Attachment 4

DELTA

ELECTRICAL TROUBLE SHOOTING
VEHICLE ARREST SYSTEM

TROUBLE SHOOTING ELECTRICAL

COPYRIGHT 1991 DELTA SCIENTIFIC CORPORATION

ALL RIGHTS RESERVED

MFG. UNDER U.S. PATENT #4,097,170 4,158,514 4,318,079 4,354,771 4,490,068 4,576,508 4,715,742

U.K. PATENT # GB 2,127,893B 2,138,883B

40355 DELTA LANE • PALMDALE, CALIFORNIA 93551, USA • PHONE (661) 575-1100 • FAX (661) 575-1109

E-MAIL: info@deltascientific.com

Doc #100-35 P-6

ELECTRICAL TROUBLE SHOOTING
PHALANX® STYLE BARRIERS OPERATING INDEPENDENTLY - BATTERY BACKUP

Safety Precautions

At all times observe good safety practices when working on either the electrical or mechanical system. Particular attention should be paid to the danger of working on the Barriers when the power is on. The Barriers are powerful hydraulic presses that can crush anything in their way. Keep hands free of the mechanism when the power is on or the HPU is up to pressure. Turn off the electric power and bleed the hydraulic pressure down to zero before working on any part of the system. Traffic should be controlled around the Barriers during any work so that vehicular accidents do not occur if the Barriers should happen to rise. After work is complete, do not allow traffic over the Barriers until all control and safety functions have been verified to be properly working.

Observe all safety precautions for the type Phalanx® Barrier being trouble shot whenever working under the Barrier. These precautions are found in the Maintenance section of this manual.

If the power unit will not run:

1) Check the main power distribution feed to the power unit and the control circuit. Correct as necessary.

2) Check any disconnect before the hydraulic power unit motor starter. Turn on as necessary.

3) With the disconnect/main switch turned 'on', manually operate the armature of the motor starter. If the motor starts, check the solenoid coil of the starter for continuity. Next check that voltage is being applied to the coil. If no voltage is being applied, check the various switches in the starter circuit by directly applying power to the starter coil (CC2 and coil terminal A1).

   If direct application of power to the coil causes the starter to pull in and the system is not up to pressure, then try the starter circuit switches in this order:

   A) Check hydraulic power unit for leaks or broken lines. Low oil level will cause reservoir level switch to open starter coil. Switch should be closed if oil is visible at least 1" from the bottom of the site gage glass.

   B) Check pressure switch. High and low pressure settings are indicated on the starter circuit drawing. The pressure switch is factory set, if values are plus/minus more than 50 psig from the indicated values, consider replacing the switch.

   C) Check voltage value to the starter. Values 15 percent low will cause the power monitor (if present) to interrupt power to the starter coil.

Copyright 2004 Delta Scientific Corporation
All Rights Reserved

D) Check that the starter overload relay has not tripped. If so, determine the cause, ie, high ambient, pump cavitation, failed pressure switch, etc. Be sure that overload relay is left with the reset in the 'manual' position. The 'automatic' reset feature can lead to failure of other parts in the hydraulic unit.

<u>If power unit runs and is up to pressure but the Barriers can't be opened or closed:</u>

4) Check control circuit voltage at terminals CC1 and CC2. Ordered voltage should be present (120-220/1/50-60). Correct as necessary.

5) The voltage selector switch on the 1PS power supply should be set for the voltage supplied in Step 4).

6) Check fuse 1FU before 1PS power supply for continuity. Replace if necessary.

7) Check fuse 2FU out of the 1PS power supply for continuity. Replace if necessary.

8) Check voltage at terminals CA1 (+) and CA2 (-). This should now be 24 VDC nominal (+2 / -0 volts). Correct if necessary by adjusting the power supply output potentiometer (adjacent incoming power conductors, labeled "V ADJ").

9) Check that the batteries are connected to the circuit and that they are not deep discharged. (**Note:** If power is to be left off the equipment for any length of time, disconnect the batteries or they may be discharged to the point of damage.)

10) With the remote control panel key switch **ON**, check that the panel power indicator light is 'on'. If not, check the voltage across xMA3 and xMA18. It should be equal to the voltage found in step 8). If not, check the interconnect lines to xCA3 and xCA18. If voltage present, check the key switch for continuity. Replace if necessary.

11) Pressing the appropriate **OPEN/CLOSE** command button should cause the control relay in the control circuit to energize and in turn switch on power to the desired control valve solenoid. Voltage to xCA4 allows x1CR to pull in, in turn energizing the Barrier **up** (close) solenoid valve. Voltage to xCA8 allows the down relay x2CR to energize the Barrier **down** (open) solenoid.

A) Determine if command buttons and relays are functioning.

1. Press Barrier **CLOSE** button. x1CR should pull in. The safety loop detector between terminal xCA5 and xCA6, if used, should be closed; jumper these terminals for this test. If x1CR fails to operate, jumper from xCA1 to xCA6. If relay still fails to energize, replace relay or PCB assembly.

2. Repeat for Barrier **OPEN**. x2CR should pull in. If not, jumper xCA1 to xCA8. (The PCB has been factory assembled with a jumper between xCA9 and xCA10). Replace relay or PCB assembly as necessary.

Copyright 2004 Delta Scientific Corporation
All Rights Reserved

B) If the **CLOSE/OPEN** relays (x1CR and x2CR) function and valve still does not shift, check:

1. With appropriate relay energized, check that line voltage is applied between terminal xCB17 and xCB18 ('close' neutral) for 'Up' and xCB19 and xCB20 ('open' neutral) for 'Down' for the appropriate Barrier.

2. If voltage is present, check affected valve coil for continuity by directly applying line voltage (xCA1 and xCA2) to the valve coil. If coil fails this, replace the valve coil or entire valve as appropriate.

Emergency Operate Circuit

12) When the emergency operate (EO) signal is given to the control circuit (by pressing the EO button), 24 VDC is applied to the EO relays x4CR which self hold as the up relays x1CR pull in and energize the directional control valves and the EO valves. The relays and valves remain energized until the reset button is actuated which releases x4CR and restores the system to normal operation. **Note:** Reset should be pressed within 15 minutes of EO actuation to prevent possible heat damage to the solenoid valve coils.

13) If the EO system is not operating, first check that the x4CR's are pulling in. If not, place a jumper across xCA13 and xCA15. If the system now works, check the EO actuate switch (button) which is normally open and the reset button which is normally closed. Correct as necessary. If the relays x4CR pull in when the EO actuate switch (button) is pressed but the valves do not shift, check that the voltage between xCB21(+) and xCB22(-) is at 24 VDC. If voltage is present, check the valve coils for continuity. Replace relay(s) or valve coil(s) as necessary.

Barrier Position Indications

14) The Barriers are equipped with limit switches which pilot relays to provide Barrier position indication. These indications are commonly used to run the Barrier **OPEN/CLOSE** (down/up) lights on the remote control panels and run traffic safety indications such as the stop/go signal lights.

If the indicator lights are not coordinated with the correct Barrier position, check:

A) Limit Switch. The Barrier limit switch is a dry contact switch powered from the control circuit. xCA11 is common; xCA12 is the connection to the limit switch relay and auxiliary relay, x3CR and x3BCR, for the two Barriers. The limit switches should be 'opened' with the Barriers in the up position. The limit switches close when the Barriers are lowered to the full down position. Verify that the contacts behave accordingly, replace if necessary.

B) If the switch is OK, jumper xCA11 to xCA12. Relays x3CR and x3BCR should pull in. Replace relay or entire PCB assembly as necessary.

Copyright 2004 Delta Scientific Corporation
All Rights Reserved

C) If relays appear OK, check bulbs by applying 24VAC xCA1/xCA2 (xMA3/xMA18 or xSA28/xSA18) directly to the suspected bulb.

Delta Model AG812 Stop/Go Signal Gate (optional)

15) The Barrier control circuit provides an independent output from the down limit switch that is used to Vend (raise) a Delta Model AG812 Series Stop/Go Signal Gate when the Barrier is fully lowered. The Signal Gate then simultaneously resets (lowers) as the Barrier is again raised off the down limit switch. Restating the above:

START - Barrier 'UP' -	AG812 Gate Arm 'DOWN'
'Lower' Command	Barrier Starts Down
Barrier Full Down	Arm Starts Up
Barrier Still Down	Arm Full Up
'Raise' Command	Barrier Starts Up/Arm Starts Down
FINISH - Barrier 'UP' -	AG812 Gate Arm 'DOWN'

A) The AG812 Access Gate is installed per the instructions on Document A2021. Wire the 220 VAC power supply to L1 and L2 on the AG812 Terminal Strip.

B) When the Barrier down button is pushed, the Barrier falls making the down limit switch auxiliary relay, 3BCR. The limit switch relay energizes and the Barrier/Signal Gate synchronization contact, 3BCR.1 closes, causing the Signal Gate to raise.

C) Determine if the limit switch and limit switch relays are functioning (paragraph 13). If OK, check:

D) When contact 3BCR.1 closes, Signal Gate should raise. If not, consult Signal Gate instructions, Document A2021 to trouble shoot the Signal Gate.

Copyright 2004 Delta Scientific Corporation
All Rights Reserved