Figure 1–2. CEC2 Components

NOTE: Illustration is not to scale. Actual harness configuration may differ from this illustration.
1–2. ELECTRONIC CONTROL UNIT (ECU)

The ECU (Figure 1–3) contains the microcomputer which is the brain of the control system. The ECU receives and processes information defining:

- Shift selector position
- Sump temperature
- Turbine speed
- Throttle position
- Input speed
- Transmission output speed

The ECU uses the information to:

- Control transmission solenoids and valves.
- Supply system status.
- Provide diagnostic information.

Each ECU has a date code stamped on the label which is attached to the outer case of the ECU. This is the date when the ECU passed final test. This date is commonly used to denote the change configuration level of the ECU. It is normal for the ECU date displayed electronically to be a few days prior to the date shown on the label.

Figure 1–3. Electronic Control Unit (ECU)

NOTE: ECU wiring harness connector retainers are individually keyed and color-coded to make sure that the proper connector is attached to the correct ECU socket. The color of the connector retainer should match the color of the connector strain relief (see Appendix C, Paragraph C–1).

1–3. SHIFT SELECTOR

Pushbutton and lever shift selectors for CEC2 are remote mounted from the ECU and connected to the ECU by a wiring harness. Both of these shift selectors have a single digit LED display and a mode indicator LED. During normal transmission operation, illumination of the LED indicator shows that a secondary or special operating condition has been selected by pressing the MODE button. During diagnostic display mode, illumination of the LED indicator shows that the displayed diagnostic code is active. Display brightness is regulated by the same vehicle potentiometer that controls dash light display brightness. More information on both types of shift selectors is continued below.

A. Pushbutton Shift Selector (Figure 1–4)

The full-function pushbutton shift selector has a MODE button and diagnostic display capability through the single digit LED display. The full-function pushbutton shift selector has the following six (6) pushbuttons:

- R (Reverse)
- D (Drive)
- N (Neutral)
- ↓ (Down) and ↑ (Up) arrows
- MODE

Figure 1–4. Typical Full-Function Pushbutton Shift Selector
GENERAL DESCRIPTION

Manual forward range downshifts and upshifts are made by pressing the ↓ (Down) and ↑ (Up) arrow buttons after selecting D (Drive). The N (Neutral) button has a raised lip to aid in finding it by touch. The MODE button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule. Diagnostic information is obtained by pressing the ↑ (Up) and ↓ (Down) arrow buttons at the same time.

B. Lever Shift Selector (Figure 1–5)

The lever shift selector can have as many as six forward range positions, as well as two R (Reverse) positions (R1 and R2) and N (Neutral). There is a hold override button which must be pressed and held in order to move between certain selector positions. The hold override button must be pressed when shifting between R, N, and D. The hold override button is released when the desired selector position is reached. The selector lever can be moved freely between D and the numbered forward ranges without pressing the hold override button. The lever selector can be chosen with the lever on the left side or on the right side and with the R (Reverse) position toward the front or toward the rear of the selector. Diagnostic information is obtained from the single digit LED display by pressing the DISPLAY MODE button.

![Figure 1–5. Typical Lever Shift Selector](image)

1–4. THROTTLE POSITION SENSOR (Figure 1–6)

The Throttle Position Sensor (TPS) can be mounted to the engine, chassis, or transmission. The TPS contains a pull actuation cable and a potentiometer. One end of the cable is attached to the engine fuel lever and the other, inside a protective housing, to the TPS potentiometer. Output voltage from the TPS is directed to the ECU through the external harness. The voltage signal indicates the throttle position and, in combination with other input data, determines shift timing.

![Figure 1–6. Throttle Position Sensor](image)
1–5. **SPEED SENSORS** *(Figure 1–7)*

Three speed sensors—input speed, turbine speed, and output speed—provide information to the ECU. The input speed signal is generated by the gear teeth on the top PTO gear. The turbine speed signal is generated by serrations on the pitot can attached to the splitter low drum. The output speed signal is generated by a toothed member attached to the output shaft. The speed ratios between the various speed sensors allow the ECU to determine if the transmission is in the selected range. Hydraulic problems are detected by comparing the speed sensor information for the current range to that range’s speed sensor information stored in the ECU memory.

![Figure 1–7. Speed Sensors](image1)

1–6. **ELECTRO-HYDRAULIC VALVE COMPONENTS** *(Figure 1–8)*

The CEC2 electro-hydraulic valve bodies contain various solenoids to control the absence or presence of solenoid pressure. Solenoid pressure, or lack of pressure, positions shift valves which apply or release transmission clutches to produce the range commanded by the ECU inputs. The ECU is connected to the solenoids by a wiring harness with sealed multi-pin twist-lock connectors at the control valve bodies.

![Figure 1–8. CEC2 Control Module](image2)
GENERAL DESCRIPTION

The sump temperature sensor in the lockup body sends information to the ECU. When oil temperature is below –25°F (–32°C), all shifts are blocked. When oil temperature is between –25°F* (–32°C) and 20°F* (–7°C), transmission shifting is limited to neutral, to limited forward ranges*, and reverse. Above 250°F* (121°C), the Hot light comes on (if equipped), and a trouble code is stored in memory. Refer to chart in Section 5, Code 24 for sump temperature sensor (thermistor) characteristics. Some applications (emergency vehicles, for example) are often exempt from shift inhibit during temperature extremes, but the CHECK TRANS light may still come on and codes may be logged in the ECU memory.

1–7. WIRING HARNESS

A. External Wiring Harness (Figure 1–9)

CEC2 uses three external wiring harnesses to provide a connection between:
- ECU
- Transmission (including input, turbine, and output speed sensors)
- Throttle position sensor
- Vehicle interface module (VIM)
- Shift selectors
- Diagnostic tool connector
- Vehicle interface.

The transmission harness may include a bulkhead fitting to separate cab and chassis components.

NOTE: Allison Transmission provides service of wiring harnesses and wiring harness components as follows:

- Repair parts for internal wiring harness and wiring harness components attached to the shift selector will be available through the Allison Transmission Parts Distribution Center (PDC). Use the P/N from your appropriate parts catalog or from Appendix C in this manual. Allison Transmission (AT) is responsible for warranty on these parts.

- Repair parts for external harnesses and external harness components must be obtained from St. Clair Technologies Inc. (SCTI). SCTI provides parts to any Allison customer or OEM and is responsible for warranty on these parts. SCTI recognizes AT, manufacturers, and SCTI part numbers. SCTI provides a technical HELPLINE at 519-627-1673 (Wallaceburg). SCTI will have parts catalogs available. The SCTI addresses and phone numbers for parts outlets are:

  St. Clair Technologies, Inc  St. Clair Technologies, Inc.
  920 Old Glass Road        Calle Damanti S/N Col
  Wallaceburg, Ontario N8A 4L8 Guadalupe – Guaymas
    Phone: 519-627-1673        Sonora, Mexico 85440
    Fax: 519-627-4227          Phone: 011-526-2222-43834
                               Fax: 011-526-2222-43553

- St. Clair Technologies, Inc. stocks a CEC2 external harness repair kit, P/N 29532362, as a source for some external harness repair parts. SCTI is the source for external harness repair parts.

* This is a programmed value subject to change.
NOTE: Illustration is not to scale. Actual harness configuration may differ from this illustration.
GENERAL DESCRIPTION

B. Internal Wiring Harnesses (Figure 1–10)

The internal wiring harnesses provide connection between the external harness, solenoids, and the temperature sensor.

Figure 1–10. CEC2 Internal Wiring Harnesses