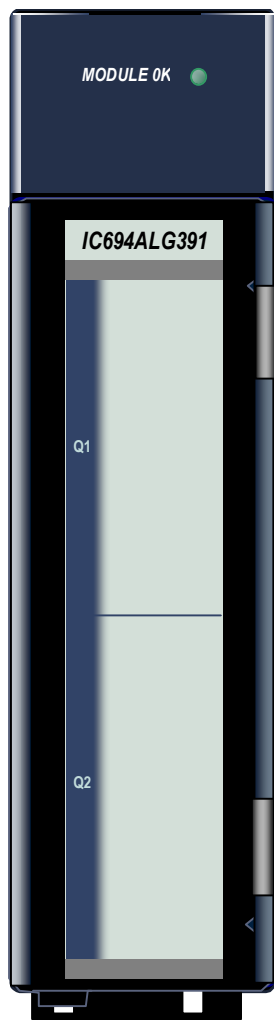


Analog Output Module, Current, 2 Channel: IC694ALG391



The **2–Channel Analog Current Output** module, IC694ALG391, has two output channels, each capable of converting 12 bits of binary (digital) data to an analog output signal for field devices. Each output can be set using a jumper on the module to produce output signals in one of two ranges:

- 0 to 20 mA
- 4 to 20 mA.

Each output may also be set up as a less accurate voltage source. The selection of current or voltage output is made with a jumper or resistor on the module terminals. Both channels are updated on every scan.

The module's outputs can be set up to either *Default to 0/4 mA* or *Hold–Last–State* if the CPU goes to the Stop mode or Reset. Selection of the output default state is made by a jumper on the module's terminal board. See Output Defaults in this section for more information.

LED

The **Module OK** LED is ON when the module's power supply is operating.

Isolated +24 VDC Power

If the module is located in an RX3i Universal Backplane, an external source of Isolated +24 VDC is required to provide power for the module. The external source can be connected via the TB1 connector on the left side of the backplane or directly on the module's terminal block.

If this module is located in an Expansion Backplane, its primary power source can be either the Isolated +24 VDC from the backplane power supply or an external Isolated +24 VDC power supply connected to the module's terminal block. If the external source is set between 27.5-30 VDC, it takes over the module's load from the Isolated 24 VDC system supply. Note that an external source should be used if it is desired to maintain hold last state operation during a loss of backplane power.

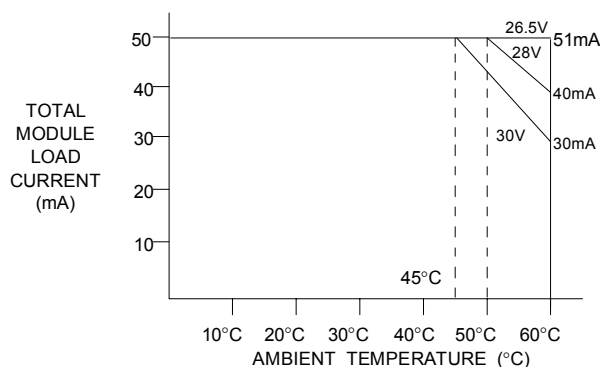
Specifications: ALG391

Output Current Range	4 to 20 mA and 0 to 20 mA
Output Voltage Range	1 to 5 volts and 0 to 5 volts
Calibration	Factory calibrated to 4 μ A per count
External Supply Voltage Range	20 VDC to 30 VDC. Depends on the current load and the ambient temperature as shown below.
External Supply Voltage Ripple	10%
Update Rate	5 milliseconds (approximate, both channels) Application dependent.
Resolution:	
4 to 20mA	4 μ A (1 LSB = 4 μ A)
0 to 20mA	5 μ A (1 LSB = 5 μ A)
1 to 5V	1 mV (1 LSB = 1 mV)
0 to 5V	1.25 mV (1 LSB = 1.25 mV)
Absolute Accuracy: *	
4 to 20mA	+/-8 μ A at 25°C (77°F)
0 to 20mA	+/-10 μ A at 25°C (77°F)
1 to 5V	+/-50 mV at 25°C (77°F)
0 to 5V	+/-50 mV at 25°C (77°F)
Maximum Compliance Voltage	25 VDC
User Load (current mode)	0 to 850 Ohms
Output Load Capacitance (current mode)	2000 pF
Output Load Inductance (current mode)	1 H
Maximum Output Loading (voltage mode)	5 mA (2 K Ohms minimum resistance) (2000 pF maximum capacitance)
Isolation, Field to Backplane (optical) and to frame ground	250 VAC continuous; 1500 VAC for 1 minute
Internal Power Consumption	30 mA from +5 VDC supply 215 mA from Isolated +24 VDC supply

Refer to Appendix A for product standards and general specifications.

* In the presence of severe RF interference (IEC 801–3, 10 V/m), accuracy may be degraded to $\pm 80 \mu$ A (4 to 20 mA range), $\pm 100 \mu$ A (0 to 20 mA range).

Load Current Derating



NOTE
WHEN IN VOLTAGE MODE,
ASSUME 20.5 mA PER
CHANNEL IN ADDITION TO
V_{OUT} LOAD CURRENT PER
CHANNEL.

EXAMPLE: BOTH CHANNELS IN 0 TO +10V
MODE WITH 2K LOADS = 51 mA

Data Format: ALG391

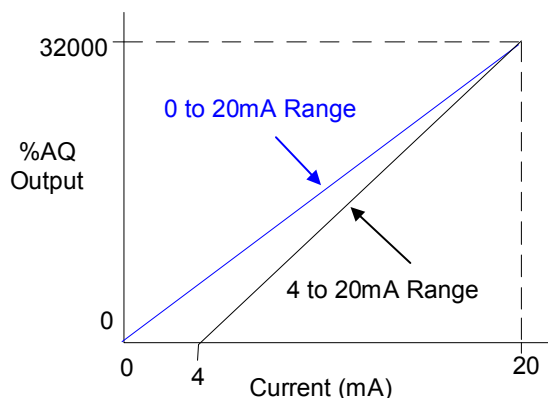
Module data is stored by the PLC CPU in 16-bit 2's complement format as shown below.

MSB													LSB		
X	11	10	9	8	7	6	5	4	3	2	1	0	X	X	X

The 13 most significant bits from the %AQ register are converted to sign magnitude by the PLC and sent to the module.

D/A Bits versus Current Outputs

The module scales the output data received from the CPU according to the range selected for the channel.



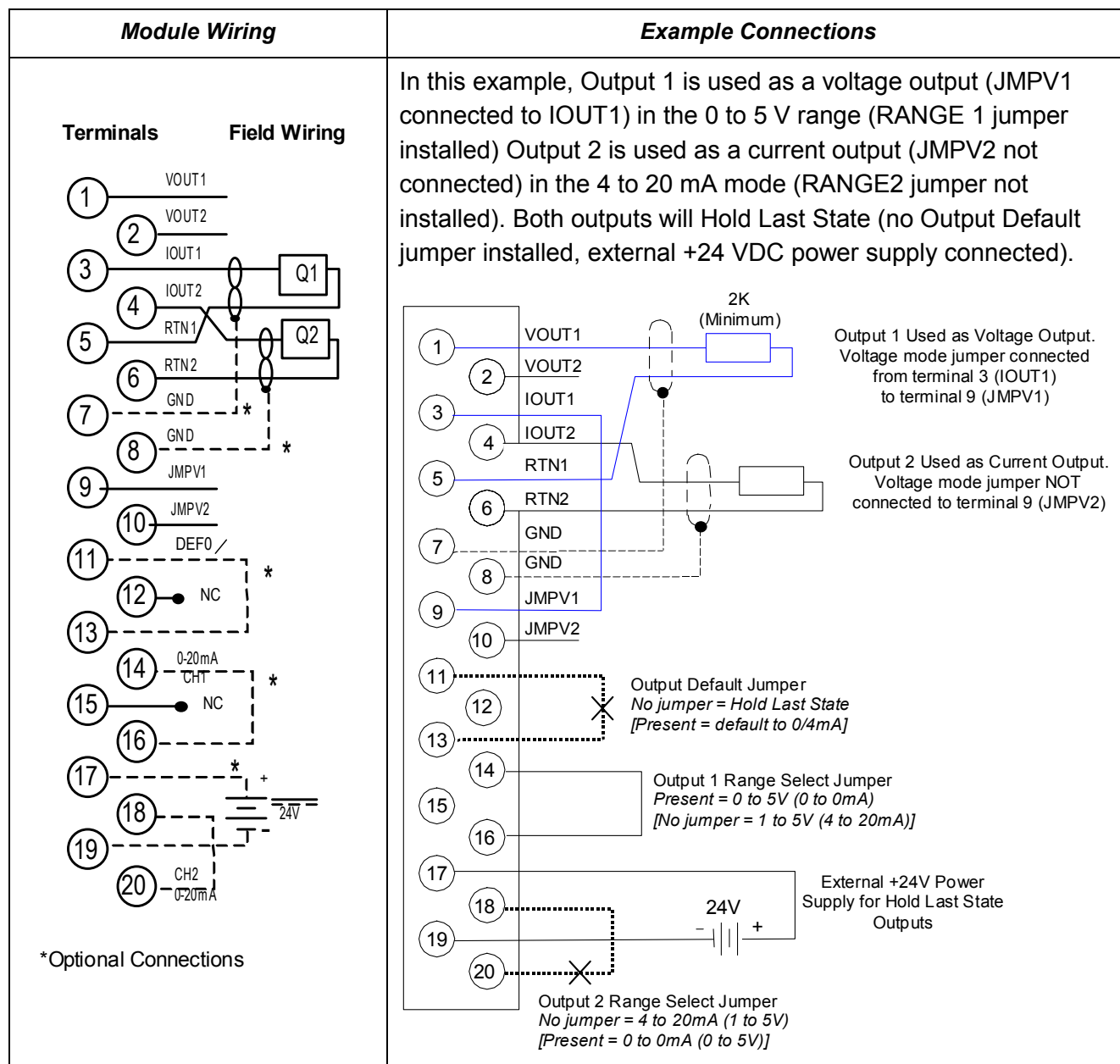
In the 4 to 20 mA range, the module scales output data with each 1000 counts representing 0.5 mA. In this range a count of 0 corresponds to 4 mA and a count of 32000 corresponds to 20 mA.

In 0 to 20 mA range, the module scales output data so that each 800 counts represents 0.5 mA. In this range, a count of 0 corresponds to 0 mA and a count of 32000 corresponds to 20 mA with each 800 counts representing 0.5 mA.

If the module receives negative data from the CPU, it outputs the low end of the range (either 0 mA or 4 mA). If a value greater than 32767 is received, it is not accepted.

Field Wiring: ALG391

To minimize the capacitive loading and noise, all field connections to the module should be wired using a good grade of twisted, shielded instrumentation cable. The shields should be connected to GND on the user terminal connector block. The GND connection provides access to the backplane (frame ground) resulting in superior rejection of noise caused by any shield drain currents. If no jumper is installed, the module performs as a current source. If the jumper is present, the module performs as a voltage source.



Current or Voltage Outputs

Each channel's range and its operation in current or voltage mode are set with jumpers on the module terminals. For voltage operation, a 250 Ohm resistor can be used instead of a voltage jumper to increase the voltage range. The table below lists the output ranges that can be set up for each output, and the jumper or resistor settings for each range.

Range of the Output	Range Jumper Installed	Voltage Jumper or Resistor Installed
4 mA to 20 mA	No	No
0 mA to 20 mA	Yes	No
0 V to 5 V	Yes	jumper
0 V to 10 V	Yes	250 Ohm resistor
1 V to 5 V	No	jumper
2 V to 10 V	No	250 Ohm resistor

Output Defaults

Both module outputs can be set to either Default to 0 or 4 mA or Hold Last State if the CPU goes to Stop mode or is Reset. The module's Output Default operation is set using another jumper on the terminal block.

If the Output Default (DEF0/4) jumper is installed on module terminals 11 and 13, both outputs default to the low end of their ranges.

If the Output Default jumper is not installed, both outputs hold the last valid output value received from the PLC CPU. This option requires an external +24 VDC power supply to maintain output power when the system power goes down.