Bailey network 90™

Analog Output Module NAOM01

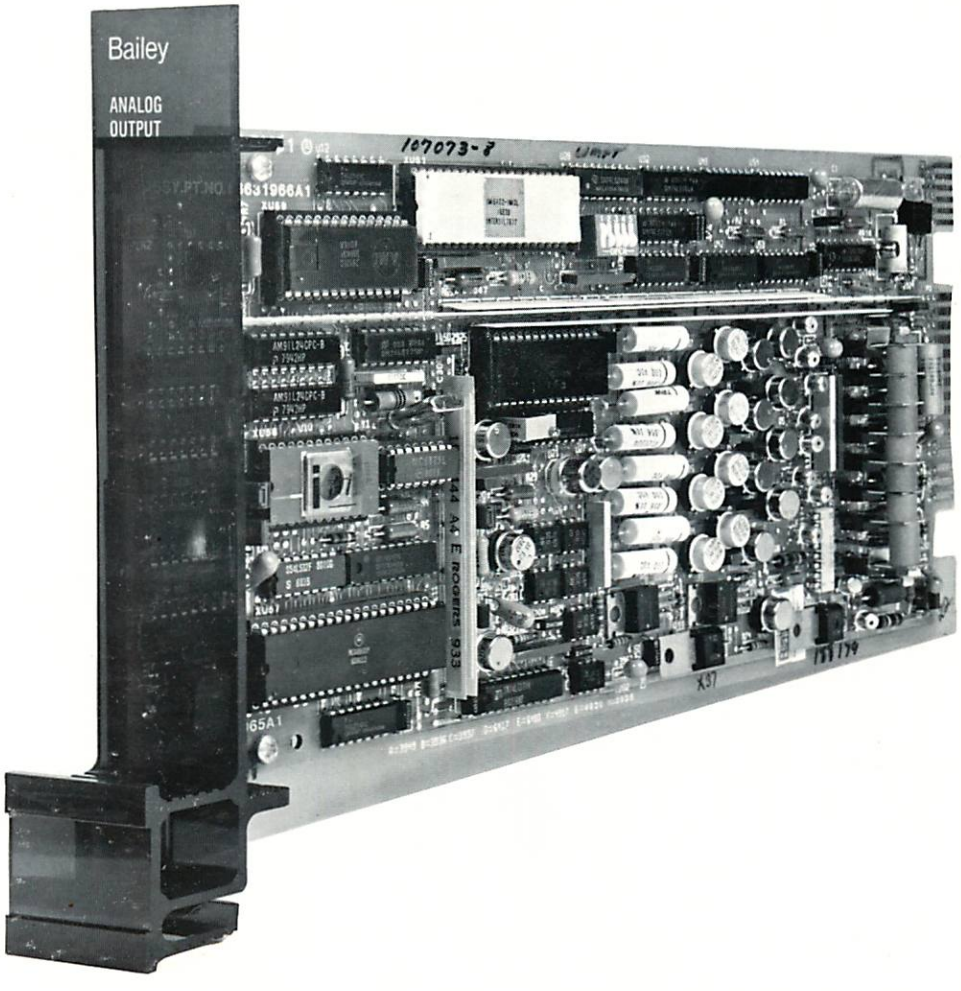

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FIGURE 1 — Analog Output Module.

Product Instruction

E93-912-3

Bailey Controls

WARNING notices as used in this manual apply to hazards or unsafe practices which could result in personal injury or death.
CAUTION notices apply to hazards or unsafe practices which could result in property damage.
NOTES highlight procedures and contain information which assist the operator in understanding the information contained in this manual.

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Contents

Foreword

This product instruction provides receiving, installation, operation, service and replacement information for the NETWORK 90™ Analog Output Module. Additional application information is given in the following publications: Function Block Specification (Product Information E93-900-2), System Engineering Procedure (Product Information E93-900-4) and Configuration and Tuning Module (Product Instruction E93-903).

Section 1 - Introduction

The Analog Output Module (AOM) illustrated in Figure 1 is a standard NETWORK 90 module that mounts in a Module Mounting Unit (MMU) of the system. The module is microprocessor based and generates a group of individual analog output signals for driving recorders, indicators or analog signal interconnection with other Process Control Units (PCU) of the system. The signals are transmitted via a cable to an Analog Output Termination Unit (TAO) and are then available for external use.

The Analog Output Module may be used with any Process Control Unit configuration, in accordance with particular application requirements.

Section 2 - Description

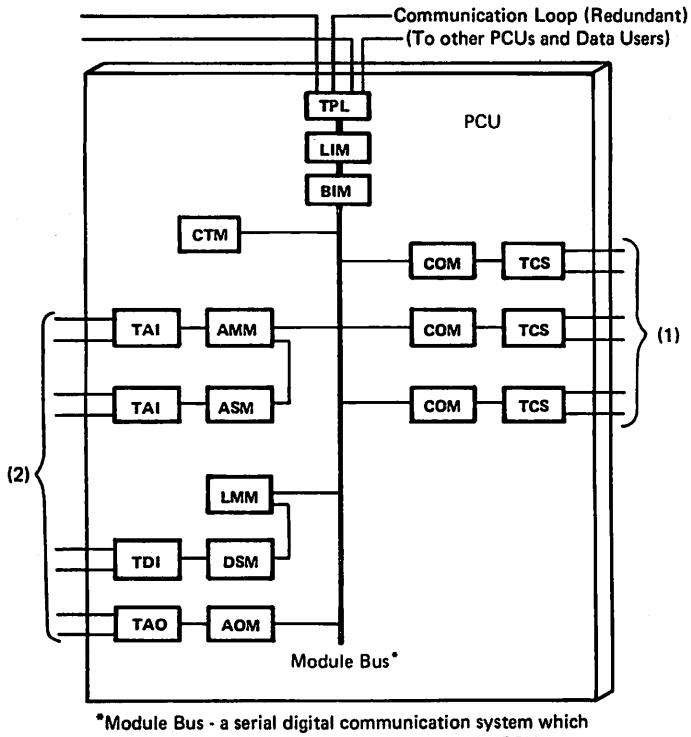
The Analog Output Module is designed to produce eight separate analog output signals in response to messages received over the Module Bus from other modules in the system.

The AOM consists of a microprocessor section and eight sets of analog output circuitry. Each output has 10 bit resolution and can be jumper selected to provide either a 4-20 milliampere current signal or 1-5 volt dc voltage signal. An alternate jumper selectable voltage range, for all eight outputs simultaneously, is 0-10 volts dc. The output section is isolated from the microprocessor section and is powered from +24 volt dc I/O power.

As shown in Figure 2, communication with other modules is via the Module Bus in typical Process Control Unit configuration. The module receives commands to set specific output values and responds to requests to read module status or output values.

The following nomenclature is applicable in the use of the Analog Output Module:

Analog Output Module	NAOM01
Analog Output Termination Unit	NTAO01
Termination Unit Cable	NKTU01
Module Mounting Unit	NMMU01



*Module Bus - a serial digital communication system which provides the data path between modules in the PCU.
(1) To Digital Control Stations and field wiring.
(2) Input/Output field wiring.

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Nomenclature

AMM	Analog Master Module
AOM	Analog Output Module
ASM	Analog Slave Module
BIM	Bus Interface Module
CIU	Computer Interface Unit
COM	Controller Module
CTM	Configuration and Tuning Module
DCS	Digital Control Station
DSM	Digital Slave Module
LIM	Loop Interface Module
LMM	Logic Master Module
OIU	Operator Interface Unit
PCU	Process Control Unit
PIM	Processor Interface Module
TAI	Termination Unit - Analog Input
TAO	Termination Unit - Analog Output
TCI	Termination Unit - Controller Interface
TCS	Termination Unit - Controller
TDI	Termination Unit - Digital Interface
TPL	Termination Unit - Plant Loop

FIGURE 2 — Typical Analog Output Module Application.

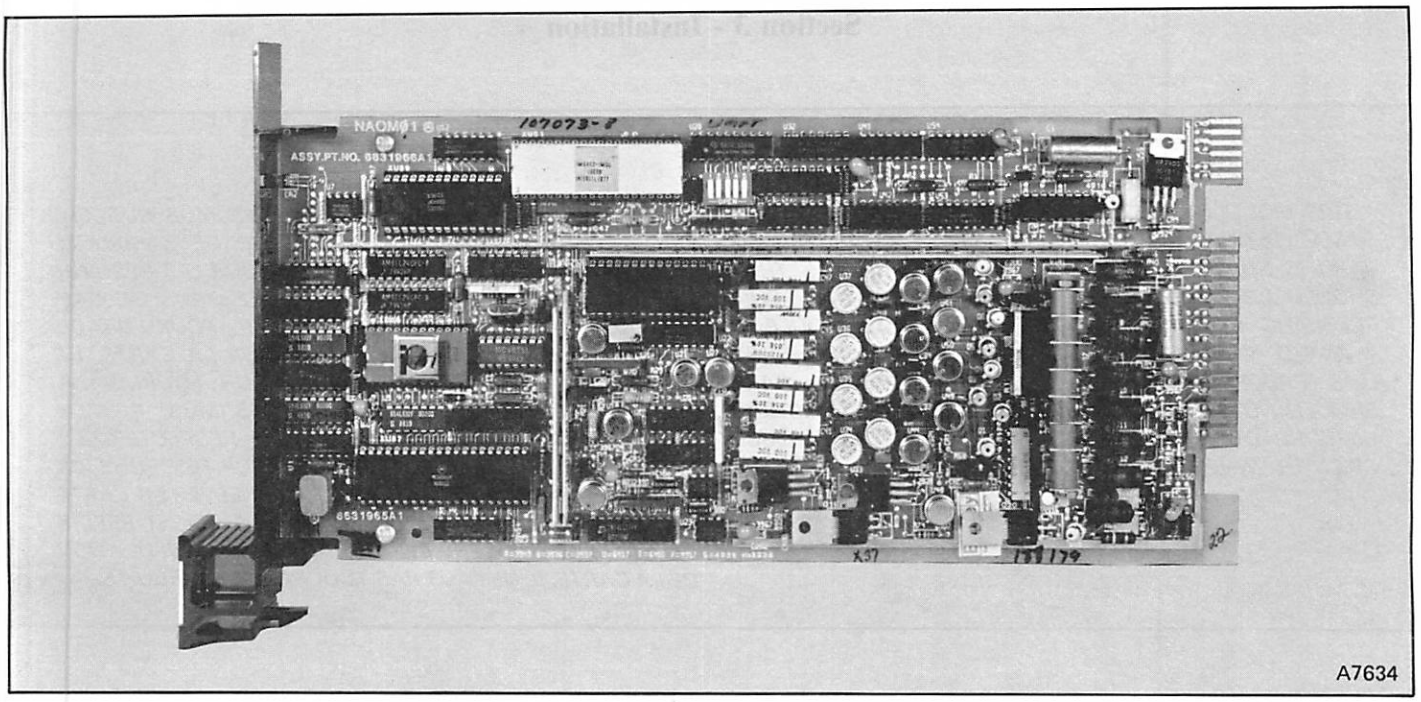


FIGURE 3 — Analog Output Module Board.

The Analog Output Module is placed into any slot of the Module Mounting Unit (MMU). Connections to module power and bus communication are made automatically through the edge connector P1 (see Figure 3). A latch is provided at the base of the front panel of the module for secure mounting to the MMU. A Red/Green LED is visible and a module reset switch is accessible on the front panel of the module.

The analog outputs are cabled from the module through the module edge connector P3, to the Termination Unit connector P1, with the use of a Termination Cable (NKTU01). The Termination Cable is a 36 conductor cable that is the connecting link be tween the Analog Output Module and the Termination Unit. The cable will usually run from the rear of the MMU slot that contains the AOM to the respective Termination Unit mounted within the cabinet.

The Analog Output Termination Unit (TAO) shown in Figure 4 is a 7" by 7" printed circuit board consisting of terminal strips, cable connectors, 16 pin sockets, fuses and circuitry. The P1 connector is used for connecting the Termination Unit to its respective module. I/O options are selected by means of dipshunts, which are described in the following section.

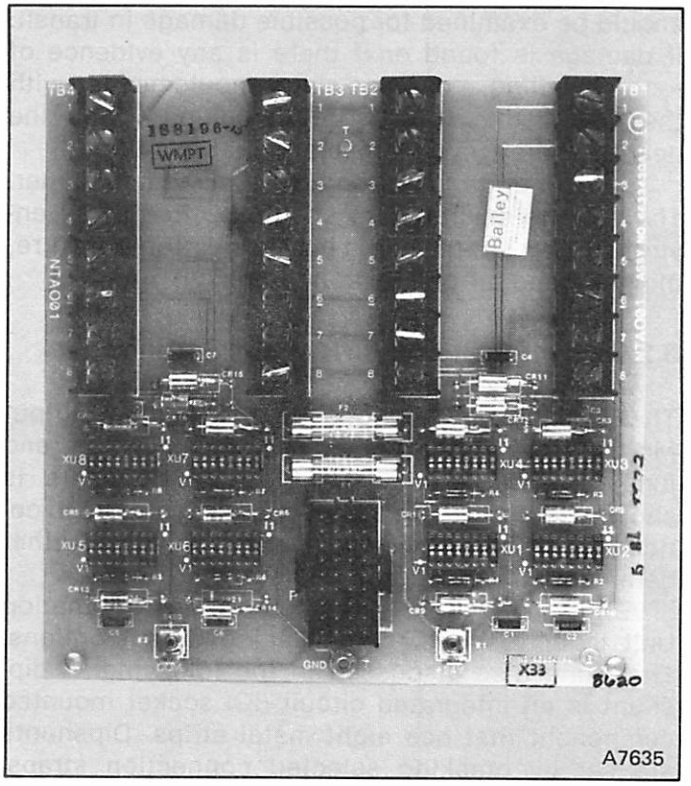


FIGURE 4 — Analog Output Termination Unit (TAO).

Section 3 - Installation

CAUTION

THIS MODULE CONTAINS MOS DEVICES WHICH CAN BE DAMAGED DURING HANDLING BY STATIC CHARGES. THE CARD IS SHIPPED IN A SPECIAL ANTI-STATIC BAG THAT SHOULD BE SAVED FOR FUTURE USE. ALTHOUGH SURROUNDING CIRCUITRY OF THE CARD AND MODULE IS PLANNED TO PROTECT MOS DEVICES, SPECIAL MOS HANDLING PROCEDURES SHOULD BE OBSERVED. A CARD SHOULD NOT BE REMOVED FROM THE ANTI-STATIC BAG UNTIL READY TO BE PUT INTO SERVICE. DO NOT TOUCH CIRCUITRY WHEN HANDLING CARD.

ATTENTION

CE MODULE EST MUNI DE DISPOSITIFS MOS SUSCEPTIBLES D'ETRE ENDOMMAGES, EN COURS DE MANIPULATION, PAR LES CHARGES STATIQUES. POUR LES BESOINS DE L'EXPEDITION LA CARTE EST PLACEE DANS UN SAC SPECIAL ANTI-STATIQUE A RESERVER POUR USAGE ULTERIEUR. BIEN QUE LES CIRCUITS SUR LA CARTE, ET LE MODULE, AIENT ETE ETUDIES POUR FOURNIR LA PROTECTION VOULUE AUX DISPOSITIFS MOS, IL N'EN DEMEURE PAS MOINS NECESSAIRE DE RESPECTER LES PROCEDURES DE MANIPULATION PRESCRITES POUR CE GENRE DE MATERIEL. ON NE DOIT PAS ENLEVER LA CARTE DE SON SAC ANTI-STATIQUE AVANT LE MOMENT PRECIS DE LA MISE EN SERVICE. DURANT LA MANIPULATION DE LA CARTE, IL NE FAUT PAS TOUCHER AUX CIRCUITS.

3.1 Receiving and Handling

In addition to special MOS handling requirements, normal precautions should be taken in routine storage and handling. Upon receipt, the Module should be examined for possible damage in transit. If damage is found or if there is any evidence of rough handling, a damage claim should be filed with the responsible transportation company and the nearest Bailey Sales Office should be notified.

Store in original packing material and container. The storage environment should be free of all environmental extremes, including temperature, moisture and air quality conditions.

3.2 Dipswitch/Jumper/Dipshunt Settings

There are several options on the Analog Output Module that are selected using dipswitch and jumpers. The location of these components is shown in Figure 5 and a brief description of each option is given. The following paragraphs give further details of how each option is set.

Dipshunt settings are made on the Termination Unit to correspond to the analog output options. These are also discussed in the following. A dipshunt is an integrated circuit (IC) socket mounted component that has eight metal strips. Dipshunts are set by breaking selected connection straps. These straps may be broken with a suitable hand tool such as #435862-1 (AMP Inc.).

Jumper	Standard - Other Outputs	10 Volt DC Outputs
E3	A O O O	B O O O

TABLE 1 — Settings for Jumper E3.

3.2.1 Analog Output Options

Jumper designations for the Analog Output Module are shown in Figure 5. Table 1 describes the setting of jumper E3 for standard and 10 volt dc outputs. Table 2 lists the settings of jumpers E6 through E13 for both voltage and current outputs. Jumpers E1 and E2 (not shown) provide for READ ONLY Memory component variations and should not be moved from original settings.

3.2.2 Address

The Analog Output Module is normally driven via the Module Bus by the Controller Module. Prior to inserting the module into the MMU, the AOM must have an address so that it can communicate over the Module Bus. A Process Control Unit (PCU) has 32 module addresses and the AOM Module can be assigned a number from 3 to 31 to define its address. The address given the module must be unique within a PCU

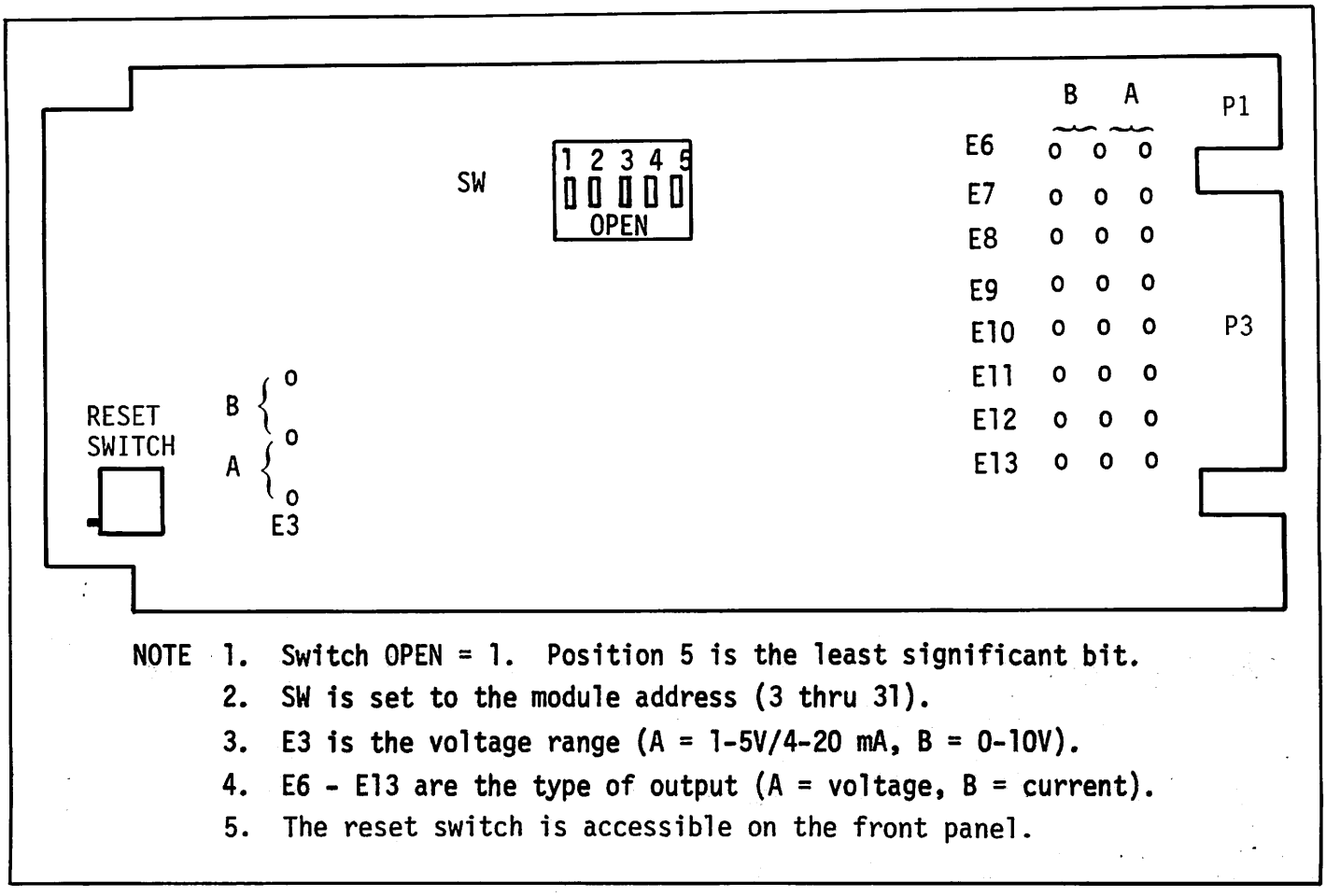


FIGURE 5 — Analog Output Module Board Layout.

and is selected by setting up a five position, binary coded dipswitch (SW2) as shown in Figures 5 and 6. Normally, addresses 0 land 1 are not used for the Analog Output Module since these are reserved for the Bus Interface Module.

3.2.3 Termination Unit Settings

The Termination Unit (TAO) is the interface between the Analog Output Module (AOM) and devices such as drives, recorders and indicators. The TAO basically consists of an array of terminal blocks and connectors whose interconnection depends on the position of dipshunts. There are eight of these dipshunts, one per channel of the AOM. Programming of the dipshunt will be determined by whether the AOM output is a voltage output or a current output.

The 24 V I/O power supply also connects to this termination unit and is distributed to the AOM and a terminal strip for external devices. Power connections are given in Table 3.

Jumper	Voltage Output	Current Output
	A	B
E6 (Ckt 8)	o o o	o o o
E7 (Ckt 7)	o o o	o o o
E8 (Ckt 6)	o o o	o o o
E9 (Ckt 5)	o o o	o o o
E10 (Ckt 4)	o o o	o o o
E11 (Ckt 3)	o o o	o o o
E12 (Ckt 2)	o o o	o o o
E13 (Ckt 1)	o o o	o o o

TABLE 2 — Settings for Jumpers E6 - E13.

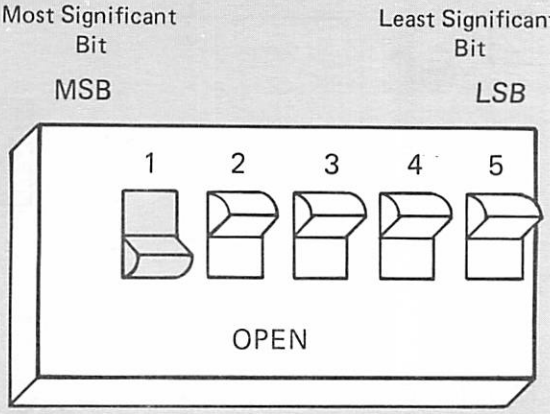
Faston Terminal	Power Connection
E1	+24 V I/O Power
E2	Power Common
Bonding Screw	Chassis GND
Output Power Connections	
TB2-1, TB3-1	+24 V I/O
TB2-2, TB3-2	Power COM
TB2-3, TB3-3	Chassis GND
TB2-6, TB3-6	+24 V I/O
TB2-7, TB3-7	Power COM
TB2-8, TB3-8	Chassis GND

TABLE 3 — I/O Power Connections.

The analog output field connections for the Termination Unit are detailed in Table 4.

Terminal Connection	Corresponding Output Circuit	Signal Description
TB1-1	CKT #1	(+) I Out/+ V Out
TB1-2	CKT #1	(—) I In/Analog Common
TB1-3	CKT #2	(+) I Out/+ V Out
TB1-4	CKT #2	(—) I In/Analog Common
TB1-5	CKT #3	(+) I Out/+ V Out
TB1-6	CKT #3	(—) I In/Analog Common
TB1-7	CKT #4	(+) I Out/+ V Out
TB1-8	CKT #4	(—) I In/Analog Common
TB4-1	CKT #5	(+) I Out/+ V Out
TB4-2	CKT #5	(—) I In/Analog Common
TB4-3	CKT #6	(+) I Out/+ V Out
TB4-4	CKT #6	(—) I In/Analog Common
TB4-5	CKT #7	(+) I Out/+ V Out
TB4-6	CKT #7	(—) I In/Analog Common
TB4-7	CKT #8	(+) I Out/+ V Out
TB4-8	CKT #8	(—) I In/Analog Common

TABLE 4 — Termination Unit Analog Output Field Connections.



Switch Closed: 0
Switch Open: 1

Example:

Module Address = 15
=01111 (binary)

Switch 1 - Closed
Switches 2, 3, 4, 5 - Open

Module Address	1	2	3	4	5	Module Address	1	2	3	4	5
0	0	0	0	0	0	16	1	0	0	0	0
1	0	0	0	0	1	17	1	0	0	0	1
2	0	0	0	1	0	18	1	0	0	1	0
3	0	0	0	1	1	19	1	0	0	1	1
4	0	0	1	0	0	20	1	0	1	0	0
5	0	0	1	0	1	21	1	0	1	0	1
6	0	0	1	1	0	22	1	0	1	1	0
7	0	0	1	1	1	23	1	0	1	1	1
8	0	1	0	0	0	24	1	1	0	0	0
9	0	1	0	0	1	25	1	1	0	0	1
10	0	1	0	1	0	26	1	1	0	1	0
11	0	1	0	1	1	27	1	1	0	1	1
12	0	1	1	0	0	28	1	1	1	0	0
13	0	1	1	0	1	29	1	1	1	0	1
14	0	1	1	1	0	30	1	1	1	1	0
15	0	1	1	1	1	31	1	1	1	1	1

FIGURE 6 — Analog Output Module Address Settings.

The 8 position dipshunts will provide the necessary output point configurations. The dipshunt is programmed with positions 1-3 open and positions 4-8 shorted as shown in Figure 7.

FIGURE 7 — Analog Output Dipshunt Configuration.

There is one dipshunt for each analog output channel. Orientation of each dipshunt in the appropriate socket will configure that point for either current or voltage operation.

Positioning of the dipshunt for a voltage output is with Pin 1 aligned with the "V1" on the module silkscreen. For a current output, the dipshunt will be turned completely around and Pin 1 will be aligned with the "I1" on the silkscreen.

Figures 8 and 9 show the point configuration for voltage and current outputs.

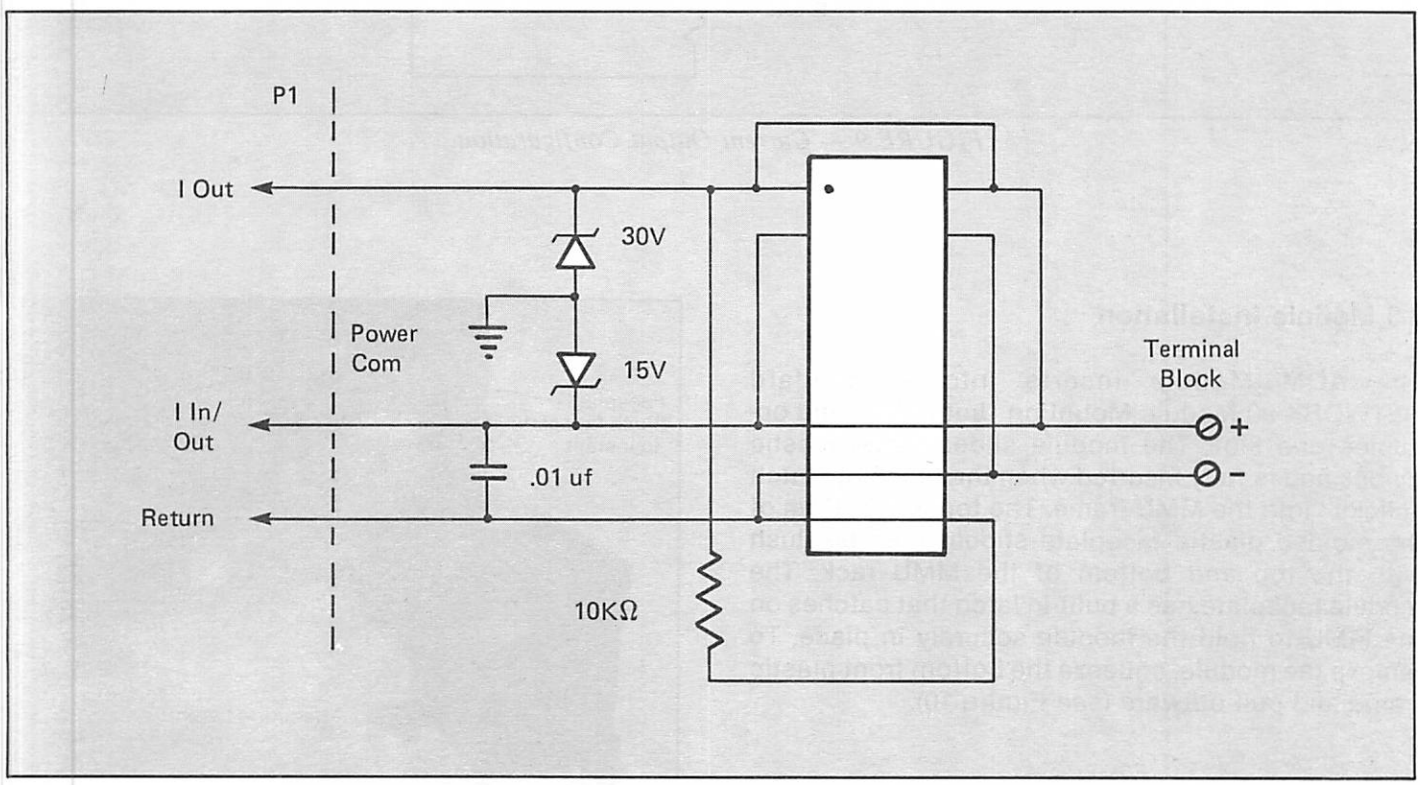


FIGURE 8 — Voltage Output Configuration.

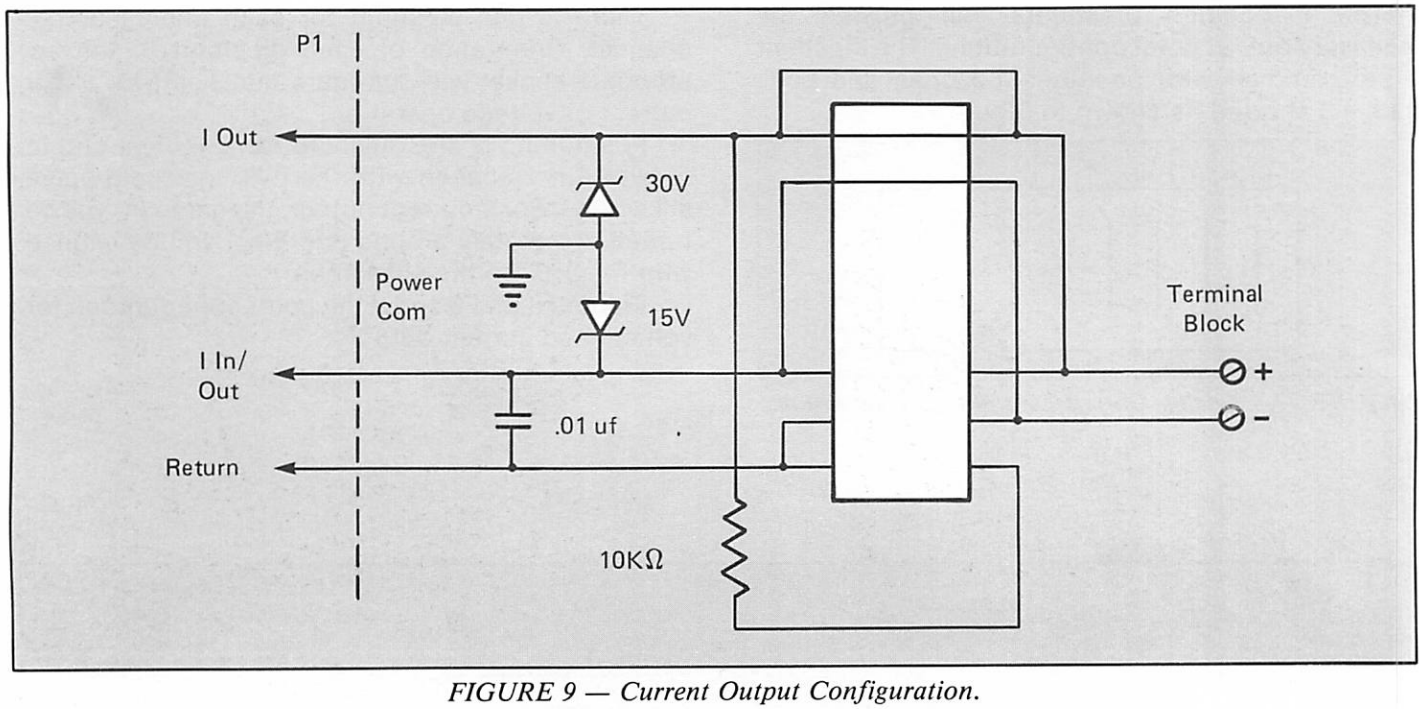


FIGURE 9 — Current Output Configuration.

3.3 Module Installation

The AOM Module inserts into a standard NETWORK 90 Module Mounting Unit (MMU) and occupies one slot. The module slides along plastic guides and is fully inserted when the faceplate latch "clicks" into the MMU frame. The top and bottom of the molded plastic faceplate should then be flush with the top and bottom of the MMU rack. The module faceplate has a built-in latch that catches on the MMU to hold the module securely in place. To remove the module, squeeze the bottom front plastic frame and pull outward (see Figure 10).

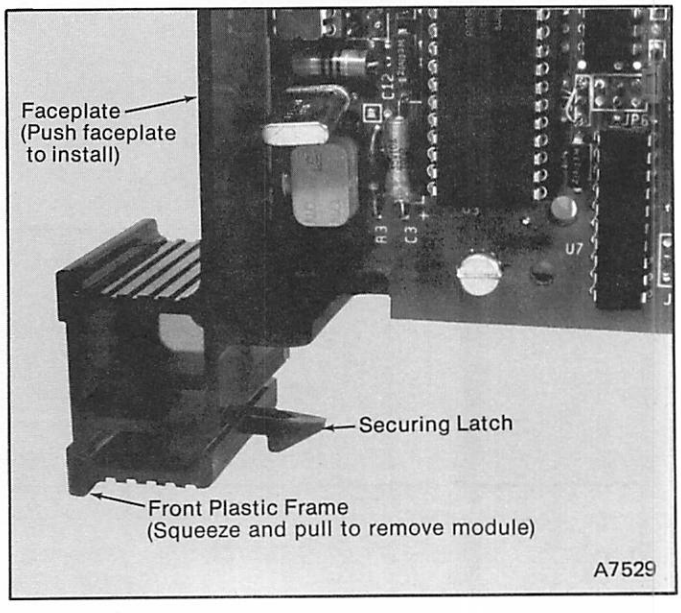
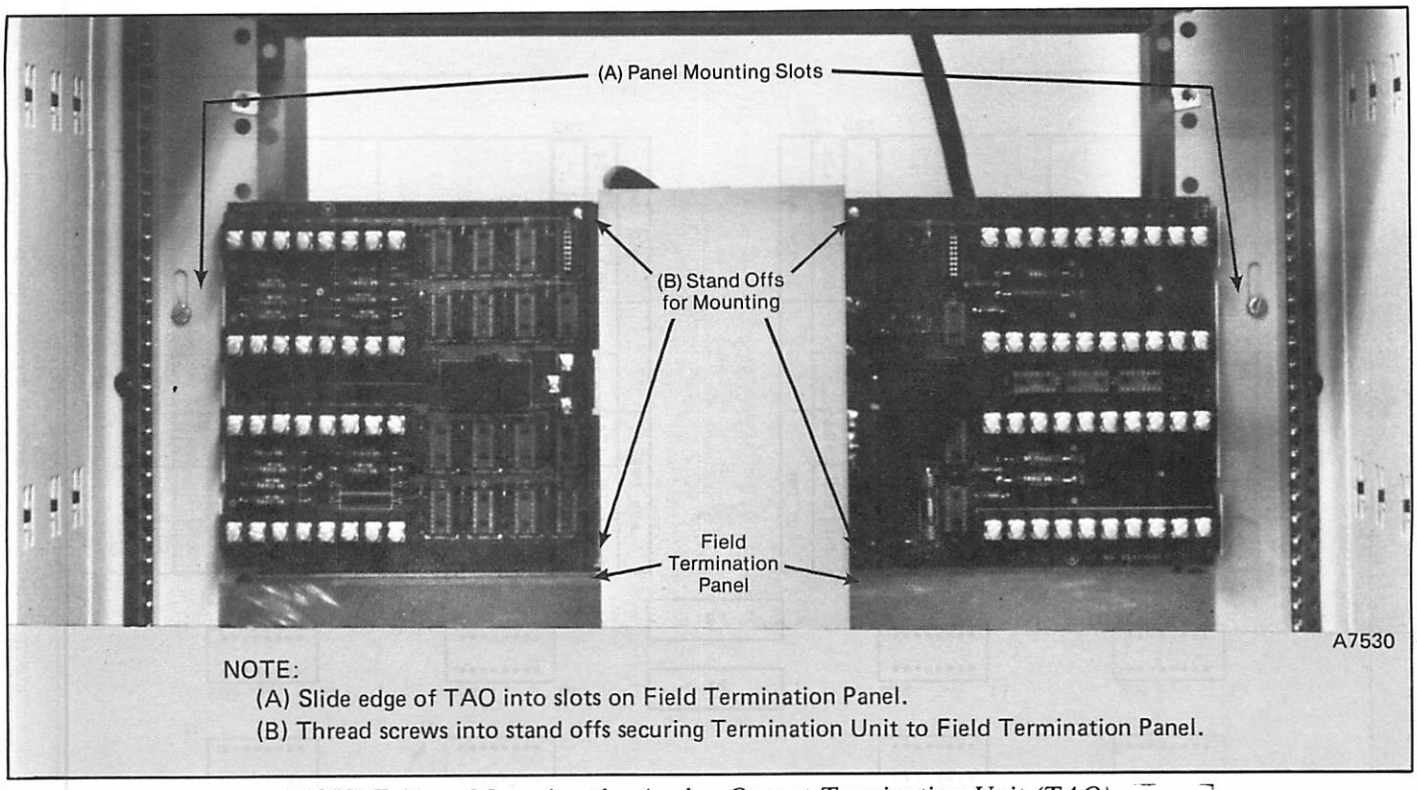


FIGURE 10 — Insertion of the Analog Output Module into the Module Mounting Unit.

3.4 Termination Unit Installation

The Termination Unit (TAO) mounts on the Field Termination Panel (FTP) with two screws as shown in Figure 11. Termination wiring assignments are given in Figure 12. A Termination Unit bonding screw and star washer is also required for external power distributed connections.



NOTE:
(A) Slide edge of TAO into slots on Field Termination Panel.
(B) Thread screws into stand offs securing Termination Unit to Field Termination Panel.

FIGURE 11 — Mounting the Analog Output Termination Unit (TAO).

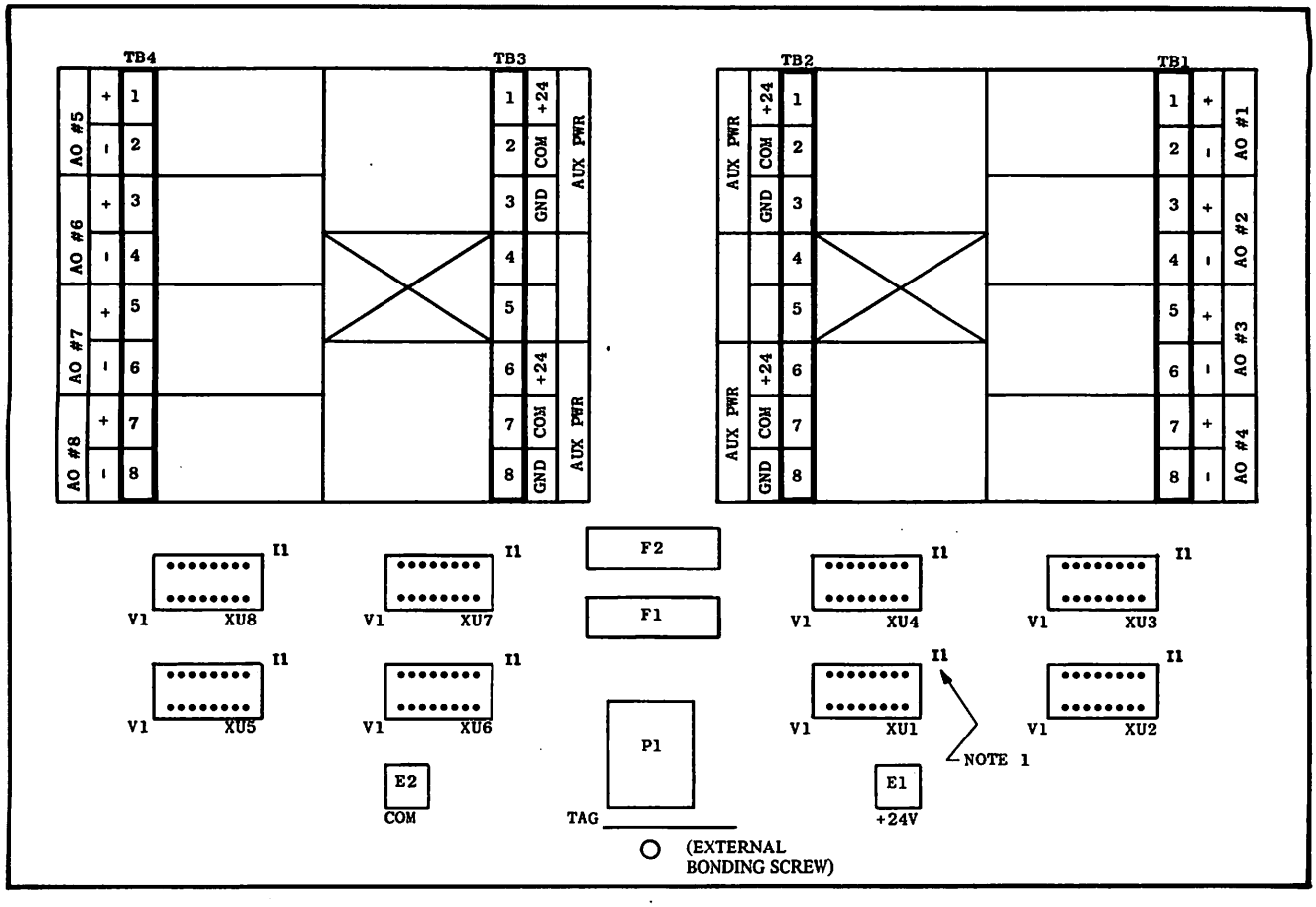
The 24 volt power source is connected to the Termination Unit. This power is distributed to the Analog Output Module via the NKTU01 cable as detailed in the next section. Fused 24 volt power is also routed to two terminal strips for delivering power to external devices.

Transient voltage protection is provided by Zener diodes on the Termination Unit to protect the Analog Output Module output drivers against voltage transients on the output wiring. The 10 K ohm resistor across the output in the voltage mode increases the stability of the AOM output circuit for high impedance loads. The capacitor connected to analog common reduces high frequency noise in the output signals.

Two fuses protect the 24 volt I/O power. F1 is a 0.5 ampere fuse which protects the supply from faults in the 24 volt circuits on the AOM. F2 is a 3 ampere fuse which protects the supply from faults in any external device being powered from the 24 volt I/O supply. Either fuse can blow without disrupting service to the other section.

3.5 Cabling

All connections are made to the Analog Output Module via the P1 and P3 connectors. Module Bus and +5 volt logic power enter the module through the P1 connector. Analog signals and +24 volt I/O power connections are made with the Termination Unit Cable (NKTU01) which is attached to the AOM P3 connector. The cable connection is standard at the back of the Module Mounting Unit. Table 5 defines all connections made to the AOM through the P3 connector pinout assignments.



NOTE: 1. ORIENT PIN #1 OF DIPSHUT FOR CURRENT OUTPUT (I 1) OR VOLTAGE OUTPUT (V 1), TYPICAL FOR XU1 THRU XU8.

2. ANALOG OUTPUTS #1 THRU #8 CORRESPOND NUMERICALLY WITH DIPSHUNTS XU1 THRU XU8.

FIGURE 12 — I/O Assignments for Analog Output Termination Unit (TAO).

Connector and Pin	Signal Description	Connector and Pin	Signal Description
P3-1	I Out Ckt. #8	P3-J	Analog Common Ckt. #3
P3-A	V Out Ckt. #8	P3-9	I Out Ckt. #3
P3-2	Analog Common Ckt. #8	P3-K	V Out Ckt. #3
P3-B	Analog Common Ckt. #7	P3-10	I Out Ckt. #2
P3-3	I Out Ckt. #7	P3-L	V Out Ckt. #2
P3-C	V Out Ckt. #7	P3-11	Analog Common Ckt. #2
P3-4	I Out Ckt. #6	P3-M	Analog Common Ckt. #1
P3-D	V Out Ckt. #6	P3-12	I Out Ckt. #1
P3-5	Analog Common Ckt. #6	P3-N	V Out Ckt. #1
P3-E	Analog Common Ckt. #5	P3-13	+24 V I/O Power
P3-6	I Out Ckt. #5	P3-P	+24 V I/O Common
P3-F	V Out Ckt. #5	P3-15	+24 V I/O Power
P3-7	I Out Ckt. #4	P3-S	+24 V I/O Common
P3-H	V Out Ckt. #4	P3-14	+24 V I/O Common
P3-8	Analog Common Ckt. #4	P3-R	+24 V I/O Common

TABLE 5 — Analog Output Module I/O Pinout Assignments.

Section 4 - Operation

The Analog Output Module is designed to generate eight analog output signals in response to messages received over the Module Bus from other modules in the system. The AOM consists of a microprocessor section and eight sets of analog output circuitry. Each output has 10 bit resolution and can be jumper selected to provide either a 4-20 mA current signal or voltage signal of 1-5 volts. As an alternative, all eight outputs can be selected for 0-10 volts. The output section is optically isolated from the microprocessor section and is powered from +24 volt I/O power.

A summary of the AOM's internal functions are as follows:

1. Initialize programmed components. All analog output circuits will be programmed to absolute zero state (—25%) during initialization. For a voltage output configuration, zero volts will appear at the output. The output will be zero milliamps for a current output configuration.
2. Process data received over the Module Bus and generate a reply message for all messages received.
3. Periodically update Machine Fault Timer.
4. Continually update each output device in sequence.

Section 5 - Application

The Analog Output Module is a standard module in Process Control Unit configuration. Communication with other modules is maintained over the Module Bus. The AOM receives commands to set output values and responds to requests to read module status or output values.

Application details are given in NETWORK 90 system documents.

Section 6 - Service and Replacement

No periodic maintenance is necessary for the Analog Output Module. Module replacement and company services are available for special maintenance requirements.

Production testing is used for all NETWORK 90 modules.

Section 7 - Specifications

Communication Interface	AOM provides serial digital communication, thru Module Bus of the Module Mounting Unit (MMU) operating as part of the Process Control Unit (PCU).
Output Capability:	
Analog Output Module (AOM)	Eight (8) 4-20 mA, 1-5 V type. Isolated field output signals for control and display applications (10 bit resolution). Allowable nominal load: Current 0-600 ohms. Voltage 1 K ohms.
Functional Specifications:	
Outputs	Each of eight (8) analog outputs provides a 4-20 mA or 1-5 V dc signal selectable on an individual basis. A second option provides a 0-10 V dc signal for all eight (8) outputs.
Security	Fault timer periodically reset thru micropocessor operation - front panel LED indicates normal operation of timer, with automatic shut down features.
Exception Reporting	Significant value changes reported over module bus on the basis of predetermined values.

Power Requirements:	+5 V dc at 0.95 A (4.75 watts) nominal. +24 V dc at 0.25 A (6 watts) maximum including output load.
Pin (P1) Connections	Pin 1 + 5 V dc — Pin 7 Open Pin 2 + 5 V dc — Pin 8 Open Pin 3 Open — Pin 9 PFI Pin 4 Open — Pin 10 PFI Pin 5 Common — Pin 11 Module Bus Pin 6 Common — Pin 12 Module Bus PFI Power Fail Interrupt
Pin (P3) Field Connections	See Table 5.
Mounting	Standard single slot mounting in Module Mounting Unit.
Termination Units:	
Analog Outputs	Standard Termination Unit for analog outputs (TAO) used for Analog Output Module (AOM) with lug and screw connections for field wiring.
Environmental Specifications	Standard environmental specifications for the system apply (CE93-900).

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

WARNING

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