Application

Module Configuration

There is no configuration required to the physical Output 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 Output Module after applications are downloaded and during Active/Standby changeover.

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

1. Define the necessary I/O variables for the field output 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, for example, 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 default or fail-safe states, and other Module settings.

T8461 Complex Equipment Definition

The T8461 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 Output Status	Boolean	Out	40
2	STATE	Field Output State	Integer	In	40
3	AI	Output voltage	Integer	In	40
4	CI	Output current	Integer	In	40
5	LINE_FLT	Line Fault Status	Boolean	In	40
6	DISCREP	Channel Discrepancy	Integer	In	3
7	HKEEPING	Housekeeping Registers	Integer	In	57
8	INFO	I/O Module Information	Integer	In	11

There are two OEM parameters that are included in the first rack (DO 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 Modules in the secondary position as the Active Module, for example, 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.

This board provides the connection to the logical output control signal for each of the field outputs.

Table 5 Rack 1: DO descriptions

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

The user application should set the output control signal to true (logic '1') to turn ON or energize an output, and false (logic 'o') to turn OFF or de-energize an output.

This board provides the majority voted numerical output state. This indicates the operational status of the output channel and associated field connection.

Table 6 Rack 2: STATE bit Descriptions

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

Table 7 Rack 2: State Output Descriptions

Channel	Description
7	Channel fault

Table 7 Rack 2: State Output Descriptions

Channel	Description
6	Field fault (for example, field leakage to 0V or 24V)
5	Short circuit in field wiring or load
4	Output energized (ON)
3	Open circuit in field wiring or load
2	Output de-energized (OFF)
1	No field supply voltage
0	Unused

Rack 3: AI

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

Table 8 Rack 3: AI Descriptions

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

The voltage is the median value that is taken from the triplicated Module. The voltage level is reported as an integer, with the units being 1/500V. This may be used directly, scaled arithmetically, or scaled using the IEC 61131 TOOLSET conversion tables.

To scale the value arithmetically, simply divide the returned 'integer' by 500 to return the voltage as either a REAL or INTEGER as required.

The IEC 61131 TOOLSET conversion tables may be used to convert the value to engineering units, in this case voltage. The full-scale range for this number format is decimal ±64, corresponding to physical range –32000 to +32000.

Rack 4: CI

The CI board returns the field loop current at the output.

Table 9 Rack 4: CI Descriptions

Channel	Description
1	Field output channel 1 current
2	Field output channel 2 current
40	Field output channel 40 current

The current is the sum value that is taken from the triplicated Module. The current level is reported as an integer, with the units being 1/1000A. This may be used directly, scaled arithmetically or scaled using the IEC 61131 TOOLSET conversion tables.

To scale the value arithmetically, simply divide the returned 'integer' by 1000 to return the current as either a REAL or INTEGER as required.

The IEC 61131 TOOLSET conversion tables may be used to convert the value to engineering units, in this case current. The full-scale range for this number format is decimal ±32, corresponding to physical range –32000 to +32000.

Rack 5: LINE_FLT

This table describes Rack 5: LINE_FLT:

Table 10 Rack 5: LINE_FLT Descriptions

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

The line fault input state is reported as true (logic '1') for a line fault condition (open circuit, short circuit, and no field supply voltage). The logic state is the majority voted value.

Rack 6: DISCREP

This table describes Rack 6: DISCREP:

Table 11 Rack 6: DISCREP bit Descriptions

Channel	Description
1	Discrepancy status outputs 1 to 16 (output 1 is LSB)
2	Discrepancy status outputs 17 to 32 (output 17 is LSB)
3	Discrepancy status outputs 33 to 40 (output 33 is LSB)

Each of the words reports the discrepancy status of 16 output channels. The corresponding bit within the word is set to '1' when a discrepancy condition is detected on that output channel's output state (rack 2).

Rack 7: HKEEPING

This table describes Rack 7: HKEEPING.

Table 12 Rack 7: Housekeeping Descriptions