ICS Regent+Plus®

PD-7016

AC Digital Output Module

110 VAC
(T7444)

Issue 1, March, 06

The AC digital output module provides control of 16 user output loads. One type of module is available to interface to outputs powered from a nominal 110 VAC field power supply. Each module's triplicated I/O Safetybus interface ensures that no Regent system failure can incorrectly apply power to an output, and that no failure in the module can affect the operation of the Regent system or other I/O modules in the system.

Features

- Sixteen output circuits, configured as two isolated groups of eight circuits each.
- Hot-replaceable.
- Automatic self-testing of triplicated I/O Safetybus circuits and many simplex logic circuits.
- 2 amp output circuits.
- Zero-cross load switching.
- Individual front panel indicators on each module show active and fault, shutdown, blown fuse, and output on/off status (logic side).
- 2500 volt minimum electrical isolation between field and logic circuits.
- Fuses accessible from front panel.
- TÜV certified, Risk Class 5, non-interfering.

Module Operation

A block diagram of a typical 110 VAC digital output module is shown in Figure 1.

The processor modules send triplicated write data commands to the output module over the I/O Safetybus. The processors' addressing data and data write commands are voted by the module (preventing I/O Safetybus failures upstream from the module from affecting module operation). The voted result is then passed to the I/O bus interface logic.

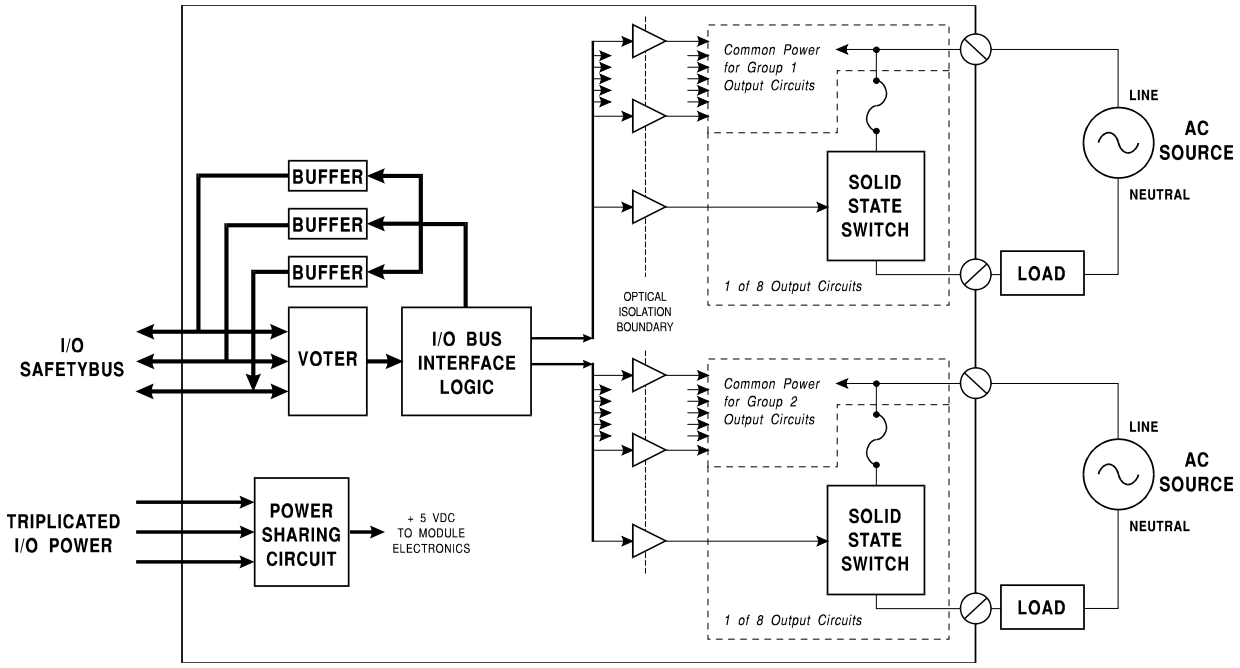

Figure 1. Block Diagram of 110 VAC Digital Output Module.

The voted output data from the I/O bus interface logic is then used to drive the output circuits. Zero crossing turn-on TRIAC drivers are used to convert the logic level output drive signals to switch 110 VAC power to load devices.

When the output is logically turned on, the field device is energized, and when the output is logically turned off, the field device is de-energized.

Optical isolation between the module's logic and field circuits provides logic-to-field isolation — protecting the output module from field signal over voltages, transients, and other electrical disturbances. It also provides a safety barrier between the primary field voltages and user accessible circuits.

Each output is individually fused to protect the circuits from short circuit conditions in output wiring and field devices.

Testing and Diagnostics

Each module's voter circuits are periodically tested by the processor modules. Discrepant data are sent through one of three legs of the I/O Safetybus to determine whether the module's voter is able to outvote the incorrect data. A failure to return the correct majority-voted result to the processors produces an I/O module error indication at the processor modules and a module fault indication at the I/O module.

Each type of module has a unique identification code that is read by the controller. This code lets the controller know which type of module is installed in each I/O chassis slot and how to address that module and its points specifically. If a module is removed, or is replaced with a module of a different type, the processor modules will indicate an I/O module error.

Loopback logic tests periodically write data to the module and then read it back to determine whether the module's I/O bus interface logic is functioning correctly.

Fuses are continually checked for continuity. Field power must be connected to the output module for t to detect blown fuses. Also, each output must be connected to a minimum load for a blown fuse to be detected.

Front Panel

The 110 VAC digital output module is shown in Figure 2. The front panel contains active and fault status indicators, a shutdown indicator, and output status and blown fuse indicators for each output circuit. The front panel also contains fuses for each output circuit.

Active and Fault Status Indicators

These green and red LEDs indicate the overall health of the module. During normal operation, the green ACTIVE indicator flashes at the controller's scan rate. If a module fault is detected the red FAULT indicator turns on and the green ACTIVE indicator turns off.

Shutdown Indicator

Upon loss of communications with the controller, output modules enter either a shutdown or hold fault mode. If the I/O assembly is set to shutdown, the red SHUTDOWN indicator will turn on when communications with the controller are lost. If the I/O assembly is set to hold, the SHUTDOWN indicator will always be off (see page 7, Fault Mode Jumper).

Note: When the module is installed in the I/O chassis or when logic power (from the I/O power supply modules) is first applied to the module, it will be in the shutdown mode until the first output scan, regardless of the fault mode jumper settings. Also, removing two I/O transceiver modules, two I/O power supply modules, or two power legs will cause the module to be in the shutdown mode.

Output Status Indicators

The output status indicators are yellow LEDs located on the logic side of the output. There are 16 output status indicators — one for each output. These indicators are lit when the output TRIAC is energized to turn on the load.

Blown Fuse Indicators

The red BLOWN FUSE indicators turn on when the adjacent front panel fuse opens. A blown fuse will also cause the module's FAULT indicator to turn on.

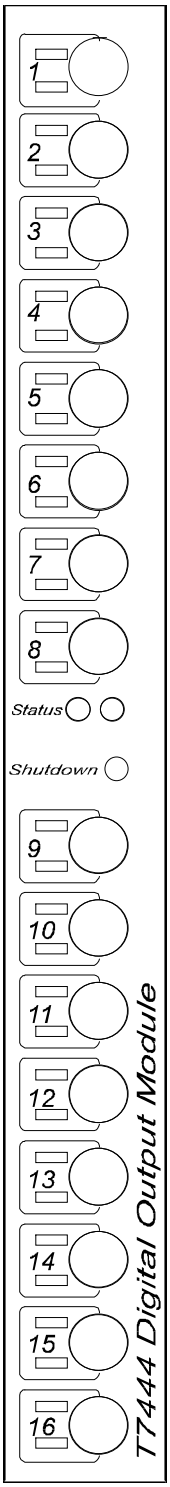

Figure 2. 110 VAC Digital Output Module.

Application

Simplex Configuration

Digital output modules provide a suitable interface to non-critical output devices. These non-critical devices typically include status alarms or other field devices that are not used for primary safety shutdown purposes. Although much of the circuitry on the digital output module is automatically tested, some logic circuits and the field-side output switch are simplex and non-tested. This simplex configuration is illustrated in Figure 3. For safety-critical outputs requiring fail-safe or fault tolerant output configurations, Guarded digital output modules should be used.

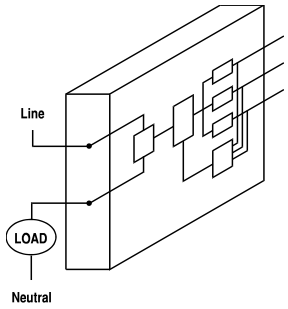

Figure 3. Simplex Digital Output Configuration.

Field Wiring

For field wiring details, refer to PD-7901 - I/O Termination Assembly.

Fault Mode Jumper

The fault mode jumper is located behind the ID switch cover in the lower left-hand corner of each I/O chassis. The position of the fault mode jumper determines the module's response to system level faults. The fault mode jumper's position will cause all output modules in the I/O chassis to either shutdown (turn off all outputs) or to hold (hold the last state) after a system level failure occurs. An example of a system level failure is the failure of two processor modules.

Keying

The I/O chassis can be physically keyed to prevent accidental damage caused by inserting a module into a slot wired for a different module type. Figure 4 illustrates how the slot keys are installed on the I/O chassis slot field wiring connectors. The slot key positions for the AC digital output module are listed in Table 1.

Table 1. Slot Key Positions.

Module	Upper Connector	Lower Connector
T7444	15	10

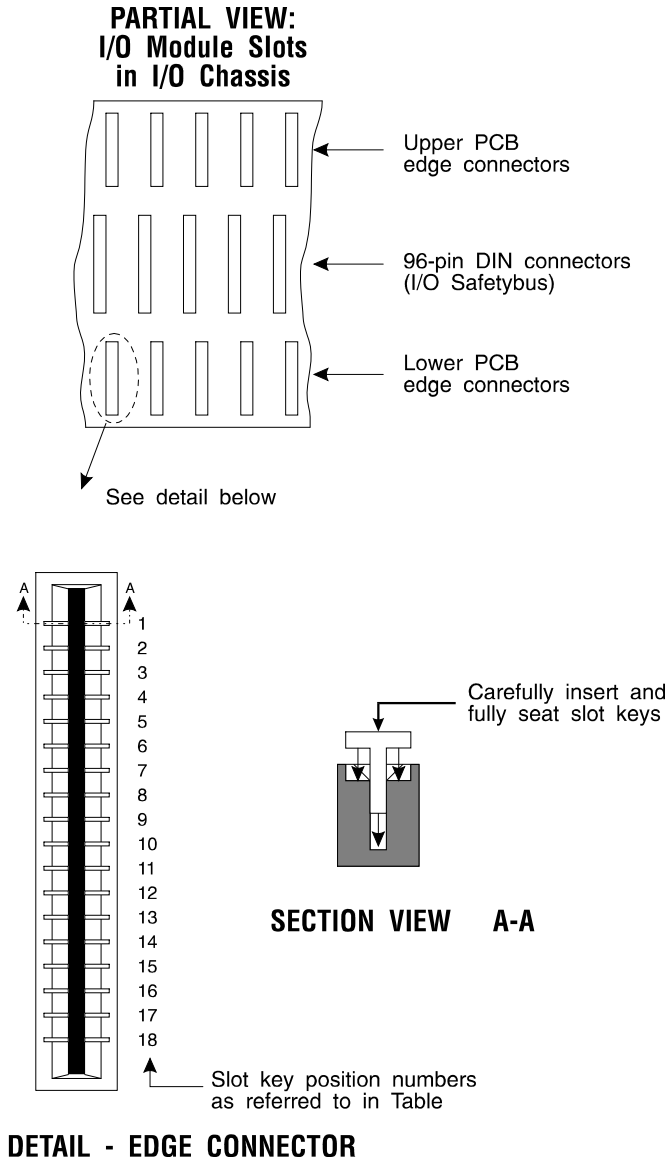

Figure 4. Installing Slot Keys.

Configuration

Each output module is configured using the WINTERPRET I/O Configuration Editor. In the editor you will perform the three steps described below to configure the output module.

1) Set the Module Type:

Position the cursor on the module slot you wish to define. Choose Set Module Type from the Edit Menu and select the appropriate digital output module from the list.

2) Edit the Module Definition:

Choose Edit Module Definition from the Edit Menu. A dialog box will open where you can define the output point definitions.

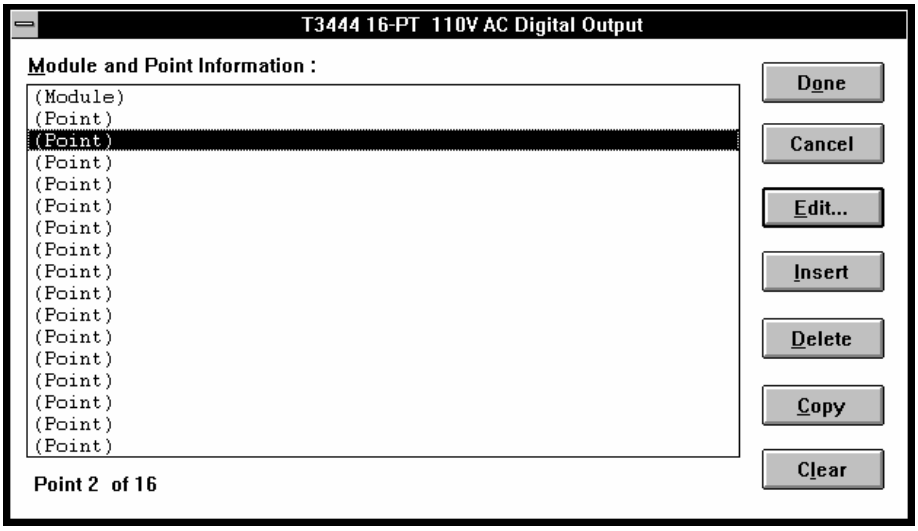

Figure 5. Digital Output Module Definition.

3) Edit each point:

Choose Edit from the Module Definition dialog box to define a name and description for each output point. In the Digital Output Point dialog, enter names and values for the configuration fields as described below.

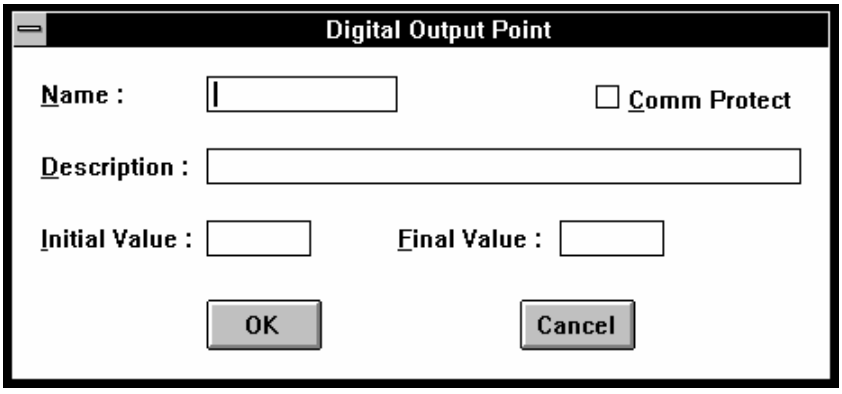

Figure 6. Defining a Digital Output Point.

Name

Also called the tag name, this is the name used in the application program to reference the output point. The name can be up to 12 characters long.

Description

This 40-character field provides a place to describe the output point definition. The description is used to help document your system (it does not affect application program operation).

Comm Protect

Marking the Comm Protect check box protects the point from changes by communications functions such as data write, forcing, and load initial value when Comm Protect is enabled.

Initial Value

The initial value for the output is loaded to the Regent when you load the I/O configuration and also when you load the application program that controls the output.

Final Value

The final value for the output is loaded to the Regent when the application program that controls the output is deleted. Unless special circumstances exist, you should always enter zero, so that the output is turned off when you delete the application program that controls it.

Output Module Definition

In addition to configuring output point definitions, you can configure an output module definition to represent the combined state of all sixteen output points. The module definition represents the 16 output point definitions as signed, 16-bit integers. In this format, output point 1 is the least significant bit (LSB) and output point 16 is the most significant bit (MSB).

Programming

Outputs are controlled by writing application programs that solve for output values. For example, placing an output tag name on a coil in ladder logic will cause the output to turn on when there is power flow to the coil in the ladder logic rung. You can also reference the logic state of the output in your

control logic by using a contact element (or similar element) with the output point name.

Maintenance

No periodic maintenance or calibration is required for this module.

Fuses can be removed and replaced without removing the module from the I/O chassis. Turning the fuse holder one-quarter turn from its locked position releases the fuse holder, extending the fuse and allowing it to be removed.

To prevent damage to the module, replacement fuses must be of the same rating and type (see Specifications, below).

Safety Considerations

TÜV The AC digital output module is TÜV certified as non-interfering, and can be used in a safety system for simplex non-safety critical outputs. For safety critical outputs, guarded output modules should be used (model T7484 or T7485 are recommended).

Specifications

Safetybus Power	0.8 load units
Number of Outputs	16 circuits divided into two groups of 8 circuits each
Voltage Range	90 to 130 VAC
Frequency Range	47 to 63 Hz
Load Current	2 amps maximum per output 0° to 50° C, derated linearly to 1 amp at 60° C 8 amps maximum per group of 8 outputs 0° to 60° C 16 amps maximum per module 0° to 60° C
Minimum Load	50 mA
On State Drop	2.0 volts maximum
Surge Current	15 amps, 20 msec
Output Leakage	5 mA maximum
Fusing	One 3 A, 250 V, fast-acting (3AG) per output, front panel mounted
Turn-On Delay	½ AC cycle, maximum
Turn-Off Delay	½ AC cycle, maximum
Heat Dissipation	28 Watts, 97 BTUs/hour
Over voltage Protection	175 VAC, continuous
Isolation	2500 volts minimum (field wiring to control logic) 2500 volts minimum (output group 1-8 to output group 9-16)
Operating Temperature	0° to 60° C (32° to 140° F)
Storage Temperature	-40° to 85° C (-40° to 185° F)

Operating Humidity	0 to 95% relative humidity, non-condensing
Vibration	
10 to 55 Hz:	±0.15mm
Shock	
Operating:	15 g, ½ sine wave, 11 msec
Electromagnetic Interference	
• IEC 801 Part 2 - Electrostatic Discharges	Level 3: Contact discharge of 6 kV
• IEC 801 Part 3 - Radiated Electromagnetic Fields	Level 3: 10 V/M, 27 MHz - 500 MHz
• ANSI/IEEE C37.90 - Surge Withstand Capability	1 kV damped 1 MHz sine wave
Safety	Certified to DIN V VDE 0801 (non-interfering) and designed to meet UL 508 and CSA 22.2, No. 142-M1981
Dimensions	
Height:	12.6" (320 mm)
Width:	1.27" (32 mm)
Depth:	10.12" (257 mm)
Weight	3.5 lbs (1.6 kg)