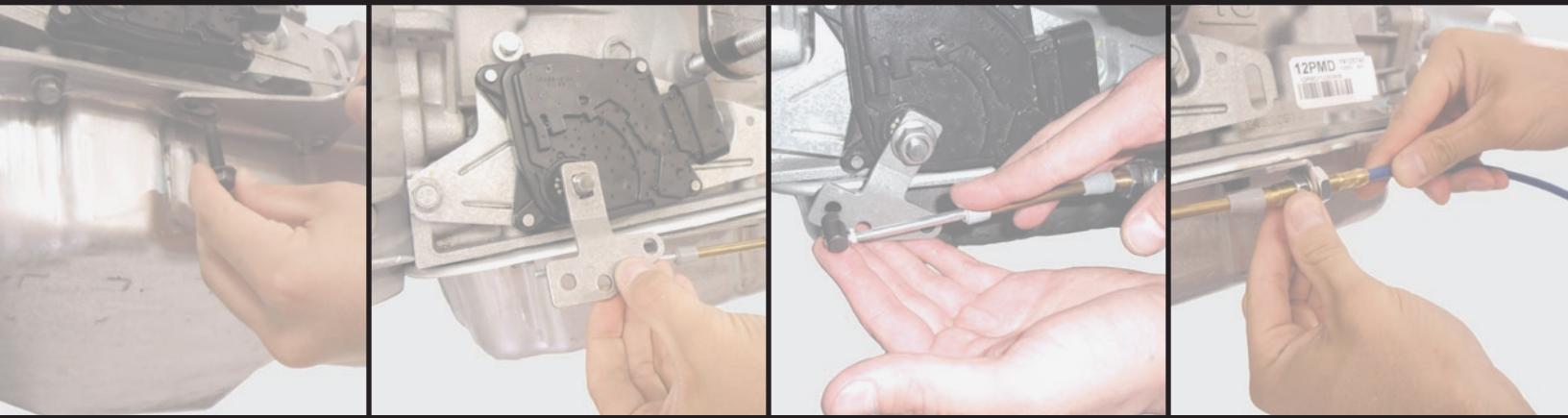




**POWERTRAIN CONTROL SOLUTIONS**  
Engineering the future of driveline control.

## PCS GEAR SELECT MODULE USER GUIDE v4.0



## PCS Gear Select Module User Guide

### 1 Introduction

#### 1.1 Included Components

- 1 - GSM Cable Motor Enclosur
- 1 - GSM Driver Interface Panel
- 1 - Wiring Harness



#### Additional Components:

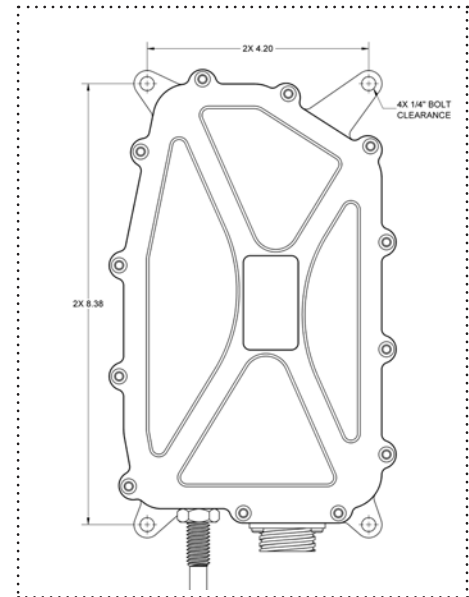
- Transmission shift cable install kit. Available for most common transmissions
- Speedometer Adapter. Required for transmissions with a mechanical speedometer output. Available for GM and Ford Transmissions

## 2 Mounting

1. The GSM Cable Motor Enclosure should be mounted in a location where the shift cable can reach the transmission. The enclosure is sealed from the environment so it can be mounted outside the cabin such as on a frame rail. Keep the enclosure away from the exhaust or other heat sources. The template can be found at the end of this manual. A template is available at the end of this document.

### Specifications

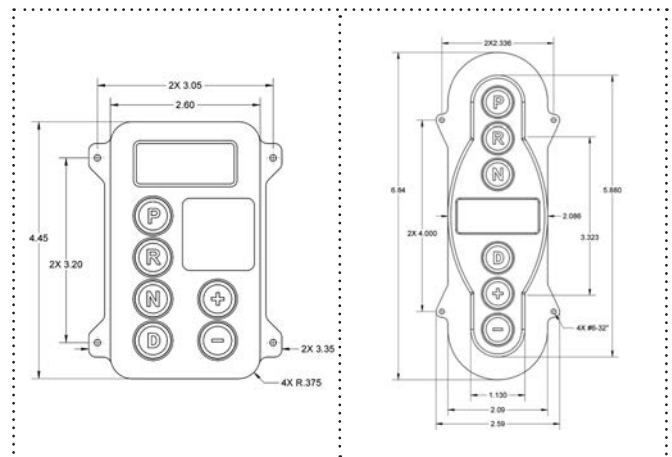
|                       |          |
|-----------------------|----------|
| Cable Length:         | 6'       |
| Cable End Thread:     | #10-32"  |
| Cable Bracket Thread: | 7/16-14" |



2. The GSM Driver Interface Panel should be mounted in a location where the driver can easily reach and see the push buttons. The case is designed to be mounted behind a panel with the appropriate cutout for a flush appearance. The templates found at the end of this manual, provide the case outline and panel cutout dimensions. Templates are available at the end of this document.

### Specifications

|                 |   |
|-----------------|---|
| Mounting Holes: | 4x #6-32" tapped thru or<br>4x #4 clearance holes |
|-----------------|---|



### 3 Shift Cable

Shift cable installation kits are available for most common transmissions. The kits consist of a bracket and shift arm to attach the cable to the transmission. If available for your transmission, the installation kit should have been purchased with your Gear Select Module.

The instructions below are based on the 4L60 installation kit. The installation procedure applies to all kits, with minor details from transmission to transmission. The specific installation kit also includes instructions for reference when installing the kit.

1. Open the plastic bag containing the parts for the cable and transmission bracket. The parts for GM transmissions are displayed in this document. There should be a cable bracket, bracket spacers, bolts, screw on cable swivel, cotter pin, and a lever arm. **(Figure 1)**



Figure 1

2. Raise and support the vehicle in a safe and proper manner. Remove the stock selector lever, if present. The stock lever will no longer be needed. Install the provided selector lever with the stamped letters on the lever facing out. The letter "F" should be to the front of the vehicle (longitudinal transmission). Install the lever, torquing to 23 lb-ft. The lever should move smoothly from front to rear with positive stop in each gear position. Final position should be to the max front position. **(Figure 2)**

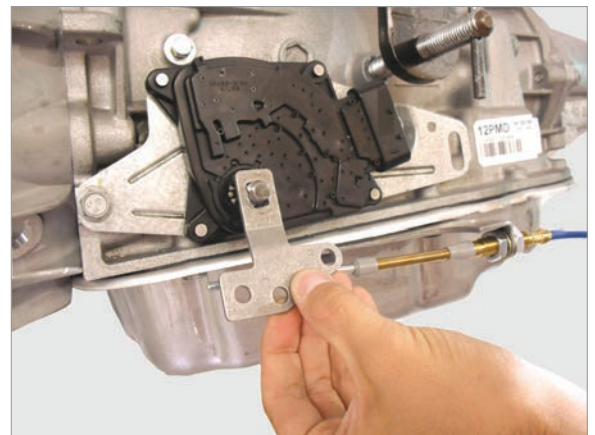


Figure 2

3. Remove the two middle transmission pan bolts on the left (driver) side of the transmission. **(Figure 3)**



Figure 3



4. Mount the cable bracket using the two bolts provided in this kit along with the two bracket spacers between the transmission cover and the cable bracket. Torque the new pan bolts at 12-13 lb-ft. Do not over tighten. **(Figure 4)**



Figure 4

5. Route the provided cable to accommodate the GSM installation and remove locking nut from the end of the cable. **(Figure 5)** Slip off the two rubber boots from cable. **(Figure 6)** Remove one locking nut and one of the two lock rings. **(Figure 7)** Slip the cable assembly into the cable bracket, then replace the lock ring and cable mounting nut. **(Figure 8)** Do not tighten the nuts just yet. Replace the rubber boots in the correct order. **(Figure 9)**

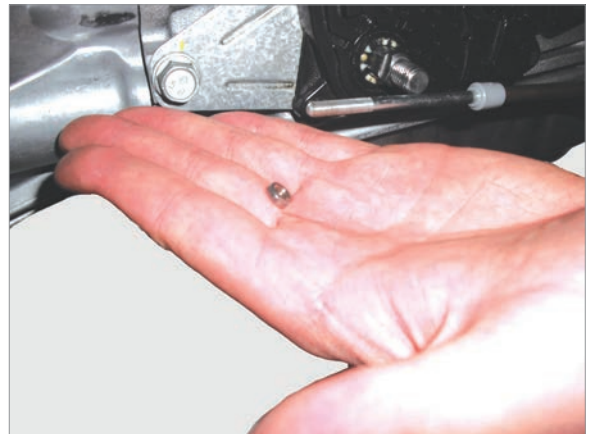


Figure 5



Figure 6



Figure 7



Figure 8



Figure 9

6. Replace the cable swivel lock nut and spin down to mid position on the threaded end. Spin on the cable swivel so that it is flush with the end of the cable. (Figure 10)

The cable will be aligned with the shift lever during the shift calibration process. (Part 4: Calibrating) Do not try to force the cable to align with the shift arm. Do not attach the cable to the shift arm at this time.



Figure 10

**NOTE:** Be sure to insert cotter pin to hold the cable swivel in place. (Figure 11)



Figure 11

7. Snug the 7/16" cable nuts as to remove any slack towards the lever. Tighten the cable nuts. **(Figure 12)**



Figure 12

#### 4 Wiring

1. Connect the GSM Cable Motor Enclosure to the harness connector labeled GSM Cable Motor Enclosure. **(Figure 1)**



Figure 1

2. Connect the GSM Driver Interface Panel to the harness. **(Figure 2)**



Figure 2

3. Verify the CAN terminator is installed into the connector labeled CAN BUS Terminator. This is a resistor that enables communication between the motor enclosure and the driver interface. This should have been installed during production. If it is not present on the harness, contact your PCS dealer. **(Figure 3)**

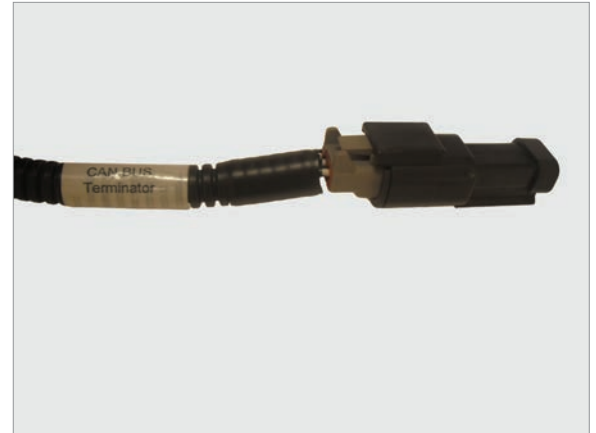


Figure 3

4. If a PCS Paddle Shifter is going to be used, follow the instructions in the Paddle Shifter manual for installation and then connect the paddle shifter receiver module harness (paddle shifter quick connect harness) to the GSM Option Connector. A paddle shifter is not required for GSM operation and can be added to the vehicle at any time. **(Figure 4)**

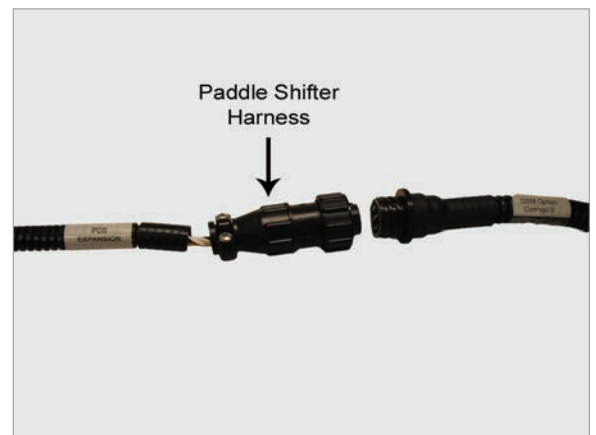


Figure 4

5. If a PCS transmission controller is controlling the transmission, connect the TCU's CAN connector to the connector labeled TCU CAN BUS. The transmission controller can transmit vehicle speed and brake light status to the GSM over the CAN connection and eliminate the need to hardwire these into the GSM. Verify the brake light switch is wired to the transmission controller. If the brake light switch is not wired to the transmission controller, then it either must be added to the transmission controller or it must be hard wired to the GSM as described in step 6. **(Figure 5)**

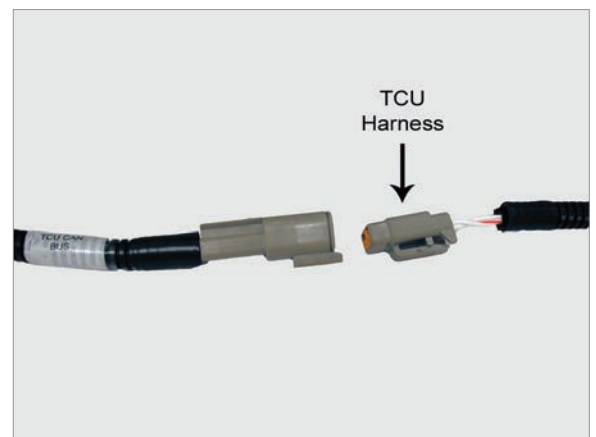
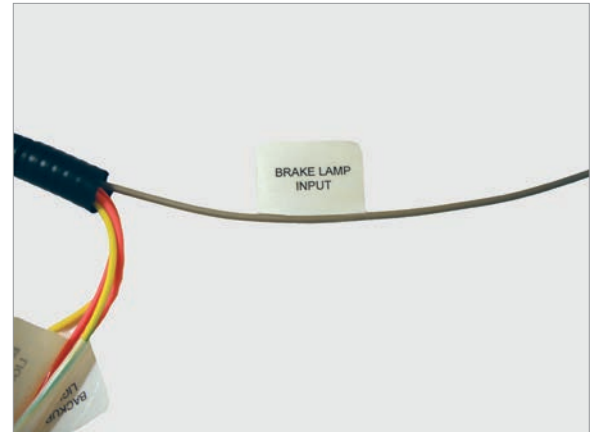


Figure 5



**SKIP STEPS 6 AND 7 IF YOU PURCHASED A-GSM4020 FOR DISCRETE SHIFT INPUTS.**

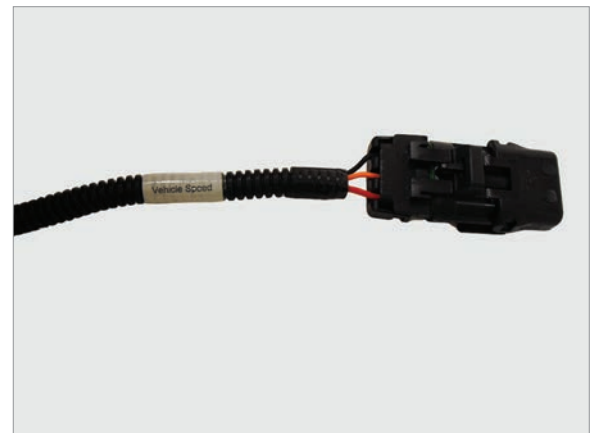
6. A brake switch signal is a required input to the GSM for safety. The GSM will not shift out of Park without pressing on the brake. If a PCS transmission controller was connected in step 5 and the brake light switch is wired and confirmed to be functioning to the transmission controller, then the brake switch signal does not need to be connected to the GSM. If a PCS transmission controller was not connected to the GSM in step 5, connect the brake switch signal to the brake lamp input wire. By default, the brake input is configured for a +12V signal when the brake is pressed. **(Figure 6)**



**Figure 6**

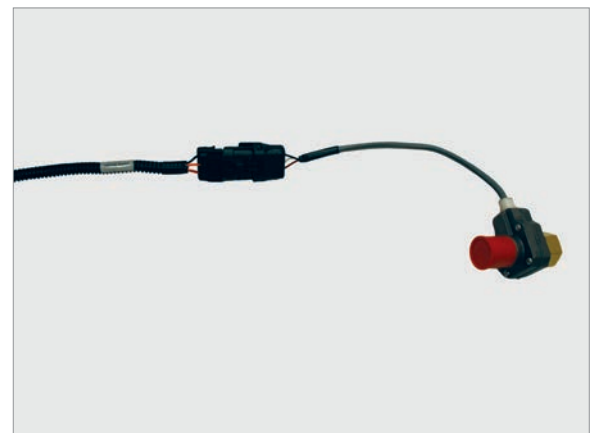
7. Vehicle speed is a required input to the GSM for safety. This speed input prevents the GSM from shifting into reverse when the vehicle speed is greater than 3 MPH, and Park when the vehicle speed is greater than 1 MPH. If this connection is not made, the GSM will function but this important safety feature will be disabled.

If a PCS transmission controller was connected in step 5, verify the GSM vehicle speed connector has a sealing plug in the connector to protect it from moisture and debris since it will not be used. **(Figure 7)**



**Figure 7**

If your transmission has a mechanical speedometer output, a speedometer signal generator is available for GM and Ford transmissions. This signal generator plugs directly into the vehicle speed connector on the GSM harness. **(Figure 8)**



**Figure 8**

If your transmission has an electronic speed sensor and is not controlled by a PCS TCU, then the speed signal must be shared between the stock controller and the GSM. “Y” cables are available from PCS for most common speed sensors to enable a plug and play connection. If a “Y” cable is not available, an unterminated pigtail is provided for connection into a speed signal. **(Figure 9)**



Figure 9

8. The two wires labeled Start provide neutral safety. These two wires are connected inside the GSM when the transmission is in Park or Neutral. If your vehicle has a functioning neutral safety circuit (the vehicle will only start in Park or Neutral – this could be implemented in the transmission wiring) then do not connect these wires. If your vehicle will start in any gear, these wires must be used to interrupt start circuit when in gear. Use of the GSM neutral safety is not required for the GSM to function, however it is extremely dangerous and not recommended to operate a vehicle without a neutral safety circuit. These wires must operate a relay to interrupt the start circuit. Do not connect the GSM directly to the solenoid circuit. Current greater than 0.5 Amps will damage the GSM. **(Figure 10-11)**

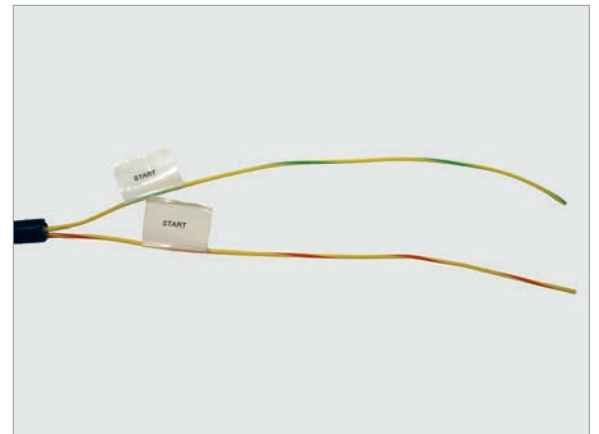
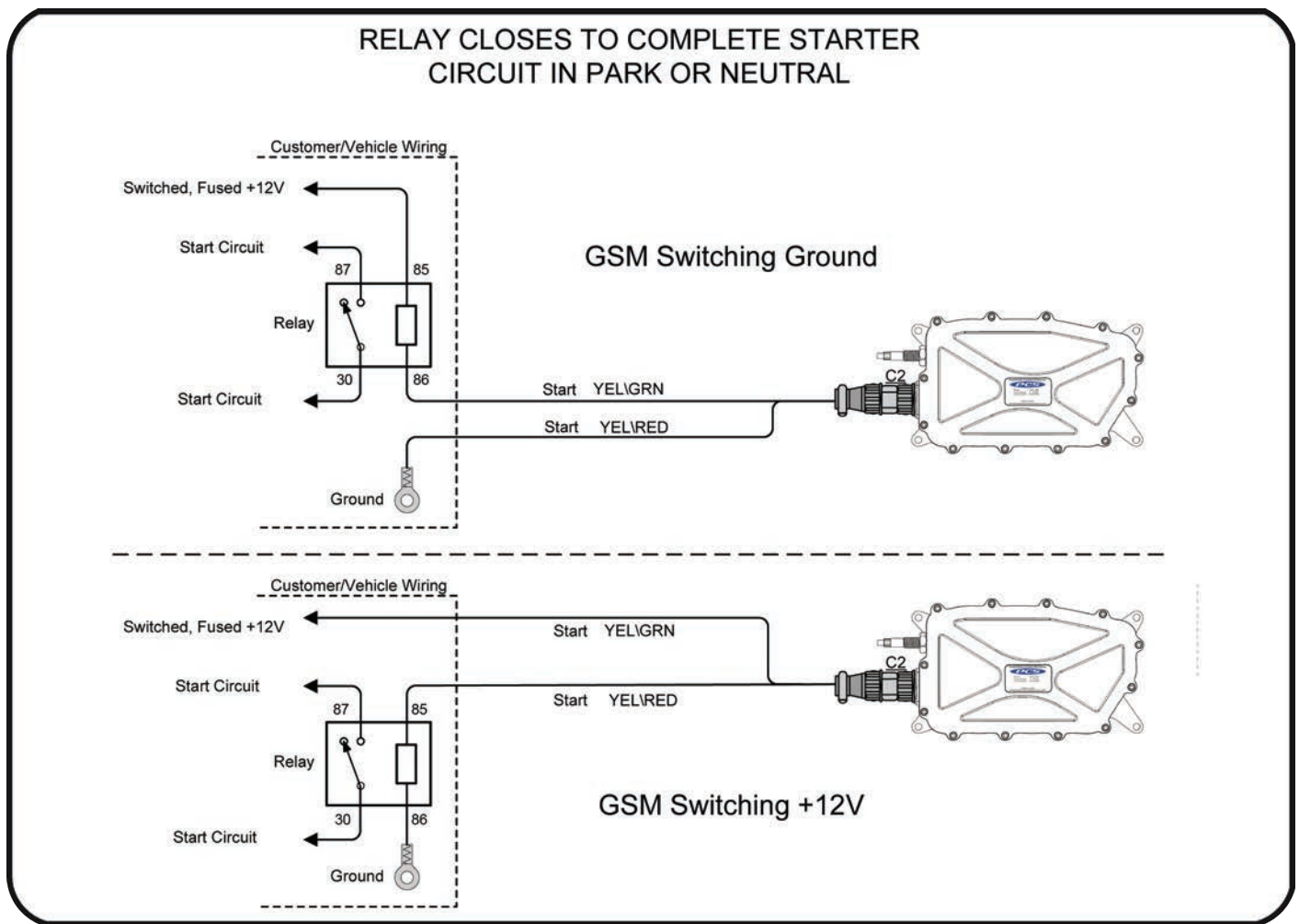
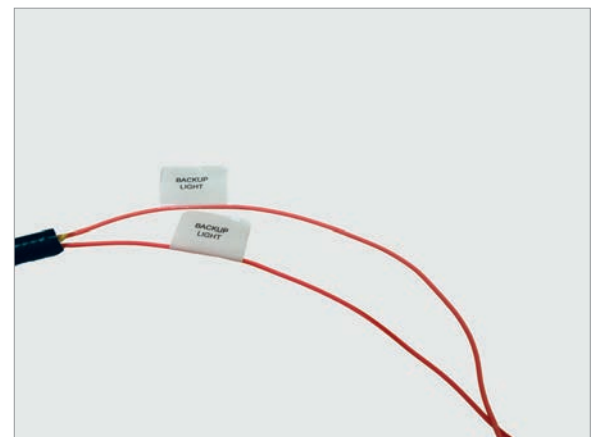


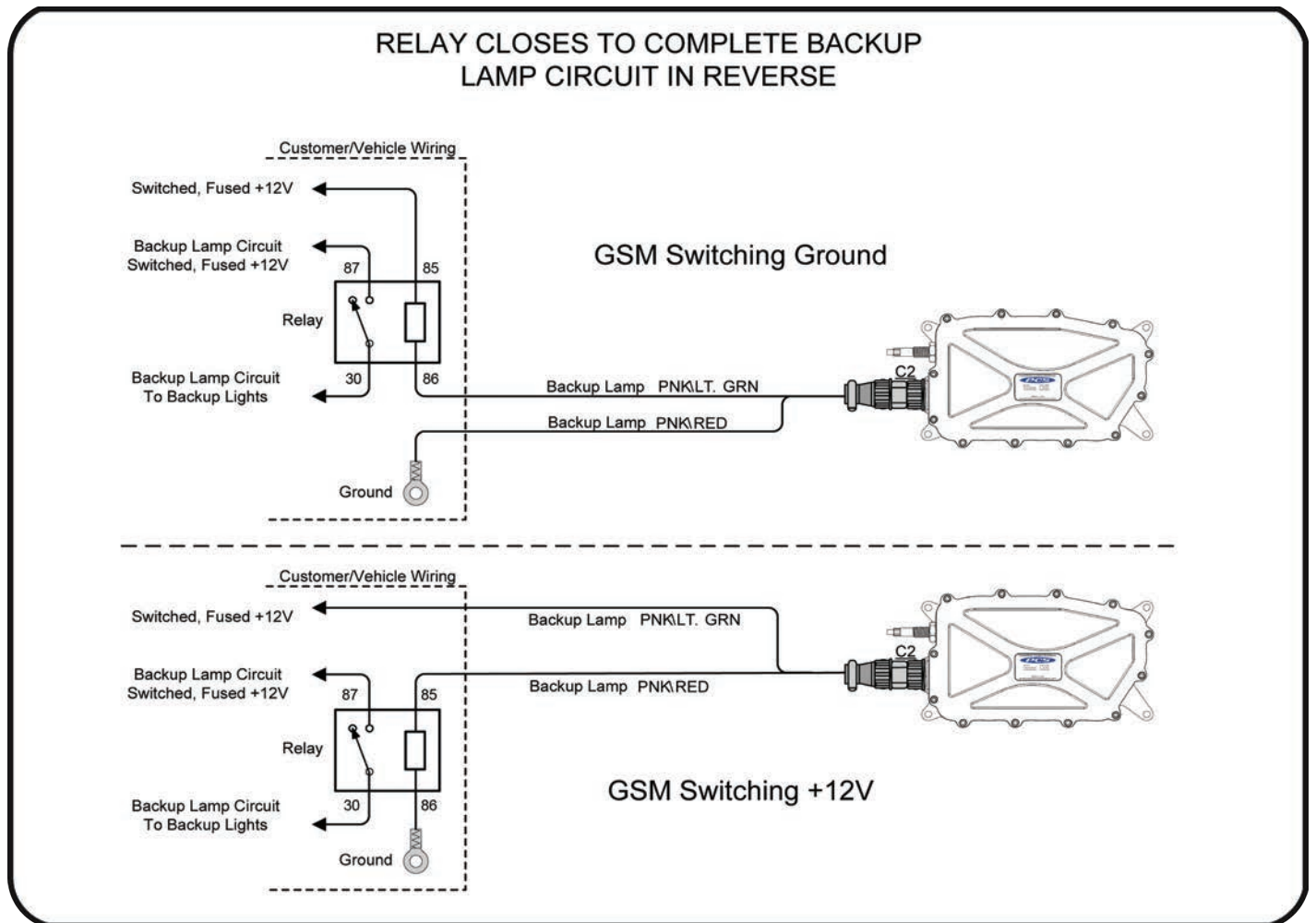
Figure 10



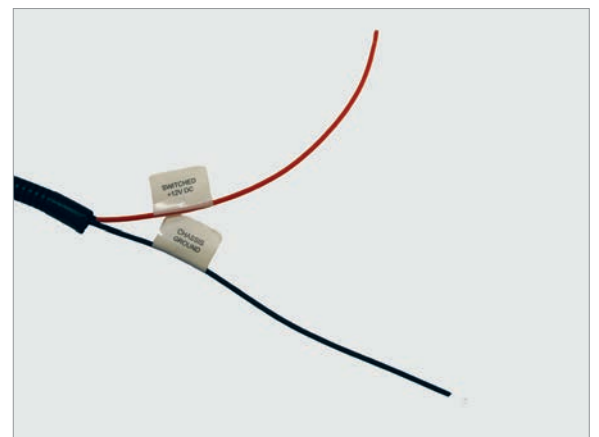
9. The two wires labeled Backup Light are used to control reverse lights. These two wires are connected inside the GSM when the transmission is in Reverse. Use of this circuit is optional and not required for the GSM to function. To control reverse lights, connect a relay as shown in the figure below. Do not connect reverse directly through the GSM. Current greater than 0.5 Amps will damage the GSM. **(Figure 12-13)**



**Figure 12**



10. Connect the red wire labeled Switched +12V DC to a switched ignition source capable of supplying 20 amps to the GSM. **(Figure 14)**
11. Connect the black wire labeled Chassis Ground to a good chassis ground or directly to the negative battery terminal. **(Figure 14)**

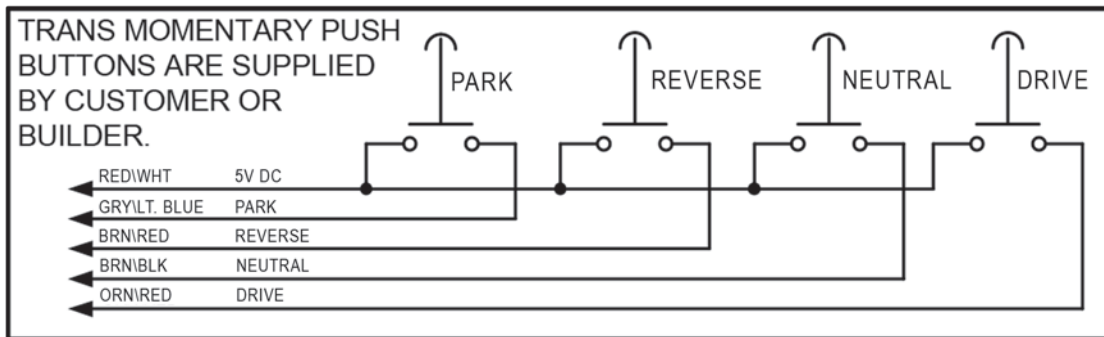


**Figure 14**



**STEP 12 IS FOR DISCRETE SHIFT INPUTS (A-GSM4020) INSTALLATION ONLY.**

12. To wire your GSM for discrete shift inputs, reference **FIGURE 15**.



**Figure 15**

## 5 Calibrating

The GSM must be calibrated for your transmission. This procedure only has to be done once and the calibration will be stored in the GSM even when power is disconnected from the GSM. If the GSM or transmission is removed and reinstalled in the vehicle the calibration must be verified and possibly redone.

The calibration procedure requires having access to the shift cable and arm at the transmission and having access to the driver interface panel. This may be easier accomplished with two people.

1. Turn power on to the GSM. When the GSM is shipped from PCS it is in programming mode and the driver interface panel will display "F#1". If the display shows this, continue to Step 2. If the panel turns on but displays current gear, then a calibration has previously been performed on the GSM. To reset the calibration, press '+' and '-' simultaneously to enter the setup menu. Then press '-' until the display scrolls 'Cable Calibrate' and displays '3Ca'. Press 'D'. The display will scroll 'Confirm Recalibration' and then display 'No'. Use the '-' button to change the display to 'Yes' and press 'D'. The display should now reset and display "F#1". Continue to Step 2. If the display does not turn on, troubleshoot the wiring, including power and ground to the GSM. **(Figure 1)**



Figure 1

2. Using the driver interface panel, set the number of transmission detents (lever positions), not including Park, Reverse, or Neutral. For example, the GM 4L60 and 4L80 have transmission detents for first, second, third, and fourth. Therefore the number 4 would be entered into the GSM. The Ford 4R70W has detents for fourth, second, and first so the number 3 would be entered even though the transmission has four gears. Use the '+' and '-' buttons until the desired number is shown and then press "D". **(Figure 2)**



Figure 2

3. If not already disconnected, disconnect the swivel and cable from the transmission shift arm. **(Figure 3)**

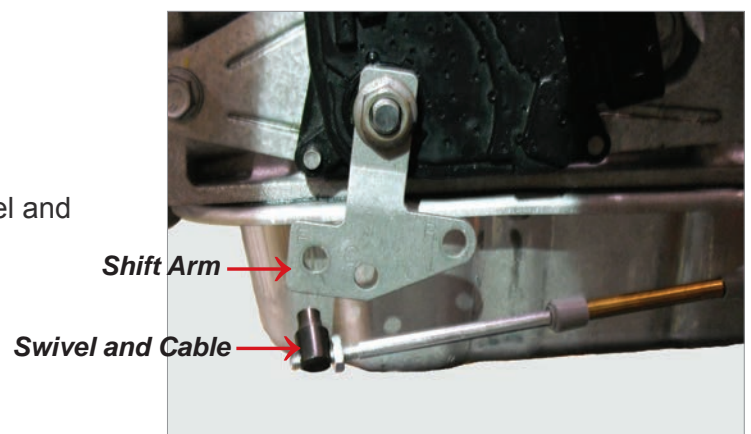
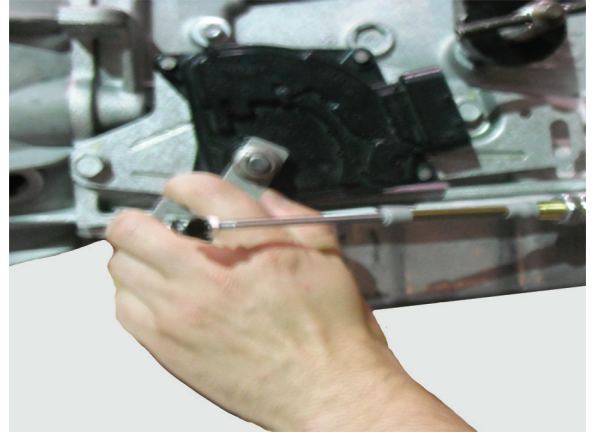


Figure 3

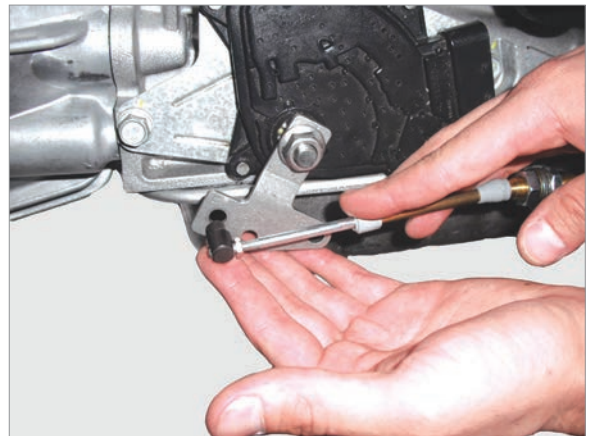
4. Manually move the transmission shift arm into the Park position. **(Figure 4)**



**Figure 4**

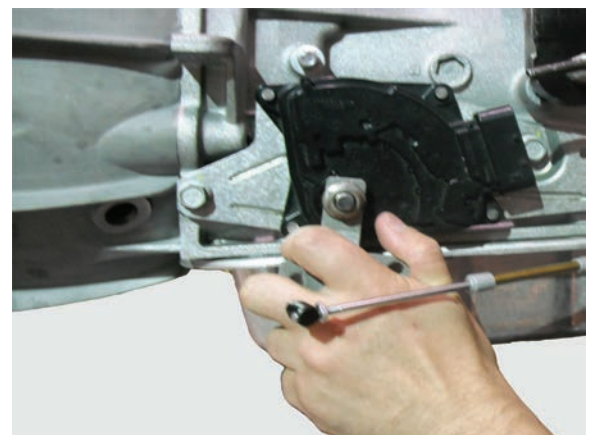
5. The driver interface panel should display "→P". Use the '+' and '-' buttons to move the cable until the swivel is aligned with the hole in the shift arm. When properly aligned, the swivel should slide in and out of the shift arm hole. Once the swivel is aligned, press "D". **(Figure 5)**

**NOTE:** If the cable fails to move, press and hold "N" while pressing "+" to increase the power level to the cable. Pressing "-" will decrease the power level to the cable.



**Figure 5**

6. With the swivel and cable not connected to the transmission shift arm, manually move the transmission into the next (Reverse) position. **(Figure 6)**



**Figure 6**

7. The driver interface panel should display “→R”. Use the ‘+’ and ‘-’ buttons to move the cable until the swivel is properly aligned with the hole in the shift arm. Once the swivel is aligned, press “D”. **(Figure 7)**



Figure 7

8. With the swivel and cable not connected to the transmission shift arm, manually move the transmission into the next (Neutral) position. **(Figure 8)**

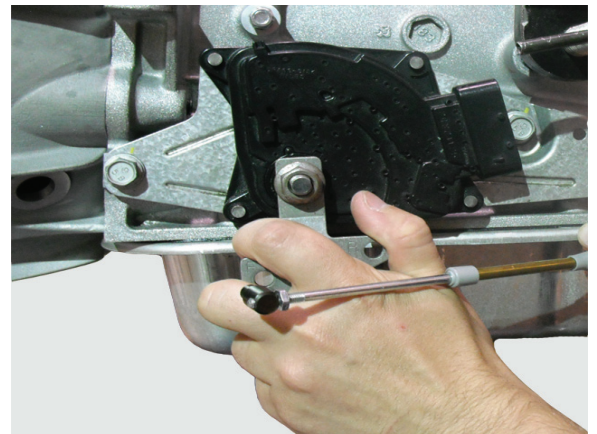


Figure 8

9. The driver interface panel should display “→N”. Use the ‘+’ and ‘-’ buttons to move the cable until the swivel is properly aligned with the hole in the shift arm. Once the swivel is aligned, press “D”. **(Figure 9)**



Figure 9



10. With the swivel and cable not connected to the transmission shift arm, manually move the transmission into the next (Drive) position. **(Figure 10)**

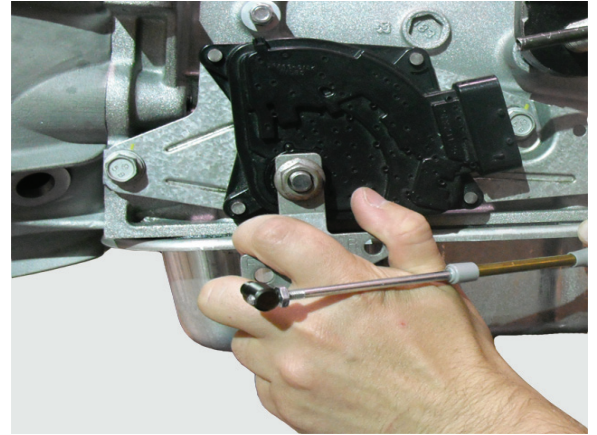


Figure 10

11. The driver interface panel should display “→D”. Use the ‘+’ and ‘-’ buttons to move the cable until the swivel is properly aligned with the hole in the shift arm. Once the swivel is aligned, press “D”. **(Figure 11)**



Figure 11

12. Continue this process through all the lever positions. Manually move the shift arm, use the ‘+’ and ‘-’ buttons to align the swivel, then press ‘D’.

13. After saving the lowest detent position, the driver interface panel will display "PIN". Insert the swivel into the transmission shift arm and use the cotter pin to secure the swivel and cable to the transmission. Keep hands clear of the shift arm and cable and press 'D'. **(Figure 13)**



Figure 13

14. The brake light safety check is disabled in test mode so all lever positions can be quickly tested. Press each button on the driver interface panel and insure the shift cable moves the shift arm to the desired detent. The shift arm should come to rest in each detent. Please note that transmission failure can occur if the position the GSM holds the shift cable is not perfectly aligned with the transmission detents. **(Figure 14)**



Figure 14

15. If the GSM is properly calibrated and no changes need to be made, press '+' and '-' simultaneously for 3 seconds to save the calibration to the GSM. If the GSM calibration needs to be adjusted, power off and on the GSM to clear the current calibration and start over with Step 1. **(Figure 15)**



Figure 15

## 6 Final Verification

1. Press “+” and “-” simultaneously to enter the setup menu. The driver interface panel will scroll “Setup...”, “1:Backlight” and then display “1BL”. **(Figure 1)**



Figure 1

2. Press and hold the “N” button to display the monitor screen. The monitor screen shows the brake status and the vehicle speed. When the brake is pressed, the left most segments on the driver interface panel will illuminate. Verify the brake signal functionality to the GSM. If the brake is working properly continue to the next step. If the brake signal is not working, troubleshoot the wiring before continuing. The GSM will not shift out of park without a functioning brake signal. **(Figure 2-3)**



Figure 2 (brake pedal pressed)



Figure 3 (brake pedal not pressed)

3. Press “P” to exit the setup menu. The display should show the current lever position. Press “R” to place the transmission into reverse. Check the backup light operation if they are controlled from the GSM. If the backup lights are functioning properly or you have chosen to not control the backup lamps from the GSM, continue to the next step. If they are not functioning, troubleshoot the wiring. **(Figure 4)**



Figure 4

4. Move the vehicle to a safe, suitable location where it can be driven. It is strongly recommended that one person drives the vehicle while a different person controls and monitors the driver interface panel. Press “P” to place the transmission into park. Start the vehicle. While holding the brake, press “D” to place the transmission into drive. Enter the setup menu by pressing “+” and “-” simultaneously. Press and hold the “N” button to display the monitor screen. Drive the vehicle while monitoring the reported GSM vehicle speed on the monitor screen. Vehicle speed should begin to read at 1 MPH and display an accurate speed. If vehicle speed is verified to be operational, continue with the next step. If vehicle speed does not read at all, troubleshoot the wiring. If vehicle speed reads, but it is not correct, contact your dealer or PCS technical support for further assistance. **(Figure 4)**

5. Move the vehicle to a safe, suitable location with ample room in front of the vehicle. With the key on, press “D” to place the transmission into drive. Turn the key off. With the brake pedal firmly pressed and clearance around the vehicle in case it moves forward, attempt to start the vehicle. If the vehicle does not start, verify it will start in “P” or “N”. If the vehicle only starts in “P” or “N” the neutral safety is working properly. If the vehicle does start when in drive, the neutral safety circuit must be connected as described in this manual.

## 7 Operation

Press the button of the desired lever position to shift the transmission. The current lever position is shown on the screen and the button is backlit blue. The brake must be pressed to shift out of park, into park, and into reverse.

When in drive, the “+” and “-” buttons can be pressed to manually move the shift lever through the forward gears. The “+” button will not move the lever into neutral, reverse, or park. The specific button for those gears must be pressed.



## 8 Menu Structure

### Menu Controls

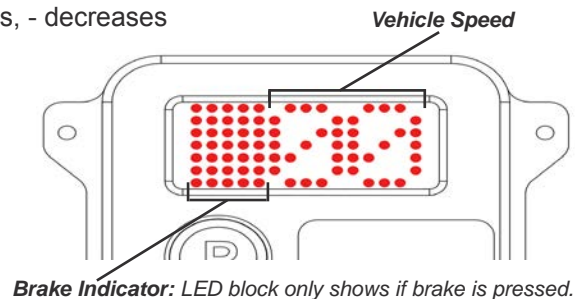
- P** will either return to the top level of setup, or, when already at the top level, it will exit the setup menu
- R** will go up 1 level in a menu state or go backwards in an edit process
- N** will display the speed and brake status
- D** will enter a menu item in a menu state or go forward in an edit process
- +** will select next menu item in a menu state or increase the value in an edit process
- will select previous menu item in a menu state or decrease the value in an edit process

### Back Light (1BL)

- Day: Displays current value(bar graph), + increases, - decreases
- Night: Displays current value(bar graph), + increases, - decreases
- Threshold: Displays current value(bar graph), + increases, - decreases

### Monitor (2Mo)

One screen to display speed in the user selected units (0-99, right two digits) with a block of LED's to show brake press (Illustrated Right).



### Calibrate Cable (3Ca)

- Confirm Calibration?
  - Yes: See GSM Calibration (p.12)
  - No

### Speed (4Sp)

- Source
  - GSM
    - Pulses per mile: Displays current value, + increases, - decreases
    - Trigger Level: Displays current value, + increases, - decreases
    - Filter: Displays current value, + increases, - decreases
    - Lockout Park: Displays current value, + increases, - decreases
    - Lockout Reverse: Displays current value, + increases, - decreases
    - Units: Displays current value, +/- toggles value. Options are "MPH" or "KPH."
  - CAN
    - CAN Format: Displays current value, +/- toggles. Options are "PCS" or "GM"
    - Lockout Park: Displays current value, + increases, - decreases
    - Lockout Reverse: Displays current value, + increases, - decreases
    - Units: Displays current value, +/- toggles value. Options are "MPH" or "KPH."

### Brake (5Br)

- Source
  - GSM
    - On Level: Displays current value, +/- toggles value. Options are "12" or "GND"
    - Pull: Displays current value, +/- toggles value. Options are "UP" or "DN"
    - Reverse Logic: Displays current value, +/- toggles value. Options are "ON" or "OFF."
  - CAN
    - CAN Format: Displays current value, +/- toggles. Options are "PCS" or "GM"

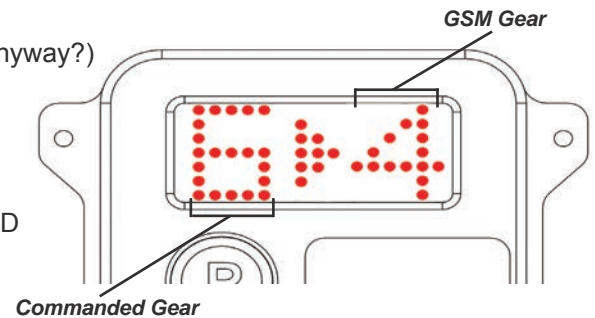
## Paddle/TCU (6Pa)

- Paddle Input: Displays current value, +/- toggles value. Options are “ON” or “OFF.”
- Manual Mode with TCU : Displays current value, +/- toggles value. Options are “ON” or “OFF.”  
*\*Note: Requires TCU firmware MajorVer >= 2 & Paddle Input must be set to “ON.”*

- OFF
- ON: TCU Detected or TCU Not Detected (Continue Anyway?)

### Manual Mode Setup (MMS)

- Manual Gear Count: Displays current value, +/- toggles value.
- Manual Range → +/- toggles GSM Gear, D moves to next commanded gear.  
*(\*Note: Please view the table below)*



| Commanded Gear | GSM Gear |
|----------------|----------|
| 6              | 4        |
| 5              | 4        |
| 4              | 3        |
| 3              | 2        |
| 2              | 1        |
| 1              | 1        |

This table is for example purposes only. Remember number of commanded gears is based on the set number of forward gears

## Input Alternatives (7In):

- Parallel PRND: *\*Note: Source for Brake & VSS must not be set to GSM*

- Parallel PRND: +/- toggles. Options are “ON” or “OFF”

- OFF

- ON

- P On Level: Displays current value, +/- toggles value. Options are “12” or “GND”
- P Pull: Displays current value, +/- toggles value. Options are “UP” or “DN”
- P Reverse Logic: Displays current value, +/- toggles value. Options are “ON” or “OFF”
- P Momentary or Toggle: Display current value, +/- toggles value. Options are “Tgl” or “Mom”
- R On Level: Displays current value, +/- toggles value. Options are “12” or “GND”
- R Pull: Displays current value, +/- toggles value. Options are “UP” or “DN”
- R Reverse Logic: Displays current value, +/- toggles value. Options are “ON” or “OFF”
- R Momentary or Toggle: Display current value, +/- toggles value. Options are “Tgl” or “Mom”
- N On Level: Displays current value, +/- toggles value. Options are “12” or “GND”
- N Pull: Displays current value, +/- toggles value. Options are “UP” or “DN”
- N Reverse Logic: Displays current value, +/- toggles value. Options are “ON” or “OFF”
- N Momentary or Toggle: Display current value, +/- toggles value. Options are “Tgl” or “Mom”
- D On Level: Displays current value, +/- toggles value. Options are “12” or “GND”
- D Pull: Displays current value, +/- toggles value. Options are “UP” or “DN”
- D Reverse Logic: Displays current value, +/- toggles value. Options are “ON” or “OFF”
- D Momentary or Toggle: Display current value, +/- toggles value. Options are “Tgl” or “Mom”

**View/Clear GSM Error Codes (8Er):**

- No Errors
- Errors: Displays error number (ex: er#1) and the description of error
  - No
  - Yes: Clears error

| Code | Scrolled Description  | Condition to Set  | Common Causes and Remedies  |
|------|---|---|---|
| 1    | ER#1: Motor position sensor fault. Clear?                           | Internal position sensors differ by more than 0.35 inches | If this code is generated, contact PCS technical support. This is most likely an indication that there is an internal fault inside the motor enclosure. PCS must perform this service. Do not attempt to open the motor enclosure.  |
| 2    | ER#2: Gear shift required excessive time. Clear?                    | Desired position move is not accomplished in 1 second     | The motor is designed to quickly move the shift arm to the desired position. Several common causes of slow motor movement include: <ul style="list-style-type: none"> <li>• Cable routing causing a very tight bend in the cable. To solve this problem reroute the cable to minimize tight bends.</li> <li>• Battery voltage too low resulting in not enough power at the motor.</li> </ul> To solve this problem, confirm the battery is fully charged or charge accordingly. Also inspect the wiring to ensure proper connection points. The GSM can draw up to 20 amps so proper wire installation practices are essential. |
| 3    | ER#3: Shift cable position was outside of calibrated range. Clear?  | Position sensor reading outside calibrated range          | This is typically an issue with the calibration. Re-perform the calibration procedure.  |
| 4    | ER#4: Button release not detected - check your input device. Clear? | Button press duration greater than 5 seconds              | Check to make sure the buttons are not stuck. Press each button and ensure the button rises back up after it is pressed. If a button appears to be sticking, contact PCS technical support.   |

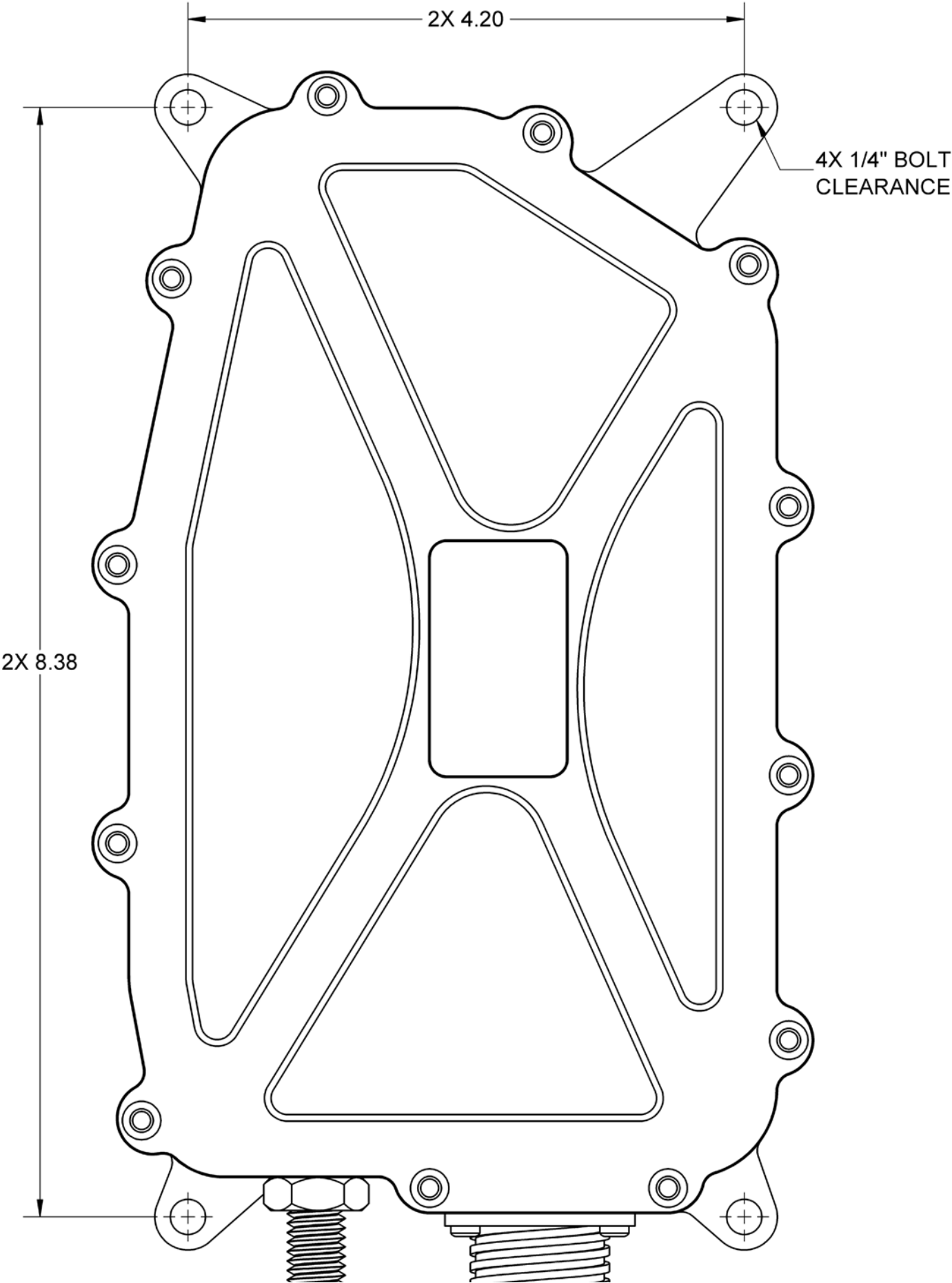
**Edit Cable and Motor Setup (9Ed):** *\*Note: Cable must be disconnected from the arm to complete the options below. When adjusting detent position, pressing "N" will change to position sensor reading.*

- Adjust Cable Position: Displays current gear: +/- toggles position
  - Save new position?
    - No
    - Yes
- Calibrate Cable Length
  - How many 1/1000 inches?: Displays current value, + increases, - decreases
 

*\*Note: To determine, measure how far the cable protrudes from its sheath.*

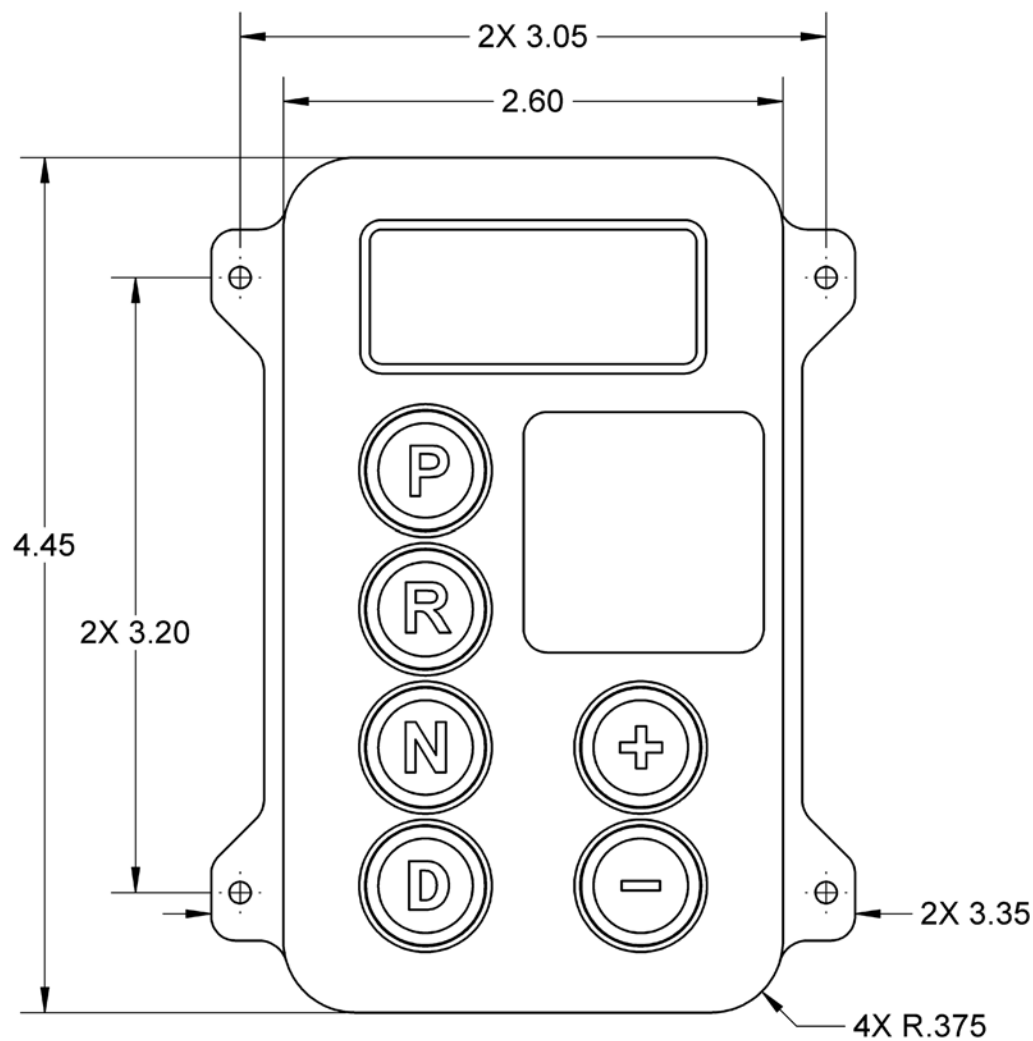
**LIMITED WARRANTY STATEMENT.** Powertrain Control Solutions, LLC. Warrants all merchandise against defects in factory workmanship and materials for a period of 12 months after purchase. This warranty applies to the first retail purchaser and covers only those products exposed to normal use or service. Provisions of this warranty shall not apply to Powertrain Control Solutions, LLC. Product used for a purpose for which it is not designed, or which has been altered in any way that would be detrimental to the performance or life of the product, or misapplication, misuse, negligence or accident. On any part or product found to be defective after examination by Powertrain Control Solutions, LLC., Powertrain Control Solutions, LLC. will only repair or replace the merchandise through the original selling dealer or on a direct basis. Powertrain Control Solutions, LLC. assumes no responsibility for diagnosis, removal and/or installation labor, loss of vehicle use, loss of time, inconvenience or any other consequential expenses. The warranties herein are in lieu of any other expressed or implied warranties, including any implied warranty of merchantability or fitness, and any other obligation on the part of Powertrain Control Solutions, LLC., or selling dealer.

# GSM Cable Motor Enclosure Template





# GSM Driver Interface Panel Template



# GSM Inline Driver Interface Panel Template

