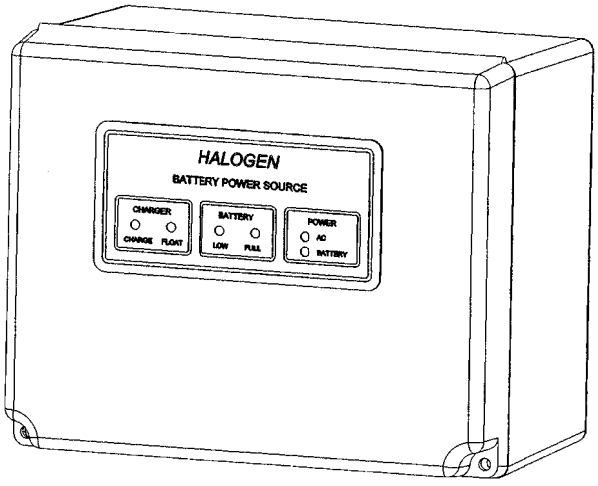
HALOGEN
VALVE SYSTEMS, INC.

24 VDC Power Supply
with Battery Backup

For Jupiter And Satellite
Gas Detector Systems

Installation And Operations Manual



Practical Safety Technology for Toxic Gases

4/05

These instructions generally describe the installation, operation and maintenance of Halogen Valve Systems' **24VDC Power Supply** with battery backup. Halogen Valve Systems reserves the right to make engineering refinements that may not be described herein.

Halogen Valve Systems takes all possible precautions in packaging to prevent shipping damage. Carefully inspect the contents and report damages to the shipping agent, Halogen Valve Systems, or your local sales representative. Inspect all packing materials before discarding to prevent loss of accessories, mounting hardware or instructions.

Halogen Valve Systems or your local sales representative can provide technical consultation and personnel training on the installation and operation of this system.

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Table of Contents

I. Introduction 1
- **A. General 1**
- **B. Warranty 1**
- **C. Standard Equipment. 1**
- **D. Specifications 1**

II. Operation 1
- **A. General 1**

III. System Installation 2
- **A. General 2**
- **B. Mounting Control Box 2**
- **C. Gas Detectors Input Wiring 2**
- **D. Output Relays 3**
- **E. 115 / 230 VAC Power 3**
- **F. Battery Power 3**
- **G. Membrane Panel Configruations 4**
- **H. LED Light Definations 4**

IV. Systems Control and Maintenance 5
- **A. Battery Replacement 5**
- **B. Circuit Board Replacement 5**
- **C. Power Supply Replacement 5**
- **D. Jupiter Gas Detector 6**

V. Optional Items Available 6
- **A. Satellite Gas Detector Relay 6**
- **B. SCADA Serial Port 7**
- **C. SCADA Information Chart 7**
- **D. Relay Interface Module 7**

VI. 24 VDC Power Supply Wiring 8

VII. Relay interface Module Wiring 9

I. Introduction

A. General

The Halogen Valve Systems' **24VDC Power Supply** with Battery Powered Backup has been developed to be used with the standard **Jupiter** and **Satellite** Gas Detection systems.

B. Warranty

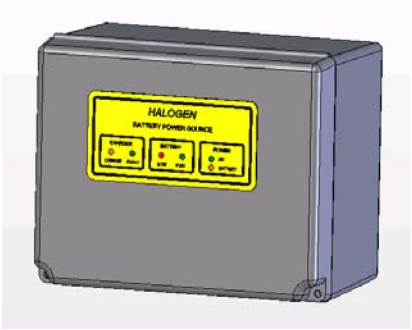
Halogen Valve Systems' **24VDC Power Supply** is warranted to be free of manufacturing defects for a period of 2 years. Any defective components shall be replaced free of charge during the warranty period with the exception of the battery which has a one year limit. Damages due to negligence or other outside and environmental forces are excluded.

C. Standard Equipment

The standard equipment for the **24VDC Power Supply** with Battery Powered Backup consists of the following major components and accessories:

Major Components

1. The NEMA-4X **Control Box** is designed to be mounted to a wall or solid structure. Inside this enclosure is a microprocessor controller designed to provide 24 VDC for a variety of equipment.



2. The lead-acid gel-cell **Battery** is UL approved and designated as HP 9-12 (12V, 36W Cell 15min) 8.0 Ah High Rate.

Additional elements required for installation

1. 115/230 VAC electrical source with dedicated disconnect.
2. Corrosion resistant NEMA-4X conduit and sealed fittings.
3. Suitable anchors for rigid wall mounting of the NEMA-4X **Control Box**.

Options

1. SCADA direct RS232 serial port connection to provide relevant information about the **24VDC Power Supply**.
2. Special internal circuit designed to accept and interpret a 4-20 ma signal from a **Satellite** gas detector to close a settable dry contact relay.
3. A **Relay Interface Module** can be provided with two 12 VDC activated output relays that are rated at 115/230 VAC—5 amp.

D. Specifications

Output Voltage ----------24 ± 3 VDC
Output Current ---------- 0.200 amps
Input Voltage range----------95-260 VAC
Input current ----------≤0.2 amps
Battery ---------- 12.7 Volts nominal
Battery Amperage----------8.0 AH
Relay Rating----------0.1 amp @ 24 VDC
Relay Contacts---------- SPST
Operating Temp. Range-------- 0 °C to 40 °C
Control Box Rating----------NEMA-4X

II. Operation

A. General <u>≤0.2 amps</u>

The **24VDC Power Supply** with Battery Powered Backup provides an uninterrupted 24 VDC power source for up to four (4) **Jupiter** gas detection systems. The battery charging circuit in the system is designed to maintain a full charge that will provide 24 VDC output in the event of an AC power loss.

The control panel is constructed of specific materials selected for use around liquid or dry chlorine gas. There is a Viton formed sealing ring between the control box and its cover surface to provide a NEMA-4x rating for the control system.

The control panel's internal DC power system is powered by 115/230 VAC. Backup power for the system is provided by a self-contained 12-volt battery that is continuously monitored by a microprocessor. A small amount of the internal DC power is used to display the status of the system and charge the battery. The remaining system power provides the 24VDC output. In the event the AC power is lost, the battery is designed to provide an output of 24 VDC for up to 3 days. The system will provide a closed contact when the battery fails.

III. System Installation

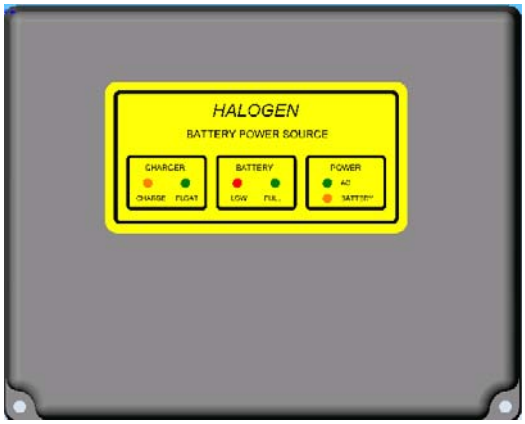
A. General

Mounting Tabs

The control system panel box, enclosure fittings (MAX-LOC cord grip) and cables are NEMA-4X rated. It is recommended that all components be located indoors or within a weather-protected building or gas cabinet. **The 24VDC Power Supply must be located within a weather-protected enclosure when mounted and in service**.

B. Mounting Control Box

Installation of the control panel should be performed by an electrician in accordance with applicable electrical codes.



The enclosure is equipped with both tapped screw holes and mounting tabs for this purpose. Insert the mounting tabs that are included with the controller. Fasten the mounting tabs to the wall using the proper fastener for the structure. The control panel and status lights must be easily observable by operating personnel.

The control system is mounted within a gasketed enclosure rated for a corrosive chemical environment. The control panel should be rigidly mounted to a wall or other permanent structure convenient to the gas detection system. Installation of the control panel should be performed by an electrician in accordance with applicable electrical codes.

CAUTION

Do not connect AC power to the control unit until instructed to do so. Verify that the AC power is turned off before connecting power leads to the control unit. Connecting AC power to the wrong terminal block will damage the control unit.

C. Gas Detectors Input Wiring

Run all rough wiring through conduit and entry fittings that maintain gas-tight integrity of panel (NEMA 4X). Connect the gas detector power wires requiring 24 VDC from the detector to the terminal block on the circuit board inside the power supply control box. Verify that the gas detector wire colors correspond with the positive and negative leads on the circuit board control blocks and that they have the proper polarity. (Red is positive and black is negative.) **Never short the 24 VDC Power Supply output. Permanent failure of this device will occur.**

Control Box Inside

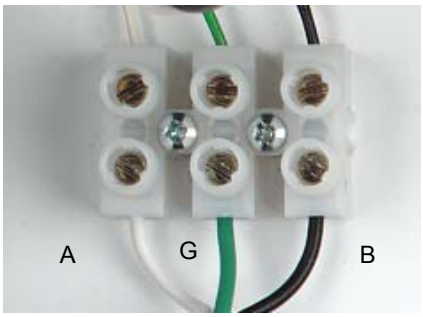
The incoming leads from the remote gas detector system or systems should be connected to the "TB1" terminal block slots 1 and 4, as shown on the circuit board wiring diagram on page 8. In the case of the **Jupiter** gas Detector systems**,** up to a maximum of 4 **Jupiter** systems can be connected to the 24 VDC power system.

A **Satellite** gas detector option will permit a connection to "TB1" terminal block on slots 1 and 2. (See page 8.) With this option you can control an internal relay to activate at various ppm levels. The closed contact output from this relay can be used to activate several of our emergency gas shutoff systems.

WARNING
If the polarity of the battery connection is accidentally reversed, the circuit board will be permanently damaged. Return to the factory for repairs.

D. Output Relays

There are two dry contact output relays rated at 24 VDC @ 100 ma on the circuit board, shown on page 8. The **Signal** relay can indicate that the internal 24 VDC power is out of range or the battery is at the critical range (below 11.5 VDC). The **Fault** relay can indicate that there is no battery or that the battery voltage is in low range (11.51 to 12.1).



Terminal Block

E. 115 / 230 VAC Power

It is recommended that 115 / 230 VAC power to the control panel be supplied from its own circuit breaker. Wiring should be through rigid PVC or flexible PVC coated conduit such as "Liquid-tite." Connections and terminations should be made only in enclosures rated for the corrosive environment encountered in chlorine facilities (NEMA 4X). Daniel Woodhead "Max Loc" or similar fittings are preferred.

Connect AC power wires to the terminal, after the control panel is mounted and all I/O connections are made. **Do not activate the AC Power until after the battery is connected**. Connect the 115 / 230 VAC powered leads to the terminal blocks marked “BLK” (B, high side) and the “WHT” (A, low side). Now connect the “GRN” (G, ground) which is grounded to the back plate. Conduit and fittings for the incoming wires should be rated NEMA-4X to maintain a gas and liquid-tight seal for the control enclosure.


Control Box with Battery

F. Battery Power

While holding the battery slightly out of the control box to provide access to the terminals, connect the positive terminal of the battery to the **Red** controller wire. Now slide the battery into the bracket and Install the battery cross bar and tighten the captive screws. Connect the negative terminal of the battery to the **Black** controller wire. Now that the battery is connected, the “BATTERY” LED light (amber) on the front membrane panel should be on and steady.

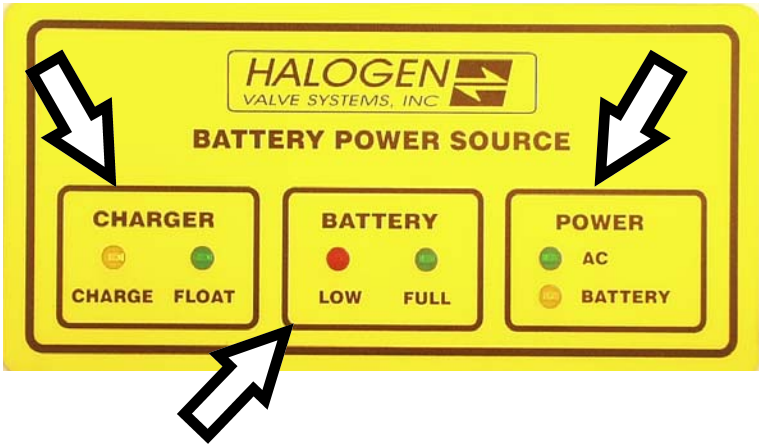
WARNING
If the “CHARGE“ light is flashing, the battery may not operate or recover. If the battery is defective or fully discharged, it will not recover regardless of charging time. In this case, the battery must be replaced.

Now that the battery is connected and in place, **you can apply 115 / 230 VAC power to the control system at the circuit breaker**. The “AC” LED light (green) should be on and steady. The system is now operational and ready to go.

Expected life of a battery of this type is 2 to 3 years under normal conditions. The sustaining charge provided by the charging circuit will maximize battery life. **It is recommended that the battery be replaced annually** with a factory fresh battery to maintain the warranty and have the ability to recover to a full charge if the power is off for an extended period of time.

Storing spare batteries is not recommended. If spare batteries are purchased, they only have a shelf life of approximately one year when stored in a cool, dry place. Recharging of the spare batteries on a regular monthly service rotation is essential to maintaining the batteries’ shelf life.

G. Membrane Panel Configurations



When 115 or 230 VAC power is applied, the "CHARGE" (amber) light will be blinking fast but then it should go to a steady amber after a few minutes. Then the battery "LOW" (red) light should come on steady. **Do not proceed with the remainder of the installation if the "CHARGE" light fails to change to steady**. The battery is defective or may have discharged to a very low level during storage or transit.

Refer to the chart below for the LED configuration definitions. The "CHARGER" status lights should be on either "CHARGE" or "FLOAT" (green) depending on the state of the charge on the battery. If the battery is fully charged, the "FLOAT" and "FULL" green lights will be on and steady. During AC operation, the battery is tested under load once per week. If the battery is bad then the "AC" (green) light will be on steady and "BATTERY" (amber) light will be fast blinking. If this occurs, order a new factory fresh battery.

If the internal DC power supply (15.5 Volts) circuit is not within its standard working limits, during AC operation, both the "AC" and "BATTERY" lights will be slowly blinking. If this unlikely condition occurs, then the internal power supply should be replaced.

H. LED Light Definitions

OS = On Steady **FB = Fast Blink** **SB = Slow Blink**

	CHARGER		BATTERY		POWER	
AC POWERED	**CHARGE**	**FLOAT**	**LOW**	**FULL**	**AC**	**BATTERY**
AC Power Applied	**OS/OFF**	**OS/OFF**	**OS/OFF**	**OS/OFF**	**OS**	**OFF**
No Battery Detected	**OFF**	**OFF**	**FB**	**OFF**	**OS**	**OFF**
Bad Battery Detected	**OS/OFF**	**OS/OFF**	**OFF**	**OFF**	**OS**	**FB**
Trickle Charge	**FB**	**OFF**	**OFF**	**OFF**	**OS**	**OFF**
Bulk Charge < 13 Volts	**OS**	**OFF**	**OS**	**OFF**	**OS**	**OFF**
Bulk Charge >= 13 Volts	**OS**	**OFF**	**OS**	**OS**	**OS**	**OFF**
Float Charge	**OFF**	**OS**	**OFF**	**OS**	**OS**	**OFF**
Internal DC Power High	**OS/OFF**	**OS/OFF**	**OS/OFF**	**OS/OFF**	**SB**	**SB**
Internal DC Power Low	**OFF**	**OFF**	**SB/OFF**	**SB/OFF**	**SB**	**SB**
BATTERY POWERED						
Charge Level						
Full (12.51 to 15.0 Volts)	**OFF**	**OFF**	**OFF**	**SB**	**OFF**	**SB**
Medium (12.11 to 12.5 Volts)	**OFF**	**OFF**	**SB**	**SB**	**OFF**	**SB**
Low (11.51 to 12.1 Volts)	**OFF**	**OFF**	**SB**	**OFF**	**OFF**	**SB**
Critical (less than 11.5 Volts)	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**

A. Battery Replacement

a) Disconnect 115 /230 VAC power.
b) Open control panel door and disconnect the black battery lead.
c) Loosen the two screws on the battery cross-bar and remove.
d) Pull the battery out about half way. Disconnect the red battery lead and remove the battery.
e) Place the new battery halfway into the bracket so that the positive terminal is within easy reach of the red battery lead. Connect the red lead, then slide the battery fully into the bracket.
f) Re-install the battery cross-bar and tighten the screws.
g) Connect the black lead to the negative terminal of the battery. The "BATTERY" light (amber) should illuminate.
h) **Now you can reconnect 115 /230 VAC power.**

12 VDC Battery

All of the power management, display and diagnostic elements of the control panel are integrated on a single circuit board mounted within the control panel enclosure. The main power circuit is located under the top support plate for safety and to protect it from damage during installation.

B. Circuit Board Replacement

The software program is stored in a memory chip that is pre-programmed at the factory. The board is not field repairable, so if it malfunctions, it must be exchanged with a new factory unit.

a) Disconnect and remove the battery using the procedures described in paragraph **A** above.
b) Disconnect the input wiring and signal output wires from the circuit board.
c) Disconnect all wiring and connections including the battery cable clip.
d) The circuit board may now be removed.
e) Remove the screws holding the circuit board in place and gently remove it.

Installation of a new circuit board is approximately the reverse of the above procedure. Reconnect the wires and cables to the circuit board making sure the connections are of the proper polarity. Be sure that the terminals and wire connections are firmly tight. **Remember - do not connect the AC power until after the battery is connected and in operation.**

C. Power Supply Replacement

The 15.0 VDC power supply can be replaced following the procedure for the circuit board replacement described in paragraph **B** above. The power supply is located just below the main circuit board and can be obtained by removing the plate that holds the circuit board after all AC and DC power to the board is terminated. After removing the wires and cables form the main circuit board, simply remove the four screws that hold the metal plate in place and gently remove it. Then, remove the wires from the power supply and replace with a new power supply. Installation of a new power supply is approximately the reverse of the removal procedure. **Remember - do not connect the AC power until after the battery is connected and in operation.**

CAUTION

Installing unauthorized power relays or other devices inside the system control box will void the Warranty. These relays can cause magnetic pulses that may permanently damage the computer.

D. Jupiter Gas Detector

Jupiter Gas Detector

The testing or calibration of sensor or remote inputs to the controller may be checked by the following procedure. This procedure also provides a check of the electrical continuity of the entire system including the sensor wiring.

1. Connect the Jupiter Gas Detection System to an output device like an Emergency Gas Shutoff System.
2. Remove the input 115/230 VAC power from the power supply and note the battery light is on and steady. Expose the gas sensor to a calibration gas or otherwise activate the gas detector system to provide a closed contact.
3. The output device or Emergency Gas Shutoff System should operate, indicating that the control unit received the signal and the 24VDC Power Supply is operating properly.

If the gas sensor continues to detect chlorine gas it will automatically shut the chlorine valve again when it is reset. Make sure that the room is completely clear of the gas before resetting the automatic gas shutoff system. Otherwise, the gas sensor will detect the residual chlorine gas in the room and shut the system down again as soon as it is turned on. This can happen easily when changing cylinders. A small amount of chlorine gas may leak out of a valve being changed and set off the gas sensor. You may increase the ppm setting that activates the relay to decrease the chance this will occur. Refer to local maximum limits for setting the upper ppm level.

This is a functional test of the entire system. When the testing is completed, the system is fully operational. The 115/230 VAC Input power should be reconnected and checked before terminating the test procedure.

V. Optional Items Available

A. Satellite Gas Detector Relay

Satellite Gas Detector

An optional Satellite Gas Detector can be connected directly to the 24 VDC Power Supply to provide a closed contact relay rated at 24 VDC @ 100 ma for an emergency gas shutoff actuator. A ppm set point switch (SW1 on the circuit board) is provided in whole number percents for the operating range of the gas sensor. To have a 3 ppm setting, for a 0 to10 ppm range sensor, you would simply set the SW1 switch on the circuit board at the number 3 (30 percent of the range) to close the relay contact when the sensor detects a 3 ppm concentration of gas. With this option activated, an output relay (TB1) in the 24 VDC Power Supply can be connected directly to the input of an emergency gas shutoff terminal to activate the closing sequence.

There is also a 4 to 20 ma output from the Satellite Gas Detector that can be connected from the 24VAC Power Supply terminal on the circuit board directly to a SCADA system. This information can be transmitted simultaneously with the signal from the gas detector.

Calibration of the Satellite Gas detector can easily be accomplished by only one person with a Calibration Kit. The Satellite gas detector must be calibrated before it can become operational. Just follow the easy calibration steps in the Satellite Instruction Manual.

B. SCADA Serial Port

An optional RS232 serial port can be provided to give the local SCADA system a large variety of additional information. Most of the items controlled by the microprocessor are available at a BAUD rate of 9600. The Fault Codes are repeated at one minute intervals while the fault persists. Chart **C**, below, depicts the ASCII characters, definitions they represent and number of minutes between system timing cycles.

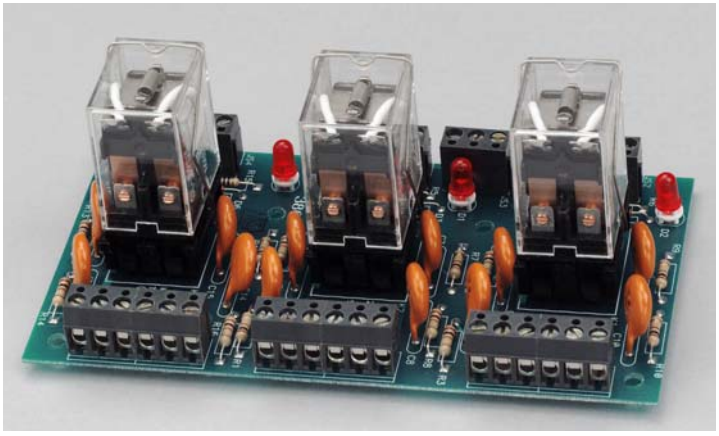
C. SCADA Information Chart

ASCII Characters	Definition	Minutes Per Cycle
SR	System Reset - Hardware or Software Reset Occurred	Now
BF	Battery Is Disconnected	1
BL	Battery Voltage Critical (Under 12.1V)	1
BH	Battery Charge > 15.0 Volts	1
CF	Trickle Charge Mode	1
GF	4-20 ma Fault Found at Input From Sensor	1
GL	Gas Leak Detected	1
+5	+5 Volt Logic Out Of Range (4.6 to 5.3V)	1
+V	+24 Volt Supply Out of Range (<12.1 or >15)	1
BD	Bad Battery	60
AC	Running on AC Power	60
BT	Running on Battery Power	60
CH	Battery Charge Full	60
CM	Battery Charge Medium	60
CL	Battery Charge Full	60
GA	Gas sensor is Attached	60

Serial Code is followed by carrage return and line feed (0x0d,0x0a)

D. Relay Interface Module

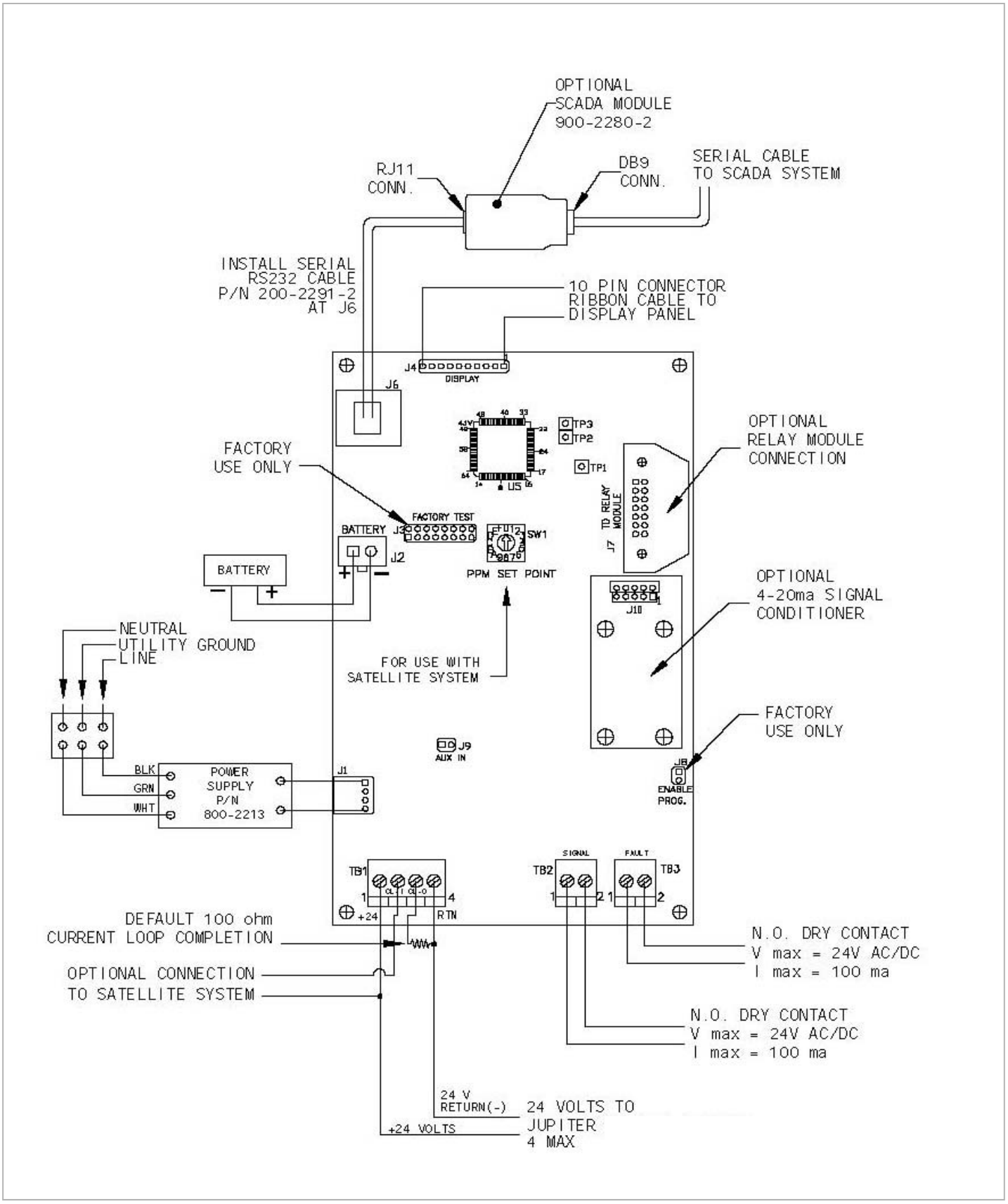
The **Relay Interface Module** can be used in the 24VDC Power Supply to provide a protected closed contact rated at 115/230 at 5 amps for the **Signal** and **Fault** circuit board terminals. The TB2 connection block can be wired to the K1 or K2 relay control block or the quick connector can be used to provide the signal that activates the module's output relays. This might be necessary if there is no SCADA system and lights and/or horns are needed to warn the staff of potential problems. Relays K1 & K2 are provided as momentary relays, but as an option, they can be changed to latching relays.



Relay Interface Module

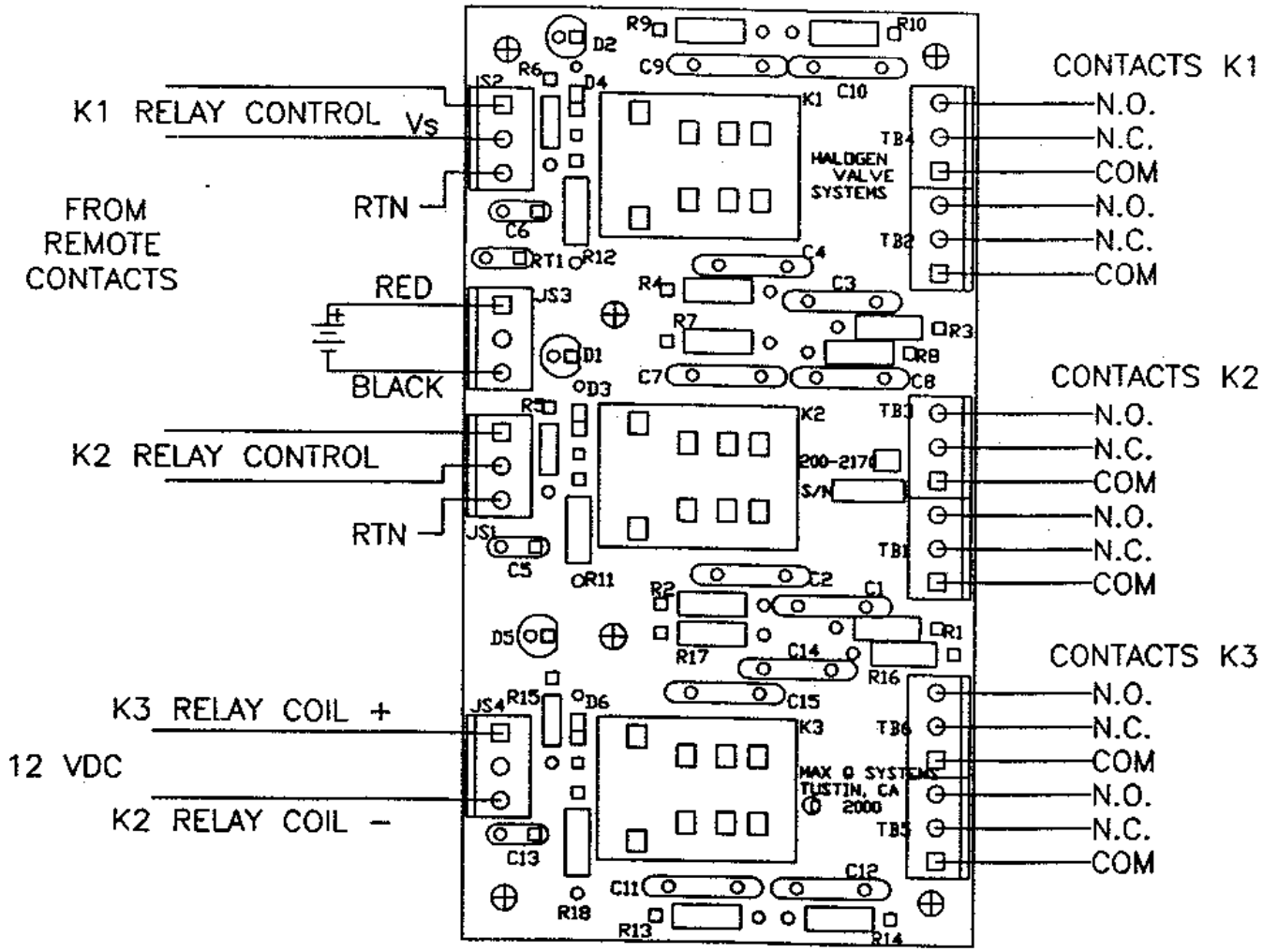
VI. 24 VDC Power Supply Wiring

*For the **24 VDC with Battery Backup***

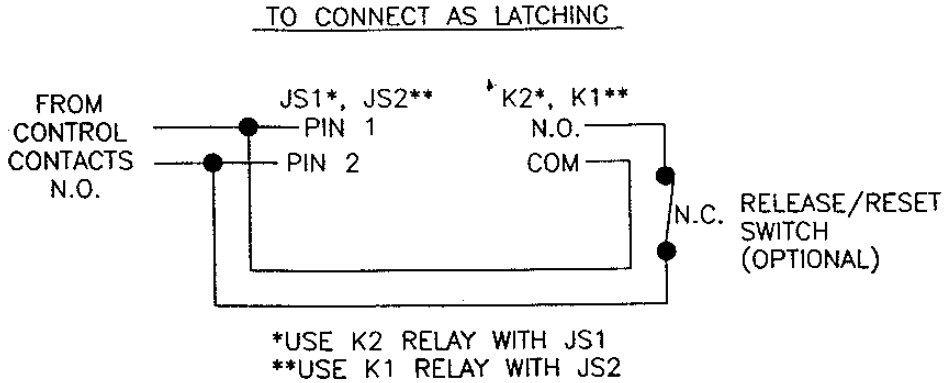


VII. Relay Interface Module Wiring

*For the Optional **Relay Interface Module***



*For the **Latching Relay Option***



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