with the module or available off our FTP site before laying out your application. This step will allow you to gain insight into how the module works prior to making decisions that will impact the long term success of the installation.

Starting with one of the ladder logic programs provided on disk with the module, complete the following steps:
If hand entering the ladder logic by hand for the SLC, remember the following:

- Configure the slot as follows:

Other	ID Code 10406
Input File Length	32
Output File Length	32
Scanned Input File Length	32
Scanned Output File Length	32
M0 File Length	160
M1 File Length	900

a) Edit the ladder logic provided on disk as needed for the application (See Section 3.0)
Verify slot location and modify ladder (Input and M0/M1 instructions) as needed

b) Edit the ladder logic provided on disk as needed for the application (See Section 3.0)

c) Install the module in the correct slot location

d) Connect the FTA cable to the front of the module

e) Connect the 24 VDC to the screw terminal on the front of the module

f) Connect the instruments to the FTA

g) Place processor into the run mode

h) Monitor the data table for data values

Table of Contents

1 Product Specifications

The ProSoft Technology, Inc. 3750-DEM module is a hardware product designed to allow the Allen-Bradley SLC platform to interface directly with Honeywell DE Smart Transmitters. The product includes the following characteristics:

1.1 General Specifications

DE Communications

- Interfaces with Honeywell Smart Transmitters operating in the DE mode
- Supports up to 8 single PV transmitters, 2 multivariable transmitters with 4 PVs each, or a mix of single and multivariable equaling 8 input channels
- Full read/write access to instrument database
- SCAN 3000 compatible memory map in SLC
- Instrument database mismatch verification
- Interfaces directly to Honeywell Field Terminal Assembly (FTA) w/ ProSoft supplied cable
- Supports redundant and non-redundant FTA implementations
- Single cable connection from DEM module to FTA

Physical

- 1746 Form Factor - Single Slot
- External 24 VDC source connection on front of DEM module provides instrument loop power (can be powered from SLC rack power supply)
- LEDs for visual module status:
  - Module Active
  - Module Fault
  - DE Com and Error

SLC Interface

- Operation via simple ladder logic
- SLC backplane interface via standard M0/M1 commands
- PV values are updated through Input File to optimize update timing
- Instrument configuration data is transferred from the 3750-DEM through the M1 file
- Configuration data for the instrument is written to the module through the M0 file
- Maximum data requirements - SCAN 3000 applications
  - Integer : 200 words
  - Floating Point : 115 values (230 words)
  - ASCII : 480 words
  - Total : 940 words

1.2 Hardware Specifications

-	Current Loads:	x.x amps @ 5V (from backplane) x.x amps @ 24 VDC (External Power Supply)
-	Operating Temperature:	0 to 60 Deg C 32 to 140 Deg F
-	Storage Temperature:	-40 to 85 Deg C -40 to 185 Deg F
-	Relative Humidity:	5-95% (w/o condensation)
-	FTA Connector:	Cable supplied with by ProSoft Technology (3 foot)
-	24 VDC Connector:	2 wire, screw termination

2 Functional Overview

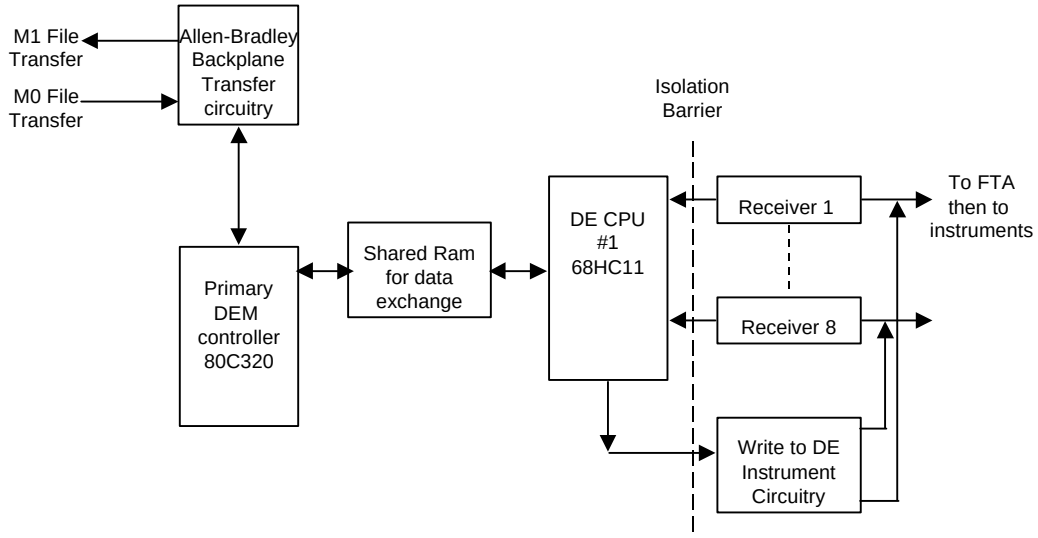
This section is intended to give the reader a functional overview of the 3750-DEM module. Details associated with the ladder logic and the memory map are not covered in this section, but can be found in Section 4 and in the Appendix.

2.1 General

The 3750-DEM module has been designed to provide a tightly integrated communications interface between the Allen-Bradley 1746 platform and the family of Honeywell Smart Transmitters.

The 3750-DEM module consists of one DE CPU microcontroller that provides communications with up to 8 DE Smart Transmitters. The figure below shows the following functional components on the module:

- A Primary DEM controller responsible for the overall operation of the board, including:
  - Access to Shared Ram
  - Backplane communications with Allen-Bradley SLC
  - Transferring data from DE processors to SLC
  - Transferring write commands from SLC to DE processors
  - Data Base Mismatch comparisons
  - LED Status indicators
- A DE CPU 68HC11 microcontroller with the following:
  - Eight data receivers which provide input signal conditioning (noise filtering, surge limiting, etc.) for the serial data inputs
  - An output channel selector and driver circuitry allowing the DE processor to output database write commands to any channel
- The Shared RAM provides a mailbox through which the Primary controller and the DE processor can communicate. The 80C320 strictly controls access to this Shared RAM.
- The DEM module is connected to a Field Terminal Assembly (FTA), not shown in diagram, which includes 250 ohm range resistors to convert the 4-20 ma current signals from the
- Smart Transmitters in the DE mode into 1-5 Volt signals



Both Single and/or Multivariable Honeywell Transmitters operating in the DE mode are supported by the module. Supported Honeywell instruments include:

- ST 3000 Smart Pressure Transmitter
- STT 3000 Smart Temperature Transmitter

- SMV 3000 Smart Multivariable Transmitter
- MagneW 300 Smart Magnetic Flowmeter
- SCM 3000 Smart Coriolis Mass Flowmeter
- SGC 3000 Smart Gas Chromatograph

There can be Single and Multi Variable instruments connected to the DEM module, in any mix totaling 8 logical DE Channels. An example configuration could be as follows:

DE Channel	Physical Type	Instrument
1	SV	ST 3000 Pressure
2	SV	STT 3000 Temperature
3	MV	PV 1 - SMV 3000
4		PV 2
5		PV 3
6		PV 4
7	MV	PV 1 - SMV 3000
8		PV 2

Multivariable Considerations

The following 'rules' must be followed when integrating multivariable devices:

1. No instrument can be physically wired to the FTA terminals within the logical limits of another instrument
2. Cannot rollover from Channel 8 to 1
3. The Tag ID must be identical and non-blank across all logical channels configured for use by a multivariable device
4. You must perform a Download Command on the physical channel in order to change the number of PVs being transmitted (DECONFIG can only be written to the first slot of a multivariable transmitters

Data transfer between the module and SLC ladder logic is implemented using standard ladder logic commands (the COP is the most common instruction for accessing the M0/M1 file data). The format for the data from the module available through the M1 and I1 files is pre-defined. The data being returned from the module is detailed in the Appendix.

Through the use of ladder logic programming, applications can be developed which can:

1. Use all of the data being returned from the module (as in the SCAN 3000 configuration) or,
2. Selectively extract only the data relevant to the application from the BTR data buffer

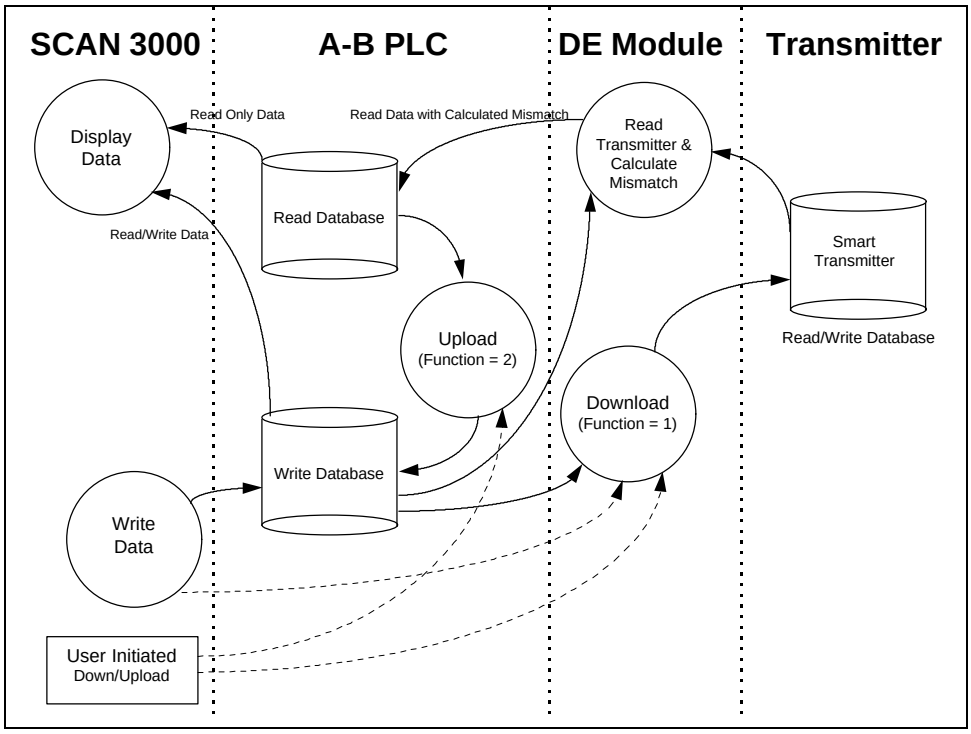
The decision on which DEM data to can be made during application development. A great deal of the SLC data base layout was designed with the Honeywell SCAN 3000 system in mind, but if not using the SCAN 3000 to interface with the SLC then the SLC data base can be modified.

2.2 Data Flow

The movement of data between the transmitter and the SLC is important to understand. The diagram below depicts the data movement paths that are supported in this application (Diagram shows SCAN 3000 implementation, but functionality will be similar for other interfaces).

Important

One of the underlying concepts that must be understood is that the SLC is considered the 'owner' of the data. Therefore the contents of the SLC data space, in particular the Write Data space, are the data to which all other data is compared.



Step	Description
Power Up	The read database will be populated by the DEM from the Smart Transmitter, and the write database will remain unchanged. The user can then choose to upload or download.
Read DE Transmitter & Calculate Mismatch	The module continuously transfers from the Smart Transmitter database to the read database, comparing the Write and Read files in the SLC for mismatch. The module performs a mismatch comparison between the two and sets the status in the read database accordingly
Upload (FC 2)	Populates write database with that of the Smart Transmitter (via the read database in the SLC). Upload may be a continuous loop if the module is to be configured in an unsecured mode. Otherwise, the Upload should only be initiated by a user
Download (FC 1)	Download populates the Smart Transmitter with the values in the write database from the SLC.

2.3 Reading from Honeywell Smart Transmitters

The ProSoft 3750-DEM module allows the SLC to read the real time data, the status data, and the configuration parameters in the Smart Transmitter's database. An overview of the data which is available from a transmitter follows (A detailed listing and description of the data is in Appendix A of this manual):

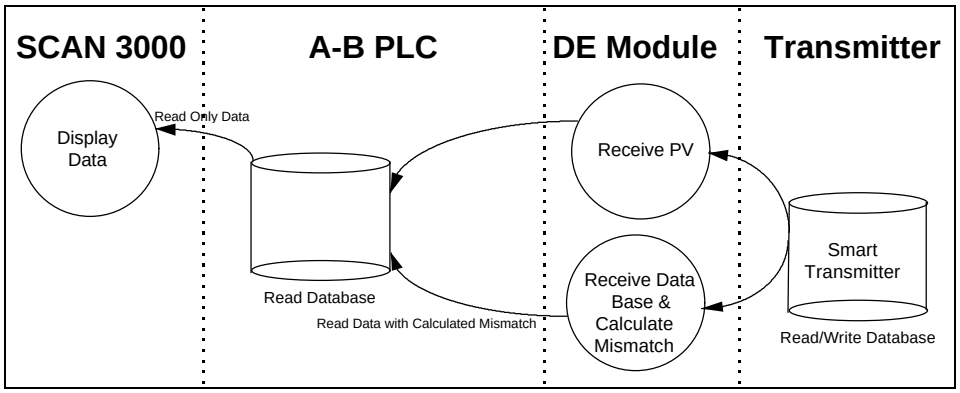
Type	Description
Real Time	PV Value
	SV Value
Status	Module Status - Health indication
	Data Base Mismatch Status flags
	PV Update Counter
	SV Update Counter
	Communication Error Counter
	Status Messages - ASCII

(Continued)

Type	Description
Configuration	Function - Download/Upload
	Tag Name – ASCII
	Serial Number - ASCII
	DE Configuration - Data base mode
	Damping Value
	PV Characterization
	Sensor Type
	PV Number (channel # on MV transmitter)
	Number of PVs - (# of channels on MV Transmitter)
	Upper Range Value - URV
	Lower Range Value - LRV
	Upper Range Limit - URL
	Lower Range Limit - LRL

The Status and Configuration values are being received from the Smart Transmitter on a continuous basis. The SLC will not actually receive these values until a complete database has been acquired from the instrument. This cycle can take anywhere from 15 to 90 seconds, depending on the instrument type. Once the database has been read into the DEM module, the cycle will automatically start over again. In this fashion the DEM module, and therefore the SLC Read Database, are being updated completely on a regular basis.

The flow of data from the instrument all of the way to the Operator display is shown in the following diagram.



2.4 Writing to Honeywell Smart Transmitters

In addition the read functionality described above, the ProSoft 3750-DEM module will allow the SLC application to change some of the configuration values in the Honeywell Smart Transmitter. These values are written to the instrument by pre-loading the appropriate register locations in the SLC and initiating a Download (Function = 1) cycle.

The module will execute the Download Command and return the completion status in the Device Status word. Upon receipt of the completion bit, the Download write register should be cleared.

> The example ladder provided with the module and listed in the Appendix performs the logic necessary to implement the Download functionality. We recommend the use of this logic, at least as a starting point, with simple modifications to the addressing.

The configuration parameters that can be written to the instrument are as follows:

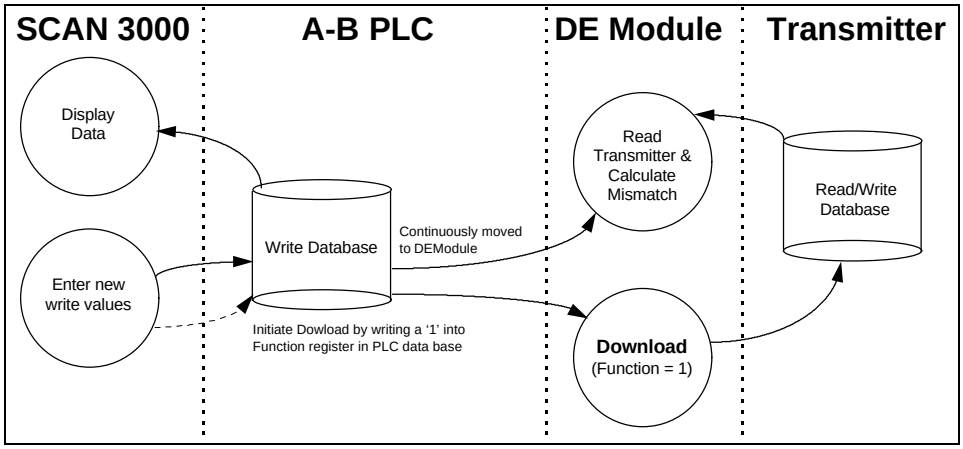
Type	Description	Write to Transmitter	Mismatch Tested
Configuration	Function - Download/Upload	N	N
	Tag Name – ASCII	Y	Y
	DE Configuration	Y	Y(1)
	Damping Value	Y	Y
	PV Characterization	Y	Y
	Sensor Type	Y	Y
	Upper Range Value – URV	Y	Y
	Lower Range Value – LRV	Y	Y
	Upper Range Limit – URL	N	Y(2)
	PV Num (channel of a multichannel)	N	Y
	Number of PV	N	Y

(1) DE Configuration modes that disable the database read also disable Mismatch testing
(2) These values are written to the module for Mismatch testing purposes

2.4.1 Performing a Download - Function 1

The Download Function performs the step of writing the new data to the instrument. Until the Function is set to 1, the Write Database is not moved to module (and therefore not to the instrument).

The flow of write data from the operator interface station to the instrument is shown in the following diagram. The Write Database image in the SLC is being moved to the DEM module for Mismatch comparison purposes.

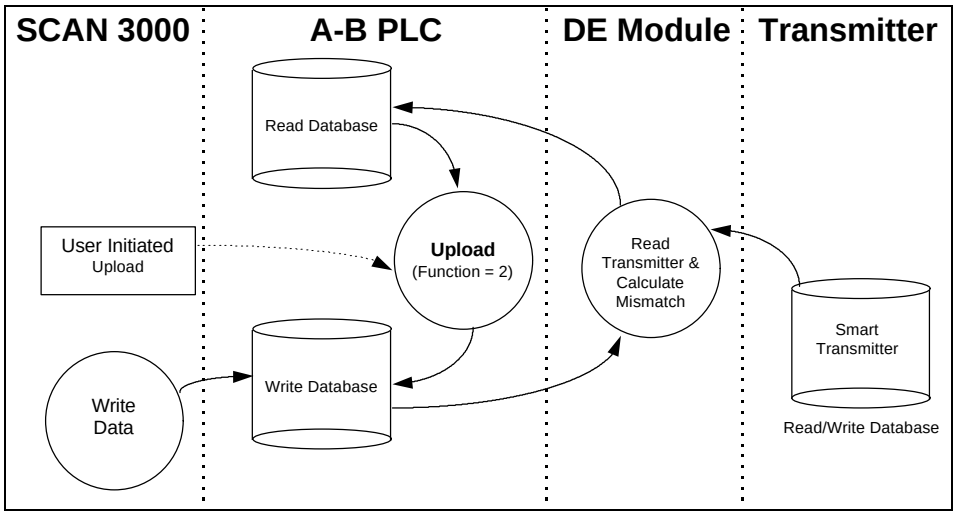


2.4.2 Performing an Upload - Function 2

The Upload Function performs the step of moving the data that has been read from the instrument database from the SLC Read database into the SLC Write database.

This function is useful for initializing the Write database when the Read database is known to contain good data. Performing this step will clear any Mismatch conditions that exist.

The flow of write data from the during the Upload function is shown in the following diagram:



2.5 PV Value Integrity

A great deal of effort is put into the task of assuring the integrity of the PV value presented to the SLC. The PV Value returned from the DEM has the following characteristics:

PV (Process Variable)
This value is the PV value unconditioned by the Data Base Mismatch. Care should be exercised when using this PV value when the mismatch flag is set as the scaling, which is based on the URV/URL/LRV parameters, may not be accurate. It is up to the programmer to incorporate the Bad PV Flag from each instrument into the application logic if needed.

During the normal operation the DEM module is performing integrity checks of the health of the PV value. Should a condition be detected which could affect the integrity, the Bad PV Flag is set (Device Status Word 1/13). The four conditions that will cause the Bad PV Flag to be set are:

PV Update Timeout
If the PV value has not been updated within 6 seconds (24 PV update cycles), the flag will be set

Data Base Mismatch
If any data base mismatch condition is detected, the flag will be set

SFC Write Detected
If a SFC write to the instrument data base is detected, the flag will be set. Note that in a redundant application, the SFC Write Detected condition will be detected when a Download command is executed from the other module or from the SFC unit.

FTA Not Present
If the FTA connector or the 24 VDC power supply is disconnected, the flag will be set.

In order to clear the Bad PV Flag, the offending condition will need to be cleared, and under most circumstances will have to wait until a new database has been received from the instrument.

2.6 Data Base Mismatch

Data base mismatch testing is performed by the DEM module on the write parameters received from the SLC. The mismatch status is returned to the SLC for use by the ladder logic or for status available to the SLC in via the Data Mismatch Active Flag in Device Status Word #1.

Bit	**Description**
0	Mismatch - URL
1	Mismatch - LRV

2	Mismatch - URV
3	Mismatch - Damping
4	Mismatch - DE Configuration
5	Mismatch - PV Characterization
6	Mismatch - Sensor Type
7	Mismatch - Tag ID
8	Mismatch - PV Number
9	Mismatch - Number of PV Values
10	Mismatch - Cold Junction Reference
11	Mismatch - Open Thermocouple Detection
12	Mismatch - Freq 50

Important

The mismatch condition is performed in the DEM module on the write parameters every time the module receives a new copy of the parameters from the SLC.

Clearing the data base mismatch condition is executed in one of several ways:

1. Wait for the mismatch condition to clear. If the mismatch was generated as the result of a Download Command, the mismatch will be cleared when the next data base is fully read from the instrument
2. Perform a Download Command to the instrument. If the write data is known to be correct executing a Download will move the new values to the instrument. If the Download is successful, the mismatch condition will clear when the next data base is fully read from the instrument
3. Perform an Upload Command.

2.7 PV Update Timing

The 3750-DEM module takes full advantage of the 32 word input file (I1) to transfer the Floating Point PV values as well as the scaled Integer PV values (for use with the PID instruction). As a result, the PV update timing is fast and deterministic.

By definition, the PV update time (for each input channel) from the instrument to the 3750-DEM module is 366 milliseconds. Since the Input file is updated at the top of every ladder scan, the worst case PV update timing for the channels is:

Worst Case Timing = 366 ms + Ladder Scan Time in ms

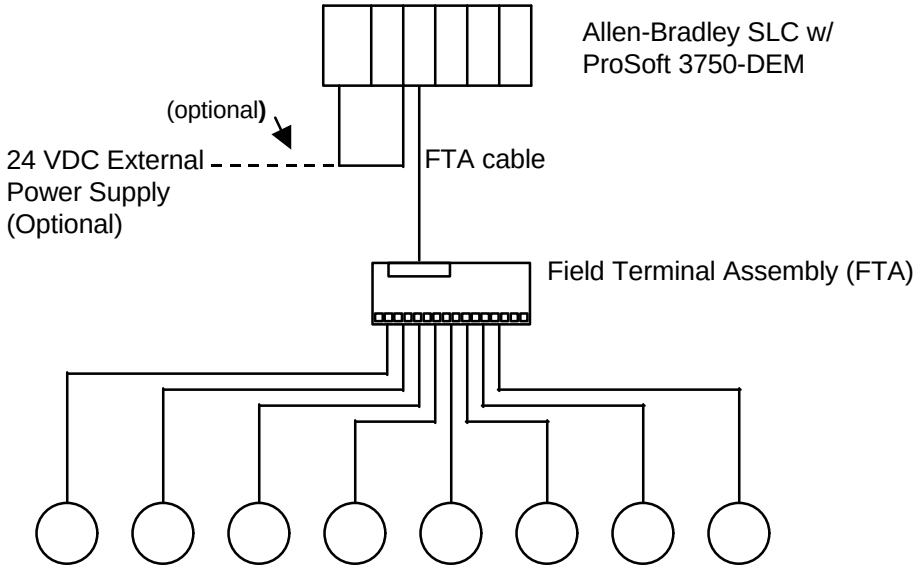
2.8 Terminating Instruments to the Module

The method for terminating the Honeywell Smart Transmitters to the 3750-DEM is through one of several Field Terminal Assembly (FTA) units. Several different FTA units are available from ProSoft as part of the 3750-DEM product package.

The transmitters are connected to the FTA through twisted pair wiring on a point to point basis. The FTA cable, supplied at a default length of 3 feet (lengths up to 50 meters possible), is used to cable the FTA to the 3750-DEM module.

The module, in its current release, requires an external 24 VDC power supply to provide instrument power. The 24 VDC power source is connected to the front of the 3750 module via screw terminals. If the SLC rack power supply is sized sufficiently, the 24 VDC output from the supply may be used to power the module (note that the supply must be able to supply approximately 25 ma per instrument to be connected).

A typical connection hierarchy is shown in the following diagram.



Honeywell Smart Transmitters
Individually terminated to FTA

2.8.1 Non-Redundant Configurations

In a typical Non-Redundant configuration, a single FTA will be connected to a single module. The FTA available in this configuration is:

Honeywell FTA Model	Description	Size
MU-TSTX03	Compression Terminals	15.24 x 12.065 cm

Note: This unit is provided by ProSoft Technology

This unit is shipped standard with each 3750-DEM unit, along with a 3-foot cable. If other configurations are required, simply contact the factory.

2.8.2 Redundant Configurations

The DE I/O system supports the implementation of redundancy at the I/O level very easily. Using a standard Redundant FTA, a set of instruments can be connected to two 3750-DEM modules. These two 3750 modules can be in separate racks or in the same racks, with either one or two SLC processors themselves in a redundant configuration.

Honeywell FTA Model	Description	Size
MU-TSTX13	Compression Terminals	30.73 x 12.065 cm
MU-TSTX53	Screw Terminals	30.73 x 12.065 cm

Note: These units are available from ProSoft Technology upon request

3 Step by Step Implementation Guide

Installation of the 3750-DEM module is easily accomplished. Installation into a system requires only a few steps. Following is a step-by-step procedure for getting an application operational:

1. Identify slot location for module.
2. Use existing example logic (See attached) provided on disk as a starting point
3. Modify this logic for correct physical slot locations
4. Modify the logic for the data file locations to be used
5. Install the card into rack and download ladder logic
6. Connect the FTA cable to the front of the module
7. Connect the instruments to the FTA
8. Power up equipment and monitor module operation via data table

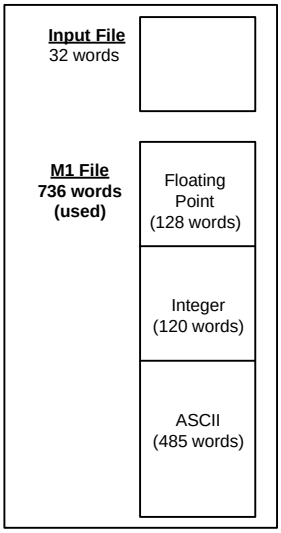
Once the hardware has been installed and the necessary programming has been downloaded to the processor, the system is ready (Presuming all other system components are safely ready).

Step	Example	User Application
1. Identify module slot position	Slot 1	Slot : _____
2. Ladder Logic	Example on disk and in Appendix	
3. Identify SLC Data Files usage	Data N: N10 Data F: F11 Data A: A12 & A13	Data N: N____ Data F: F____ Data A: A____ & A____
4. Modify Logic for slot position	I1 M0:1 M1:1	I____ M0:____ M1:____
6. Install card in rack	Power down rack and install module	
7. Connect FTA Cable and 24VDC	Connect FTA Cable to module, locking in connector with bail clips. Connect the 24VDC power source to module	
8. Connect instruments to the FTA	Terminate the instrument wires to the FTA.	
9. Apply power to system and place SLC in RUN	Power up rack. Module will begin talking to DE devices	

4 Reading Data from the Module – Input and M1 Files

4.1 Data Structure Overview

Instrument data is transferred from the 3750-DEM module to the SLC through the Input File and through the M1 File. The following diagram shows the sizes and types of data transferred within the individual file types.



4.2 Reading the Input File – PV Value Updates

In order to assure optimum PV Value update timing, the 8 PV values received by the module are transferred to the SLC through the Input image for the slot containing the module. The following table details the structure of the data received in the Input image.

Word	Input File Address (Example)	Name	Description
0	I1:0	PV Update Flags & PV Timeout Flag	
1	I1:1	Module Status	This value represents the operating status of the module. Expected status codes are: **Code** — **Description** 0 — All OK 1 — DE CPU Init Error 2 — DE CPU Reset Error 3 — DE Timeout Error 5 — FTA Not Connected If Status Codes 1-3 are received, the module has detected a failure condition in the DE processor. See the Hardware Diagnostics Section for troubleshooting details. If Status Code 5 is received, the module has determined that the FTA is not connected. Verify the connection and plug back in. The module will clear the error condition itself and continue operation once the FTA is reconnected.

(Continued)

Word	Input File Address (Example)	Name	Description
2-17	I1:2 To I1:17	PV Values 1 to 8 (8 Float values or 16 words)	These 8 floating point values contain the PV Values received from the instrument in the instrument's default engineering units. The movement of these values to the data table may be conditioned by the state of the PV Update Flag in word 0. The PV EU value is calculated based on the URV and LRV values in the instrument data base, therefore the PV value is not updated to the SLC until after the Configuration Data Base has been received from the instrument at least once (approximately 15-90 seconds after power up or reset of the module).
18 to 25	I1:18 To I1:25	PV Value 1 to 8 Integer 0 to 16383	An integer value representing 0 to 100% of span for the PV value being returned from the instrument. These values can be fed directly the PID instruction in the SLC. The value is range limited in the 3750-DEM module to be sure not to create a rollover condition (i.e., will not go over 16383 or under 0).

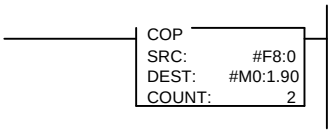
In order to transfer the Floating Point values received through the input image into a floating point file, simply use the COP instruction. The following Section details this capability.

4.2.1 Floating Point Support

The movement of floating point data between the DEM module and the SLC Floating Point table is easily accomplished through some simple ladder logic programming.

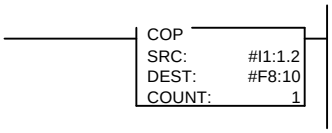
The programming necessary to move the Floating Point data to/from the module takes advantage of the COP command that exists in the PLC and the SLC. The COP command is unique in the SLC data movement commands in that it is an untyped function, meaning that no data conversion is done when moving data between file types (i.e., it is an image copy not a value copy).

The structure of the COP command to move data from a Floating Point file into the M0 File (something you would do to move floating point values to the module) is as follows:



This command will move one floating point value in two 16-bit integer images to the integer file. For multiple floating point values simply increase the count field by a factor of 2 per floating point value.

The structure of the COP command to move data from an Integer file (or Input File) to a Floating Point file (something you would do to receive floating point values from the module) is as follows:



This command will move two 16-bit integer registers containing one floating point value image to the floating point file. For multiple values simply increase the count field.

4.3 Reading the M1 File

The M1 File is a data file that contains the results of the instrument database reads performed by the DEM module. There are three data file types returned from the module in the M1 File (Float, Integer and ASCII), each with its own data structure.

4.3.1 PV and SV Values

In addition to the PV Values returned in the Input File, the DEM module also returns the SV (Secondary Variable) Values. In most instruments, the SV value represents the Body Temperature of the instrument.

The binary status flags (mismatch and other health status flags) should be used to determine the status of the PV and SV variables.

The M1 File is used to transfer the SV values. The following table overviews the placement of this data in the M1 File.

M1 File Word Address	Name	Description
0 to 15	SV Value Last Good	Secondary Variable returned from each instrument. This space represents 8 SV values in Floating Point format.

4.3.2 Floating Point Data Values

Floating Point data results received from the instruments are returned to the SLC through the M1 File. This data generally consists of the configuration values from the instrument used to scale the PV value being transmitted by the instrument. Some of these values can also be written to the instrument (See later Section) which will allow the instrument's operating Span to be altered from the SLC.

M1 File Word Address	Object Name	Description
16 to 22 23 to 29 30 to 36 37 to 43 44 to 50 51 to 57 58 to 64 65 to 71	FloatReadData 1 FloatReadData 2 FloatReadData 3 FloatReadData 4 FloatReadData 5 FloatReadData 6 FloatReadData 7 FloatReadData 8	The FloatReadData object, detailed in the appendix, contains 7 floating point values. These values consist primarily of the floating point scaling and damping values received from the instrument database: **Word** – **Name** – **Description** 0 – LRV – Lower Range Value 1 – URV – Upper Range Value 2 – URL – Upper Range Limit 3 – Damping – Damping Factor (Float) 4 – LRL – Lower Range Limit 5-6 – Spare

4.3.3 Integer Data Values

Integer status and configuration data is transmitted from the DEM module to the SLC via the M1 File. This data consists of binary, byte and word values which can be used by the SLC ladder logic or by an Operator Interface package (such as SCAN 3000, Wonderware, RSView, etc.) to determine the operating status of the DEM module and the health of the instruments.

M1 File Word Address	Object Name	Description
130 to 144	IntReadData 1	The IntReadData object, detailed in the Appendix, contains 15 integer (16 bit) values. Some of the values are bits packed into words, others are byte values packed into words, and others are full integer values.
145 to 159	IntReadData 2	
160 to 174	IntReadData 3	
175 to 189	IntReadData 4	
190 to 204	IntReadData 5	
205 to 219	IntReadData 6	
220 to 234	IntReadData 7	
235 to 249	IntReadData 8	

An overview of the IntReadData object is shown in the following table. Note that some of the words are split into High and Low byte representations. To view these values easily when monitoring the SLC data table, place the Radix in the Hex mode.

Object Word Offset	Name	Description
0	Device Status Flags 1	The bits in this word are used to indicate the current data collection status for the Channel.
1	Device Status Flags 2	The bits in this word are used to indicate the current mismatch status for each data variable that is verified.
2 H	Special DB byte	A byte value returned from the DE CPU, bit mapped with instrument status information.
2 L	Status Bits 1	To be defined by Honeywell
3 H	Status Bits 2	To be defined by Honeywell
3 L	Status Bits 3	To be defined by Honeywell
4	Spare	
5	PV Value 0 to 16383	An integer value representing 0 to 100% of span for the PV value being returned from the instrument.
6 H	CFG database update counter	A byte value returned from the DE CPU. This value represents the number of times the entire configuration database has been acquired from the instrument since reset. This counter will rollover at 255 (0xFF)
6 L	Communication error counter	A byte value returned from the DE CPU. This value represents the number of DE communication errors since reset. This counter will rollover at 255 (0xFF)
7 H	PV updated counter	A byte value returned from the DE CPU. This value represents the number of times the PV value has been acquired since reset. This counter will rollover at 255 (0XFF)
7 L	SV updated counter	A byte value returned from the DE CPU. This value represents the number of times the SV value has been acquired from the instrument since reset. This counter will rollover at 255 (0XFF)
8 H	Spare	
8 L	Function	This byte value is used by the module to decode the DE command functions to be performed by the DE channel. Valid commands include Imaging (default), Download and Upload.
9 H	DE CFG – Operational Mode	This byte value controls the DE operation mode for the transmitter configuration, determining what data the transmitter will send to the module. The codes allow the transmitter to be switched between Analog mode and the different DE modes. Note that the instruments must be in the DE mode for the 3750-DEM to be able to collect data.

(Continued)

Object Word Offset	Name	Description
9 L	Damping	This byte value sets the digital filter constant used in the instrument to process the PV value. In the download process, this value is multiplied by three to put it into the correct DE damping parameter value. Valid codes from 0 to 9. Note that the actual damping constants differ between instrument types.
10 H	PV Characterization	This byte value determines the algorithm used in the transmitter for process variable characterization. The PV Characterization value chosen must be valid for the transmitter. The value is not checked prior to transfer to the DE processor.
10 L	Sensor Type	Value indicates the instrument type connected to the DE Channel.
11 H	PV Number	In a multi-variable transmitter, this value indicates the relative number of the PV value coming from the instrument. Used in combination with Number of PV value in low byte. In a single variable instrument, this will have a value of 1.
11 L	Number of PVs	Indicates the total number of PV values to be returned from the instrument. This value will be 1 in a single variable instrument and could be up to 4 in a MV instrument.
12,13,14	Spare	

4.3.4 ASCII Data Values

Some data returned from the instrument, and from the DEM module itself, is in the ASCII form. This data representation was originally developed for Honeywell DCS applications that transferred the ASCII status information directly to an Operator display. The data contained in this section of the M1 file can be used in this fashion also. If the data is not needed, it does not have to be copied out of the M1 file to the SLC data table.

M1 File Word Address	Object Name	Description
250 to 309	ASCIIReadData 1	The ASCIIReadData object, detailed in the Appendix, contains 120 ASCII character values (60 words).
310 to 369	ASCIIReadData 2	
370 to 429	ASCIIReadData 3	
430 to 489	ASCIIReadData 4	
490 to 549	ASCIIReadData 5	
550 to 609	ASCIIReadData 6	
610 to 669	ASCIIReadData 7	
670 to 729	ASCIIReadData 8	

The ASCIIReadData object structure is shown in the following table.

Object Word Offset	Name	Description
0 to 3	Tag Name	ASCII string containing the Tag Name used to identify the transmitter to the system. The Tag Name must be unique for every physical transmitter on a module (i.e., every channel of a multivariable transmitter must be the same Tag Name)
4 to 7	Serial Number	ASCII string representing the transmitter Serial Number. This is a transmitter parameter that is read only from the instrument to the DEM module

(Continued)

Object Word Offset	Name	Description
8 to 11	Software Revision	ASCII string containing the firmware revision level of the transmitter. This is a transmitter parameter that is read only from the instrument to the DEM module
12 to 27	Scratch Pad	ASCII string containing the transmitter's scratch pad. This is a transmitter parameter that is read only from the instrument to the DEM module
28 to 59	Transmitter Status	ASCII string containing the transmitter's detailed status. This is a transmitter parameter that is read only from the instrument to the DEM module

4.3.5 Product Revision Information

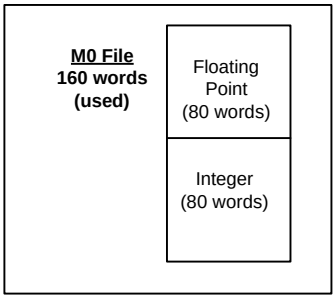
The DEM returns the firmware revision level at the tail end of the M1 file. This data consists of 6 words that allow the factory to determine exactly the firmware release running in the unit. The structure and location of the data is as follows:

M1 File Word Address	Name	Description
730 731	Product Name	These two words represent the product name of the module in an ASCII representation. In the case of the 3750 product, the letters ' DEM ' should be displayed when placing the programming software in the ASCII data representation mode.
732 733	Product Revision	These two words represent the product revision level of the firmware in an ASCII representation. An example of the data displayed would be '1.00' when placing the programming software in the ASCII data representation mode.
734	Product Operating System	This word represents the module's internal operating system revision level in an ASCII representation.
735	Product Run Number	This number represents the 'batch' number that your particular chip belongs to in an ASCII representation.

5 Writing Data to the Module – M0 File

5.1 Data Structure Overview

Instrument configuration data is transferred from the SLC to the 3750-DEM module through the M0 File. The following diagram shows the sizes and types of data transferred within the individual file types.



5.2 How the Write Data is Used

The module receives the data from the M0 file for each instrument channel once per scan of the PV value (every 366 ms). This data is used to accomplish two objectives:

a) The Integer and Floating Point values are received into the DE Command space in the DEM module. These values are compared immediately against the last values read from the module. Any differences cause a mismatch condition and the corresponding mismatch flags in the Device Status Flags 2 word to be asserted.
b) Correspondingly, if a mismatch condition does exist, there are two ways to clear this condition:
    1. Assure that the Integer and Float values being written to the module match the values in the instrument by performing an Upload Command (Function 2). The ladder logic in the SLC (see Example in Appendix) will copy the values being read into the Write data space
    2. Initiate a Download to the instrument (Function 1). Upon acceptance by the instrument and read back from the instrument into the module, the mismatch condition will be cleared.

5.2.1 Integer Format Data

Following is the data structure for the Integer write data:

M0 File Word Address	Object Name	Description
80 to 89	IntWriteData 1	The IntWriteData object is a 10 word object containing the integer and ASCII values necessary to either configure an instrument (actually write to the instrument) or to clear any mismatch conditions which may arise.
90 to 99	IntWriteData 2	
100 to 109	IntWriteData 3	
110 to 119	IntWriteData 4	
120 to 129	IntWriteData 5	
130 to 139	IntWriteData 6	
140 to 149	IntWriteData 7	
150 to 159	IntWriteData 8	

The actual structure of the 10 word block moved to the DEM module is outlined in the following table. Details on the individual parameters can be found in the Appendix.

Object Word Offset	Name	Description
0	Command Bits	This value is used by the module to command several miscellaneous binary values.
1	Function	This byte value is used by the module to decode the DE command functions to be performed for the DE channel.
2 H	DE Config	This byte value controls the DE operation mode for the transmitter configuration, determining what data the transmitter will send to the module.
2 L	Damping	This byte value sets the digital filter constant used in the instrument to process the PV value.
3 H	PV Characterization	This byte value determines the algorithm used in the transmitter for process variable characterization. The PV Characterization value chosen must be valid for the transmitter. The value is not checked prior to transfer to the DE processor.
3 L	Sensor Type	Value indicates the type of instrument that is connected to the DE Channel.
4 H	PV Number	In a muli-variable transmitter, this value indicates the relative number of the PV value coming from the instrument. Used in combination with Number of PV value in low byte. In a single variable instrument, this will have a value of 1.
4 L	Number of PVs	Indicates the total number of PV values to be returned from the instrument. This value will be 1 in a single variable instrument and could be up to 4 in a MV instrument.
5-8	Tag Name	This string of 8 ASCII characters is used to identify the instrument in the system. The Tag Name must be unique for every physical transmitter on a module (i.e., every channel of a multivariable transmitter must be the same Tag Name)
9	Spare	

5.2.2 Floating Point Format Data

Following is the data structure for the Floating Point write data:

M1 File Word Address	Object Name	Description
0 to 9	FloatWriteData 1	The FloatWriteData object, detailed in the Appendix, contains 5 Floating Point values that are required by the module and/or the instrument to configure and clear mismatch conditions.
10 to 19	FloatWriteData 2	
20 to 29	FloatWriteData 3	
30 to 39	FloatWriteData 4	
40 to 49	FloatWriteData 5	
50 to 59	FloatWriteData 6	
60 to 69	FloatWriteData 7	
70 to 79	FloatWriteData 8	

The actual structure of the 10 word block moved to the DEM module is outlined in the following table. Details on the individual parameters can be found in the Appendix.

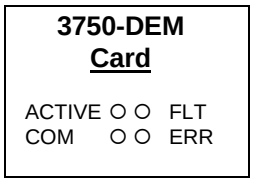
Object Word Offset	Name	Description
0.1	LRV (float)	This floating point value is used to calculate the instrument's LRV using the equation: Instrument LRV = LRV / URL
2.3	URV (float)	This floating point value is used to calculate the instrument's Span using the equation: Instrument Span = (URV - LRV) / URL
4.5	URL (float)	Upper Range Limit. This value is used by the DEM module for Mismatch comparison purposes only. It is not written to the instrument during a Download
6.7	Damping(float) (Future)	This value is the floating point representation of the damping factor. When the byte value of Damping is 7Eh, the DE CPU is returning the value in floating point format (future)
8.9	Spare(float)	

6 Hardware Diagnostics & Troubleshooting

Several hardware diagnostics capabilities have been implemented using the LED indicator lights on the front of the module. The following sections explain the meaning of the individual LEDs on the module.

6.1 Normal Operation of Module (Fault LED Off)

Under normal operating conditions, the LEDs will indicate the module's operating status:



ProSoft Module	Color	Status	Indication
ACT	Green	Blink (Fast)	Normal state : The module is operational
		On/Off	The module has not cleared the reset condition after power up. Make sure the processor is in the RUN mode.
FLT	Red	Off	Normal State : No system problems are detected during background diagnostics
		On	A system problem was detected during background diagnostics. Please see the next Section of this manual or contact the Factory for assistance
COM	Green		DE CPU Communication Status This light blinks every time a valid PV variable is received from an instrument on one of the 8 DE channels annunciated by the LED
ERR	Amber	Off	Normal State : When the error LED is off and the related port is actively transferring data, there are no communication errors
		Blink	Periodic communication errors are occurring during data communications. The conditions which will cause the LED to blink are: • Download Fail • Data Base Mismatch on at least one channel
		On	This LED will stay on under several conditions: • FTA not Connected • Loss of 24 VDC power to module

6.2 Faulted Status of Module (Fault LED On)

Should the DEM fail during operation, this condition will be indicated visually on the LEDs on front of the module.

Although there are many possible detailed conditions which can cause the module to fault, they all come down to the fact that the main micro on the DEM has failed to communicate with one or both of the DE Communication processors.

Normally this condition is indicative of a hardware problem, possibly a failure, but it may also indicate that the DE CPU failed due to erroneous data being received either from the SLC or from the instrument.

Although the exact cause of the fault condition should be determined from the Module Status value in the data table, the LEDs on the front of the module will also indicate some status.

6.2.1 DE Init Error

ACTIVE ● ● FLT
COM ○ ○ ERR

The module is in a faulted condition. This indicates that the main CPU on the DEM has failed to communicate with the DE processor.

6.2.2 DE Reset Error

ACTIVE ○ ● FLT
COM ○ ○ ERR

The module is in a faulted condition. This indicates that the 6811 DE CPU processors has failed to Reset properly during initialization. Try resetting the module again. Call the Factory if all else fails.

6.2.3 DE Timeout Error

ACTIVE ○ ● FLT
COM ○ ● ERR

The module is in a faulted condition. This indicates that the 6811 DE CPU processor has not returned control of the Shared RAM in the proper timeframe. Try resetting the module. Call the factory if all else fails.

6.3 Clearing a Fault Condition

To clear a fault condition, verify the data being transferred from the SLC.

During the power up and initialization of the module, the health of the DE Communication processor is verified. If there is a hardware problem, it should be detected at this time and annunciated on the LEDs.

If the condition does not clear, contact the factory with the LED status information.

6.4 Troubleshooting

In order to assist in the troubleshooting of the module, the following tables have been put together to assist you. Please use the following to help in using the module, but if you have additional questions or problems please do not hesitate to contact us.

The entries in this section have been placed in the order in which the problems would most likely occur after powering up the module.

Problem Description	Steps to take
Processor Fault	1) Be sure that the module is plugged into the slot that has been configured for the DEM module. 2) Assure that the slot in the SLC rack configuration has been set up correctly: ID Code : Input Length: 32 words Output Length:: 32 words M0 Length: M1 Length:
ERR LED is on continuously	This is normally an indication of one of the following: 1) The FTA cable is not connected to a FTA. The FTA satisfies an input to the module indicating it presence. 2) The 24 VDC has not been connected to the module or has not been connected correctly. To be sure of the problem, look at word 1 in the module's input file to determine the Module Status Code.

(Continued)

Problem Description	Steps to take
ERR LED blinks	There are at least two conditions that could cause the Error LED to blink. 1) If there are input channels that do not have instruments connected to them, and the DE CFG value in the Write Data Base for these channels is set to 3 or 4, the module will return a mismatch error for the channel. To clear the error, set the DE CFG value to 0. 2) If there is an instrument connected to the input channel, then verify that the values being returned from the instrument match the values in the Write Data base for the channel. To determine the exact item(s) which are mismatched, review the Device Status Flags 2 word. There are two ways to clear the mismatch: a) Perform a Function 2 (enter at 2 in the Write Database Function word. This will copy the read image from the instrument into the write image, thereby clearing the mismatch. b) If the Write Database is correct then perform a Function 1 (enter a 1 in the Write Database Function word). This will write the values to the instrument, and upon reading these values back, the module will clear the mismatch flags. If the mismatch flags do not clear, there most likely is an illegal value in one of the fields being written to the instrument.

A Support, Service and Warranty

Technical Support

ProSoft Technology survives on its ability to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

Factory/Technical Support
ProSoft Technology, Inc.
9801 Camino Media, Suite 105
Bakersfield, CA 93311
(661) 664-7208
(800) 326-7066
(661) 664-7233 (fax)
E-mail address: prosoft@prosoft-technology.com
Web Site : http://www.prosoft-technology.com

Before calling for support, please prepare yourself for the call. In order to provide the best and quickest support possible, we will most likely ask for the following information (you may wish to fax it to us prior to calling):

1. Product Version Number
2. System hierarchy
3. Module Operation
   - M0/M1 and I1 File operation
   - LED patterns

An after-hours answering system (on the Bakersfield number) allows pager access to one of our qualified technical and/or application support engineers at any time to answer the questions that are important to you.

Module Service and Repair

The DEM card is an electronic product, designed and manufactured to function under somewhat adverse conditions. As with any product, through age, misapplication, or any one of many possible problems, the card may require repair.

When purchased from ProSoft Technology, the module has a one-year parts and labor warranty according to the limits specified in the warranty. Replacement and/or returns should be directed to the distributor from whom the product was purchased. If you need to return the card for repair, it is first necessary to obtain an RMA number from ProSoft Technology. Please call the factory for this number and display the number prominently on the outside of the shipping carton used to return the card.

General Warranty Policy

ProSoft Technology, Inc. (Hereinafter referred to as ProSoft) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at ProSoft's election, of defective or non-conforming Product, and ProSoft shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication of misuse of the Product; (b) failure of Customer to adhere to any of ProSoft's specifications or instructions; (c) neglect of, abuse of, or accident to, the Product; or (d) any associated or complementary equipment or software not furnished by ProSoft.

Limited warranty service may be obtained by delivering the Product to ProSoft and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of

loss or damage in transit, to prepay shipping charges to ProSoft, and to use the original shipping container or equivalent. Contact ProSoft Customer Service for further information.

Limitation of Liability

EXCEPT AS EXPRESSLY PROVIDED HEREIN, PROSOFT MAKES NO WARRANT OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY EQUIPMENT, PARTS OR SERVICES PROVIDED PURSUANT TO THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER PROSOFT OR ITS DEALER SHALL BE LIABLE FOR ANY OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION IN CONTRACT OR TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), SUCH AS, BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS OR BENEFITS RESULTING FROM, OR ARISING OUT OF, OR IN CONNECTION WITH THE USE OR FURNISHING OF EQUIPMENT, PARTS OR SERVICES HEREUNDER OR THE PERFORMANCE, USE OR INABILITY TO USE THE SAME, EVEN IF PROSOFT OR ITS DEALER'S TOTAL LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT.

Where directed by State Law, some of the above exclusions or limitations may not be applicable in some states. This warranty provides specific legal rights; other rights that vary from state to state may also exist. This warranty shall not be applicable to the extent that any provisions of this warranty is prohibited by any Federal, State or Municipal Law that cannot be preempted.

Hardware Product Warranty Details

Warranty Period : ProSoft warranties hardware product for a period of one (1) year.
Warranty Procedure: Upon return of the hardware Product ProSoft will, at its option, repair or replace Product at no additional charge, freight prepaid, except as set forth below. Repair parts and replacement Product will be furnished on an exchange basis and will be either reconditioned or new. All replaced Product and parts become the property of ProSoft. If ProSoft determines that the Product is not under warranty, it will, at the Customer's option, repair the Product using current ProSoft standard rates for parts and labor, and return the Product freight collect.

B Memory Mapping and Object Definitions

Input File Data Format

Type	I1 File		
N	0	PV update flags	
		bits 0 to 7 – Update Status	
		bits 8 to 15 – Trouble Flag (Timeout - loss of Comm w/ device)	
N	1	module status	
F	2 to 17	FloatResultsData - PV	8 values - 16 words
N	18 to 25	PV - Integer Scaled 0 to 16383	8 words
	26 to 31	Spare	

M1 File Data Format
Data to be transferred from module

Type	M1 File		
F	0	FloatResultsData- SV	8 values - 16 words
F	16	FloatReadData_1	7 values - 14 words
F	30	FloatReadData_2	7 values - 14 words
F	44	FloatReadData_3	7 values - 14 words
F	58	FloatReadData_4	7 values - 14 words
F	72	FloatReadData_5	7 values - 14 words
F	86	FloatReadData_6	7 values - 14 words
F	100	FloatReadData_7	7 values - 14 words
F	114	FloatReadData_8	7 values - 14 words
N	130	IntReadData_1	15 words
N	145	IntReadData_2	15 words
N	160	IntReadData_3	15 words
N	175	IntReadData_4	15 words
N	190	IntReadData_5	15 words
N	205	IntReadData_6	15 words
N	220	IntReadData_7	15 words
N	235	IntReadData_8	15 words
A	250	ASCCIIReadData_1	60 words
A	310	ASCCIIReadData_2	60 words
A	370	ASCCIIReadData_3	60 words
A	430	ASCCIIReadData_4	60 words
A	490	ASCCIIReadData_5	60 words
A	550	ASCCIIReadData_6	60 words
A	610	ASCCIIReadData_7	60 words
A	670	ASCCIIReadData_8	60 words
A	730	Module Revision Info	6 words

M0 File Data Format
Data to be transferred to module

Type	M0 File		
F	0	FloatWriteData_1	5 values - 10 words
F	10	FloatWriteData_2	5 values - 10 words
F	20	FloatWriteData_3	5 values - 10 words
F	30	FloatWriteData_4	5 values - 10 words
F	40	FloatWriteData_5	5 values - 10 words
F	50	FloatWriteData_6	5 values - 10 words
F	60	FloatWriteData_7	5 values - 10 words
F	70	FloatWriteData_8	5 values - 10 words
N	80	IntWriteData_1	10 words
N	90	IntWriteData_2	10 words
N	100	IntWriteData_3	10 words
N	110	IntWriteData_4	10 words
N	120	IntWriteData_5	10 words
N	130	IntWriteData_6	10 words
N	140	IntWriteData_7	10 words
N	150	IntWriteData_8	10 words

N Type - Integer File Layout – SCAN 3000 Compatible
Corresponds to Example Ladder logic

Word	Object Type	Length
0	IntReadData_1	15 words
15	IntReadData_2	15 words
30	IntReadData_3	15 words
45	IntReadData_4	15 words
60	IntReadData_5	15 words
75	IntReadData_6	15 words
90	IntReadData_7	15 words
105	IntReadData_8	15 words
120	IntWriteData_1	10 words
130	IntWriteData_2	10 words
140	IntWriteData_3	10 words
150	IntWriteData_4	10 words
160	IntWriteData_5	10 words
170	IntWriteData_6	10 words
180	IntWriteData_7	10 words
190	IntWriteData_8	10 words
200		

F Type - Floating Point File Layout – SCAN 3000 Compatible
Corresponds to Example Ladder logic

Word	Object Type	Length
0	FloatResultsData - PV	16
8	FloatResultsData - SV	16
16	FloatReadData_1	7 values
23	FloatReadData_2	7 values
30	FloatReadData_3	7 values
37	FloatReadData_4	7 values
44	FloatReadData_5	7 values
51	FloatReadData_6	7 values
58	FloatReadData_7	7 values
65	FloatReadData_8	7 values
72-74	Unused	3 values
75	FloatWriteData_1	5 values
80	FloatWriteData_2	5 values
85	FloatWriteData_3	5 values
90	FloatWriteData_4	5 values
95	FloatWriteData_5	5 values
100	FloatWriteData_6	5 values
105	FloatWriteData_7	5 values
110	FloatWriteData_8	5 values
115		

A Type - ASCII Point File Layout – SCAN 3000 Compatible
Corresponds to Example Ladder logic

ASCII File Organization

Word	Object Type	Length
0	ASCCIIReadData_1	60 words
60	ASCCIIReadData_2	60 words
120	ASCCIIReadData_3	60 words
180	ASCCIIReadData_4	60 words
240		
0	ASCCIIReadData_5	60 words
60	ASCCIIReadData_6	60 words
120	ASCCIIReadData_7	60 words
180	ASCCIIReadData_8	60 words
240	Module Rev Info	6 words
244		

IntReadData Object Definition

Length : 15 words

Overview : Read data from DE Device

0		Device Status Flags #1		
	0	function done	Bool	
	1	function passed	Bool	
	2	PV update flag	Bool	
	3	PV output flag	Bool	
	4	sfc_det	Bool	
	5	sv update flag	Bool	
	6	cfg data base update flag	Bool	
	7	real cfg dbase available flag	Bool	
	8	cold junction reference	Bool	
	9	Open thermocouple detection	Bool	
	10	freq50	bool	
	11	Data Mismatch Active Flag	bool	1 = mismatch
	12	Spare	bool	
	13	pv_bad_flag	bool	1 = Bad
	14	pv_under_range (<0 %)	bool	1 = out of range
	15	pv_over_range (> 100%)	bool	1 = out of range
1		Device Status Flags #2		
	0	Mismatch - LRV	bool	1 = mismatch
	1	Mismatch - URV	bool	1 = mismatch
	2	Mismatch - URL	bool	1 = mismatch
	3	Mismatch - Damping	bool	1 = mismatch
	4	Mismatch - DE_CONF	bool	1 = mismatch
	5	Mismatch - PV Characterization	bool	1 = mismatch
	6	Mismatch - Sensor Type	bool	1 = mismatch
	7	Mismatch - Tag ID	bool	1 = mismatch
	8	Mismatch - PV Num	bool	1 = mismatch
	9	Mismatch - Number of PVs	bool	1 = mismatch
	10	Mismatch - Cold junction reference	bool	1 = mismatch
	11	Mismatch - Open thermo detect	bool	1 = mismatch
	12	Mismatch - freq50	bool	1 = mismatch
		Spare (bits 13 - 15)		
2	H	special_db	byte	
	L	stat_bits1	byte	
3	H	stat_bits2	byte	
	L	stat_bits3	byte	
4		Spare		
5		PV value - 0 to 4095		
6	H	cfg data base update counter	byte	
	L	comm err cntr	byte	
7	H	pv updated counter	byte	
	L	sv update counter	byte	
8	H	Spare	byte	
	L	function	byte	
9	H	DE cfg - operational mode	byte	
	L	damping	byte	
10	H	pv characterization	byte	
	L	sensor type	byte	
11	H	PV Number	byte	
	L	Number of PVs	byte	
12		Spare		
13		Spare		
14		Spare		

FloatReadData Object Definition

Length : 7 Floats (14 words)
Overview : Read float config data from DE Device

1	R	LRV - Lower range value	Mismatch value
2	R	URV - Upper range value	Mismatch value
3	R	URL - Upper range Limit	Mismatch value - read only
4	R	Damping	Exact usage unclear at this time
5	R	LRL - Lower range Limit	Display only value
6	R	Spare	
7	R	Spare	

ASCIIReadData Object Definition

Object Name : ASCIIReadDdata
Length : 120 bytes(60 words)
Overview :Read ASCII Config Data from PLC to DE Device

0	Tag Name	8 bytes
4	serial number	8 bytes
8	software revision	8 bytes
12	scratch pad	32 bytes
28	transmitter/mismatch status	64 bytes

IntWriteData Object Definition

Object Name : IntWriteData
Length : 10 words
Overview : Write data from PLC to DE Device

0		Cmd bits	
	0	cjtact - cold junction compensation	
	1	piuotcdf - open thermo detected	
	2	freq 50	
	3	Spare	
	4-15	Spare	
1	H	Spare	byte
	L	Function	byte
2	H	DE cfg - operational mode	byte
	L	damping	byte
3	H	PV Characterization	byte
	L	sensor type	byte
4	H	PV Number	byte
	L	Number of PVs	byte
5-8		Tag Name	ASCII Data
9		Spare	

FloatWriteData Object Definition

Object Name : FloatWriteData
Length : 5 Floats (10 words)
Overview : Write float config data to DE Device

1	R	LRV - Lower range value	
2	R	URV - Upper range value	
3	R	URL - Upper range Limit	not writeable, for mismatch only
4	R	Damping	Exact usage unclear at this time
5	R	Spare	

C Detailed Honeywell DE Parameter Descriptions

Device Status Flags #1

Bit	Name	Description
0	Function Done	0 = Not complete, 1 = Complete Status Flag associated with the function parameter. When the Function parameter is set to one(1) to initiate a database write to the instrument, this bit may be monitored to determine completion
1	Function Passed	0 = Function Failed, 1 = Function Passed Flag to be used in conjunction with Function Done Flag. When the Function Command is set to anything besides Imaging PV, the Function Done Flag is set False. When the requested Function Command is completed, the 3750 will return to the Imaging PV mode, set the Function Done Flag to 1 and set the Function Passed depending on the outcome of the command. Note that if a Download to an Instrument is initiated and no parameters have been changed in the database, the Function Passed Flag will not be set.
2	PV Update Flag (Toggles)	This flag indicates that the DEM has received a new PV value from the instrument in this DE Channel. This flag will be toggled during the next Block Transfer with the current BTR Block ID number, unless a new PV value is received again.
3	PV Output	This flag indicates that the PV is in Output Mode. In this implementation the instrument can only be placed in Output Mode by the SFC (hand held) In this mode, the PV is forced to a value which overrides the transmitter PV. This is a read only value
4	SFC Detected	This flag indicates that the DE CPU has detected that the SFC has changed transmitter parameters. This bit is for status indication only in the SLC but is used by the DEM as part of the parameter mismatch logic.
5	SV Updated Flag (Toggles)	This flag indicates that the DEM has received a new SV value from the instrument in this DE Channel. This flag will be toggled during the next Block Transfer with the current BTR Block ID number, unless a new SV value is received again.
6	Config Data Base Update (Toggles)	This flag indicates that the DEM has received a new Configuration Database from the DE CPU. This flag will only be updated by the DE CPU when the complete data base has been received from the instrument.
7	Spare	
8	Cold Junction Ref	A flag indicating if cold junction reference is being used by the transmitter. This value may be changed in the instrument by the SLC via the Download Function. 0 External reference used 1 Internal (to transmitter) reference is used
9	Open Thermocouple Detect	A flag indicating if Open Thermocouple Detection is enabled in the transmitter. This value may be changed in the instrument by the SLC via the Download Function. 0 Detection Not Enabled 1 Detection Enabled
10	Freq 50	A flag indicating if 50 or 60 Hertz filtering is being used in the transmitter. This value may be changed in the instrument by the SLC via the Download Function(VERIFY THIS). 0 60 Hz 1 50 Hz
11	Data Mismatch Active Flag	A flag set by the DEM whenever an active database mismatch condition exists. The exact mismatched parameters can be determined by checking Device Status Flags #2. The Data Mismatch flag will be cleared by the DEM whenever the condition causing the mismatch is cleared. 0 No mismatch condition 1 Mismatch condition
12	Spare	

13	Bad PV Flag	A flag set by the DEM whenever the PV value is suspected or known to be bad. Once the PV value is good again, this flag will be cleared by the DEM. Conditions causing this flag to be set include: PV Update Timeout : If the PV value has not been updated within the timeout period, the flag is set FTA Not Present : If the FTA connector or the 24 VDC power supply is disconnected, the flag will be set SFC Write Detected : If and SFC write to the instrument data base is detected, the flag will be set. Note that in a redundant application, the SFC Write Detected condition will be detected when a Download command is executed from the other module or from the SFC unit. Database Mismatch : If the data base mismatch condition is detected, the flag will be set
14	PV Under Range Flag	This flag is set whenever the PV value is under 0%.
15	PV Over Range Flag	This flag is set whenever the PV value is over 100%.

Device Status Flags #2

The bits in this word are used to indicate the current mismatch status for each data variable which is verified. When the bit is set (1) the variable is in a mismatched condition. The mismatch may be cleared by performing a download to the instrument or by performing an upload (copying the read data base to the write data base). If the SLC database is downloaded to the instrument, the mismatch condition will not clear until the complete data base has been read back from the instrument.

Bit	Description
0	URL - Mismatch
1	LRV - Mismatch
2	URV - Mismatch
3	Damping - Mismatch
4	DE Config - Mismatch
5	PV Char - Mismatch
6	Sensor Type - Mismatch
7	Tag ID - Mismatch
8	PV Number - Mismatch
9	Number of PV Values - Mismatch
10	Cold Junction Ref - Mismatch
11	Open Thermocouple Detect - Mismatch
12	Freq 50 - Mismatch
13	Spare
14	Spare
15	Spare

Special DB byte

Bit	Description
0	Initial Power-up Data base
1	1st DB Capture in progress
2	4 Byte Data Base
3	No DE Data Available
4	SFC Write Detected
5	Output Mode
6	Not Used
7	Not Used

Status Bits 1 (To be defined by Honeywell)
Status Bits 2 (To be defined by Honeywell)
Status Bits 3 (To be defined by Honeywell)

PV Number

In a multi-variable transmitter, this value indicates the relative number of the PV value coming from the instrument. Used in combination with Number of PV value in low byte. In a single variable instrument, this will have a value of 1.

Number of PVs

Indicates the total number of PV values being returned from the instrument. This value will be 1 in a single variable instrument

PV Value - 0 to 16383

An integer representation of the value being returned in the PV - Last Good Value field. This value is intended to be used for PID logic and other applications that would require that the Floating Point value be de-scaled. This value is initialized to 0 during power up.

Configuration database update counter

Updated by the DE CPU, for debug purposes, every time the instrument data base has been completely received. The counter increments from 0 to 0ffh and rolls over to 0.

Communication error counter

Updated by the DE CPU, for debug purposes, to indicate the number of DE communication errors which have occurred since reset. The counter increments from 0 to 0ffh and rolls over to 0.

PV updated counter

Updated by the DE CPU every time the PV value is received from an instrument. Note also that the COMM LED on the module will also toggle on when a PV is received.

SV updated counter

Updated by the DE CPU every time the SV variable is received from an instrument

Function

This value describes the operating mode of the DEM for the DE Channel and the corresponding transmitter. The following modes are defined and/or supported:

Function	Description
0	Imaging PV (Default)
1	Download Transmitter Parameters to Instrument
2	Upload Transmitter Parameters Performed in ladder logic. Copies data base read back from instrument into write registers
3	Set LRL (Not supported, use mode #1)
4	Set URL (Not supported, use mode #1)
5	Correct LRL (Not supported, use mode #1)
6	Correct URL (Not supported, use mode #1)
7	Correct Zero Point (Not supported, use mode #1)
8	Restore Calib (Not supported)
9	

DE CFG - Operational Mode

Indicates the DE operational mode for the transmitter configuration and the data which will be returned from the instrument. The available values are as follows:

0	Analog Mode
1	PV value only
2	PV and SV only
3	PV and Configuration Data Base (6 Byte mode)
4	PV, SV and Configuration Data Base (6 Byte Mode)

Note that the DE CFG value must be at least a 3 (instrument must be in 6 byte mode) in order for the database to be read from the instrument

Damping

This is the damping value correspond to the particular damping value in the transmitter. These values are based on a lookup table which is a function of the type of transmitter.

Damping	SPT	STT	SFM
0	0.0	0.0	0.0
1	0.16	0.30	0.5
2	0.32	0.70	1.0
3	0.48	1.5	2.0
4	1.0	3.1	3.0
5	2.0	6.3	4.0
6	4.0	12.7	5.0
7	8.0	25.5	10.0
8	16.0	51.1	50.0
9	32.0	102.3	100.0

PV Characterization

This parameter defines the algorithm used in the transmitter for process variable characterization. The correct PV Characterization parameter chosen when downloading the database must be in the set that is supported by the transmitter installed in the DE Channel.

> The PV Characterization value is not checked by the DEM module against the transmitter type. The User must be cautious when writing the value to be sure that the correct value is selected

Sensor Type

Value indicates the type of instrument which is connected to the DE Channel. Possible values are:

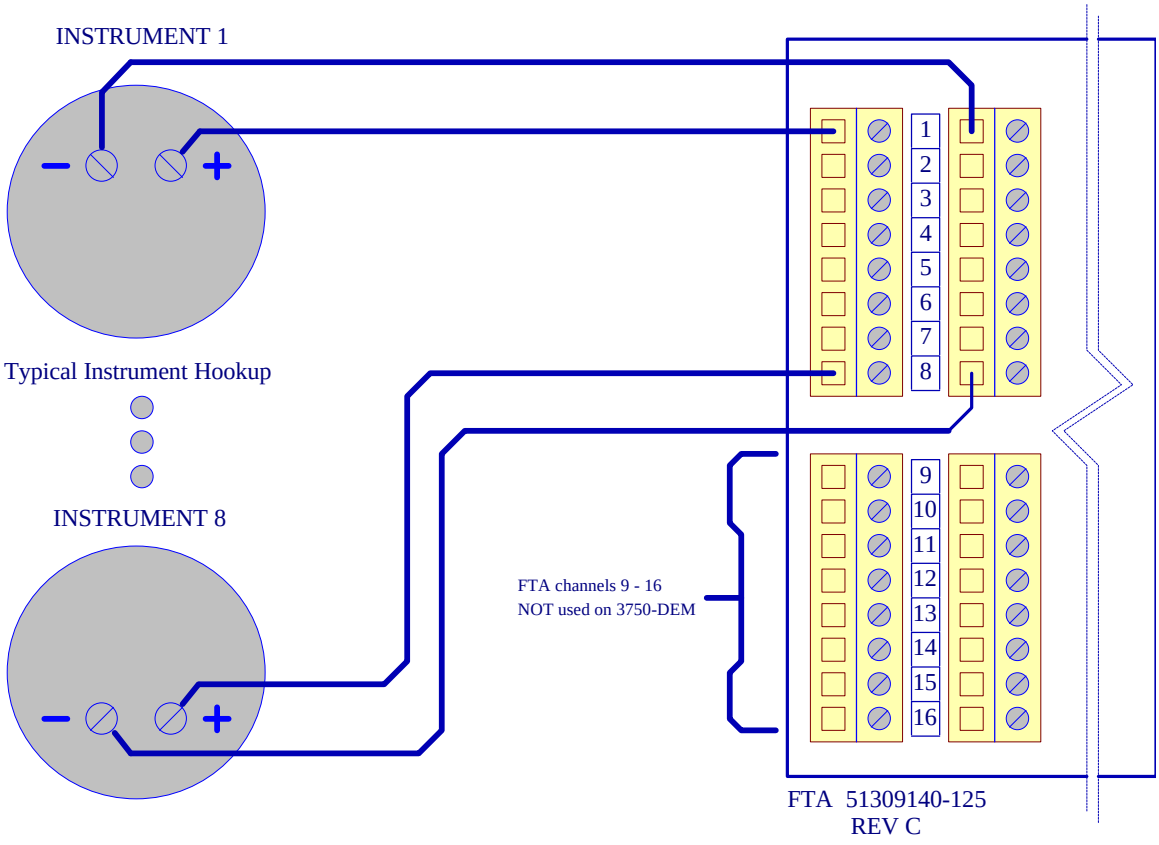
Value	Hex	Description
8	8	SPT DP
9	9	SPT GP
10	A	SPT AP
11	B	STT
12	C	SFM
13	D	SCM
14	E	SGC
15	F	SVP
16	10	MTT
17	11	STP
18	12	SLV
19	13	SDU
20	14	Generic

D Product Revision History

Revision 1.1 5/20/97
Initial release of product
Based strongly on applicaton code in 3700-DEM

Revision 1.2 5/30/97
Deleted PV and SV NaN data types from code and documentation

E Field Terminal Assembly Connections



Installation Instructions:
Power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods Article 501-4(b) of the National Electrical Code, NFPA 70 for installations in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction.

A. Warning – Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2
B. Warning – Explosion Hazard – When in hazardous locations, turn off power before replacing or wiring modules
C. Warning – Explosion Hazard – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

F Example SLC Ladder Logic

The following ladder logic provides an example for the ladder logic necessary to integrate the 3750-DEM module into a SCAN 3000 Application. This logic can be incorporated directly as is, or if desired modified as needed for the application.

The ladder logic is build around the presumption that the memory map for the data will follow that needed to interface directly with the SCAN 3000 software. As such, the register mapping detailed in Appendix A is followed.

Specifically, in the example logic, the following files have been used:

Integer	N10
Float	F11
ASCII	A12
	A13

The Processor Configuration Information to setup the slot to accept the module is as follows:

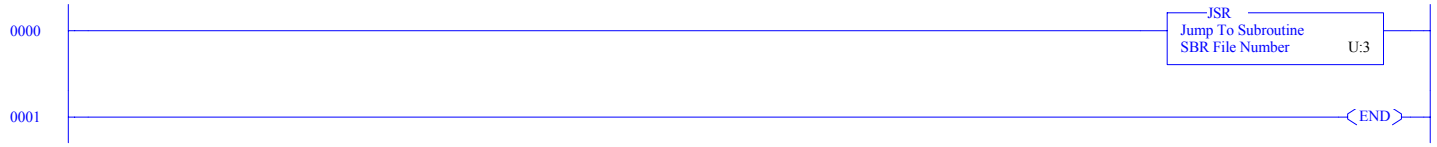
```
I/O CONFIGURATION FOR : DEM_3750

       RACK 1 : 1746-A4    4 Slot Backplane
       RACK 2 :            Not Installed
       RACK 3 :            Not Installed

       SLOT   CATALOG #    DESCRIPTION
       0      1747-L532    5/03 CPU – 12K USER
       1      OTHER        I/O MODULE – ID CODE = 10406
       2
       3
       4
       5
       6
       7
```

```
SPECIAL CONFIG FOR SLOT :     1
   MODULE'S ID CODE :   10406
   MAXIMUM INPUT WORDS:    32
   MAXIMUM OUTPUT WORDS:   32
   SCANNED INPUT WORDS:    32
   SCANNED OUTPUT WORDS:   32
   M0 LENGTH :            160
   M1 LENGTH :            900
   'G' FILE SIZE:           0
   ISR NUMBER:              0
```

LAD 2 - --- Total Rungs in File = 2



Copy PV Values to Floating Poin File
The PV values (Last Good) are returned in the Input image (words 2 to 17)

0000

COP
Copy File
Source #I:1.2
Dest #F11:0
Length 8

Copy the data image from the module into the working registers in the SLC

0001

Copy SV

COP
Copy File
Source #M1:1.0
Dest #F11:8
Length 8

Copy FP
URE/LRV/
URV/
Damping

COP
Copy File
Source #M1:1.16
Dest #F11:16
Length 56

Copy INT
image

COP
Copy File
Source #M1:1.130
Dest #N10:0
Length 120

Copy ASCII
image

COP
Copy File
Source #M1:1.250
Dest #A12:0
Length 120

Copy ASCII
image

COP
Copy File
Source #M1:1.370
Dest #A12:120
Length 120

Copy ASCII
image

COP
Copy File
Source #M1:1.490
Dest #A13:0
Length 120

Copy ASCII
image

COP
Copy File
Source #M1:1.610
Dest #A13:120
Length 125

0002

COP
Copy File
Source #F11:75
Dest #M0:1.0
Length 80

COP
Copy File
Source #N10:120
Dest #M0:1.80
Length 80

Call the Function 1 and 2 write handling routine

0003

JSR
Jump To Subroutine
SBR File Number U:4

0004

END

Function 1
Clears Function 1 Enable upon receiving Function Done flag. Logic is here for all 8 channels.

0000

N10:0 0 — N10:121 (U) 0
N10:15 0 — N10:131 (U) 0
N10:30 0 — N10:141 (U) 0
N10:45 0 — N10:151 (U) 0
N10:60 0 — N10:161 (U) 0
N10:75 0 — N10:171 (U) 0
N10:90 0 — N10:181 (U) 0
N10:105 0 — N10:191 (U) 0

Channel 1 Function 2.
Performs copy of appropriate read data collected from the instrument channel and moves it into the Write Database for the channel. Once the data has been moved, the Function register is cleared to disable the Function.

0001

N10:121 1

CPT
Compute
Dest N10:120 0<
Expression (M1:1.130 AND 1792) | 256

COP
Copy File
Source #M1:1.138
Dest #N10:121
Length 4

COP
Copy File
Source #M1:1.16
Dest #F11:75
Length 5

COP
Copy File
Source #M1:1.250
Dest #N10:125
Length 4

MOV
Move
Source 0 0<
Dest N10:121 0<

Channel 2 Function 2.

0002

N10:131 1

CPT
Compute
Dest N10:130 0<
Expression (M1:1.145 AND 1792) | 256

COP
Copy File
Source #M1:1.153
Dest #N10:131
Length 4

COP
Copy File
Source #M1:1.30
Dest #F11:80
Length 5

COP
Copy File
Source #M1:1.310
Dest #N10:135
Length 4

MOV
Move
Source 0 0<
Dest N10:131 0<

Channel 3 Function 2.

0003

N10:141
1

CPT
Compute
Dest N10:140
0<
Expression (M1:1.160 AND 1792) | 256

COP
Copy File
Source #M1:1.168
Dest #N10:141
Length 4

COP
Copy File
Source #M1:1.44
Dest #F11:85
Length 5

COP
Copy File
Source #M1:1.370
Dest #N10:145
Length 4

MOV
Move
Source 0
0<
Dest N10:141
0<

Channel 4 Function 2.

0004

N10:151
1

CPT
Compute
Dest N10:150
0<
Expression (M1:1.175 AND 1792) | 256

COP
Copy File
Source #M1:1.183
Dest #N10:151
Length 4

COP
Copy File
Source #M1:1.58
Dest #F11:90
Length 5

COP
Copy File
Source #M1:1.430
Dest #N10:155
Length 4

MOV
Move
Source 0
0<
Dest N10:151
0<

Channel 5 Function 2.

0005

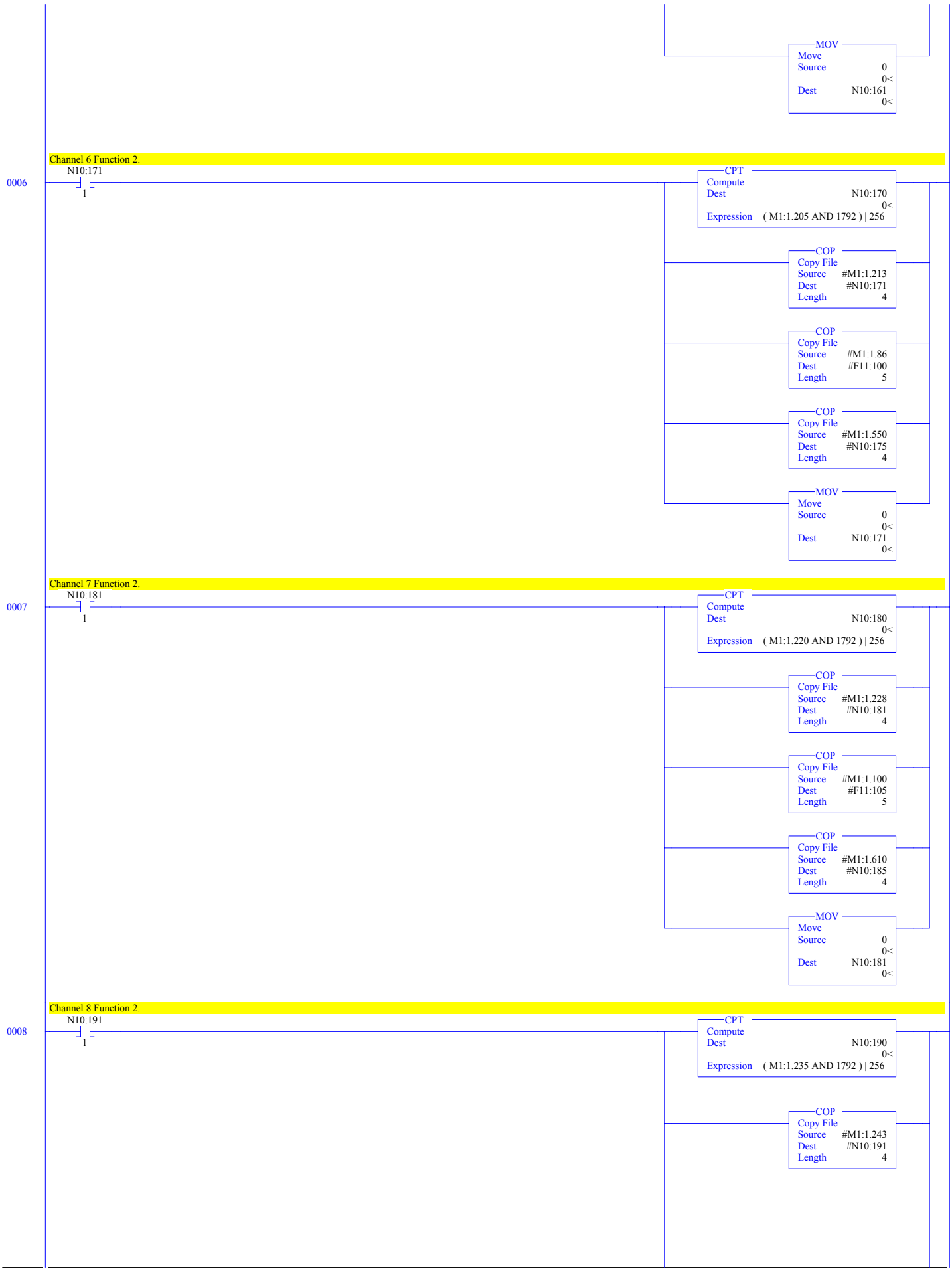
N10:161
1

CPT
Compute
Dest N10:160
0<
Expression (M1:1.190 AND 1792) | 256

COP
Copy File
Source #M1:1.198
Dest #N10:161
Length 4

COP
Copy File
Source #M1:1.72
Dest #F11:95
Length 5

COP
Copy File
Source #M1:1.490
Dest #N10:165
Length 4


MOV
Move
Source 0
0<
Dest N10:161
0<
Channel 6 Function 2.
N10:171
1
0006
CPT
Compute
Dest N10:170
0<
Expression (M1:1.205 AND 1792) | 256
COP
Copy File
Source #M1:1.213
Dest #N10:171
Length 4
COP
Copy File
Source #M1:1.86
Dest #F11:100
Length 5
COP
Copy File
Source #M1:1.550
Dest #N10:175
Length 4
MOV
Move
Source 0
0<
Dest N10:171
0<
Channel 7 Function 2.
N10:181
1
0007
CPT
Compute
Dest N10:180
0<
Expression (M1:1.220 AND 1792) | 256
COP
Copy File
Source #M1:1.228
Dest #N10:181
Length 4
COP
Copy File
Source #M1:1.100
Dest #F11:105
Length 5
COP
Copy File
Source #M1:1.610
Dest #N10:185
Length 4
MOV
Move
Source 0
0<
Dest N10:181
0<
Channel 8 Function 2.
N10:191
1
0008
CPT
Compute
Dest N10:190
0<
Expression (M1:1.235 AND 1792) | 256
COP
Copy File
Source #M1:1.243
Dest #N10:191
Length 4


COP
Copy File
Source #M1:1.114
Dest #F11:110
Length 5
COP
Copy File
Source #M1:1.670
Dest #N10:195
Length 4
MOV
Move
Source 0
0<
Dest N10:191
0<
0009
END

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
I:1.0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	OTHER - I/O Module - ID Code = 10406
I:1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.2	1	0	1	1	1	1	0	1	1	0	0	0	1	1	0	1	OTHER - I/O Module - ID Code = 10406
I:1.3	1	1	1	1	1	1	1	0	1	0	0	1	0	1	1	0	OTHER - I/O Module - ID Code = 10406
I:1.4	1	0	1	1	1	1	0	1	0	1	1	1	0	1	1	1	OTHER - I/O Module - ID Code = 10406
I:1.5	0	0	0	0	0	1	0	1	1	1	1	0	0	1	0	0	OTHER - I/O Module - ID Code = 10406
I:1.6	0	0	1	1	1	0	1	1	1	0	1	0	1	0	1	0	OTHER - I/O Module - ID Code = 10406
I:1.7	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.8	0	0	1	1	1	1	1	1	0	1	0	0	1	1	1	0	OTHER - I/O Module - ID Code = 10406
I:1.9	1	1	0	1	0	0	1	1	1	0	1	0	1	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.10	1	0	1	1	1	1	1	0	1	0	1	1	0	1	0	0	OTHER - I/O Module - ID Code = 10406
I:1.11	0	0	0	1	0	0	1	0	0	1	1	1	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.12	0	1	0	0	0	0	1	1	1	1	0	0	0	1	1	0	OTHER - I/O Module - ID Code = 10406
I:1.13	1	1	0	0	0	0	0	1	1	1	0	1	0	1	0	0	OTHER - I/O Module - ID Code = 10406
I:1.14	0	1	0	0	0	0	0	1	1	1	0	0	1	1	0	1	OTHER - I/O Module - ID Code = 10406
I:1.15	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	0	OTHER - I/O Module - ID Code = 10406
I:1.16	1	0	1	1	1	1	0	1	1	1	0	0	0	1	0	1	OTHER - I/O Module - ID Code = 10406
I:1.17	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.21	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	OTHER - I/O Module - ID Code = 10406
I:1.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.23	0	0	0	1	1	1	1	0	1	0	1	0	0	0	1	0	OTHER - I/O Module - ID Code = 10406
I:1.24	0	0	1	0	0	0	0	0	1	1	1	0	0	1	0	1	OTHER - I/O Module - ID Code = 10406
I:1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406
I:1.31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	OTHER - I/O Module - ID Code = 10406

Offset	0	1	2	3	4	5	6	7	8	9
N10:0	16516	0	0	0	0	0	3072	-18499	0	1027
N10:10	3089	257	0	0	0	16516	0	0	0	0
N10:20	0	4096	-27715	0	1024	3083	257	0	0	0
N10:30	16516	0	0	0	0	0	6144	-10817	0	1024
N10:40	3080	257	0	0	0	132	0	0	16384	0
N10:50	43	5888	-14659	0	1024	3080	257	0	0	0
N10:60	16516	0	0	0	0	0	3072	-19712	0	775
N10:70	3089	259	0	0	0	128	0	0	0	0
N10:80	7843	3072	1280	0	771	3089	515	0	0	0
N10:90	128	0	0	0	0	8421	3328	-21248	0	771
N10:100	3089	771	0	0	0	16516	0	0	0	0
N10:110	0	5888	-14403	0	1027	3080	257	0	0	0
N10:120	0	0	1027	3089	257	17256	24942	12336	12385	0
N10:130	0	0	1024	3083	257	25448	24942	12337	12338	0
N10:140	0	0	1024	3080	257	21569	18208	20033	19781	0
N10:150	0	0	1024	3080	257	27244	26656	12340	0	0
N10:160	0	0	775	3089	259	17256	24942	12340	13622	0
N10:170	0	0	771	3089	515	17256	24942	12340	13622	0
N10:180	0	0	771	3089	771	17256	24942	12340	13622	0
N10:190	0	0	1027	3080	257	17224	12344	21334	21554	0
N10:200	0	0	0	0	0	0	0	0	0	0
N10:210	0	0	0	0	0	0	0	0	0	0
N10:220	0	0	0	0	0	0	0	0	0	0
N10:230	0	0	0	0	0	0	0	0	0	0
N10:240	0	0	0	0	0	0	0	0	0	0
N10:250	0	0	0	0	0	0				

Offset	0	1	2	3	4
F11:0	-0.069432	-0.0595339	-0.0274139	0.807863	-0.351518
F11:5	397.546	25.692	-0.0964865	21.9014	0
F11:10	22.7197	26.1602	-1.#QNAN	-1.#QNAN	-8.05887e+18
F11:15	27.2729	0	125	400	0
F11:20	-400	0	0	0	350
F11:25	350	0	-35.0001	0	0
F11:30	0	300	400	0	0
F11:35	0	0	0	300	400
F11:40	0	0	0	0	0
F11:45	400	400	0	-400	0
F11:50	0	0	830.419	20760.5	0
F11:55	0	0	0	0	50
F11:60	850	0	-200	0	0
F11:65	0	100	400	0	0
F11:70	0	0	0	0	0
F11:75	50	850	0	-200	0
F11:80	0	0	100	400	0
F11:85	0	0	0	0	0
F11:90	0	125	400	0	-400
F11:95	0	350	350	0	-35.0001
F11:100	0	300	400	0	0
F11:105	0	300	400	0	0
F11:110	0	400	400	0	-400
F11:115	0	830.419	20760.5	0	0

Offset	0	1	2	3	4	5	6	7	8	9
A12:0	Ch	an	00	0a	15	44	01	56	1.	1
A12:10			XX	XX	XX	XX	XX	XX	XX	XX
A12:20	XX	XX	XX	XX	XX	XX	XX	XX	I	NP
A12:30	UT	O	PE	N	PV	3	BA	D	PT	C
A12:40	OM	P	PV	4						
A12:50										
A12:60	ch	an	01	02	30	02	58	23	3.	5
A12:70										
A12:80									ST	AT
A12:90	US	O	KA	Y						
A12:100										
A12:110										
A12:120	TA	G	NA	ME	12	71	19	25	6.	3
A12:130			CA	RA		SH	AR	RA	TT	O
A12:140	GY	X	XX	XX	XX	XX	XX	XX	ST	AT
A12:150	US	O	KA	Y						
A12:160										
A12:170										
A12:180	jl	h	04	\00\00	17	80	33	88	A.	3
A12:190			XX	XX	XX	XX	XX	XX	XX	XX
A12:200	XX	XX	XX	XX	XX	XX	XX	XX	CO	RR
A12:210	EC	TS	R	ES	ET					
A12:220										
A12:230										
A12:240	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00
A12:250	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00				

Offset	0	1	2	3	4	5	6	7	8	9
A13:0	Ch	an	04	56	15	43	21	61	0.	0
A13:10			NE	W	SM	V	30	00		
A13:20	MU	LT	I-	VA	RI	AB	LE		3	W
A13:30	IR	E	RT	D	PV	3				
A13:40										
A13:50										
A13:60	Ch	an	04	56	15	43	21	61	0.	0
A13:70			NE	W	SM	V	30	00		
A13:80	MU	LT	I-	VA	RI	AB	LE		3	W
A13:90	IR	E	RT	D	PV	3				
A13:100										
A13:110										
A13:120	Ch	an	04	56	15	43	21	61	0.	0
A13:130			NE	W	SM	V	30	00		
A13:140	MU	LT	I-	VA	RI	AB	LE		3	W
A13:150	IR	E	RT	D	PV	3				
A13:160										
A13:170										
A13:180	CH	08	SV	T2	18	42	80	45	A.	6
A13:190			XX	XX	XX	XX	XX	XX	XX	XX
A13:200	XX	XX	XX	XX	XX	XX	XX	XX	ST	AT
A13:210	US	O	KA	Y						
A13:220										
A13:230										
A13:240	DE	M	1.	10	01	\00\00	\00\00	\00\00	\00\00	\00\00
A13:250	\00\00	\00\00	\00\00	\00\00	\00\00	\00\00				