

**SERVICE REPAIR**

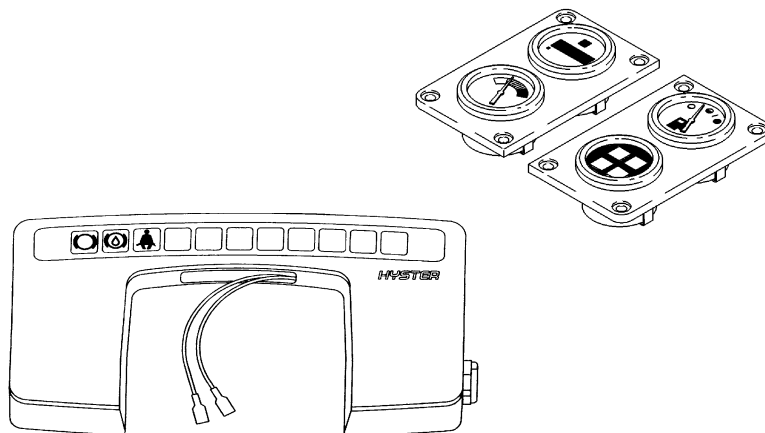
**MANUAL**

Hyster B010 (S25XL, S30XL, S35XL) Forklift

***HYSTER***

# **INSTRUMENT PANEL INDICATORS AND SENDERS**

**H14.00-18.00XM-12 (H360-450H, EC5-6) [A214];  
S6.00-7.00XL (S135-155XL, S155XLS) [B024, C024];  
E3.50-5.50XL (E70-120XL) [C098];  
S3.50-5.50XL (S70-120XL) [D004];  
H13.00-16.00XL (H300-360, H330-360XL-EC) [D019];  
H36.00-H48.00E (H800-1050E) [D117];  
H8.00-12.00XL (H165-280XL) [E007];  
H20.00-H32.00F (H440-700F, FS) [E008];  
H6.00-7.00XL (H135-155XL) [F006, G006];**



# **HYSTER**

# SAFETY PRECAUTIONS

## MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- **DISCONNECT THE BATTERY CONNECTOR** before doing any maintenance or repair on electric lift trucks.
- Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See **HOW TO PUT THE LIFT TRUCK ON BLOCKS** in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a **DO NOT OPERATE** tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

**NOTE:** The following symbols and words indicate safety information in this manual:



### **WARNING**

**Indicates a condition that can cause immediate death or injury!**



### **CAUTION**

**Indicates a condition that can cause property damage!**

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H36.00-H48.00E (H800-1050E) [D117];  
H8.00-12.00XL (H165-280XL) [E007];  
H20.00-H32.00F (H440-700F, FS) [E008];  
H6.00-7.00XL (H135-155XL) [F006, G006];

**Thanks very much for your reading,  
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manual**

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please download the PDF document first, and then  
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**Have any questions please write to me:  
[admin@servicemanualperfect.com](mailto:admin@servicemanualperfect.com)**

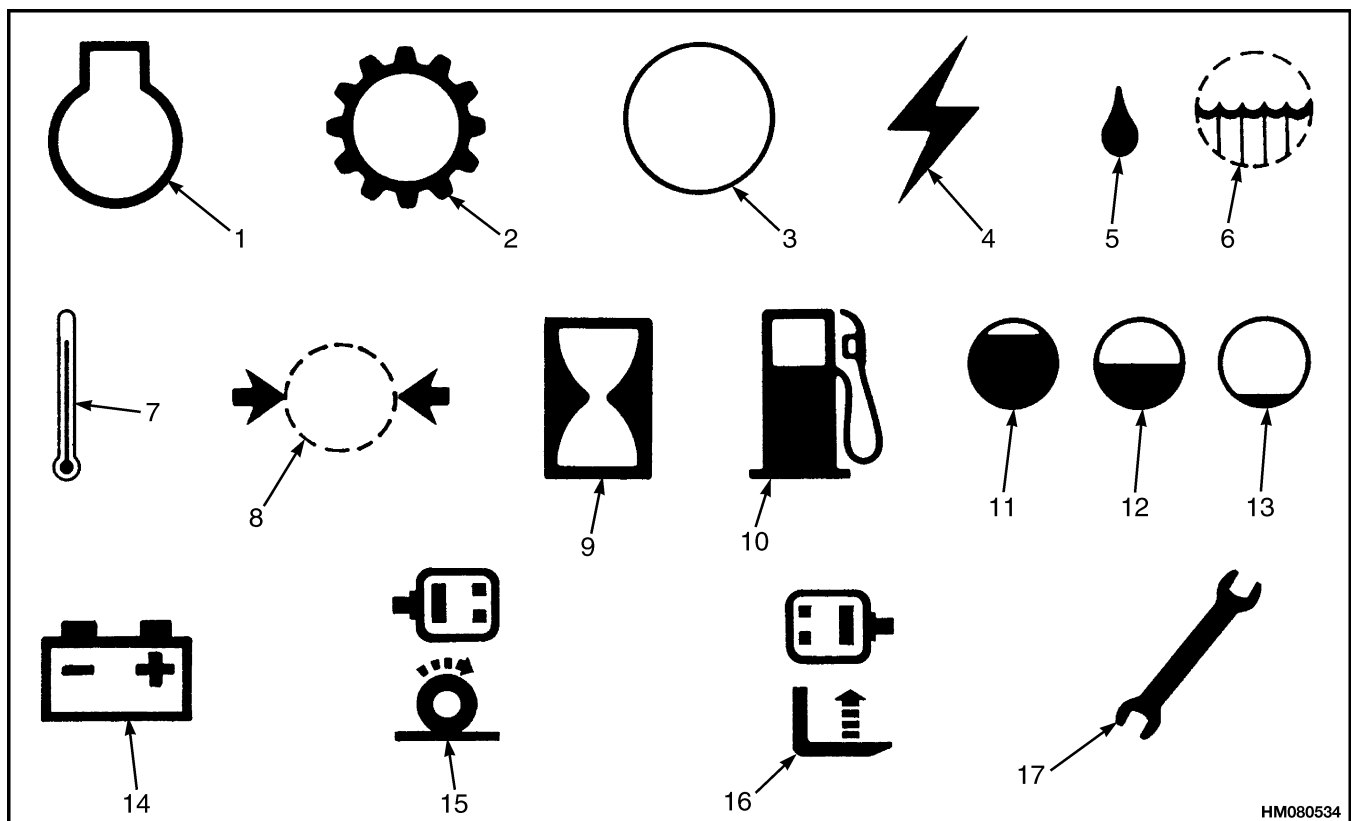
## General

**NOTE:** Battery indicator meters, used on electric lift trucks, are described in the SRM section **Battery Indicators** 2260 SRM 138.

The gauges and meters provide information to the operator on the condition of various systems. Gauges may be either direct reading (mechanical) or indirect (electrical). Unlike mechanical gauges, electrical gauges have electrical meter-movements, light emitting diode (LED) or digital displays inside the case. These meters, receive an electrical signal from a sender unit, usually in the engine or transmission case. The indicators of electric lift trucks receive an electrical signal from a sensor (motor temperature) or a control board. This section only describes the electrical "gauges", meters, senders and instrument

panel displays. "Gauges" will be referred to as meters.

The meters and displays are used to provide operator information on the status of many systems including: (1) engine coolant temperature, (2) engine or transmission oil pressure or temperature, (3) fuel level, (4) battery current (ammeter), battery voltage (voltmeter), battery or state of charge (battery indicators), (5) motor temperature, (6) motor brush wear, (7) traction system status and (8) elapsed time. See Figure 1, Figure 2, Figure 4, Figure 5, Figure 6, Figure 7, Figure 9 and Figure 10. However, every truck or piece of equipment is not equipped with each one of these meters.



- |                         |                       |                               |
|-------------------------|-----------------------|-------------------------------|
| 1. ENGINE               | 7. TEMPERATURE        | 13. FUEL LEVEL - EMPTY        |
| 2. TRANSMISSION         | 8. PRESSURE           | 14. BATTERY                   |
| 3. GENERATOR OR AMMETER | 9. HOURS              | 15. BRUSH WEAR TRACTION MOTOR |
| 4. CURRENT              | 10. FUEL              | 16. BRUSH WEAR LIFT MOTOR     |
| 5. OIL                  | 11. FUEL LEVEL - FULL | 17. MAINTENANCE               |
| 6. WATER                | 12. FUEL LEVEL - 1/2  |                               |

*Figure 1. International Meter Face Symbols*

## Description

Many meters have meter-movements that move an indicating needle attached to a shaft (or pin). The shaft rotates to swing the needle when current flows through the movement. The movement operates on the same principle (electromagnetic) that rotates a motor shaft. However, shaft rotation of a meter is limited to much less than even one full revolution. The amount of rotation or deflection of the needle is directly related to the amount of current flow through the meter-movement. Meter faces (or scales) are calibrated to indicate a range of values that are converted from a directly proportional current flow through the sender. See Figure 1 and Figure 2 for some typical examples of meter faces with various calibrations.

Meters such as ammeters, voltmeters and some hourmeters, are able to convert this proportional current within the meter case. Many other meters and displays require a separate sender. See Figure 2. Senders convert a specific pressure, temperature or fluid level into a current flow that is directly related to a given voltage (electrical system voltage) applied. See Figure 3.

### STEERING COLUMN GAUGES, METERS, AND INDICATORS

Some lift trucks use a cluster of gauges, meters, and indicator lights at the base of the steering column. See Figure 4. The left side includes an hourmeter and engine coolant temperature gauge. For diesel and gasoline units, the right side has a fuel level gauge. Below the fuel level gauge is a four function indicator that has separate warning indicators for the alternator, engine and transmission oil pressure, and transmission oil temperature. For LPG units, the fuel gauge is replaced by a bezel with the Hyster emblem. The indicator with the gasoline pump symbol will now indicate low LPG tank pressure. However, the optional pressure switch must be installed in the LPG system. The indicator for oil pressure and temperature (oil clutch units or powershift transmissions) are combined in a two-function warning light in the lower right position.

### LED DISPLAY PANEL

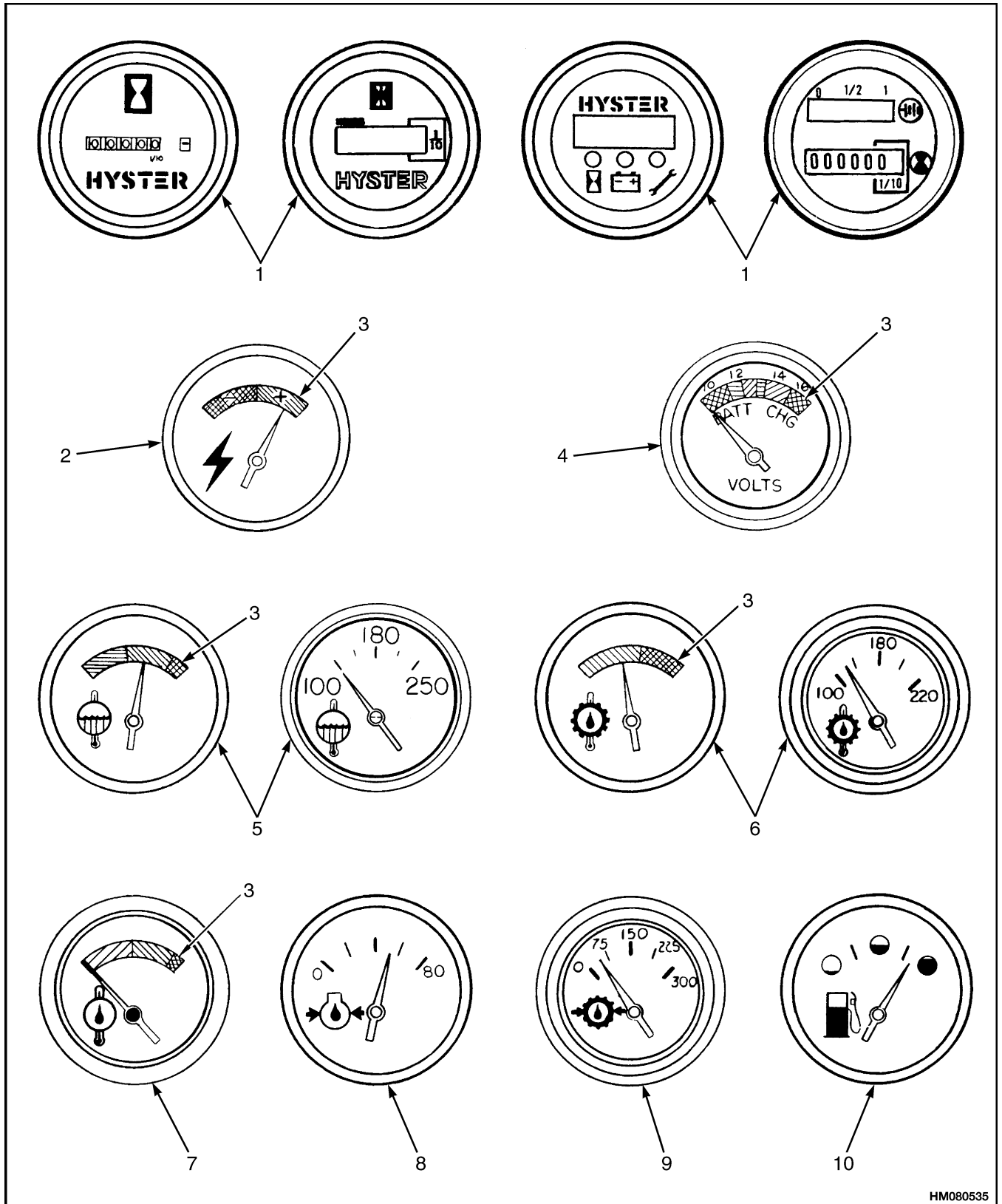
Some lift trucks have a Light Emitting Diode (LED) warning display on the instrument panel. See Figure 7, Figure 9, and Figure 10. The following paragraphs describe how the circuit for each function operates and how to check its operation. The LED warning display must be replaced as a complete unit. The sensors for the LED warning display can be replaced as separate parts.

### Battery Discharge Indicators

**NOTE:** See the SRM section **Battery Indicators** 2260 SRM 138 for a more complete description of the operation and the adjustment and repair procedures.

Earlier units without the LX control card have a battery discharge indicator that is a scale with a series of 10 LED's of different colors. See (1, 2, and 3 of Figure 7. The LED's illuminate in a sequence (green, yellow, red) to indicate the discharge of the battery as the battery voltage decreases during operation. No more than two LED's are illuminated at one time. When the battery is fully charged, the two green LED's at the end of the scale are illuminated. When the battery discharges during operation, the illumination sequence moves to the left. The color changes from green to yellow to red. When the battery is discharged to the red section of the battery discharge indicator, the last two red LED's begin to flash just before the "lift interrupt" is enabled. When the last two red LED's are illuminated continuously, the controller for the battery discharge indicator stops the power to the hydraulic pump. This action prevents the lift truck from lifting. Enough battery power is normally available to move the lift truck to a battery charger or to a place where a charged battery can be installed.





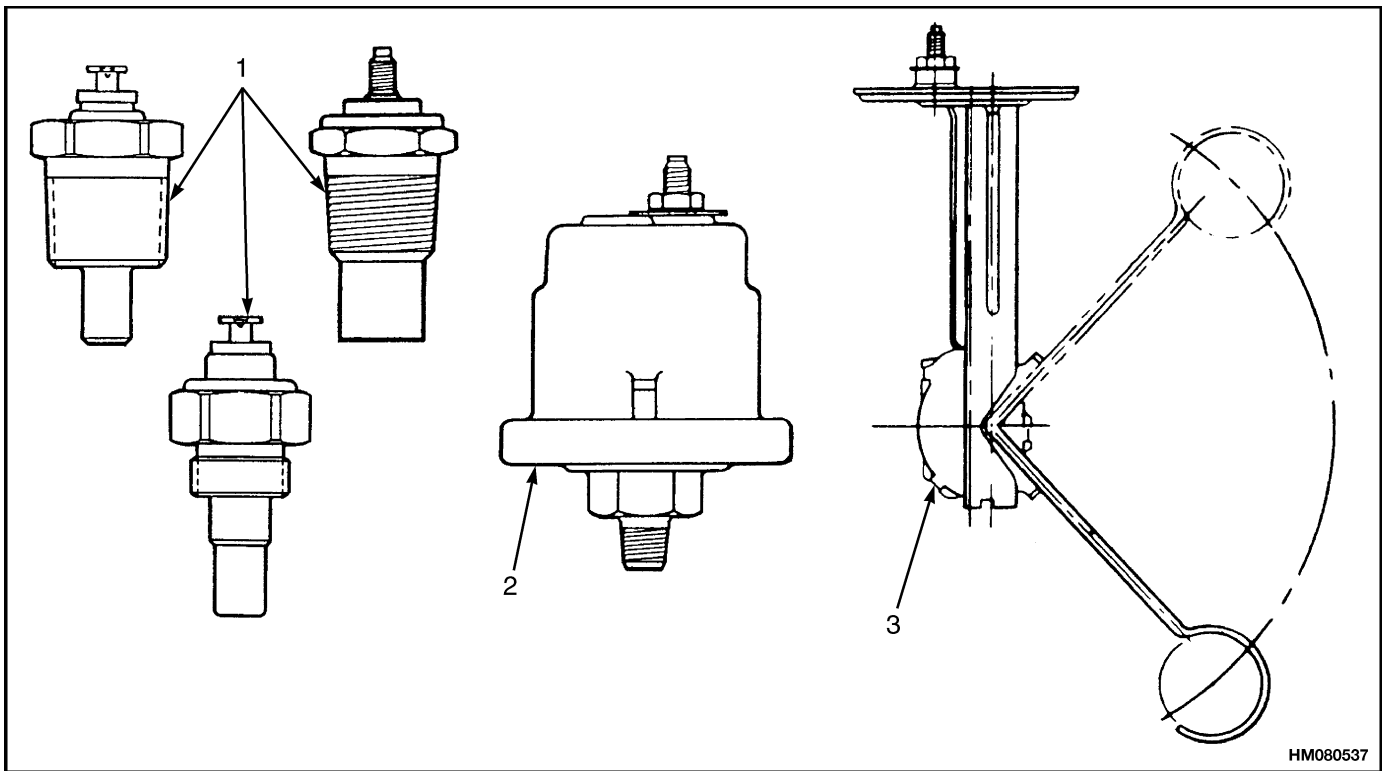
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Figure 2. Typical Meter Faces for Lift Trucks With Engines

*Legend for Figure 2*

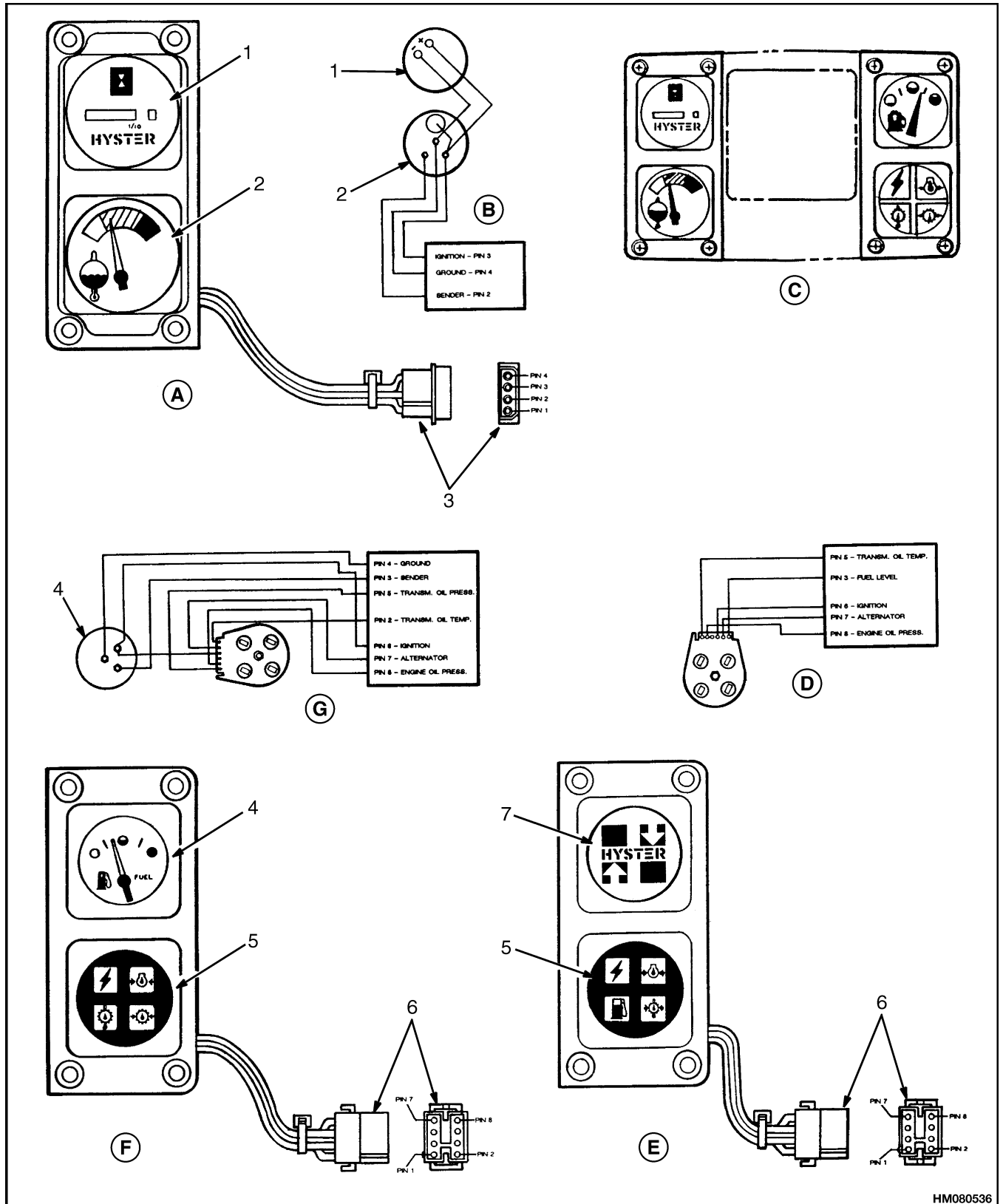
**NOTE:** METER FACE NUMBERS, INCREMENTS, AND COLORED BANDS CAN BE DIFFERENT THAN SHOWN.

- |   |                                 |
|---|---------------------------------|
| 1. HOURMETER (ENGINE POWERED OR ELECTRIC LIFT TRUCKS) | 6. TRANSMISSION OIL TEMPERATURE |
| 2. AMMETER  | 7. HYDRAULIC OIL TEMPERATURE    |
| 3. COLORED BANDS                                      | 8. ENGINE OIL PRESSURE          |
| 4. VOLTMETER  | 9. TRANSMISSION OIL PRESSURE    |
| 5. ENGINE COOLANT TEMPERATURE                         | 10. FUEL LEVEL                  |



- |                              |                      |
|------------------------------|----------------------|
| 1. FLUID TEMPERATURE SENDERS | 3. FUEL LEVEL SENDER |
| 2. FLUID PRESSURE SENDER     |                      |

*Figure 3. Typical Senders for Lift Trucks With Engines*

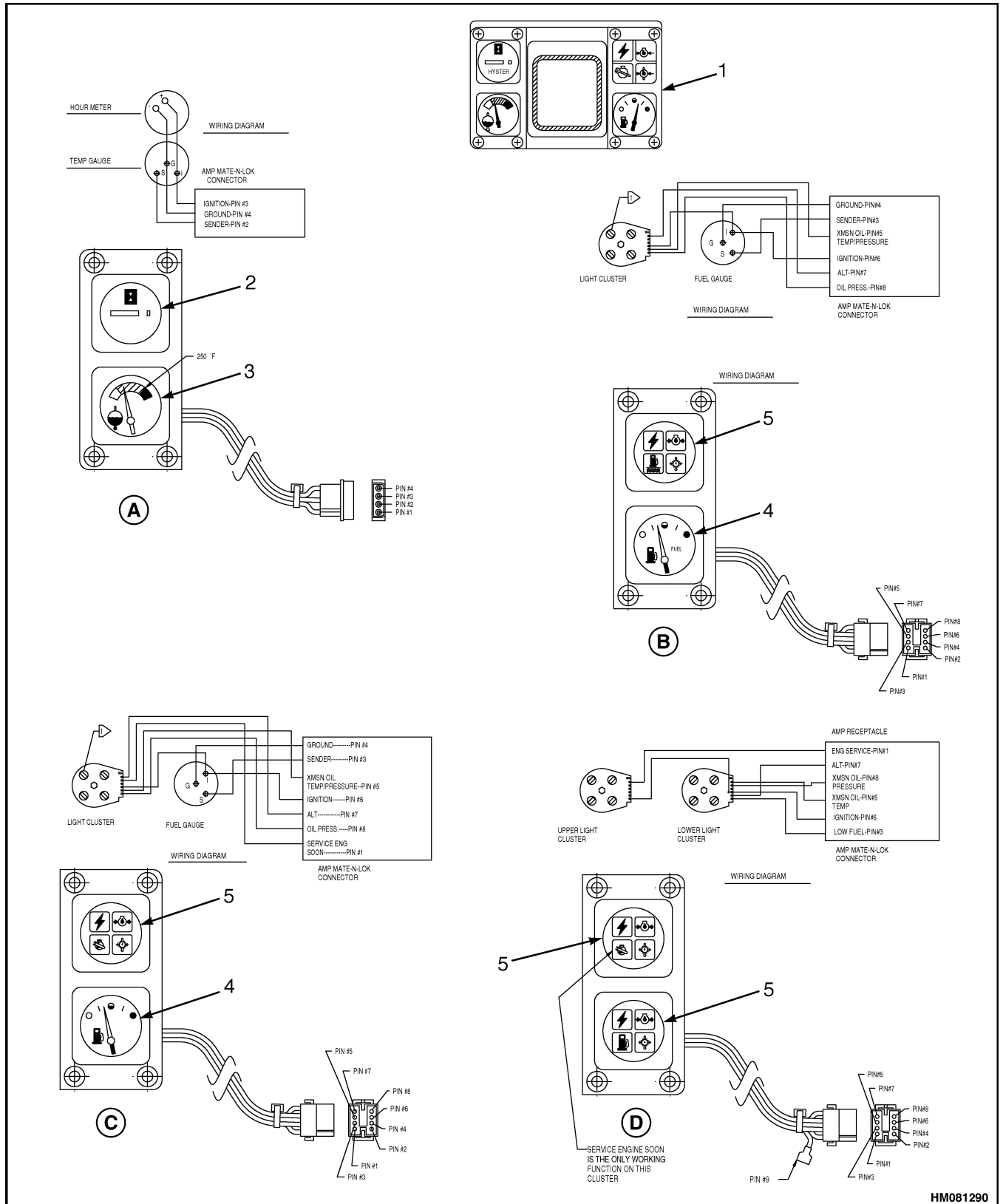


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Figure 4. Typical Meters on Steering Column Assembly for Lift Trucks With Engines

*Legend for Figure 4*

- |                                     |   |
|-------------------------------------|---|
| <b>A.</b> LEFT HAND - ALL UNITS     | <b>E.</b> RIGHT HAND - LPG POWERED UNITS                    |
| <b>B.</b> WIRING DIAGRAM            | <b>F.</b> RIGHT HAND - DIESEL AND GASOLINE<br>POWERED UNITS |
| <b>C.</b> GAUGES ON STEERING COLUMN | <b>G.</b> WIRING DIAGRAM                                    |
| <b>D.</b> WIRING DIAGRAM            |   |
| 1. HOURMETER                        | 5. INDICATOR LIGHTS   |
| 2. ENGINE COOLANT TEMPERATURE GAUGE | 6. 8-PIN CONNECTOR  |
| 3. 4-PIN CONNECTOR                  | 7. COVER WITH LOGO  |
| 4. FUEL LEVEL GAUGE                 |   |

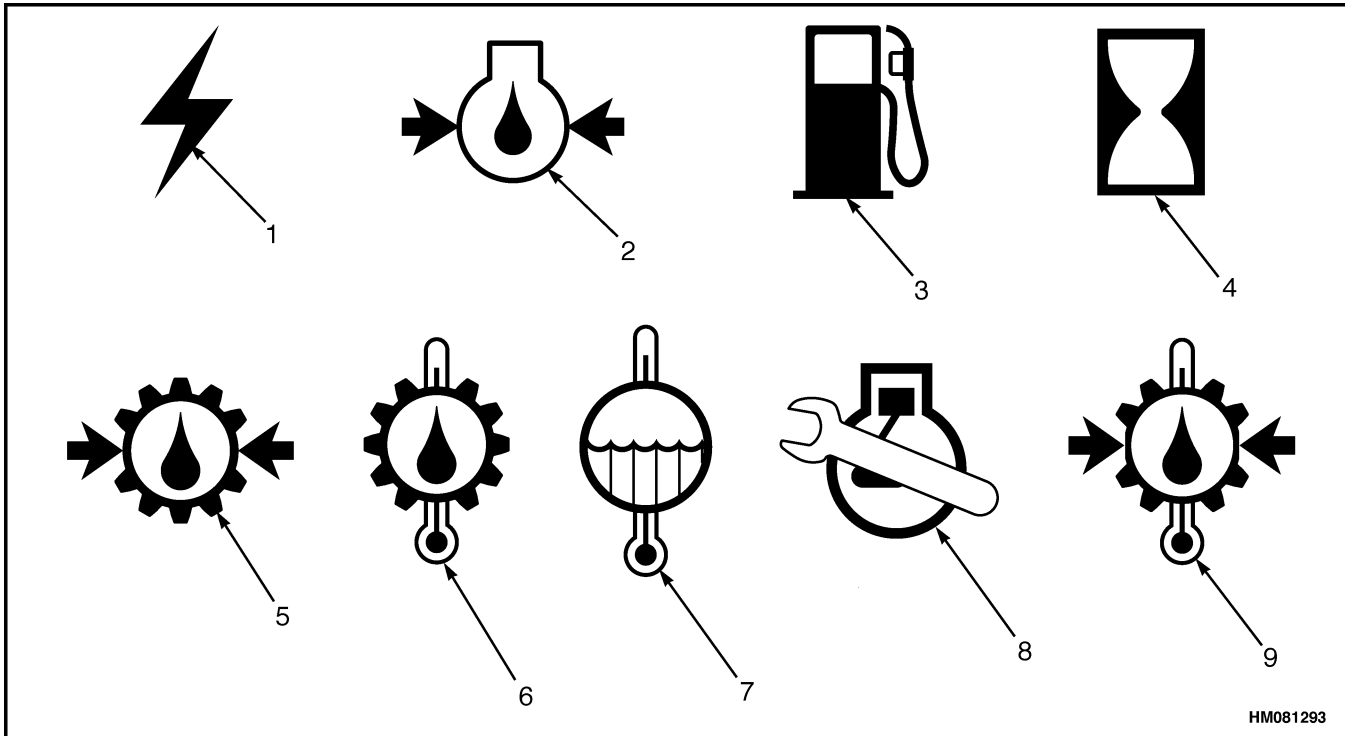


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Figure 5. Steering Column Meters for H/S6.00-7.00XL (H/S135-155XL, S155XLS) (C024) (G006)

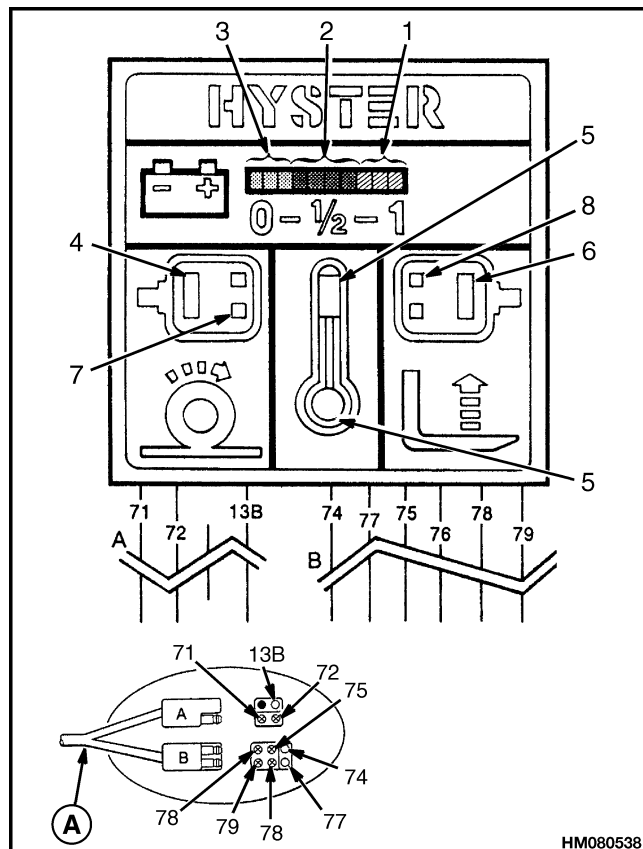
*Legend for Figure 5*

- |   |   |
|---|---|
| <b>A.</b> LEFT HAND - ALL UNITS             | <b>C.</b> RIGHT HAND GASOLINE POWERED UNITS |
| <b>B.</b> RIGHT HAND - DIESEL POWERED UNITS | <b>D.</b> RIGHT HAND - LPG POWERED UNITS    |
| 1. INSTRUMENT CLUSTER                       | 4. FUEL LEVEL GAUGE                         |
| 2. HOURMETER                                | 5. INDICATOR LIGHTS                         |
| 3. ENGINE COOLANT TEMPERATURE GAUGE         |   |



- |                         |                                 |
|-------------------------|---------------------------------|
| 1. ALTERNATOR INDICATOR | 5. TRANSMISSION OIL PRESSURE    |
| 2. ENGINE OIL PRESSURE  | 6. TRANSMISSION OIL TEMPERATURE |
| 3. FUEL LEVEL           | 7. COOLANT TEMPERATURE          |
| 4. HOUR METER           | 8. CHECK ENGINE INDICATOR       |
|                         | 9. INDICATOR LIGHTS             |

**Figure 6. Meter Face Symbols for H/S6.00-7.00XL (H/S135-155XL, S155XLS) (C024) (G006)**



#### A. TO DISPLAY PANEL

1. BATTERY INDICATOR LED, GREEN (3)
2. BATTERY INDICATOR LED, YELLOW (4)
3. BATTERY INDICATOR LED, RED (3)
4. TEMPERATURE ALARM, TRACTION MOTOR
5. TEMPERATURE ALARM, (ILLUMINATES WITH 4 OR 6)
6. TEMPERATURE ALARM, HYDRAULIC MOTOR
7. BRUSH WEAR INDICATORS, TRACTION MOTOR
8. BRUSH WEAR INDICATORS, HYDRAULIC MOTOR
13. B - BATTERY POSITIVE
71. BATTERY NEGATIVE
72. BATTERY INDICATOR
74. TRACTION MOTOR TEMP.
75. TRACTION BRUSH WEAR
76. TRACTION BRUSH WEAR
77. PUMP MOTOR TEMP.
78. PUMP BRUSH WEAR
79. PUMP BRUSH WEAR

**Figure 7. LED Display Panel (Some Earlier Electric Lift Trucks)**

## Brush Wear Indicators

The brush wear indicators illuminate when the motor brushes must be replaced. The earlier units have two indicators for the traction motor and two for the pump motor. See Figure 7. The later display unit has one indicator for each motor. See Figure 9 and Figure 10. The sensor wires for the brush wear indicators are an insert in the brush material when the brush is made. The sensor wires are insulated from the brush material. When the brush wears within approximately 0.060 inch of the brush lead, the insulation between the sensor wire and the brush material is destroyed. The connection between the brush and the sensor wire causes the indicator to illuminate.

The operation of the brush wear indicators can be checked during periodic maintenance. The battery must be removed from the lift truck for access to the motors. See Figure 8.



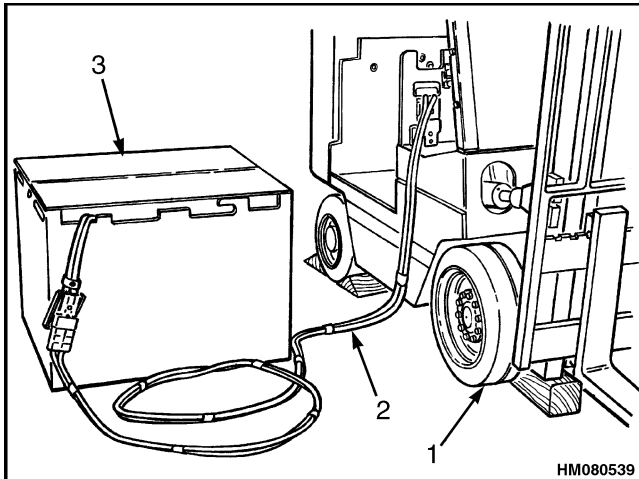
### WARNING

**Lift truck movement can cause an injury or damage. Raise the drive wheels from the floor to prevent lift truck movement. Use the correct procedure in the Operating Manual or the section Periodic Maintenance of the Service Manual to raise the drive wheels.**

Use a jumper cable so that the battery can be connected and still have motor access. Disconnect the sensor wires, one at a time, from the outside of the motor case. Touch the end of the sensor wire to battery negative. The LED indicator will illuminate if the circuit is operating correctly. The motor brushes must be replaced when they are worn. If equipped with brush wear indicators, the condition of the commutator and the motor brushes must still be checked during periodic maintenance.

## Motor Temperature Indicators

The traction motor and the hydraulic pump motor have thermal switches inside the motors. See Figure 7 and Figure 9. When the temperature increases to 300°F for Prestolite motors or 338°F for GE motors, the thermal switch closes and the LED (ZX or earlier units) on the instrument panel display illuminates. This temperature is set by the manufacturer of the motor and is below the temperature where the insulation in the motor will have reduced life.

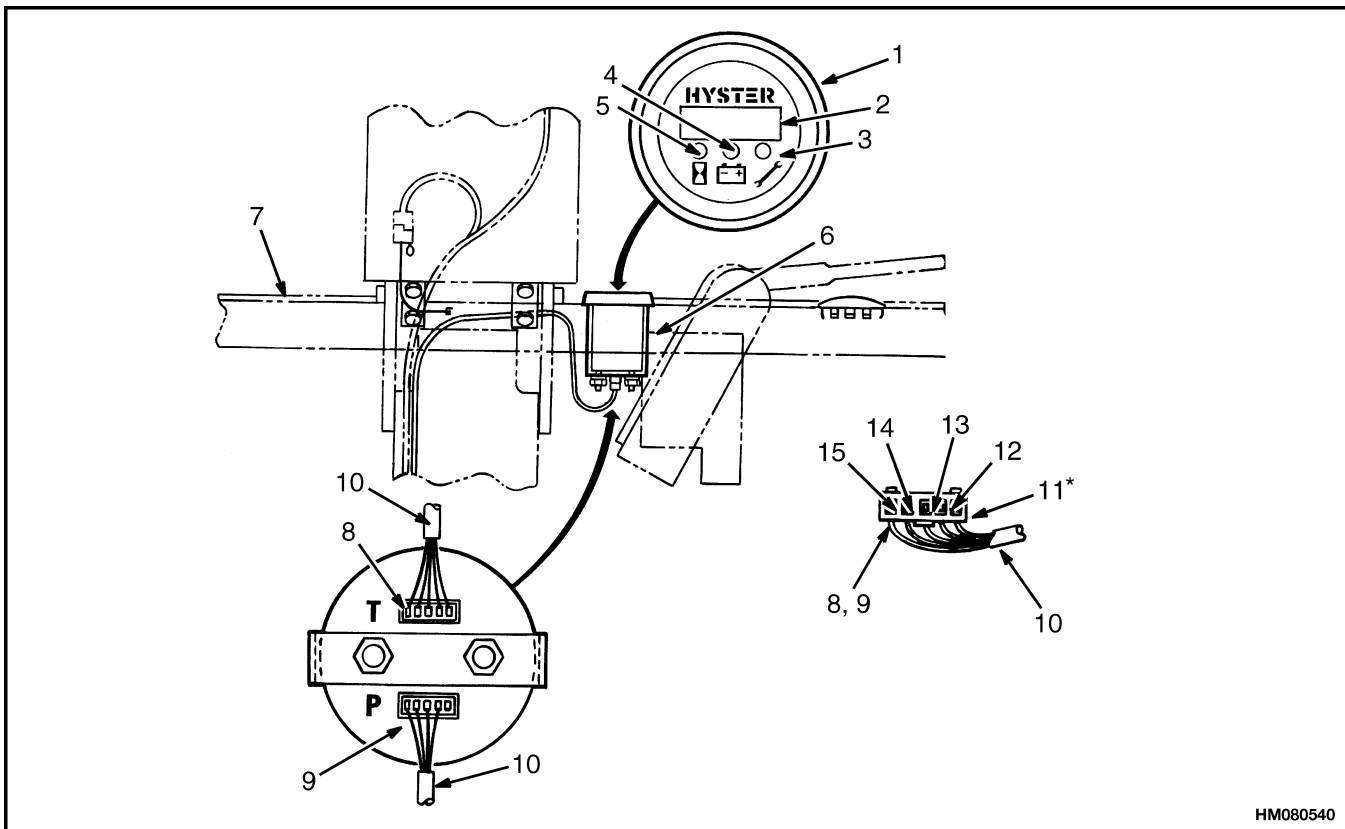


**Legend for Figure 8**

Connect the battery so that the motor can be operated. The battery must be removed for access to the motor. Use a jumper cable to connect the battery to the lift truck. Raise the drive wheels. See "How to Raise Drive Wheels" in the section **Periodic Maintenance** for your lift truck or the **Operating Manual** for your lift truck.

- 1. RAISE DRIVE WHEELS
- 2. JUMPER
- 3. BATTERY

**Figure 8. Connect Battery So Motor Can be Operated**



**Figure 9. GE Instrument Panel Display and Plug Connector E40-60XL**



*Legend for Figure 9*

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. DISPLAY UNIT</li> <li>2. FOUR DIGIT DISPLAY</li> <li>3. FUNCTION INDICATOR, STATUS CODE (GREEN LED)</li> <li>4. FUNCTION INDICATOR, BATTERY (GREEN LED)</li> <li>5. FUNCTION INDICATOR, HOURMETER (GREEN LED)</li> <li>6. MOUNT FOR DISPLAY UNIT</li> <li>7. INSTRUMENT PANEL</li> </ol> | <ol style="list-style-type: none"> <li>8. CONNECTOR FOR MOTOR CONTROLLER, TRACTION</li> <li>9. CONNECTOR FOR MOTOR CONTROLLER, LIFT PUMP</li> <li>10. TO CONTROL CARD PLUG Y</li> <li>11. RED*</li> <li>12. WHITE</li> <li>13. GREEN</li> <li>14. BARE</li> <li>15. GREEN</li> </ol> |
|--|--|

\*TRACTION CARD PLUG ONLY

**WARNING**

**Lift truck movement can cause an injury or damage. Raise the drive wheels from the floor to prevent lift truck movement. Use the correct procedure in the Operating Manual or the section Periodic Maintenance of the Service Manual to raise the drive wheels.**

The operation of the motor temperature indicators can be checked during periodic maintenance. The battery must be removed from the lift truck for access to the motors. See Figure 8.

Use a jumper cable so that the battery can be connected and still have motor access. Disconnect the sensor wires from the outside of the motor case. Touch the ends of the sensor wires together. The LED indicator will illuminate if the circuit is operating correctly. The thermal switch can be replaced if it has a malfunction. However, the motor must be disassembled to replace the thermal switch.

**LX SERIES DISPLAY PANEL****WARNING**

**Some adjustments can cause the lift truck to operate differently than normal. This different operation of the truck can result in personal injury or damage. Do NOT try to make adjustments for the instrument panel display without using the procedures in the section EV-100/200 LX Series Diagnostic Motor Controller and Handset 2200 SRM 460.**

There are two instrument panel displays used on some electric lift trucks that have the EV-100/200 "LX" series control cards. Both instrument panel displays are shown in Figure 9 and Figure 10. These instrument panel displays are optional on some electric lift trucks with the EV-100 or EV-200 LX series motor controller.

The early unit has a four digit display and three LED function indicators. The indicators show which function value is displayed by the digits. Not all functions are available on all lift truck models. Following is a list of the functions: Battery Indicator, Status Codes, Traction Hourmeter and Pump Hourmeter. Later units have the same digital display and the same function indicators with the additional motor brush wear indicator and temperature alarm indicator LED's.

The following paragraphs describe how the circuit for each function operates. The display panel must be replaced as a complete unit. The sensors for brush wear and motor temperature can be replaced as separate parts.

The digits show the operating hours when the hourmeter function indicator is ON. When the battery indicator is ON, the digits show the charge condition of the battery. See Figure 9 and Figure 10. The status code indicator is ON when the digits show the status code number. The brush wear or temperature alarm indicators of the later units will be ON if the traction or pump motor brushes are too worn or the motor is too hot. Refer to the descriptions Brush Wear Indicators and Motor Temperature Indicators for a complete description of the operation of these indicators.

**Hourmeter Functions**

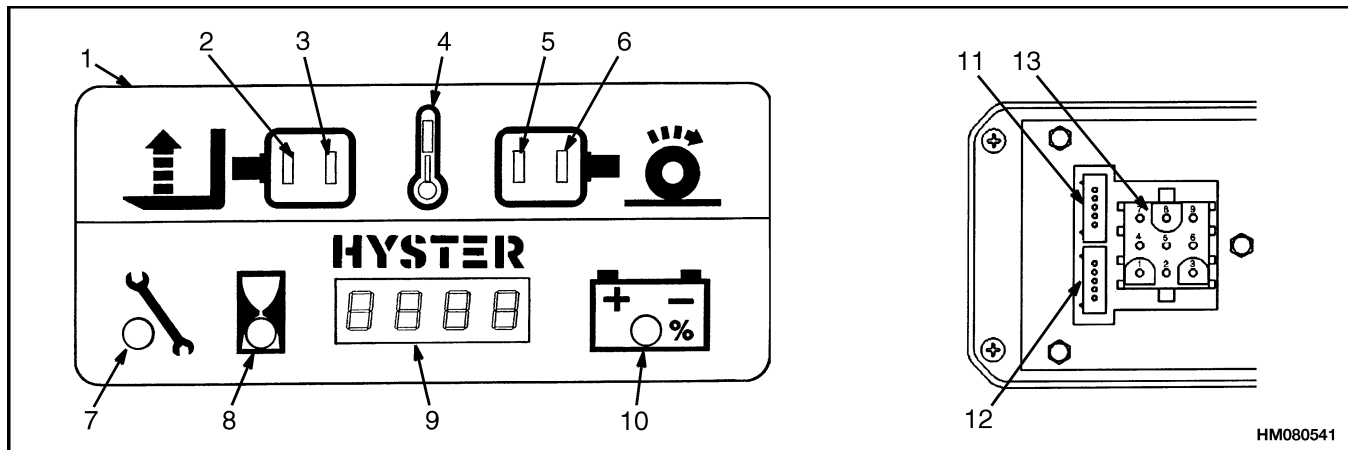
The hourmeter function on the instrument panel display is controlled by the EV-100/200 "LX" series control card. There can be a display for the operating time of the traction circuit. On some units, there can also be a display for the operating time of the pump circuit. Only those units that have the EV-100LXP pump control card can have the optional pump hourmeter function.

The instrument panel display shows the operating time of 0000 to 9999 hours. The traction time is displayed for four seconds after the lift truck has been operating and the key is turned to the **OFF** position. If there is a pump hourmeter, the pump time will now be displayed for another four seconds.

**Battery Indicator Function**

**NOTE:** See the SRM section **Battery Indicators** 2260 SRM 138 for a more complete description of the operation and the adjustment and repair procedures.

The battery indicator reading is displayed on the four digit display when the green function indicator above the battery symbol is ON. See Figure 9 and Figure 10.



9-Pin Connector Wiring		
Pin No.	Wire No.	Connection/Function
1	95	Traction Motor Temperature
2	96	Pump Motor Temperature
3	93	Traction Motor Brush (A) Wear
4	94	Traction Motor Brush (B) Wear
5	98	Pump Motor Brush (A) Wear
6	99	Pump Motor Brush (B) Wear
7	-	Not Used
8	13	Battery Negative
9	10	Battery Positive from Key Switch

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1. DISPLAY UNIT</li> <li>2. BRUSH WEAR INDICATOR, HYDRAULIC MOTOR (YELLOW LED)</li> <li>3. TEMPERATURE ALARM, HYDRAULIC MOTOR (RED LED)</li> <li>4. TEMPERATURE ALARM (RED LED) (ILLUMINATES WITH 3 OR 5)</li> <li>5. TEMPERATURE ALARM, TRACTION MOTOR (RED LED)</li> <li>6. BRUSH WEAR INDICATOR, TRACTION MOTOR (YELLOW LED)</li> </ul> | <ul style="list-style-type: none"> <li>7. STATUS CODE FUNCTION INDICATOR (GREEN LED)</li> <li>8. HOURMETER FUNCTION INDICATOR (GREEN LED)</li> <li>9. FOUR DIGIT DISPLAY</li> <li>10. BATTERY FUNCTION INDICATOR (GREEN LED)</li> <li>11. CONNECTOR, HYDRAULIC PUMP CARD</li> <li>12. CONNECTOR, TRACTION CARD</li> <li>13. 9-PIN MOTOR CONNECTOR</li> </ul> |
|---|--|

**Figure 10. ITW Instrument Panel Display E40-60XL**

This battery indicator uses the traction control shunt to measure the current during operation. This current and battery voltage are checked at the same time for an accurate reading of battery voltage with a load (during use). This method of checking voltage and current is much more accurate than other methods used by battery indicators on earlier lift trucks. This method allows more usage of the battery. Lift truck operation can be different than with other battery indicators when a battery is low or a different battery is connected.

The battery indicator function shows the battery charge by the numbers between 0 and 100. The digital display will flash when the display reads 19. At a display of 9 (80% discharged), the control will disable the lift pump circuit. After the circuit has disabled the lift pump, charge or change the battery.

The control also checks the battery voltage each time a battery is connected. The traction control will prevent lift truck operation if the battery voltage is not correct as set by the traction function of the control card. A status code of -16 (voltage too high) or -15 (voltage too low) will show on the instrument panel display. The battery can have a voltage that is too high or too low. A battery with the correct voltage can also be over discharged from use or other reasons and have a voltage that is less than the minimum voltage range.

### Status Code Function

The status codes are code numbers for different symptoms that the control card can sense. The control card will show this code number on the digital display. The control card will flash the status code

on the display. Every third display will show the battery charge instead of the status code.

**NOTE:** See the section **EV-100/200 LX Series Diagnostic Motor Controller and Handset** 2200 SRM 460 for a description of the different status code displays.

## ZX SERIES DISPLAY PANELS

### Display Panel



#### WARNING

**Some adjustments can cause the lift truck to operate differently than normal. This different operation of the truck can result in personal injury or damage. Do NOT try to make adjustments for the instrument panel display without using the procedures in the section EV-100/200ZX Motor Controller Parameter Tables 2200 SRM 595.**

There are two display panels available on lift trucks with the EV-100ZX SCR motor controller. The lift trucks can only have one of the two display panels:

- a basic display that gives the operator basic information about the operation of the lift truck
- a performance display that includes diagnostic capabilities similar to the Handset.

### Basic Display Panels

The EV-100 "ZX" Series motor controller can have two Basic display panels that include one of two types of Battery Indicators. See Figure 11 and Figure 12.