



Fast Isolated Analog Output Module (Catalog Number 1897-NOV)

Contents

Use this document as a guide when installing the 1897-NOV output module.

To	See page
↓ Prevent Electrostatic Discharge	Below
↓ Understand Compliance to European Union Directives	2
↓ Calculate Power Requirements	2
↓ Determine Module Placement	3
↓ Install the Module and Remote Termination Panel	3
↓ Key the Backplane Connector	4
↓ Connect the Wiring to the Module	4
↓ Connect Wiring to the Remote Termination Panel	5
↓ Connect Cables to the Remote Termination Panel	5
↓ Grounding Your Field Devices	7
↓ Configuring Your Output Module	7
↓ Reading Data from Your Output Module	9
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For this reference information	See page
➡ Troubleshooting with the Indicators	10
➡ UL/CSA Hazardous Location Approval	11
➡ Specifications	12

Prevent Electrostatic Discharge

The analog output module is sensitive to electrostatic discharge.



ATTENTION: Electrostatic discharge can damage integrated circuits or semiconductors if you touch backplane connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential
- Wear an approved wrist-strap grounding device
- Do not touch the backplane connector or connector pins
- Do not touch circuit components inside the module
- If available, use a static-safe work station
- When not in use, keep the module in its static-shield box

Understand Compliance to European Union Directives

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2EMC – Generic Immunity Standard, Part 2 – Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as these Allen-Bradley publications:

Publication	Publication number
Industrial Automation Wiring and Grounding Guidelines For Noise Immunity	1770-4.1
Guidelines for Handling Lithium Batteries	AG-5.4
Automation Systems Catalog	B111

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

Calculate Power Requirements

The module receives its power through the 1771 I/O power supply and requires 2A from the backplane.

Add this current to the requirements of all other modules in the I/O chassis to prevent overloading the chassis backplane and/or backplane power supply.

Determine Module Placement in the I/O Chassis

Place your module in any I/O module slot of the I/O chassis except for the extreme left slot. This slot is reserved for PC processors or adapter modules.



ATTENTION: Do not insert or remove modules from the I/O chassis while system power is ON. Failure to observe this rule could result in damage to module circuitry.

Group your modules to minimize adverse affects from radiated electrical noise and heat. We recommend the following.

- Group analog input and low voltage dc modules away from ac modules or high voltage dc modules to minimize electrical noise interference.
- Do not place this module in the same I/O group with a discrete high-density I/O module when using 2-slot addressing.

Install the Module and the Remote Termination Panel



ATTENTION: Remove power from the 1771 I/O chassis backplane and field wiring arm before removing or installing an I/O module.

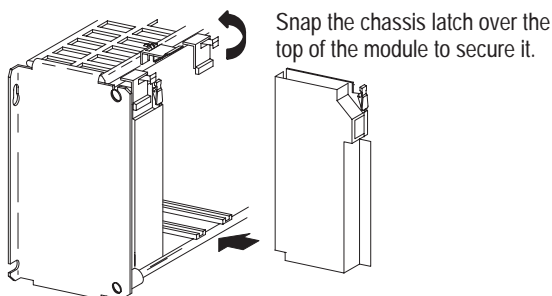
- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.
- Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

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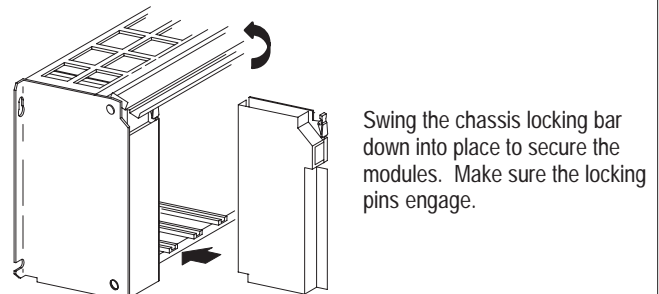
Place the module in the card guides on the top and bottom of the chassis that guide the module into position.

Important: Apply firm even pressure on the module to seat it into its backplane connector.

1771-A1B, -A2B, -A3B, -A3B1, -A4B I/O chassis



1771-A1B, -A2B, -A3B1, -A4B Series B I/O chassis



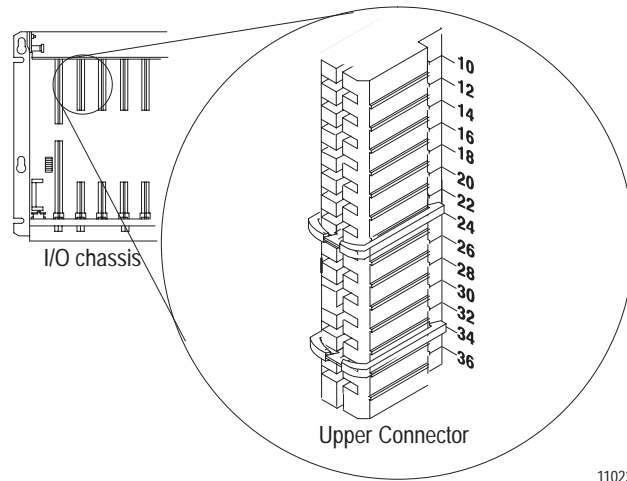
2 Key the Backplane Connector

Place your module in any slot in the chassis except the leftmost slot which is reserved for processors or adapters.

Position the keying bands in the backplane connectors to correspond to the key slots on the module.

Place the keying bands:
 between 26 and 28
 between 32 and 34

You can change the position of these bands if subsequent system design and rewiring makes insertion of a different type of module necessary.

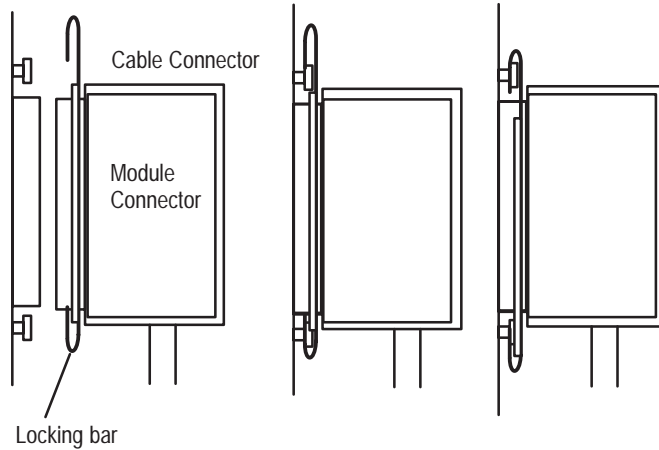
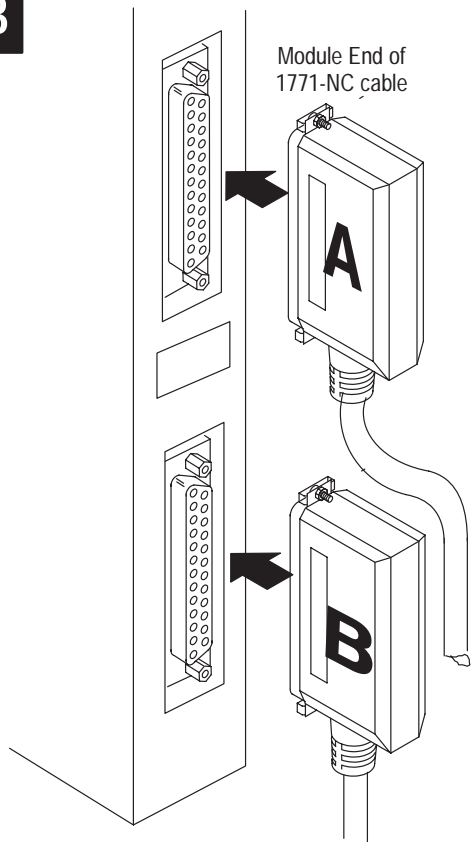


11022-I

3

Connect the Cable to the Module

1. Slide the locking bar up.
2. Insert the cable connector into the mating connector on the front of the module.
3. Slide the locking bar down over the mating pins on the module to lock the connector onto the module.



11023-I

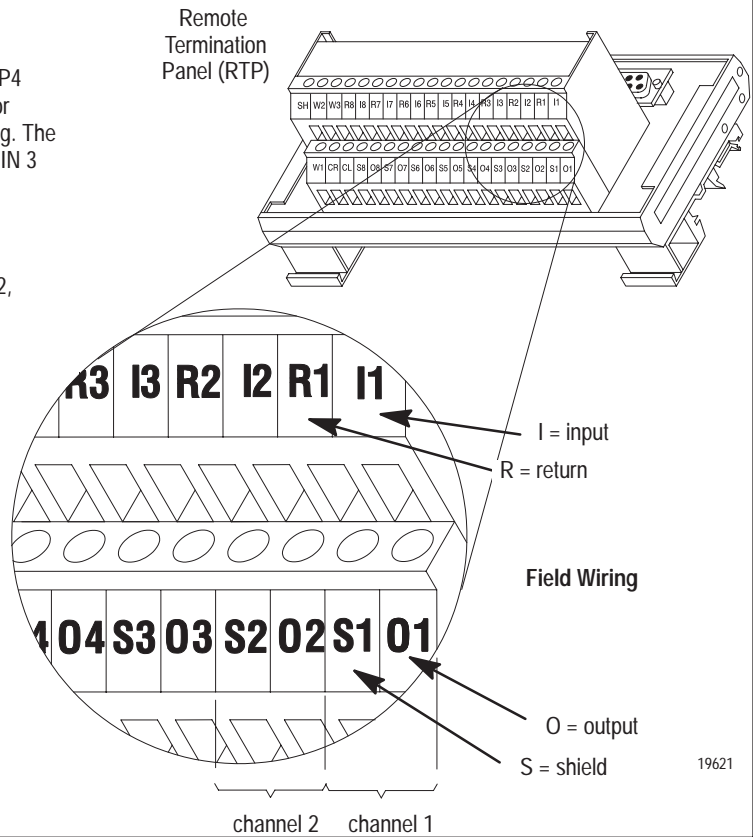
4 Connect Wiring to the Remote Termination Panel

The 1897-NOV module is cable-connected to a 1771-RTP4 remote termination panel using cat. no. 1771-NC6 (6 ft) or -NC15 (15 ft) cables. This RTP has straight-through wiring. The remote termination panel mounts on standard DIN 1 or DIN 3 mounting rails.

Each channel has four connections: R, I, O, and S. Field wiring to the RTP is the same for all RTP variations. Channel 1 uses R1, I1, O1, and S1; channel 2 uses R2, I2, O2, and S2; and so on for the remaining channels.

1. Strip 3/8 inch (9.25 mm) of insulation from the 22-12 AWG wire.
2. Insert the wire into the open connector slot.
3. Tighten the screw to clamp the wire.

Output Type	Connect	To	
Voltage	+	O1	Output
	-	R1	Return
	Shield	S1	Shield



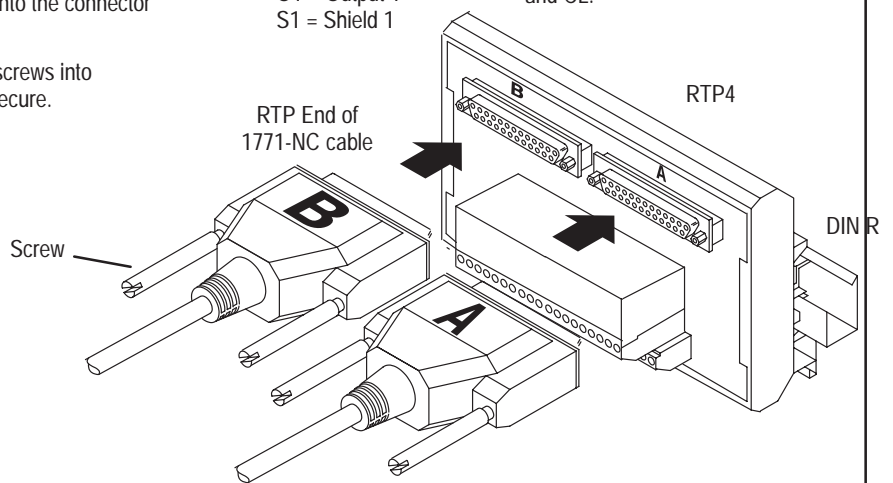
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5 Connect the Cables to the Remote Termination Panel

1. Insert the RTP end of the cable into the connector on the the RTP.
2. Alternately tighten the retaining screws into the connector on the RTP until secure.

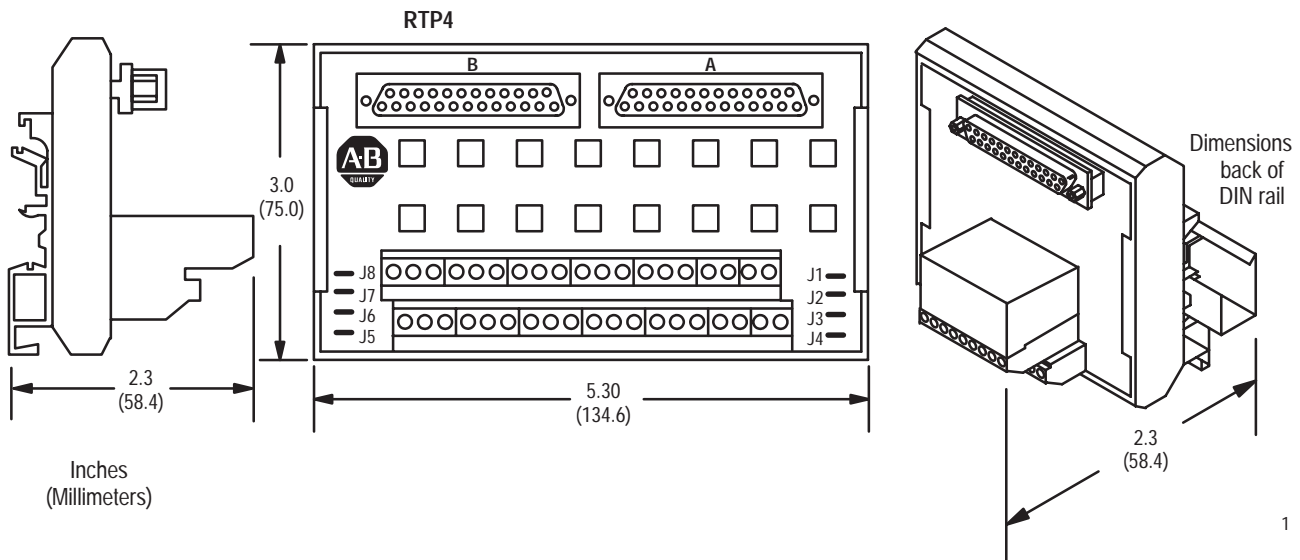
Example: Channel 1 Connections
 R1 = Return 1
 I1 = Input 1
 O1 = Output 1
 S1 = Shield 1

Note: Terminals W1, W2 and W3 are spares. Do not use terminals CR and CL.



11024-I

Remote Termination Panel Dimensions



Building Your Own Cables

You can terminate the analog module to a terminal block by cutting the 25-pin RTP end connector off the standard cable and wiring to your terminal block. Refer to the following table for wire termination designations.

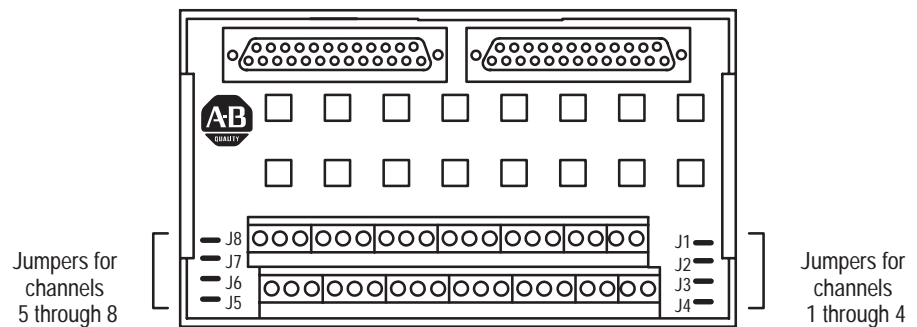
Wire Termination Designations

Module Top Connector				Module Bottom Connector			
Channel Number	Signal	37-Pin Connector	Wire Color	Channel Number	Signal	37-Pin Connector	Wire Color
1	I1	20	Blk	5	I5	20	Blk
	O1	22	Blk/Wht		O5	22	Blk/Wht
	R1	21	Wht/Blk		R5	21	Wht/Blk
2	I2	24	Orn	6	I6	24	Orn
	O2	26	Orn/Blk		O6	26	Orn/Blk
	R2	25	Wht		R6	25	Wht
3	I3	29	Grn	7	I7	29	Grn
	O3	31	Grn/Blk		O7	31	Grn/Blk
	R3	30	Grn/Wht		R7	30	Grn/Wht
4	I4	33	Blu	8	I8	33	Blu
	O4	35	Blu/Blk		O8	35	Blu/Blk
	R4	34	Blu/Wht		R8	34	Blu/Wht
				Not used		36	Red
						37	Red/Wht

Grounding Your Field Devices

When using shielded cable, ground the foil shield and drain wire only at one end of the cable. We recommend that you wrap the foil shield and drain wire together and connect them to the “S” connection on the RTP for the particular channel. All shield connections are internally connected together in the RTP so that only one wire is required to ground the entire remote termination panel. Connect a wire from the “SH” connection on the RTP to a ground stud on the metal cabinet in which the remote termination panel is mounted.

If you **do not** want to ground a particular shield at the RTP, you can remove the jumper for that particular channel. This will allow the shield to float at the RTP end. To remove a jumper, you must cut it out. **Once the jumper is removed it cannot be replaced.** Clip as close to the circuit board as possible at both ends to completely remove it. The jumpers are labeled J1 through J8, corresponding to channels 1 through 8 respectively.



Refer to publication 1770-4.1, Programmable Controller Wiring and Grounding Guidelines, for additional information.

Communicating with Your Output Module

The 1897–NOV module uses digital data transfers for backplane data transfer. Configure your module as a double density module (1 slot addressing). Address all channels individually.

The module uses channel 8 as a trigger to synchronize data transfer to the module’s digital-to-analog converters (DACs). All DACs are updated following a write of data to channel 8. This update occurs regardless of whether data changed on any other channel.

When any channel other than channel 8 is written to, the data is parsed and stored internally, but the DAC is not updated until a channel 8 write is completed. The status of which channel(s) change (and, as a result, modify the analog outputs on the module on the next trigger event) is reflected in the digital input image table. The least significant byte of the digital input word will indicate the updated channel(s). If the input bit is 1 (high), on the next trigger event, the analog output value associated with that channel changes.

Output Image Definition

The digital output data resides in the modules Rack/Group/Slot location in the programmable controller **output** image table. The format of the 16-bit data word written to the module over the backplane is:

Dec. Bits	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Octal Bits	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
	Sign	Ch ID 2	Ch ID 1	Ch ID 0	Data MSB						Data word				Data LSB	

The data word is a 12 bit analog value: –4095 through 4095 – corresponding to –10.7V through 10.7V. Bits 12,13,14 represent the number of the channel which is to receive this data:

Decimal	Bit 14	Bit 13	Bit 12	Channel Number
Octal	Bit 16	Bit 15	Bit 14	
	0	0	0	1
	0	0	1	2
	0	1	0	3
	0	1	1	4
	1	0	0	5
	1	0	1	6
	1	1	0	7
	1	1	1	8

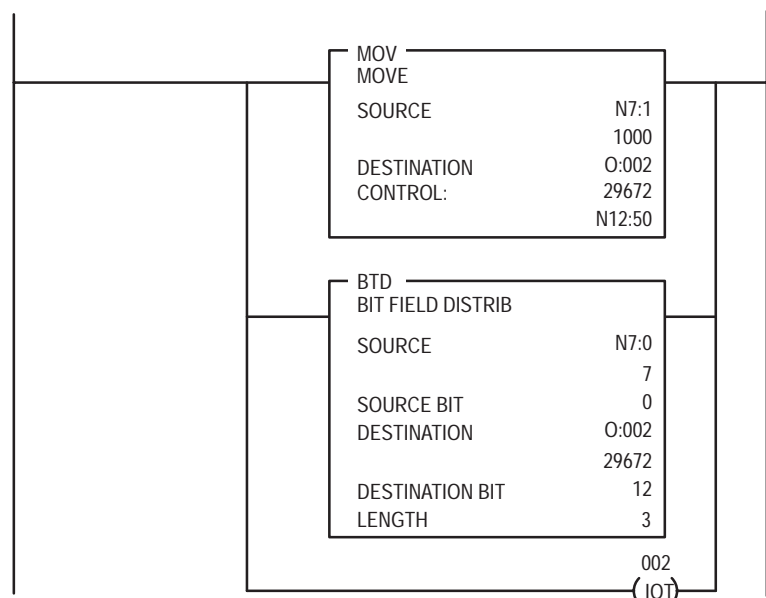
The bit pattern is MASKED onto the data in the ladder program. The following ladder rung is an example of how to accomplish this masking:

Program Action

To set a single channel 'immediately' on the NOV.
 N7:0 → Channel number to be updated: 0 through 7.
 N7:1 → Analog value to be set –4095 through 4095.

NOTE 1: Analog value must be set first, then masked by the channel data.

NOTE 2: The channel and analog data must be present (in the same scan, prior to this rung) when this rung is executed in order for the correct channel to get the data.



Reading Data from Your Module

The digital status data resides in the modules Rack/Group/Slot location in the programmable controller **input** image table. The following table shows the format of the 16 bit data word read from the module over the backplane:

Input Data Definition

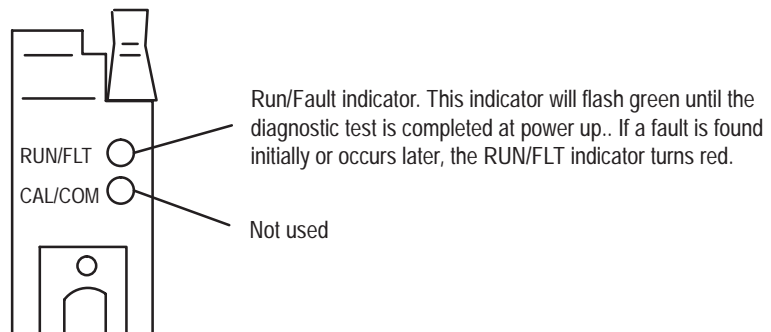
Dec. Bits	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Octal Bits	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word 1	Not used						Module Reset	DAC update in progress	Channel "Armed"							

Word	Bit	Description
	Bits 00-07	Channel "Armed" – set when the channel has an output which is going to change the next time that trigger event occurs. Bit 00 corresponds to channel 1, bit 01 corresponds to channel 2, and so on.
	Bit 08	DAC update in progress – set when the module is busy updating the DAC's
	Bit 09	Module in Reset – set when the I/O Reset line is asserted indicating that all channels have been zeroed (including all pending changes)
	Bits 10-15	Not used

NOTE: If a channel output value is changed, that value (which is different from the current state of the output) is written to the "pending output" buffer. The corresponding "channel armed" bit will then be set. If you change that channel value back to the current output value without a trigger event, the "channel armed" bit **will still be set**.

Interpreting the Indicator Lights

The front panel of the analog module contains two bi-color indicators: a red/green RUN/FLT (fault) indicator and a red/green CAL/COM indicator. The CAL/COM indicator is not used on this module.



10528-I

At power-up, an initial module self-check occurs. The module checks:

- correct RAM operation
- EPROM operation
- EEPROM operation



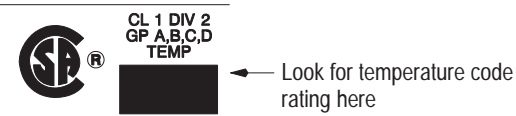
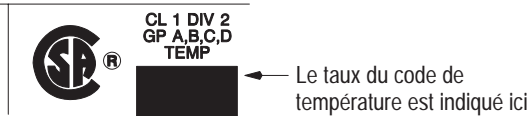


The RUN/FAULT indicator will be green when the check is completed satisfactorily. It will flash green until the first valid block transfer write has been received. If a fault is found initially or occurs later, the RUN/FLT indicator turns red.

After passing initial diagnostics, the module turns the RUN/FLT indicator to flashing green. The indicator will turn red if a fault is detected.

Troubleshooting with the Indicators

The following table shows indications, probable causes and recommended actions to correct common faults which may occur.

Indication	Probable Cause	Recommended Action
Both indicators are OFF	No power to module	Check power to I/O chassis. Recycle as necessary.
	Possible short on the module LED driver failure	Replace module.
RUN/FLT indicator ON red	Microprocessor, oscillator or EPROM failure	Replace module.
	If immediately after power-up, indicates RAM or EPROM failure.	Replace module.
	If during operation, indicates possible microprocessor or backplane interface failure.	Replace module.
RUN/FLT indicator is flashing green	Power-up diagnostics successfully completed.	Normal operation.
RUN/FLT indicator is green but module data is wrong (for example, with cable off, input channel data values are at minimum scale values)	Internal fuse may be bad	Replace module

CSA Hazardous Location Approval	Approbation d'utilisation dans des emplacements dangereux par la CSA
<p>CSA® certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label as shown below, and not by statements in any user documentation.</p>	<p>La CSA® certifie les produits d'utilisation générale aussi bien que ceux qui s'utilisent dans des emplacements dangereux. La certification CSA en vigueur est indiquée par l'étiquette du produit et non par des affirmations dans la documentation à l'usage des utilisateurs.</p>
<p>Example of the CSA certification product label</p> 	<p>Exemple d'étiquette de certification d'un produit par la CSA</p> 
<p>To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for CSA-certified Allen-Bradley industrial control products.</p> <ul style="list-style-type: none"> This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only. The products having the appropriate CSA markings (that is, Class I Division 2, Groups A, B, C, D), are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction. 	<p>Pour satisfaire à la certification de la CSA dans des endroits dangereux, les informations suivantes font partie intégrante de la documentation des produits industriels de contrôle Allen-Bradley certifiés par la CSA.</p> <ul style="list-style-type: none"> Cet équipement convient à l'utilisation dans des emplacements de Classe 1, Division 2, Groupes A, B, C, D, ou ne convient qu'à l'utilisation dans des endroits non dangereux. Les produits portant le marquage approprié de la CSA (c'est à dire, Classe 1, Division 2, Groupes A, B, C, D) sont certifiés à l'utilisation pour d'autres équipements où la convenance de combinaison (application ou utilisation) est déterminée par la CSA ou le bureau local d'inspection qualifié.
<p>Important: Due to the modular nature of a PLC® control system, the product with the highest temperature rating determines the overall temperature code rating of a PLC control system in a Class I, Division 2 location. The temperature code rating is marked on the product label as shown.</p>	<p>Important: Par suite de la nature modulaire du système de contrôle PLC®, le produit ayant le taux le plus élevé de température détermine le taux d'ensemble du code de température du système de contrôle d'un PLC dans un emplacement de Classe 1, Division 2. Le taux du code de température est indiqué sur l'étiquette du produit.</p>
<p>Temperature code rating</p> 	<p>Taux du code de température</p> 
<p>The following warnings apply to products having CSA certification for use in hazardous locations.</p>	<p>Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.</p>
 <p>ATTENTION: Explosion hazard —</p> <ul style="list-style-type: none"> Substitution of components may impair suitability for Class I, Division 2. Do not replace components unless power has been switched off or the area is known to be non-hazardous. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on an Allen-Bradley product using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute. 	 <p>AVERTISSEMENT: Risque d'explosion —</p> <ul style="list-style-type: none"> La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2. Couper le courant ou s'assurer que l'emplacement est désigné non dangereux avant de remplacer les composants. Avant de débrancher l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux. Avant de débrancher les connecteurs, couper le courant ou s'assurer que l'emplacement est reconnu non dangereux. Attacher tous connecteurs fournis par l'utilisateur et reliés aux circuits externes d'un appareil Allen-Bradley à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens permettant aux connexions de résister à une force de séparation de 15 newtons (3,4 lb. - 1,5 kg) appliquée pendant au moins une minute.

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Specifications

1897-NOV Fast Isolated Analog Voltage Output Module

Number of Channels (depends on specific module)	8 individually isolated
I/O Chassis Location	any single I/O module slot
D/A Resolution	12 bits or 13 bits plus sign bit
Isolation Voltage	Designed to withstand 1000V dc continuous between input and output channels and between input and backplane connections. Modules are 100% tested at 1200V dc for 1 second between input channels and backplane connections.
Backplane Current	2.0A Maximum
Power Dissipation	10.0W @ 5V
Output Range	+10.4V into an open circuit
Output Impedance	1.0Ω maximum
Output Drive Capability	1KΩ or larger (10mA maximum)
Output Overvoltage Protection	140V ac rms continuous
Offset Drift	±400 μV/°C
Gain Drift	±50 ppm/°C
Accuracy with Calibration (Including Non-linearity, Gain, and Offset)	0.01% of full range @ 25°C Typical 0.08% of full range @ 25°C Worst Case
Environmental Conditions Operating Temperature Rate of Change Storage Temperature Relative Humidity – Operating Nonoperating	0 to 60°C (32 to 140°F) Ambient changes > 0.5°C per minute may temporarily degrade performance during periods of change. –40 to 85°C (–40 to 185°F) 5 to 95% (without condensation) ; 5 to 80% (without condensation)
Connecting Cable(s)	1771-NC6 = 1.8m (6ft) 1771-NC15 = 4.6m (15ft)
Keying	Between 26 and 28 Between 32 and 34
Agency Certification (when product is marked)	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives



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