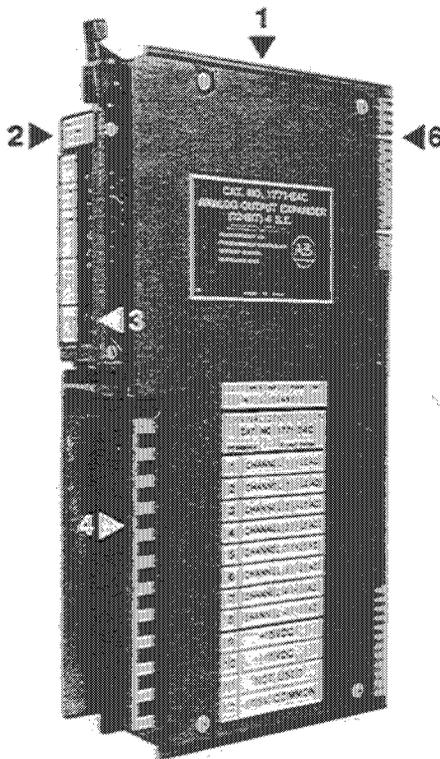




Allen-Bradley Analog Output Expander Module

(Cat. No. 1771-E4)



Product Data

1. Protective cover
2. Yellow identification label
3. Status indicator
4. Field wiring arm connects here
5. Label identifies user input connections
6. Slotted for I/O insertion only

Description

The Analog Output Expander Module is used with an Analog Output Module (cat. no. 1771-OF). You may connect up to four peripheral output devices to the 1771-E4 expander module. Expander modules provide a cost effective means of expanding the analog output capacity of a PC system.

When using block transfer programming, you can use up to 14 1771-E4 expander modules with each 1771-OF output module. This allows as many as 60 outputs per analog output system. When using single transfer programming, you can use up to three 1771-E4 expander modules with each 1771-OF output module. This allows as many as 16 outputs per analog output system. For more information about expanding the outputs of an output module, refer to the Analog Output System User's Manual (publication 1771-804, dated September, 1983 or later).

NOTE: The 1771-E4 expander module cannot be used with a 1771-OF series A output module.

Each 1771I/O chassis can contain up to two expanded 1771-OF output modules, provided that they are compatible with the other modules in the chassis. For details regarding module compatibility, refer to the Analog Output System User's Manual (publication 1771-804).

The Analog Output Expander Module Assembly (cat. no.1771-E4) includes the following:

- Analog Output Expander Module (cat. no. 1771-E4C)
- Field Wiring Arm (cat. no. 1771-WB)
- Product Data (publication 1771-954)

The 1771-E4 expander module is compatible with the requirements of the Instrument Society of America Standard ISA S50.1 (1975), Compatibility of Analog Signals for Electronic Industrial Process Instruments.

Operation

The PC processor transfers digital values to the 1771-E4 expander module through the 1771-OF output module. The 1771-OF output module transmits digital information to the 1771-E4 expander module through the I/O chassis backplane without any external wiring. The 1771-E4 expander module converts the digital values to analog signals which are output to analog devices.

Installation

When you install a 1771-E4 expander module, you should:

- Designate the master and expander module number
- Select voltage or current range
- Select whether the outputs will be at maximum or minimum during power-up or reset
- Key the I/O chassis
- Insert the module in a 1771I/O chassis
- Connect the output device cables

The following paragraphs describe operations you must perform when installing a 1771-E4 expander module.

NOTE: Refer to the Analog Output System User's Manual (publication 1771-804, dated September, 1983 or later) for details on setting programming plugs.

Master Number Selection

During configuration, designate the 1771-OF, series B analog output module as either master 1 or master 2. If you connect the analog output expander module to master 1, place a programming plug in the master 1 position. If you connect the expander module to master 2, place a programming plug in the master 2 position.

Module Number Selection

Number the 1771-E4 expander modules, consecutively, from 1 through 14. You cannot skip module numbers (for example, expander 1, expander 3 but no expander 2). When using block transfer, you can install up to 14 1771-E4 expander modules. When using single transfer, you can install up to three 1771-E4 expander modules.

Output Range Selection

The 1771-E4 expander module has four output channels. The voltage and current ranges given in the specifications section are nominal. Precise voltage and current ranges for these nominal ranges are shown in tables A and B. Although this range is factory set, you can change each output, individually, without re-calibrating the module.

Table A
Output Voltage Ranges

3 Digit BCD Operating Mode			
Nominal Range	BCD Output Code Range	Output Voltage Range	$\Delta V/\text{Bit}$
1 to 5 volts	000-999	1 to 4.996 volts	4mV/Bit
0 to 10 volts	000-999	0 to 9.990 volts	10mV/Bit
-10 to 10 volts	000-999	-10 to 9.980 volts	20mV/Bit
-5 to 5 volts	000-999	-5 to 4.990 volts	10mV/Bit
0 to 5 volts	000-999	0 to 4.995 volts	5mV/Bit
12 Bit Binary Operating Mode			
Nominal Range	Binary Output Code Range	Output Voltage Range	$\Delta V/\text{Bit}$
1 to 5 volts	0000-7777 ⁸	1 to 4.9990 volts	0.98mV/Bit
0 to 10 volts	0000-7777 ⁸	0 to 9.9976 volts	2.44mV/Bit
-10 to 10 volts	0000-7777 ⁸	-10 to 9.9951 volts	4.88mV/Bit
-5 to 5 volts	0000-7777 ⁸	-5 to 4.9976 volts	2.44mV/Bit
0 to 5 volts	0000-7777 ⁸	0 to 4.9988 volts	1.22mV/Bit

Table B
Output Current Ranges

3 Digit BCD Operating Mode			
Nominal Range	BCD Output Code Range	Voltage Range	ΔI/Bit
4 to 20mA	000-999	4 to 19.984mA	0.016mA/Bit
0 to 20mA	000-999	0 to 19.980mA	0.020mA/Bit
-20 to 20mA	000-999	-20 to 19.960mA	0.040mA/Bit
12 Bit Binary Operating Mode			
Nominal Range	BCD Output Code Range	Voltage Range	ΔI/Bit
4 to 20mA	0000-7777 ⁸	4 to 19.9961mA	0.0039mA/Bit
0 to 20mA	0000-7777 ⁸	0 to 19.9951 mA	0.0049mA/Bit
-20 to 20mA	0000-7777 ⁸	-20 to 19.9902mA	0.0098mA/Bit

Minimum or Maximum Output

Select each channel individually for maximum or minimum output during power-up or reset. For minimum output, insert the plug. For maximum output, do not insert the plug.

Compliance

Compliance is defined as the maximum allowable load impedance in the current mode. The standard compliance of the expander module is 600 ohms. Additional compliance allows a maximum load impedance of 1100 ohms on the 4 to 20mA range only. Additional compliance is obtained by internally referencing the “- lead” terminal to the -15V DC terminal.

Diagnostics

The 1771-E4 expander module has a green DC ON indicator which illuminates when -15V and +15V DC are present (figure 1).

A read block transfer returns a diagnostic word to the processor. Bits 15-00 of this word are set on to indicate a fault in a particular 1771-E4 expander module.

A read single transfer returns a different diagnostic word. Bits 02-00 of this word are set on to indicate a fault in a particular 1771-E4 expander module.

For details regarding diagnostics, refer to the Analog Output System User’s Manual (publication 1771-804, dated September, 1983 or later).

Figure 1
Status Indicator



Connections

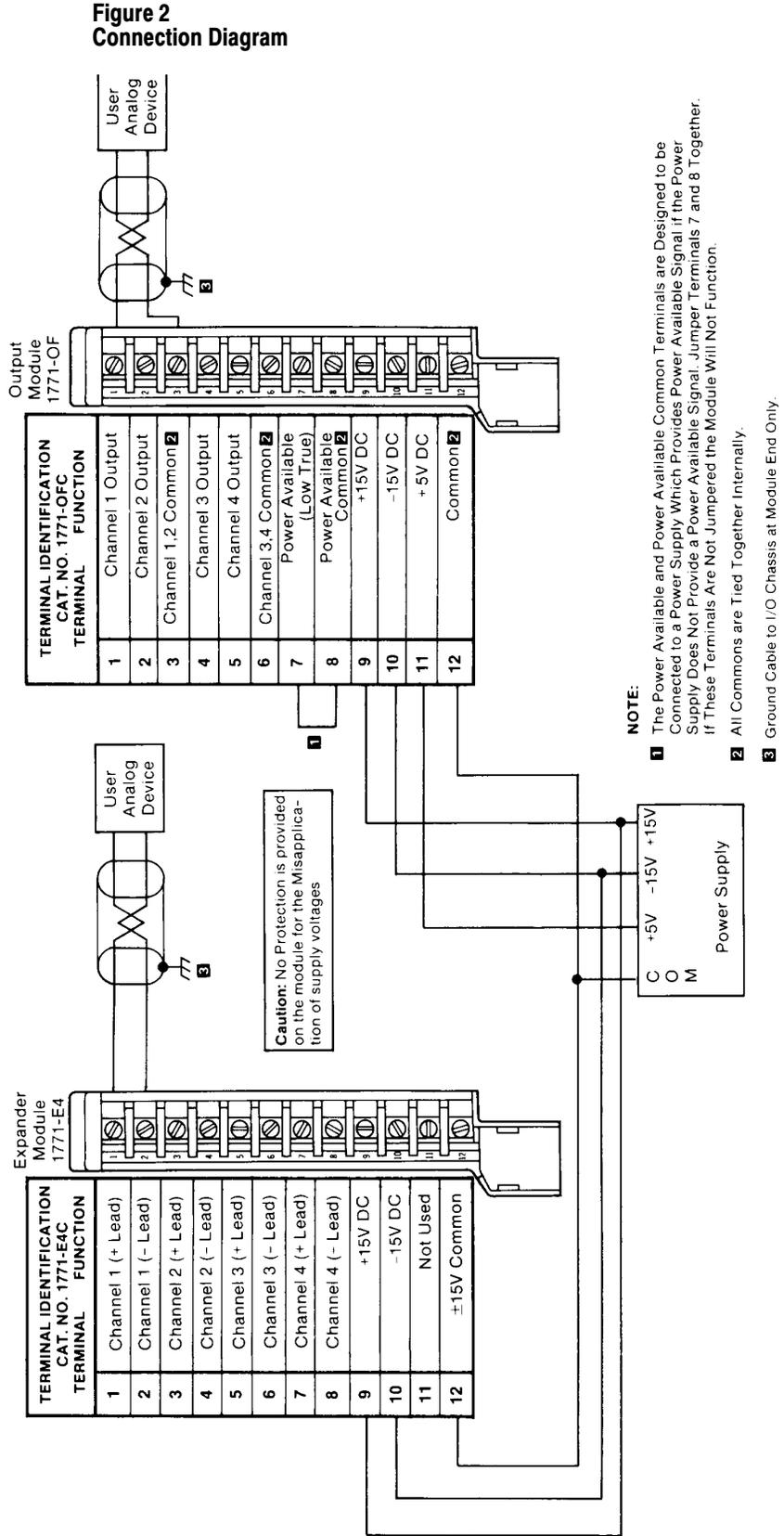


WARNING: Disconnect and lockout AC power from the controller and system power supplies before installing and wiring the 1771-E4 expander module. Failure to observe this warning could result in damage to the module circuitry and/or undesired operation with possible injury to personnel.

The connection diagram (figure 2) shows field wiring arm connections. The field wiring arm functions as a terminal strip for your wiring. It pivots on the I/O chassis and allows you to remove your 1771-E4 expander module without disconnecting wiring. You do not have to make connections between the terminal strips of the 1771-E4 expander module and the 1771-OF output module. The 1771-OF output module transmits digital information to the 1771-E4 expander module through the I/O chassis backplane without any external wiring.

A label on the side cover identifies terminal connections. We have provided additional space for you to label your outputs on the front of the module and on the field wiring arms.

(See Applicable Codes and Laws)



Output Connectors

Use shielded cable for signal transmission from the 1771-E4 expander module to your peripheral device. We recommend Belden 8761, or equivalent. This cable consists of a single insulated, twisted pair of conductors, covered along its entire length by a foil shield. The shield reduces the effect of induced noise at any point along the cable and must cover the enclosed pair of wires as completely as possible. Most importantly, the shield must be grounded at one end only. The best ground for this connection is usually the enclosure ground at an I/O chassis mounting bolt or stud. At the other end of the cable, which connects to the output device, cut the shield short. Tape it back to insulate it from any electrical contact.

We recommend a maximum cable length of 50 feet for voltage mode output devices. This recommendation is based on considerations of signal degradation and noise immunity in typical industrial environments. Cable length for current mode output devices, however, need not be as restrictive. Current mode analog signals are less sensitive than voltage signals to noise induced along transmission cables.

External Power Supply Connectors

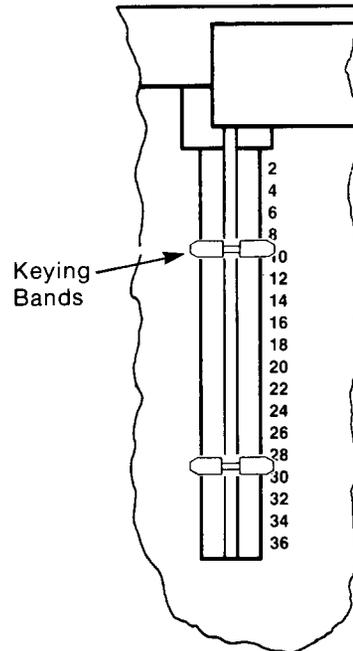
The 1771-E4 expander module requires field wiring arm connections to a power supply separate from a system power supply (figure 2). You can use the PLC Remote Power Supply (cat. no. 1778-P2) or an equivalent. When you use the 1778-P2 power supply, you can connect module power to the field wiring arm with the Module Power Cable (cat. no. 1770-CF). You must order this power cable separately. If an equivalent power supply is chosen, you must supply all connections.

Keying

The 1771-E4 expander module is keyed to guard against installation into a wrong slot. To implement this protection, insert the keying bands supplied with the I/O chassis into the upper backplane connector in the following positions (figure 3):

- Between 8 and 10
- Between 28 and 30

Figure 3
Keying Diagram



Power Requirements

The 1771-E4 expander module derives its power from two sources: the system power supply and an external power supply which you must furnish.

System Power Supply

The 1771-E4 expander module requires a current of 165mA from the +5V DC circuit of the system power supply. This amount must be totalled with the current requirements of the other modules in the I/O chassis to avoid overloading the supply or I/O chassis backplane.

External Power Supply

In addition to the system power, you need a separate external power supply to operate the 1771-E4 expander module and your analog devices. You can use the PLC Remote Power Supply (cat. no. 1778-P2) or equivalent. The 1778-P2 power supply provides external power to a maximum of five 1771-E4 expander modules or four 1771-OF output modules in the current mode. The external supply that is used to power these modules must not be used for system power. Using the separate power supply protects the analog signals against transients caused by the switching of the digital circuits. Specifications for this external DC power source are listed in table [C](#).



WARNING: Should +15V or -15V DC fail at the expander module, output circuits of the module will approach the remaining voltage. Failure of either of these two voltages could result in unwanted machine motion with possible injury to personnel.

Table C
Output Expander Module External Power Requirements

Specifications	+15 Volts	-15 Volts
Maximum Current (per Analog Output Expander Module) ¹	200mA	200mA
Voltage Tolerance	1%	1%
Regulations (type)	Series	Series
Line Regulations (for 10V AC input change)	± 0.02%	± 0.02%
Load Regulation	± 1.0%	± 1.0%
Ripple (at Swingarm)	10mV p-p	10mV p-p
Overvoltage Protection	+18V	-18V

NOTE:

Current requirements in the Current Mode is based on the equation:
 $Current = 120mA + (20mA \times \text{Number of Current Outputs})$

EXAMPLE

Module selected for 1 Voltage Output and 3 Current Outputs

Current	=	120 + (20 x 3)	+15 Volts	-15 Volts
	=	120+60 =	180mA	180mA

¹ Current requirement in the Voltage Mode: +15 Volts 120mA -15 Volts 120mA

Specifications

Location

- 1771 I/O chassis
- One slot

Outputs per Module

- 4 single-ended

Output Voltage Ranges

- 1 to 5V DC
- 0 to 5V DC
- -10 to 10V DC
- 0 to 10V DC
- -5 to 5V DC

Output Current Ranges

- 4 to 20mA
- 0 to 20mA
- -20 to 20mA

Digital Resolution

- 3-digit BCD or 12 bit Binary

Input Range

- BCD: 000 to 999
- Binary: 0000 to 7777₈

Backplane Power

- 165mA

Output Overload Protection

- Short circuit load conditions not to exceed one minute

Output Impedance

- ≤ 0.25 ohms for voltage outputs exclusive of contact wiring resistance
- ≥ 1.5 megohms for current outputs

Output Current in the Voltage Mode

- 10mA (max)

Load Resistance in the Current Mode

- Up to 600 ohms (max)

Environmental Conditions

- Operational Temperature: 0° to 60°C (32° to 140° F)
- Storage Temperature: -40° to 85°C (-40° to 185° F)
- Relative Humidity: 5% to 95% (without condensation)

Opto-Electrical Isolation

- 1500V RMS (transient)

D/A Converter

- Monotonic

Settling Time

- 1ms, typical for a resistive load

Absolute Accuracy

Includes linearity, gain and offset at 25° C:

- $\pm 0.1\%$ of full scale
- $\pm 1/2$ LSD (BCD mode)
- $\pm 1/2$ LSB (Binary mode)

Temperature Coefficient

- ± 55 ppm/°C of full scale range

Keying

- Between 8 and 10
- Between 28 and 30



As a subsidiary of Rockwell International, one of the world's largest technology companies — Allen-Bradley meets today's challenges of industrial automation with over 85 years of practical plant-floor experience. More than 11,000 employees throughout the world design, manufacture and apply a wide range of control and automation products and supporting services to help our customers continuously improve quality, productivity and time to market. These products and services not only control individual machines but integrate the manufacturing process, while providing access to vital plant floor data that can be used to support decision-making throughout the enterprise.

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