

OPERATION AND STORAGE INSTRUCTION FOR JOSLYN (RS) REMOTE SUPERVISORY CONTROL WITH BATTERY BACKUP FOR DEAD LINE SWITCHING

STORAGE

1. All components should be stored in dry location with protective end caps exposed connectors.
2. Position the battery ON/OFF switch in the OFF position. This will prevent discharge and disconnects battery power.
3. Recharging of the batteries every six months is recommended if long term storage occurs.

REMOTE OPERATION

1. The BATTERY ON/OFF switch should be in the ON position.
2. For Remote operation the LOCAL/REMOTE switch should be placed in the REMOTE position.

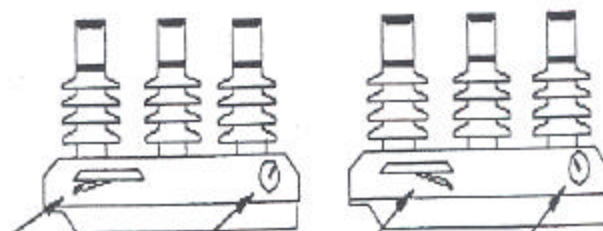
LOCAL OPERATION

ELECTRICAL OPERATION OF THE SWITCH

1. The BATTERY ON/OFF switch should be in the ON position.
2. for Local operation the LOCAL/REMOTE switch should be placed in the LOCAL position.
3. To OPEN the switch:
 - a. Push the OPEN pushbutton, the switch should open immediately.
 - b. Check the switch position using the SWITCH INDICATION toggle switch.
4. To CLOSE the switch
 - a. Push the CLOSE pushbutton, the switch will take approximately 2-3 seconds to close with 120 VAC present and approximately 6-8 seconds to close if 120 VAC is missing. The CLOSE pushbutton may be released prior to the switch closing.
 - b. Check switch position using the SWITCH INDICATION toggle switch.

MANUAL OPERATION OF THE SWITCH

1. The mechanical switch position indicator is located on the side of the mechanism housing as shown in the figure below.
2. To OPEN the VBM switch, push on the manual operating crank using a switch hook: stick. One very fast crank. with a switch hook stick is required.
3. To CLOSE the VBM switch, push on the manual operating crank using a switch hook stick until the mechanism is actuated and the crank arm latches up. This will require approximately 20-25 cranks with the switch hook stick.



PUSH TO CLOSE

POSITION INDICATOR

PUSH TO OPEN

POSITION INDICATOR

THEORY OF OPERATION CONTROL CABINET FUNCTIONAL OVERVIEW

The Joslyn Remote Supervisory (RS) Control with Battery Backup for dead line switching is designed to allow operation of the Joslyn VBM switch either locally or remotely with 120 VAC present or missing. Backup power is provided by two 12V sealed lead acid batteries which are series connected to provide 24 volt operating power for the VBM switch, control and power supply circuits. The batteries are maintained in a proper charge condition by a multi-stage charger circuit which is located on the DC Power Supply circuit board (Assembly No. 3129D0184). Monitoring of the battery condition is accomplished by a battery alarm and disconnect feature located on the same PC board. This circuit provides a high/low voltage alarm and a battery disconnect circuit, which prevents excessive discharge of the batteries which could severely limit life. The DC Power Supply board also provides a 12 volt, 2 amp regulated output and a 24 volt 1 amp output. The operating station in the cabinet allows selection of local or remote operation, switch indication and lamp test. When in the local operating mode, the operating station allows electrical opening or closing of the switch. When the remote operating mode is selected, the local open and close pushbuttons are disabled.

120 VAC OPERATION

With 120 VAC present, the 27-1 relays are energized. This disconnects 24 VDC from the VBM control circuits and connects 60 VAC from the center tap of transformer (T1) to the control circuits of the VBM switch. Power for the switch indication circuits is still from the output of the battery charger board. With the Local-Remote switch (43-2) in the local position (as shown on the schematic) the open and close pushbuttons in the cabinet can be used to supply power to the open or close circuits of the VBM respectively. With the Local-Remote switch in the remote position, the open and close pushbuttons in the control are disconnected from the VBM switch. Close and open signals will then be provided by the RTU close control and open control contacts.

OPENING VBM SWITCH

(LOCAL POSITION)

With 120 VAC present, the 27-1b "a" contacts are closed which provide power through the AC line-protector (57), through FU-1 and T1 to the open pushbutton 43-5. With the VBM switch closed, the 52/a contacts are closed. When the open pushbutton is depressed, current flows to the open solenoid (52/TS) which opens the switch in approximately 25 milliseconds. When the VBM switch opens the 52/a , contact opens which interrupts current through the open solenoid.

(REMOTE OPERATION)

Remote operation is the same as local operation except the current to the open solenoid is supplied through the RTU open contact.

CLOSING THE VBM SWITCH

(LOCAL OPERATION)

With 120 VAC present, the 27-1b "a" contacts are closed which provide power through the AC line protector (57), through FU-1 and T1 to the close pushbutton 43-4. With the VBM switch open, the 52/b contacts are closed. When the close pushbutton is depressed, power is provided to the closing relay (52/X) through PA8-M, R2 and the two 52/Y "b" contacts. The 52/X relay energizes which supplies power to the VBM closing motor through PA8-A and PA8-L, R1 and the 52/X "a" contacts which are now closed. The 52/X relay seals itself in through PAS-A, a 52/b contact and R2. The closing motor runs for approximately 2-3 seconds before the VBM switch closes. When the VBM switch closes, the 52/b contacts opening interrupting current flow through the motor and de-energizing the 52/X relay. Anti-pump protection is provided by the 52/Y relay which energizes once the VBM switch is open and seals in until the close control signal is removed. The 52/Y relay being energized prevents the close control relay (52/X) from energizing which ensures that the close signal must be removed before it can cause a second closing of the VBM switch. -

(REMOTE OPERATION)

Remote closing operation of the VBM switch is similar except power for the motor and the 52/x relay flow through the RTU remote close contact. The remote contact must therefore be maintained until the switch is closed, which takes approximately 2-3 seconds.

24 VDC OPERATION

When 120 VAC is not present, the AC loss of voltage relays (27-1a & 27-1b) are de-energized. This closes the 27-1b "b" contacts which allows the batteries to supply 24 VDC to the VBM control circuits through F1 and D4. Open and close operation is the same as with 120 VAC present except power to all circuits is 24 VDC instead of 60 VAC. Run time of the VBM closing motor is approximately 6-8 seconds with 24 VDC power.

BATTERY CHARGER CIRCUIT

The battery charger circuit on the DC power supply board utilizes an integrated circuit battery charger chip which provides optimum charging cycles for maximizing battery ampacity. The IC (U3) provides three normal charge states and a current limited turn-on state (Trickle Charge) which prevents high currents in abnormal conditions such as a shorted battery cell. The IC contains a temperature compensated internal reference which allows proper charging characteristics over a wide temperature range. Current demands of .5 amps or less are supplied by the series pass transistor Q3.

CHARGER STATES OF OPERATION

Trickle Charge - In the event that the charger is energized into a shorted output, the battery charger circuit does not go to full charge current capability but instead goes to a trickle charge state. In this state the charger limits the current supplied to the load to approximately 10 milliamps as determined by the value of R18 on the battery charger board.

Bulk Charge Mode - When the charger is energized into a normally discharged set of batteries, the charger circuitry will initially go to a bulk charge mode which is designed to provide a quick recharge of the batteries. In this mode the charger is in a current control mode and charges the batteries at the maximum current setting which is .5 amps as determined by resistors R14, R15, R16 and R17.

Overcharge Mode - To ensure maximum charge and ampacity, the IC charger is designed to go into an overcharge mode after charging the batteries in the bulk mode. In the overcharge mode the voltage to the batteries is raised to a level higher than the normal "float" or steady state level and remains at this level until the current drawn from the charge decreases to a setpoint determined by resistors R14 and R15. Once this setpoint has been reached, the IC charger automatically switches to the float mode.

Float Mode - This is the normal steady state condition of the charger circuit. In this mode the batteries are held at a precise voltage level set by the R4, R12 and R13.

BATTERY ALARM & DISCONNECT CIRCUIT

The battery alarm and disconnect circuit on the DC power supply board provides a high/low voltage alarm and a battery disconnect feature in the event that there is a severe battery discharge which might cause permanent damage to the batteries. The integrated circuit, U2, provides the circuitry necessary to monitor the voltage of the battery and provides the output drive for the alarm relay, 27-2, and for the disconnect FEE, Q2. U2 has an internal reference of 2.5 volts which is compared to the voltages set up by resistor networks connected to pins 5, 7 and 10. When the voltage at pin 10 exceeds the reference voltage, the open collector output of pin 13 is pulled low (grounded).

This turns Q2 on and connects the batteries to the charger circuit. In the event that AC power is not available, this allows the batteries to supply the 12 and 24 volt regulator circuits and also allows the batteries to supply the IBM switch circuits. If the voltage at pin 10 of U2 drops below 2.5 volts, pin 13 output goes to a high impedance state which allow R10 to pull the gate of Q2 equal to the source of Q2 which shuts Q2 off and prevents further discharge of the batteries. R2 is adjusted at the factory so that this occurs at a setting of $17 \pm .5$ volts. The voltages at pins 6 and 7 of U2 are used to control the Battery High/Low Alarm Relay, 27-2.

If the voltage at pin 6 exceeds 2.5 volts, the base of Q1 is pulled low (grounded) by pin 9 of U2, this causes a battery high/low alarm by de-energizing the 27-2 relay and opening the "a" contact. Pin 9 also pulls the voltage to pin 10 low which forces U2 to shut the Hexfet, Q2, since this simulates a battery low voltage at pin 10. The high voltage at pin 6 also activates a crowbar driver internal to U2. Pin 1 of U2 is driven high which turns on Q3, blowing the battery output fuse F1. If the voltage at pin 7 of U2 drops under 2.5 volts, the base of Q1 is pulled low by pin 4 of U2. This de-energizes the transistor, which drops out the 27-2 relay and thus provides an alarm by opening the "a" contact. R5 is factory adjusted to provide a low battery voltage alarm at 22.0 +/- .5 volts. R3 then fixes the high battery voltage alarm at 30.0 +/- .5 volts. C3 provides a delay on operation of 27-2 which helps in preventing spurious alarms.

24 AND 12 VOLT DC OUTPUTS

U1 provides a regulated 12 VDU output which is rated at 2 amps continuous. This DC-DC convertor provides efficient power transformation and also provides output overvoltage and short circuit protection. VR1 provides a regulated 24 VDC output when AC power is available. When AC power is not available, the output of VR1 is the battery voltage minus approximately 2 volts. When AC power is available, the input power for U1 and VR1 is automatically supplied by the batteries with no interruption of the DC outputs.