

# **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.

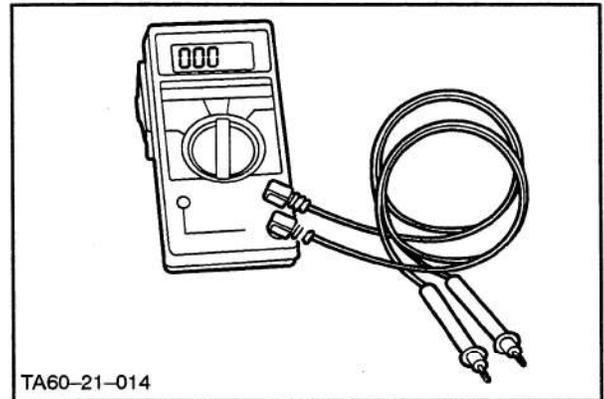
## SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

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 ±100.

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

The transmission is now ready for calibration.

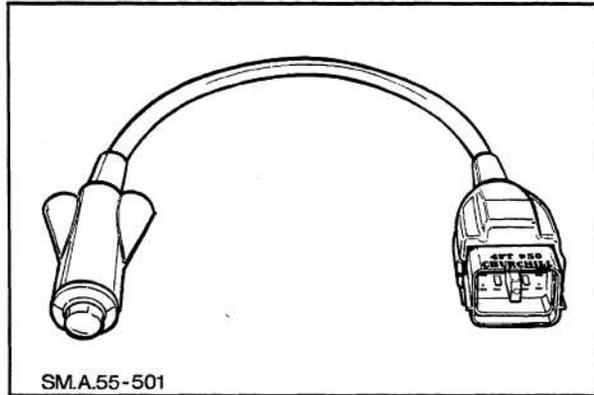


Figure 4-4-2

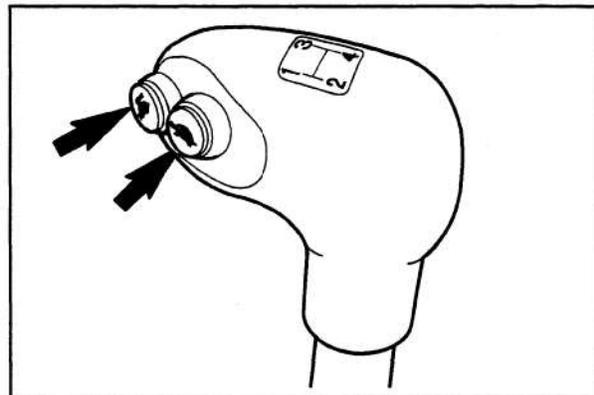


Figure 4-4-3

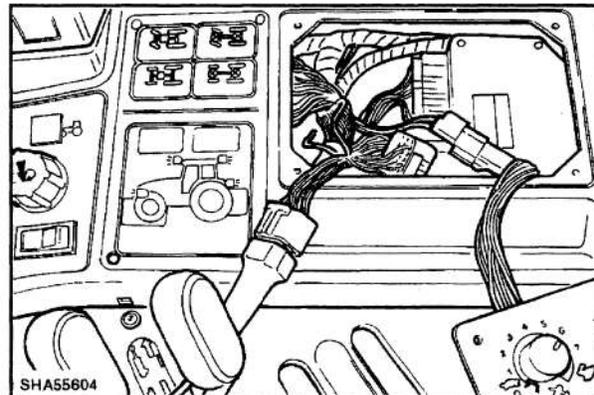


Figure 4-4-4

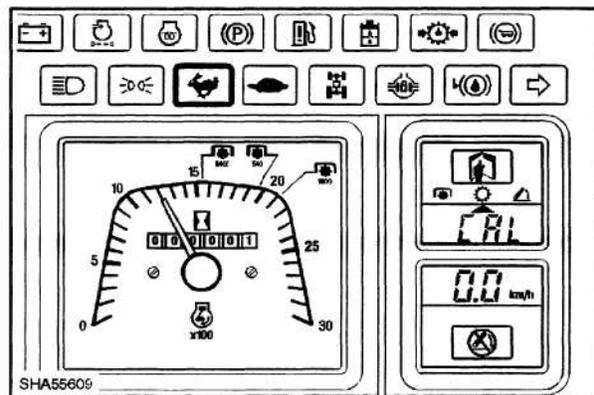


Figure 4-4-5

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.

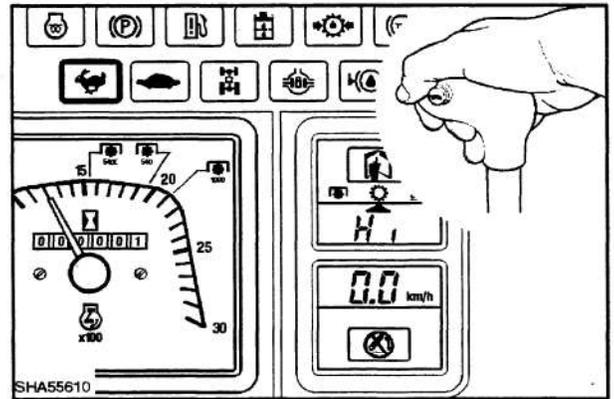


Figure 4-4-6

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.

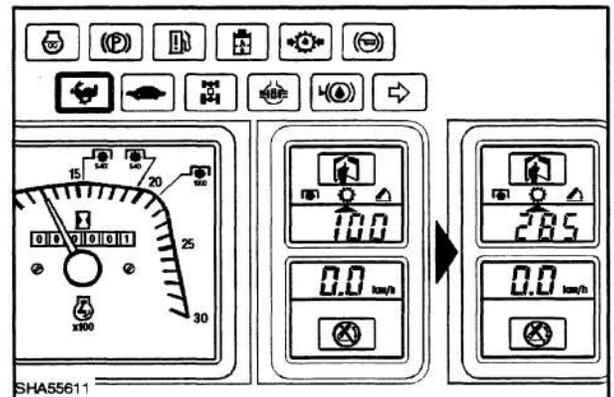


Figure 4-4-7

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

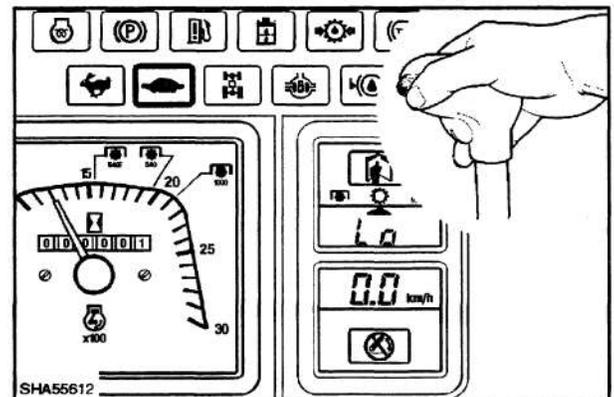


Figure 4-4-8

**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.

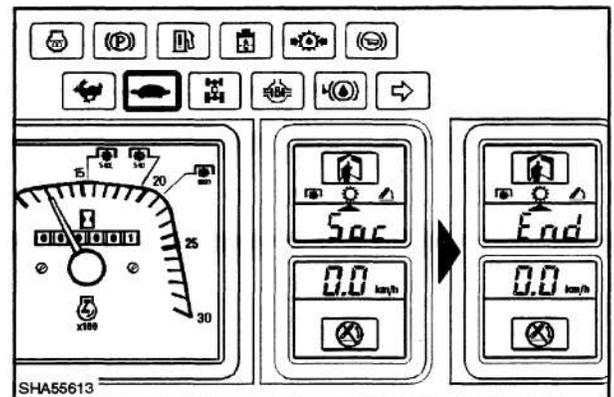


Figure 4-4-9

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.

(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).

2. Install suitable pressure gauges, (0–600 lbf/in<sup>2</sup>, 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.

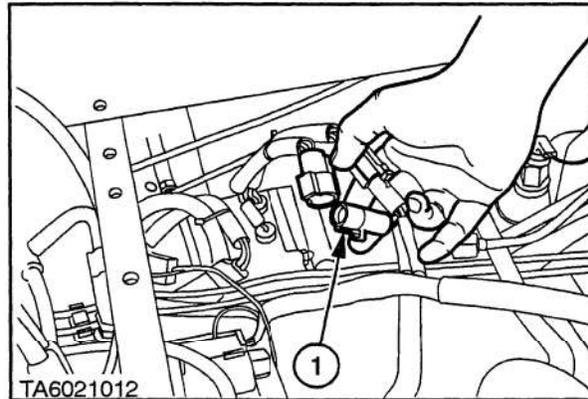


Figure 4-4-10

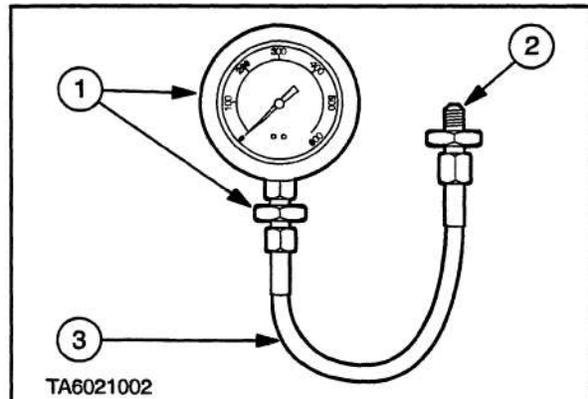


Figure 4-4-11

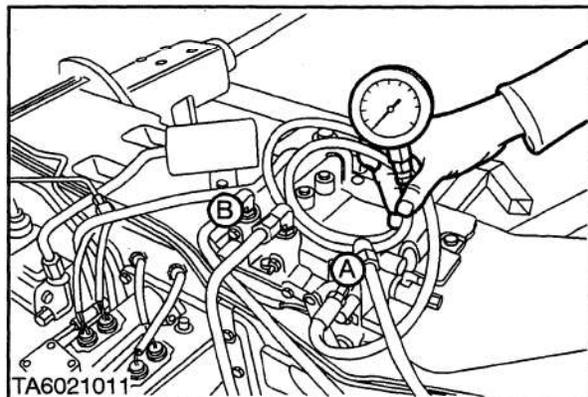


Figure 4-4-12

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.

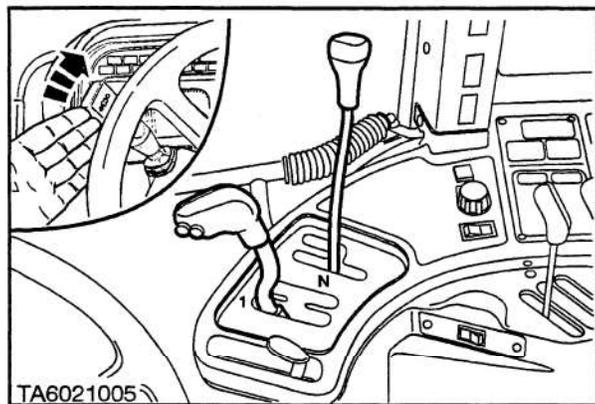


Figure 4-4-13

4. Using the Hi-Lo buttons on the main shift lever, switch between Hi and Lo drive and observe the gauges.

Each clutch should obtain 235–261 lbf/in<sup>2</sup> (16–18 bar) maximum pressure, when fully engaged and zero pressure when disengaged.

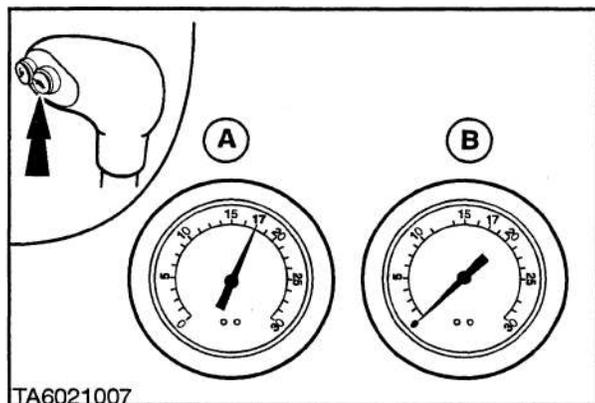


Figure 4-4-14

During the swapping of clutches there is an overlap period where both clutches have approximately 75 lbf/in<sup>2</sup> (5 bar) at the crossover point.

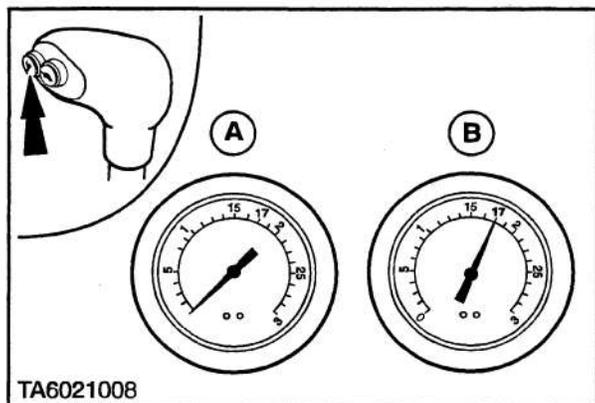


Figure 4-4-15

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.

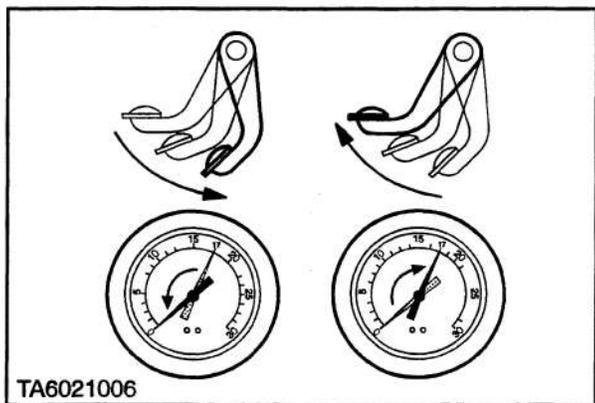


Figure 4-4-16

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.

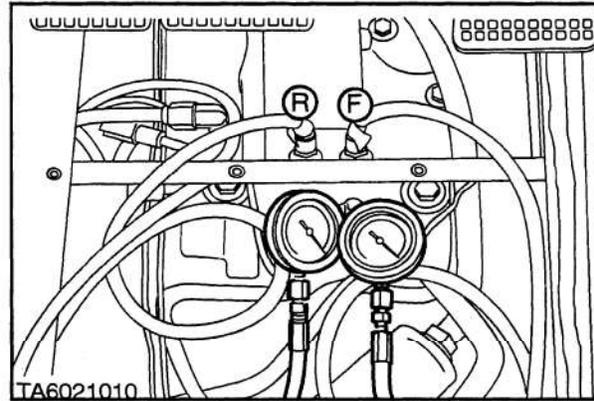


Figure 4-4-17

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:–

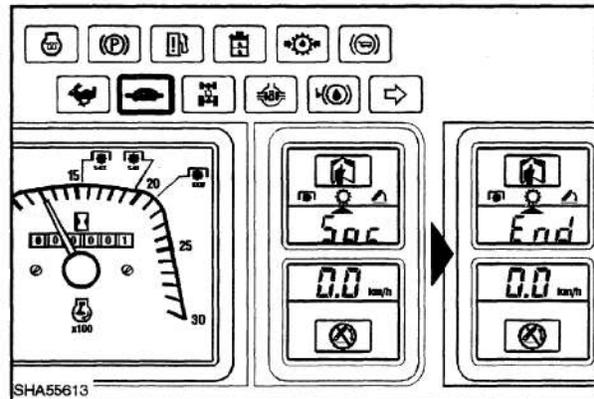


Figure 4-4-18

- (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.

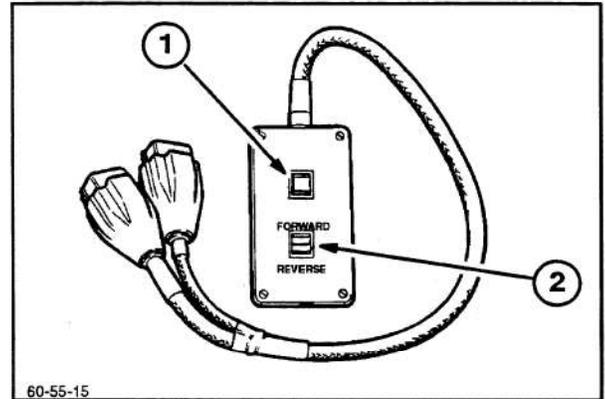


Figure 4-4-20

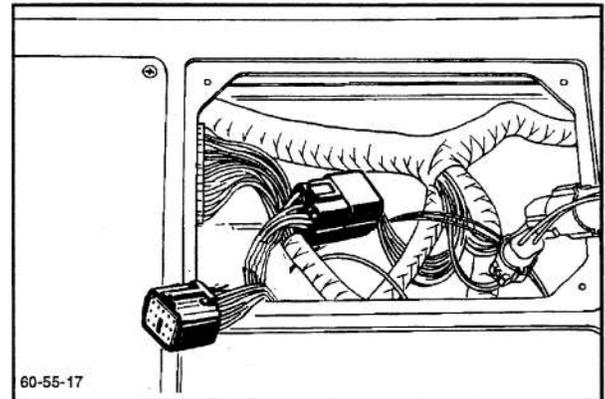


Figure 4-4-21

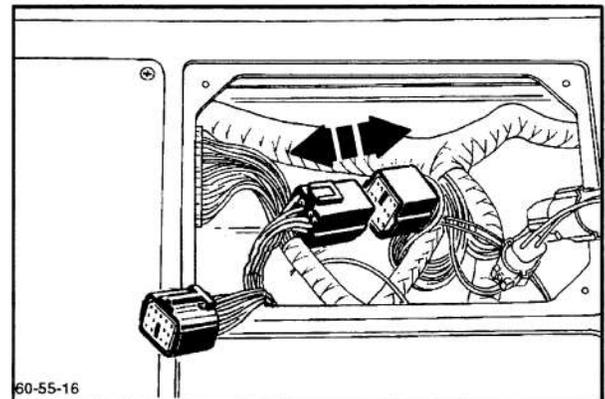


Figure 4-4-22

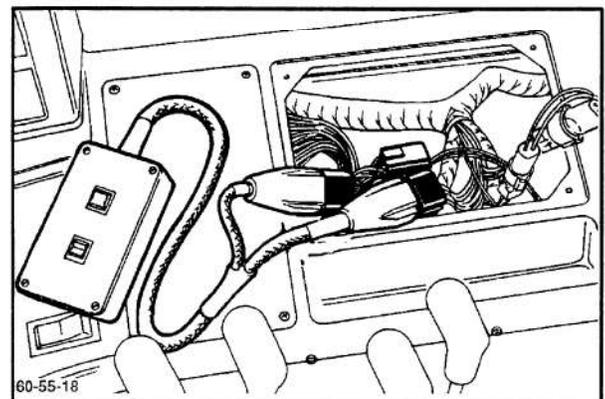


Figure 4-4-23

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 tractors 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.

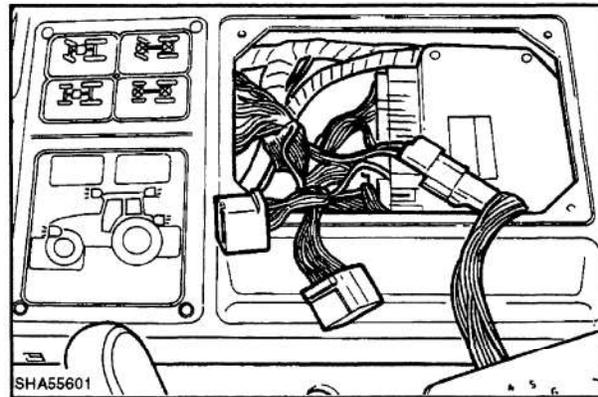


Figure 4-4-24

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.

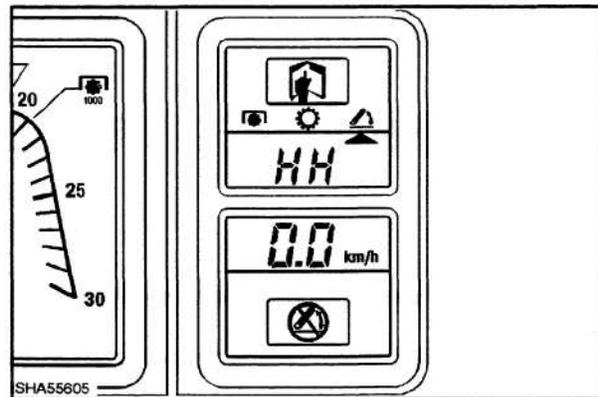


Figure 4-4-25

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.

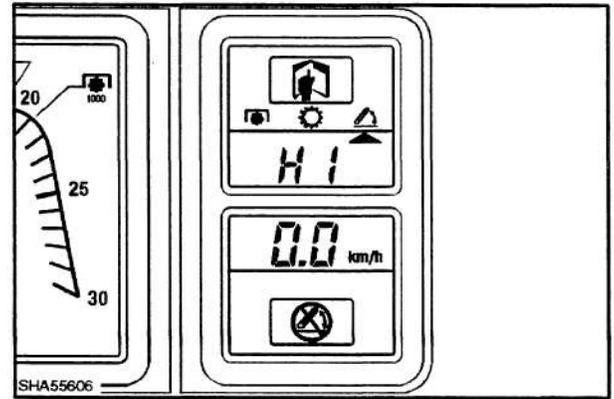


Figure 4-4-26

**H2 CLUTCH CALIBRATION VIEW**

Displays the previous clutch calibrations.

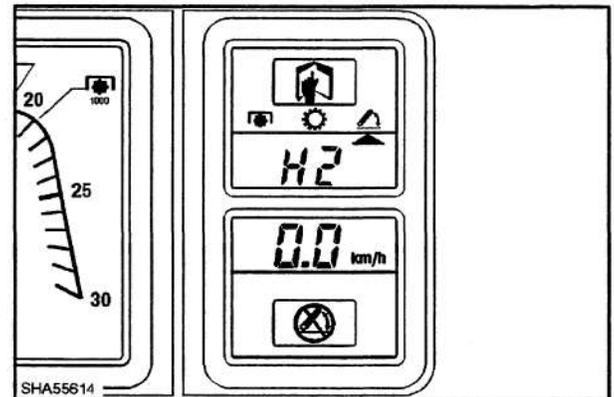


Figure 4-4-27

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

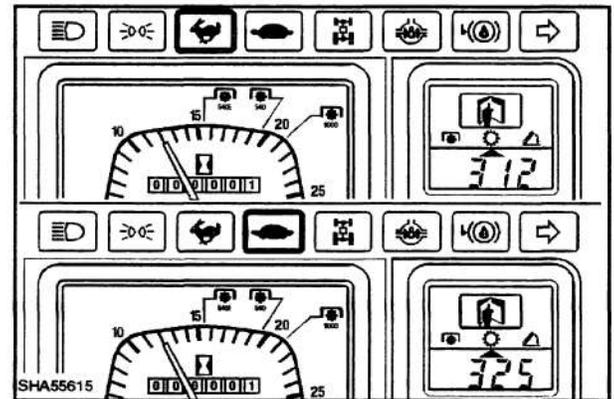


Figure 4-4-28

**H3 EDC VALVE CALIBRATION VALUES.**

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

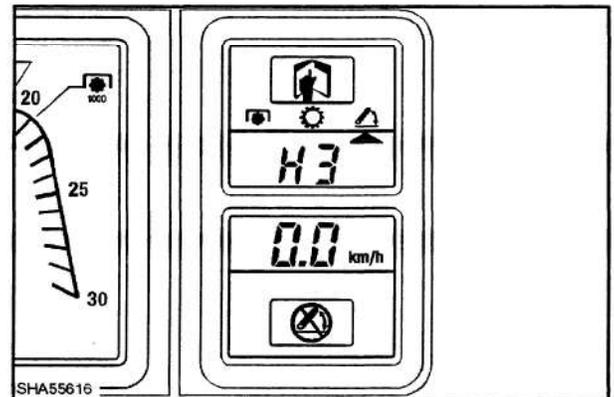


Figure 4-4-29

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**H4 SOFTWARE REVISION LEVEL.**

Displays the software installed into the processor.

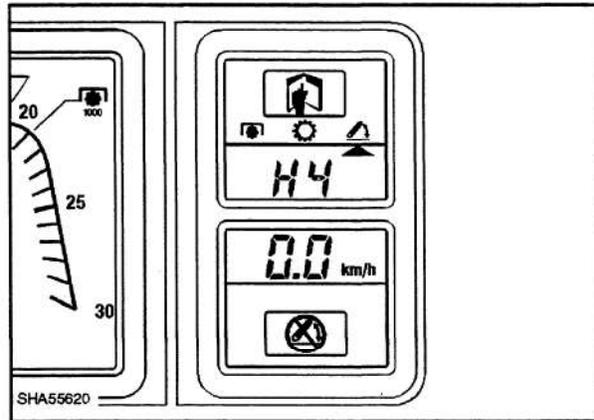


Figure 4-4-30

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)

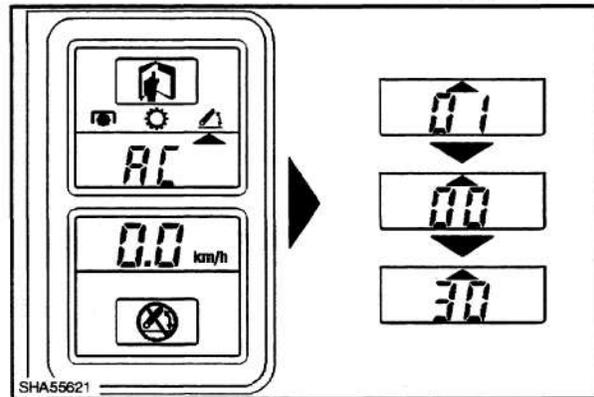


Figure 4-4-31

**H5 SWITCH TEST**

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

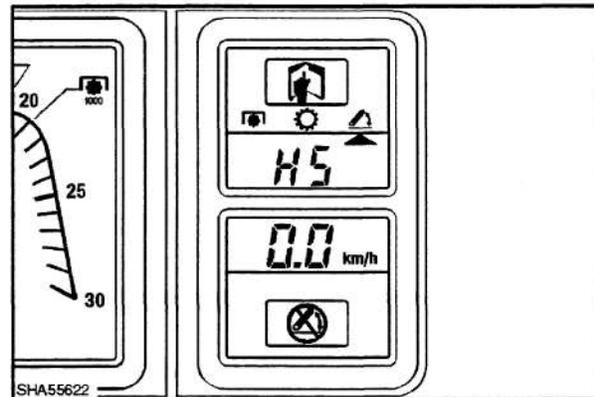


Figure 4-4-32

The display will show "d0".

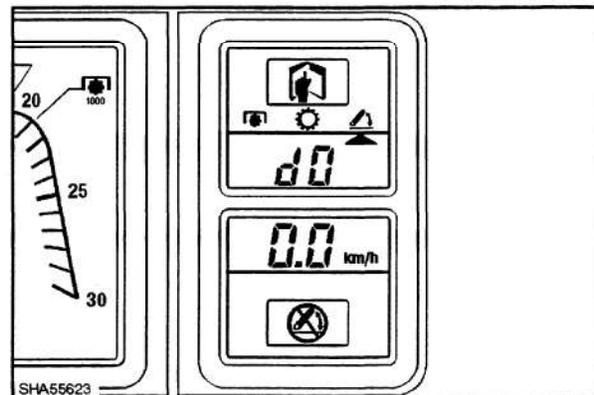


Figure 4-4-33

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.

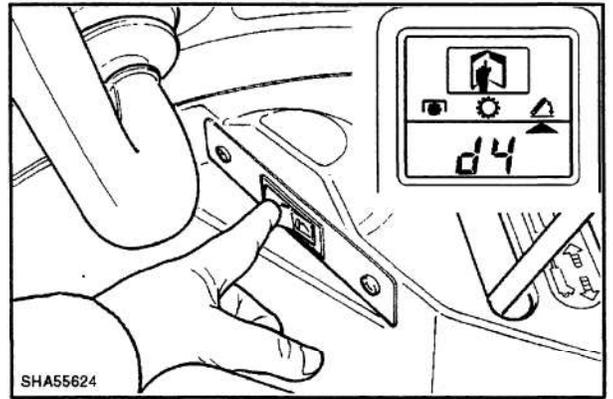


Figure 4-4-34

Switch Code	Switch Description	Special Requirements
d1	External lower switch	
d2	External raise switch	
d3	work switch	
d4	Raise switch	
d71	Clutch pedal switch	Shuttle lever in forward
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.

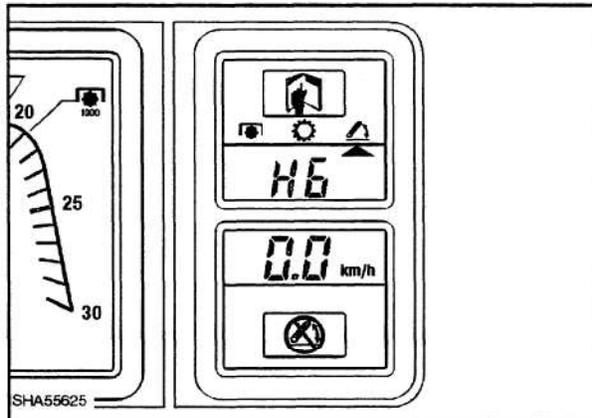


Figure 4-4-35

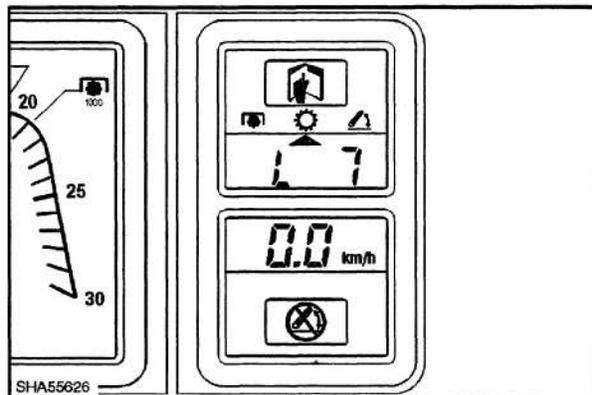


Figure 4-4-36

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.

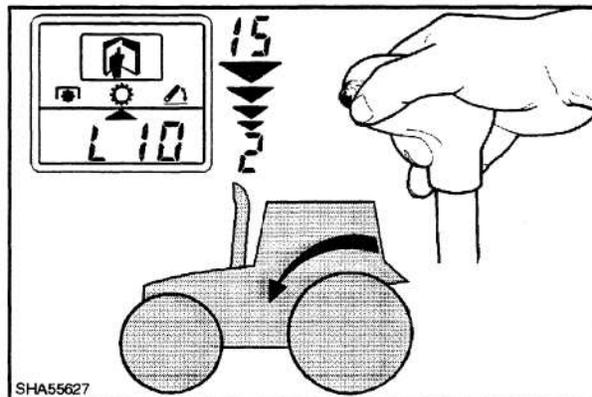


Figure 4-4-37

**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.

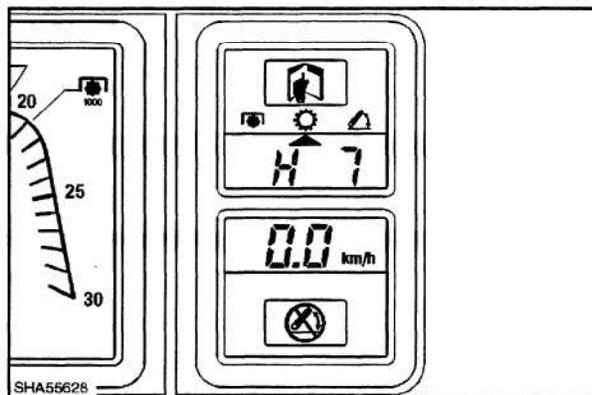


Figure 4-4-38

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**H8 NON VOLATILE MEMORY RESET**

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

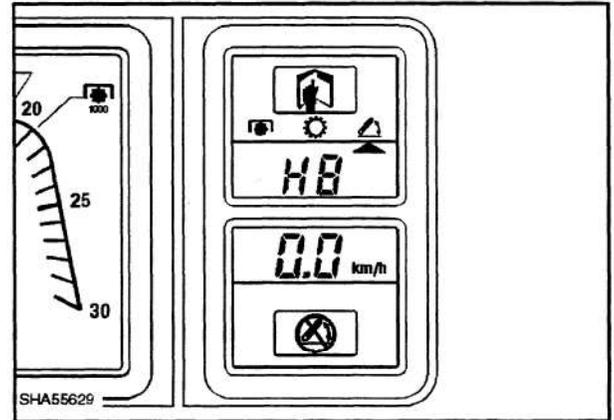


Figure 4-4-39

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.

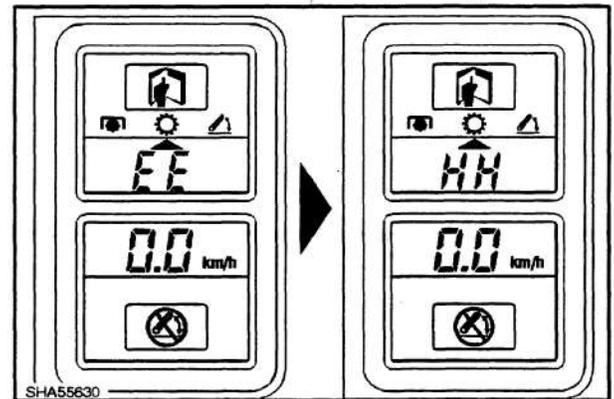


Figure 4-4-40

**H9 VOLT METER**

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

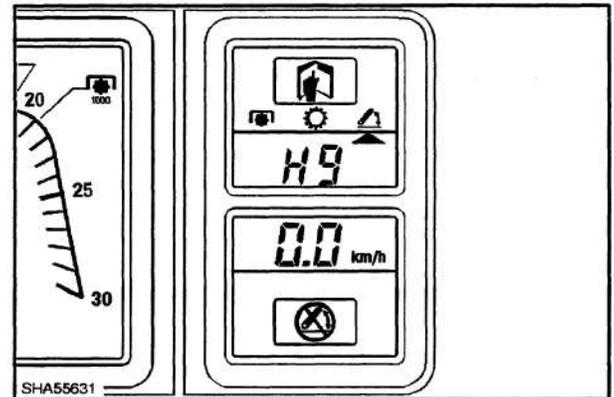


Figure 4-4-41

There are 37 channels which can be accessed.

To select a channel use the upshift and downshift buttons.

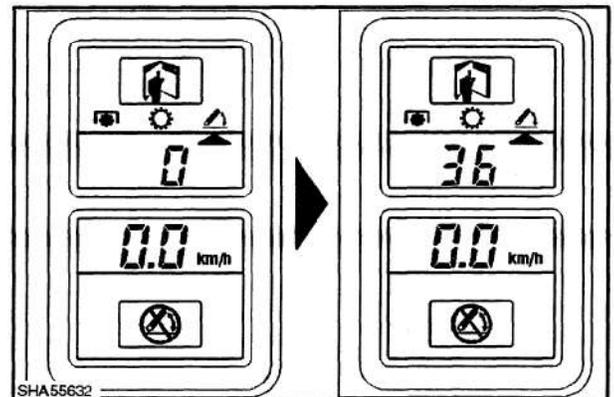


Figure 4-4-42

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.*

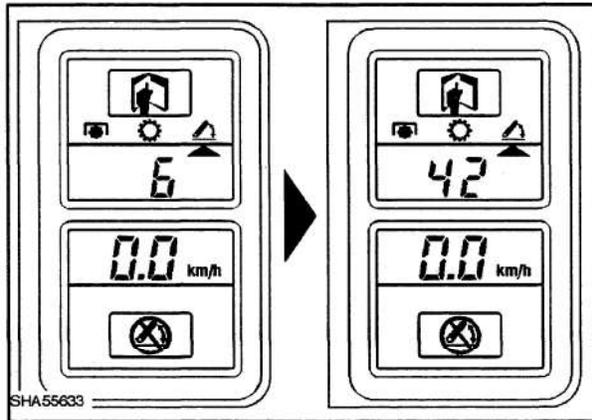


Figure 4-4-43

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.*

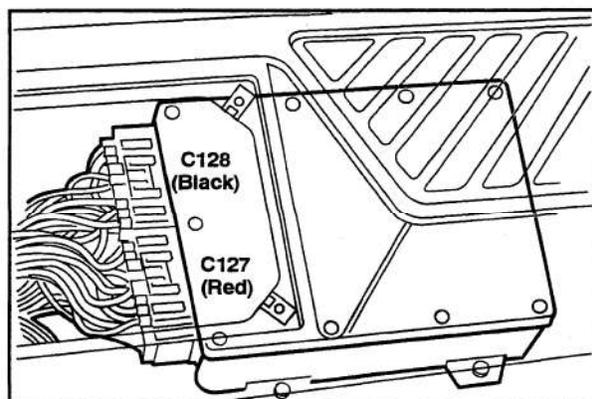


Figure 4-4-44

## 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.

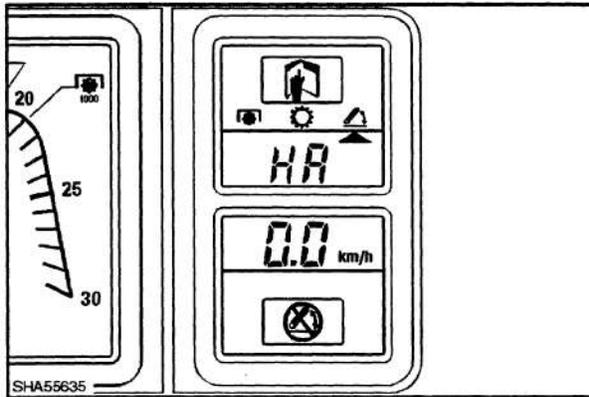


Figure 4-4-45

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

0 = fully down

99 = fully up

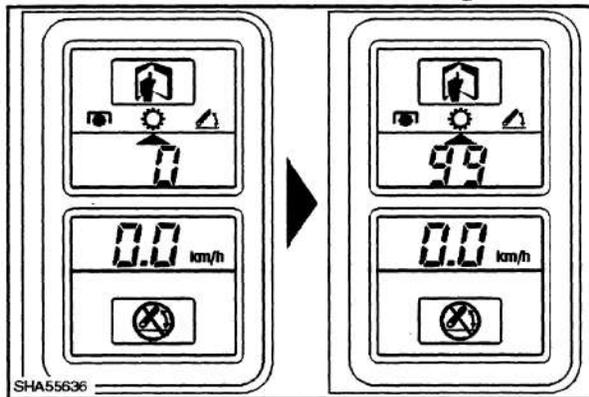


Figure 4-4-46

**HB PWM COMPENSATION FIGURE**

This is not used.

**NOTE:** Factory set to 16.

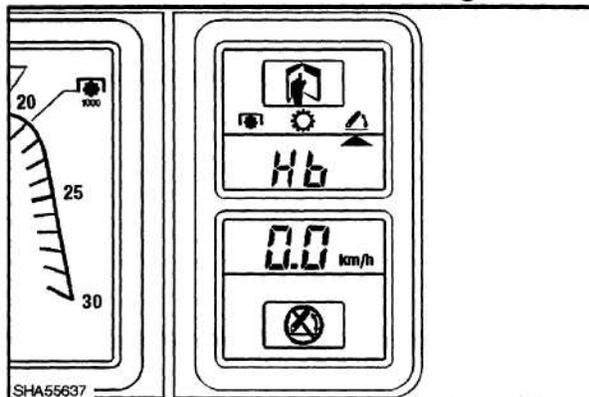


Figure 4-4-47

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**HC TRANSMISSION OIL TEMPERATURE VIEW**

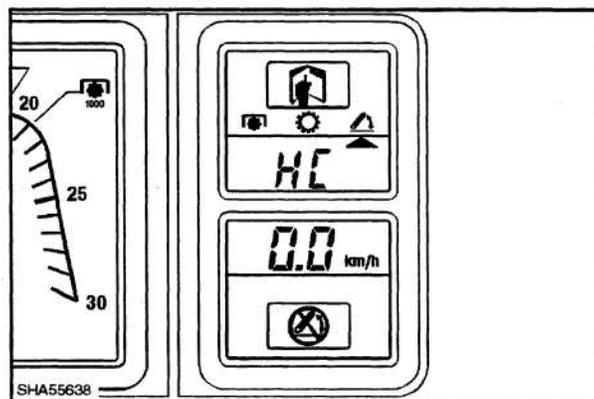


Figure 4-4-48

Shows transmission oil temperature in degrees Celsius.

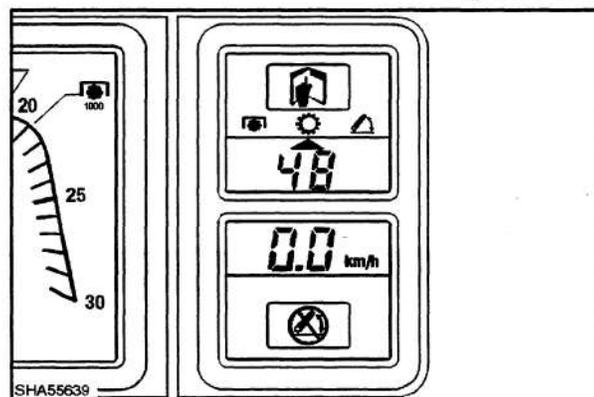


Figure 4-4-49

**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.

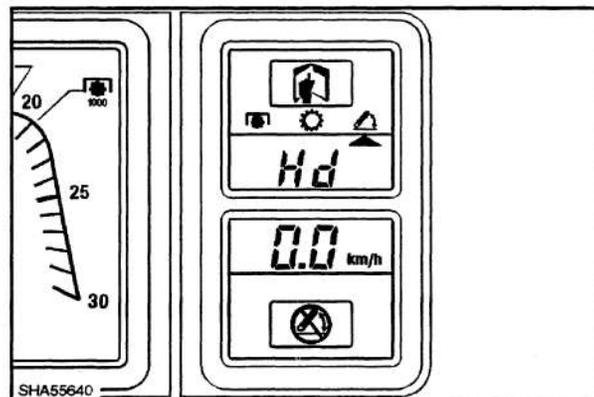


Figure 4-4-50

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(%)

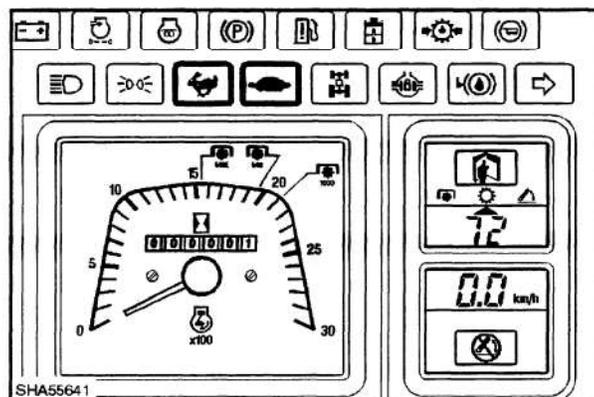


Figure 4-4-51

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.

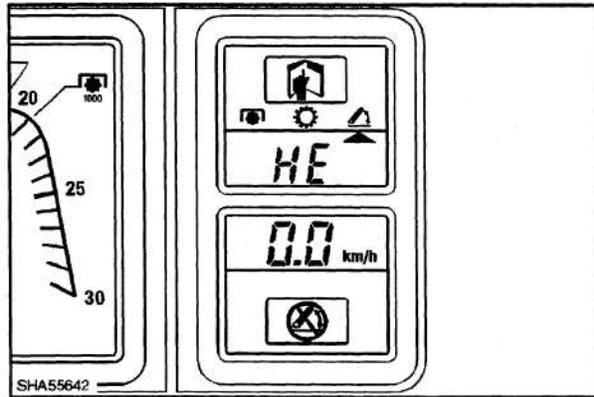


Figure 4-4-52

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

3, 4, or 8 mph.

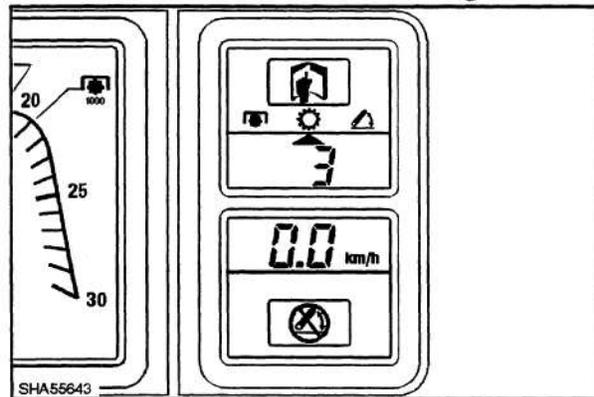


Figure 4-4-53

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

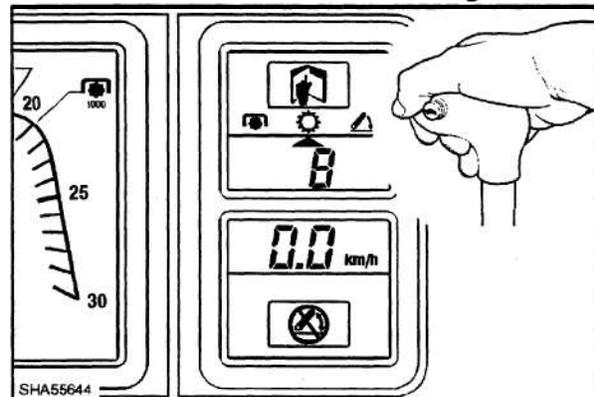


Figure 4-4-54

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.

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.

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.

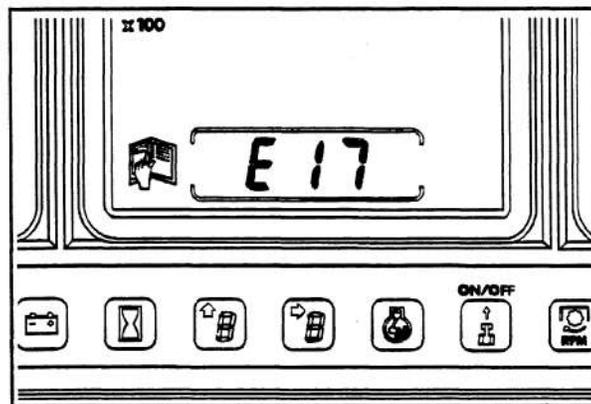


Figure 4-4-55

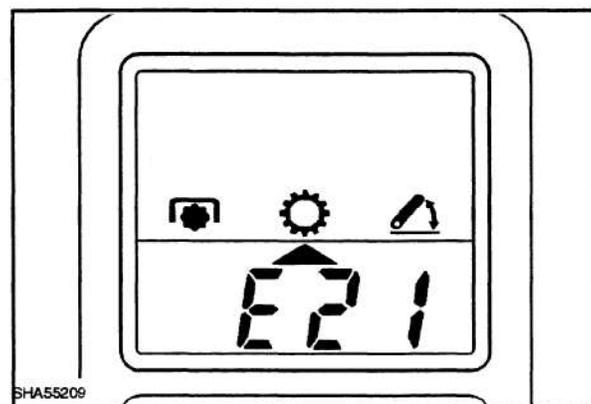


Figure 4-4-56

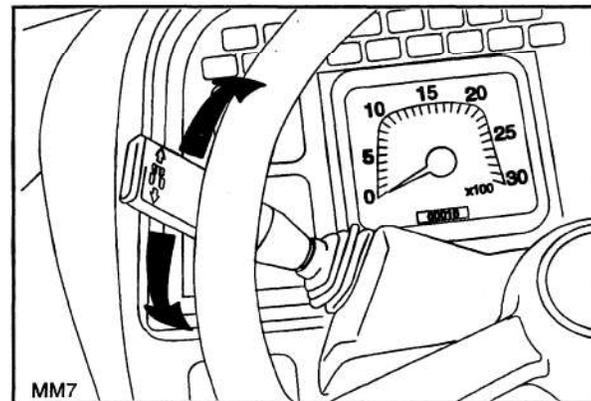


Figure 4-4-57

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

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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)

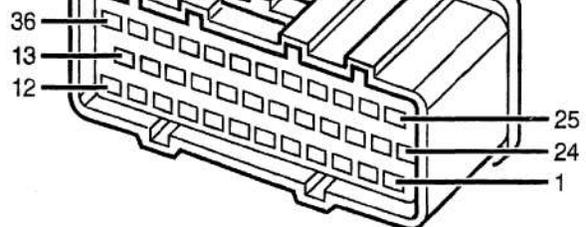
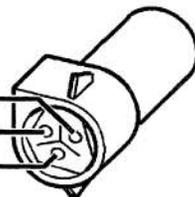
YES

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

C128

C077

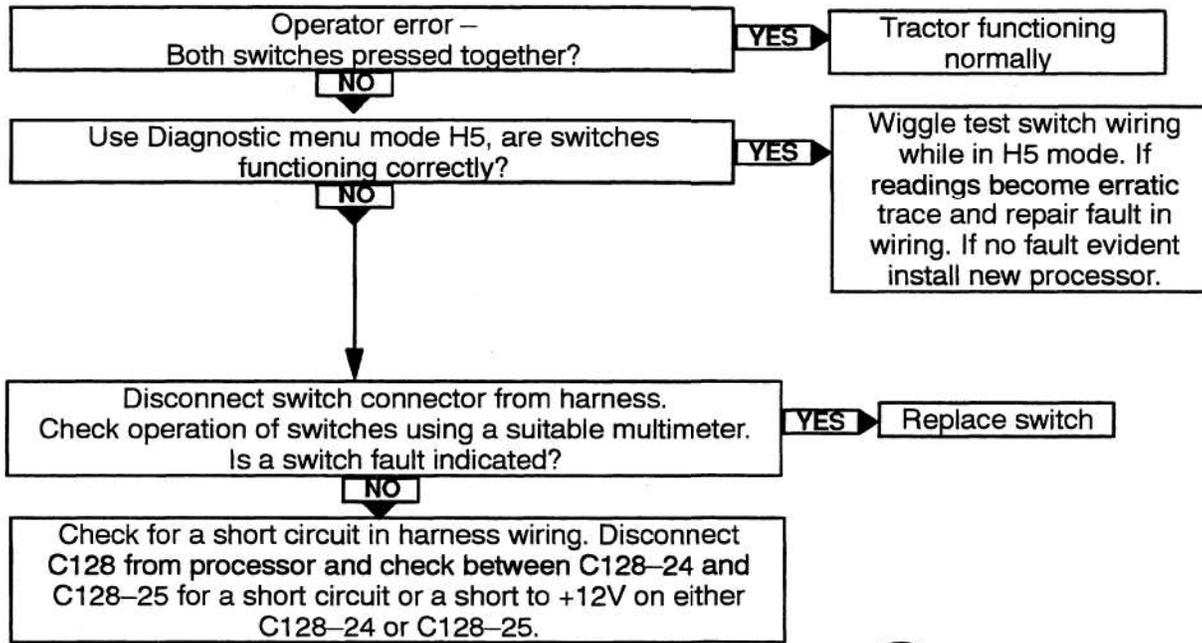
CM-7430-Y/R/B  
CM-7570A-B  
CM-7525B-G/B/S



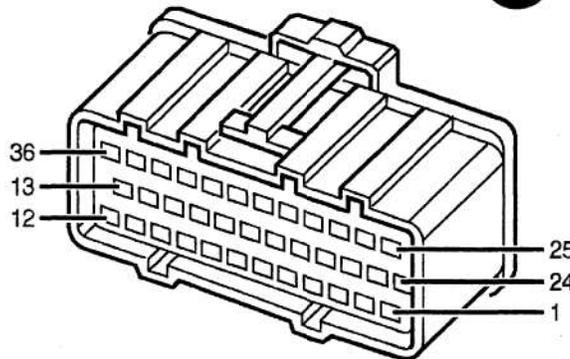
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODE**

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

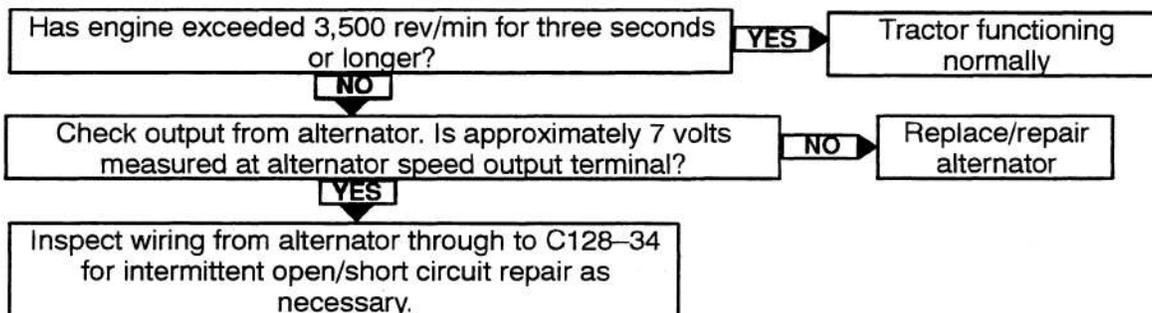


C128



**ERROR CODE**

**E26 – ERPM TOO HIGH**  
EFFECTS – Poor shift quality and possibly unable to perform calibration

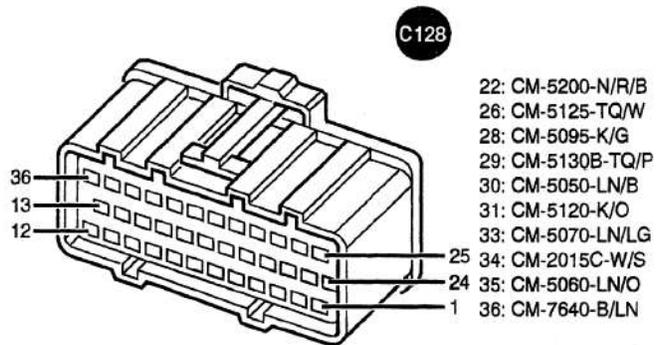
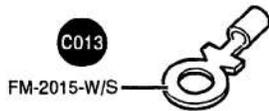
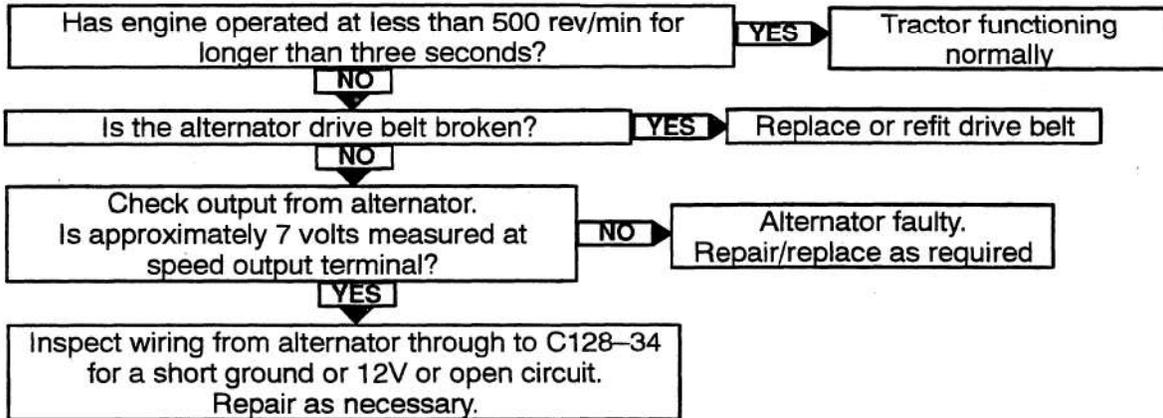


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODE**

**E27 – ERPM TOO LOW**

EFFECTS – Poor shift quality and possibly unable to perform calibration

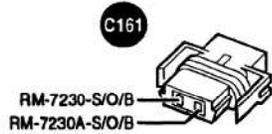
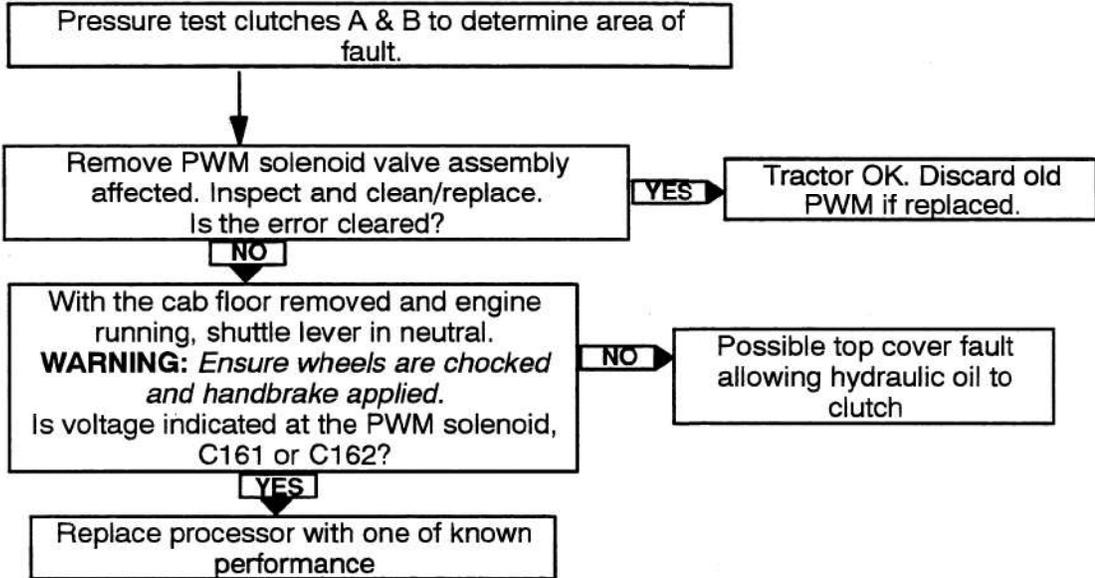


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODE**

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

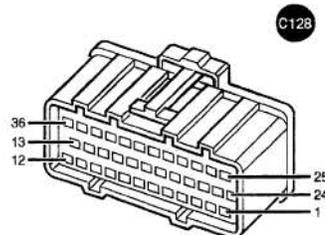
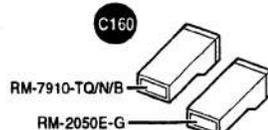
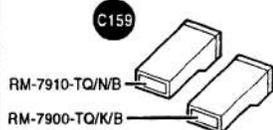
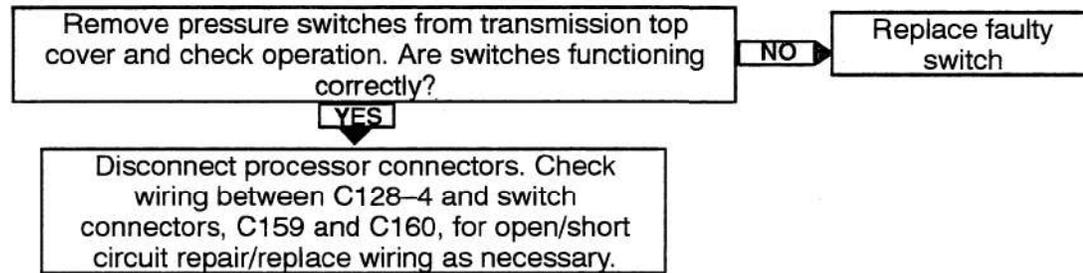
EFFECTS – Transmission disabled



**ERROR CODE**

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

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

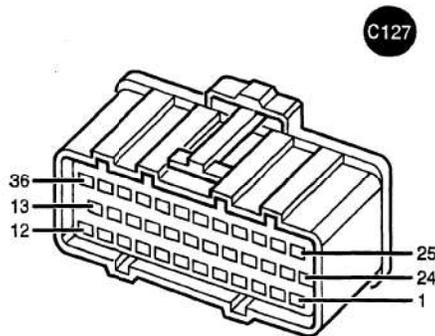
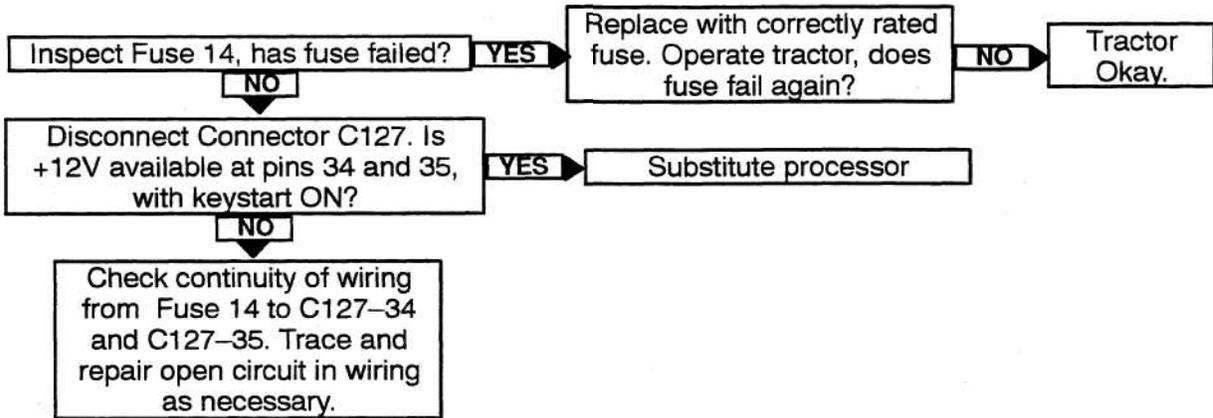


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODE**

**E34 – FUSE 14 BLOWN**

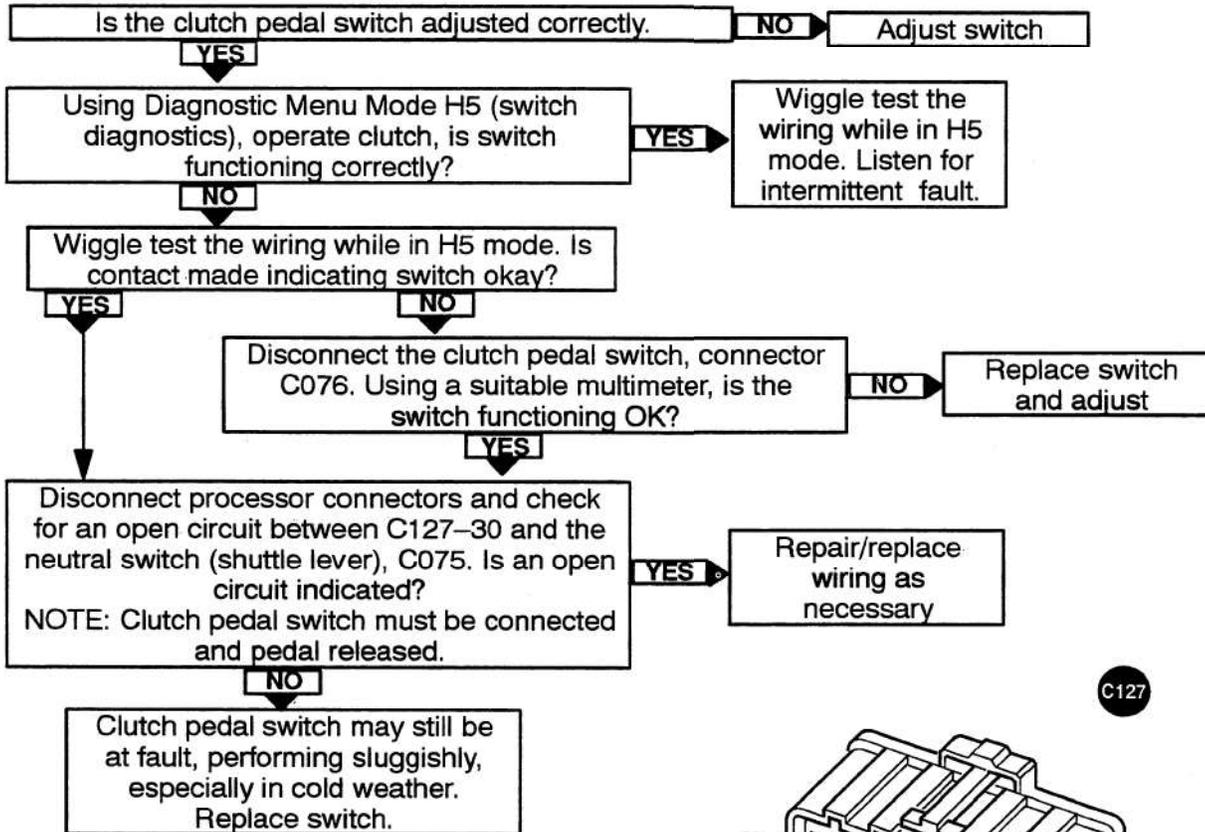
EFFECTS – Transmission disabled.



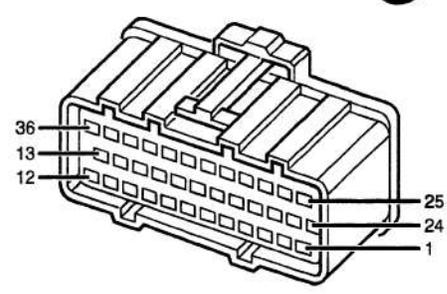
**ERROR CODE**

**E37 – CLUTCH PEDAL SWITCH OPEN CIRCUIT**

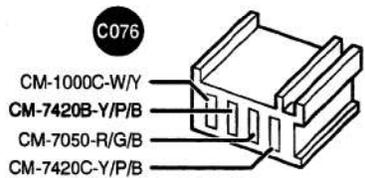
EFFECTS – Transmission disabled.



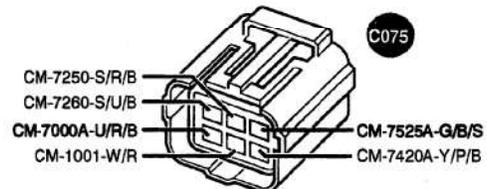
C127



C076



C075



SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODES:**

**E38 – CLUTCH 'B' SOLENOID (HIGH/REVERSE) SHORT CIRCUIT**

**E39 – CLUTCH 'B' SOLENOID OPEN CIRCUIT**

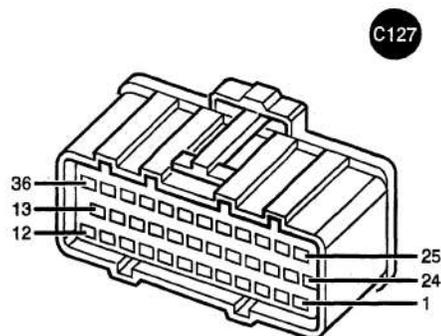
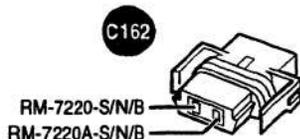
**EFFECTS – Transmission disabled.**

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**

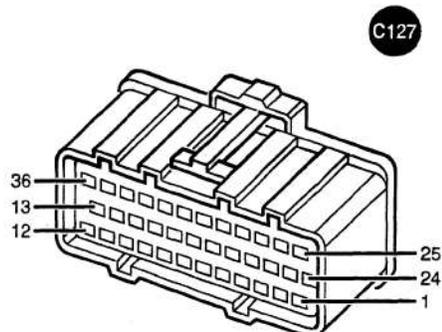
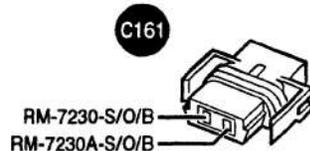
**EFFECTS – Transmission disabled.**

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**

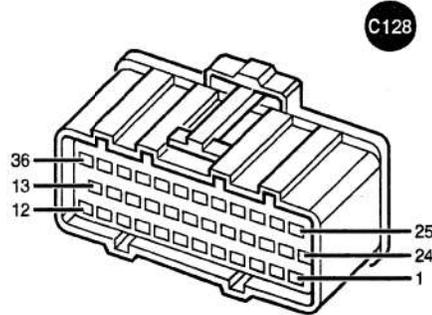
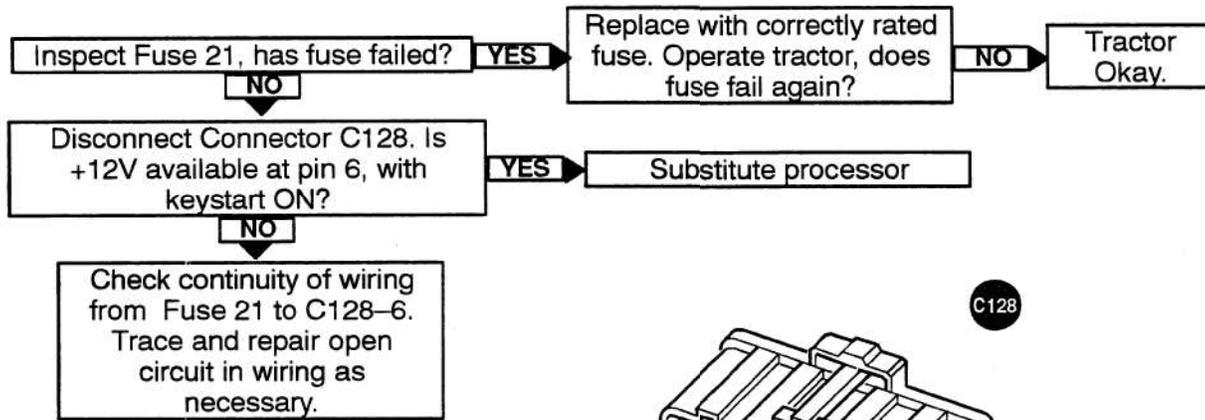
Disconnect processor connectors. Check for short to ground or an open circuit between C127-18 and C127-26 and the solenoid harness side connector, C161. Repair/replace wiring as necessary.



SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

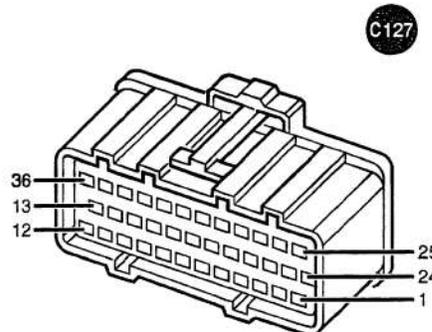
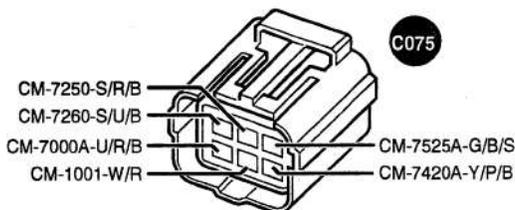
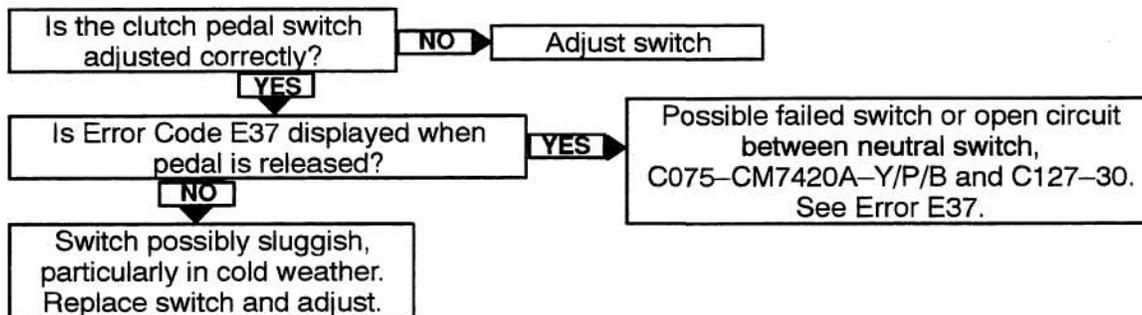
**ERROR CODE**

**E46 – FUSE 21 OPEN CIRCUIT**  
EFFECTS – Transmission disabled



**ERROR CODE**

**E47 – CLUTCH PEDAL SWITCH SET TOO HIGH**  
EFFECTS – Inching jerky and high pedal position

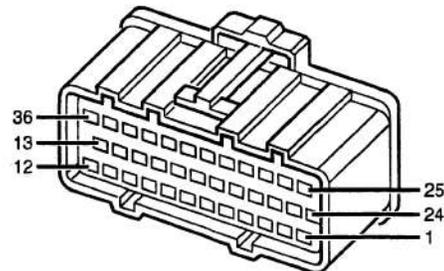
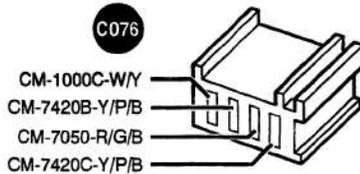
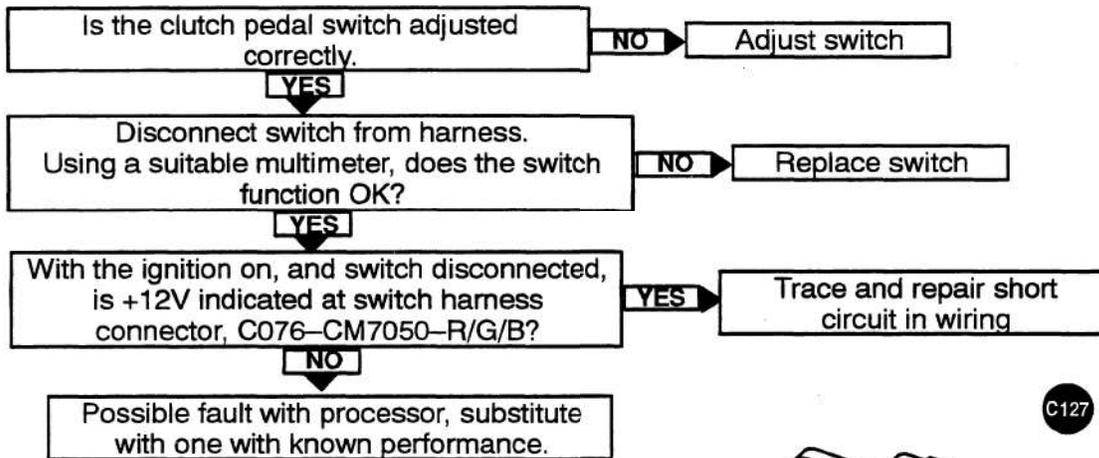


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODE**

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

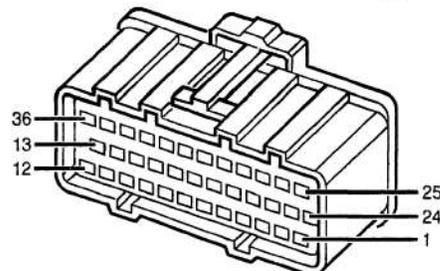
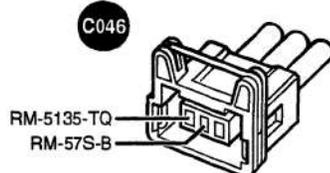
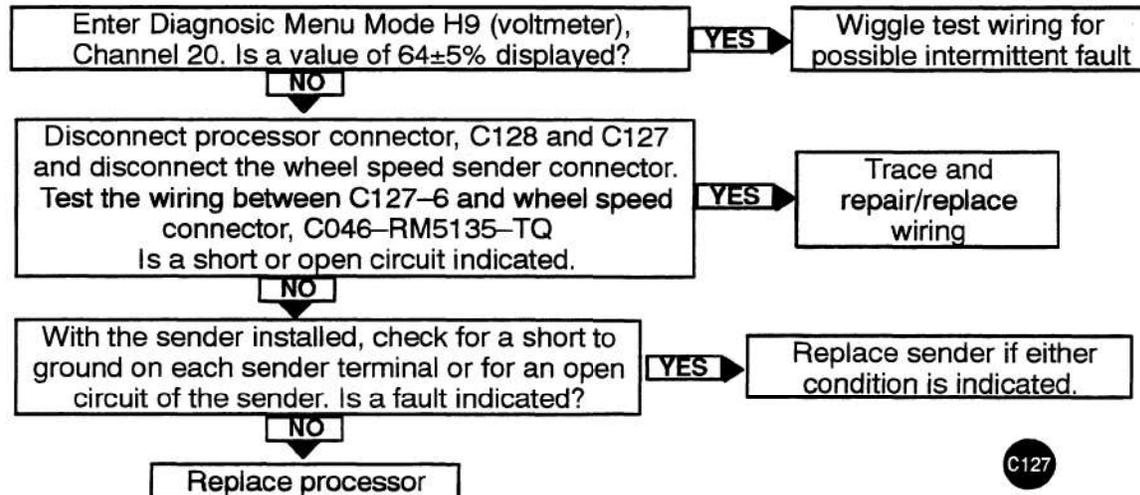
**EFFECTS** – Tractor performs normally but clutch pedal will not cut off power to clutch solenoids.



**ERROR CODE**

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

**EFFECTS** – Shift quality generally poor



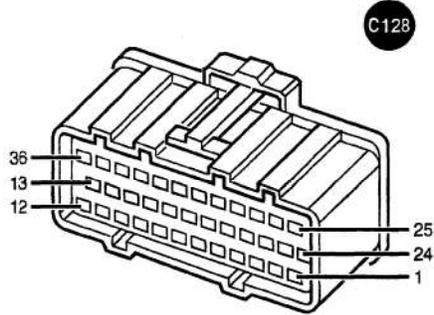
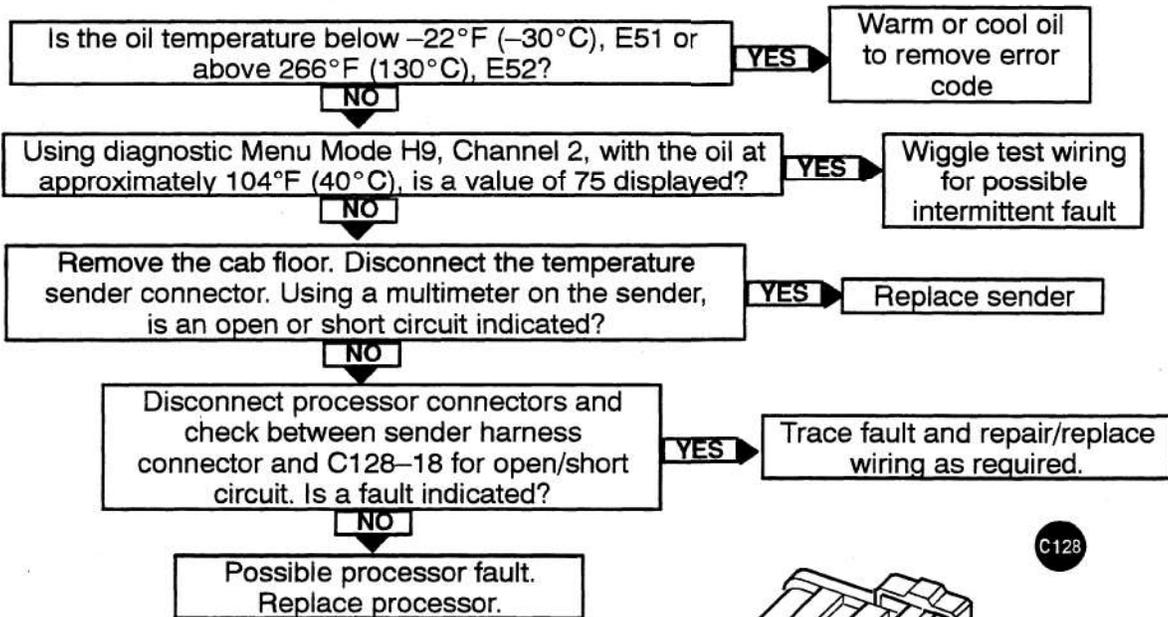
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODES;**

**E51** – TEMPERATURE SENDER OPEN CIRCUIT

**E52** – TEMPERATURE SENDER SHORT CIRCUIT

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

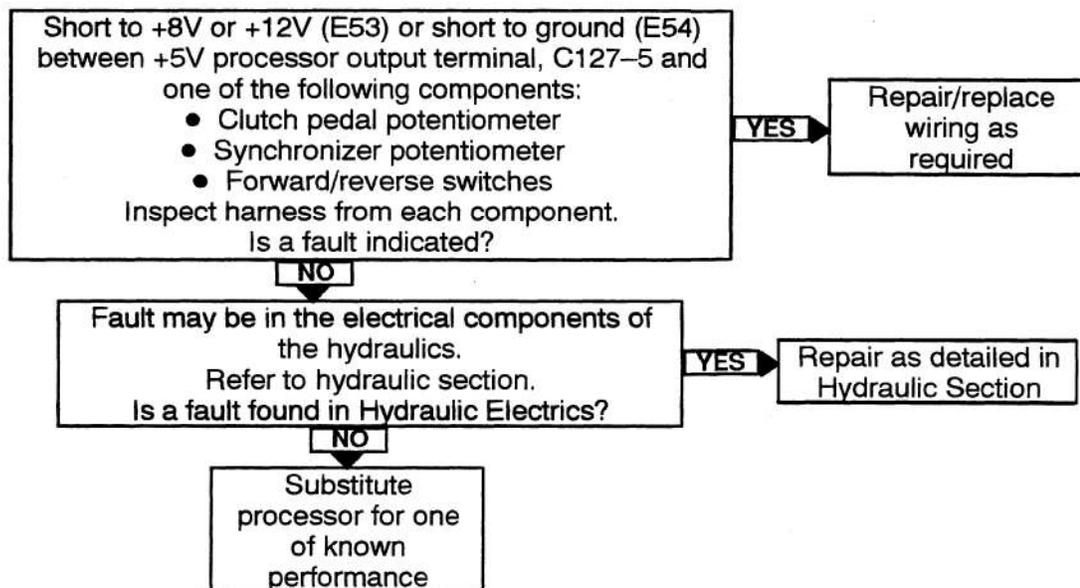


**ERROR CODES;**

**E53** – 5 VOLT REFERENCE FAILED HIGH (SHORT TO (+8V or +12V)

**E54** – 5 VOLT REFERENCE FAILED LOW (SHORT TO GROUND)

EFFECTS – Transmission disabled.



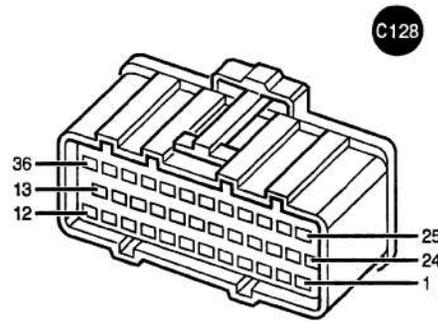
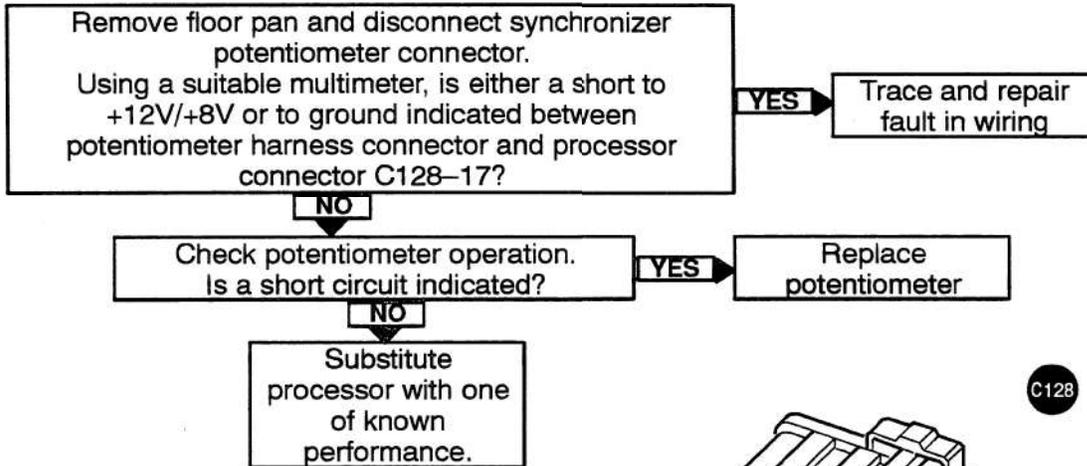
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODES;**

**E61 – SYNCHRO POTENTIOMETER SIGNAL TOO HIGH**

**E62 – SYNCHRO POTENTIOMETER SIGNAL TOO LOW**

**EFFECTS – The synchronizer is disabled**

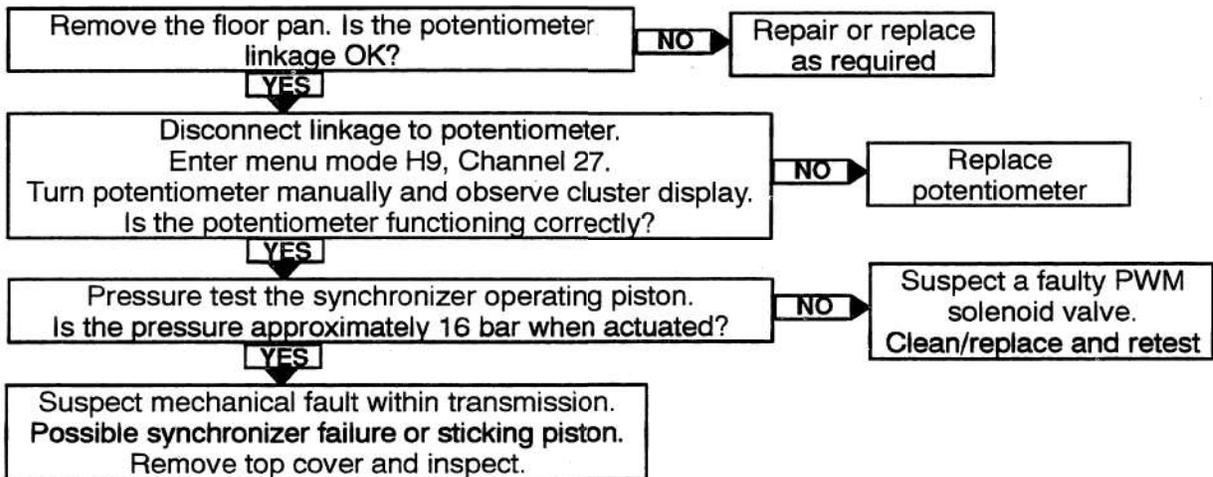


**ERROR CODES;**

**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;**

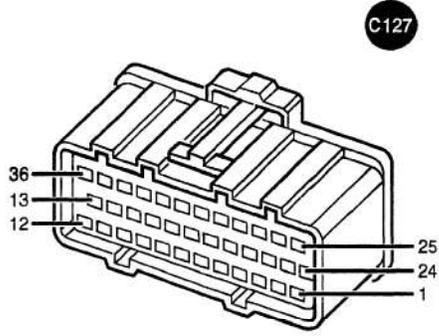
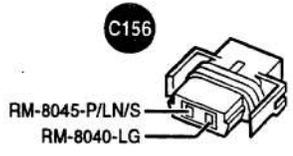
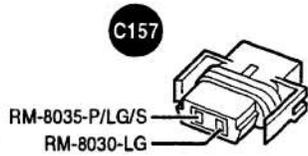
**E65** – HI/LO (FORWARD DRIVE) SOLENOID OPEN CIRCUIT  
**E66** – SHUTTLE (REVERSE DRIVE) SOLENOID OPEN CIRCUIT  
 EFFECTS – Transmission disabled.

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.



**ERROR CODES;**

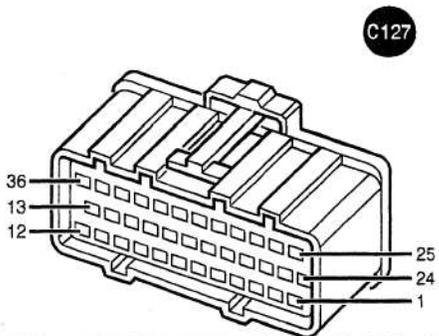
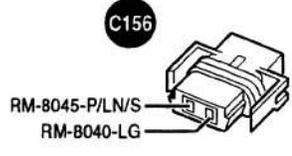
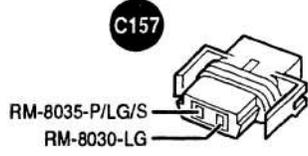
**E67** – HI-LO (FORWARD) SOLENOID SHORT CIRCUIT  
**E68** – SHUTTLE (REVERSE) SOLENOID SHORT CIRCUIT  
 EFFECTS – Transmission disabled.

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.



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**

**ELO – 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

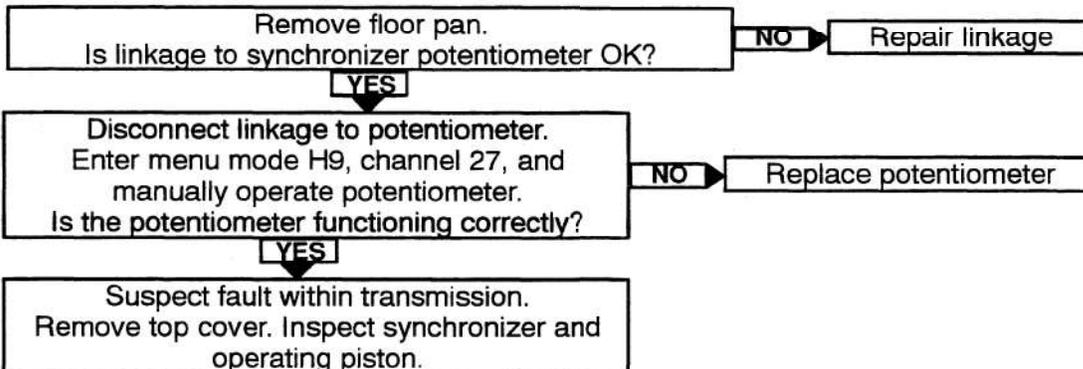
**YES**

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.



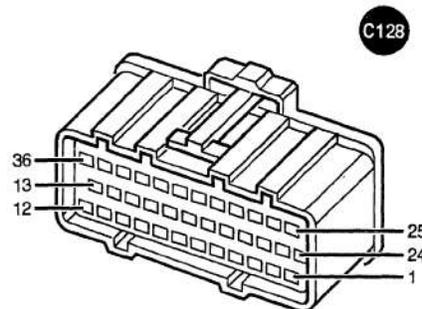
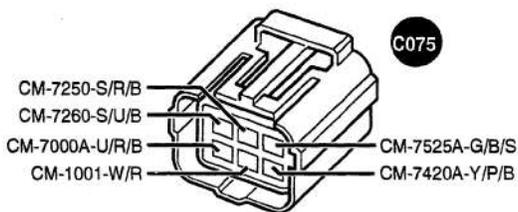
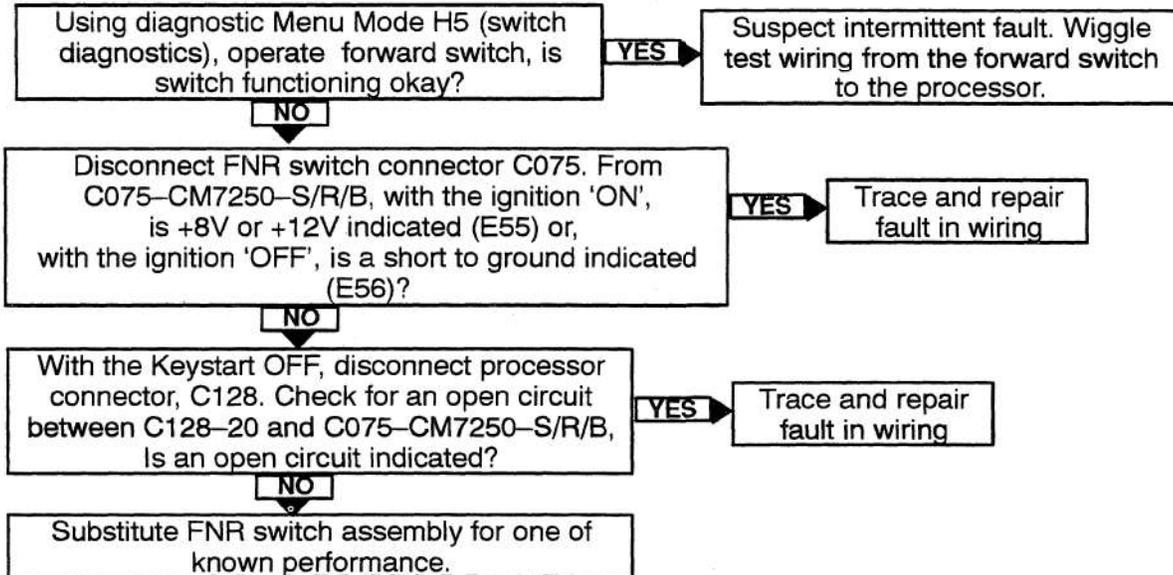
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODES;**

**E55** – FORWARD SWITCH FAILED TO +8V OR +12V

**E56** – FORWARD SWITCH FAILED TO GROUND OR OPEN CIRCUIT

EFFECTS – Transmission enabled



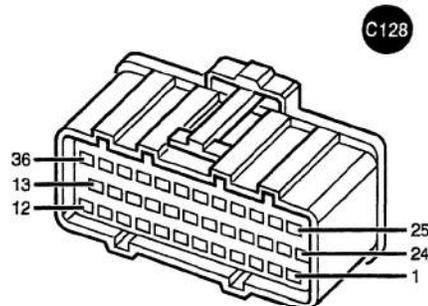
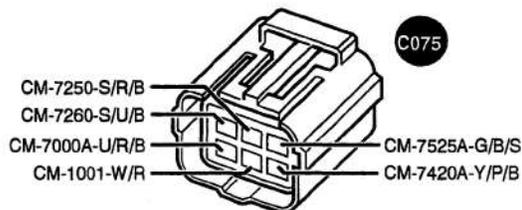
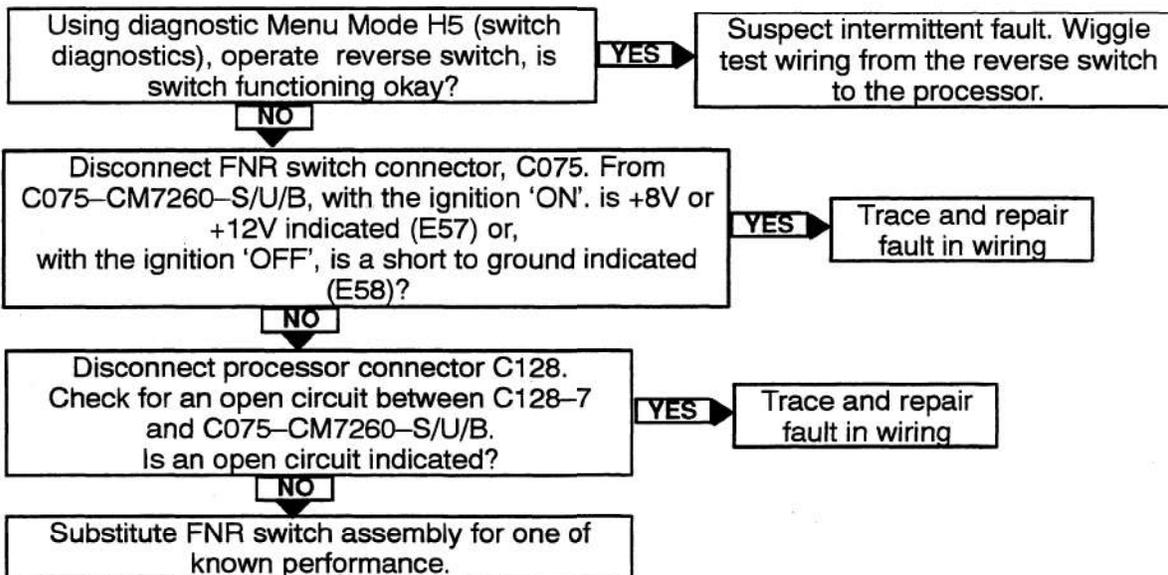
SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

**ERROR CODES;**

**E57** – REVERSE SWITCH FAILED TO +8V OR +12V

**E58** – REVERSE SWITCH FAILED TO GROUND OR OPEN CIRCUIT

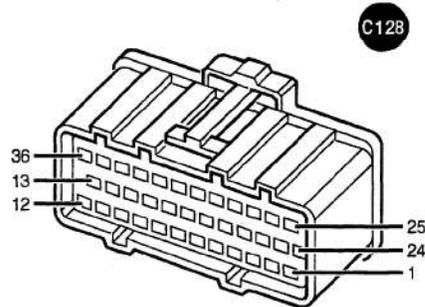
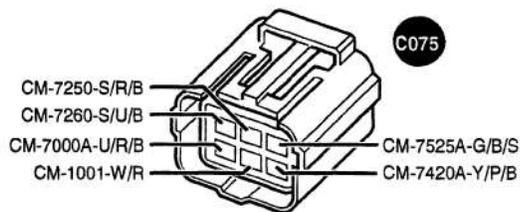
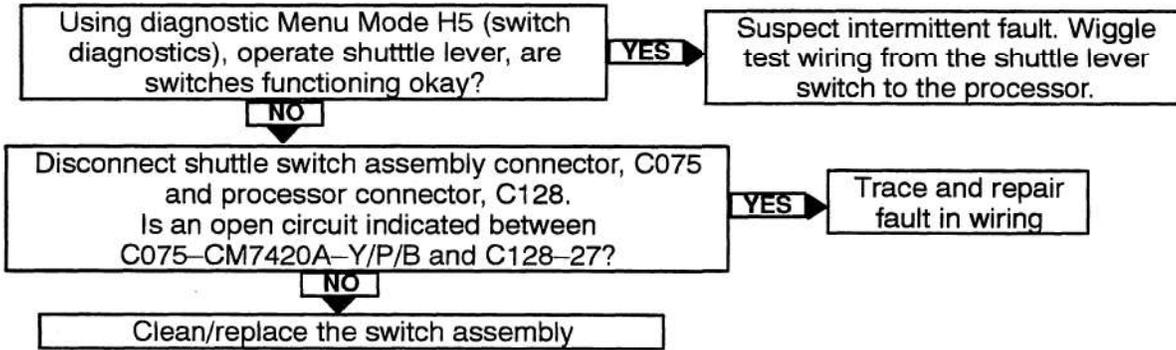
EFFECTS – Transmission enabled



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

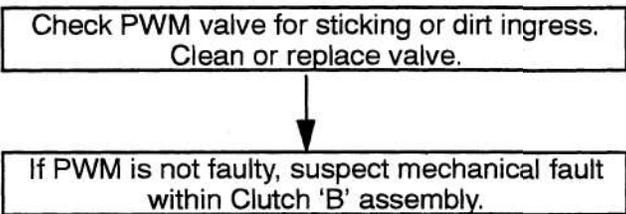
Position range lever into high range

U26 – CLUTCH PEDAL NOT FULLY RELEASED

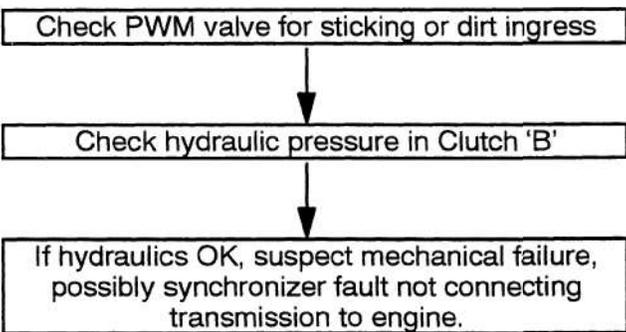
Release clutch pedal and/or check pedal  
operation

SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

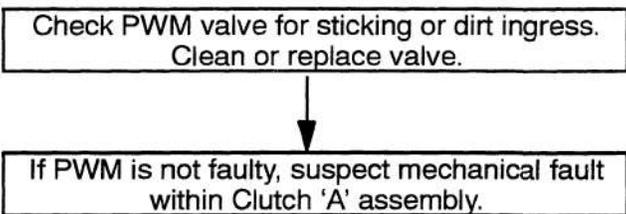
U27 – HI (B) CLUTCH CALIBRATION IS TOO LOW  
(ENGINE REV/MIN DROPPED TOO SOON)



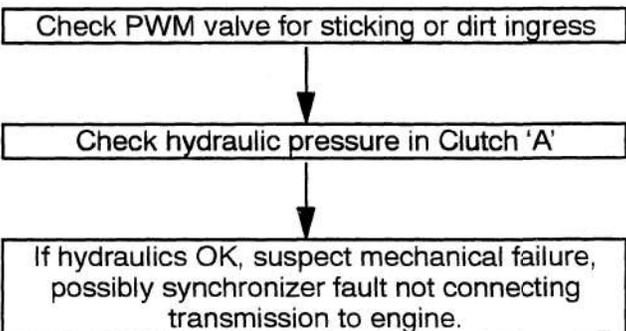
U28 – HI (B) CLUTCH CALIBRATION IS TOO HIGH. (MAX. ALLOWED CALIBRATION  
VALUE EXCEEDED WITHOUT DROPPING ENGINE REV/MIN.)



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

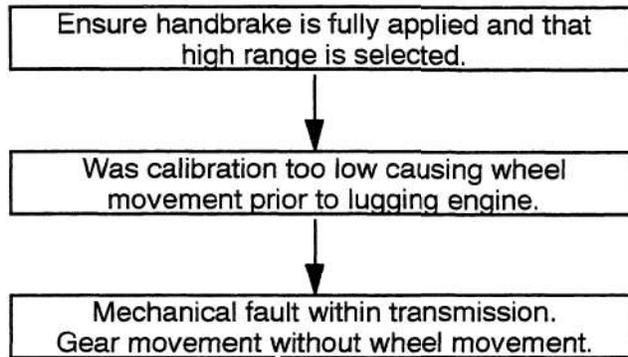


U30 – LO (A) CLUTCH CALIBRATION IS TOO HIGH. (MAX. ALLOWED CALIBRATION  
VALUE REACHED WITHOUT DROPPING ENGINE REV/MIN.)

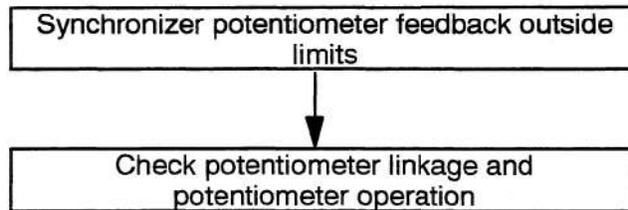


SECTION 4 – TRANSMISSIONS (Dual Command Transmission)

U31 – WHEEL MOTION DETECTED DURING CALIBRATION



U37 – SYNCHRONIZER SHUTTLE (REVERSE) MODE CALIBRATION



U38 – SYNCHRONIZER HI-LO (FORWARD) MODE CALIBRATION

