

SECTION 4

TRANSMISSIONS

CHAPTER 4

DUAL COMMAND TRANSMISSION

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SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

Introduction

The transmission electronic management system has an inbuilt self diagnostic facility. This facility utilizes the digital display of the gear shift handle assembly to indicate, in coded format, any malfunction in the electrical and electronic circuitry and in the micro-processor. It should be noted that the self diagnostic capability is generally limited to diagnosis of the electrical and electronic circuitry and related components, however, there are some codes, which can be generated if pressure switch circuits are not closed because of an actual lack of hydraulic pressure. Any malfunction of the mechanical and hydraulic components must be diagnosed using conventional techniques, performance characteristics and tooling, such as pressure testing equipment. Full guidance for both electrical self diagnosis and conventional diagnosis is contained within this section.

Trouble-shooting and fault finding should always be carried out in a logical and planned sequence, many apparent faults associated with electronic components are often hastily diagnosed and result in the replacement of expensive components. An extra few minutes confirming the apparent fault will result in a more positive and cost effective repair.

With the use of micro-processors it is often that this item is blamed for any malfunction but the real truth is that this item is usually sound and that the fault is due to poor contacts in the associated connectors.

Each connector illustrated and identified in the wiring diagrams in Chapter 9 Section 2 and referred to in the following fault finding procedure, has the same identification reference. For example, the main transmission processor connectors are referred to as Connectors C100 and C101 in the illustration and also referred to as C100 and C101 in the fault finding procedure. Often in the fault finding flow chart the connector and pin are abbreviated and will read, for example, C100-21. The C100 refers to the connector and the 21 to the pin number. Alternatively, for connectors with fewer pins, the identification will read, C014-FM3100-B/G/S. This is broken down as follows:

| | |
|--------|--|
| C014 | Connector number |
| FM3100 | Front Main harness, circuit number 3100 |
| B/G/S | Wire color |

Reference will have to be made to the wiring chapter of Section 2 to correctly identify the pin in question.

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Where the fault finding procedure requires checks for continuity a visual inspection of the wiring should be made prior to conducting tests to ensure that obvious 'mechanical' damage has not occurred to the harness or the connectors.

A good quality multimeter is an essential item to perform fault finding. It should be capable of measuring resistance of at least 20,000 ohms and measuring voltage and current. When using the multimeter it is good practice to select a high range and work downwards to avoid damaging the instrument.

IMPORTANT: *Care should be used when using the multimeter, only use the instrument as instructed to avoid damage to the internal elements of the micro-processor. When checking the continuity of wiring, sensors or switches it is necessary to isolate the electronic micro-processor and ensure the keystack is turned off to prevent possible further damage. The keystack should only be switched on and the processor connected where specifically instructed in the fault finding procedure.*

If it is found necessary to clean the connectors a contact spray should be used. **DO NOT USE ANY OTHER METHOD FOR CLEANING TERMINALS.** Do not use a cleaner that contains Trichloro-ethylene, this solvent will damage the plastic body of the connector. It is preferable to use a cleaner with a Freon T.F. base.

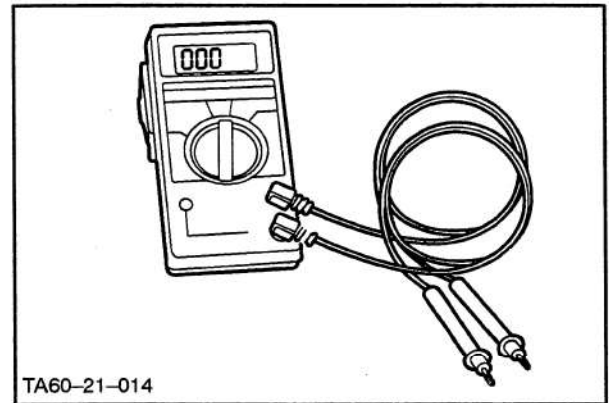


Figure 4-4-1

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

CLUTCH AND SYNCHRONIZER CALIBRATION

The Hi-Lo transmission has wet multi-plate clutches that require periodic calibration to compensate for wear. Calibration should only be necessary if a deterioration in gear shift quality is noted.

NOTE: During the calibration procedure the electronic management system detects precisely the point at which the clutches start to engage. The engagement is detected by a reduction in engine speed. During calibration it is essential that no action is taken to cause the engine speed to vary. Be sure that the air conditioner and all electrical equipment is switched off. Do not operate the PTO or any hydraulic lever or move the hand or foot throttle.

There are two methods to enter the calibration mode:

- (i) Through the diagnostic connector, using special tool No. FNH00874 and menu mode H1, or,
- (ii) By depressing both Hi and Lo buttons on the shift lever during start up.

Tractor Preparation

NOTE: The clutches can be adjusted when the transmission oil is at a temperature of 68°F (20°C) or over. The clutches should be adjusted when the transmission oil is at 140°F (60°C) or over.

Park the tractor on level ground, away from obstacles (in case of unexpected tractor movement).

Apply handbrake, switch off all electrical equipment and air conditioning if fitted. Stop the engine and place remote levers in neutral and lower hydraulic equipment to the ground.

Place all the shift levers in neutral. Block the wheels, front and rear.

Either, (i) Install tool FNH00874 into the diagnostic plug and select H1 by depressing the diagnostic switch once or (ii) press and hold both the Hi and Lo buttons and start the engine.

“CAL” will appear in the transmission display, (release Hi and Lo buttons).

Set engine speed to 1200 ERPM \pm 100.

Select forward, first gear, high range (C) and release the clutch.

The transmission is now ready for calibration.

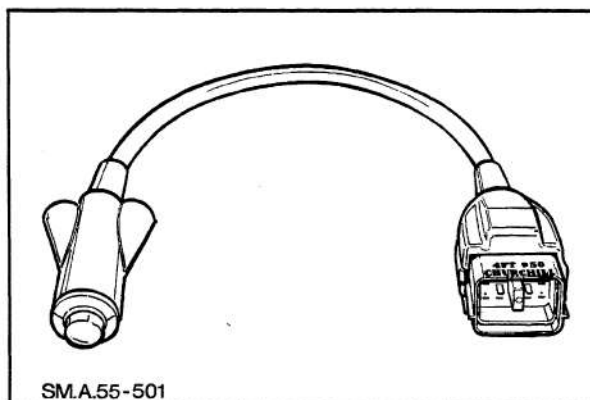


Figure 4-4-2

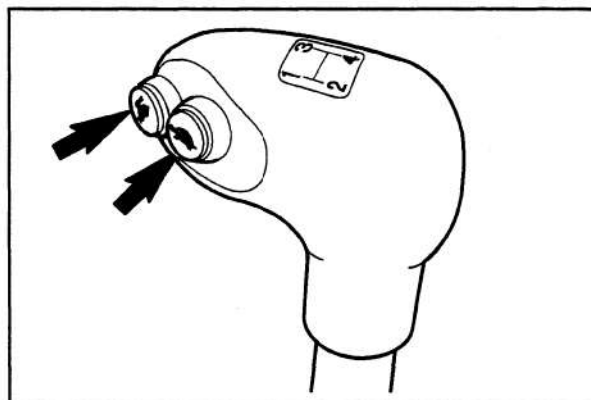


Figure 4-4-3

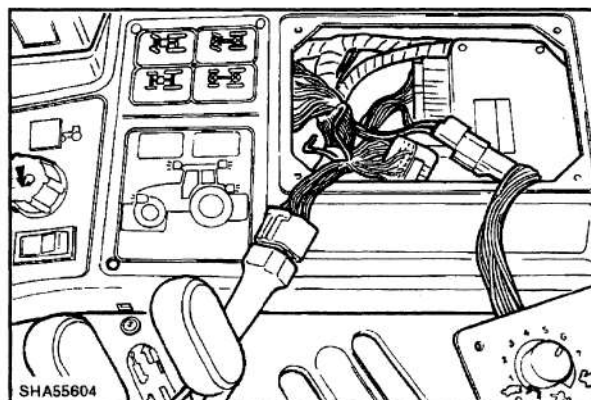


Figure 4-4-4

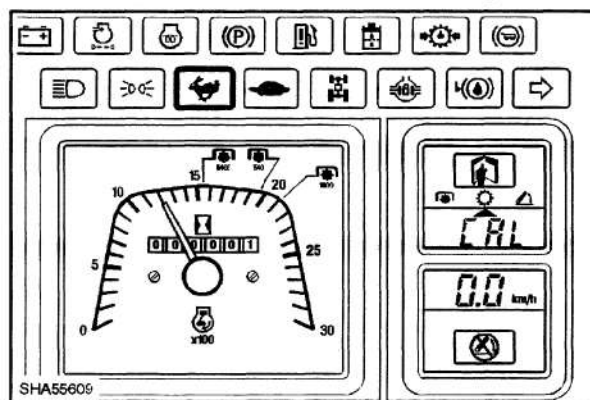


Figure 4-4-5

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

Press and hold upshift button to calibrate clutch Hi.

If the start up procedure was incorrect a "U" code will appear. See 'Error Codes' on page 4-4-24.

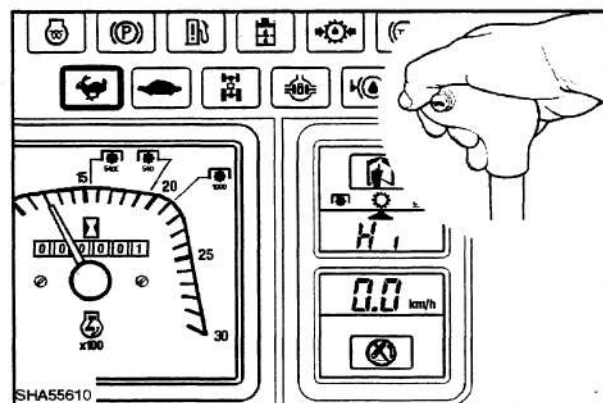


Figure 4-4-6

After a few seconds the displayed Hi is replaced by a number which increases during calibration.

Hold the upshift button until the engine speed decreases by 50 RPM and the number stops increasing.

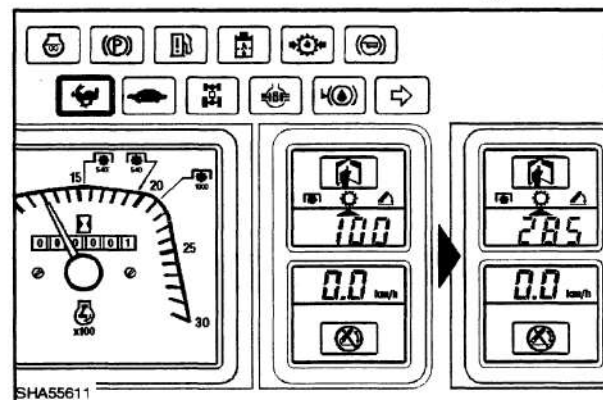


Figure 4-4-7

Press the down shift button to calibrate the Lo clutch in the same manner as the Hi clutch.

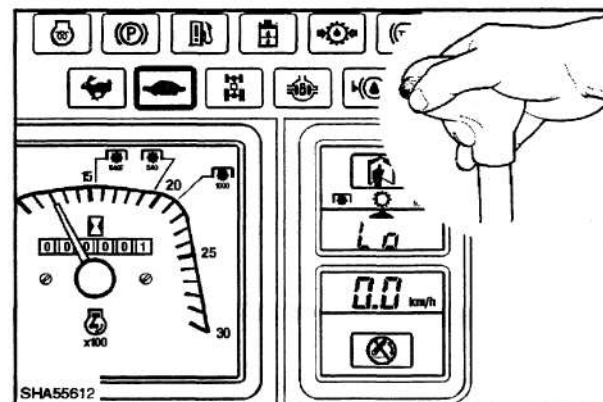


Figure 4-4-8

Synchronizer Calibration

To calibrate the synchronizer, at any stage after initial tractor preparation, press both the Hi and Lo buttons and hold.

"SOC" appears during calibration.

"END" displays to signify completion.

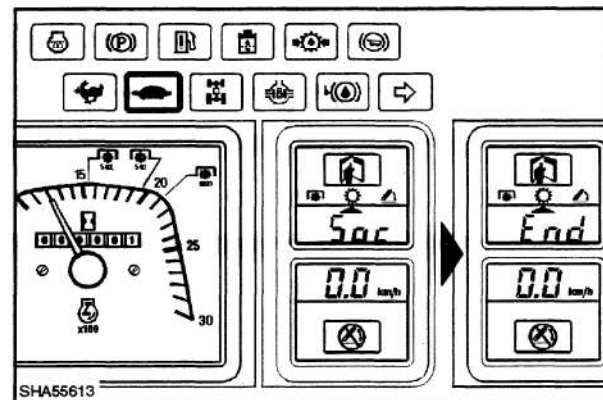


Figure 4-4-9

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

PRESSURE TESTING

Transmission Clutches A and B

1. Prepare the tractor for pressure testing:
 - (i) Remove the instrument console side covers, lift and remove cab rubber mat and remove the floor pan.
 - (ii) Remove the instrument console side covers, lift and remove cab rubber mat and remove the floor pan.
 - (iii) Ensure the handbrake is fully applied and wheels chocked.
 - (iv) Disconnect a range switch connector and install Special Tool FNH00875 (bypass connector) into the harness, (1) Figure 4-4-10.
 - (v) Start and run the tractor to warm the transmission oil to a minimum temperature of 140°F (60°C).

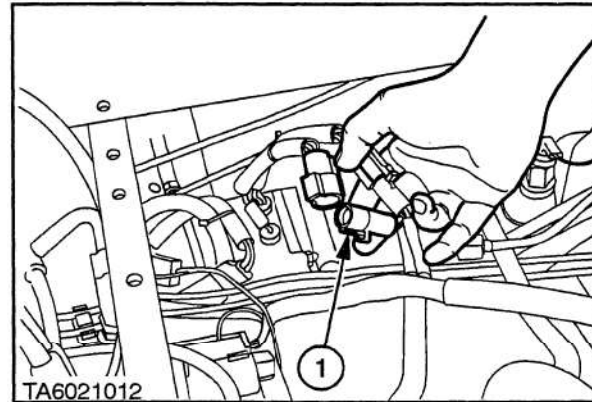


Figure 4-4-10

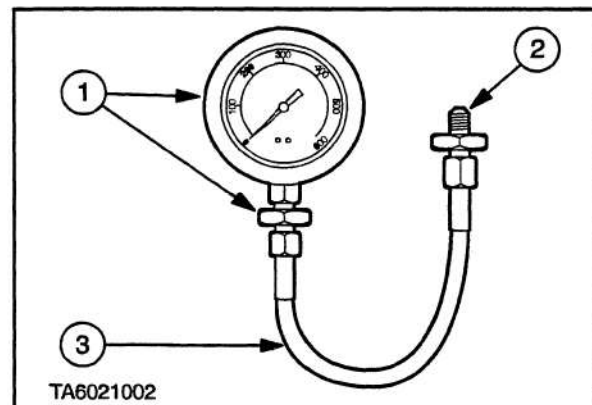


Figure 4-4-11

2. Install suitable pressure gauges, (0–600 lbf/in², 0–40 bar), Figure 4-4-11.
 1. Pressure gauge, FT8503A, with adaptor FT8503–8
 2. Adaptor, FNH00877-8 (10–1.00mm x 7/16 JIC)
 3. Hose, (Finis Code 3936707)

Into clutch A and B pressure test points. Figure 4-4-12.

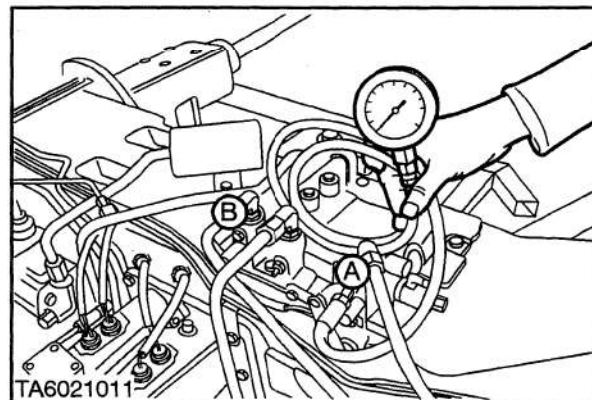


Figure 4-4-12

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

3. Start the engine, engage **1st GEAR**, and shuttle to **FORWARD**, leaving the **RANGE IN NEUTRAL**. Increase engine speed to approx 1200 rev/min.
4. Using the Hi-Lo buttons on the main shift lever, switch between Hi and lo drive and observe the gauges.

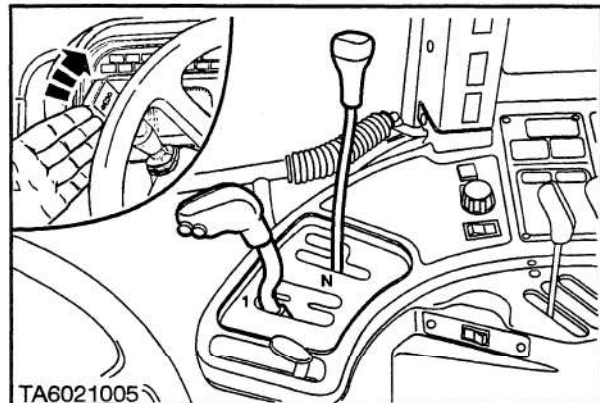


Figure 4-4-13

Each clutch should obtain 235–261 lbf/in² (16–18 bar) maximum pressure, when fully engaged and zero pressure when disengaged.

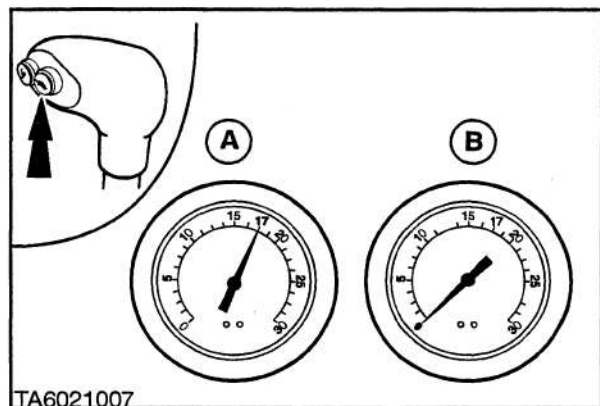


Figure 4-4-14

During the swapping of clutches there is an overlap period where both clutches have approximately 75 lbf/in² (5 bar) at the crossover point.

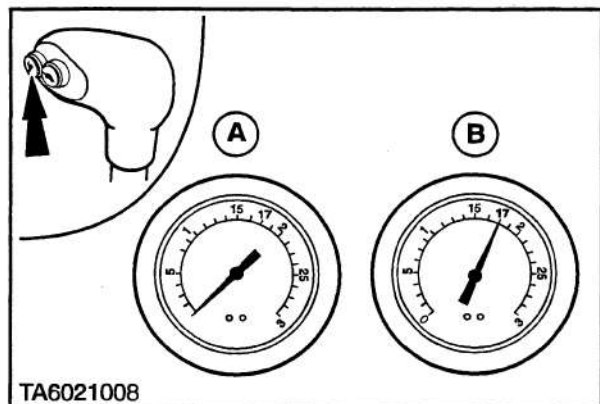


Figure 4-4-15

When the clutch pedal is depressed a gradual reducing of pressure should be seen and when the clutch pedal switch has operated, zero pressure should be indicated on the gauge. When releasing the clutch the opposite of disengaging should be seen with a gradual and smooth increase of pressure up to maximum pressure.

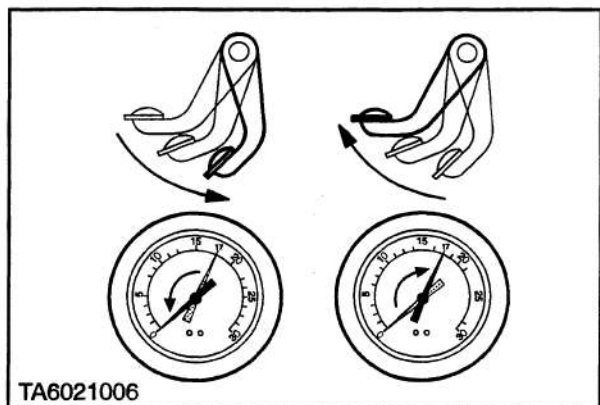


Figure 4-4-16

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

Shuttle Synchronizer Operating Piston Pressure Testing

NOTE: Due to the operating characteristics of the synchronizer it is not possible to accurately pressure test the synchronizer operating piston during normal tractor operation. The synchronizer will only take the required pressure to move and then the pressure will be cut. This would be seen only as a momentary blip on a pressure gauge. Therefore the following procedure, using the calibration mode, should be used to determine if full pressure is being achieved.

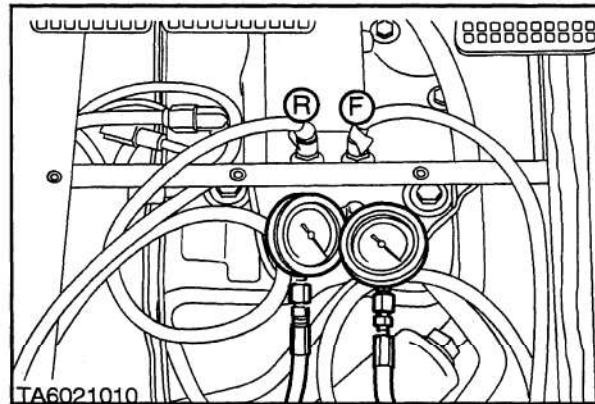


Figure 4-4-17

1. Prepare the tractor as described for testing the A and B clutches.

NOTE: If only pressure testing the synchronizer piston it is not necessary to install the range switch bypass connector, tool number FNH00875.

2. Install the pressure gauges, adaptors and hoses into the test points located in the top cover, Figure 4-4-17.

3. Enter the calibration mode for the synchronizer:–

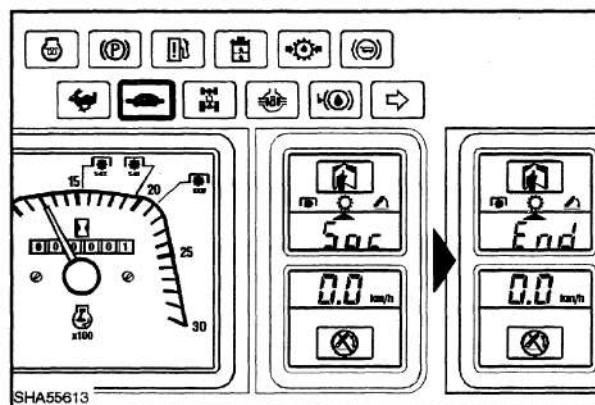


Figure 4-4-18

- (i) Press and hold engaged, both the Hi–Lo shift buttons on the main lever. With the buttons depressed start the engine.
- (ii) 'CAL' will be displayed on the instrument panel. Release the buttons.
- (iii) Press and hold in both the Hi–Lo shift buttons again. After a few seconds 'SOC' will be displayed and the synchronizer calibration will commence.

The table (Figure 4-4-19) shows the synchronizer calibration stages and at what stage pressure can be expected to be seen.

| Stage | Pressures | |
|-------|----------------------|-------------|
| | Forward (F) | Reverse (R) |
| 1 | NO | NO |
| 2 | NO | YES |
| 3 | B CLUTCH PRESSURIZED | |
| 4 | NO | NO |
| 5 | YES | NO |

Figure 4-4-19

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

LIMP HOME

**WARNING**

Care should be taken when operating the tractor with the limp home harness connected. Clutch engagement will be harsher than normal. Do not leave the limp home harness connected when the operation has been completed.

In the unlikely event of an electrical fault developing within the transmission that renders the tractor immobile, for example, failure of the supply voltage to the PWM valves, the emergency 'Limp Home Harness', Special Tool No. NH.21-100 for Semi-Powershift and Hi-Lo transmissions, is available to enable the tractor to be driven onto a transporter or hard standing, in order that the repair can be carried out in a suitable location. The Limp Home device **is not and must not** be used as a means to continue operating the tractor in its work environment.

To engage and operate the 'Limp Home Harness' proceed as follows:—

1. Apply the parking brake.
2. Stop the engine and turn keystart off.
3. Remove the electronic draft control panel.
4. Locate and disconnect the cab main harness access connector, Figure 4-4-21, enabling the connection of the limp home harness connector, marked with 'HARNESS', Figure 4-4-20, into the cab main harness of the tractor, Figure 4-4-23.
5. Connect the other connector of the Limp Home harness Figure 4-4-20, marked 'DIAGNOSTIC', to the 'BLACK' diagnostic plug, Figure 4-4-23.
6. Start the vehicle.
7. Select forward or reverse using the switch, (2) Figure 4-4-20, on the Limp home harness control box.
8. Operate the momentary switch, (1) Figure 4-4-20, of the Limp Home Harness to move the vehicle. If necessary, depress the foot throttle to increase engine speed.
9. When the tractor has been delivered to the repair area, disconnect the Limp Home Harness and reconnect the limp home access connector of the cab main harness and proceed with diagnosing and repairing the fault.

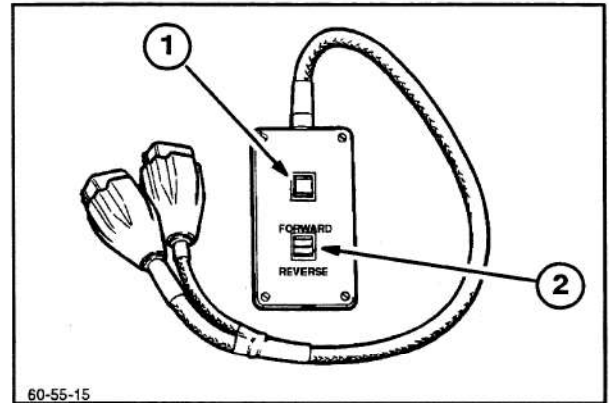


Figure 4-4-20

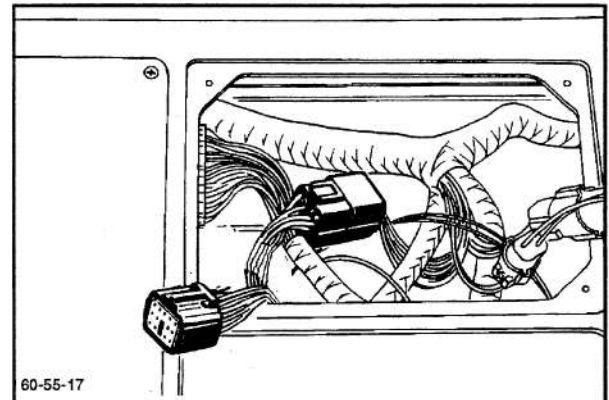


Figure 4-4-21

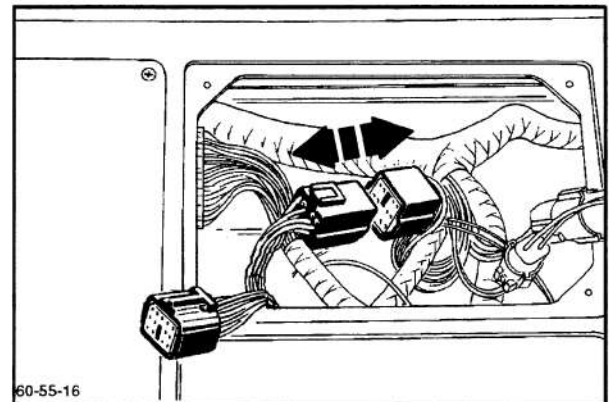


Figure 4-4-22

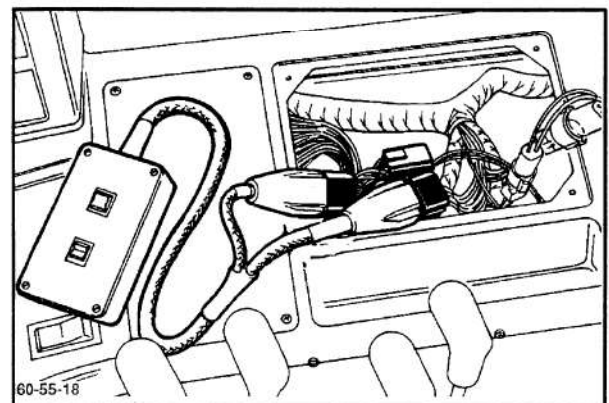


Figure 4-4-23

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

TRANSMISSION DIAGNOSTICS

The tractors with Hi-Lo transmission has a built in diagnostic system. To gain access to the diagnostic 'H' menu mode routine it is necessary to use tool FNH00874.

The tractor's diagnostic connector is located under the right hand electronic draft control (EDC) panel.

The instrument cluster is used to display the information, EIC and AEIC clusters.

NOTE: Both instrument clusters show the same information, so for ease of explanation, only one cluster type is illustrated.

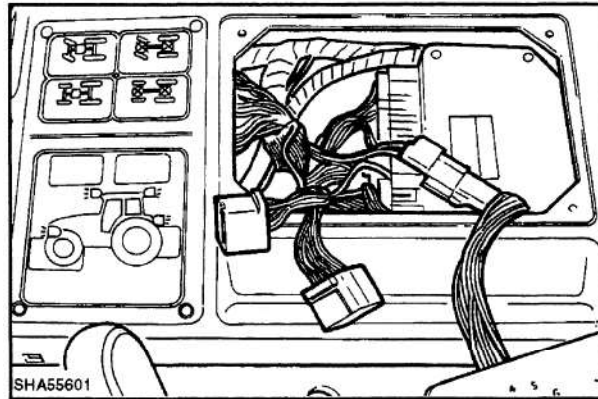


Figure 4-4-24

Connect Tool FNH00874 to the diagnostic connector and turn key.

The LCDs will change to display "HH" to indicate that the "H" menu has been activated.

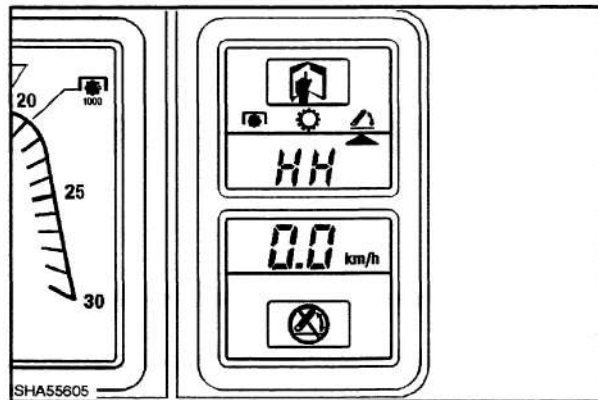


Figure 4-4-25

| HH | Service Menu |
|----|-------------------------------------|
| H1 | Clutch calibration |
| H2 | View clutch calibration |
| H3 | EDC valve calibration values |
| H4 | Software revision level |
| H5 | Switch test |
| H6 | Low clutch quick fill adjust |
| H7 | High clutch quick fill adjust |
| H8 | Non volatile memory reset |
| H9 | Voltmeter |
| HA | Clutch pedal position view (%) |
| HB | PWM temperature compensation factor |
| HC | Transmission temperature |
| HD | Synchronizer potentiometer check |
| HE | Fly shift manual adjust |

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

H1 CLUTCH AND SYNCHRONIZER CALIBRATION

This mode is used to calibrate the Hi and Lo clutch packs.

See CALIBRATIONS section of this Chapter for full details.

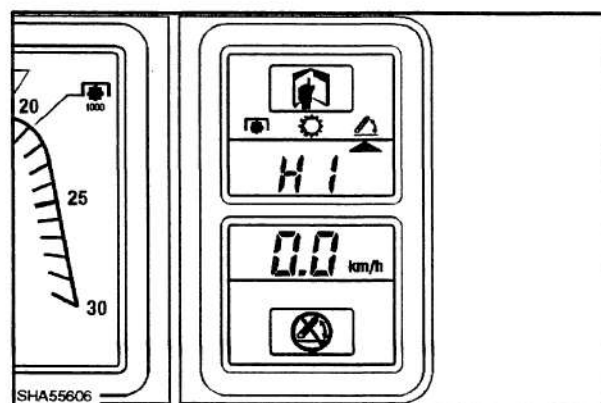


Figure 4-4-26

H2 CLUTCH CALIBRATION VIEW

Displays the previous clutch calibrations.

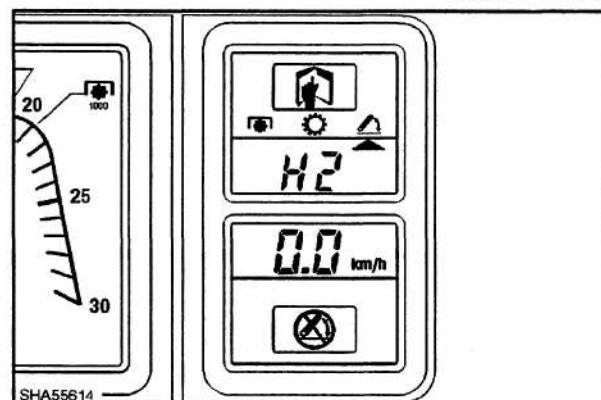


Figure 4-4-27

The display will show 'Lo' clutch calibration number and then 'Hi' clutch calibration number.

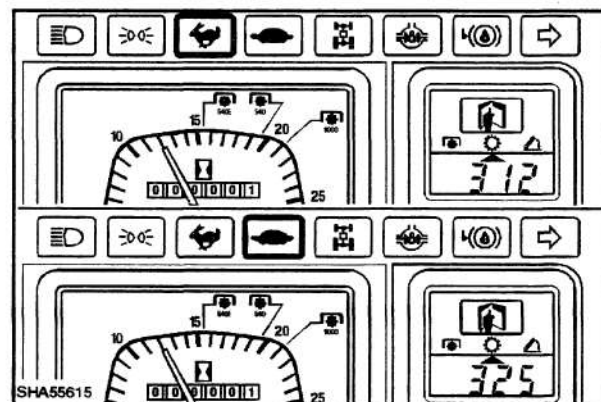


Figure 4-4-28

H3 EDC VALVE CALIBRATION VALUES.

Displays information relating to EDC set up. See Section 8, Hydraulics.

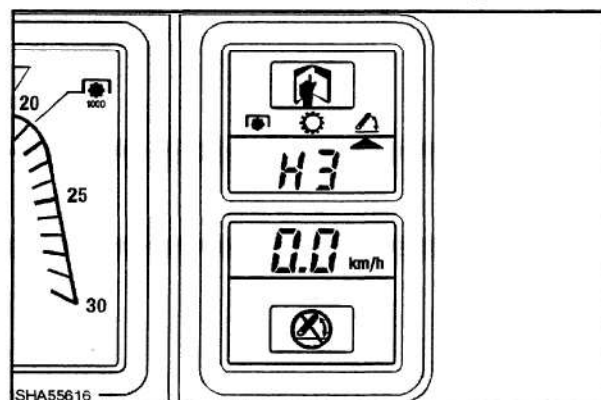


Figure 4-4-29

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

H4 SOFTWARE REVISION LEVEL.

Displays the software installed into the processor.

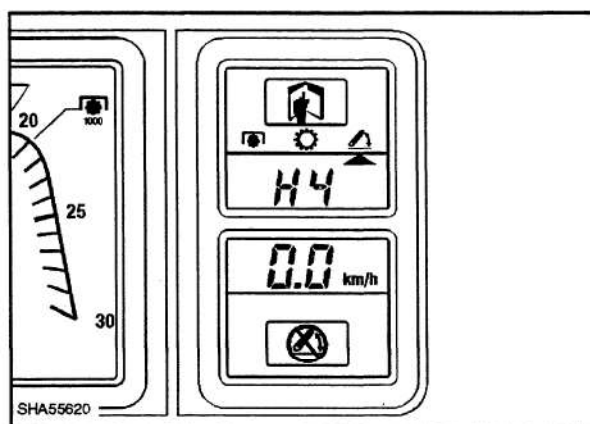


Figure 4-4-30

The display shows 5 figures consecutively.

- AC - Hi/Lo
- 01 - Production software level
- 00 - Prototype software level
- 30/40 - 19 or 25 mph (30 or 40 kph)

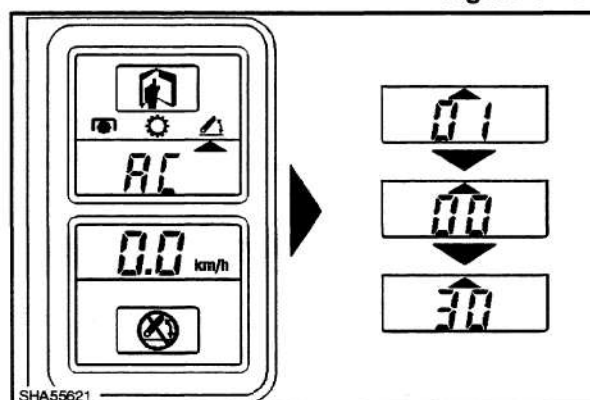


Figure 4-4-31

H5 SWITCH TEST

Tests the function of all switches used in the transmission or EDC system.

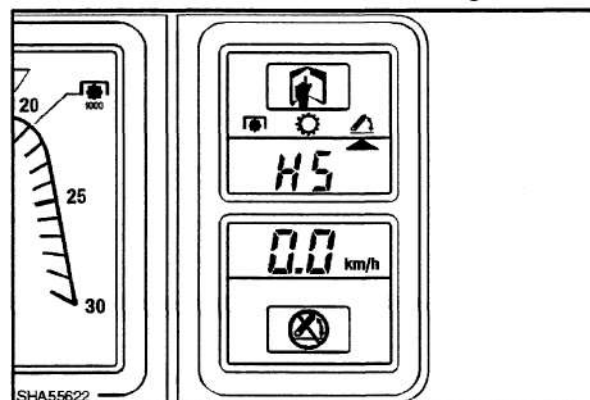


Figure 4-4-32

The display will show "d0".

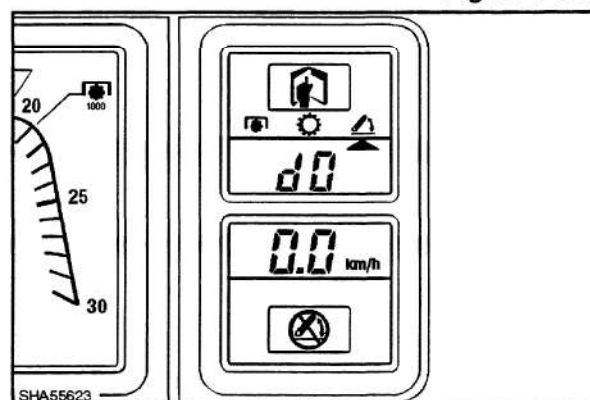


Figure 4-4-33

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

When a switch is operated, its code will be displayed and an audible tone heard to indicate correct function.

If the code does not appear and the tone sound, the switch or the wiring to the switch is at fault.

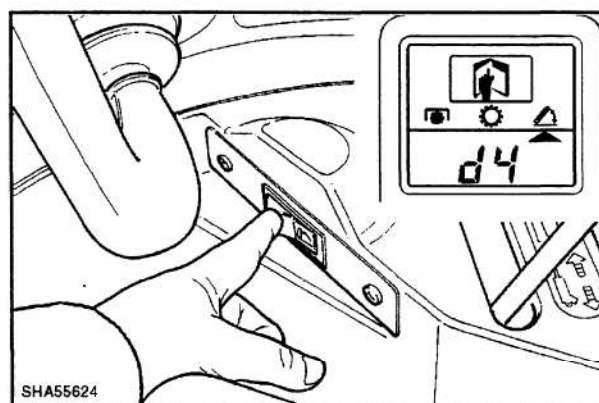


Figure 4-4-34

| Switch Code | Switch Description | Special Requirements |
|-------------|------------------------------|--|
| d1 | External lower switch | Shuttle lever in forward |
| d2 | External raise switch | |
| d3 | work switch | |
| d4 | Raise switch | |
| d71 | Clutch pedal switch | |
| d74 | Downshift switch | |
| d75 | Upshift switch | |
| d81 | 1, 2, or 4 in gear | |
| d82 | 3 or 4 in gear | |
| d83 | Low or medium range in gear | |
| d85 | Neutral safety start switch | Clutch pedal down, shuttle lever from forward to neutral |
| d91 | Transmission pressure switch | |
| d93 | Fuse 21 sense | |
| d95 | Shuttle lever in forward | |
| d96 | Shuttle lever in reverse | |
| d98 | Medium or high range in gear | |

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

H6 LOW CLUTCH QUICK FILL ADJUSTMENT

Adjusts the time taken for the initial partial fill of the clutch.

This adjustment can be carried out with the engine running and a gear selected.

The display will show a fill time value.

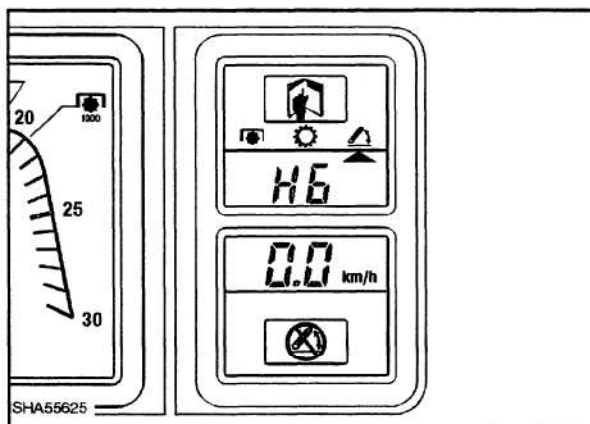


Figure 4-4-35

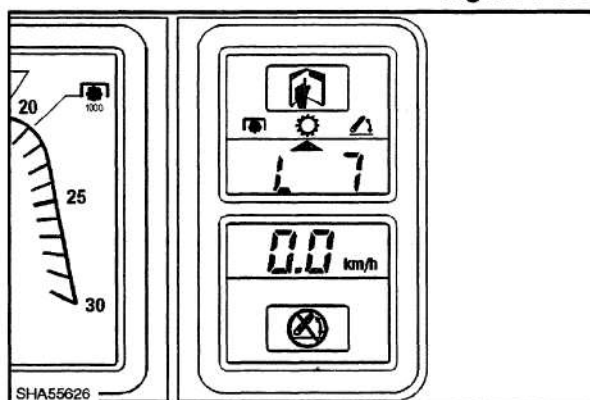


Figure 4-4-36

Increase or decrease the figure with the upshift/downshift buttons with the clutch pedal depressed.

Slowly release the clutch pedal.

If the figure is too high a small 'bump' (forward movement) is felt, decrease the figure until the 'bump' disappears.

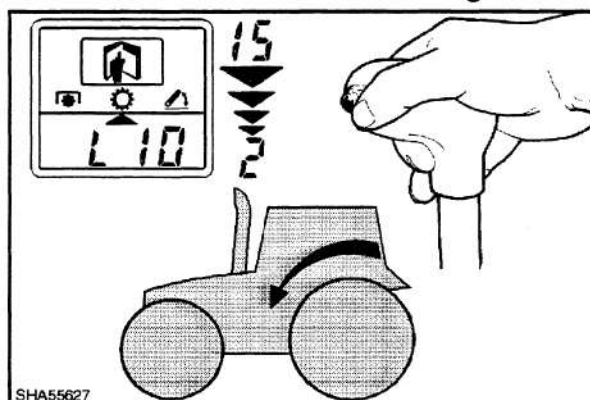


Figure 4-4-37

H7 HIGH CLUTCH QUICKFILL ADJUSTMENT

A similar calibration can be carried out for the high clutch. Displays the H (for high) and the clutch fill time value.

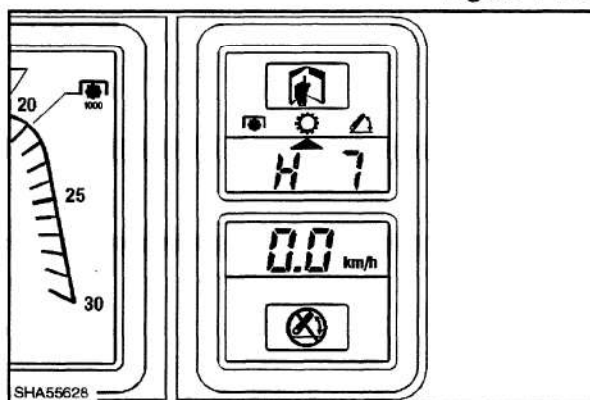


Figure 4-4-38

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

H8 NON VOLATILE MEMORY RESET

Used to reset (clear) all calibration figures in the processor.

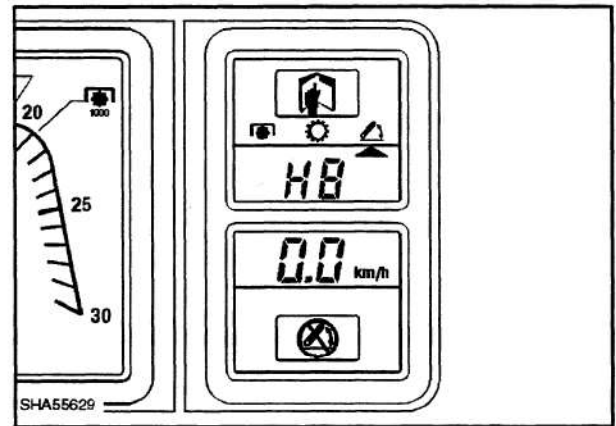


Figure 4-4-39

With H8 selected the procedure is automatic.

The display changes from "H8" to "EE" to "HH", indicating the processor is now reset.

NOTE: This will also erase EDC calibration figures.

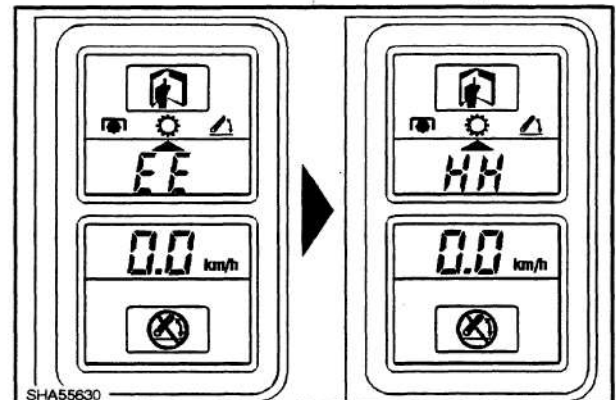


Figure 4-4-40

H9 VOLT METER

Allows various voltage tests to be carried out on the inputs and outputs of the processor.

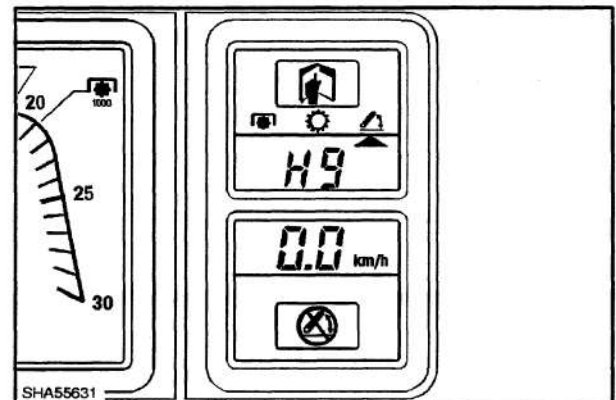


Figure 4-4-41

There are 37 channels which can be accessed.

To select a channel use the upshift and downshift buttons.

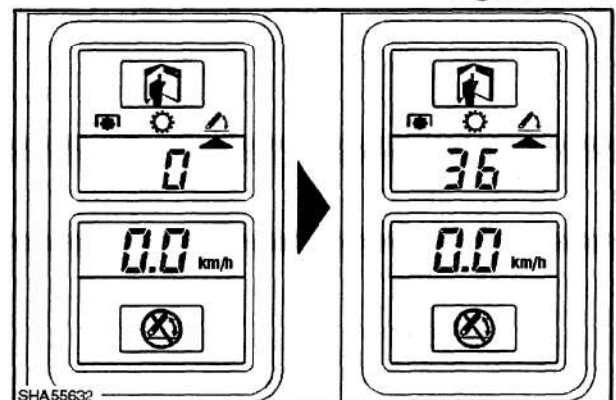


Figure 4-4-42

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

On reaching the desired channel release the upshift/downshift button and the channel number will be replaced by a value. Compare the value displayed with the value shown in the table on the following page.

NOTE: The value is the output voltage from the processor displayed as a percentage. This cannot be directly translated into a voltage due to the internal processes of the module.

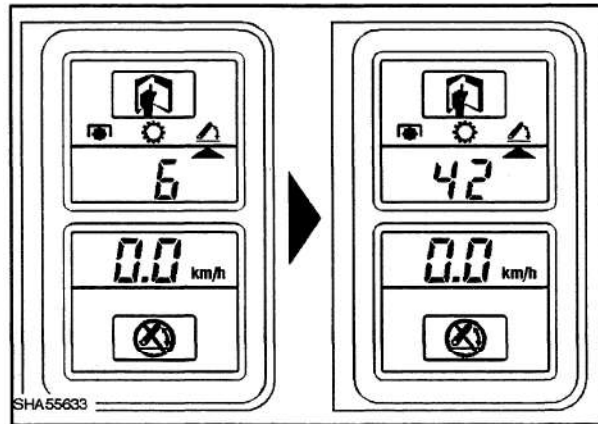


Figure 4-4-43

If the value displayed varies by more than 5% to that in the table a fault is indicated in either the component or the wiring relevant to that channel.

NOTE: It is worthwhile checking the connectors of the affected circuit, including the processor connectors, prior to replacing any components.

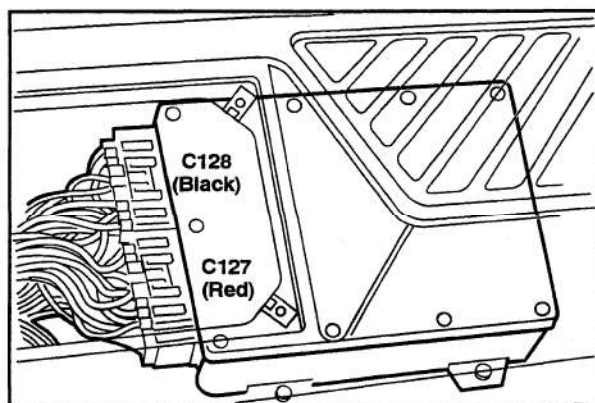


Figure 4-4-44

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

| Channel | Description | Typical Value |
|---------|---|---|
| 0 | Clutch pedal position | 91% released 26% depressed |
| 1 | Transmission oil temperature | 75% at 104°F (40°C) |
| 2 | 40 degree oil hydraulic oil temperature switch | 96% > 104°F (40°C) 2% < 104°F (40°C) |
| 3 | Fuse 12 sense | 96% |
| 4 | Not applicable to service | — |
| 5 | 5 volt reference | 49% |
| 6 | 12 volt Vf input | 42% |
| 7 | 12 volt Vd input | 3% |
| 8 | 12 volt Vh input | 41% |
| 9 | 8 volt reference | 79% |
| 10 | Solenoid for synchro in high, fast current sense | 3% off |
| 11 | Solenoid for synchro in reverse, fast current sense | 3% off |
| 12 | Low clutch solenoid, fast current sense | 0% Clutch engaged/ out of gear 32% Pedal released in underdrive |
| 13 | High clutch solenoid, fast current sense | 0% Clutch engaged/ out of gear 32 % pedal released in direct drive |
| 14 | Solenoid for synchro in high, current sense | 0% off 93% max |
| 15 | Solenoid for synchro in reverse, current sense | 0% off 93% max |
| 16 | Low clutch solenoid current sense | 0% Clutch engaged/ out of gear 82% pedal released in low |
| 17 | High clutch solenoid current sense | 0% Clutch engaged/ out of gear 82% pedal released in high |
| 20 | Wheel speed sensor DC check | 64% |
| 36 | Shuttle lever in forward | 26% off (Neutral), 61% on (Forward) |
| 37 | Shuttle lever in reverse | 26% off (Neutral), 61% on (Reverse) |

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

HA CLUTCH PEDAL POSITION VIEW

Used to show position of the clutch pedal.

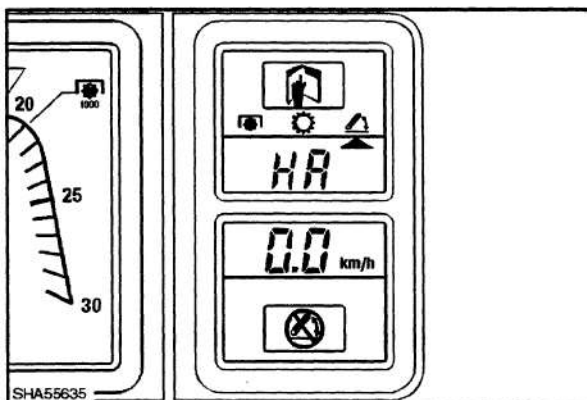


Figure 4-4-45

As the pedal is cycled from up to down the display shows percentage (%) pedal position;

0 = fully down

99 = fully up

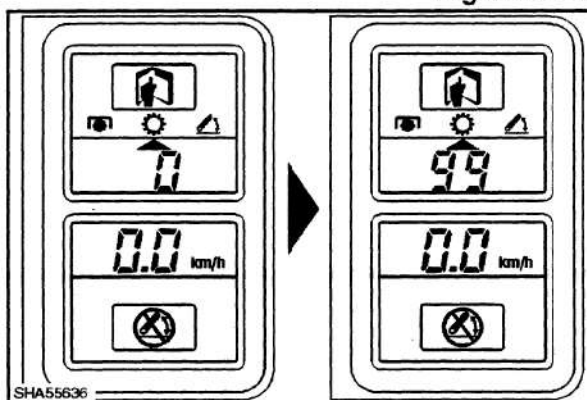


Figure 4-4-46

HB PWM COMPENSATION FIGURE

This is not used.

NOTE: Factory set to 16.

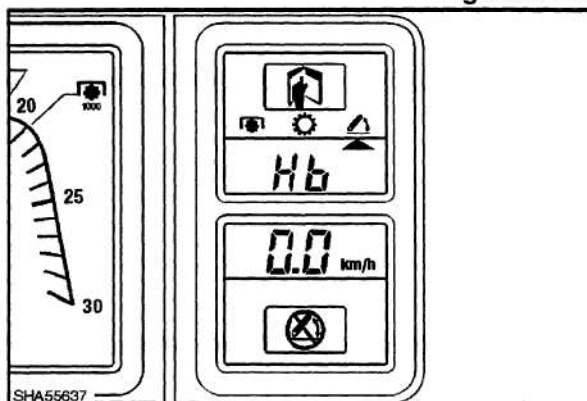


Figure 4-4-47

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

HC TRANSMISSION OIL TEMPERATURE VIEW

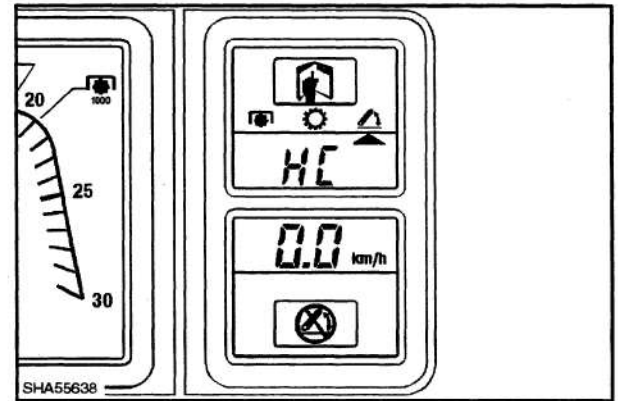


Figure 4-4-48

Shows transmission oil temperature in degrees Celsius.

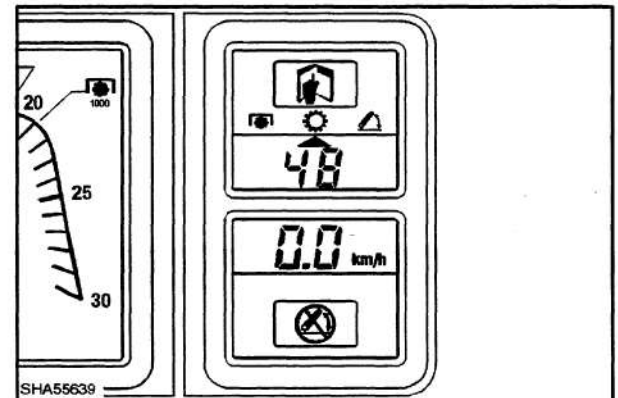


Figure 4-4-49

HD SYNCHRONIZER POTENTIOMETER CHECK

Checks the operation of the forward/reverse synchronizer.

The engine must be running with the transmission in neutral and the clutch released.

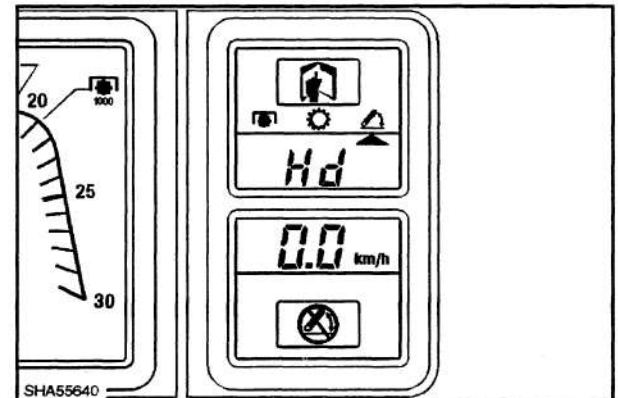


Figure 4-4-50

The Hi/Lo indicator lamps flash to indicate test mode.

Press and hold the downshift to display reverse position indicated as a % of potentiometer movement – approx 75(%).

Press and hold upshift for forward – approx 25(%).

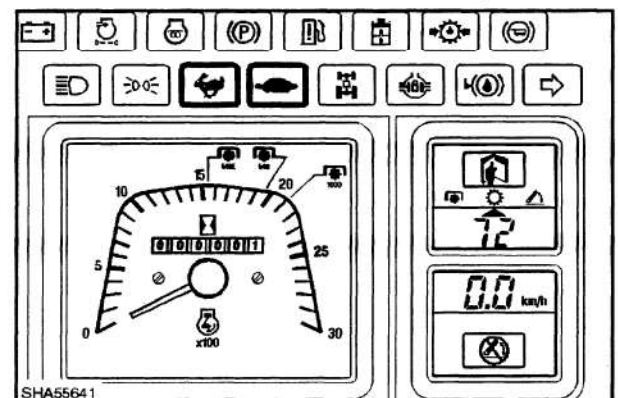


Figure 4-4-51

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

HE FLYSHIFT MANUAL ADJUST

The flyshift delay after a clutched mechanical gear shift can be adjusted to suit various operating speeds.

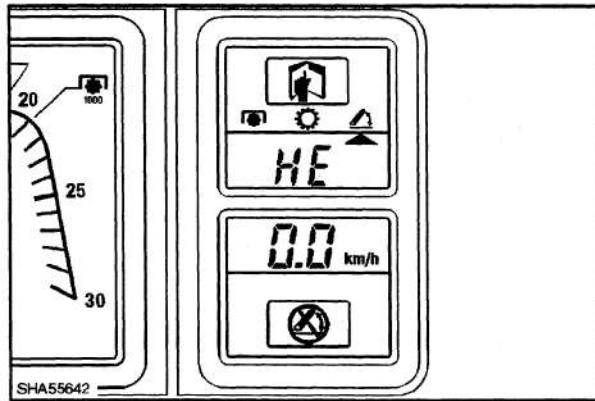


Figure 4-4-52

The figure that displays is the ground speed over which the flyshift delay is eliminated;

3, 4, or 8 mph.

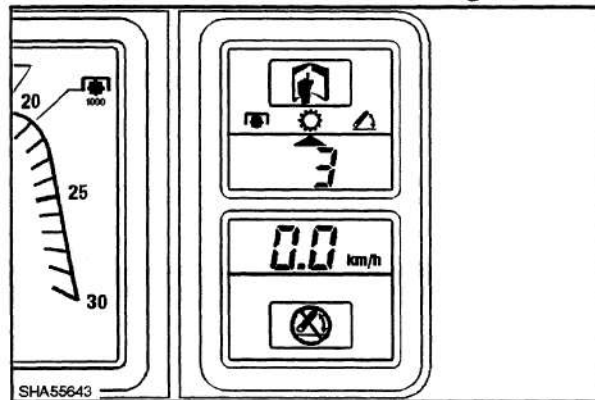


Figure 4-4-53

Change the ground speed by using the upshift or down shift buttons.

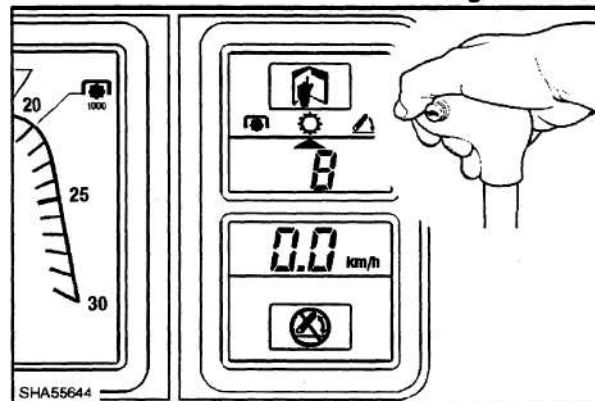


Figure 4-4-54

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES

Hi-Lo Transmission Error Display Logic

1. Errors are displayed on the right hand liquid crystal display of the AEIC panel or the center display of EIC panels.

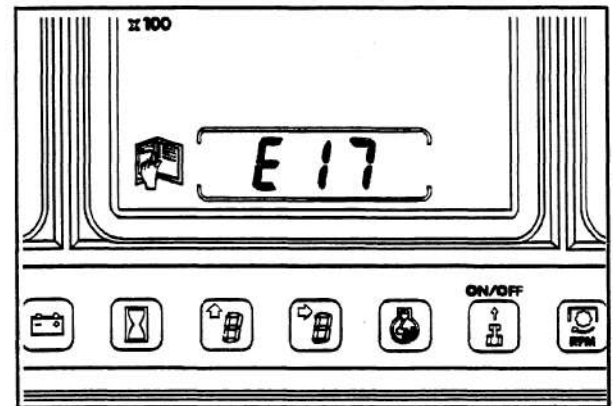


Figure 4-4-55

2. Error codes always flash.

3. Generally, error codes accompanied by a pulse alarm signal require action by the operator, and the alarm will continue until the operator takes action.

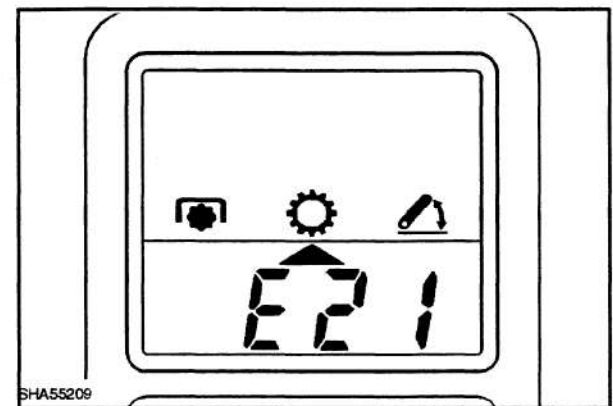


Figure 4-4-56

- a) "CP" can be cleared by cycling the clutch pedal. In most cases the shuttle lever can also be used to clear "CP".

- b) Most other errors, accompanied by a pulse alarm, can be cleared by cycling the shuttle lever. Under certain conditions, the pulse alarm will continue for 4 seconds while the lever is in neutral.

4. Other error codes, those not accompanied by a pulse alarm are accompanied by a steady 5 second alarm which then stops. If the error clears during the 5 second period the alarm will stop when the error clears.

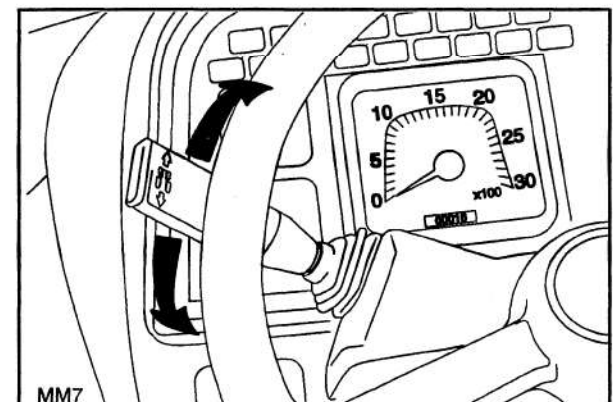


Figure 4-4-57

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

5. After the 5 second period the alarm will cease if the transmission is still operable. If the transmission is disabled, only the error code will be displayed.

6. Errors have priority. Errors accompanied by the pulse alarm will not allow lower priority errors to be displayed, but pulse alarm errors are usually temporary in nature. For errors without pulse alarm:
 - a) If a lower priority error occurs when a higher priority error is being displayed, the lower priority error will not be displayed until the higher priority error is cleared. If the lower priority error is a result of the higher priority error it will not be displayed.

 - b) If a higher priority error occurs when a lower priority error is being displayed, the higher priority error will interrupt the display of the lower priority error and will continue to be displayed until cleared.

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

Error Code Listing

| ERROR CODE | ERROR DESCRIPTION | PRIORITY | TRANS. STATUS | DISPLAY MODE |
|------------|--|----------|---------------|--------------|
| E21 | Chassis harness disconnected | 1 | Disable | Latched |
| E34 | Fuse 14 Blown | 2 | Disable | Latched |
| E32 | Clutch hydraulic pressure detected | 3 | Disable | Latched |
| E53 | 5 volt reference failed, shorted to 12 volts | 4 | Disable | Latched |
| E54 | 5 volt reference failed short to ground | 5 | Disable | Latched |
| E12 | Clutch pedal potentiometer signal too high | 6 | Disable | Latched |
| E11 | Clutch pedal potentiometer signal too low | 7 | Enabled | Latched |
| E61 | Synchronizer potentiometer signal too high | 8 | Disable | Latched |
| E62 | Synchronizer potentiometer signal too low | 9 | Disable | Latched |
| E46 | Fuse 21 blown | 10 | Enabled | Latched |
| E33 | Clutch pressure switch, open or short circuit | 11 | Enabled | Latched |
| E39 | High clutch solenoid open circuit | 12 | Enabled | Latched |
| E38 | High clutch solenoid short circuit | 13 | Enabled | Latched |
| E41 | Low clutch solenoid open circuit | 14 | Enabled | Latched |
| E40 | Low clutch solenoid short circuit | 15 | Enabled | Latched |
| E66 | Reverse solenoid open circuit | 16 | Enabled | Latched |
| E68 | Reverse solenoid short circuit | 17 | Enabled | Latched |
| E65 | High solenoid open circuit | 18 | Enabled | Latched |
| E67 | High solenoid short circuit | 19 | Enabled | Latched |
| E37 | Clutch disconnect switch open circuit | 20 | Enabled | Latched |
| E24 | Synchronizer not calibrated | 21 | Enabled | Latched |
| E70 | Unable to initialize synchronizer during start-up | 22 | Enabled | Latched |
| E47 | Clutch disconnect switch misadjusted high | 23 | Enabled | Latched |
| E48 | Clutch disconnect switch short circuit/misadjusted | 24 | Enabled | Latched |
| E51 | Transmission temperature sensor open circuit | 25 | Enabled | Latched |
| E52 | Transmission temperature sensor short circuit | 26 | Enabled | Latched |
| E24 | Both clutches not calibrated | 27 | Enabled | Latched |
| E64 | Synchronizer failed to engage reverse | 28 | Enabled | Latched |
| E63 | Synchronizer failed to engage high | 29 | Enabled | Latched |
| E59 | Forward/neutral/reverse switch disagreement | 30 | Enabled | Latched |
| CP | Depress clutch pedal to enable transmission | 31 | Disable | Latched |
| EHi | Hi clutch not calibrated | 32 | Enabled | Latched |
| ELo | Lo clutch not calibrated | 33 | Enabled | Latched |
| E55 | Forward switch failed to +8V or +12V | 34 | Enabled | Latched |

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

| ERROR CODE | ERROR DESCRIPTION | PRIORITY | TRANS. STATUS | DISPLAY MODE |
|------------|--|----------|---------------|--------------|
| E56 | Forward switch failed to ground or open circuit | 35 | Enabled | Latched |
| E57 | Reverse switch failed to +8V or +12V | 36 | Enabled | Latched |
| E58 | Reverse switch failed to ground or open circuit | 37 | Enabled | Latched |
| E13 | Up and downshift switches both on | 38 | Enabled | Temporary |
| E49 | Wheel speed sensor circuit open or short circuit | 39 | Enabled | Temporary |
| E26 | ERPM speed too high | 40 | Enabled | Temporary |
| E27 | ERPM speed too low | 41 | Enabled | Temporary |

Clutch Spring Pressure Calibration Error Codes

| ERROR CODE | ERROR DESCRIPTION |
|------------|--|
| U20 | Correct start up procedure not used |
| U21 | Engine rev/min too low |
| U22 | Engine rev/min too high |
| U23 | Forward/reverse shuttle lever not in forward |
| U24 | Main shift lever is not in gear |
| U25 | Range lever not in gear |
| U26 | Clutch pedal not fully released |
| U27 | Hi Clutch calibration is too low |
| U28 | Hi Clutch calibration is too high |
| U29 | Lo Clutch calibration is too low |
| U30 | Lo Clutch calibration is too high |
| U31 | Wheel motion detected during calibration |
| U37 | Synchronizer shuttle mode calibration |
| U38 | Synchronizer Hi-Lo mode calibration |

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**E21 – CHASSIS HARNESS DISCONNECTED**

EFFECT – Transmission disabled

Inspect main harness connectors

ERROR CODE**E24 – SYNCHRONIZER AND CLUTCHES NOT CALIBRATED**

EFFECT – Transmission disabled

Has a new processor been installed or H8 used without performing calibration after installation?

YES

Perform calibration procedures

NO

Calibration values have corrupted in processor. Attempt calibration. If error occurs again replace processor.

ERROR CODES;**E11 – CLUTCH PEDAL POTENTIOMETER SIGNAL TOO LOW****E12 – CLUTCH PEDAL POTENTIOMETER SIGNAL TOO HIGH**

EFFECTS – Transmission disabled

Using Diagnostic 'H' menu, select H9, Channel 0, (clutch pedal position mode). Is the clutch operation within the typical values of 91 released and 26 depressed?

YES

Wiggle test potentiometer wiring while in H9, Channel 0. If readings become erratic trace and repair fault in wiring. If no fault evident install new processor.

NO

Disconnect potentiometer. Check operation using suitable multimeter. Is potentiometer O.K.?

NO

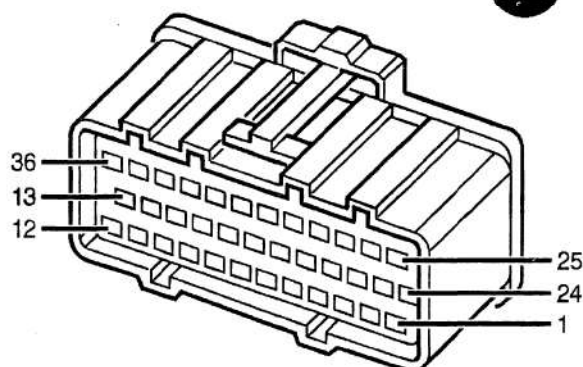
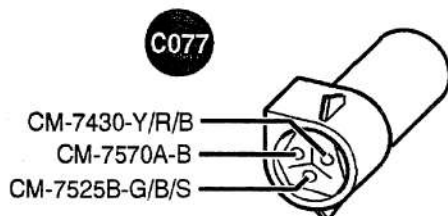
Replace potentiometer

YES

Check for short to ground or open circuit between C077-CM7430-Y/R/B and C128-19 (E11)

YES

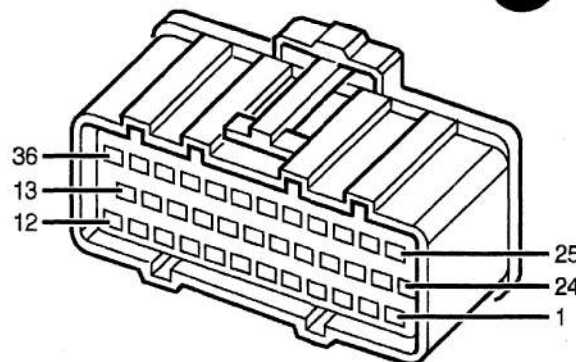
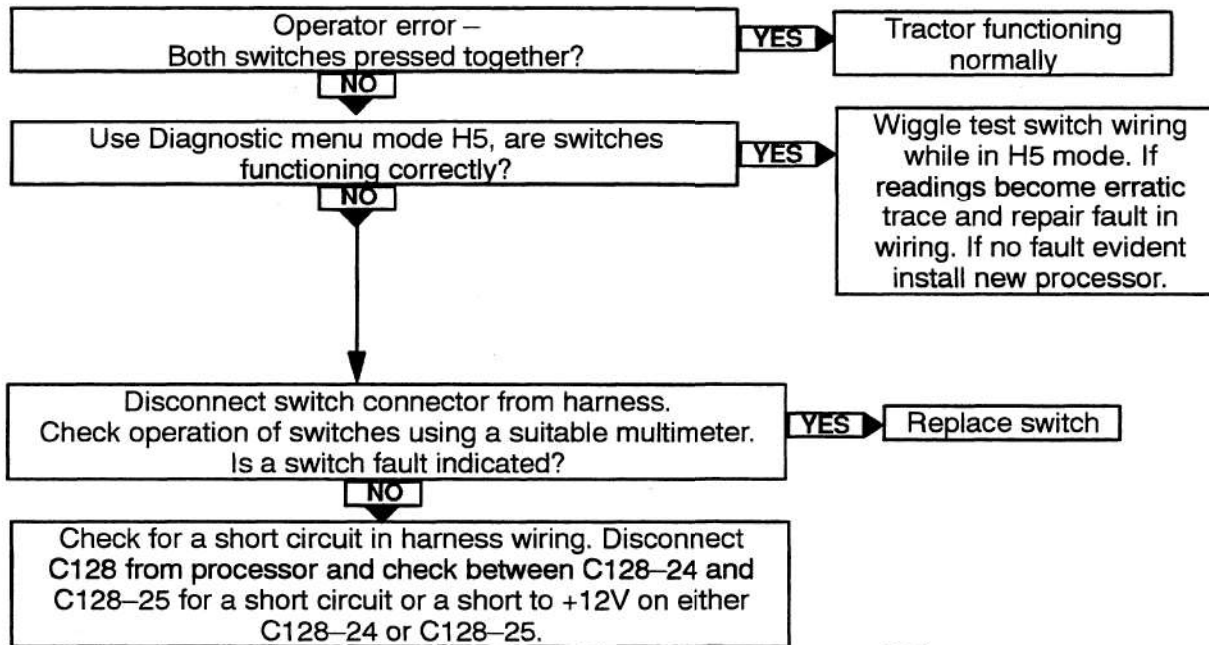
Check for short to +12V or +8V between C077-CM7430-Y/R/B and C128-19 (E12)



SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

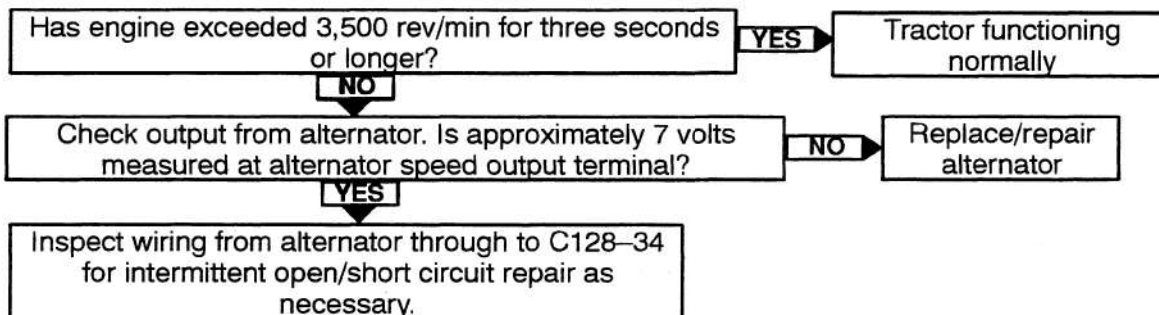
ERROR CODE

E13 – UP AND DOWNSHIFT SWITCHES BOTH ON
EFFECTS – No shift triggered

**ERROR CODE**

E26 – ERPM TOO HIGH

EFFECTS – Poor shift quality and possibly unable to perform calibration

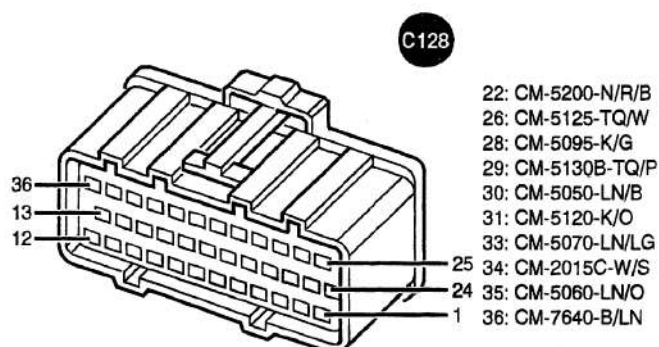
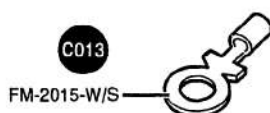
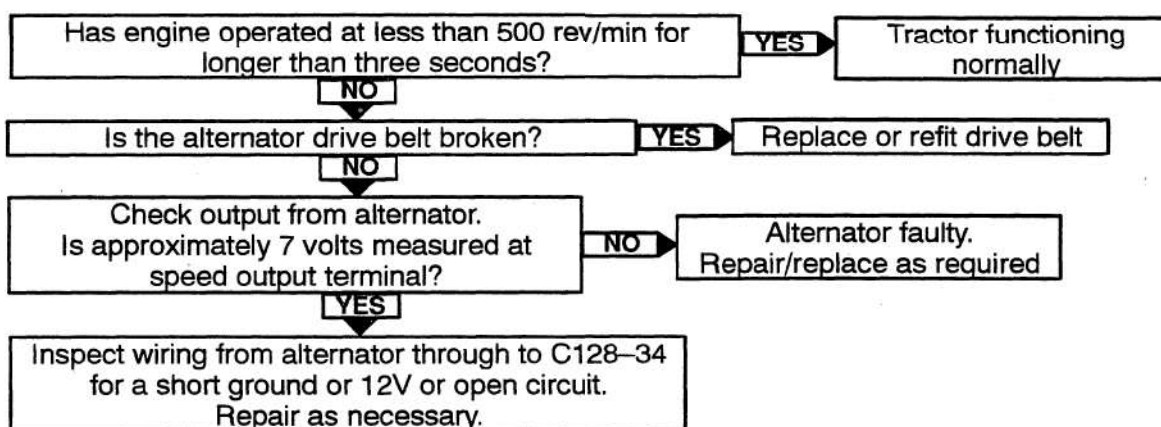


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE

E27 – ERPM TOO LOW

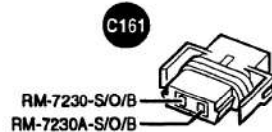
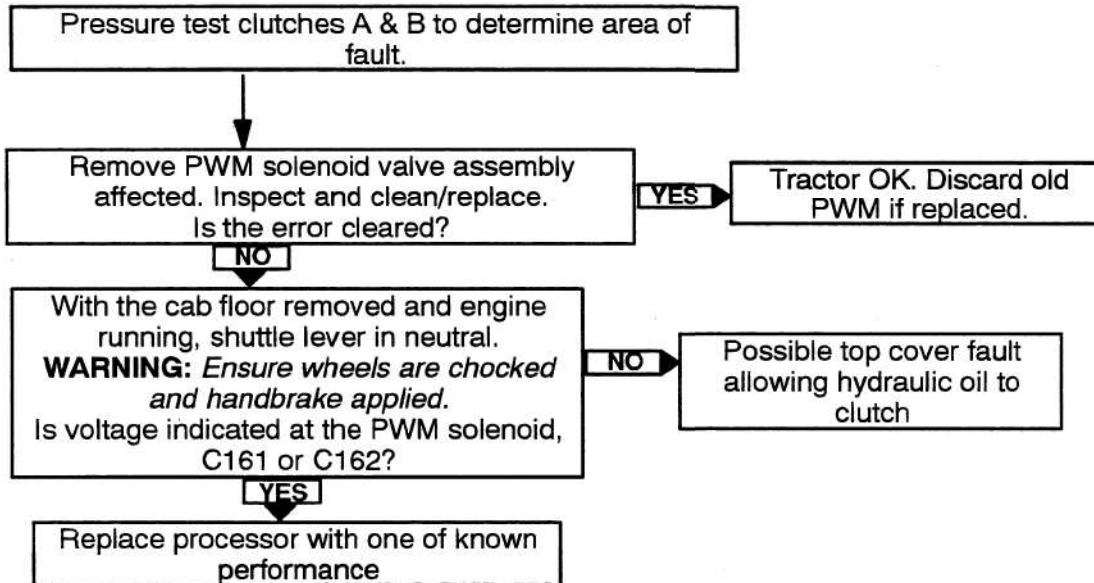
EFFECTS – Poor shift quality and possibly unable to perform calibration



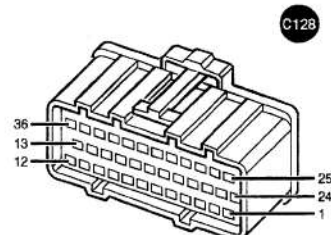
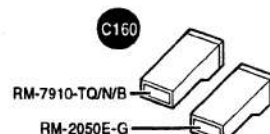
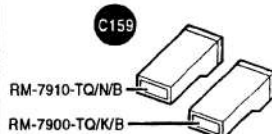
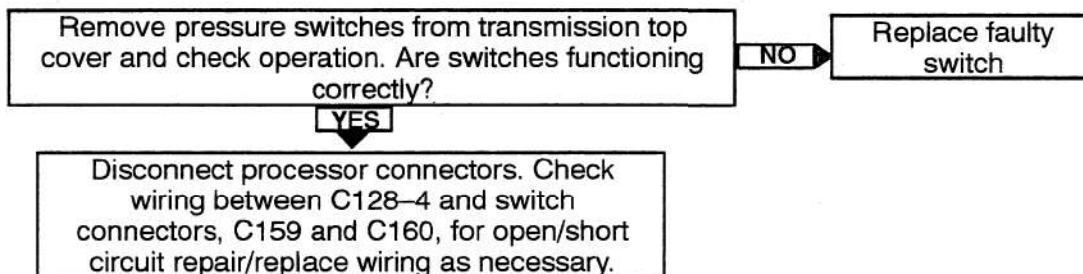
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**E32 – CLUTCH HYDRAULIC PRESSURE DETECTED WHEN NOT COMMANDED (SHUTTLE LEVER IN NEUTRAL)**

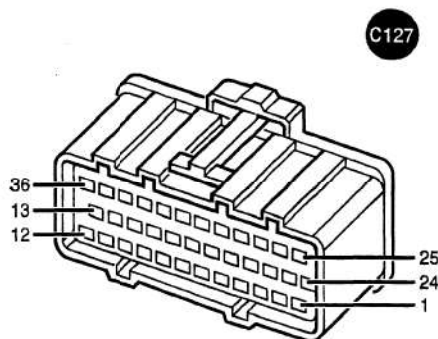
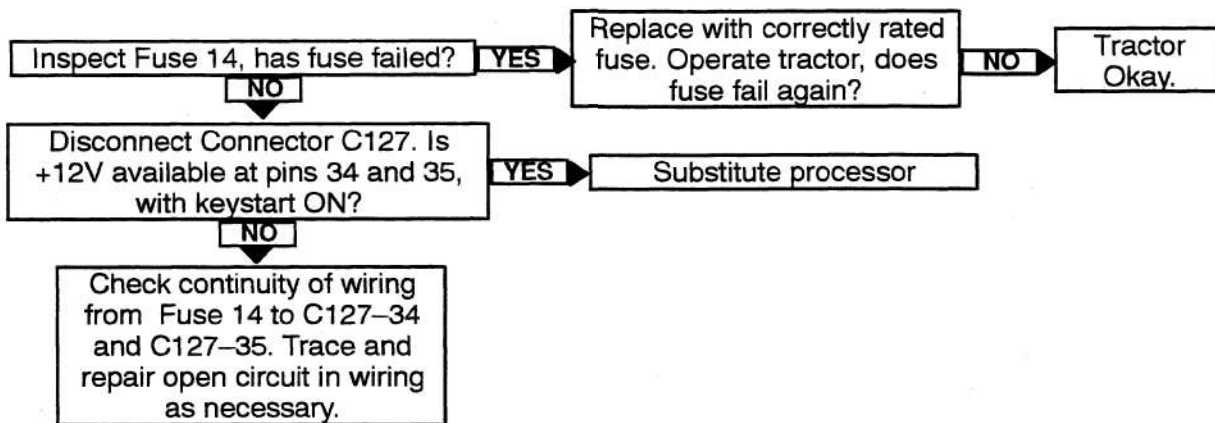
EFFECTS – Transmission disabled

**ERROR CODE****E33 – CLUTCH PRESSURE SWITCH OPEN/SHORT CIRCUIT**

EFFECTS – Disables the dump logic software and also displays E32. Transmission remains operative.



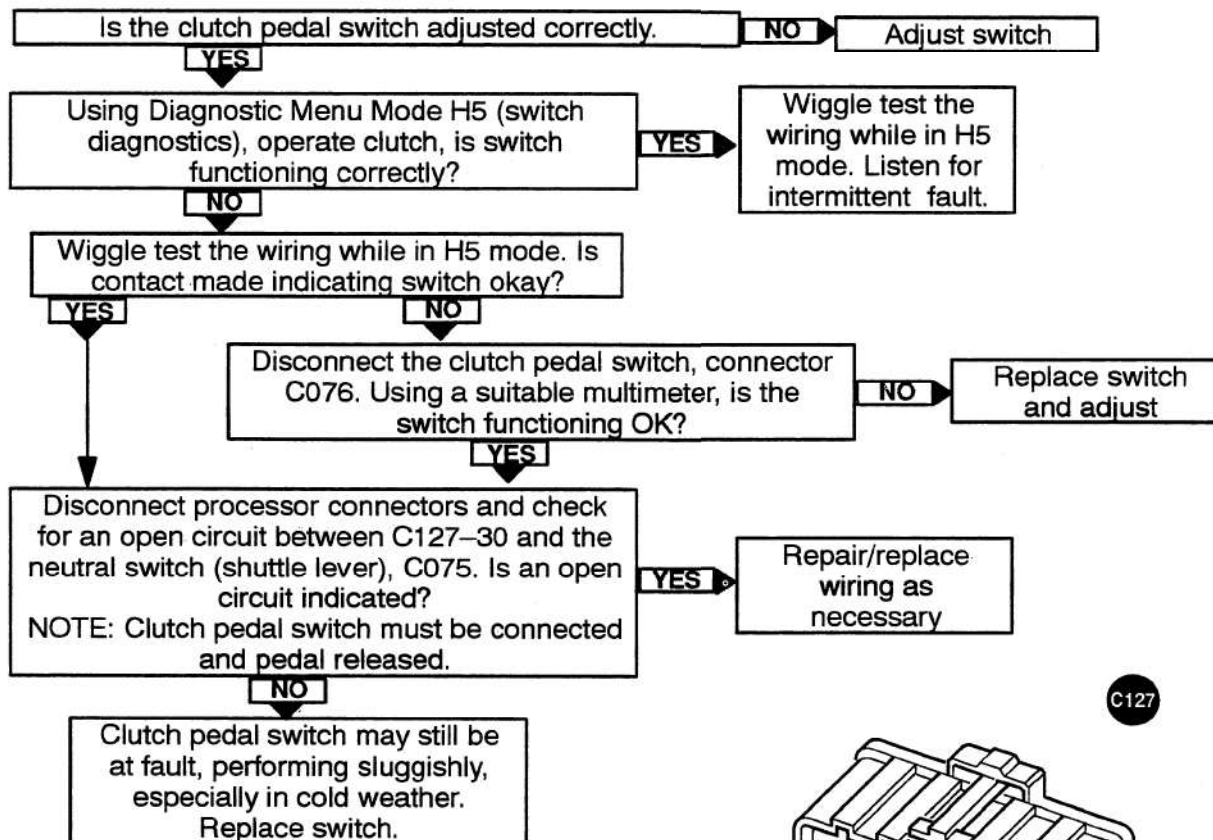
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**E34 – FUSE 14 BLOWN****EFFECTS** – Transmission disabled.

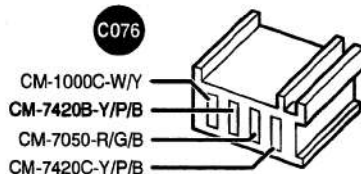
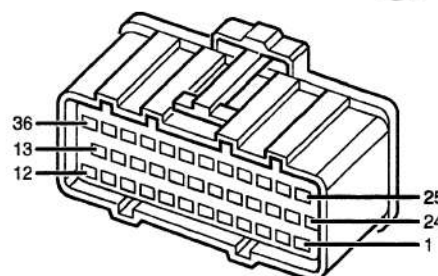
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**E37 – CLUTCH PEDAL SWITCH OPEN CIRCUIT**

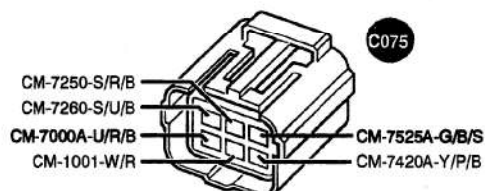
EFFECTS – Transmission disabled.



C127



CM-1000C-W/Y
CM-7420B-Y/P/B
CM-7050-R/G/B
CM-7420C-Y/P/B



CM-7250-S/R/B
CM-7260-S/U/B
CM-7000A-U/R/B
CM-1001-W/R
CM-7525A-G/B/S
CM-7420A-Y/P/B

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES:**E38** – CLUTCH 'B' SOLENOID (HIGH/REVERSE) SHORT CIRCUIT**E39** – CLUTCH 'B' SOLENOID OPEN CIRCUIT

EFFECTS – Transmission disabled.

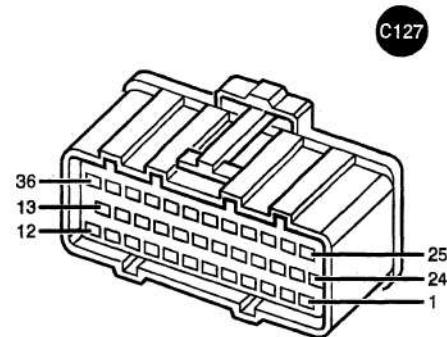
With the cab floor removed, disconnect connector C162 to Clutch B. With a suitable multimeter check the solenoid for open/short circuit. Is a solenoid fault indicated?

YES

Replace solenoid

NO

Disconnect processor connectors. Check for short to ground or an open circuit between C127-17 and C127-12 and the solenoid harness side connector, C162. Repair/replace wiring as necessary.

**ERROR CODES:****E40** – CLUTCH 'A' (LOW) SOLENOID SHORT CIRCUIT**E41** – CLUTCH 'A' SOLENOID OPEN CIRCUIT

EFFECTS – Transmission disabled.

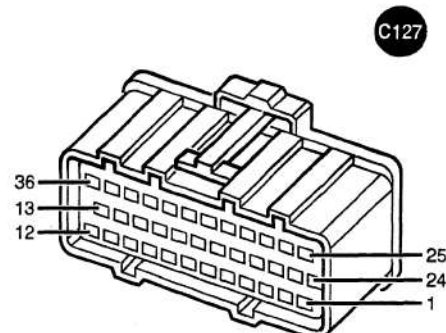
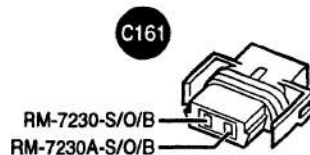
With the cab floor removed, disconnect connector C161 to Clutch A. With a suitable multimeter check the solenoid for open/short circuit. Is a solenoid fault indicated?

YES

Replace solenoid

NO

Disconnect processor connectors. Check for short to ground or an open circuit between C127-18 and C127-26 and the solenoid harness side connector, C161. Repair/replace wiring as necessary.

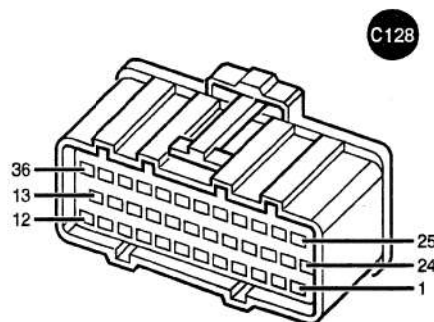
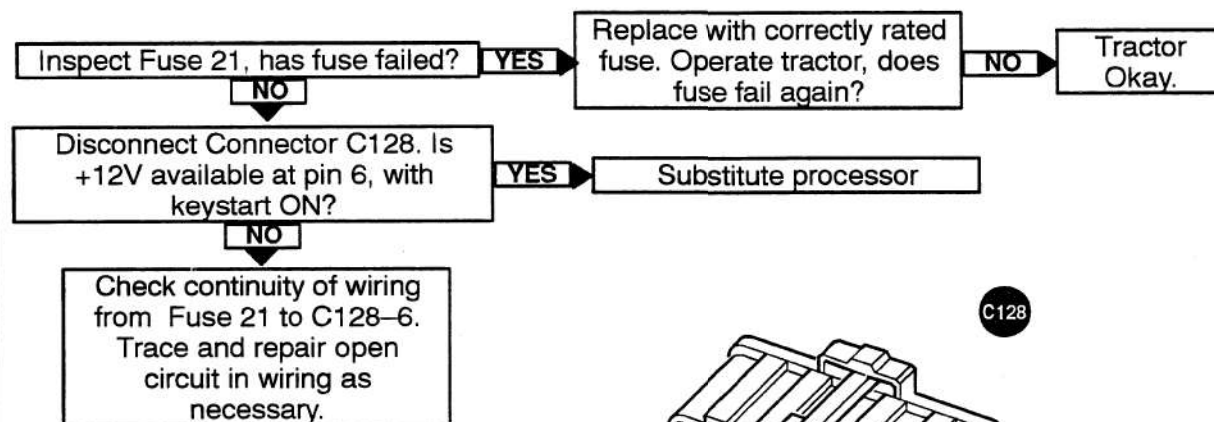


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE

E46 – FUSE 21 OPEN CIRCUIT

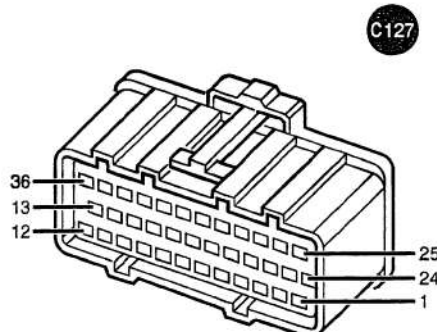
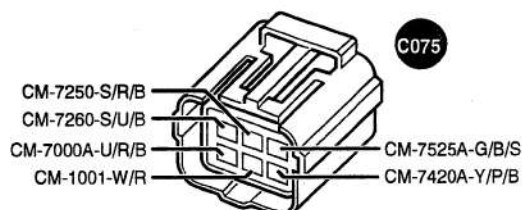
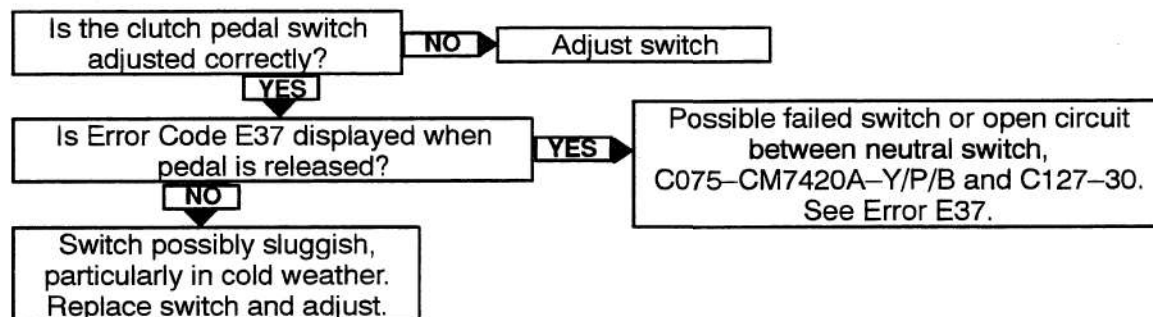
EFFECTS – Transmission disabled



ERROR CODE

E47 – CLUTCH PEDAL SWITCH SET TOO HIGH

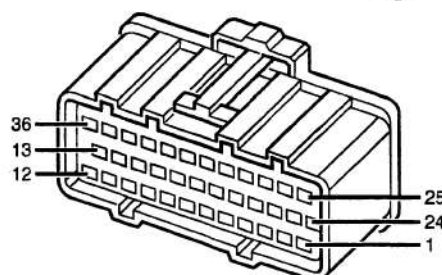
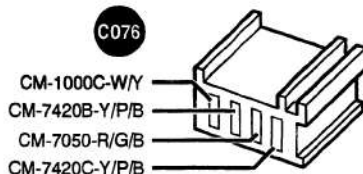
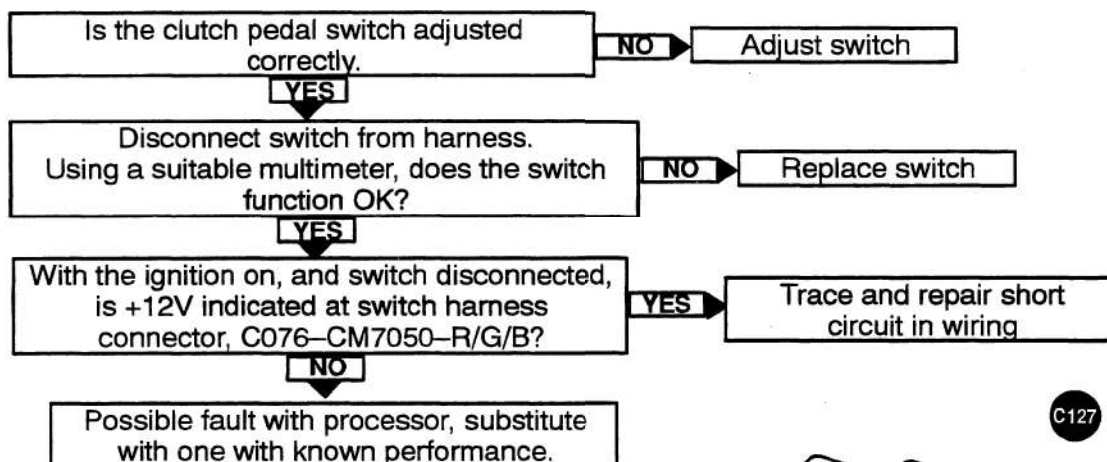
EFFECTS – Inching jerky and high pedal position



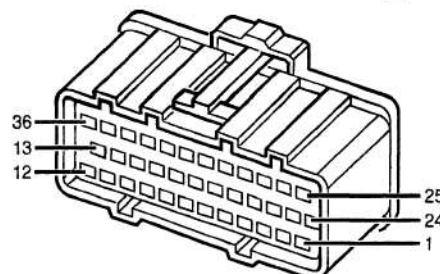
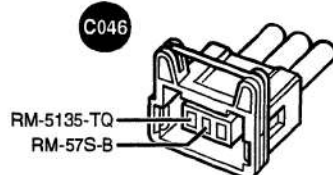
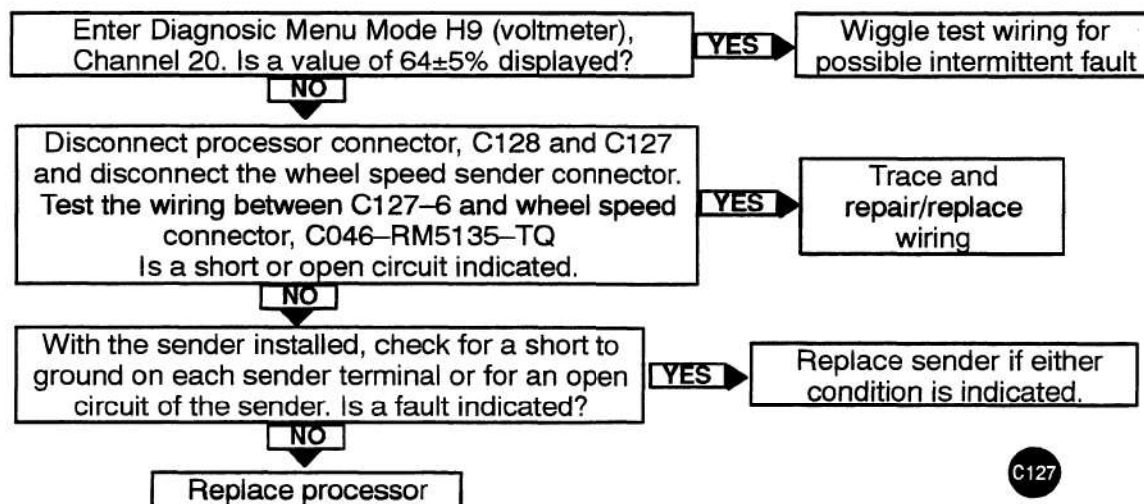
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**E48 – CLUTCH PEDAL SWITCH SET TOO LOW**

EFFECTS – Tractor performs normally but clutch pedal will not cut off power to clutch solenoids.

**ERROR CODE****E49 – WHEEL SPEED SENSOR SHORT OR OPEN CIRCUIT**

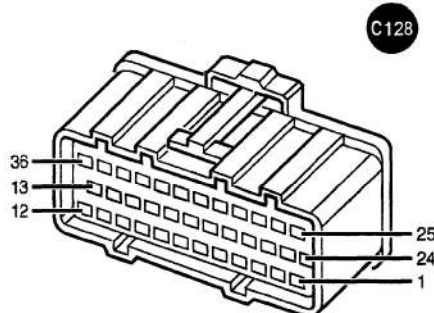
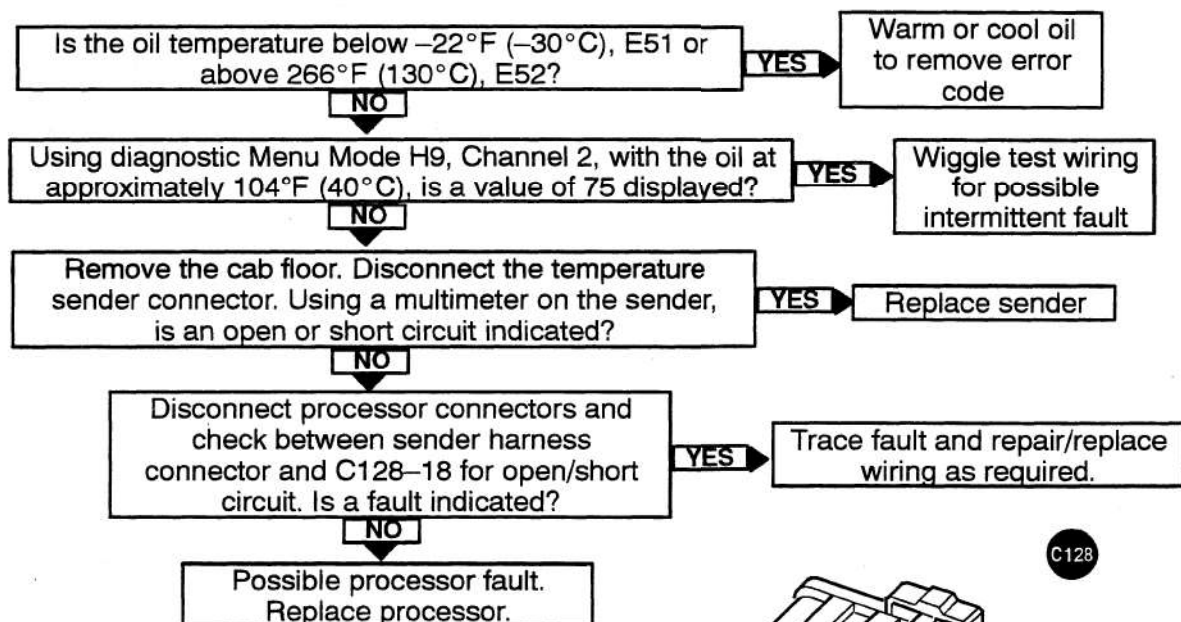
EFFECTS – Shift quality generally poor



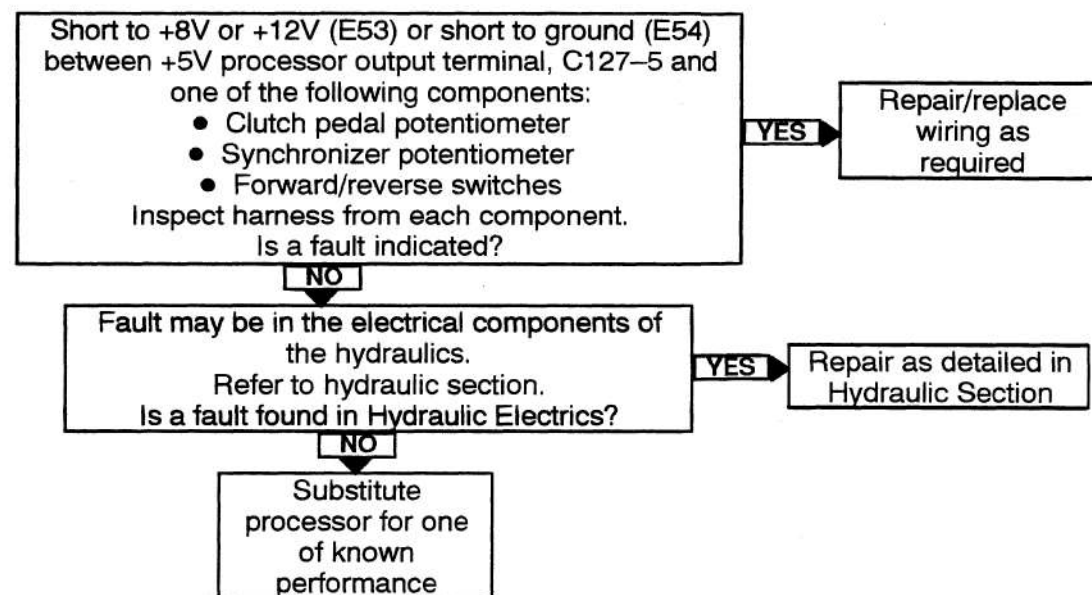
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES;**E51** – TEMPERATURE SENDER OPEN CIRCUIT**E52** – TEMPERATURE SENDER SHORT CIRCUIT

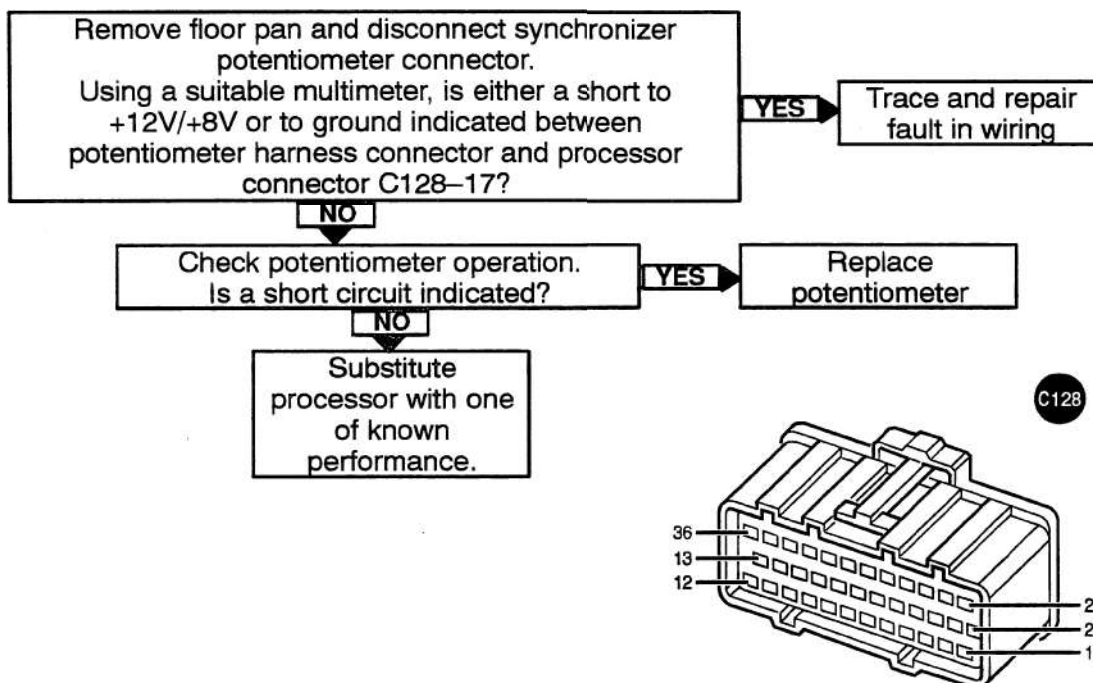
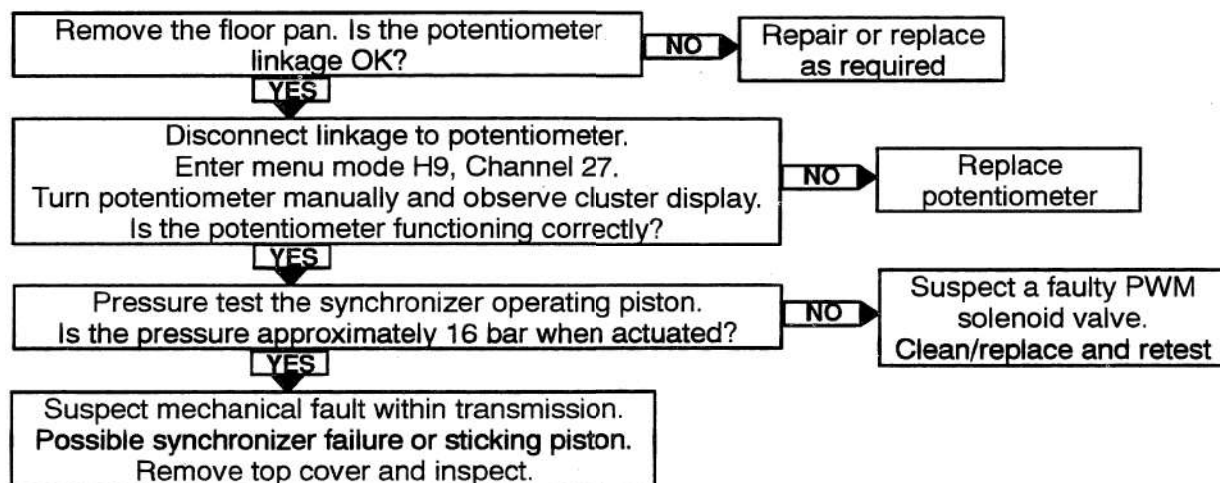
EFFECTS – Slow shifting and clutch pedal higher than normal during inching.

**ERROR CODES;****E53** – 5 VOLT REFERENCE FAILED HIGH (SHORT TO (+8V or +12V)**E54** – 5 VOLT REFERENCE FAILED LOW (SHORT TO GROUND)

EFFECTS – Transmission disabled.



SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES;**E61** – SYNCHRO POTENTIOMETER SIGNAL TOO HIGH**E62** – SYNCHRO POTENTIOMETER SIGNAL TOO LOW**EFFECTS** – The synchronizer is disabled**ERROR CODES;****E63** – SYNCHRONIZER NOT FULLY ENGAGING HI-LO (FORWARD) POSITION**E64** – SYNCHRONIZER NOT FULLY ENGAGING SHUTTLE (REVERSE) POSITION**EFFECTS** – If the previously engaged mode can be reselected, the error is cleared and the shift can be re-attempted. If synchronizer cannot be engaged only lo-forward drive will be possible.

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES;**E65** – HI/LO (FORWARD DRIVE) SOLENOID OPEN CIRCUIT**E66** – SHUTTLE (REVERSE DRIVE) SOLENOID OPEN CIRCUIT

EFFECTS – Transmission disabled.

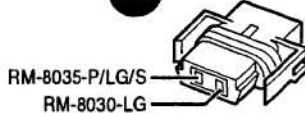
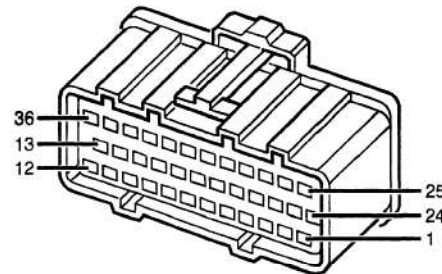
Remove floor pan and disconnect affected solenoid.
Test across solenoid terminals with a suitable
multimeter. Is an open circuit indicated?

YES

Replace solenoid

NO

Disconnect processor connectors.
Test for an open circuit between C127–11 and
C157–RM8030–LG, and between C127–36
and C157–RM8035–P/LG/S, for E65.
Test for an open circuit between C127–13 and
C156–RM8045–P/LN/S, for E66.
Trace fault and repair/replace wiring as
required.

C157**C156****C127****ERROR CODES;****E67** – HI–LO (FORWARD) SOLENOID SHORT CIRCUIT**E68** – SHUTTLE (REVERSE) SOLENOID SHORT CIRCUIT

EFFECTS – Transmission disabled.

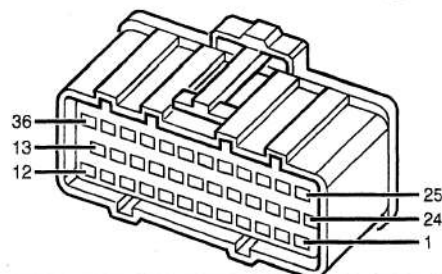
Remove floor pan and disconnect affected solenoid.
Test across solenoid terminals and from each terminal
to ground with a suitable multimeter.
Is a short circuit indicated?

YES

Replace solenoid

NO

Disconnect processor connectors.
Test for a short circuit between C127–11 and
C157–RM8030–LG, and between C127–36
and C157–RM8035–P/LG/S, for E67.
Test for a short circuit between C127–13 and
C156–RM8045–P/LN/S, and between
C127–14 and C156–RM8040–LG, for E68.
Trace short in harness and repair/replace
wiring as required.

C157**C156****C127**

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE**CP – GEAR SELECTED WITHOUT CLUTCH PEDAL DEPRESSED**

EFFECTS – Transmission disabled.

Cycle the clutch pedal or shuttle lever to clear error code.

ERROR CODE**EHI – CLUTCH B NOT CALIBRATED**

EFFECTS – Transmission disabled

Was clutch 'B' calibrated after a change of processor or after using H8 (memory clear) mode?

NO

Perform calibration to clear error code

YES

Replace processor with one of known performance

ERROR CODE**EL0 – CLUTCH A NOT CALIBRATED**

EFFECTS – Transmission disabled

Was clutch 'A' calibrated after a change of processor or after using H8 (memory clear) mode?

NO

Perform calibration to clear error code

YES

Processor possibly corrupted. Replace with one of known performance

ERROR CODE**E70 – UNABLE TO INITIALIZE SYNCHRONIZER DURING START UP PROCEDURE**

EFFECTS – Transmission operable in 'Low Forward' only.

Remove floor pan.
Is linkage to synchronizer potentiometer OK?

NO

Repair linkage

YES

Disconnect linkage to potentiometer.
Enter menu mode H9, channel 27, and manually operate potentiometer.
Is the potentiometer functioning correctly?

NO

Replace potentiometer

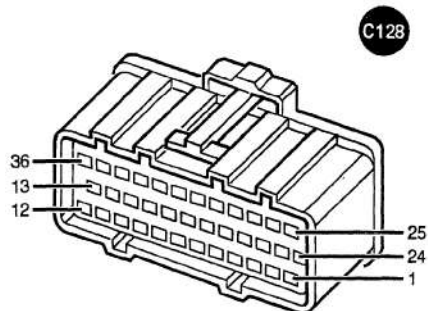
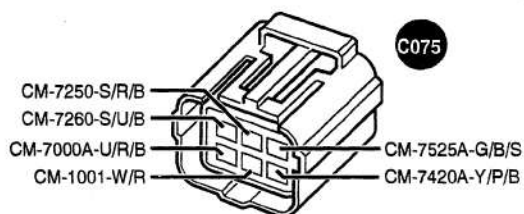
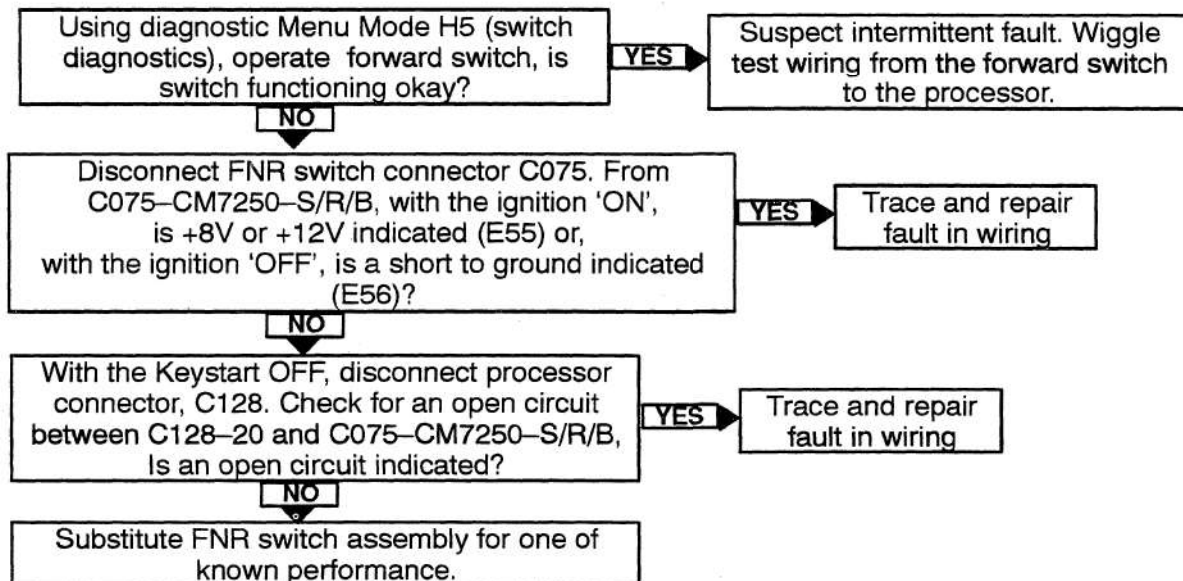
YES

Suspect fault within transmission.
Remove top cover. Inspect synchronizer and operating piston.

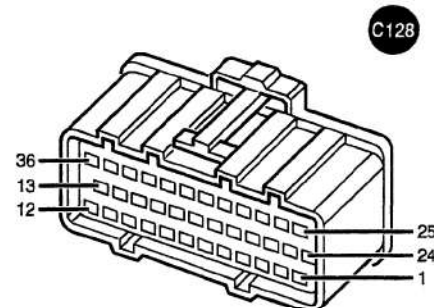
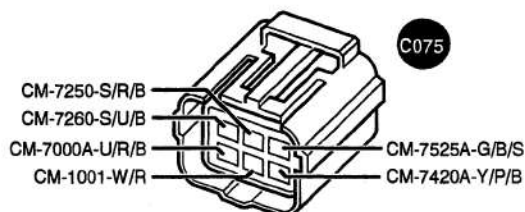
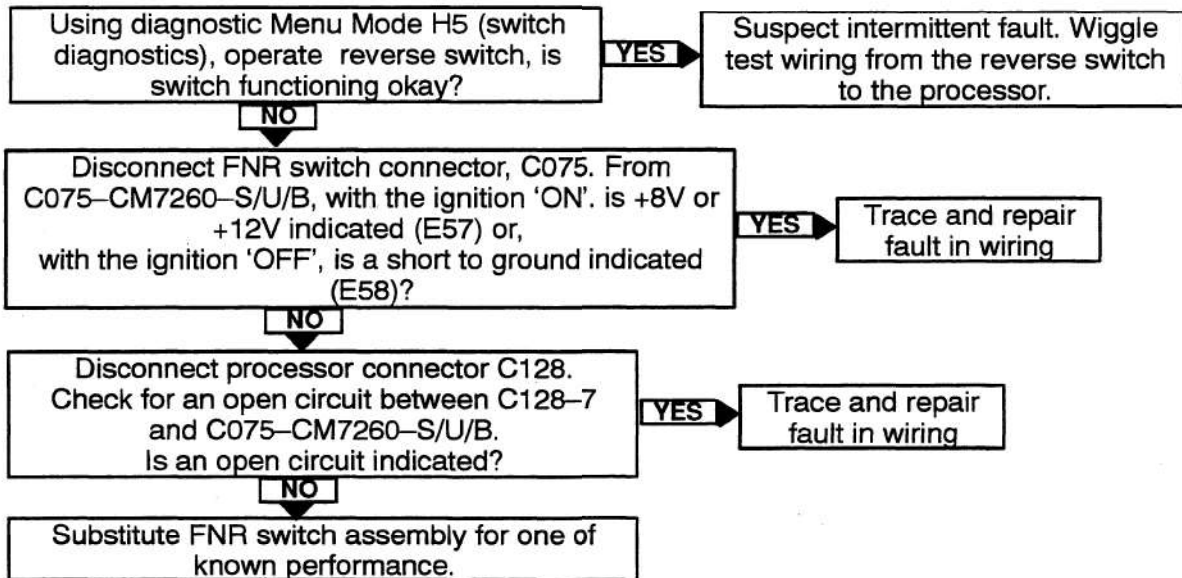
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES;**E55** – FORWARD SWITCH FAILED TO +8V OR +12V**E56** – FORWARD SWITCH FAILED TO GROUND OR OPEN CIRCUIT

EFFECTS – Transmission enabled



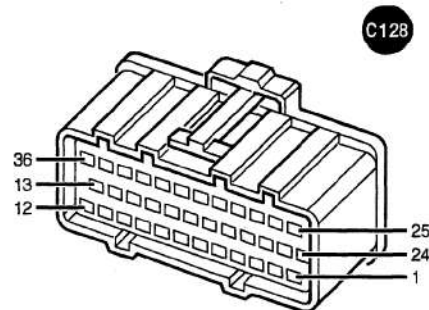
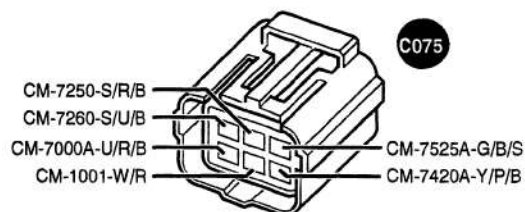
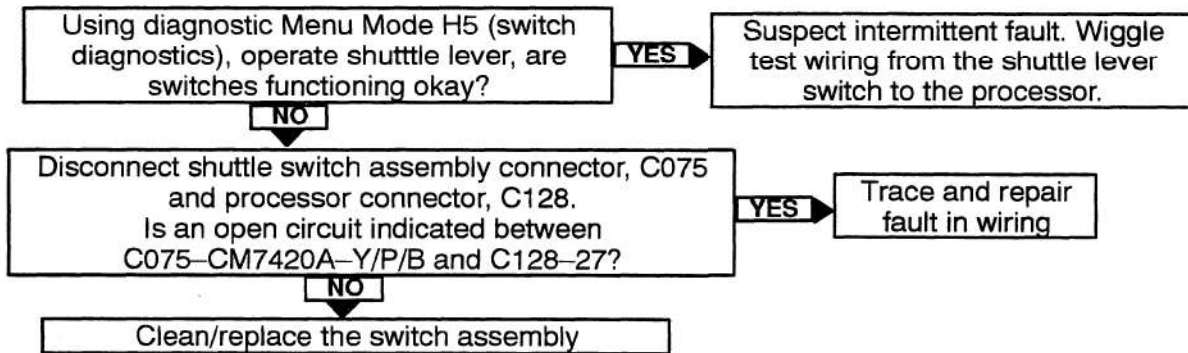
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODES;**E57** – REVERSE SWITCH FAILED TO +8V OR +12V**E58** – REVERSE SWITCH FAILED TO GROUND OR OPEN CIRCUIT**EFFECTS** – Transmission enabled

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

ERROR CODE

**E59 – FORWARD/NEUTRAL/REVERSE SWITCH
DISAGREEMENT (MORE THAN ONE SWITCH OR NO SWITCHES APPLIED)**
EFFECTS – Transmission enabled



CLUTCH CALIBRATION ERROR CODES

U20 – CORRECT START UP PROCEDURE WAS NOT USED

Depress and release clutch pedal and proceed
with clutch calibration

U21 – ENGINE REV/MIN TOO LOW

Adjust to 1200 rev/min \pm 100 rev/min

U22 – ENGINE REV/MIN TOO HIGH

Adjust to 1200 rev/min \pm 100 rev/min

U23 – FORWARD/REVERSE SHUTTLE LEVER IS NOT IN FORWARD

Position lever into forward mode

U24 – MAIN SHIFT LEVER IS NOT IN GEAR

Position main range lever into 1st gear

U25 – RANGE LEVER NOT IN GEAR

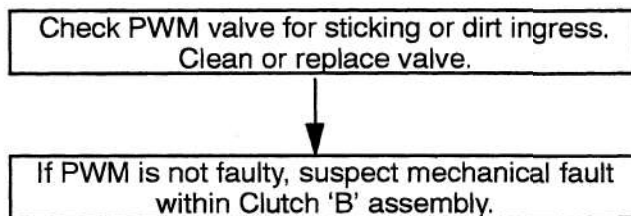
Position range lever into high range

U26 – CLUTCH PEDAL NOT FULLY RELEASED

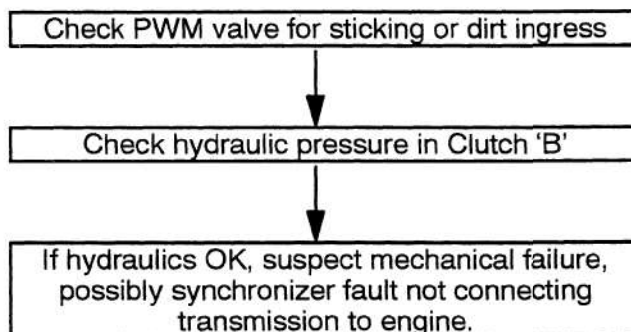
Release clutch pedal and/or check pedal
operation

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

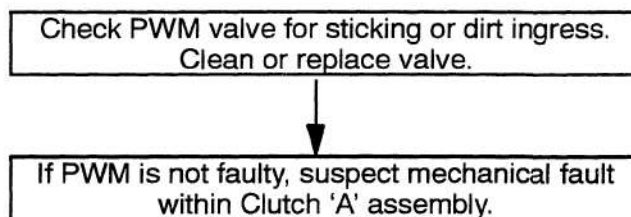
U27 – HI (B) CLUTCH CALIBRATION IS TOO LOW
(ENGINE REV/MIN DROPPED TOO SOON)



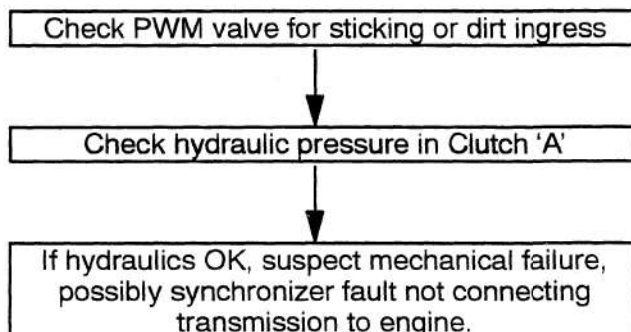
U28 – HI (B) CLUTCH CALIBRATION IS TOO HIGH. (MAX. ALLOWED CALIBRATION
VALUE EXCEEDED WITHOUT DROPPING ENGINE REV/MIN.)



U29 – LO (A) CLUTCH CALIBRATION IS TOO LOW
(ENGINE REV/MIN DROPPED TOO SOON)

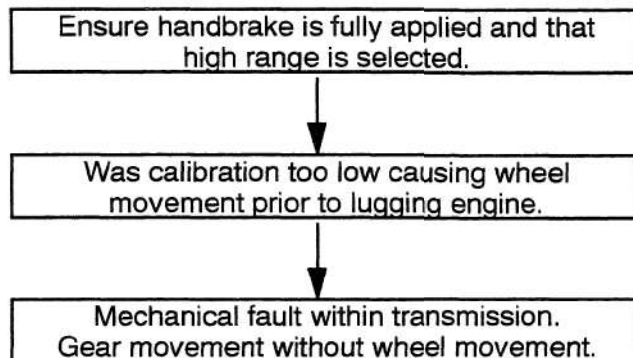


U30 – LO (A) CLUTCH CALIBRATION IS TOO HIGH. (MAX. ALLOWED CALIBRATION
VALUE REACHED WITHOUT DROPPING ENGINE REV/MIN.)

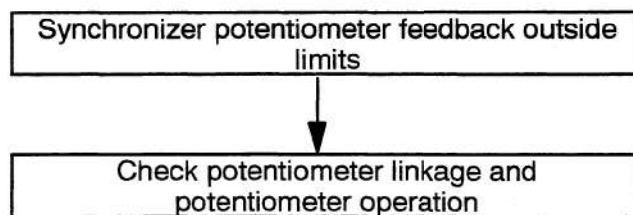


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

U31 – WHEEL MOTION DETECTED DURING CALIBRATION



U37 – SYNCHRONIZER SHUTTLE (REVERSE) MODE CALIBRATION



U38 – SYNCHRONIZER HI-LO (FORWARD) MODE CALIBRATION

