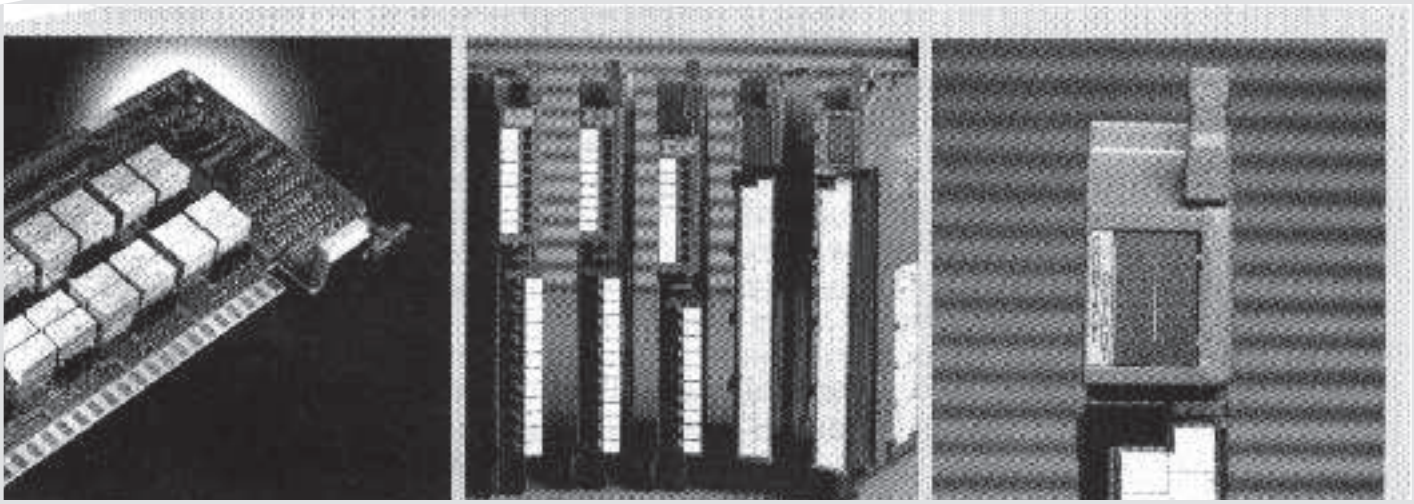
1771 Digital I/O
Relay Contact Output Modules

(Cat. Nos. 1771-OW, -OW16, -OWN, -OWNA, -OX, -OYL, -OZL)

Product Data



Eliminate leakage current. Relay contact output modules offer dry circuits, that is, circuits without leakage current. Leakage currents are present on solid-state outputs; these currents are capable of energizing highly sensitive output load devices such as low-power latching relays. Open contacts on output relays assure that no leakage currents occur in critical applications.

Select the configuration mode for outputs. Allen-Bradley relay contact output modules offer either normally-open (Form A) or normally-closed (Form B) configurations. You can select the form configuration for four of the contact output modules, the 1771-OW, -OW16, -OWN, and -OX. The 1771-OW has eight selectable outputs. The 1771-OW16 has eight normally-open and eight selectable outputs. The 1771-OWN has 32 selectable outputs.The 1771-OX has four selectable outputs. Selectable–configuration means you can predetermine whether an output will be on or off when local power is lost to the control system or the output module. The 1771-OWNA has 32 non-selectable normally-open contacts.

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Allen-Bradley

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Benefits

Provide output isolation. Isolation helps assure that a failure on one output circuit does not pull down another output circuit, thus increasing overall system integrity. This isolation also protects the backplane logic from line transients on the output circuits.

Increase flexibility in applied voltages. You can apply either ac or dc voltages to relay contact output circuits. The range of these voltages can be broad (within the module's operating specifications) without impacting the module's performance.

Sink or source power. Contacts on relays permit dc outputs to be sinking or sourcing as required by the devices being controlled. Solid-state outputs require specific compatibility with the load device as to current sinking or sourcing.

Switch analog signals through relays. You can use analog module inputs for different devices by switching circuits through relays. Analog signals are typically low voltage (+10V dc) and low current (4-20 mA). Contact resistance can be critical, and should be accounted for in low-impedance circuits.

Using This Publication

This publication provides you with information about Allen-Bradley's relay contact output modules. The publication is divided into two sections. The first section contains general information that pertains to all of the relay modules; the second section contains module-specific information. The following table lists the relay contact modules and the page number on which you can find information about each.

Relay Contact Output Modules

For more information about this module:	Refer to page:
1771-OW (8 outputs/selectable)	15
1771-OW16 (8 fixed, 8 selectable)	15
1771-OWN (32 outputs/selectable)	17
1771-OWNA (32 outputs)	19
1771-OX (4 outputs/power)	21
1771-OYL (24V/8outputs)	23
1771-OZL (24V/8outputs)	25

Allen-Bradley relay contact output modules use one of the following relay types:

Relay Type	Catalog Number
Electromechanical	1771-OW 1771-OW16 1771-OWN 1771-OWNA
Dry-Reed	1771-OYL, 1771-OYZ
Mercury-Wetted	1771-OX

Electromechanical Relays

Electromechanical relays contain the most economical design for power applications. These modules typically can handle line surges and noise through closed contacts. Electromechanical relays are not recommended for low voltage/low current applications. Electromechanical relays are generally slower than dry-reed relays. They are not recommended for use in environments with contaminants such as acid, ammonia, nitrogen, or chlorine (noxious environments) because they are not hermetically sealed. Allen-Bradley modules that use electromechanical relays include the 1771-OW, 1771-OW16, 1771-OWN, and 1771-OWNA modules.

Dry-Reed Relays

Dry-reed relays are noted for their speed. These relays are well-suited for low-voltage, low-power applications. They are hermetically sealed and thus offer protection in noxious environments. Dry reeds, however, cannot handle surge currents due to their low-voltage design. Allen-Bradley modules that use dry-reed relays are the 1771-OYL and 1771-OZL modules.

Mercury-Wetted Relays

The mercury-wetted relay is a power version of the dry-reed switch. These relays feature long life and high contact reliability because the mercury re-coats the contacts on every operation. Mercury-wetted relays are also hermetically sealed and have no bounce on outputs and offer a clean switch. Of the three types of relays, mercury-wetted relays are the slowest (10 ms). ATTENTION: The 1771-OX module contains mercury-wetted relays. At the end of the equipment's life, it should be collected separately from any unsorted municipal waste.

System Compatibility

The following table lists the Allen-Bradley relay contact output modules and shows compatibility and use of data table for each.

System Compatibility and Use of Data Table

Module Cat No.	Module Series	Output Image Bits Used	Addressing			Compatible Chassis
			2-slot	1-slot	1/2-slot	
1771-OW	A	8	Y	Y	Y	A,B
1771-OW16	B	16	R	Y	Y	B
1771-OWN	A	32	N	R	Y	B
1771-OWNA	A	32	N	R	Y	B
1771-OX	A	8 (4 actual outputs)	Y	Y	Y	A,B
1771-OYL	A	8	Y	Y	Y	A,B
1771-OZL	A	8	Y	Y	Y	A,B

A = Compatible with superseded chassis (1771-A1, -A2, -A4)
B= Compatible with current chassis (1771-A1B, -A2B, -A3B, -A3B1, -A4B, -AM1, -AM2)
Y = Compatible without restriction
N = Not compatible
R = Conditional module placement; you must use an input module and an output module in an odd/even pair of slots of the I/O chassis beginning with slot 0.

Power Supply Requirements

Relay contact output modules receive power through the 1771 I/O chassis backplane from the chassis power supply. Refer to the module specifications on pages 11 through 24 for the current required from the power supply (in mA) to operate the module. You should total the current requirements for all the modules in the chassis to avoid overloading the power supply or the I/O chassis backplane.

Keying

Plastic keying bands shipped with each I/O chassis let you configure your I/O slots to accept only one type of module. You can configure any backplane connector in an I/O chassis to receive your contact output module except for the leftmost connector, which is reserved for adapter or processor modules. Since mixed voltages are often used on relay modules, most of the contact output relay modules all have the same keying slots. Refer to the module specifications for specific keying positions.

Status Indicators

Status indicators on the front of each module show the system logic side status of the output relays. Each module has one indicator per output. When the indicator is on, it means the output relay coil is energized; when the indicator is off, it means the output relay coil is not energized. You can quickly isolate many types of external hardware-related faults by comparing these indicators with their corresponding output devices, and the control program.

Incandescent lamps also create a spike due to their low turn-on resistance before they become hot. Therefore, you must use derating or surge suppression (for example Allen-Bradley surge suppressors 1492-H2K120, 1492-H2K024, and 1492-H2K240). Specified relay current is typically derated at ten times the steady-state current of the incandescent lamp load. For derating, you can calculate cold-start load by measuring the cold load resistance. You can also experience large current surges when bulbs burn out (e.g. 20-50 amps).

Environments

The operating temperature of the relay greatly influences the life of the relay contacts. The 1771 relay contact output modules have a maximum operating temperature of 60°. Operation at lower temperatures will extend relay contact life.

Since electromechanical relays are not hermetically sealed, they are not recommended in environments with contaminants such as acid, ammonia, nitrogen, and chlorine— especially with voltages under 24V ac/dc or for prolonged periods without operation. Such environments contaminate the relay contacts, causing reliability problems. Higher voltage usage, between 24 and 120V ac/dc, and continued operation help keep contacts clean as a result of the burning off of contact contaminants. Relays are also subject to reliability problems under high vibration environments as mechanical motion can intermittently break contacts.

Mercury-wetted relays and dry-reed relays are hermetically sealed from the environments, thus preventing environmental reliability problems. Mercury-wetted relays are generally sensitive to mounting position.

Output Module Loading

The life of the relays in the output modules is directly affected by the load through the contacts and the operating temperature.

Minimum currents and voltages specified for 1771 relay contact output modules are selected to provide clean contacts throughout the life of the contacts. The relays can operate below the minimum specifications, but operation will not be reliable.

Exceeding the maximum power ratings for the module will shorten the life of the relay contacts. Do not operate relay contact output modules at power levels greater than maximum specifications.

By using the operating range graphs, you can determine if you are within the operating capability of the relay. You only need to know any two of the following:

- voltage
- load current (mA)
- load power consumption (W)

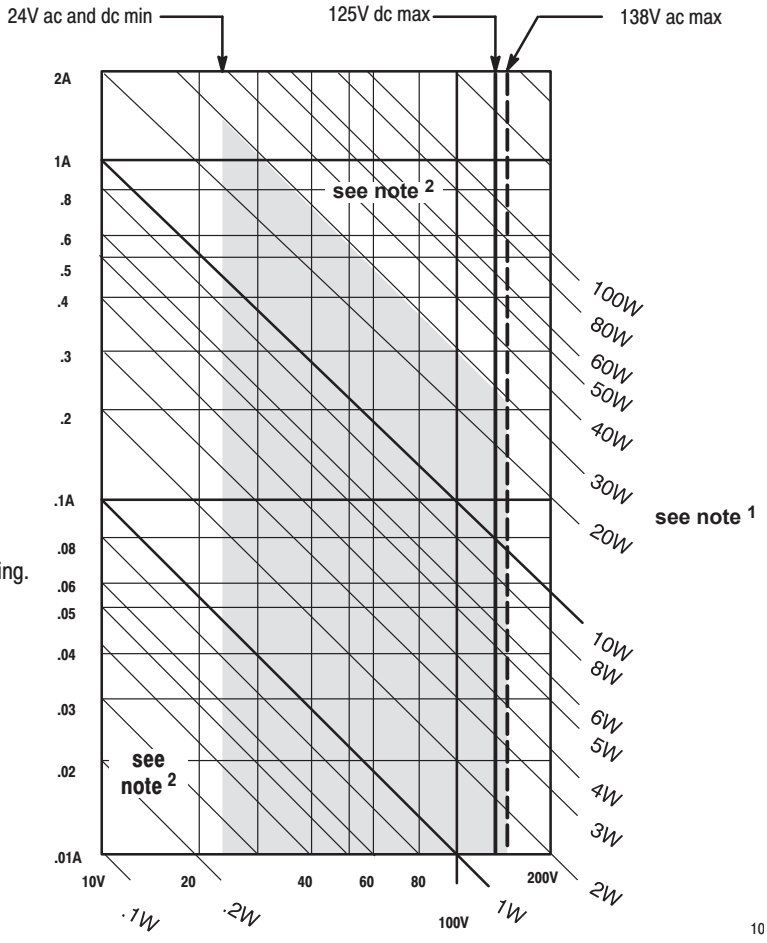
Using Figure 1, follow this example:

Given a 30V dc, 4W indicator, is this in operating range?

1. Locate the vertical line for 30V.
2. Locate the angled line for 4W; it is at this angle (\).
3. Find where the two lines cross. If this is within the shaded area of the graph, you are in the permissible operating area for the relay contact output module. (In this example, you are in the permissible operating range.)

Refer to the following operating range graphs to determine the operating capability of the relay.

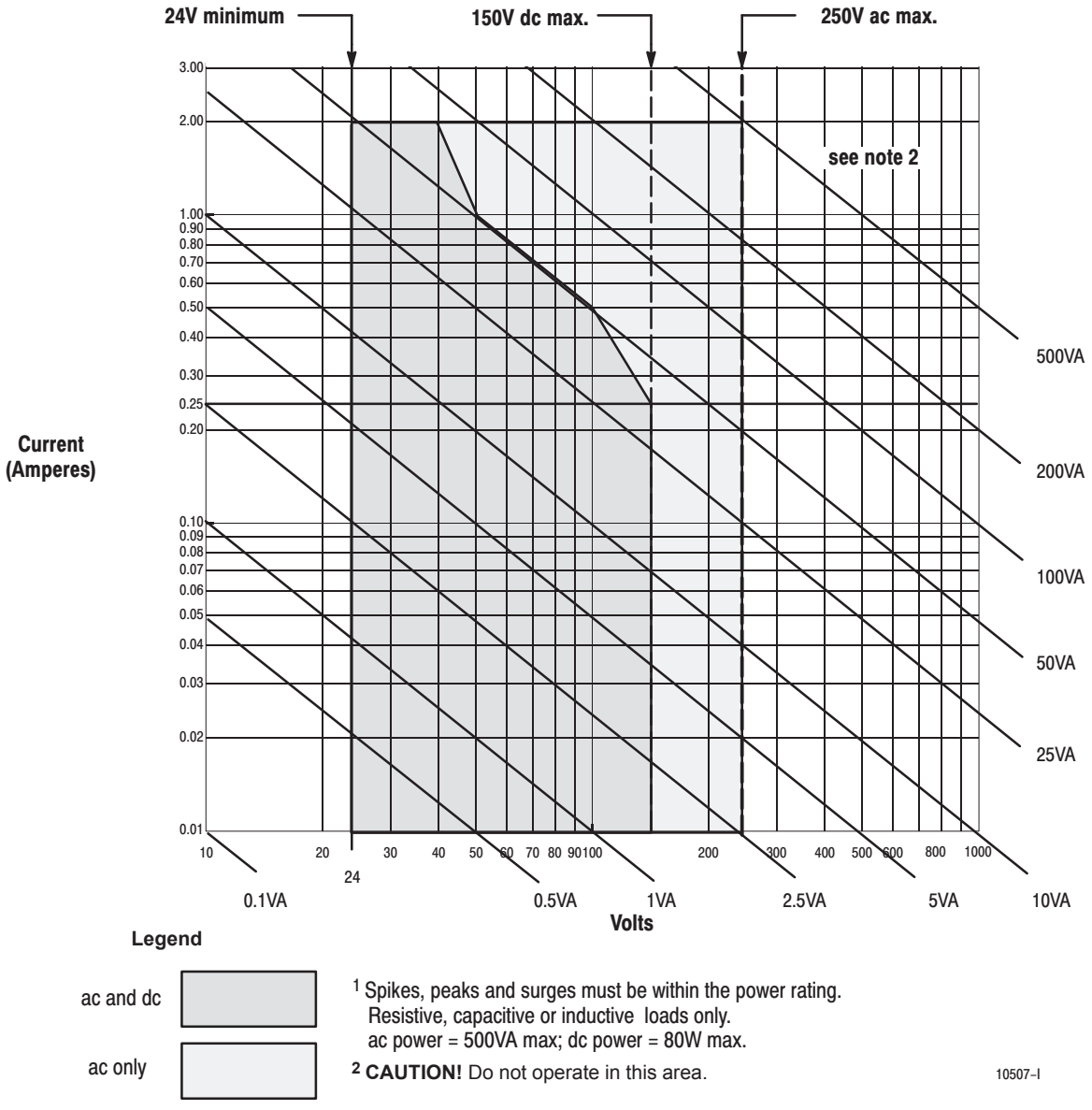
Figure 1
1771-OW, -OWN, -OWNA ac and dc Operating Load Range[1] (Relay Contacts)



[1] Spikes, peaks and surges must be within the power rating. Resistive loads only. ac or dc power = 30W max.

[2] **CAUTION!** Do not operate in this area.

Figure 2
1771-OW16 ac and dc Operating Load Range[1]
(Relay Contacts)



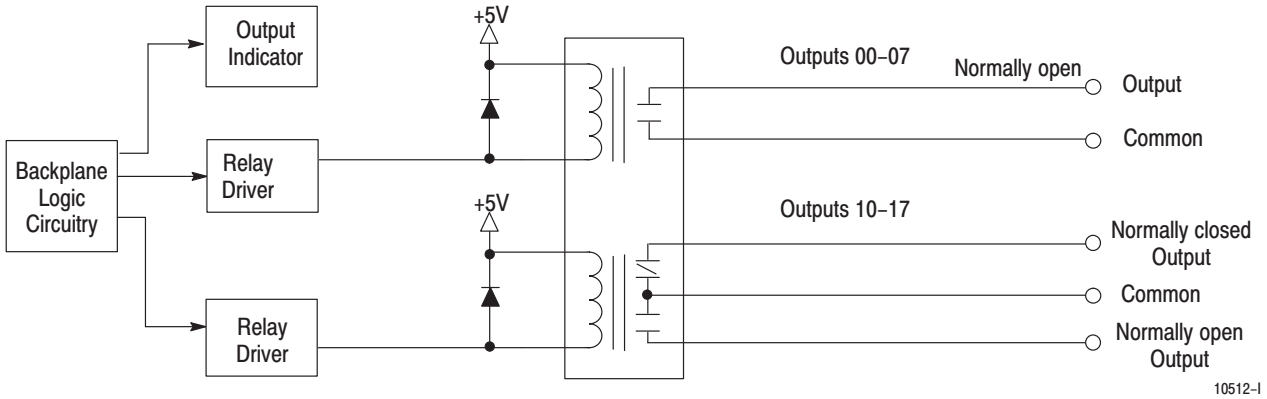
[1] Spikes, peaks and surges must be within the power rating. Resistive, capacitive or inductive loads only. ac power = 500VA max; dc power = 80W max.

[2] **CAUTION!** Do not operate in this area.

10507–I

Selectable Relay Contact Output Module (Cat. No. 1771-OW16 Series B)

Simplified Schematic



Application Notes

Load Type. 1771-OW16 modules do not contain surge limiting circuitry. With properly chosen surge limiting devices, this module can be used to switch resistive (e.g., lamps, indicators, heating elements), capacitive and inductive loads (e.g., motor starters, solenoids, relays). When driving inductive or high current loads, a resistor-capacitor network should be placed across the module's relay contacts at the field wiring arm. This will help reduce the generation of electromagnetic noise created by the contacts when changing state.

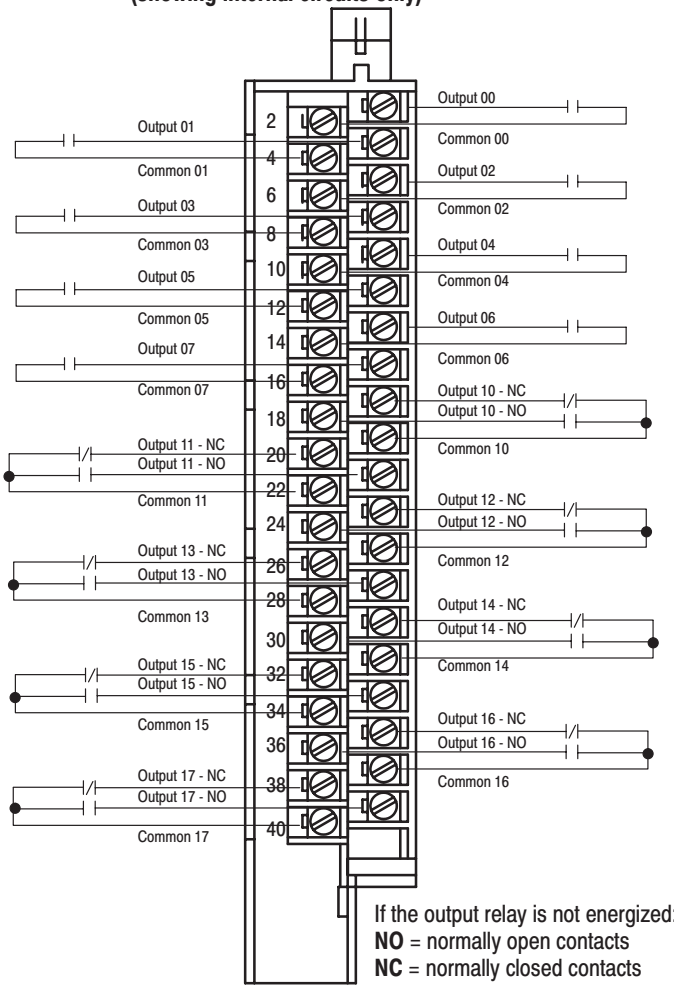
Isolation. Outputs on the 1771-OW16 module are arranged in 2 groups of 8. Each output has a separate common and is electrically isolated from module logic circuitry. The first group of outputs are arranged as normally-open contacts. The second group of outputs are selectable normally-open or normally-closed. The module can simultaneously switch all 16 outputs to separate loads. Each output can conduct a maximum load of 2.0A continuously at 500VA for ac loads, and 80W maximum for dc loads, but the total output power of the module cannot exceed 1440VA or 1280W.

Connection to Input Modules. You can use the 1771-OW16 module to drive an input of the following ac modules: 1771-IA, -IA2, -IAD, -IAN, -ID, -ID16, -IN, -IND. The 1771-OW16 module can drive an input of the following dc modules at nominal voltage: 1771-IB, -IBD, -IBN, -IH, -IQ, -IQ16, -IT, -IV, and -IVN. For reliable operation, a load current of at least 10mA should be maintained.

No Increase from Parallel Operation. Do not attempt to increase load current or wattage capability beyond the rating by connecting two or more outputs in parallel. The slightest variation in output relay switching time may cause one set of the contacts to switch the total load current.

Configuring Output Selection. When the output image table bit at the address corresponding to any output is energized (set to 1), the corresponding relay contact is closed or opened, respective to the jumper setting.

Connection Diagram
(showing internal circuits only)



Specifications (Cat. No. 1771-OW16 Series B)	
Outputs per module	16
Module Location	1771-A1B thru -A4B I/O Chassis; 1771-AM1 or -AM2
Voltage Rating	24-250V ac (rms), 47-63Hz; 24-150V dc
Power Rating[1]	dc: 80 Watts per output (max); 1280 Watts per module (max.) ac: 500 VA per output (max); 1440 VA per module (max.) **cos Φ ⩾ 0.4**
Current Rating (maximum per channel)[2]	ac: 2A per output at rated power dc: 2A per output up to 40V; 1A per output at 50V 0.5A per output at 100V; 0.25A per output at 150V
Maximum Surge Current	dc: 2A maximum per output (at rated power); ac: Refer to Table A below
Minimum Contact Load	10mA
Operate/Release Time	10ms maximum; 5ms (±1ms) typical
Bounce Time Maximum	4ms
Switching Frequency Maximum	1/3Hz @ maximum load
Expected Life of Electrical Contacts	300K operations @ 25ºC (**cos Φ = 1)**
Power Dissipation	All relays off: 0.015 Watts; All relays on: 6.55 Watts
Thermal Dissipation	All relays off: 0.05 BTU/hr; All relays on: 22.24 BTU/hr
Backplane Current	1.3A maximum
Maximum Cable Length	1000ft (304.8m)
Isolation Voltage	1500V ac for 1 second customer side to system side; 1500V ac for 1 second channel to channel; relay rated 4000V coil to contact
Conductors Wire Size Category	14 gauge ($2mm^2$) stranded maximum[3] 3/64 inch (1.2mm) insulation maximum 1[4]
Environmental Conditions Operational Temp. Storage Temperature Relative Humidity	 0º to 60ºC (32º to 140ºF) -40º to 85ºC (-40º to 185ºF) 5 to 95% (without condensation)
Keying	Between 2 and 4 Between 32 and 34
Field Wiring Arm	Catalog Number 1771-WN
Wiring Arm Screw Torque	7-9 inch-pounds
Agency Certification (when product or packaging is marked)	• CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
Installation Data	1771-2.206

[1] An individual output should not be subjected to high power loads and then be required to run low power loads.
[2] Output current maximum per module is limited by the maximum output power rating.
[3] 14 gauge wire connected to all terminals may not allow the field wiring arm cover to close. A smaller wire size may be required.
[4] You use this conductor category information for planning conductor routing as described in the system-level installation manual.

Table A
Maximum ac Surge Current

Maximum Contact Rating					
ac Voltage	Amperes		Continuous Carrying Current	Maximum VoltAmperes	
	Make	Break		Make	Break
120	30	3	2	3600	360
240	15	1.5	2	3600	360

Sample Connection Diagram for the 1771-OW16 Module Driving a 120V ac Input Module