

USING THE RPS-1, RECHARGEABLE POWER SUPPLY IN THE OM-420

OVERVIEW:

The RPS-1 is a self-contained battery power source for use in conjunction with the OM-320/420 System Base to power transducers requiring external power (e.g. Strain Gages, Pressure transducers, 4 to 20ma Loop Transmitters, etc.) over a voltage range from 3.5 to 22 VDC.

The RPS-1 contains two User-configurable, rechargeable gel-cell type batteries and integral recharging circuitry. The charging circuitry will accept AC or DC current from Photovoltaic arrays, wind generators, utility sourced transformers/plug-in power supplies, or other current sources. The sealed batteries are capable of operating in any orientation and over a temperature range of -10 to 60C. A slide switch allows the User to configure the RPS-1 for 12 or 24VDC operation.

Two User-programmable Power Supply outputs are available which can source 7 different regulated voltage levels from 3.5VDC to 22VDC. Outputs are short circuit / over-current protected.

The two Power Supplies can be independently programmed for output voltage as well as type of operational mode. Two modes are available, Continuous ON or AUTOMATIC Operation. In AUTOMATIC Operation, the power supply is under control of an optically isolated low voltage (5VDC, 0.5mA) control input signal. This control INPUT interfaces directly to a OM-320/420 Digital Output line which can be programmed to cycle the RPS-1 power supplies ON and OFF, providing transducer excitation under OM-320/420 control during a logging session. This automatic power supply cycling technique maximizes RPS-1 battery life. See Figure 1 for a sample Hypernet

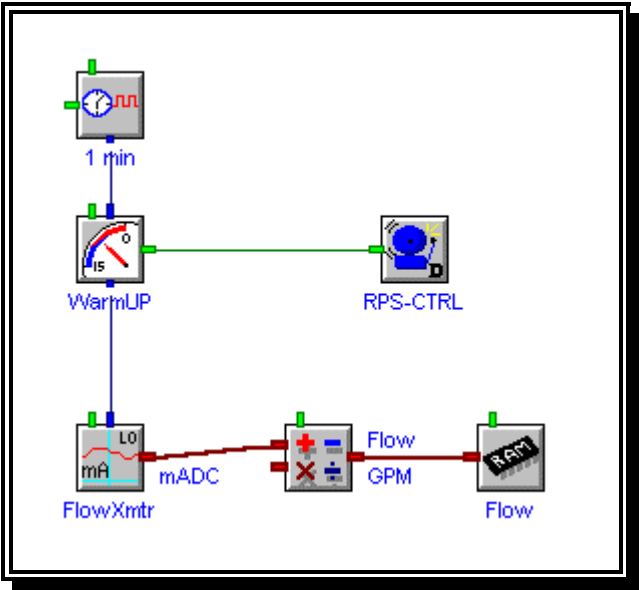


Figure 1: RPS-1 Control Using HyperWare Warm-Up Icon

An integral State-of-Charge (SOC) indicator is provided which will display an approximate Battery State-of-Charge based on battery voltage under a fixed load. Test is actuated by depressing a momentary SOC Test Switch.

HARDWARE / USER CONTROLS:

Figure 1 illustrates the functional blocks contained within the RPS-1. An explanation of each block follows:

MAIN POWER SWITCH

Provides ON/OFF control of the RPS-1. In the OFF position, the batteries are disconnected from the RPS-1 circuits (power supplies, State-of-Charge indicator, charging circuits, etc.). This switch in either 12 VDC or 24 VDC ON position selects how the two 12 volt gel-cell batteries are connected (parallel for 12 VDC nominal output or series for 24 VDC nominal output). Note: For charging, the Main Power switch must be in either the 12VDC or 24VDC position.

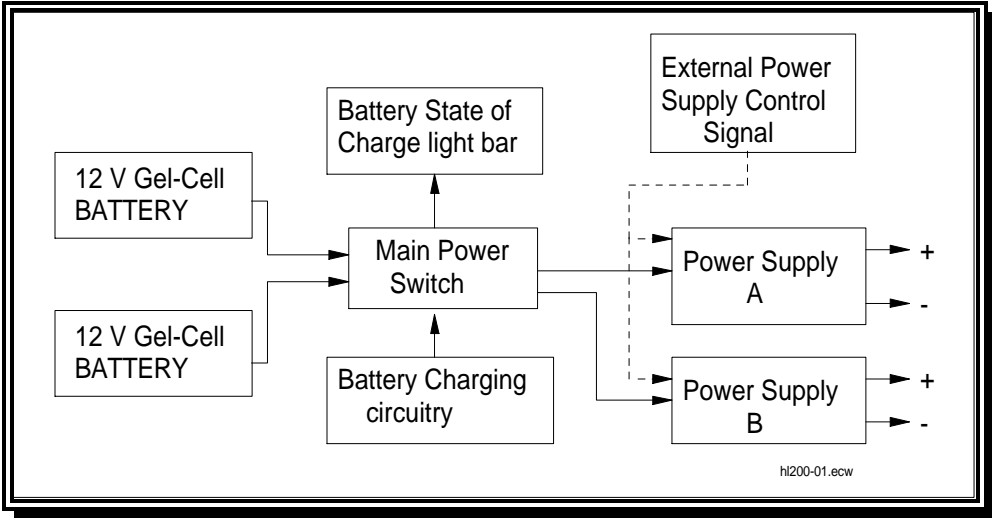


Figure 2: RPS-1 Functional Block Diagram

CHARGER INPUT

Two terminal connections are provided for connection of an external current source for charging the RPS-1 batteries.

POWER SUPPLY OUTPUTS

Two independent User programmable voltage power supply outputs (A and B) feed the twelve position terminal strip on the right side of the unit. The top four terminals are all connected to the A supply output and the middle four to the B supply output. The bottom four terminals are all connected together and to the COMMON (circuit ground) of the two supplies.

OUTPUT VOLTAGE / MODE SWITCHES

Each of the two power supplies has an eight position DIP switch associated with it. The top seven switches determine the output voltage for that supply and the last switch (#8) defines the mode of operation (AUTO or ON) for the power supply.

CONTROL INPUT

Two terminal connections are provided for connection of a low voltage power supply control signal. This input signal controls the ON/OFF cycling of power supplies set to the AUTO mode. Typically, this control input is controlled by a OM-320/420 Digital Output.

STATE-OF-CHARGE INDICATOR

When the TEST button is depressed, an approximate battery state of charge is displayed on the 10 position Display. This display is based on the battery voltage under a slight load.

INSTALLATION

MOUNTING

The RPS-1 should be mounted in a vertical position in order to optimize rain shedding and prevent direct spray into the bottom fittings. The enclosure is designed for indoor and outdoor exposure within the specified temperature limits. Battery life and capacity is at a maximum when the batteries are at a temperature of 20C (68F). Shading from direct sunlight and/or insulation WITHOUT RESTRICTING AIR FLOW AROUND THE UNIT can optimize battery life and capacity. During charging, the batteries will emit small amounts of FLAMMABLE AND EXPLOSIVE HYDROGEN GAS. Additionally, heat is generated by the voltage regulating circuits. For these two reasons, ventilation around the package will maximize performance as well as minimize risk of potentially hazardous explosions.

WIRING

The OM-420 is factory configured to use OM-320/420 Digital Output #1 to control the RPS-1. These connections are as follows: The positive Digital Output (Marked D01 on the TSA) is connected to the RPS-1 positive CONTROL INPUT terminal. The negative Digital Output (Marked GND on the TSA) is connected to the RPS-1 negative CONTROL INPUT terminal. (See Figure 2)

Power Supply wiring should be routed through the liquid-tite fittings in the bottom of the OM-420 enclosure. For most applications, 18 AWG wire will suffice without excessive voltage drop (18 AWG will result in less than 0.1 V drop in 100 feet at 150 mA). PVC jacketed multi-conductor wire is a good choice that seals well in the liquid-tite fittings.

OPERATION / SET-UP

POWER SUPPLIES

Select the desired output voltage for the A and B power supplies from the following table:

- 1 = 22 VDC
- 2 = 18 VDC
- 3 = 15 VDC
- 4 = 12 VDC
- 5 = 10 VDC
- 6 = 5 VDC
- 7 = 3.5 VDC

Set ONE of the seven VOLTAGE PROGRAMMING switches to the desired choice on each supply. If a supply is not utilized, set all switches OFF (to the left). Correct voltage setting can be verified with a volt meter reading from the OUTPUT terminal to the COMMON terminal. ONLY ONE voltage programming switch should be ON for each supply.

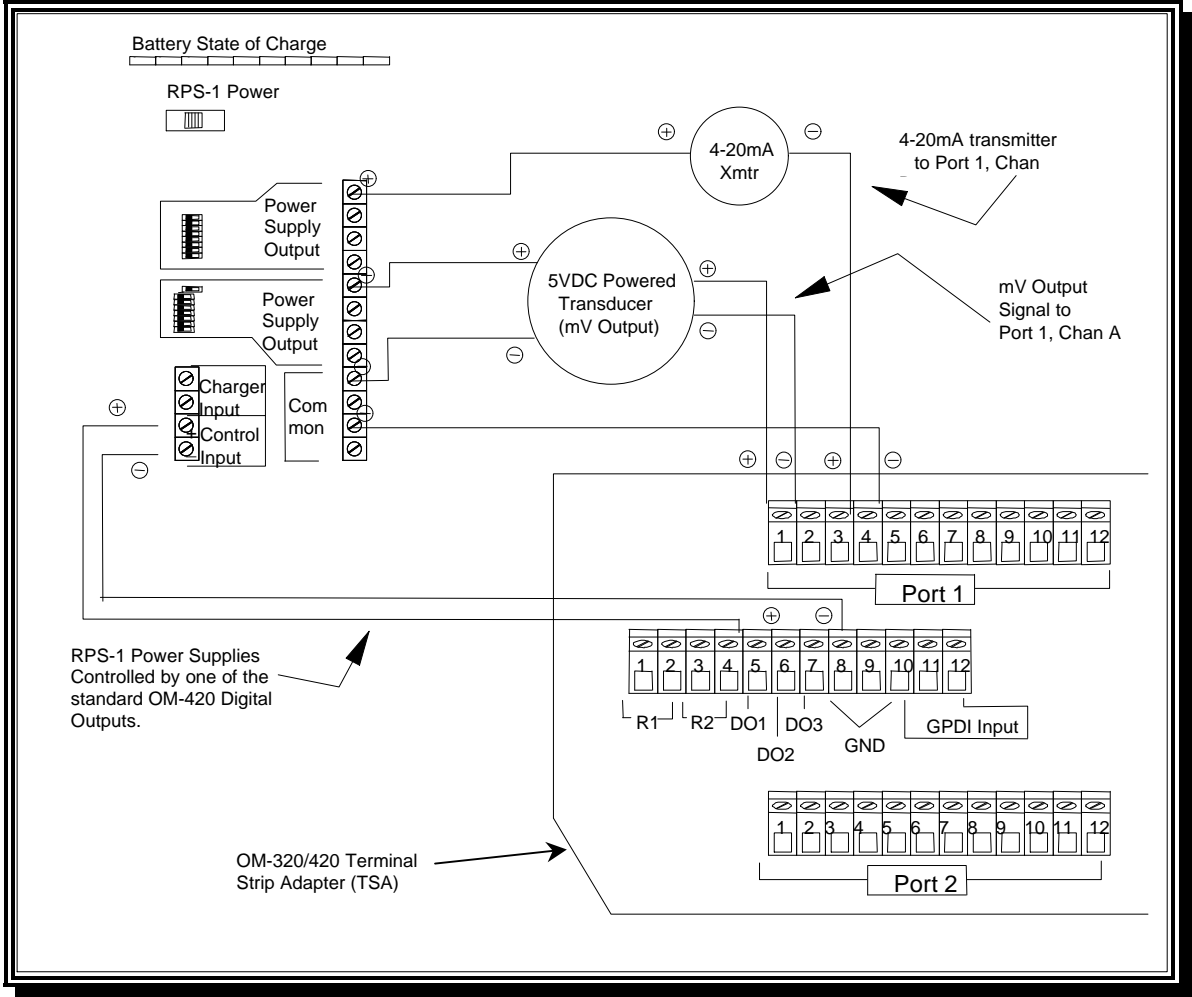


Figure 3: RPS-1 Control Wiring

The MODE switch (bottom or eighth switch) should be set for the desired operation, AUTO or ON. AUTO mode configures the supply to cycle ON and OFF per the state of the control signal coming from an external device (OM-320/420). When the CONTROL INPUT signal (connected on the four position terminal strip) is HIGH (5 VDC), either power supply configured in the AUTO MODE, turns ON. The ON position configures the power supply to be continually outputting the selected voltage to the OUTPUT terminals. The ON position is commonly used for set-up and troubleshooting of the sensor wiring.

The power supply outputs are internally current limited and protected from shorts. Current limiting occurs at approximately 250 mA. If loads approaching this current level are connected, the output voltage should be tested with a volt-meter to insure continued proper regulation. If the voltage is less than the OUTPUT VOLTAGE SWITCH programmed setting, the power supply is in current limit mode and the current load must be reduced. In many applications, this can be simply done by reprogramming the output voltage to the next lower output voltage (providing the sensor will accept the lower level). The A and B power supply OUTPUT terminals should NEVER be connected together.

The MAIN POWER SWITCH must be set in the 12VDC or the 24VDC position for the power supplies to function. For optimum battery life, set the MAIN POWER SWITCH at 12VDC if neither power supply

voltage is set to 12 VDC or higher output. For 12VDC or higher power supply OUTPUT VOLTAGE settings, the MAIN POWER SWITCH must be set to 24VDC. In the 12VDC mode, the two batteries are in parallel, hence the amp hour capacity is doubled (i.e. approx. 4AH). In the 24VDC mode, the two batteries are connected in series and the amp hour capacity is approximately 2AH

CONTROL INPUT

The two CONTROL INPUT terminals are provided for connection of an external control signal. When HIGH (5 VDC), any power supplies set to AUTO mode will turn on their outputs. When the control signal returns to a LO (0 VDC) state, the supply outputs will turn OFF.

Note: Ensure polarity is correct when making control wiring connections.

CHARGING

The two internal gel-cell batteries can be charged from a current source connected to the CHARGER terminals. Charging can be performed simultaneous with power supply operation. The CHARGER input will accept an AC or DC source and polarity of connection is not specified as an integral rectifier bridge circuit compensates for AC or either polarity of DC.

With the MAIN POWER SWITCH set in the 12 VDC position, CHARGER input voltages of 13.5 to 20 VAC or VDC are acceptable. With the switch in the 24 VDC setting, input voltages of 25.5 to 32 VAC or VDC are acceptable. Charging current is limited within the RPS-1 to a maximum of 200 mA. Photovoltaic arrays can be directly connected to the CHARGER terminal allowing for extremely long term stand-alone operation (contact factory for photovoltaic module and mounting kit information).

NOTE: The MAIN POWER SWITCH must be in the 24VDC or 12VDC position to allow charging.

BOOST CHARGE

The 'BOOST CHARGE' momentary push button switch on the RPS-1 provides initial charging current to units with batteries that have been completely discharged.

If the RPS-1 batteries have been 100% discharged, insufficient voltage exists to enable the charging circuitry and allow the batteries to recharge. The BOOST CHARGE button bypasses the charging circuitry and allows a direct charging current to flow into the batteries.

To use the BOOST CHARGE feature on batteries that are suspected as being completely dead (eg no lights glow when the Battery State of Charge TEST button is depressed) connect up the charging source to the correct terminals on the RPS-1 as normal. Then press and hold the BOOST CHARGE button for approximately 10 seconds then release it. To insure that the unit is charging, wait a few minutes, then press the Battery State of Charge TEST button and one or more lights should glow indicating that the battery voltage is increasing.

NOTE: Batteries that have been completely discharged may be permanently damaged and will exhibit shortened life unless they are immediately recharged fully. It is not advisable to discharge batteries to the point where the BOOST CHARGE is needed to initiate charging.

If the batteries do not recharge after a 24 hour period or discharge very quickly after removal from the charging source, it is likely that they have been damaged and should be replaced.

STATE-OF-CHARGE (SOC) INDICATION

Depressing the TEST switch connects a slight load across the batteries and displays a relative battery voltage (indicative of state of charge of the battery) on the 10 step LED display. The test button should be

held down for approximately 10 seconds to dissipate any battery surface charge and give the most consistent reading. Best SOC readings are given with both power supplies off and no charging current. If the supplies are delivering current to an external load, the SOC will indicate slightly lower than actual. If charging current is flowing into the batteries, the SOC will indicate slightly higher than actual.

MISCELLANEOUS

CONTROL INPUT...SPECIAL APPLICATIONS

The CONTROL INPUT circuit is schematically shown in Figure 3. The signal is optically isolated from the RPS-1 circuitry through the opto-isolator diode. The signal current flowing through the diode is limited by the 8.2K series resistor as shipped from the factory (red circuit board jumper in the INTERNAL position). This allows for nominal 0 and 5 VDC operation as provided from the OM-320/420 Digital Output.

For special applications, it may be desired to bypass the RPS-1 current limiting resistor and provide external current limiting. The RPS-1 can be configured for this by placing the red pin jumper on the PCB in the EXTERNAL position (See Figure 4). This RED colored jumper is located on the back of the RPS-1 circuit board. Access is gained by the following steps:

1. TURN THE RPS-1 & OM-320/420 POWER OFF,
2. Remove the OM-320/420 TSA retaining thumbscrew and unplug the TSA
3. Remove the three thumbscrews at the top of the OM-320/420-200 enclosure.
4. Slowly, tug on the front panel handle (located near the top of the front panel) and the front panel will swing open on its hinge.

If this RED jumper is moved to the EXTERNAL position, current limiting MUST BE PROVIDED to limit the current flowing through the opto-isolator diode to less than 5 mA. Typical turn-on current is approximately 200 uA. Assume a 1.2 Volt drop across the diode for calculations.

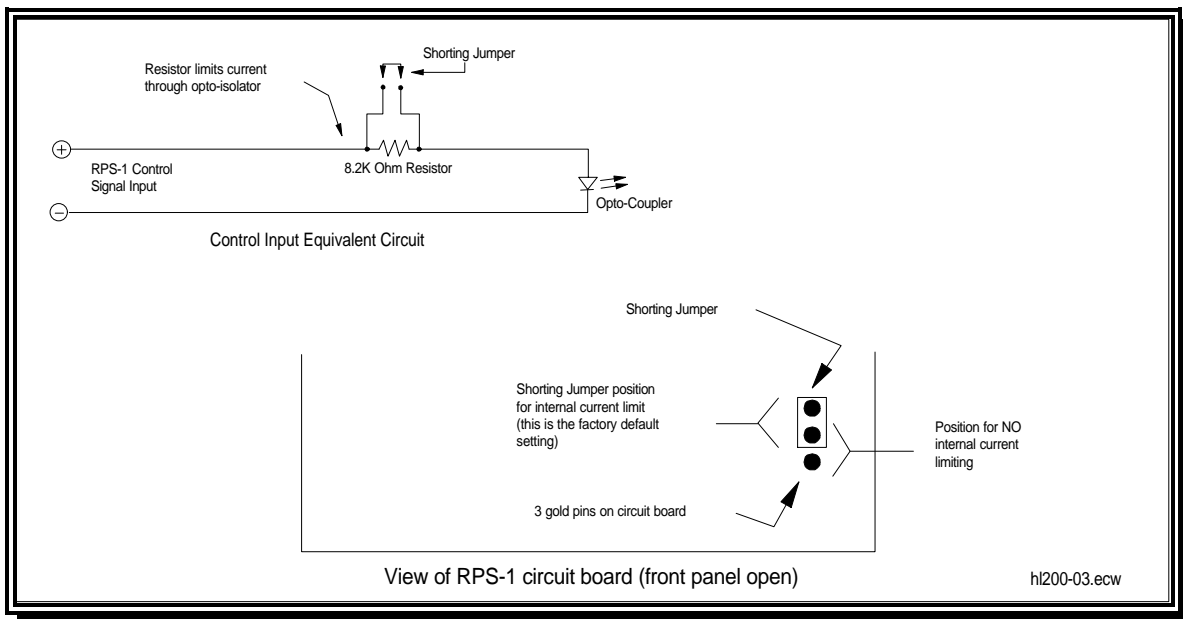


Figure 4

BATTERY REPLACEMENT

NOTE: USE CAUTION IN WORKING WITH THE GEL-CELL BATTERIES TO PREVENT SHORTING OF THE TERMINALS OR WIRING AT ALL TIMES!

Under reasonable operating conditions and temperatures, the two gel-cell batteries should provide several hundred charge/discharge cycles. When the batteries will not charge completely and/or they discharge rapidly, they will need to be replaced. To remove the batteries, follow these steps

1. TURN THE MAIN POWER SWITCH OFF
2. Unscrew the four thumbscrews from the battery pack cover (On the inside of the enclosure door).
3. Disconnect the two plastic wiring connectors.
4. Remove the old batteries and insert the new ones.
5. Reconnect the two plastic wiring connectors, Ensure that all wires match colors.
6. Tuck the connectors between the batteries and the edge of the enclosure door
7. Replace cover & install thumbscrews
- 8.

CAUTION: CHECK THESE CONNECTIONS BEFORE TURNING THE MAIN POWER SWITCH ON, INCORRECT CONNECTION WILL RESULT IN PERMANENT DAMAGE TO THE RPS-1.

TROUBLESHOOTING

SYMPTOM: OUTPUT VOLTAGE IS LOW

PROBLEM: Batteries are discharged

SOLUTION: Recharge the batteries

PROBLEM: Power Supply is in current limiting mode

SOLUTION: Decrease the load current draw by reducing supply voltage (if compatible with sensor requirements), switching some of the load to the other Power Supply.

PROBLEM: More than one OUTPUT VOLTAGE PROGRAMMING SWITCH is ON.

SOLUTION: Review the OUTPUT VOLTAGE setting table and correct the switch settings.

PROBLEM: Desired power supply output voltage is 12 VDC or greater and the MAIN POWER SWITCH is set to 12 VDC.

SOLUTION: Switch the MAIN POWER SWITCH to 24 VDC.

SYMPTOM: OUTPUT VOLTAGE IS CORRECT BUT VOLTAGE AT SENSOR IS LOW

PROBLEM: Excessive voltage drop in sensor wiring

SOLUTION: Check for bad connections in wiring loop

SOLUTION: Use larger gage wire (18 AWG should be sufficient for most applications)

SYMPTOM: STATE-OF-CHARGE INDICATOR DOES NOT LIGHT

PROBLEM: The MAIN POWER SWITCH is OFF

SOLUTION: Switch to 12VDC or 24VDC position

PROBLEM: Batteries are fully discharged.
SOLUTION: Charge the batteries.

SYMPTOM: STATE-OF-CHARGE INDICATOR SHOWS LESS THAN FULL

PROBLEM: Batteries are slightly discharged
SOLUTION: Charge

PROBLEM: Power supplies are ON dropping the battery voltage
SOLUTION: Turn off supplies before checking the SOC or use the measurement as a relative SOC only

PROBLEM: Batteries are cold
SOLUTION: SOC readings are affected by temperature. Use the display as a relative measure only.

PROBLEM: Batteries are worn-out
SOLUTION: Replace batteries

SYMPTOM: BATTERIES DO NOT APPEAR TO CHARGE

PROBLEM: Batteries are bad.
SOLUTION: Replace batteries.

PROBLEM: MAIN power switch is OFF during charging
SOLUTION: Switch must be ON

PROBLEM: Batteries have insufficient charge to power charging start-up circuitry.
SOLUTION: Press and hold the BOOST CHARGE button for approximately 10 seconds, then release it. After a few minutes, press the Battery State of Charge Test button and one or more of the LED lights should illuminate indicating that the batteries are starting to take a charge.

PROBLEM: Charging input voltage is lower than the battery voltage.
SOLUTION: Increase the CHARGER input voltage. The minimum input voltage for the a MAIN POWER SWITCH setting of 12 VDC is 13.5 VDC/VAC and for the 24VDC setting is 25.5 VDC/VAC.

SYMPTOM: POWER SUPPLIES DO NOT TURN ON

PROBLEM: Main Power switch is OFF.
SOLUTION: Turn to 12 VDC or 24 VDC position.

PROBLEM: CONTROL INPUT signal wire polarity is reversed.
SOLUTION: Check polarity of signal wire with a volt-meter and check connections to terminal strip.