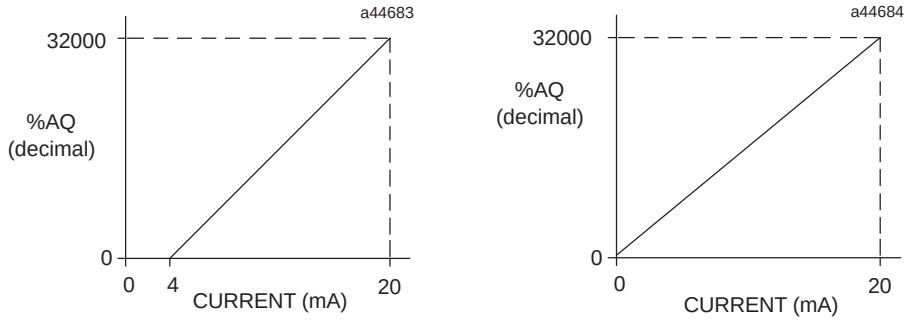
IC693ALG392 Current/Voltage Ranges and Output Modes

Current Operation

In the 4 to 20 mA range user data is scaled so that 4 mA corresponds to a count of 0 and 20 mA corresponds to a count of 32000. In the 0 to 20 mA range, user data is scaled so that 0 mA corresponds to a count of 0 and 20 mA corresponds to 32000. Note that in the 0 to 20 mA mode, you can enter a value up to 32767 which provides a maximum output of approximately 20.5 mA. Scaling of the current output for both the 4 to 20 mA range and the 0 to 20 mA range is shown below. In current mode the module also provides an open loop fault detect which is reported to the PLC in the %I table.



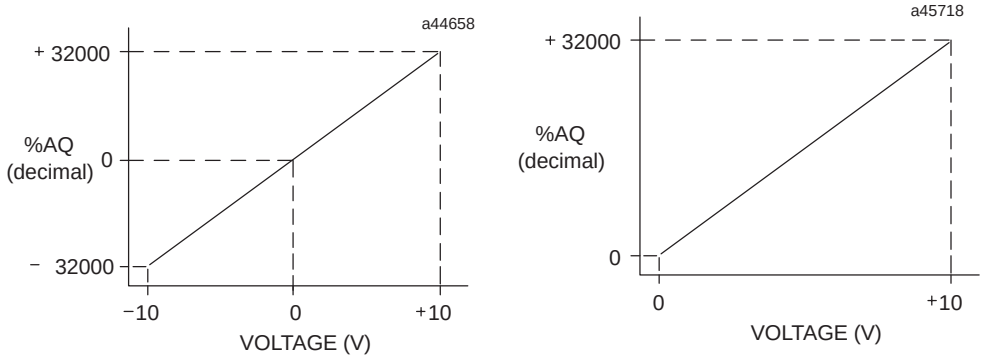
4 to 20 mA Range **0 to 20 mA Range**

Figure 11-13. Scaling for Current Output

Voltage Operation

For *Voltage Operation* in the default unipolar mode (0 to +10 volts), user data is scaled so that 0 volts corresponds to a count of 0 and +10 volts corresponds to a count of 32000. In this mode, you can enter up to 32767 for an overrange of approximately 10.24 volts output. In the –10 to +10 volt range user data is scaled so that –10 volts corresponds to a count of –32000 and +10 volts corresponds to a count of +32000. In this range, you can enter –32767 to +32767 for an overrange of approximately –10.24 volts to +10.24 volts.

Scaling of the voltage output for both the 0 to +10 volt range and the –10 to +10 volt range is as shown in the following figure.



Bipolar Mode **Unipolar Mode**

Figure 11-14. Scaling for Voltage Output

CPU Interface to the 8-Channel Analog Current/Voltage Output Module

The Series 90-30 PLC uses the data within the %AQ data table to record analog values for use by the programmable controller. This scheme for the 8-Channel Analog Current/Voltage Output module is shown below. More information on the CPU interface to analog modules can be found at the beginning of this chapter.

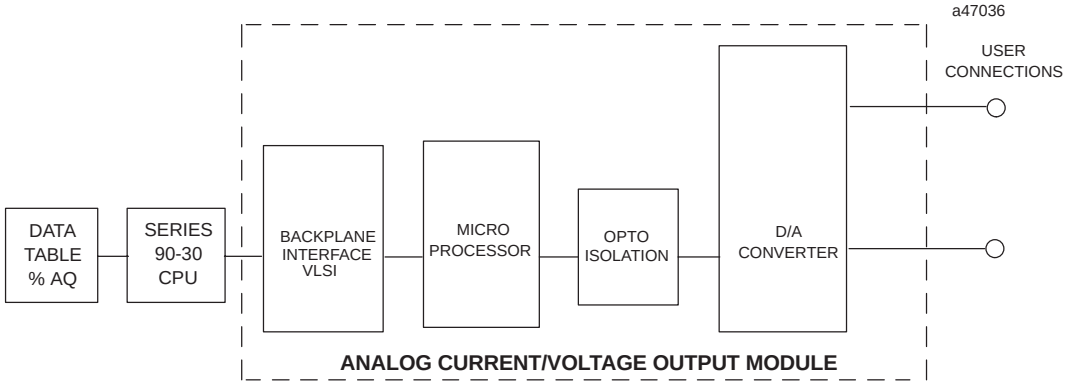


Figure 11-15. Basic Block Diagram for IC693ALG392

The following table summarizes the above information, including the module output range, user input data range, and the resolution of the selected range

Module Output Range	User Input Data Range	Resolution
4 to 20 mA	0 to 32000	15 bits
0 to 20.5 mA	0 to 32767	15 bits
0 to +10 volts	0 to 32767	15 bits
–10 to +10 volts	–32767 to +32767	16 bits

IC693ALG392 Field Wiring Connections

Connections to this module from user devices are made to screw terminals on a removable 20-terminal connector block mounted on the front of the module. The actual terminals used are described in the following table and are shown in the following wiring diagrams.

Terminal Assignments

Pin assignments for the 20 terminal I/O connector on the 8-Channel Analog Current/Voltage Output module are as shown in the following table.

Table 11-4. Terminal Pin Assignments for IC693ALG392

Pin Number	Signal Name	Signal Definition
1	24VIN	User Supplied +24 Volt Input
2	V CH 1	Channel 1 Voltage Output
3	I CH 1	Channel 1 Current Output
4	V CH 2	Channel 2 Voltage Output
5	I CH 2	Channel 2 Current output
6	V CH 3	Channel 3 Voltage Output
7	I CH 3	Channel 3 Current output
8	V CH 4	Channel 4 Voltage Output
9	I CH 4	Channel 4 Current output
10	V CH 5	Channel 5 Voltage Output
11	I CH 5	Channel 5 Current output
12	V CH 6	Channel 6 Voltage Output
13	I CH 6	Channel 6 Current output
14	V CH 7	Channel 7 Voltage Output
15	I CH 7	Channel 7 Current output
16	V CH 8	Channel 8 Voltage Output
17	I CH 8	Channel 8 Current output
18	V COM	Voltage Common
19	I COM	Current Common/User +24 Volt Return
20	GND	Frame ground connection for cable shields

IC693ALG392 Analog Output Module Field Wiring Diagram

The following figure provides information for connecting field wiring to the user terminal board on the 8-Channel Analog Current/Voltage Output Module.

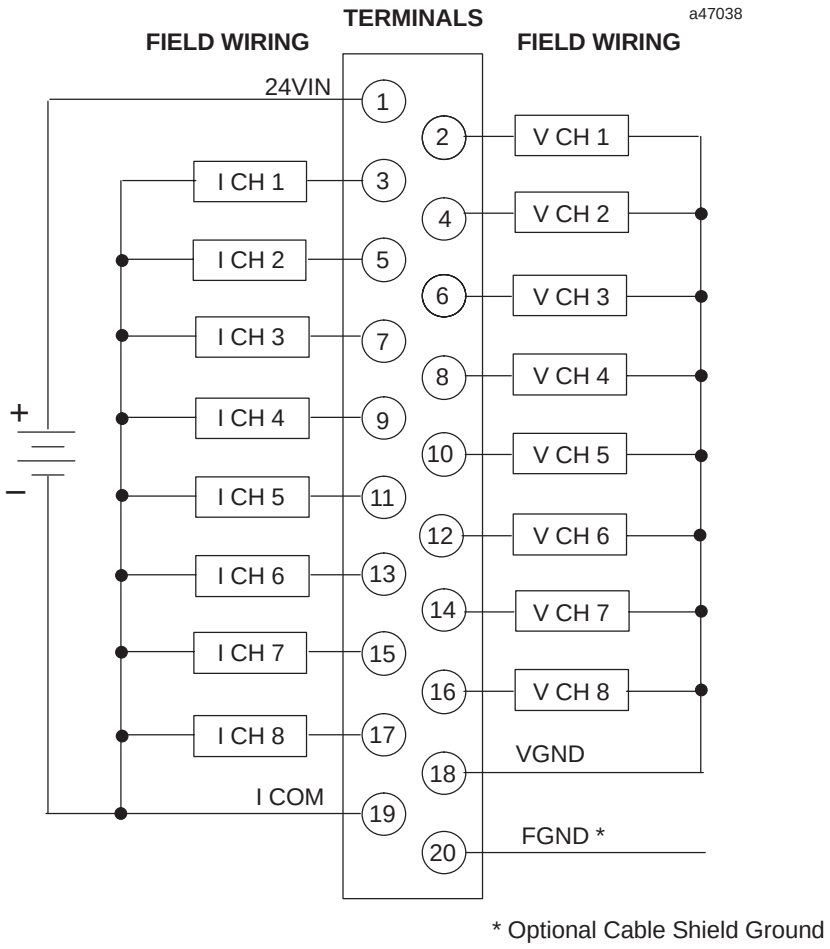


Figure 11-16. Field Wiring for 8-Channel Analog Current/Voltage Output Module, IC693ALG392

Note

Each channel can be configured independent of other channels to operate as a voltage output ***or*** a current output – *not both simultaneously.*

Please refer to Chapter 2 for wiring and shield ground connection details.

IC693ALG392 Status Reporting

The Analog Current/Voltage Output module provides status information to the PLC. This status information is updated once each PLC sweep and consists of three items:

- *health of the module* (all ranges)
- o*verload or open wire detect* (current mode only)
- *status of the user-supplied power* to the module (all ranges)

IC693ALG392 Power Requirements and LEDs

This module requires a maximum of 110 mA from the 5V bus on the PLC backplane for the logic side The module's analog power *must be supplied* by a user supplied single +24 VDC power source *and* requires a maximum current of 315 mA.

There are two green LED indicators on the module which provide module and user supply status. The top LED, **OK,** provides module status information and the bottom LED, **USOK,** indicates whether the user supply is present and is above a minimum designated level. Note that both LEDs are powered from the +5V backplane power bus.

The LEDs have six possible status combinations, which are described below.

LED Status Indications for IC693MDL392			
Combination	**LED**	**Status**	**Description**
1	OK	ON	Module OK and configured
	USOK	ON	User power is present
2	OK	FLASH	Module OK but not configured
	USOK	OFF	No user power
3	OK	FLASH	Module OK but not configured
	USOK	ON	User power is present
4	OK	ON	Module OK and configured
	USOK	OFF	No user power
5	OK	OFF	Module is defective or no +5V backplane power present
	USOK	OFF	User power may or may not be present
6	OK	OFF	Module not OK
	USOK	ON	User power is present

Location in System

This module can be installed in any I/O slot of a 5 or 10-slot baseplate in a Series 90-30 PLC system.

References Used

The number of 8-Channel Analog Current/Voltage Output modules which may be installed in a system depends on the amount of %AQ and %I references available. Each module uses 8 %AQ references (depending on the number of channels enabled) and 8 or 16 %I references (depending on *open wire detect* configuration).

There are 32 %AQ references available in a Model 311, Model 313, and Model 323 system, 64 %AQ references available in a Model 331 system, 256 %AQ references available in a Model 340 and Model 341 system, and 512 %AQ references available in a Model 351 and Model 352 system

The maximum number of 8-Channel Analog Current/Voltage Output modules that can be installed in a system are:

- 4 in a system using CPU Models 311, 313, or 323
- 8 in a system using CPU Model 331
- 32 in a system using CPU Models 340 and 341
- 64 in a system using CPU Models 350 – 364

Other Configuration Considerations

When planning the module configuration for your application you must also consider the load capacity of the installed power supply and the total load requirements of all modules that are installed in the baseplate.

Refer to Chapter 1 in this manual for details on power supply, baseplate, and module load requirements. The following table lists the specifications for this module. *Note that test conditions, unless otherwise noted, are: V_{USER} = 24 VDC at an ambient temperature of 25°C (77°F).*

Table 11-5. Specifications for IC693ALG392

Number of Output Channels	1 to 8 selectable, single-ended
Output Current Range	4 to 20 mA and 0 to 20 mA
Output Voltage Range	0 to 10 V and –10 to +10 V
Calibration	Factory calibrated to .625µA for 0 - 20 mA; 0.5µA for 4 - 20 mA; and .3125 mV for voltage (per count)
User Supply Voltage (nominal)	+24 VDC, from user supplied voltage source
External Supply Voltage Range	20 to 30 VDC
Power Supply Rejection Ratio (PSRR) [1]	
Current	5 µA/V (typical), 10 µA/V (maximum)
Voltage	25 mV/V (typical), 50 mV/V (maximum)
External Power Supply Voltage Ripple	10% (maximum)
Internal Supply Voltage	+5 VDC from PLC backplane
Update Rate	8 msec (approximate, all eight channels) *Determined by I/O scan time, and is application dependent.*
Resolution:	
4 to 20 mA	0.5 µA (1 LSB = 0.5 µA)
0 to 20 mA	.625 µA (1 LSB = .625 µA)
0 to 10 V	.3125 mV (1 LSB = .3125 mV)
–10 to +10 V	.3125 mV (1 LSB = .3125 mV)
Absolute Accuracy: [3]	
Current Mode	± 0.1% of full scale @ 25°C (77°F), typical ± 0.25% of full scale @ 25°C (77°F), maximum ± 0.5% of full scale over operating temperature range (maximum)
Voltage Mode	± 0.25% of full scale @ 25°C (77°F), typical ± 0.5% of full scale @ 25°C (77°F), maximum ± 1.0% of full scale over operating temperature range (maximum)
Maximum Compliance Voltage	V_{USER} –3V (minimum) to V_{USER} (maximum)
User Load (current mode)	0 to 850Ω (minimum at V_{USER} = 20V, maximum 1350Ω at V_{USER} = 30V) [2]
Output Load Capacitance (current mode)	2000 pF (maximum)
Output Load Inductance (current mode)	1 H
Output Loading (voltage mode)	5 mA (2K ohms minimum resistance)
Output load Capacitance	(1 µF maximum capacitance)
Isolation	1500 volts between field and logic side
Internal Power Consumption	110 mA from +5V PLC backplane supply 315 mA from +24V user supply

Refer to Appendix C for product standards and general specifications.

[1] PSSR is measured by varying V_{USER} from 24V to 30V.

[2] Load less than 800 Ω is temperature dependent.

[3] In the presence of severe RF interference (IEC 801-3, 10V/m), accuracy may be degraded to ±1% FS for current outputs and ±3% FS for voltage outputs.