

6.0 - Diagnostics & Troubleshooting:

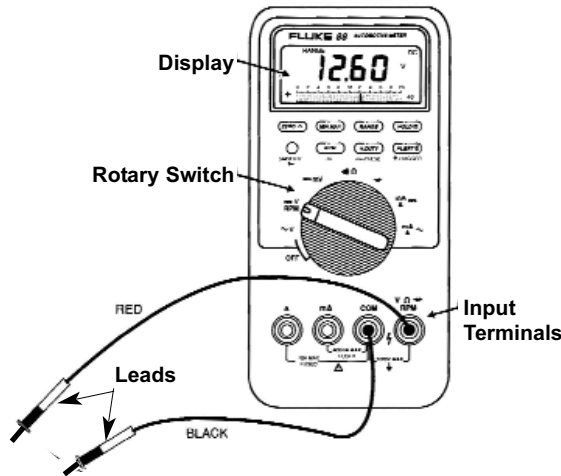


6.0 Diagnostics & Troubleshooting

I. Voltmeter

Voltmeters are typically hand-held, battery operated instruments (similar to the image below) that are used for testing and troubleshooting electronic systems.

Voltmeter



Symbol	Definition
AC	Alternate Current Voltage
DC	Direct Current Voltage
V	Volts
mV	Millivolts (1/1000 volts)
A	Ampere (amps) Current
mA	Milliampere (1/1000 amps)
Ω	Ohms. Resistance
k Ω	Kilohm (1000 ohms) Resistance
M Ω	Megohm (1 000 000 ohms) Resistance
Hz	Hertz (1 cycle/sec). Frequency
kHz	Kilohertz (1000 cycles/sec). Frequency
ms	Milliseconds (1/1000 sec)
RPM 1	Revolutions/ min. Counting 1 cycle/ spark
RPM 2	Revolutions/ min. Counting 2 cycles/ spark

II. Voltmeter: Voltage and Continuity

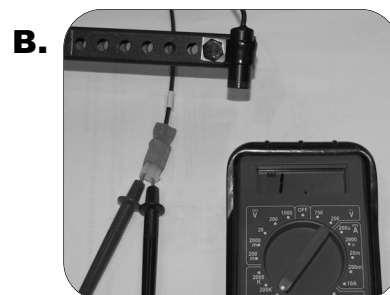
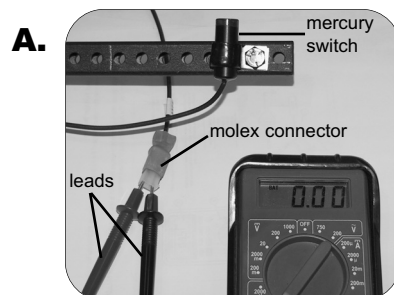
Voltmeter Set-up for Testing Voltage & Continuity

1. When testing **voltage** with a Voltmeter, make sure the rotary switch/ dial is set to **Volts (V)**.
2. When testing **continuity** with a Voltmeter, make sure the rotary switch/ dial is set to **Ohms (Ω)**.
3. The black & red testing **leads** should be plugged into the COM (common) input terminal and the Volts/ Ohms input terminal.

III. Continuity Testing- Mercury Switches

Testing for Continuity in a Mercury Switch

1. Set the Voltmeter to Ohms (Ω).
2. Place the leads inside the molex connector for the mercury switch. One lead on each terminal (see photos below).
3. Tilt mercury switch into an upright position (Photo A).
4. Reading on the Display should show **0 (zero)** if there is continuity (closed loop).
5. Tilt mercury switch into an inverted position (Photo B).
6. Reading on the Display should show **1 (or value other than 0)*** if the loop is open (no continuity). ***Note:** display reading can vary depending on the voltmeter.

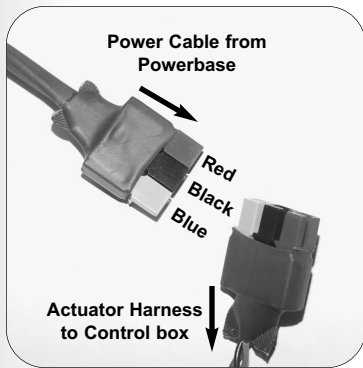


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IV. Voltage Testing

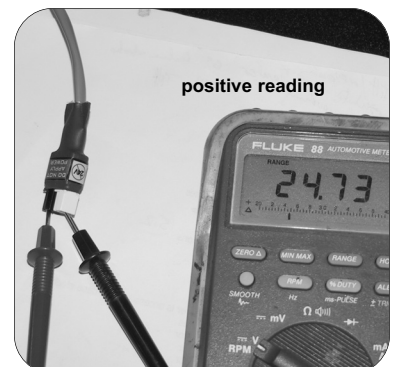
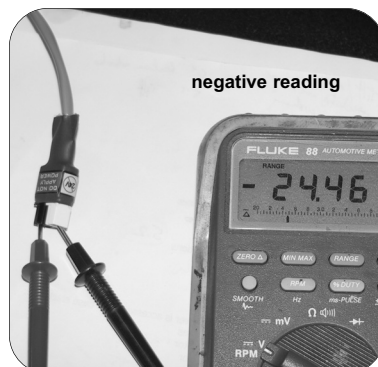
Testing for Voltage at the TRx Power Harness (from Battery)

1. Set the Voltmeter to Volts (V).
2. Press the 'zero' button** to clear the voltmeter display (**not available on all voltmeters)
3. Disconnect the existing power connection between the Power Cable (from powerbase) and the Actuator Harness (red/black/blue triple a-mode connection) from the control box
4. Place the leads inside the *red* and *black* a-mode terminals from the *Power Cable* connector.
5. The Display should show a voltage reading (greater than) **>18 Volts** if functioning properly



Testing for Voltage to the Actuator (from Actuator Harness)

1. Set the Voltmeter to Volts (V).
2. Press the 'zero' button** to clear the voltmeter display (**not available on all voltmeters)
3. Disconnect the existing power connection between the Actuator Harness and the specific Actuator (motor) being tested.
4. Place the leads inside each a-mode terminal on the motor connection *from* the Actuator Harness.
5. Press the control switch that operates the actuator motor
6. The Display should show a voltage reading (greater than) **>18 Volts** if functioning properly.
7. **Note:** Test (toggle) the actuator in both directions (the display should indicate *positive* and *negative* values depending on the direction of the actuator).



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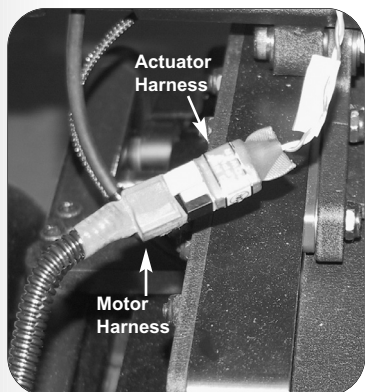
V. Powering the Actuators

Applying Power Directly to an Actuator

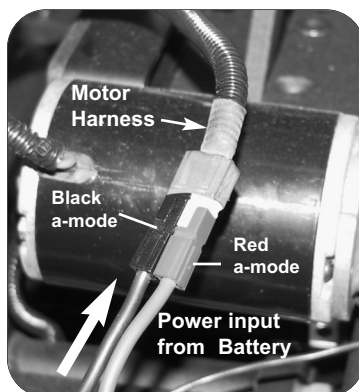
In order to test/ service an actuator, or in the case of a dead battery, it may be necessary to apply power directly to an actuator.

1. Disconnect the existing connection between the motor harness and the actuator harness.
2. Connect the the power source directly to the motor harness from the actuator (see note below).

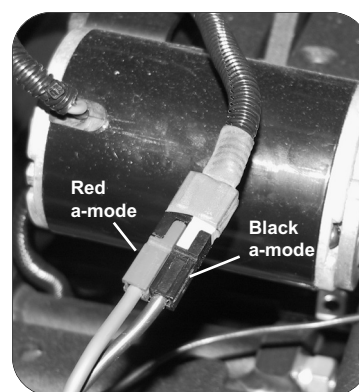
Note: by changing the polarity of the a-mode connectors, the actuator can be made to “push” or “pull” (depending on which motor direction is appropriate). Positive over Negative will cause a pushing action; and Negative over Positive will cause a pulling action.



Original Actuator Connection



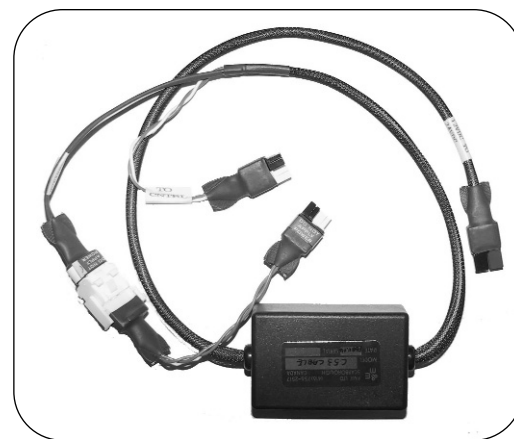
Positive over Negative- 'Push'



Negative over Positive- 'Pull'

C53 Actuator By-Pass Cable for Power Elevating Seat (PES) Systems

The C53 actuator by-pass cable was designed for use on our PES Systems. The C53 by-pass cable allows power to be applied directly to the PES actuator and by-passes the seat controller and on-board batteries. The by-pass connection requires **12 to 24 Volts** to operate the PES actuator. This connection is intended *only* for use by Service Technicians for the purpose of accessing on-board batteries that have been depleted beyond charging and require replacement, **or** for the original installation of the batteries. Refer to **Figure 25**. (p.105) for detailed installation instructions for the C53 by-pass cable.

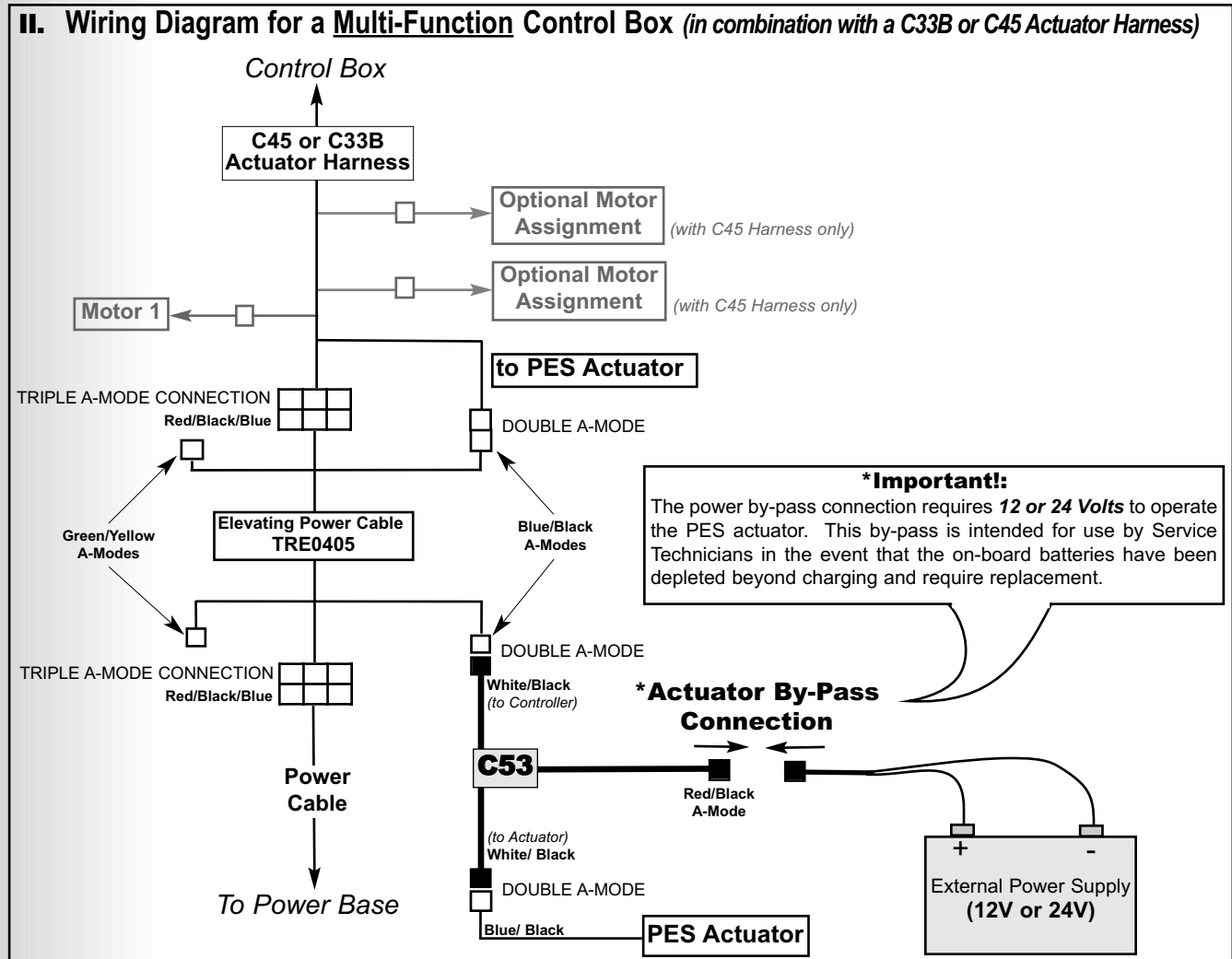
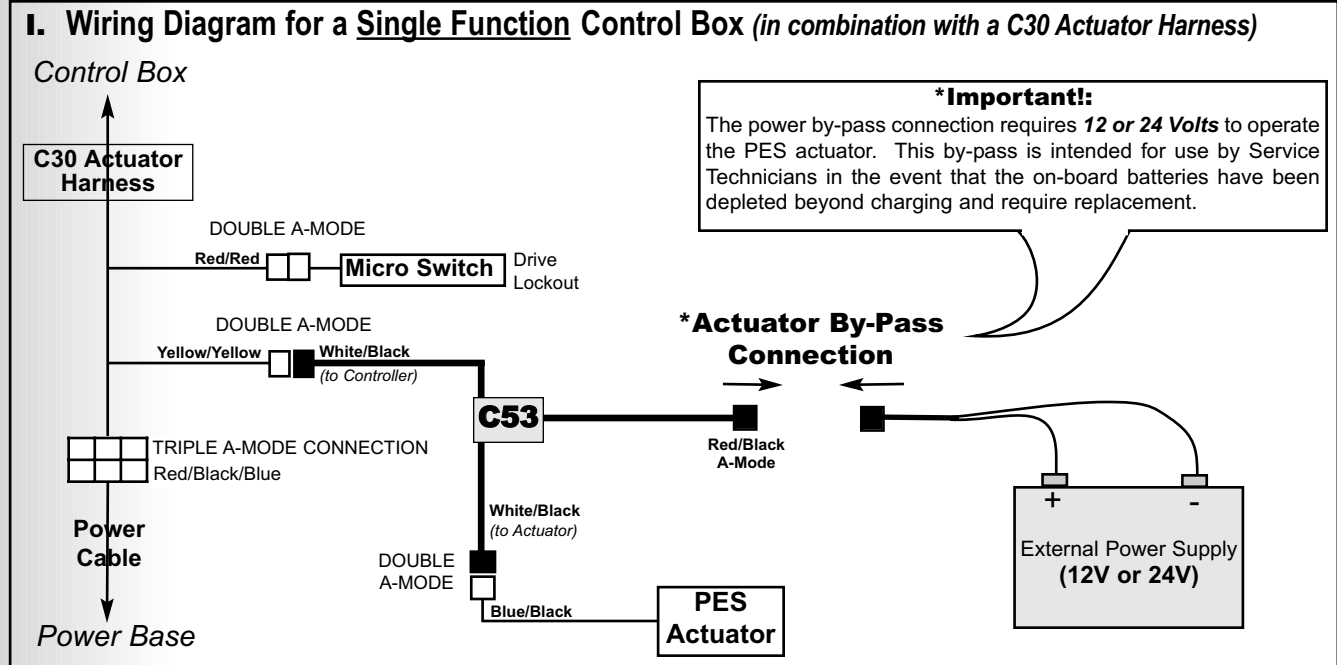


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V. Powering the Actuators

Figure 25. - Installation of the C53 By-Pass Cable (for PES Systems)



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VI. Lazarus M07 Battery Charger Booster

Lazarus M07

The Lazarus is a specially designed battery charger booster that helps start the charging of depleted batteries (less than 18 volts). **Note:** An external charge must be used with the Lazarus.

Operating Instructions:

To ensure the Lazarus works effectively, please follow the directions below. Before starting to operate your Lazarus, be sure to unplug your on board charger. **You must use an external charger with the Lazarus.**

Connect the battery charger to the female connector of the Lazarus.

Plug the male, free-hanging plug into the battery charger connector of the wheelchair.

Press and hold the START button. Hold the START button until the green RUN indicator lights up and stays on. Then release the START button.

Once the green RUN light stays on for 1 minute, the Lazarus must be disconnected and the battery charger should be connected directly to the wheelchair. If this is not done, the batteries in the Lazarus will lose power.

If the red START indicator does not light up or goes out while you're holding the START button, this means that the wheelchair and battery charger may be incompatible or have wiring faults. In this case, disconnect the Lazarus immediately.

If the green RUN light does not stay on, it means that either the charger or wheelchair batteries are defective.

Important!: For optimal performance from the Lazarus, follow the operating instructions carefully. Only use the Lazarus with plug-compatible wheelchairs and chargers. Please also make sure that the voltage battery charger connector of the wheelchair reads positive on pin 1 and negative on pin 2. If the pins are not numbered on your wheelchair battery charger connector, look for the numbering on the female connector of Lazarus. Please note that defective batteries, even with the use of the Lazarus, may not start charging, or hold the charge.



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VII. Wiring: Following the Path

Although the wiring of a typical TRx seating system can appear very complex and intimidating, each system follows a similar/ consistent wiring configuration. Most electrical problems can be identified by 'following the path'; from the batteries to the control box to the harnesses, actuators and limit switches. By examining the electronics in a systematic fashion, the problem can be readily isolated and resolved. The following is a list of "Yes or No" questions that has been developed to help diagnose electrical defects

Electrical Defects:

Important Electronics Information needed to diagnose problems:

Control Box Type: _____ Controller Type: _____ TRx Switches: Y / N? Functions thru Joystick: Y / N?

*To resolve symptoms identified in questions below, please refer to the **Troubleshooting Guide**, p.106*

Questions:	Yes/ No
Are the batteries fully charged (25V or higher)? Actual Charge: _____ V	Y / N
Are the fuses OK (power harness fuse/ base fuse)?	Y / N
Does the wheelchair drive?	Y / N
.....Is the seating system in the neutral/ home position?	Y / N
Does the Red drive lockout (DLO) light come on?	Y / N
.....Does the Red DLO light remain on?	Y / N
Is the Control Box programmed correctly (Dip Switches/ Jumpers)?	Y / N
Is it a new part installation?	Y / N
Are all cables/switches properly connected with no visible damage or cuts?	Y / N
Is the problem intermittent (day to day/ during tilt/ during elevating/etc...)?	Y / N
.....Explain: _____	
.....Are cable ties affecting the connection (too tight/ too loose)?	Y / N
Does it work with all available switches (TRx Switch/ Joystick/ Attendant Switch)?	Y / N
Is the switch/cable plugged into the correct port?	Y / N
Is there voltage (power) at the power harness (from battery)? <i>(check with voltmeter- see p.101)</i>	Y / N
Is there voltage (power) to the actuator? <i>(check with voltmeter- see p.101)</i>	Y / N
Has the original pre-tilt angle been adjusted? Actual Pre-Tilt: _____°	Y / N
Are the mercury switches/ micro-switches functioning properly (Tilt/PES/DLO)?	Y / N
.....Is the angle/position of the mercury switch/micro-switch set correctly?	Y / N
.....Is there continuity in the mercury switches? <i>(check with voltmeter- see p.100)</i>	Y / N

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VIII. Troubleshooting Guide

Symptom	Probable Cause	Solutions
<i>Wheelchair power is ON, but system does not Drive</i>	System tilted/ elevated beyond the Drive Lockout (DLO) angle Drive Motors not engaged	Return seating system to neutral (home) position. Engage Drive Motors
<i>Seating System is not functioning</i>	Low batteries Loose/ Faulty electrical connection Blown fuse	Check/ Charge/ Replace Batteries Check cable connections/ Check cable ties (too tight/ too loose) Inspect/ Replace fuse.
<i>Intermittent Seating System functions (day to day, during tilt, during recline...)</i>	Loose/ Faulty electrical connection Faulty Power Harness Faulty Mercury Switch Spongy Battery (<i>fluctuating charge</i>)	Check cable connections/ Check cable ties (too tight/ too loose) Check/ Replace Power Harness Check/ Replace mercury switch Check/ Replace Battery
<i>Drive Lockout (DLO) is not functioning</i>	Relay box not programmed correctly Mercury Switch is not set-up properly	Check the relay box configuration guide and verify dip switch/ jumper settings. Adjust Mercury Switch (refer to Section 4.0- the Electronic System, Limit Switches)
<i>DLO red indicator light does not light up</i>	Faulty Mercury Switch Mercury Switch is not set-up properly	Check/ Replace mercury switch Adjust Mercury Switch (refer to Section 4.0- the Electronic System, Limit Switches)
<i>DLO red indicator light is ON, but no lockout</i>	Incorrect switch settings in relay box Incorrect wiring connections	Check dip switch/ jumper settings in relay box (refer to the Configuration Guide) Check connections.
<i>Limit switch not functioning properly</i>	Loose/ faulty electrical connection Faulty limit switch Limit switch is not set-up properly	Check connections. Check/ Replace limit switch Adjust Limit Switch (refer to Section 4.0- the Electronic System, Limit Switches)
<i>System only operates in one direction</i>	Faulty limit switch Limit switch is not set-up properly Low Voltage/ Battery not charged	Check/ Replace limit switch Adjust Limit Switch (refer to Section 4.0- the Electronic System, Limit Switches) Test system power cable using Voltmeter/ charge batteries (Lazarus)
<i>Joystick will not function</i>	Joystick not plugged in Joystick not turned on Blown base fuse	Inspect cable connection Turn on power to the Joystick via the keypad Inspect/ Replace fuse
<i>Tilt/Recline actuator keeps running</i>	Pinched switch harness Stuck switch	adjust harness/ cable position to prevent pinching Inspect/ Repair / Replace switch

***Note:** For further assistance on these and any other issues, please contact our Technical Service Department at 888-433-6818.