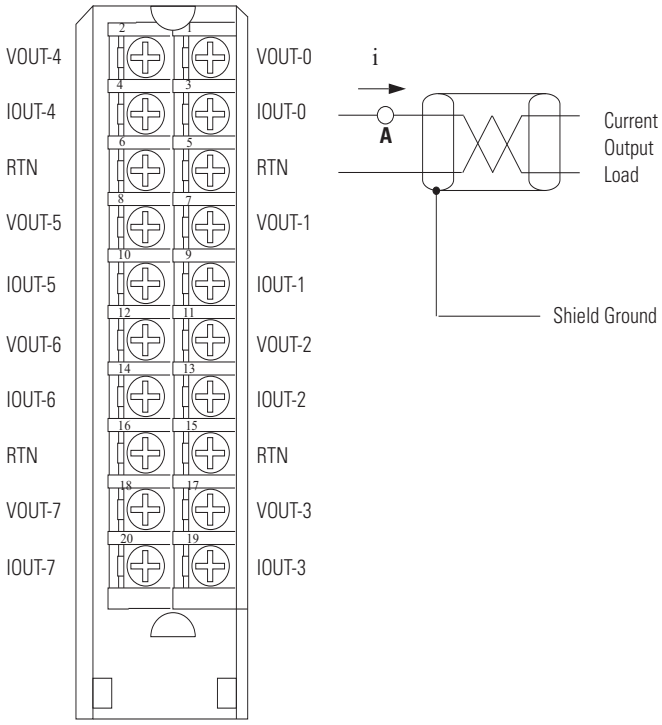
1756-OF8, 1756-OF8K

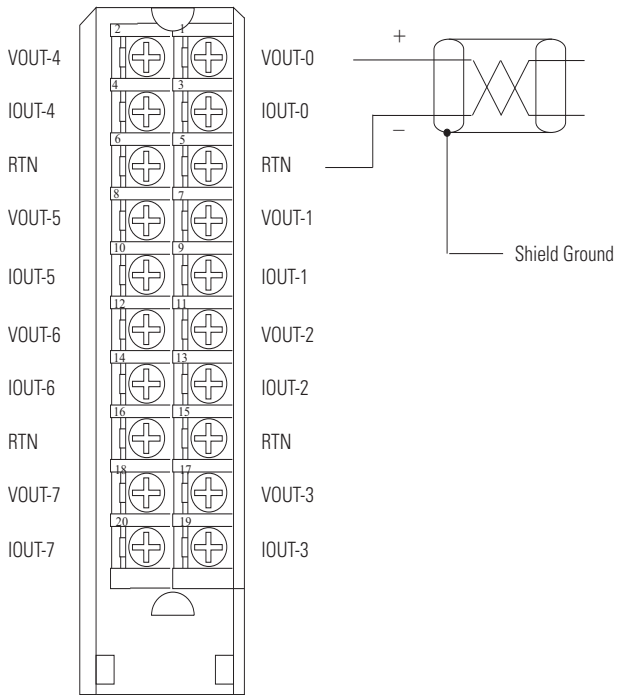
ControlLogix voltage/current output analog module

1756-OF8, 1756-OF8K Current

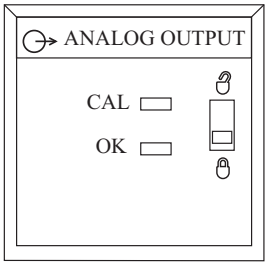


- Place additional loop devices (such as strip chart recorders) at the A location noted in the drawing.
- All terminals marked RTN are connected internally.

1756-OF8, 1756-OF8K Voltage



All terminals marked RTN are connected internally.



Signal and User Counts - 1756-OF8, 1756-OF8K

Range	Low Signal and User Counts	High Signal and User Counts
0…20 mA	0 mA -32768 counts	21.2916 mA 32767 counts
±10V	-10.4336V -32768 counts	10.4336V 32767 counts

Technical Specifications - 1756-OF8, 1756-OF8K

Attribute	1756-OF8, 1756-OF8K
Outputs	Eight voltages or current
Output range	± 10V 0…20 mA
Resolution	15 bits across 21 mA - 650 nA/bit 15 bits across 10.4V - 320 μV/bit
Current draw @ 5.1V	150 mA
Current draw @ 24V	210 mA
Total backplane power	5.8 W
Voltage and current ratings	Backplane: 5.1V DC, 150 mA max, 24V DC, 210 mA max Output Voltage: -10…+10V Output Current: 4…20mA
Power consumption	5.8 W backplane power
Power dissipation	5.8 W to 3.15 W; 0 ohm to 750 ohm loads
Thermal dissipation	16.78 BTU/hr
Open circuit detection	Current output only (Output must be set to >0.1 mA)
Overvoltage protection	24V DC
Short circuit protection	Electronically current limited to 21 mA or less
Drive capability	Voltage: > 2000 Ω Current: 0…750 Ω
Settling time	< 2 ms to 95% of final value with resistive loads
Calibrated accuracy @ 25 °C (77 °F)	Better than 0.05% of range from 4…21 mA, -10.4…10.4V
Calibration interval	12 months typical
Offset drift	50 μV/°C typical (Voltage mode) 0.1 μA/°C typical (Current mode)
Gain drift with temperature, max	Voltage: 25 ppm/°C max Current: 50 ppm/°C max
Module error	Voltage: 0.15% of range Current: 0.3% of range
Module scan time, min	12 ms floating point 8 ms integer
Data format	Integer mode (left justified, 2 s complement) IEEE 32-bit floating point
Module conversion method	R-Ladder DAC, monotonicity with no missing codes
Isolation voltage	250V (continuous), Reinforced insulation type, Output Channels to Backplane No isolation between individual Output Channels
Module keying	Electronic, software configurable
Removable terminal block	1756-TBNH 1756-TBSH
RTB keying	User-defined mechanical
Slot width	1

Technical Specifications - 1756-OF8, 1756-OF8K

Attribute	1756-OF8, 1756-OF8K
Wire size	1756-TBNH Single wire connection: 0.33…2.1 mm2(22…14 AWG) solid or stranded copper wire, rated at 105 °C (221 °F) or greater, 1.2 mm (3/64 in.) insulation max. Double wire connection: 0.33…1.3 mm2(22…16 AWG) solid or stranded copper wire, rated at 105 °C (221 °F) or greater, 1.2 mm (3/64 in.) insulation max. Do not wire more than two conductors on any terminal. 1756-TBSH Single wire connection, 0.33…2.1 mm2(22…14 AWG) solid, or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 1.2 mm (3/64 in.) insulation max. Do not wire multiple conductors on any terminal.
Terminal block torque specs	1756-TBNH: 1.36 N•m (12 lb•in)
Wiring category(1)	1 - on signal ports
Enclosure type	None (open-style)
North American temp code	T4A
ATEX temp code	T4
IECEx temp code	T4

(1) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OF8, 1756-OF8K

Attribute	1756-OF8, 1756-OF8K
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 °C < Ta < +60 °C (+32 °F < Ta < +140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test dB, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz

Choosing a Data Format

Data format defines the format of channel data sent from the controller to the module, defines the format of the "data echo" that the module produces, and determines the features that are available to your application. You choose a data format when you choose a Communications Format. For more information on Communications Format, see page 10-6.

You can choose one of the two following data formats:

- Integer mode
- Floating point mode

Table 7.2 lists the features that are available in each format.

Table 7.2 Features Available in Each Data Format

Data format:	Features available:	Features not available:
Integer mode	Ramp to program value	Clamping
	Ramp to fault value	Ramp in Run mode
	Hold for initialization	Rate and Limit alarms
	Hold Last State or User Value in fault or program mode	Scaling
Floating point mode	All features	N/A

Features Specific to Analog Output Modules

Table 7.3 lists features that are specific to the non-isolated analog output modules. The features are described later in this section.

Table 7.3

Feature:	Page of description:
Ramping/Rate Limiting	7-3
Hold for Initialization	7-4
Open Wire Detection	7-4
Clamping/Limiting	7-5
Clamp/Limit Alarms	7-5
Data Echo	7-6

Ramping/Rate Limiting

Ramping limits the speed at which an analog output signal can change. This prevents fast transitions in the output from damaging the devices that an output module controls. Ramping is also known as **rate limiting**.

Table 7.4 describes the types of ramping that are possible:

Table 7.4

Ramping type:	Description:
Run mode ramping	This type of ramping occurs when the module is in Run mode and begins operation at the configured maximum ramp rate when the module receives a new output level. **IMPORTANT**: This is only available in floating point mode.
Ramp to program mode	This type of ramping occurs when the present output value changes to the Program Value after a Program Command is received from the controller.
Ramp to fault mode	This type of ramping occurs when the present output value changes to the Fault Value after a communications fault occurs.

The maximum rate of change in outputs is expressed in engineering units per second and called the **maximum ramp rate**. To see how to enable Run mode ramping and set the maximum ramp rate, see page 10-13.

Hold for Initialization

Hold for Initialization causes outputs to hold present state until the value commanded by the controller matches the value at the output screw terminal within 0.1% of full scale, providing a bumpless transfer.

If Hold for Initialization is selected, outputs hold if any of the three conditions occur:

- Initial connection is established after power-up
- A new connection is established after a communications fault occurs
- There is a transition to Run mode from Program state

The InHold bit for a channel indicates that the channel is holding. To see how to enable the Hold for Initialization bit, see page 10-12.

Open Wire Detection

This feature detects when current flow is not present at any channel. The 1756-OF4 and 1756-OF8 modules must be configured for 0-20mA operation to use this feature. At least 0.1mA of current must be flowing from the output for detection to occur.

When an open wire condition occurs at any channel, a status bit is set for that channel. For more information on the use of status bits, see page 7-11.

Clamping/Limiting

Clamping limits the output from the analog module to remain within a range configured by the controller, even when the controller commands an output outside that range. This safety feature sets a high clamp and a low clamp.

Once clamps are determined for a module, any data received from the controller that exceeds those clamps sets an appropriate limit alarm and transitions the output to that limit but not beyond the requested value.

For example, an application may set the high clamp on a module for 8V and the low clamp for -8V. If a controller sends a value corresponding to 9V to the module, the module will only apply 8V to its screw terminals.

Clamping alarms can be disabled or latched on a per channel basis.

IMPORTANT Clamping is only available in floating point mode.

To see how to set the clamping limits, see page 10-13.

Clamp/Limit Alarms

This function works directly with clamping. When a module receives a data value from the controller that exceeds clamping limits, it applies signal values to the clamping limit but also sends a status bit to the controller notifying it that the value sent exceeds the clamping limits.

Using the example above, if a module has clamping limits of 8V and -8V but then receives data to apply 9V, only 8V is applied to the screw terminals and the module sends a status bit back to the controller informing it that the 9V value exceeds the module's clamping limits.

IMPORTANT Limit alarms are only available in floating point mode.

To see how to enable all alarms, see page 10-13.

Data Echo

Data Echo automatically multicasts channel data values which match the analog value that was sent to the module's screw terminals at that time.

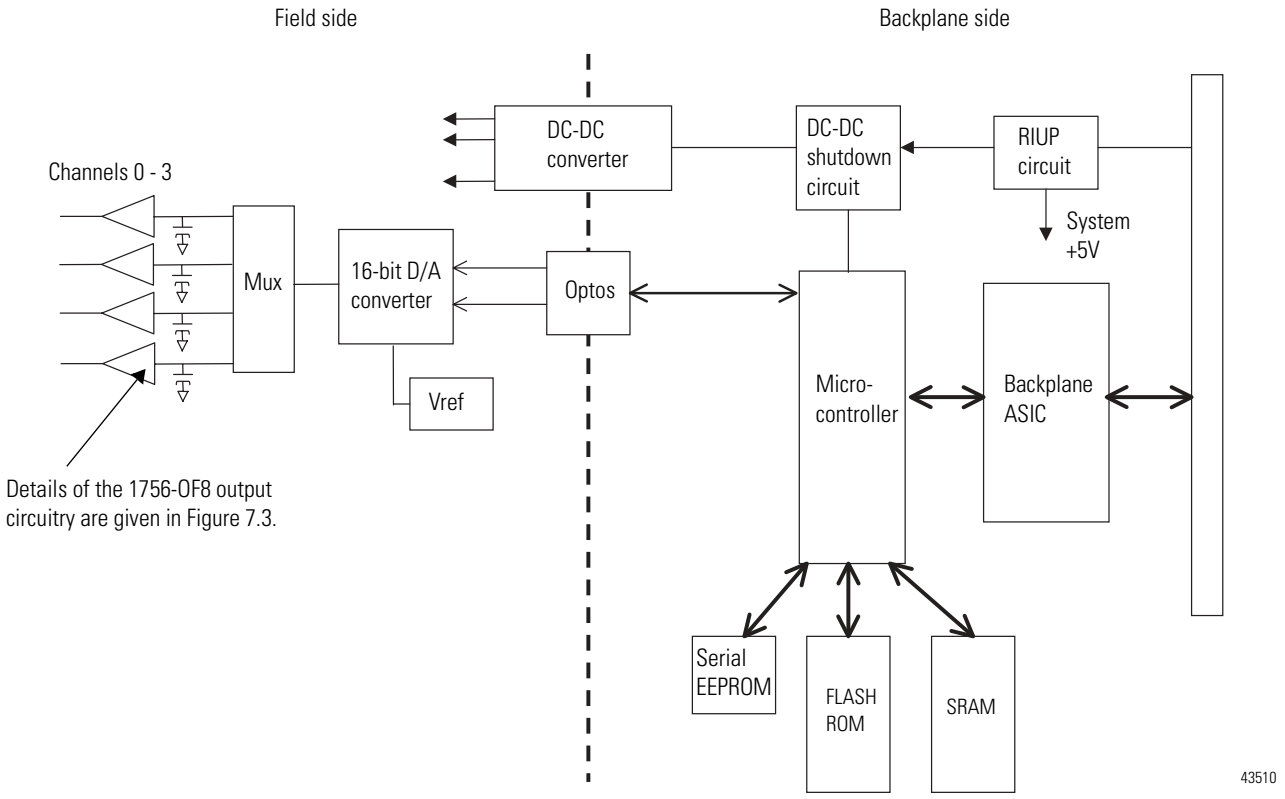
Fault and status data is also sent.This data is sent in the format (floating point or integer) selected at the Requested Packet Interval (RPI).

Using Module Block and Output Circuit Diagrams

This section shows the 1756-OF4 and 1756-OF8 modules' block diagrams and output circuit diagrams.

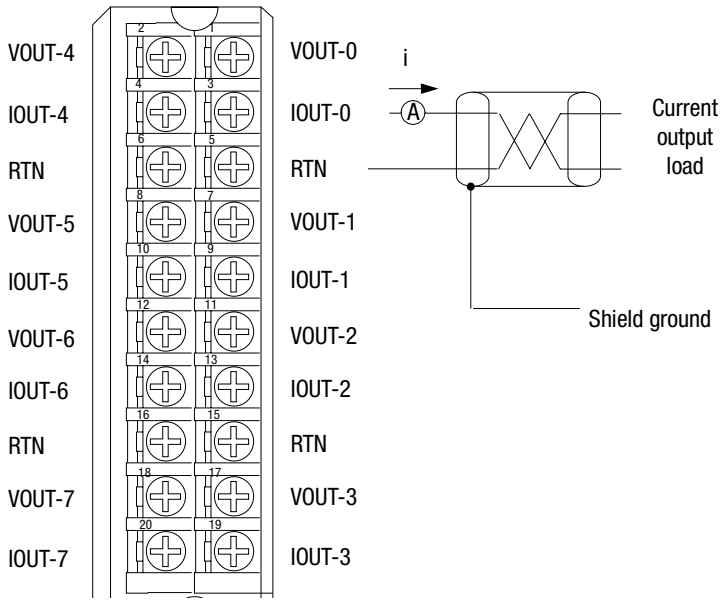
Module Block Diagram

Figure 7.1 1756-OF4 Module Block Diagram



Wiring the 1756-OF8 Module

Figure 7.6 1756-OF8 Current wiring example

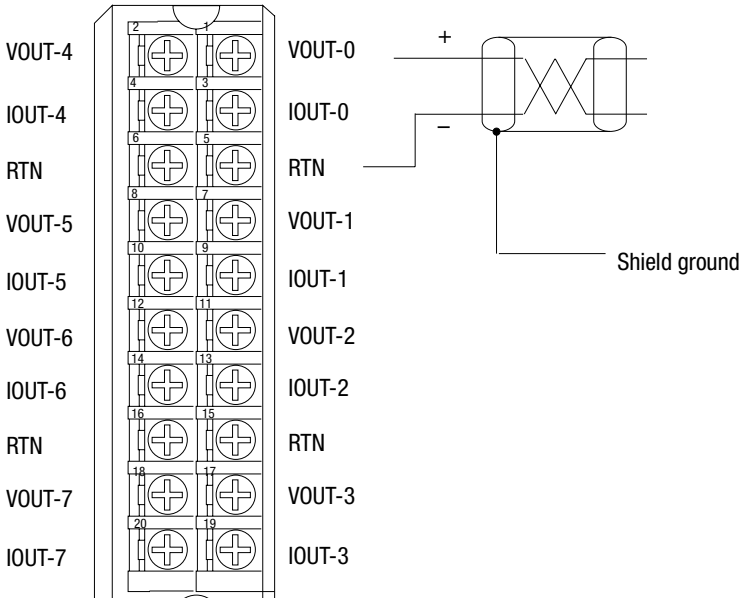


NOTES:

1. Place additional loop devices (e.g. strip chart recorders, etc.) at the A location noted above.
2. Do not connect more than 2 wires to any single terminal.
3. All terminals marked RTN are connected internally.

40916-M

Figure 7.7 1756-OF8 Voltage wiring example



NOTES:

1. Do not connect more than 2 wires to any single terminal.
2. All terminals marked RTN are connected internally.

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