Application

Module configuration

There is no configuration required to the physical Input Module. All configurable characteristics of the Module are performed using tools on the Engineering Workstation (EWS) and become part of the application or System.INI file that is loaded into the TMR Processor. The TMR Processor automatically configures the Input Module after applications are downloaded and during Active/Standby changeover.

The IEC 61131 TOOLSET provides the main interface to configure the Input Module. Details of the configuration tools and configuration sequence are provided in Trusted Toolset Suite Product Description, publication ICSTT-RM249 (PD-T8082). There are three procedures necessary to configure the Input Module. These are:

1. Define the necessary I/O variables for the field input data and module status data using the Dictionary Editor of the IEC 61131 TOOLSET.
2. Create an I/O Module definition in the I/O Connection Editor for each I/O Module. The I/O Module definition defines physical information, e.g. Chassis and Slot location, and allows variables to be connected to the I/O channels of the Module.
3. Using the Trusted® System Configuration Manager, define custom LED indicator modes, per-channel threshold levels and noise filtering, and other Module settings.

T8403 Complex Equipment Definition

The T8403 I/O Complex Equipment Definition includes eight I/O boards, referenced numerically by Rack number:

Table 3 Complex Equipment Definition

Rack	I/O Board	Description	Data Type	Direction	No. of channels
1	DI	OEM Parameters	-	-	-
		Field Input Status	Boolean	In	40
2	STATE	Field Input State	Integer	In	40
3	AI	Input voltage	Integer	In	40
4	SPARE	Not used	Integer		16
5	LINE_FLT	Line Fault Status	Boolean	In	40
6	DISCREP	Channel Discrepancy	Integer	In	3
7	HKEEPING	Housekeeping Registers	Integer	In	51
8	INFO	I/O Module Information	Integer	In	11

There are two OEM parameters included in the first rack (DI Board). These OEM parameters define the primary module position; declaring the Module's chassis and slot location. There is no need to define the secondary module

position within the IEC 61131 TOOLSET. Where systems may be required to start up with a Module in the secondary position as the Active Module, e.g. primary module is not installed when application is started, the secondary module's position should be declared in the Module definition of the System Configuration Manager.

Table 4 OEM Parameters

OEM Parameter	Description	Notes
TICS_CHASSIS	The number of the Trusted Chassis where the primary I/O Module is installed	The Trusted Controller Chassis is 1, and Trusted Expander Chassis are 2 to 15.
TICS_SLOT	The slot number in the Chassis where the primary I/O Module is installed	The I/O Module slots in the Trusted Controller Chassis are numbered from 1 to 8. The I/O Module slots in the Trusted Expander Chassis are numbered from 1 to 12.

Rack 1: DI

This board provides the logical input state for each of the field inputs.

Table 5 Rack 1: DI descriptions

Channel	Description
1	Field input channel 1 logical state
2	Field input channel 2 logical state
40	Field input channel 40 logical state

The input state is reported as true (logic '1') for a closed contact input, and false (logic '0') for an open contact input. The logic state is the majority voted value.

Rack 2: STATE

This board provides the majority voted numerical input state. This input channel state indicates the threshold band within which the input voltage lies.

Table 6 Rack 2: STATE descriptions

Channel	Description
1	Field input channel 1 state
2	Field input channel 2 state
40	Field input channel 40 state

Table 7 Rack 2: STATE Output descriptions

Channel	Description
7	Unknown
5	Short circuit
4	Closed contact
3	Indeterminate
2	Open contact
1	Open circuit

The input channel has a value 7 (Unknown) when:

1. The input channel cannot be correctly measured by two or more slices of the TMR Input Module.
2. The TMR Processor detects a 2003 channel discrepancy between the three slices of the TMR Input Module.
3. The Module is simulated (not installed or the TMR Processor cannot communicate with 2003 slices of the Module).

Rack 3: AI

The AI board returns the field loop voltage at the input.

Table 8 Rack 3: Channel Field Voltage

Channel	Description
1	Field input channel 1 voltage
2	Field input channel 2 voltage
40	Field input channel 40 voltage

The voltage is the median value taken from the triplicated Module. The voltage level is reported as an integer, with the units being 1/512v. This may be used directly, scaled arithmetically or scaled using the conversion tables.

When used directly the value may be considered as a signed, fixed-point binary value, i.e.:

Table 9 Rack 3: Channel Field Voltage Bit Definitions

Bit																
15	14	13	12	11	10	9		8	7	6	5	4	3	2	1	0
Sign	Integer							Fractional								

To scale the value arithmetically, simply divide the input value by 512 to return the voltage as either a REAL or INTEGER as required.

The IEC 61131 TOOLSET conversion tables may be used to convert the input value to engineering units, in this case voltage. The full scale range for this number format is decimal ±64, corresponding to physical range –32768 to

+32767. Other units may be chosen depending on the numeric resolution and span of the desired result.

When the TMR Processor detects a 2003 channel fault or discrepancy, or if the Input Module is simulated, the input voltage numeric value is reported as –2048.

Rack 4: SPARE

This rack is reserved for future used and is included to promote consistency with other Trusted I/O Modules.

Rack 5: LINE_FLT

This table describes Rack 5: LINE_FLT:

Table 10 Rack 5: LINE_FLT

Channel	Description
1	Field input channel 1 line fault
2	Field input channel 2 line fault
40	Field input channel 40 line fault

The line fault input is reported as true (logic '1') for a line fault condition (open circuit, indeterminate, or short circuit condition). The logic state is the majority voted value.

When the TMR Processor detects a 2003 channel fault or discrepancy, or if the Input Module is simulated, the line fault input is set to True.

Rack 6: DISCREP

This table describes Rack 6: DISCREP.

Table 11 Rack 6: DISCREP Bit Descriptions

Channel	Description
1	Discrepancy status inputs 1 to 16 (input 1 is LSB, bit 0)
2	Discrepancy status inputs 17 to 32 (input 17 is LSB, bit 0)
3	Discrepancy status inputs 33 to 40 (input 33 is LSB, bit 0)

Each of the integers reports the discrepancy status of 16 input channels. The corresponding bit within the integer is set to '1' when a discrepancy condition is detected on that input channel's input state (rack 2). For example, if Slice B of the Input Module reports the state of channel 4 as state 5, while Slices A and