General Description

The ICU3-M2 is a basic electronic dashboard that accepts input from the fuel level sensor, the transmission temperature sensor (if installed), the J1587 datalink, and the J1939 datalink. To interpret datalink messages, see **Section 54.00**, Subject 310. The information is processed by a micro-computer and displayed on electronic gauges driven by stepper motors. Only the air gauges operate mechanically.

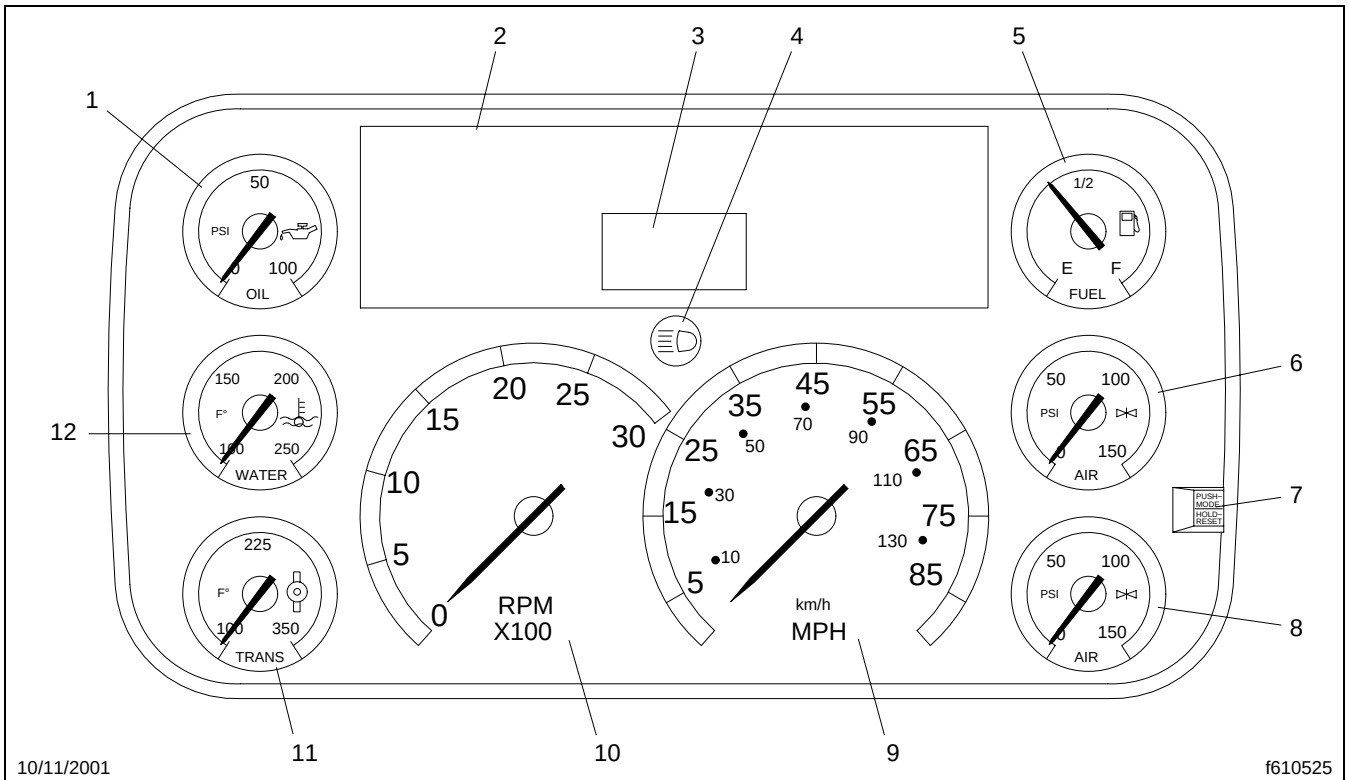
The following gauges are available:

- Speedometer
- Tachometer (optional)
- Engine Oil Pressure
- Coolant Temperature
- Fuel Level
- Transmission Fluid Temperature (optional)
- Primary Air Pressure (optional)
- Secondary Air Pressure (optional)

The transmission fluid temperature gauge is required on vehicles with automatic transmissions.

The speedometer and tachometer are large-faced electronic gauges located below the dash message center. See **Fig. 1**.

The other gauges are small-faced gauges on the driver's instrument panel, to either side of the speedometer and tachometer. The engine oil pressure, coolant temperature, transmission fluid temperature, and fuel level gauges are electronic; the air pressure



10/11/2001 f610525

1. Engine Oil Pressure Gauge
2. Dash Message Center
3. Dash Driver Display Screen
4. Headlight High-Beam Indicator
5. Fuel Level Gauge
6. Primary Air Pressure Gauge (optional)
7. Mode/Reset Push Button
8. Secondary Air Pressure Gauge (optional)
9. Speedometer (U.S. version)
10. Tachometer (optional)
11. Transmission Fluid Temperature Gauge (optional)
12. Coolant Temperature Gauge

Fig. 1, ICU3-M2 Gauge Layout (typical, U.S.)

General Information

gauges are mechanical. The ICU3-M2 cannot drive gauges located on the auxiliary instrument panel.

- air pressure gauges
- mode/reset button
- top row light bulbs
- top row warning and indicator lenses (telltales)

NOTE: The two air pressure gauges and the mode/reset button are one assembly. All three must be replaced at the same time.

Dash Message Center

The dash message center is the heart of the instrument cluster. It has two parts, a set of 26 warning and indicator lights similar to those found on a conventional lightbar, and a dash driver display screen. The driver display screen is a one-line by seven-character liquid crystal display (LCD) that normally shows odometer readings. Below that is a smaller one-line by three-character LCD that shows voltmeter readings.

Information provided by the dash driver display screen includes:

- odometer readings (in miles or kilometers)
- trip and total engine distance
- trip and total engine hours
- service screens
- a listing of active faults

Mode/Reset Switch

The mode/reset switch (located on the right side of the instrument cluster) is used to scroll through the displays on the driver display screen, and to reset the trip distance and trip hours values to zero.

There are two basic functions: the mode function and the reset function. To activate the mode function, press and release the mode/reset switch. This will take you to the next screen in the series. To activate the reset function, press and hold the mode/reset switch for at least one second. In most cases, this will allow you to change the information on that screen. In some cases, this will take you to new screens that give you more information.

When the odometer reading is displayed and the parking brake is applied:

- Press the mode/reset switch once to display the trip odometer.
- Press the mode/reset switch again to display trip engine hours.
- Press the mode/reset switch once more to display the select (SELECt) screen and the current units, MI or KM.
- Press the mode/reset switch once more to display the diagnostic (DiAG) screen. If the vehicle has gone past its next scheduled service, the service screen will appear as an active fault.
- Press the mode/reset switch once more to display total engine miles.
- Press the mode/reset switch once more to display total engine hours.
- Press the mode/reset switch once more to display engine oil level (if the oil level message is enabled).

  NOTE: If the ICU3-2M senses an oil level message from the MBE900 engine, the oil level screen displays automatically. Otherwise, this screen will not appear.
- Press the mode/reset switch once more to display the setup (SEt UP) screen. The setup screen can be used to reset the service interval.
- Press the mode/reset switch once more to return to the odometer reading.

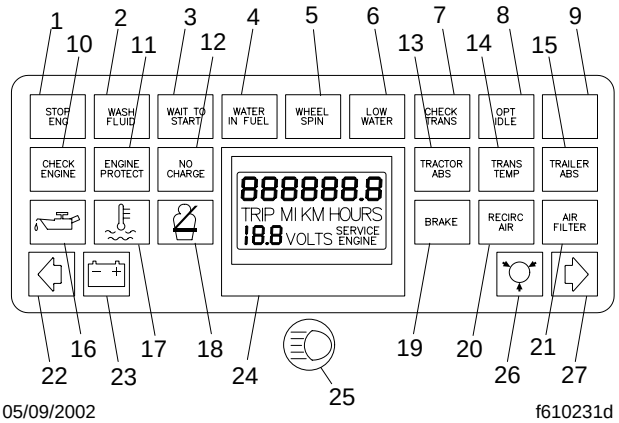
To toggle between MI (miles) or KM (kilometers), go to the select screen and hold the mode/reset switch. To see more information about active faults, go to the diagnostic screen and hold the mode/reset switch.

To reset trip miles and/or trip hours to zero, go to that screen and hold the mode/reset switch. To reset the service interval, and for detailed information about mode/reset switch function, go to the flow charts in **Subject 410**.

Warning and Indicator Lights

The ICU3-M2 has spaces for 26 warning and indicator lights. See **Fig. 2** for a typical installation.

There are four rows of warning and indicator lights. The lights (also called "telltales") in the top row are optional, and may be installed in any order. The light



Typical installation shown. Location of legends installed in the top row may vary, and other legends may be specified.

1. Stop Engine Warning (optional)
2. Low Washer Fluid Indicator (optional)
3. Wait To Start Indicator (optional)
4. Water In Fuel Indicator (optional)
5. Wheel Spin Indicator (optional)
6. Low Coolant Level Indicator (optional)
7. Check Transmission Indicator (optional)
8. Optimized Idle Indicator (optional)
9. Additional Warning Indicator (optional)
10. Check Engine Indicator
11. Engine Protection Warning
12. Alternator No Charge Indicator (optional)
13. Tractor ABS Warning
14. High Transmission Temperature Warning (optional)
15. Not Used
16. Low Engine Oil Pressure Warning
17. High Coolant Temperature Warning
18. Fasten Seat Belt Warning
19. Brake System Warning and Parking Brake Indicator
20. Recirculated Air Indicator (optional)
21. Air Filter Restriction Indicator (optional)
22. Left Turn Signal
23. Low Battery Voltage Warning
24. Dash Driver Display Screen
25. High Beams On Indicator
26. Low Air Pressure Warning
27. Right Turn Signal

Fig. 2, Dash Message Center, ICU3-M2

in position 8 (counting left to right across the top row) is a permanently-mounted amber LED. The remaining top row positions use replaceable incandescent lamps.

NOTE: Positions 1 through 8 are ground and data bus-activated circuits; position 9 is power-activated and data bus-activated.

The lights on the other three rows are installed at fixed positions that do not vary. Some lights are optional; if an optional light is not requested, the position is blank (does not light up).

The following fixed-position lights are standard:

- Check Engine Indicator (amber)
- Engine Protection Warning (red)
- Low Air Pressure Warning (red)
- Low Engine Oil Pressure Warning (red)
- High Coolant Temperature Warning (red)
- Fasten Seat Belt Warning (red)
- Low Battery Voltage Indicator (red)
- Parking Brake On Warning (red)
- Tractor ABS Indicator (amber)
- Left Turn Signal (green)
- Right Turn Signal (green)
- High Beams On Indicator (blue)

The following fixed-position lights are optional:

- Air Filter Restriction Indicator (amber)
- Alternator No Charge Indicator (amber)
- High Transmission Temperature Warning (amber)—installed on vehicles with automatic transmissions
- Recirculated Air Indicator (amber)

The following lights are optional and their location may vary anywhere in the top row:

- Stop Engine Warning (red)
- Low Coolant Level Warning (red)
- EBS (Electronic Braking System) Warning (red)
- Check Transmission Indicator (amber)
- Intake Heater Indicator (amber)
- Low Washer Fluid Indicator (amber)
- Optimized Idle Indicator (amber)
- Wait To Start Indicator (amber)
- Water In Fuel Indicator (amber)

General Information

- Wheel Spin Indicator (amber)

Other optional lights may be specified.

Principles of Operation

Ignition Sequence

When the ignition keyswitch is turned on, the ICU3-M2 runs through the ignition sequence. See **Fig. 3**. If the headlights are turned on, the screen displays the odometer and waits for the ignition to be turned on.

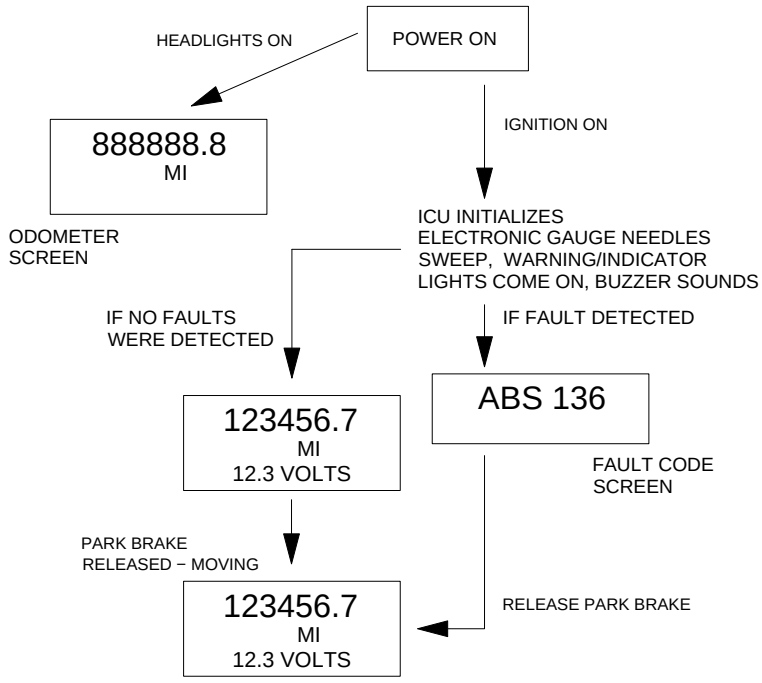
IMPORTANT: When the ignition keyswitch is first turned on, all the electronic gauges complete a full sweep of their dials, the warning and indicator lights light up, and the buzzer sounds for 3 seconds.

The following warning and indicator lights go on during the ignition sequence:

- Low Engine Oil Pressure Warning
- High Coolant Temperature Warning
- Low Air Pressure Warning
- Parking Brake On Warning
- Low Battery Voltage Indicator
- Fasten Seat Belt Warning
- All engine warning and indicator lights, including Engine Protection, Check Engine, and Stop Engine
- All ABS warning and indicator lights, including Wheel Spin and Tractor ABS

NOTE: While the engine and ABS warning lights go on during the ignition sequence, they are not controlled by the ICU3-M2, but by their own system ECU (electronic control unit).

Once the ignition keyswitch has been turned on, the ICU performs a self-test, looking for active faults.



During the first half of the self-test, all segments of the display illuminate. During the second half of the self-test, the software revision level is displayed.

NOTE: If there is more than one fault, the ICU3-M2 displays them, one after another, changing every 3 seconds, until the park brake is released.

Fig. 3, ICU3-M2 Ignition Sequence

During the first half of the self-test, all segments of the display illuminate as follows: "888888.8." During the second half of the self-test, the software revision level is displayed.

If there are no active faults, the screen displays the odometer.

If, however, the ICU3-M2 has received active fault codes from other devices, it displays the three-letter acronym and MID number for each for 3 seconds, one after the other, until the parking brake is released or the ignition keyswitch is turned off.

The screen displays a code, called the message identifier (MID), indicating the ECU or system that is not functioning properly.

NOTE: If the ICU3-M2 receives a message from an ECU that has not been pre-programmed into the ICU's memory, it displays "SYS ###" instead, where ### is replaced by the MID of the broadcasting device.

Once the parking brake is released, the ICU3-M2 displays the odometer again.

Odometer

The odometer is set to display in either miles or kilometers, depending on the primary scale of the speedometer. The legend, either "MI" or "KM," illuminates between the odometer and the volts display when the engine is running or the headlights are turned on.

The odometer is a seven-digit display with a decimal point, until the vehicle has traveled 999,999.9 miles or kilometers (km). At one million miles (km), the odometer rolls over to "1000000," without the decimal point, and can continue up to 9,999,999. The odometer only displays significant figures (no leading zeros).

IMPORTANT: Although the odometer uses data supplied by the engine ECU to update its count, it keeps its own mileage starting from zero, when it was first installed. The ICU odometer may not match the engine ECU odometer. This may occur if the engine has been operated with the ICU disconnected, as may occur during factory break-in or engine service, or if the ICU has been replaced.

Buzzer

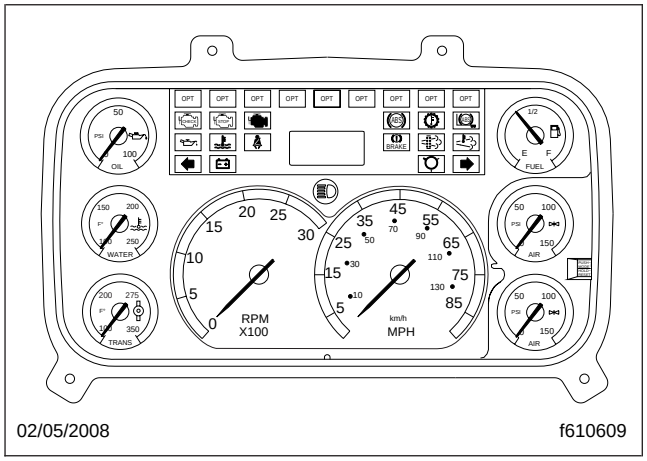
The buzzer sounds during the ignition sequence and whenever one of the following conditions exist:

- The engine oil pressure falls below the preset level, which is 5 to 9 psi (35 to 60 kPa) on most engines.
- The coolant temperature rises above the preset level, which is 189°F (87°C) on MBE900 engines, and 215°F (101°C) on Caterpillar engines.
- The air pressure falls below the preset level of approximately 70 psi (483 kPa).
- The parking brake is set with the vehicle moving at a speed greater than 2 miles per hour.
- The J1939 brake failure message is received from the ABS.
- The J1939 heartbeat message is not received from the ABS.

Instrumentation Control Unit (ICU3-M2) Removal and Installation

Removal

The instrumentation control unit (ICU3-M2) is a self-contained one-piece unit, including housing, gauges, and the dash message center. For instructions, see **Fig. 1**.



02/05/2008 f610609

Fig. 1, ICU3-M2

1. Disconnect all negative leads from the batteries.
2. Drain the primary and secondary air tanks.
3. Remove the top steering column (clam-shell) cover. For instructions, see **Section 54.09, Subject 100**.

CAUTION

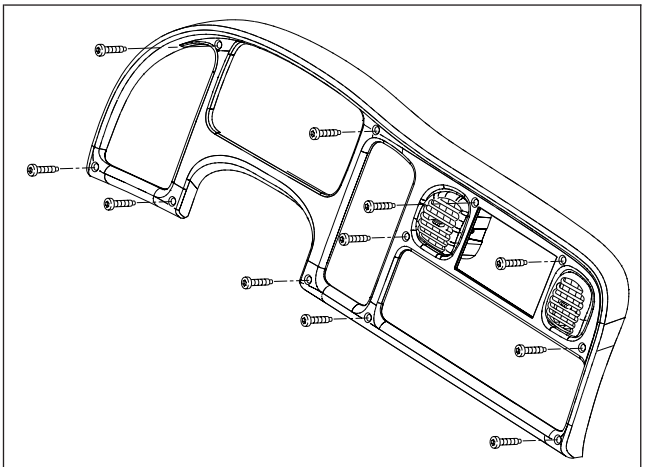
Electronic components of the ICU3-M2 are vulnerable to damage from static electricity. If available, wear a wrist grounding strap connected to a ground in the cab or workbench. If a grounding strap is not available, touch a grounded component immediately before doing any work that could bring a tool or body part in contact with ICU3-M2 circuitry.

4. Remove the dash trim piece by removing the 11 screws securing it. All fasteners for this procedure are 10–16 Torx-drive dog-point screws, 7/8-inch long (22 mm). See **Fig. 2**.

CAUTION

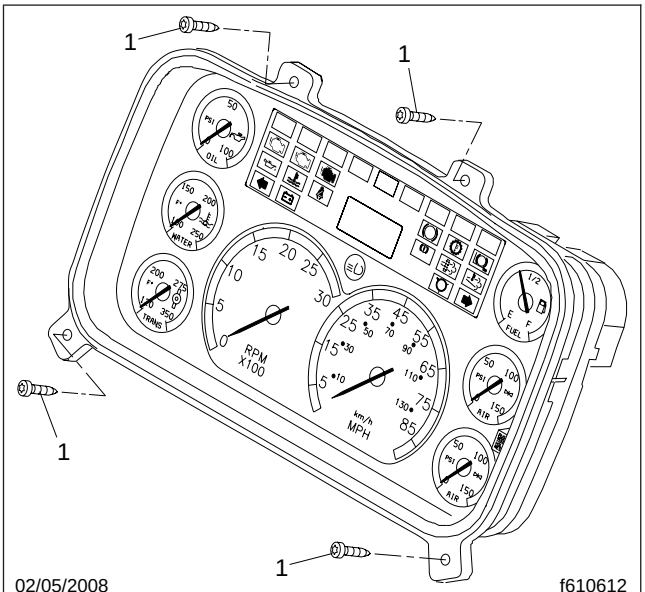
Do not forcibly pull the ICU3-M2 from the dash. This may dislodge or damage electrical connections or air hoses from the back of the ICU3-M2, or damage the dash.

5. Remove the four screws securing the ICU. Carefully remove the ICU from the dash. See **Fig. 3**.
6. Unplug the two electrical connectors from the back of the ICU. See **Fig. 4**.



08/18/2002 f610579b

Fig. 2, Dash Trim Piece

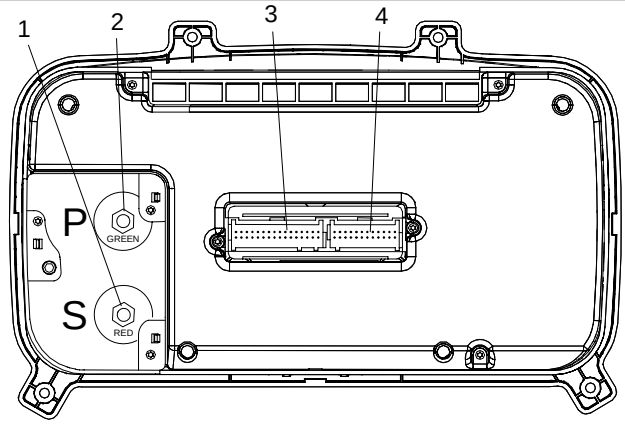


02/05/2008 f610612

1. 10–16 Torx Dog-Point Screw, 7/8" Long (22 mm)

Fig. 3, ICU3-M2 Installation

Instrumentation Control Unit (ICU3-M2) Removal and Installation



1. Secondary Air Pressure Gauge
2. Primary Air Pressure Gauge
3. 32-Pin Electrical Connector
4. 24-Pin Electrical Connector

Fig. 4, ICU3-M2, Rear View

7. Remove the air hoses by pressing the push-lock connectors, then pulling the air hoses away from the gauges. The hoses are color-coded for ease of installation. The primary air hose is green and is connected to the upper gauge. The secondary air hose is red and is connected to the lower gauge.

Installation

1. Connect the air hoses to the air gauges by pressing the correct air line firmly into its push-lock connector on the back of the gauge. The primary (upper) gauge connects to the green air line. The secondary (lower) gauge connects to the red air line. See **Fig. 4**.
2. Plug the electrical connectors into the back of the ICU3-M2.

NOTE: All fasteners for this procedure are 10–16 Torx-drive dog-point screws, 7/8-inch long (22 mm).

3. Place the ICU3-M2 in the dash opening and secure it with the four 10–16 dog-point screws. Tighten the screws 30 lbf·in (340 N·cm).
4. Install the dash trim piece and secure it with the 11 dog-point screws. Tighten the screws 30 lbf·in (340 N·cm).
5. Connect the negative battery leads.
6. Turn the ignition switch to RUN and test the operation of the cluster. All the electronic gauges should make one complete sweep and return to their normal indicating positions; the warning and indicator lights should turn on, then off.

   If any gauges are not working properly, the ICU3-M2 will need to be serviced or replaced.

NOTE: Mechanical (air) gauges do not make a sweep.

7. Install the top steering column cover. For instructions, see **Section 54.09, Subject 100**.

Air Pressure Gauge Replacement

Replacement

NOTE: The mode/reset switch is part of the air gauge module and is replaced when the air gauges are replaced.

The only replaceable gauges on the ICU3-M2 are the air pressure gauges. If any other gauge fails, the entire unit must be replaced. See **Fig. 1**.

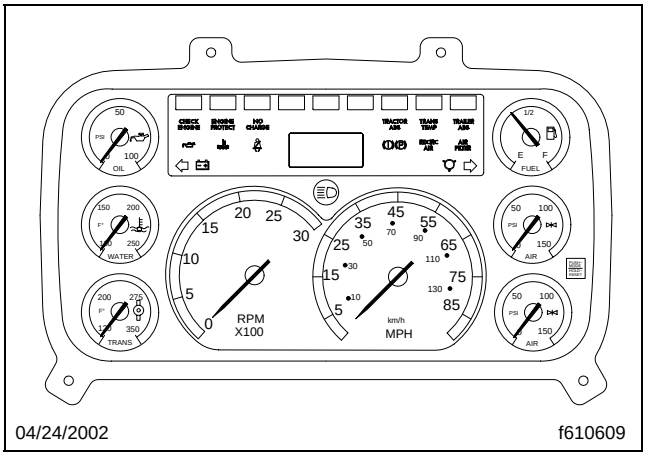
1. Drain the primary and secondary air tanks.

⚠ CAUTION

Electronic components of the ICU3-M2 are vulnerable to damage from static electricity. If available, wear a wrist grounding strap connected to a ground in the cab or workbench. If a grounding strap is not available, touch a grounded component immediately before doing any work which could bring a tool or body part in contact with ICU3-M2 circuitry.

2. Remove the ICU3-M2 from the dash, including disconnecting the electrical connectors and the air lines. For detailed instructions, see **Subject 100**.

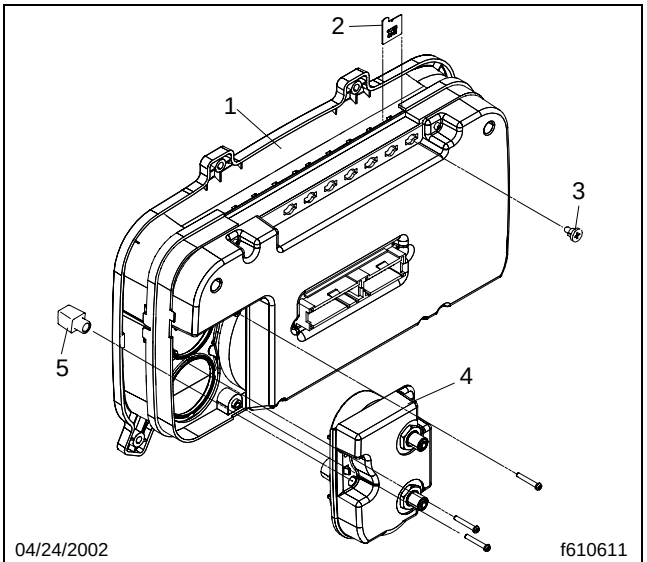
NOTE: Be careful not to damage the ribbon electrical connector or the air gauge needles when removing the air gauge module. The gauge needles are exposed once the module is removed. A thin-ribbon electrical connector connects the air gauge module and the ICU3-M2 housing. Once the fasteners securing the air gauge module are removed, take care in separating the module from the ribbon electrical connector.



04/24/2002 f610609

Fig. 1, ICU3-M2

3. Carefully place the ICU3-M2 face down on a smooth surface and remove the three Torx-head screws securing the air gauge module to the ICU. Do not remove the air gauge module cover. See **Fig. 2**.
4. Remove the button from the mode/reset switch.
5. Separate the air gauge module slightly from the ICU to allow access to the electrical ribbon connecting the module to the ICU.
6. Remove the electrical connection ribbon from the ICU, not from the air gauge module. Grip the ribbon firmly at each side and lift out, then remove the air gauge module.
7. Place the ICU3-M2 face down on a clean, smooth surface. Placing the unit on a clean towel or cloth will help keep the plastic face from getting scratched during this procedure.
8. Place the air gauge module close to the opening it belongs in and connect the electrical ribbon connector in its slot. Gripping the ribbon end firmly at the edges, place the ribbon end into the slot and push it straight in until it stops.
9. Place the air gauge module into its opening in the ICU3-M2. Make sure the rubber alignment pin in



04/24/2002 f610611

1. ICU3-M2
2. Telltale
3. Light Bulb
4. Air Gauge Module
5. Mode/Reset Button

Fig. 2, ICU3-M2, Rear View (exploded)

Air Pressure Gauge Replacement

the ICU cavity lines up with the matching alignment receptacle in the air gauge module when placing the module in the ICU.

10. Install the three Torx-head mounting screws and tighten them to secure the air gauge module. See **Fig. 2**.
11. Install the button on the mode/reset switch, as removed.
12. Install the ICU3-M2, including the electrical connectors and the air lines. For detailed instructions, see **Subject 100**.
13. After installing the ICU3-M2, start the engine and verify the proper operation of the air gauge module as the air pressure builds up.

Replacement

The instrumentation control unit (ICU3-M2) is a self-contained one-piece unit, including housing, gauges, and the dash message center. See **Fig. 1**.

⚠ CAUTION

Electronic components of the ICU3-M2 are vulnerable to damage from static electricity. If available, wear a wrist grounding strap connected to a ground in the cab or workbench. If a grounding strap is not available, touch a grounded component immediately before doing any work which could bring a tool or body part in contact with ICU3-M2 circuitry.

NOTE: Since the top-row warning and indicator lights are optional, not all positions in the row may have a bulb and telltale installed.

The nine top-row warning and indicator bulbs are all replaceable except for the bulb in position 8, counting left to right; the bulb in that position is a permanent LED. The replaceable light bulbs are incandescent.

The term "telltale" refers to the small plastic bezel in the top row with a warning or indicator message printed on it. These are also replaceable.

1. Remove the dash trim piece by removing the 11 screws securing it. All fasteners for this procedure are 10–16 Torx-drive dog-point screws, 7/8-inch long (22 mm). See **Fig. 2**.

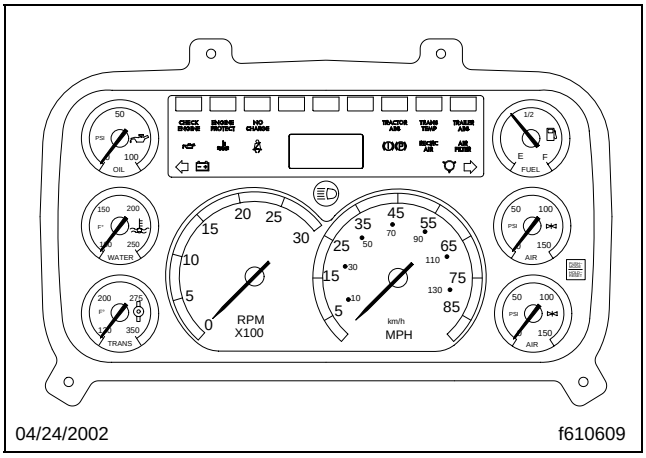


Fig. 1, ICU3-M2

⚠ CAUTION

Do not forcibly pull the ICU3-M2 from the dash. This may dislodge or damage electrical connections or air hoses from back of the ICU3-M2, or damage the dash.

2. Remove the four screws securing the ICU. Carefully remove the ICU from the dash. See **Fig. 3**.
3. Carefully pull the unit forward to access the top row of replaceable light bulbs and telltales. Take care not to scratch the clear plastic front of the unit. Placing a clean towel over the front of the unit before pulling it forward may help prevent scratches.

To Replace Light Bulbs

1. Use a small screwdriver or flat blade to twist out the bulb by its base behind the affected telltale. Turn the bulb 1/4 turn and remove. See **Fig. 4**.
2. Place a good bulb in the opening and twist 1/4 turn to install.

To Replace Telltales

1. Using a pair of needlenose pliers or a similar tool, grab the exposed tab at the top of the telltale slot and carefully pull the telltale out from the top of the ICU. See **Fig. 4**.

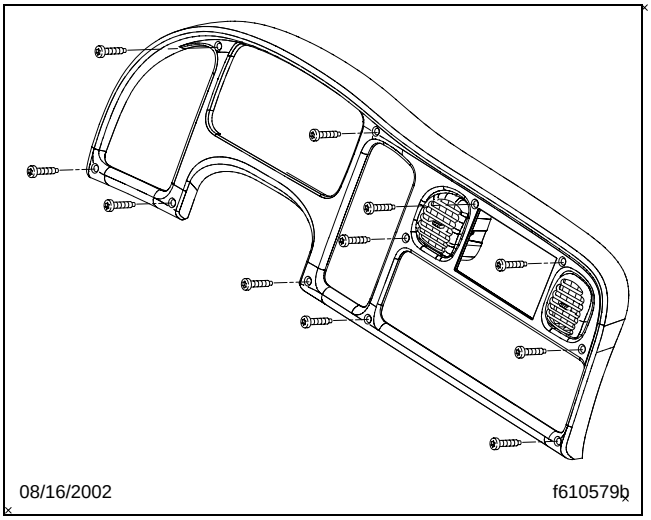
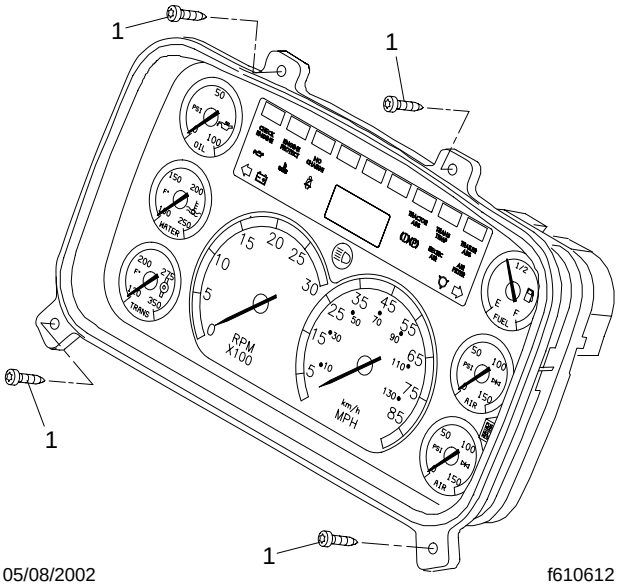


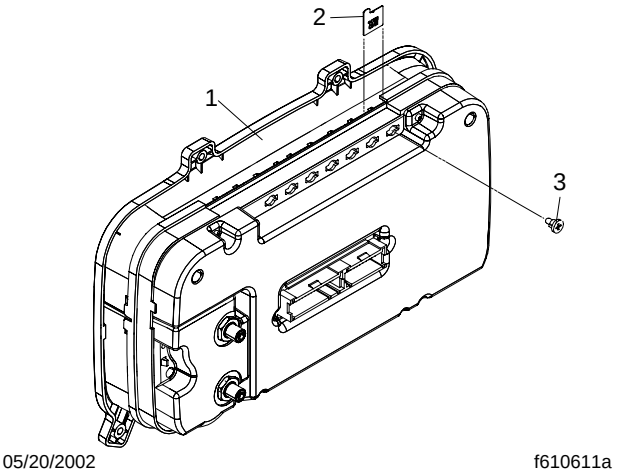
Fig. 2, Dash Trim Piece

Light Bulb/Telltale Replacement



1. 10–16 Torx Dog-Point Screw, 7/8" Long (22 mm)

Fig. 3, ICU3-M2 Installation



NOTE: For clarity, air gauge and electrical connections are shown removed.

1. ICU3-M2
2. Telltale
3. Light Bulb

Fig. 4, ICU3-M2, Rear View (exploded)

2. Place the telltale in its correct slot the same way it was removed. Properly orient the telltale so the text is readable from the front, then grab the top tab of the telltale and slide it into the slot.

Turn on the ignition keyswitch. Check all bulbs and telltales for correct operation.

See **Table 1** for an ICU symptom chart.

ICU Symptom Chart	
Problem	**Where to Begin Diagnosis**
Gauges (except air pressure gauges) are not working or are inaccurate.	See **Table 2** for initial gauge test procedures.
Single datalink-driven gauge is not working or is inaccurate.	See **Table 3** to diagnose the single datalink-driven gauge.
Multiple datalink-drive gauges are not working or are inaccurate.	See **Table 4** to diagnose multiple datalink-drives gauges.
Air pressure gauges are not working or are inaccurate.	See **Table 5** for air pressure gauge diagnosis.
Fuel gauge is not working or are inaccurate.	See **Table 6** for fuel gauge diagnosis.
Transmission temperature gauge is not working or is inaccurate.	See **Table 7** for transmission temperature gauge diagnosis.
Active ICU fault codes (MID 140) are inaccurate.	See **Table 8** for ICU3-M2 fault code (MID 140) diagnosis.
Backlighting is not working.	See **Table 9** for gauge backlighting diagnosis.
Mode/Reset button is not working.	See **Table 10** for Mode/Reset button diagnosis.
The parking brake and ABS warning lights stay on with the key off.	There is feedback in the ignition circuit providing power to the ICU while the key is off. Isolate the source of this feedback and repair as necessary.
LCD displays seven hyphens.	Indicates a program memory failure. Fault code 140 s240 12 may be active in Servicelink. See **Table 8**, "ICU3-M2 Fault Code (MID 140) Diagnosis" for more information. This failure requires replacement of the ICU.
LCD displays "no Eng" or "no ABS."	These are roll call faults indicating the engine or ABS is not detected by the ICU on the J1587 datalink. This does not indicate an ICU problem, nor does it indicate a J1587 datalink problem to the ICU.
LCD displays "no data."	The ICU is unable to detect any data on the J1587 datalink. If the ICU is the only ECU not showing up in the Servicelink ECU list, check J1587 datalink to ICU. If no ECUs show up in the Servicelink ECU list, the problem could be anywhere in the J1587 datalink—troubleshoot accordingly.
LCD displays "no J1939."	The ICU is unable to detect any data on the J1939 datalink. Use the "M2 J1939 Test" Datalink Monitor template in Servicelink to troubleshoot. If only the ICU is not communicating, then check the J1939 branch circuit to the ICU. If no ECUs are communicating, the problem could be anywhere in the J1939 datalink—troubleshoot accordingly.
The "No Charge" light stays on after replacing the bulkhead module.	Apply reference parameter 26-01001-000 to the bulkhead module.

Table 1, ICU Diagnosis Symptom Chart

Troubleshooting

Initial Test Gauge Procedure			
Test	**Test Description**	**Test Result**	**Action**
1	Turn the ignition on. All the gauges, except air pressure gauges, should sweep full scale and back in unison. Do the gauges sweep correctly when the ignition is turned on?	Yes	Go to test 3.
		No	Go to test 2.
2	Check the power and ground to the ICU. • +12V Battery on D14 • +12V Ignition on D15 • Ground on D13 Are the power and ground supplies OK?	Yes	Replace the ICU.
		No	Repair the power and/or ground supply as necessary.
3	Are any engine fault codes active (MID 128)?	Yes	Correct any active engine fault codes first. If the gauge problem is still present, go to test 4.
		No	Go to test 4.
4	Are any ICU fault codes active (MID 140)?	Yes	See **Table 8** – ICU3-M2 Fault Code (MID 140) Diagnosis.
		No	Go to test 5.
5	Which gauge(s) has a problem? NOTE: Datalink driven gauges include the following: speedometer, tachometer, engine oil pressure, and engine coolant temperature.	Single datalink driven gauge	See **Table 3** – Diagnosis for Single Datalink-Driven Gauge Not Working or is Inaccurate.
		Multiple datalink driven gauges	See **Table 4** – Diagnosis for Multiple Datalink-Driven Gauges Not Working.
		Air pressure gauge	See **Table 5** – Air Pressure Gauge Diagnosis.
		Fuel level gauge	See **Table 6** – Fuel Gauge Diagnosis.
		Transmission temperature	See **Table 7** – Transmission Temperature Gauge Diagnosis.

Table 2, Initial Test Gauge Procedure

Diagnosis for Single Datalink-Driven Gauge not Working or is Inaccurate			
Test	**Test Description**	**Test Result**	**Action**
1	Connect Servicelink and open the "ICU3-M2 J1587 Gauges" Datalink Monitor template. Make sure the operating conditions are such that the gauge would be registering (e.g. engine at operating temperature). Start the engine. NOTE: A test drive may be necessary if diagnosing the speedometer. Do the readings closely match?	Yes	Go to test 2.
		No	Replace the ICU.
2	Which best describes the problem with the ICU gauge?	Gauge not working	Check the sensor that the engine ECM uses to supply data to the ICU (e.g. if the oil pressure gauge is not working, check the oil pressure sensor and wiring). Refer to engine manufacturer's service information if necessary.
		Gauge inaccurate	Go to test 3.
3	It is necessary to independently verify the gauge accuracy. For the speedometer, drive the vehicle with another vehicle pacing to note the speed or monitor the ABS wheel speed sensors using Meritor Toolbox. For engine coolant temperature and oil pressure, it may be necessary to connect a mechanical gauge. For the tachometer, it will be necessary to use a tool that measures engine speed. Does the independent verification confirm the ICU gauge is inaccurate?	Yes	Check the sensor the engine ECM uses to supply data to the ICU (e.g. if the oil pressure gauge is inaccurate, check the oil pressure sensor). Refer to the engine manufacturer's service information if necessary.
		No	No problem found.

Table 3, Diagnosis for Single Datalink-Driven Gauge not Working or is Inaccurate

Diagnosis for Multiple Datalink-Drives Gauges Not Working			
Test	**Test Description**	**Test Result**	**Action**
1	Connect Servicelink to the vehicle. Will Servicelink connect?	Yes	Go to test 2.
		No	Assuming Servicelink and the vehicle adapter is functioning, check the J1587 datalink for shorts or opens. Repair as necessary.
2	Does the engine ECM (MID 128) show up in the Servicelink J1708 ECU list?	No	Go to test 3.
		Yes	Check the J1587 datalink to the engine ECM. If OK, See engine OEM's literature for further diagnosis.

Troubleshooting

Diagnosis for Multiple Datalink-Drives Gauges Not Working			
Test	**Test Description**	**Test Result**	**Action**
3	Does the ICU3-M2 (MID 140) show up in the Servicelink J1708 ECU list?	No	Go to test 4.
		Yes	Check the J1587 datalink to the ICU, repair as necessary. If OK, replace the ICU.
4	In Servicelink, open the ICU3-M2 Datalink Monitor template. Start the engine. Make sure the operating conditions are such that the gauge would be registering (e.g. engine at operating temperature). NOTE: A test drive may be necessary if diagnosing the speedometer. Monitor the problem gauges on both the ICU and on the template. Do the affected gauges function in the template?	Yes	Replace the ICU.
		No	Refer to engine OEM service literature for further diagnosis.

Table 4, Diagnosis for Multiple Datalink-Drives Gauges Not Working

Air Pressure Gauge Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
1	Which air pressure gauge is not functioning correctly?	Primary or secondary	Go to test 2.
		Application	Go to test 3.
		Suspension	Go to test 4.
2	Drain the air tanks. Connect an accurate pressure gauge to the primary or secondary air tank (whichever one corresponds with the problem gauge). Start the engine and build air pressure until the compressor cuts out. Is the air pressure gauge in the cluster within 6 PSI of the test gauge?	Yes	The gauge is OK.
		No	Check the airline to gauge for kinks. If OK, replace the air pressure gauge module.
3	Connect an accurate pressure gauge to a delivery port on the foot valve. Make a 90 PSI brake application while observing the application air pressure gauge in the cluster and the test gauge. Is the air pressure gauge in the cluster within 3 PSI of the test gauge?	Yes	The gauge is OK.
		No	Check the air line to gauge for kinks. If OK, replace the gauge.

Air Pressure Gauge Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
4	Connect an accurate pressure gauge to the air suspension. Is the air pressure gauge in the cluster within 3 psi of the test gauge?	Yes	The gauge is OK.
		No	Check the airline to gauge for kinks. If OK, replace the gauge.

Table 5, Air Pressure Gauge Diagnosis

Fuel Gauge Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
1	Is there an accuracy problem with the gauge? NOTE: A "YES" answer means the gauge registers, but does not read accurately. A "NO" answer means the gauge is not working and registers empty all the time except during the ignition power on sweep.	Yes	Go to test 3.
		No	Go to test 2.
2	Disconnect the fuel level sender connector. Apply 30 ohms across the terminals on the fuel level sender harness connector. Turn the ignition on. Does the fuel gauge read to the FULL mark or slightly above?	Yes	Make sure there is fuel in the tank for the gauge to register. If there is, replace the fuel level sender.
		No	Check the wiring between the fuel level sender and the ICU. If a problem is found, repair as necessary. If the wiring is OK, replace the ICU.
3	Disconnect the fuel level sender connector. Apply 30 ohms across the terminals on the fuel level sender harness connector. Turn the ignition on. Does the fuel gauge read to the FULL mark or slightly above?	Yes	Go to test 4.
		No	Check circuits 47 and 47G between the ICU and the fuel level sender for excess resistance. If none is found, replace the ICU.
4	Apply 103 ohms across the terminals on the fuel level sender harness connector. Turn the ignition on. Does the fuel gauge read approximately 1/2 full (within about 2 needle widths above or below 1/2 full)?	Yes	The fuel level gauge and the wiring between the ICU and the sender is functioning normally. If the fuel level displayed on the gauge is still suspected to be inaccurate, check the fuel level sender.
		No	Check circuits 47 and 47G between the ICU and the fuel level sender for excess resistance. If none is found, replace the ICU.

Table 6, Fuel Gauge Diagnosis

Troubleshooting

Transmission Temperature Gauge Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
1	What best describes the problem with the transmission oil temperature gauge?	Reads minimum scale all the time	Go to test 2.
		Reads maximum scale all the time	Go to test 3.
		Reads inaccurate	Go to test 4.
2	Disconnect the transmission oil temperature sensor connector. Short the terminals on the transmission oil temperature sensor harness connector. Turn the ignition on. Does the transmission oil temperature gauge now read full scale (350F)?	Yes	Replace transmission oil temperature sensor.
		No	Check circuits 30 and 30G between the ICU and the transmission oil temperature sensor; there may be an open in one of these circuits. If the wiring is OK, replace the ICU.
3	Disconnect the transmission oil temperature sensor connector. Turn the ignition on. Does the transmission oil temperature gauge now read minimum scale?	Yes	Replace transmission temperature sensor.
		No	Check circuits 30 and 30G between the ICU and the transmission oil temperature sensor; circuit 30 may be shorted to ground or circuit 30 and 30G may be shorted together. If the wiring is OK, replace the ICU.
4	Disconnect the transmission oil temperature sensor. Now, apply 267 ohms across the terminals on the transmission oil temperature sensor harness connector. Turn the ignition on. Does the transmission oil temperature gauge read approximately 2 needle widths above or below 275F?	Yes	The transmission oil temperature gauge and the wiring between the ICU and the sensor are functioning normally. If the temperature displayed on the gauge is still suspected to be inaccurate, check the transmission oil temperature sensor.
		No	Check circuits 30 and 30G between the ICU and the transmission oil temperature sensor for excess resistance. If none is found, replace the ICU.

Table 7, Transmission Temperature Gauge Diagnosis

ICU3-M2 Fault Code (MID 140) Diagnosis				
MID	**PID/SID**	**FMI**	**Fault Description**	**Action**
140	p168	01	"ICU3-M2 low voltage—less than 10.5 volts."	Check the power and ground circuits to the ICU and repair as necessary. If OK, check vehicle batteries and charging system.
	s240	12	"ICU3-M2 program memory failure—odometer read/write to EEPROM fails." NOTE: When this failure occurs, the ICU will be unable to display the fault on the LCD, but the fault will display in Servicelink. However, when this fault is active, the LCD display will show a series of seven hyphens.	Replace ICU.
	s254	12	"ICU3-M2 Controller Failure—ICU self test detects checksum errors."	Replace ICU.

Table 8, ICU3-M2 Fault Code (MID 140) Diagnosis

Gauge Backlighting Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
1	Is only the air pressure gauge backlighting affected?	Yes	Go to test 2.
		No	Go to test 3.
2	Remove the three air gauge module screws and carefully lift the air gauge module off the back of the ICU while leaving the ribbon cable connected. Inspect the ribbon cable connection to the ICU PC board. Make sure there is no corrosion and that it is plugged in all the way. Is the ribbon cable connection OK?	Yes	Replace the air pressure gauge module.
		No	Repair the ribbon cable connection as necessary.
3	Access the back of the ICU and disconnect the two electrical connectors. Turn the headlights on. Measure voltage in pins A1(+) and D3(–) while increasing and decreasing the dimmer switch. The voltage should range between approximately 2.5V (full dim) and 11.3V (full bright). Is the backlighting voltage OK?	Yes	Replace the ICU
		No	Go to test 4.

Troubleshooting

Gauge Backlighting Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
4	Access the back of the ICU and disconnect the two electrical connectors. Turn the headlights on. Measure voltage in pins A1(+) and a known good ground while increasing and decreasing the dimmer switch. The voltage should range between approximately 2.5V (full dim) and 11.3V (full bright). Is the backlighting voltage OK?	Yes	Repair the backlighting ground circuit to ICU pin D3 as necessary.
		No	Check circuit 29A between the BHM and the ICU. If OK, check dimmer switch and BHM. Repair as necessary.

Table 9, Gauge Backlighting Diagnosis

Mode/Reset Button Diagnosis			
Test	**Test Description**	**Test Result**	**Action**
1	Does the mode reset button stick or fail to spring back when released?	Yes	Replace the air pressure gauge module.
		No	Go to test 2.
2	Remove the three air gauge module screws and carefully lift the air gauge module off the back of the ICU. Leave the ribbon cable connected. Inspect the ribbon cable connection to the ICU PC board. Make sure there is no corrosion and that it is plugged in all the way. Is the ribbon cable connection OK?	Yes	If the mode/reset button is not working and the ribbon cable connection is OK, replace the air gauge module.
		No	Repair the ribbon cable connection as necessary.

Table 10, Mode/Reset Button Diagnosis

The two ICU3-M2 main cab harness connectors are pink and plug into pins located in the center of the unit, on the back. Connector #1 has 24 cavities, numbered A1 through A12, and B1 through B12. See **Table 1**.

Connector #2 has 32 cavities, numbered C1 through C16, and D1 through D16. See **Table 2**.

See **Table 3** for Message Identifiers (MIDs).

See **Table 4** for fuel level sensor resistance.

See **Table 5** for transmission oil temperature sensor resistance, standard gauge.

See **Table 6** for transmission oil temperature sensor resistance, metric gauge.

ICU3-M2 Connector #1 Pin Assignments, Pins A1 Through B12		
Pin	**Description**	**Wire**
A1	Panel Backlight Power (+)	29A
A2	Multifunction Switch Windshield Wiper Input	473C
A3	Low Air Pressure Input	18B
A6	Traction Control Switch (Optional Indicator #2)	376T
A7	Preheater Relay #1 Coil Signal (Optional Indicator #3)	431B1
B1	Wheel Spin Warning Lamp (Optional Indicator #5)	376S
B3	J1708 Network (–)	1587–
B5	Multifunction Switch Common Input	473
B6	Multifunction Switch Turn Signal Input	473A
B7	Multifunction Switch High Beam/Washer Input	473B
B9	Cruise Control Switch Input	440D
B10	J1708 Network (+)	1587+
B11	Tractor ABS Indicator	376L

Table 1, ICU3-M2 Connector #1 Pin Assignments, Pins A1 Through B12

ICU3-M2 Connector #2 Pin Assignments, Pins C1 Through D16		
Pin	**Description**	**Wire**
C1	Do Not Shift Warning Lamp (Optional Indicator #8)	E115
C5	Park Brake Indicator	125S
C11	Wheel Spin Warning Lamp (Optional Indicator #7)	376S
C12	Transmission Oil Temperature (–)	30G
C13	Transmission Oil Temperature (+)	30
C15	Check Engine Warning Lamp	440A
C16	Engine Protection Warning Lamp	440S
D1	Fuel Level (+)	47
D2	Fuel Level (–)	47G
D3	Panel Backlight Ground (–)	GND
D5	J1939 (+)	1939+

Specifications

ICU3-M2 Connector #2 Pin Assignments, Pins C1 Through D16		
Pin	**Description**	**Wire**
D9	J1939 (–)	1939–
D12	Trailer ABS Warning Lamp	376F1
D13	PC Board Ground (–)	GND
D14	Battery Power (+)	81
D15	Ignition Power (+)	81C
D16	Headlamp Power (+)	81C

Table 2, ICU3-M2 Connector #2 Pin Assignments, Pins C1 Through D16

Message Identifiers (MIDs)		
MID	**Description**	**Text Message**
128	Engine Control Unit	ECU128
130	Transmission Control Unit	tCU130
136	Anti-Lock Brake System (ABS)	AbS136
140	Instrumentation Control Unit	ICU140
181	Satellite Communications	SAT181
219	Collision Detection Unit	CdU219
223	Transmission Shift Unit	tSU223
231	Cellular Phone	CEL231
232	SPACE (Seat Belt Unit)	SbU232
###	Generic MID	SYS###

Table 3, Message Identifiers (MIDs)

Fuel Level Sensor Resistance (Stewart-Warner)		
Gauge Reading	**Sensor Resistance: ohms**	
	Acceptable Range	**Nominal**
Empty	244.0 to 249.0	246.5
Empty Stop	232.0 to 239.2	235.6
1/8	190.8 to 196.9	193.8
1/4	149.6 to 154.5	152.1
3/8	126.1 to 129.0	127.5
1/2	102.5 to 103.5	103.0
5/8	84.4 to 85.7	85.0
3/4	66.2 to 67.8	67.0
7/8	47.8 to 49.2	48.5
Full	29.4 to 30.6	30.0

Table 4, Fuel Level Sensor Resistance (Stewart-Warner)

Transmission Oil Temperature Sensor (Hi-Stat) Resistance Standard Gauge (ºF)	
Gauge Temperature: ºF	**Sensor Resistance: ohms**
125	3318
163	1626
200	837
238	460
275	267
313	162
350	102

Table 5, Transmission Oil Temperature Sensor (Hi-Stat) Resistance Standard Gauge (ºF)

Transmission Oil Temperature Sensor (Hi-Stat) Resistance Metric Gauge (ºC)	
Gauge Temperature: ºC	**Sensor Resistance: ohms**
60	2490
80	1255
100	680
120	390
140	234
160	145
180	95

Table 6, Transmission Oil Temperature Sensor (Hi-Stat) Resistance Metric Gauge (ºC)

Mode/Reset Switch Functions

Use the following flow charts to cycle through the Mode/Reset switch functions and screens.

See **Fig. 1** for the start sequence. See **Fig. 2** for the trip miles and hours screens, and **Fig. 3** for the engine miles and service interval setup screens.

See **Fig. 4** for the fault code screens, and **Fig. 5** for the service hour screens. See **Fig. 6** for the oil level screens, and **Fig. 7** for the reset and toggle function screens.

Mode/Reset Switch Functions

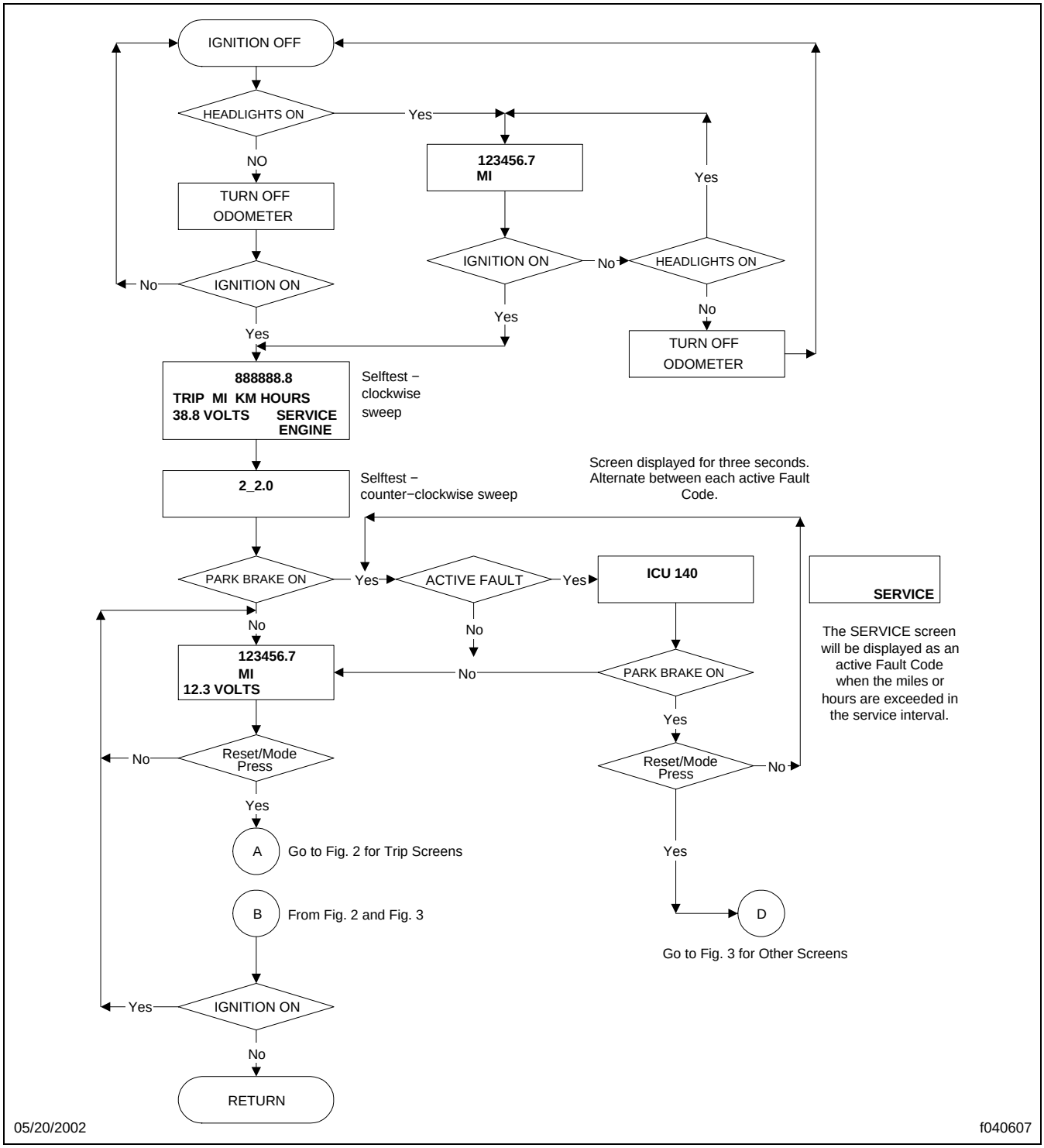


Fig. 1, Start Sequence

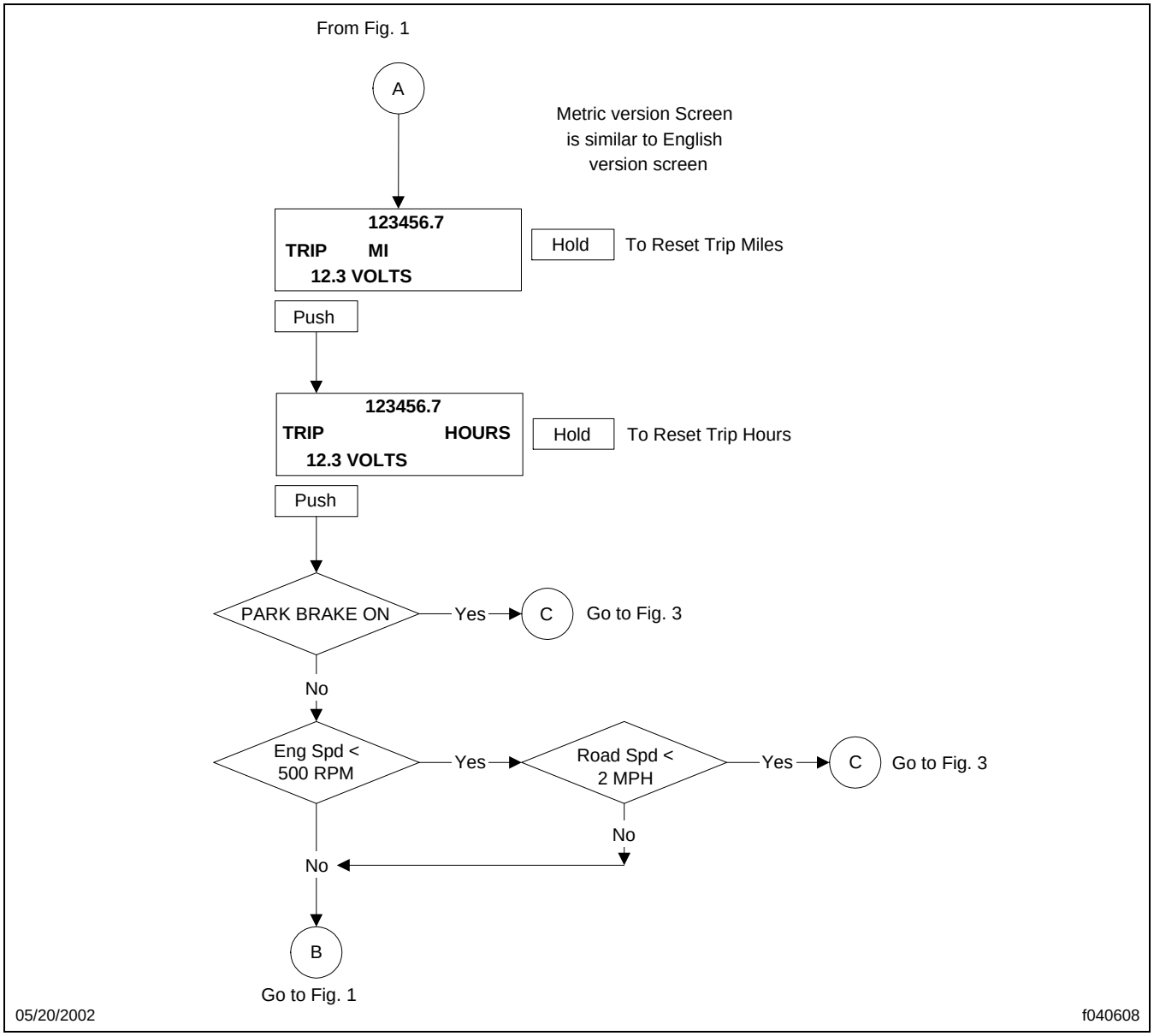


Fig. 2, Trip Screens

Mode/Reset Switch Functions

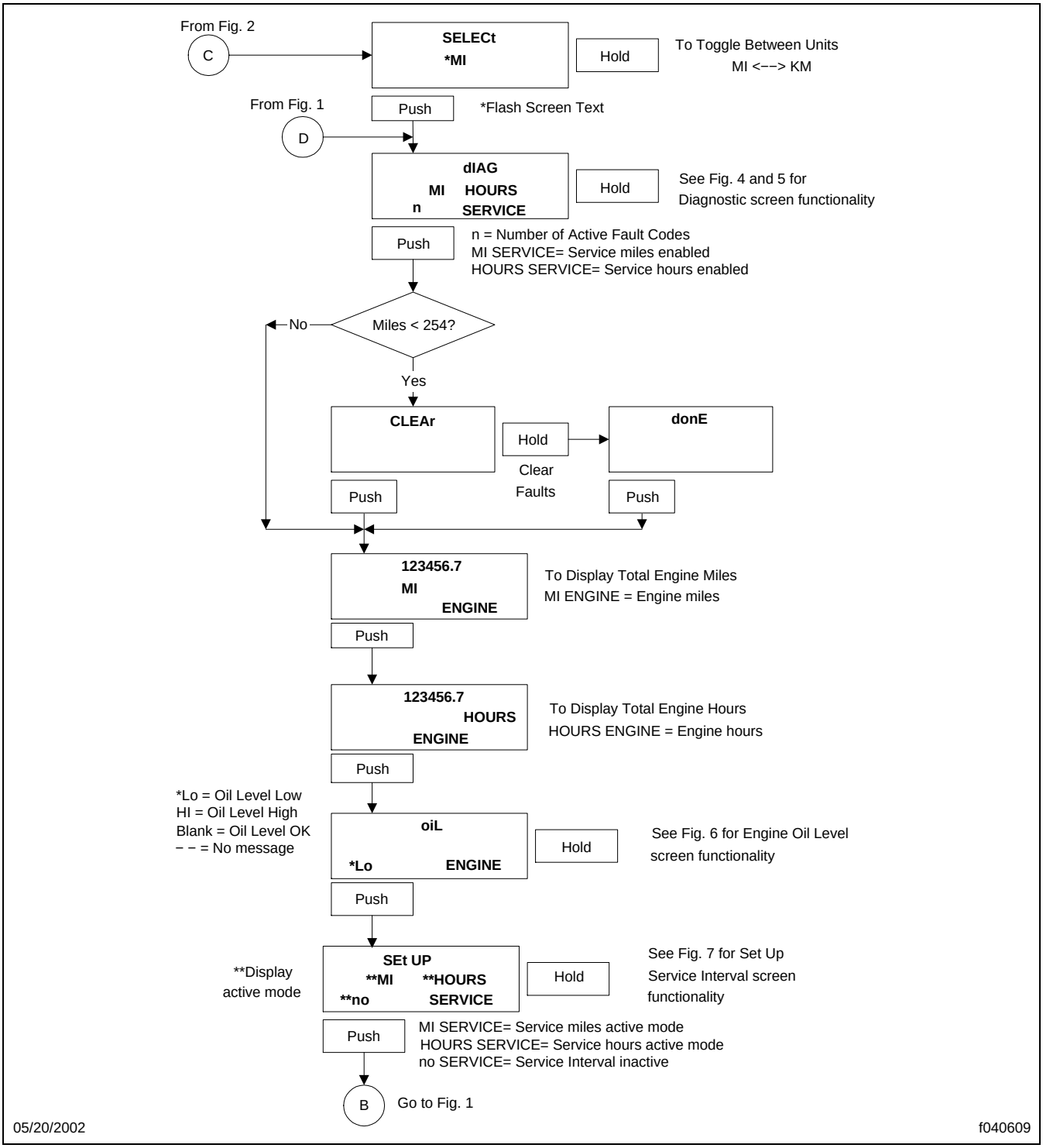


Fig. 3, Engine Miles and Service Interval Setup Screens

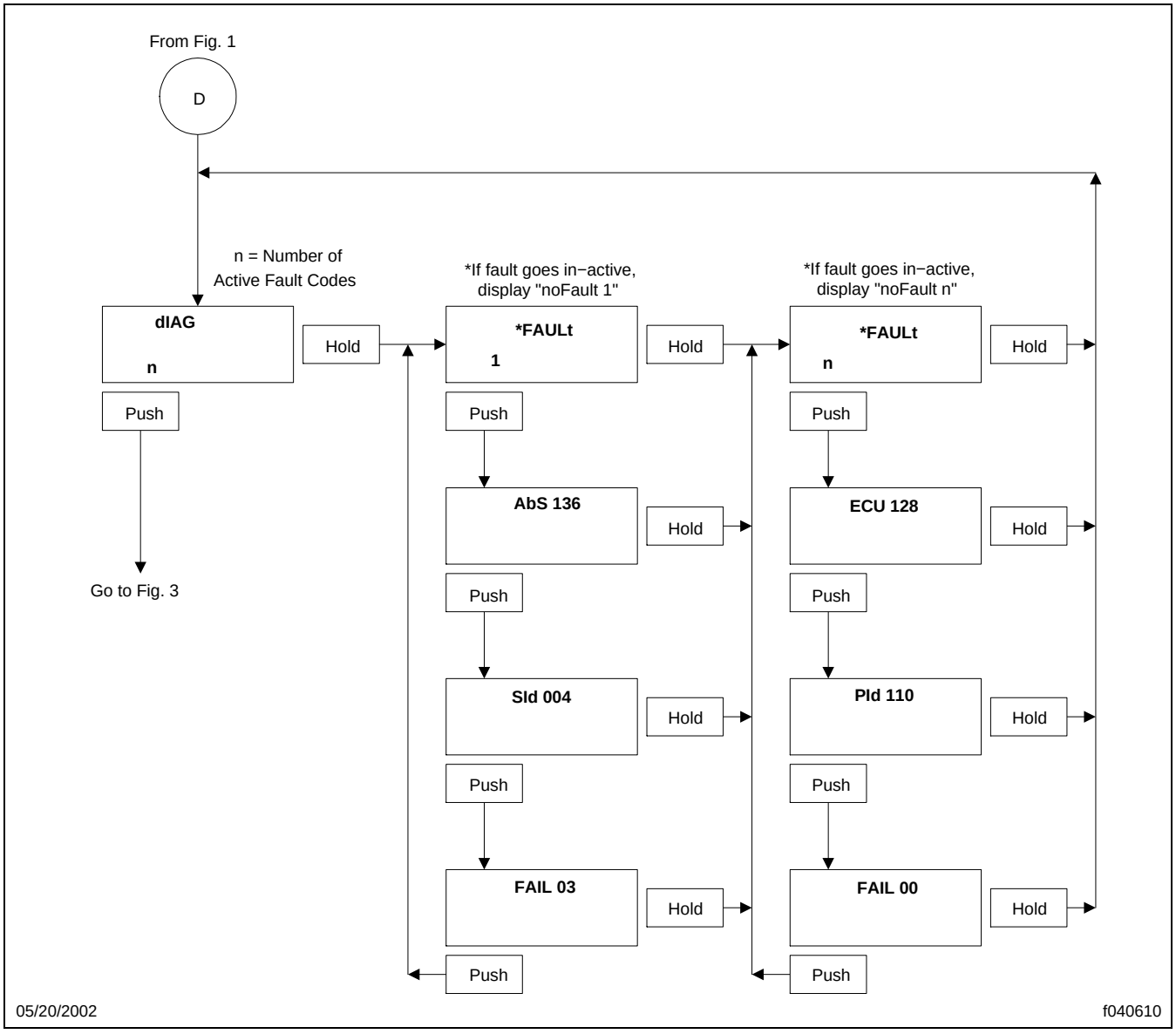


Fig. 4, Fault Screens

Mode/Reset Switch Functions

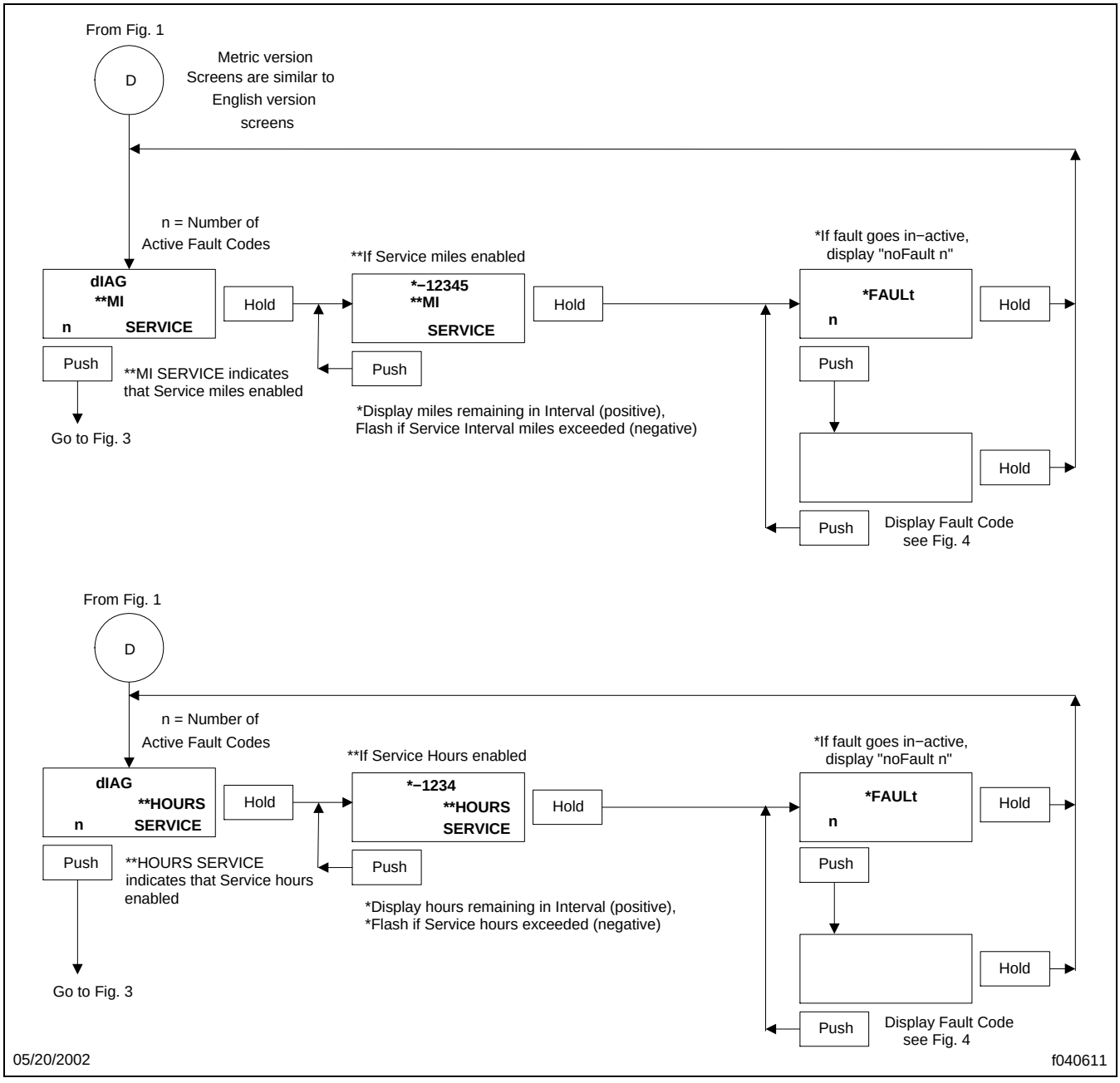


Fig. 5, Service Hour Screens

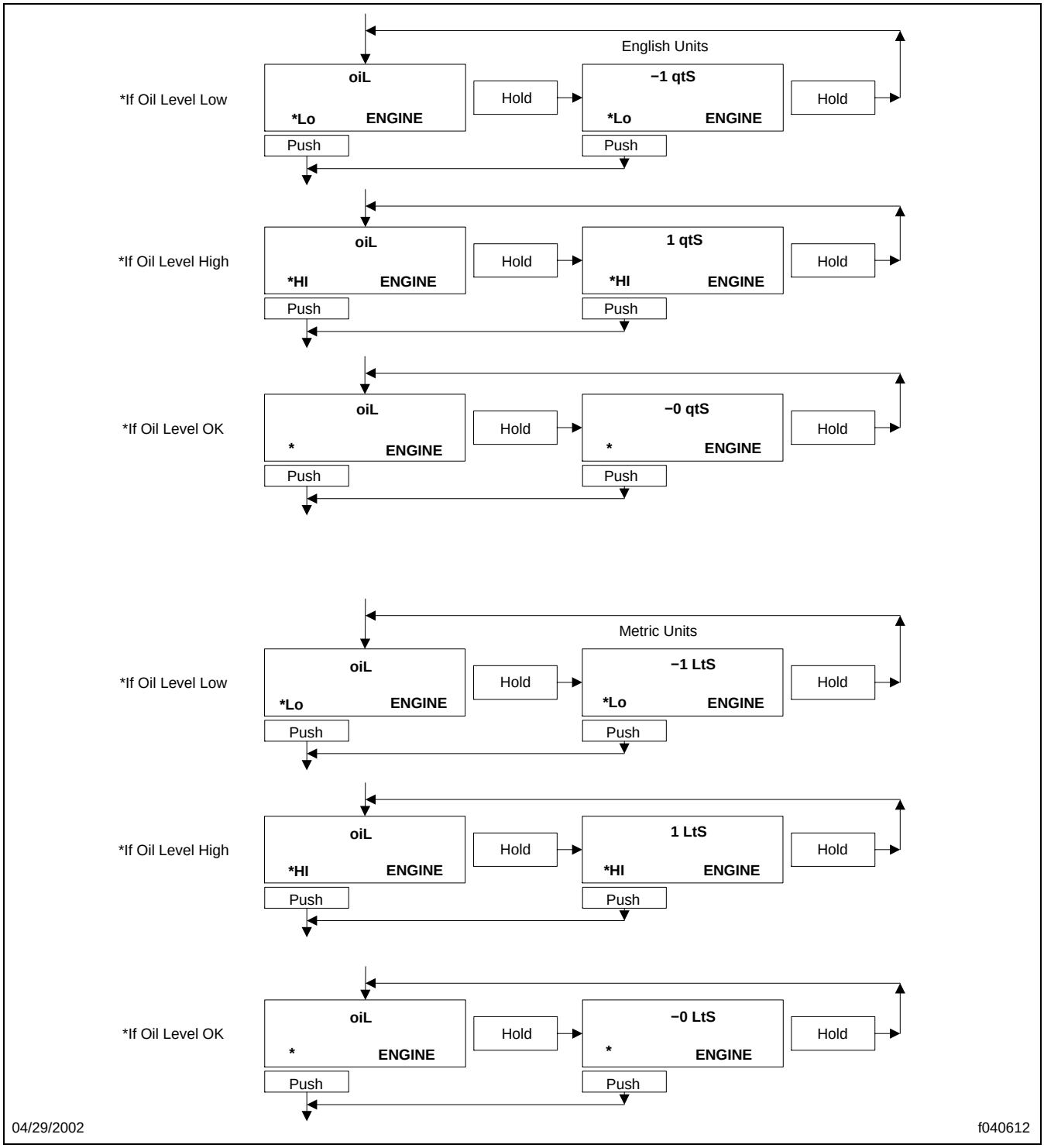


Fig. 6, Oil Level Screens

Mode/Reset Switch Functions

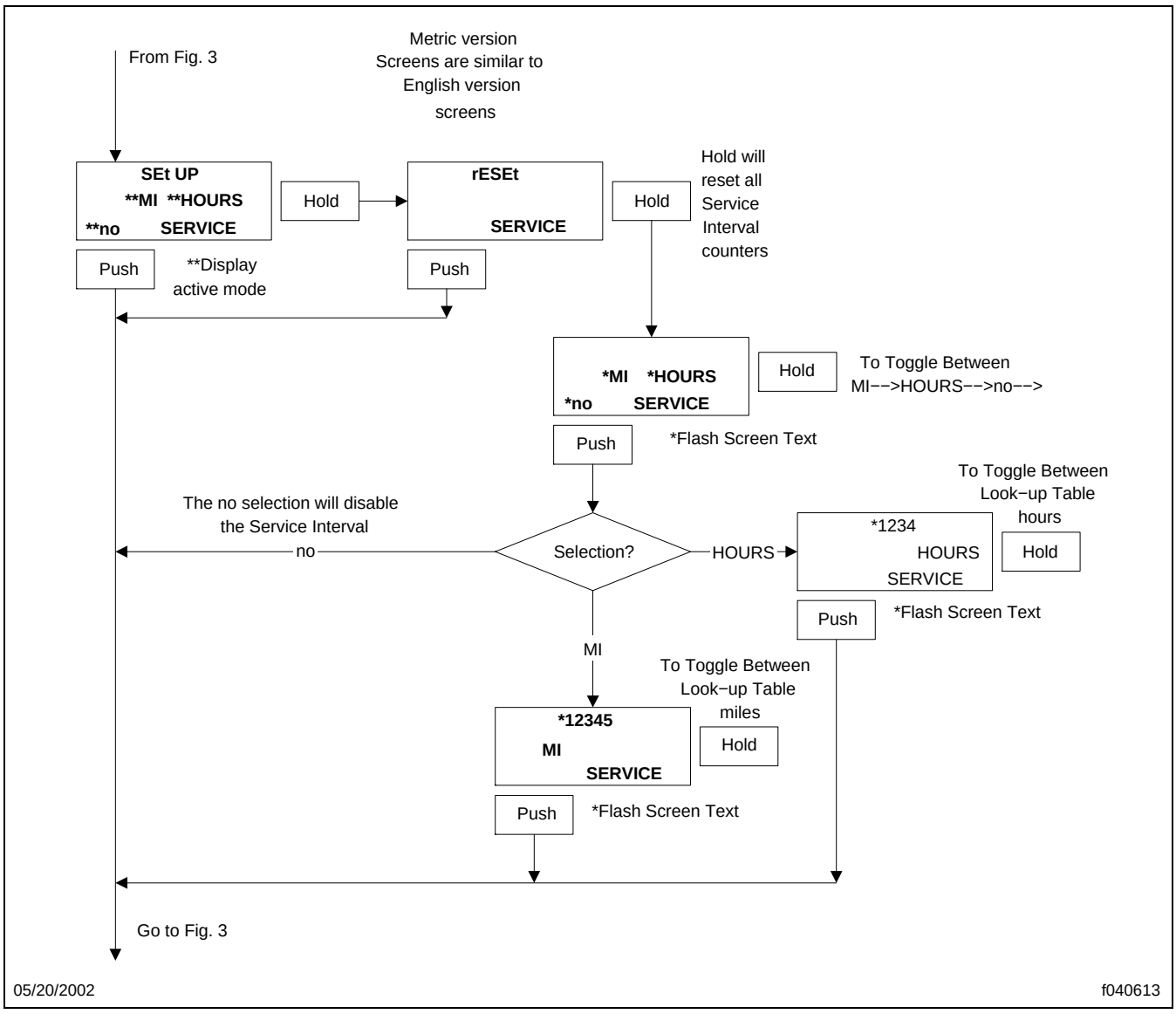


Fig. 7, Reset and Toggle Function Screens