MOV Backseat Relay
Model 201602-ACDC
Calibration

1. Introduction

The purpose of this procedure is to provide a means of bench verifying that the Camp Creek Technologies 201602-ACDC MOV Backseat Relay responds correctly to current inputs.

Since the relay operates on relative current readings to detect increased motor load as the valve reaches the backseat, calibration of current reading is not required for proper functioning of the device.

Calibration affects the displayed value of current. In practice, this device is not intended to be a high precision MOV analyzer.

This test does not exercise the full three phase operation sequence; however, it will verify that each phase current input is operational. The backseating operational sequence is defined by the firmware and may be verified by operating valves as described in the User's Manual.

This procedure does not apply to Models 201602-AC (also may be labeled as 201602) or 201602-DC which have different hardware and firmware.

This procedure applies to version 4.x of the relay firmware.

2. References

2.1 MOV Backseat User's Manual, TM201602ACDC.

2.2 Documentation and updates: http://campcreektech.com/mov.html

3. Equipment Required

3.1 MOV Backseat Relay

3.2 Digital Multimeter (DMM)

3.3 Variable DC voltage source, 0 to 1 volts, at least 200 mA

4. Limits and Precautions

4.1 Do not use this procedure for models 201602-AC or 201602-DC.

4.2 Do not exceed 1 amp or 3 volts at the input jacks.

5. Procedure

5.1 Check Reference 2.1 for firmware updates. Update per Section 6 as needed.

5.2 Disconnect all phase inputs.

5.3 Turn on the backseat relay.

5.4 Step through the SETUP screens and return to STOPPED. There are no requirements for any particular setting; but, if a Restore Defaults screen is encountered, you may select Yes to restore. Restore Defaults does not affect calibration settings.

5.5 Enable the Calibrate menu:

5.5.1 With the PREREQ or STOPPED screen showing, press the [+] key exactly 7 times.

5.5.2 With the PREREQ or STOPPED screen still showing, press the [-] key exactly 5 times.

NOTE: If key presses are wrong, press STOP to reset count and try again.

5.6 Press SETUP until Phase A Zero screen appears.

5.7 Three readings will be displayed showing the actual ADC values. Required values are 512 (506 to 518).

5.8 Press [-] to show As Found/As Left. Record the three readings under Zero As Found on Data Sheet. These are the calibration values that were previous saved.

5.9 Release [-]. The live readings will reappear. If different from the As Found, press [+] to save the new readings. Record Zero As Left on Data Sheet.

5.10 Press SETUP to obtain the Phase B Zero screen. Repeat steps 5.7 through 5.9.

5.11 Press SETUP to obtain the Phase C Zero screen. Repeat steps 5.7 through 5.9.

5.12 Press SETUP to obtain the Phase A Gain screen.

5.13 Connect the 0-1 VDC source, with the DMM (DC Volts) in parallel, to Phase A input.

NOTE: There are three sensitivity ranges in the relay that are automatically selected. The range will be identified as 0, 1, or 2 on the display. Range 0 is lowest, switching to range 1 at about 25 millivolts and switching to range 2 at about 200 millivolts. Maximum input is about 980 millivolts. A caret (^) will show in place of range number 2 if this limit is reached.

5.14 Adjust source until DMM shows actual voltage of approximately 20 millivolts with range 0 showing. If the range shows 1, decrease input to show range 0. Record under Gain Required on Data Sheet.

5.15 Record relay voltage reading under Gain As Found on Data Sheet.

5.16 If adjustment is required, press [+] or [-] to obtain the best match to actual voltage. Record Gain As Left on Data Sheet.

5.17 Adjust source until DMM shows actual voltage of approximately 180 millivolts with range 1 showing. If the range shows 2, decrease input to show range 1. Record under Gain Required on Data Sheet.

5.18 Record relay voltage reading under Gain As Found on Data Sheet.

5.19 If adjustment is required, press [+] or [-] to obtain the best match to actual voltage. Record Gain As Left on Data Sheet.

5.20 Adjust source until DMM shows actual voltage of approximately 400 millivolts with range 2 showing. If the range shows ^, decrease input to show range 2. Record under Gain Required on Data Sheet.

5.21 Record relay voltage reading under Gain As Found on Data Sheet.

5.22 If adjustment is required, press [+] or [-] to obtain the best match to actual voltage. Record Gain As Left on Data Sheet.

5.23 Disconnect test equipment from Phase A.

5.24 Repeat steps 5.13 through 5.23 for Phase B

5.25 Repeat steps 5.13 through 5.23 for Phase C

5.26 Press SETUP to show the Shunt A Cal screen.

5.27 Reconnect voltage source in series with the DMM current measuring jacks. Set DMM to DC current function.

5.28 Connect voltage source (current loop) to Phase A.

5.29 Adjust source to obtain approximately 200 mA displayed on the DMM. Record under Shunt Required on Data Sheet.

5.30 Record relay reading under Shunt As Found.

5.31 Adjust [+] or [-] to obtain best match to Required.

5.32 Record relay reading under Shunt As Left.

5.33 Disconnect test equipment from Phase A.

5.34 Repeat steps 5.28 through 5.33 for Phase B.

5.35 Repeat steps 5.28 through 5.33 for Phase C.

5.36 If there is any live circuitry connected to the relay jacks, disconnect for the following test.

5.37 Press SETUP to enter the Permit Circuit Test. This test will check the operation of the redundant hard logic permit circuit. The green LED will be off during this test.

5.38 Press OPERATE MOV. Verify the red LED comes on.

5.39 Press STOP. Verify the red LED goes off.

5.40 Press SETUP to exit this test.

5.41 OPTIONAL – reset run time settings

5.41.1 Press STOP.

5.41.2 Press [+] exactly one time and press [-] exactly one time. This will revert to the default menus.

5.41.3 Press setup to step through the screens.

5.41.4 Update date and time if needed.

5.41.5 If run time settings had been changed from default, the last screen will show *Restore Defaults? [-]No [+]Yes*. Press [+] to reset. This restore will not affect the calibrations performed under this procedure. See Section 7 if a calibration reset is desired.

5.42 Turn off relay and disconnect test equipment.

5.43 For long term storage, remove batteries to prevent damage from alkaline battery leakage.

6. Firmware Update

Firmware may be updated easily in the field using the latest code downloaded from the web site referenced in Section 2. The installed version is displayed momentarily on power up.

Model 201602-ACDC requires firmware version 4.0 or above. Versions 3.x and below will not work.

NOTE: Calibration is retained when firmware is updated

6.1 Unzip the update file. It will contain these instructions and an image2.hex file.

6.2 Copy the image2.hex file to a micro-SD card. The card used for logging may be used for this purpose.

6.3 Turn relay off.

6.4 Insert SD card in the slot on the side of the relay, contact side facing up.

6.5 Press the [-] key. While holding it down, press the power key.

6.6 The screen should show *Bootloader v2.0, Press SETUP to pgm*.

6.7 The [-] key may be released once the bootloader screen displays.

6.8 If you wish to cancel the update, press the STOP or power key.

6.9 Press SETUP. The screen will show *Erasing* for about 3 seconds followed by *Programming* for about 3 seconds.

6.10 Once complete, the normal relay startup screen will appear, identifying the version number.

6.11 The SD card may now be removed.

7. Key Codes for Menu Selection

Pressing these [+] and [-] buttons multiple times in the PREREQ or STOPPED screen defines what menu items will appear when pressing SETUP:

1 x [+]	1 x [-]	Default menu
7 x [+]	5 x [-]	Calibrate - Enables the Zero, Gain, and Shunt screens

Press STOP again while in the STOPPED screen if you need to retry the key counts.

Pressing the following buttons from the PREREQ or STOPPED screen will bring up a *Reset Calibration?* screen when SETUP is pressed. If [+] is then pressed, the calibration settings will be reset to default. Any other key will cancel the reset. If reset, a new calibration should be performed, though the default should still be within the 5% specs.

14 x [+]	8 x [-]	Reset Calibration

Settings except date & time are stored in non-volatile memory and saved when power is off or batteries removed. Date and time are maintained separately by a clock and will be lost if batteries are removed.

MOV Backseat Relay
Data Sheet

Model 201602-ACDC

Serial _____

Zero, ADC counts

	Required 512 (506 to 518)					
	Range 0		Range 1		Range 2	
	As Found	As Left	As Found	As Left	As Found	As Left
Phase A						
Phase B						
Phase C						

Gain, Amps Displayed

	Range 0			Range 1			Range 2		
	As Found	Required ±5%	As Left	As Found	Required ±5%	As Left	As Found	Required ±5%	As Left
Phase A									
Phase B									
Phase C									

Shunt, mA

	As Found	Required ±5%	As Left
Phase A			
Phase B			
Phase C			

_____√ Verify Permit Circuit Test

By_____ Date _____

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