Installation Instructions—70 Series 8173A-6507 Analog Control Unit

Document 108616 Rev 01

- **These products are not designed, tested, nor recommended for use in human safety applications.**
- Static Electricity can damage the electronics. Ensure you are properly grounded when handling the unit.
- Use with linear bipolar (+/-15 Volt) regulated power supply only. See power supply specifications on page 4.
- Unit may be susceptible to high levels of Radio Frequency Interference (RFI), such as that generated when using walkie-talkies.

The 8173A-6507 Analog Control Unit provides a voltage output signal which varies proportional to target movement, position, or translucence depending upon the application or sensor head used. The 8173A-6507 is compatible with all Cutler-Hammer 70 Series photoelectric heads. When used with the 1372A-6501 Slot Sensor head, the 8173A-6507 output varies directly with the amount of the light source strip blocked.

THEORY OF OPERATION

A complete analog control system consists of three parts: Sensor head(s) including light source and detector, the analog control unit, and a power supply provided by the user.

The analog control unit provides the modulated signal for the source and provides an analog output voltage proportional to the amount of light being returned to the detector. This output can be integrated into your control system.

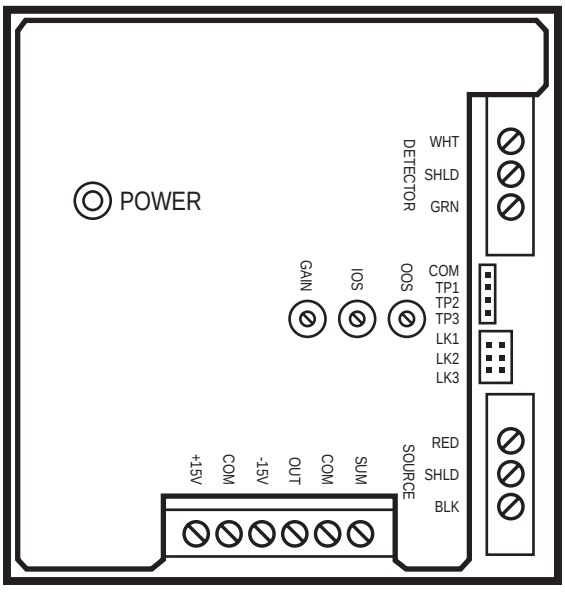
Adjustments on the 8173A-6507 Analog Control Unit include optical gain, input voltage offset, output voltage offset, gain range, and output signal polarity. See ADJUSTMENTS AND SWITCHES on page 4 of this manual for a more detailed description.

SETUP PROCEDURE

To setup the 8173A-6507 Analog Control Unit, follow the UNPACKING and INSTALLATION procedures that follow. You must always perform the INITIAL ADJUSTMENT on page 2. Use a high-impedance digital-volt meter (DVM) to make the measurements at TP3. Then choose one of the three SPAN ADJUSTMENT procedures on page 3 that most closely matches your requirements. If you wish to set span adjustments to voltages other than what is listed, use the procedure as a guide and substitute your required voltages. Finally, a procedure is provided for CONNECTING PAIRS OF 8173A-6507/1372A-6501 UNITS FOR CENTERING OUTPUT.

UNPACKING

Ground yourself and then carefully remove the unit from box and static dissipating plastic bag. **CAUTION: Static electricity can damage electronics.**

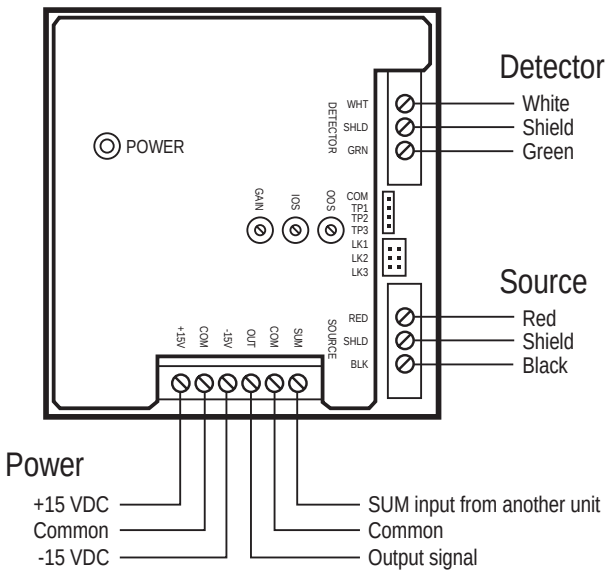


The 8173A-6507 Analog Control Unit

INSTALLATION

1. Secure 8173A-6507 to a DIN rail or other holder.
2. Observing color codes listed on the metal top plate, connect sensor cable to the twin 3-screw terminal strips. You may need to first trim off any crimped terminals supplied with the sensor cable. Keep unshielded leads short.

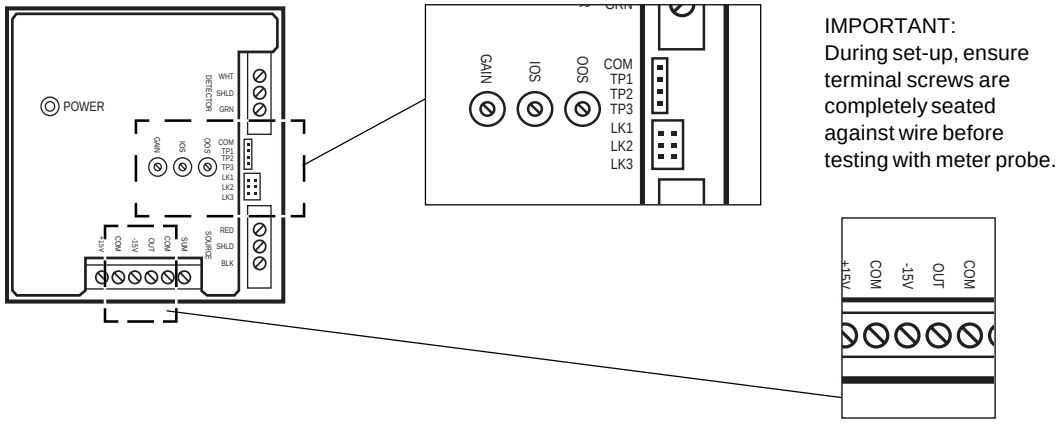
   Sensor Cable Routing: Good wiring practice requires that the sensor head cables be routed separately from power wiring and kept clear of SCR drives, high current relays, motor starters, and other electrical noise sources and associated cabling. Where possible, source and detector cables are best routed away from each other. This includes cables from multiple 8173 units. Where possible, twist exposed wire pairs of a cable together. The routing of source and particularly the detector cable, should provide protection against severe vibration and impact shocks. The cables at the termination points on the modules should be dressed with the minimum length of exposed wire to minimize cross talk and potential for interference coupling.
3. Connect bipolar DC power to the 8173 using the 6-screw terminal strips. With the power supplies off, connect the common wire (or wires) from the power supply to the terminal labeled "COM." Connect the +15 Volt supply wires to the terminal labeled "+15V" and connect the -15 Volt supply wires to the terminal labeled "-15V."
4. Turn on power supply and place the common or negative lead of a DC voltmeter on the "COM" terminal. Using the positive lead, verify that the +15 V supply is between +14.25 and +17.25 VDC, and the -15V supply is between -14.25 and -17.25 VDC.
5. After completing Adjustment Procedure (see below), turn off power and connect 8173A-6507 output to your equipment input: Use "COM" terminal for "Common" or input "Ground" connection. Use "OUT" terminal from 8173 for "Input" connection to your equipment.



Wiring Connections for the 8173A-6507 Analog Control Unit

ADJUSTMENTS

The diagram shows the location of the adjustments detailed on the following two pages.



IMPORTANT:
During set-up, ensure terminal screws are completely seated against wire before testing with meter probe.

INITIAL ADJUSTMENT

1. Verify that 3 jumpers are in place connecting pairs of pins labeled "LK1," "LK2," and "LK3." (If you are using the 1372A-6501 Slot Sensor Head, ensure that only "LK2" is installed.)
2. Connect a DC voltmeter: Negative to "COM" and positive to "TP3."
3. Apply power and wait approximately 10 minutes for the output to stabilize.
4. Completely block the light beam and verify that the "POWER" LED is glowing steadily. If not, check power supply and connections.
5. Unblock the beam and set-up sensor head for maximum optical signal expected in the application. If the "POWER" LED is still glowing steadily, proceed to Step 7.
6. If the signal level is too high, the "POWER" LED will flash, or the LED will go out in the case of extremely high gain. Verify that jumper "LK1" is in place. If jumper "LK1" is already in place, reduce the light level by partially obstructing the light beam or misaligning the beam until the "POWER" LED is steady.
7. Completely block the sensor light beam.
8. Using a small screwdriver, adjust "IOS" (Input Offset) for 0.00 Volts.
9. Turn the 25 turn "GAIN" pot fully counter clockwise.
10. Move voltmeter positive to "OUT" terminal. Adjust "OOS" for 0.00 Volts.
11. Perform one of the SPAN ADJUSTMENTS shown on the following page.

SPAN ADJUSTMENTS—Performed Only After INITIAL ADJUSTMENT on Previous Page.

Adjustment for Full Output Span (example: -9V to +9V)

1. Setup sensor head for half the maximum optical signal expected in the application (i.e. for the 1372A-6501 Slot Sensor Head, you would cover half of the light source).
2. Ensure all the jumpers labelled "LK1," "LK2," and "LK3" are installed. (If you are using the 1372A-6501 Slot Sensor Head, ensure that only "LK2" is installed.)
3. Connect a DC voltmeter with negative lead to "COM" and the positive lead to "TP3," and adjust "IOS" for 0.0 Volts.
4. With the light slot uncovered, connect the positive lead to the "OUT" terminal and adjust "GAIN" for 9 Volts. If the correct voltage is achieved, go to Step 7.
5. If the output voltage will not go positive enough, remove the jumper labeled "LK3" and adjust "GAIN" for maximum output voltage. If achieved, go to Step 7.
6. If the output voltage will still not go positive enough, remove "LK1" and repeat the INITIAL ADJUSTMENT on page 2 and repeat SPAN ADJUSTMENT.
7. Completely block the light beam and note the voltage reading—it should be negative, then adjust "IOS" to balance the two readings between negative (covered) and positive (uncovered). If either voltage exceeds 9 Volts, reduce the "GAIN" setting.
8. Alternately uncover and cover the light beam and adjust "GAIN" to increase or decrease the overall voltage range to +9 Volts (uncovered) and -9 Volts (covered).

Adjustment for Positive Output Span (example: 0 to +9V)

1. Setup sensor head for maximum optical signal expected in the application.
2. Ensure jumper labelled "LK2" is installed.
3. Connect a DC voltmeter with negative lead to "COM" and the positive lead to "OUT:" Adjust "GAIN" for most positive output voltage desired, in this example 9.00 V. If the correct voltage is achieved, go to Step 6.
4. If the output voltage will not go positive enough, remove the jumper labeled "LK3" and adjust "GAIN" for maximum output voltage. If achieved, go to Step 6.
5. If the output voltage will still not go positive enough, remove "LK1" and repeat the INITIAL ADJUSTMENT on page 2 and repeat SPAN ADJUSTMENT.
6. Verify that output voltage decreases as optical signal decreases and vice versa.
7. You have adjusted the 8173A-6507 for a span between 0 Volts and a positive voltage. Adjust "OOS" and "GAIN" as needed to change either value. Do not change "IOS."

Adjustment for Negative Output Span (example: 0 to -9V)

1. Setup sensor head for maximum optical signal expected in the application.
2. Remove the jumper labelled "LK2."
3. Connect a DC voltmeter with negative lead to "COM" and the positive lead to "OUT:" Adjust "GAIN" for most negative output voltage desired, in this example minus 9.00 V. If the correct voltage is achieved, go to Step 6.
4. If the output voltage will not go negative enough, remove the jumper labeled "LK3" and adjust "GAIN" for minimum output voltage. If achieved, go to Step 6.
5. If the output voltage will still not go negative enough, remove "LK1" and repeat the INITIAL ADJUSTMENT on page 2 and repeat SPAN ADJUSTMENT.
6. Verify that output voltage goes more negative as optical signal increases and vice versa.
7. You have adjusted the 8173A-6507 for a span between 0 Volts and a negative voltage. Adjust "OOS" and "GAIN" as needed to change either value. Do not change "IOS."

CONNECTING PAIRS OF 8173A-6507/1372A-6501 UNITS FOR CENTERING OUTPUT

1. For each 8173A-6507/1372A-6501 Sensor combination, perform the INITIAL ADJUSTMENT and the adjustment for POSITIVE OUTPUT SPAN (0 to +9 V) as previously described.
2. Designate one 8173A-6507/1372A-6501 combination as Master, the other as Slave.
3. Connect the "OUT" terminal of Slave to the "SUM" terminal of Master.
4. Connect a DC voltmeter to the "OUT" and "COM" terminals of Master.
5. Shift target so that it completely blocks one sensor and leaves the other sensor unobstructed. Note the value of the output voltage. Shift target so that it blocks the other sensor and leaves the first sensor unobstructed. The value of the output voltage should have varied from -9 V to +9 V or vice versa.

TROUBLESHOOTING

For troubleshooting and applications information, contact:
Cutler-Hammer Photoelectric Applications Engineering at (800) 426-9184.

Specifications

Electrical

LED Indicator:	Steady “ON” indicates power is on. “FLASHING” indicates the signal level is too high (reduce the gain or light level). “OFF” condition can indicate no supply power or extremely high gain.
Input Power:	+15 VDC 0.1 A max. and -15 VDC 0.05 A max., tolerance of +15%, -5%; total high frequency noise level above 500 Hz to be less than 10 mV. Use linear regulated power supply only.
Dissipation:	Less than 2 Watts
Output:	Equivalent to a nominal series source resistance of 330 Ohm for positive output and 660 Ohm for negative output when non-limiting. Voltage limited within the range +12 V to -12 V.
Output Current:	Maximum 15 mA sourcing and sinking. Continuous output current rating may not be exceeded for more than 10 seconds without damage to the unit.
Summing Input:	Used to sum the output of another unit or to provide extra offset capability. Allows an external input to be added with the internal signal, and inverted at the output. Output = (internal signal -1*sum input). Impedance is 10,000 Ohms
Source Drive:	Provides modulated drive current to the remote LED(s). Drive is ground referenced and the active terminal may be shorted to ground but must not be connected to a voltage source.
Source Current:	25 mA peak at 25° C
Modulation:	15 kHz with 50% duty cycle
Detector Input:	Accepts the photocurrent from the remote photodiode(s). Ambient light photocurrents above 100 mA may affect linearity. Signal offset due to source/detector crosstalk may increase noticeably due to: non-standard cabling, cables longer than 40 feet., improper splices, and anything else that contributes to the parasitic coupling between source output and receiver input. Although such offsets can be adjusted out, they are not necessarily a constant factor.
Input Protection:	Protected against damage from low power static discharges and other voltages less than 20 V.
Rise Time:	20 mS for 10% to 90% of signal range at +/-10 V output.
Cable Length:	Cables must be continuous wire with no splices, terminal junctions or damage. Up to 40 feet of shielded twisted pair cable can be used without degrading performance. Where cables longer than 40 feet are required, the source and detector cables should be separated to limit cross-talk.

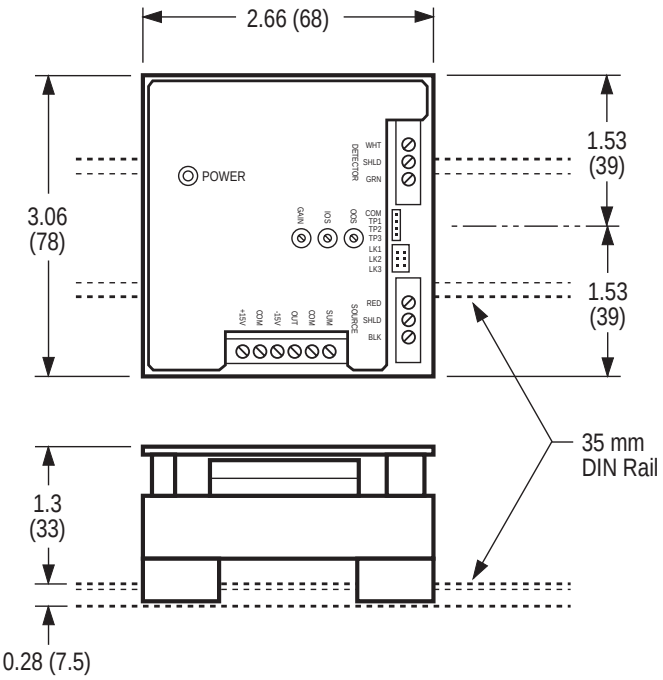
Mechanical and Environmental

Mounting:	DIN rail mounted
Terminations:	6 screw terminal block positions for remote sensor heads 6 screw terminal block positions for power and signal input and output
Weight:	Approximately 4 ounces (550 grams)
Temperature:	0° C to +55° C (Operation from -25° C to +85° C is possible but conformance to this specification cannot be guaranteed.)
Relative Humidity:	Up to 90% non-condensing
Thermal Stability:	Output drift is less than 5% after a 10 minute warm-up period under constant temperature conditions. Output change is less than 0.5%/degree C over the operating temperature range.

Adjustments and Switches

Input Offset (IOS):	A 25 turn pot provides adjustment for a constant that is subtracted from the input signal.
Gain Pot:	A 25 turn pot allows continuous adjustment of output signal level from 0 to 100% of the available signal.
LK1 Jumper:	Reduces the optical signal gain by 10. This extends the range of inputs that can be accommodated without overload.
LK3 Jumper:	Reduces the demodulated signal by 10 to decrease the output
LK2 Jumper:	When installed, the output voltage increases as the optical signal increases. When removed, the output voltage decreases as the optical signal increases. The LK2 Jumper is removed when the output from one Sensor Amplifier is input to the SUM input of another Sensor Amplifier for differential output.
Output Offset (OOS):	A 25 turn pot provides for the adjustment of a constant that is always added to the output.

Approximate Dimensions



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