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General



WARNING

If the lift truck has been operated using a low battery, check all contactors for welded contacts before connecting a charged battery. Lift truck operation cannot be controlled if the contacts are welded.



CAUTION

Do not operate an electric lift truck with a discharged battery. Continued operation can damage contactors, motors, and the battery.

This section has a description and the repair and adjustment procedures for the different battery indicators used on electric lift trucks.

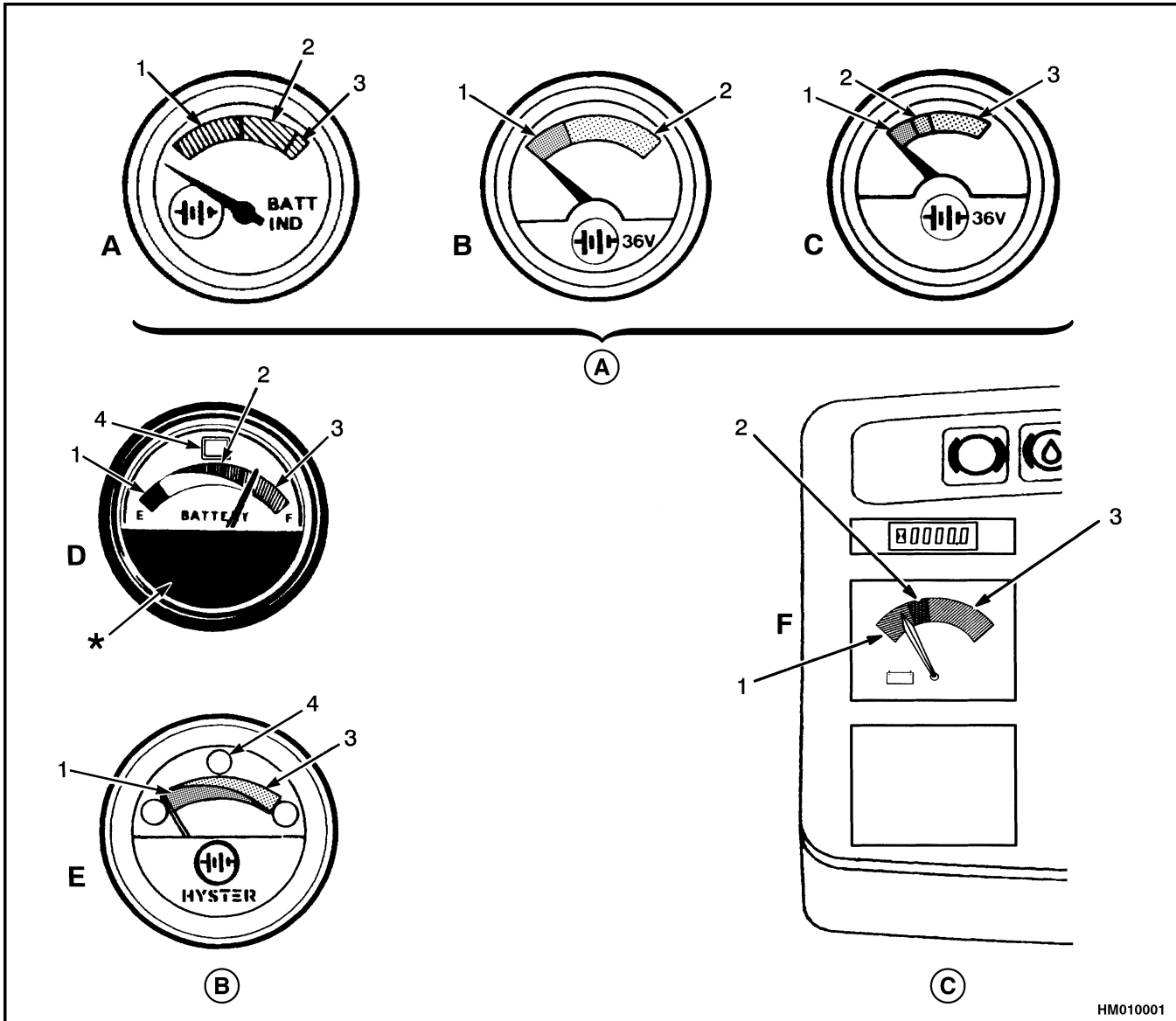
INDICATORS WITH METER MOVEMENTS

The lift truck can have one of two types of battery indicators. One type of indicator does not have Lift Interrupt and is not adjustable. See Figure 1. The other type of battery indicator has Lift Interrupt and is adjustable for different batteries or operating conditions. See Figure 2. The indicator that does not have Lift Interrupt is a voltmeter. The face of the meter has a green and red band. Some meters also have a yellow band between the red and green bands. During operation, the indicator needle moves from the green to the red band to indicate a discharged battery. When the battery is fully charged, the needle is in the green band.

The early (D of Figure 1) battery indicator with Lift Interrupt automatically measures the charge of the battery. A separate controller for the meter has an electronic circuit. This circuit controls the meter movement, a warning light (early units only), and an electronic switch for the main hydraulic pump. The circuit can remember the charge on the battery when the battery is disconnected and connected. The meter face has a band that is red at the left end

and green at the right. Some indicators have a split area with green on top and yellow on the bottom. Some other meters have a yellow band between the red and green bands. The needle location indicates the battery charge level. When the needle is at the edge of the red area of the band, the warning light illuminates if the indicator has one. At this point, the battery has approximately 5% (reserve) capacity remaining. If the reserve is used, the needle enters the red band and power to the hydraulic pump motor is interrupted until the battery is charged or replaced. Normally there is enough battery power to move the lift truck to a battery charger or to a place where a charged battery can be installed. When the needle of the indicator is in the red band, the battery must be charged or changed. Continued operation will damage the battery, contactors, or motors.

Another of the battery indicators with Lift Interrupt is also a gauge type instrument (E of Figure 1). A separate controller for this indicator has an electronic circuit that controls the indicator needle, a red warning light, and an electronic switch for the main hydraulic pump. The circuit can remember the charge on the battery when the battery is disconnected and connected. This gauge indicator has a band that is a split area with green on the top and red on the bottom. The needle location indicates the battery charge level. When the battery has been discharged so the warning light illuminates, there is still some capacity in the battery. If operation is continued, power to the main hydraulic pump circuit is interrupted (specific gravity is approximately 1.140). This action prevents the operation of the main hydraulic pump. Normally there is enough battery power to move the lift truck to a battery charger or to a place where a charged battery can be installed. When the warning light illuminates, the battery must be charged or changed. Continued operation will damage the battery, contactors, or motors.



- A. BATTERY INDICATORS WITHOUT LIFT INTERRUPT
- B. BATTERY INDICATORS WITH LIFT INTERRUPT

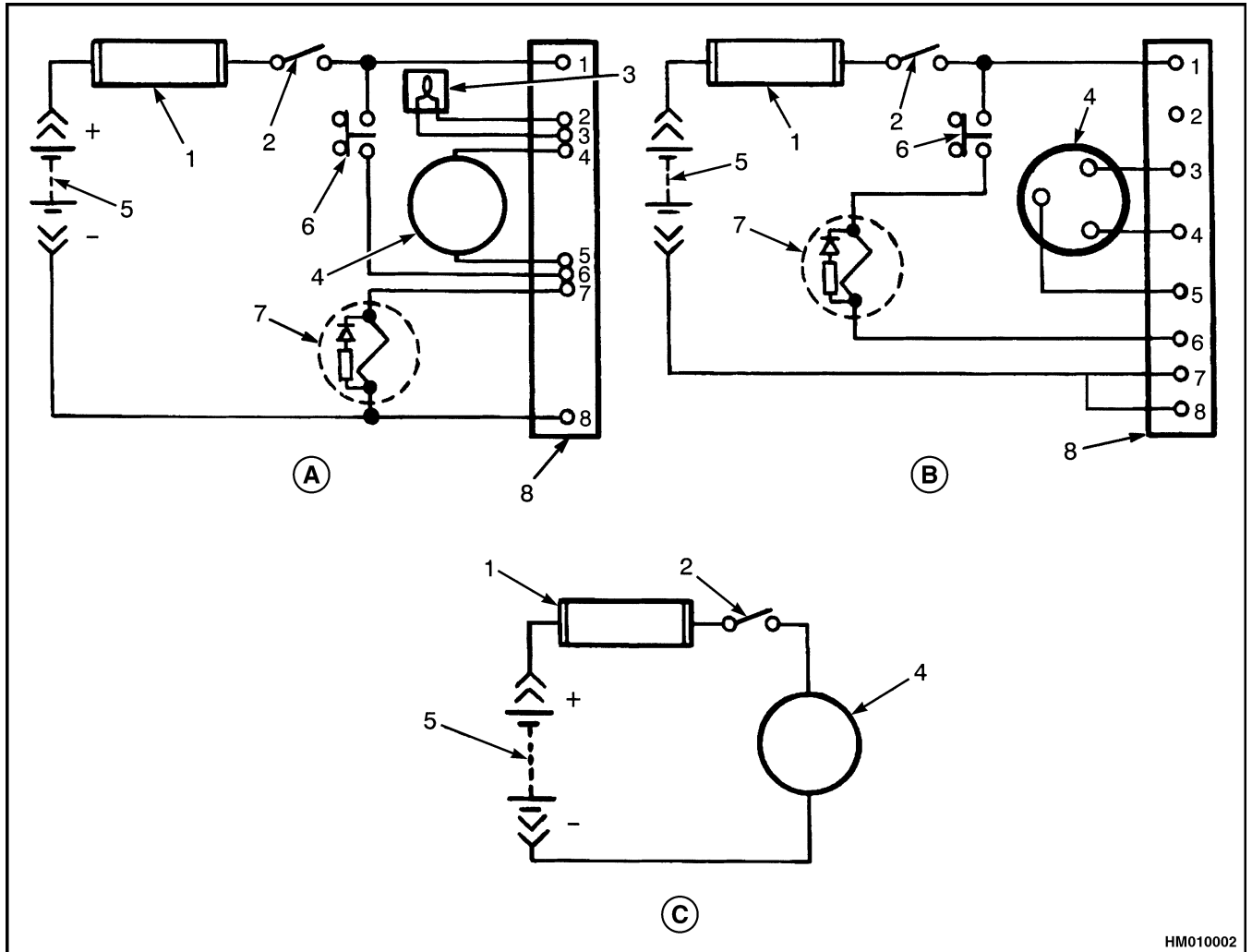
- C. BATTERY INDICATOR WITHOUT LIFT INTERRUPT

- 1. RED BAND
- 2. YELLOW BAND

- 3. GREEN BAND
- 4. LIGHT (LIFT INTERRUPT INDICATOR)

*LOWER METER FACE CAN BE DIFFERENT THAN SHOWN.

Figure 1. Battery Indicators With Meter Movements



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- A. BATTERY INDICATOR, EARLY MODELS (WITHOUT INTERRUPT)
- B. BATTERY INDICATOR, LATER MODELS (WITH LIFT INTERRUPT)
- C. BATTERY INDICATOR (WITHOUT LIFT INTERRUPT)

- | | |
|-----------------------------------|------------------------------|
| 1. FUSE | 5. BATTERY |
| 2. KEY SWITCH | 6. PUMP MOTOR SWITCH |
| 3. LIFT INTERRUPT INDICATOR LIGHT | 7. PUMP MOTOR CONTACTOR |
| 4. BATTERY INDICATOR | 8. CONTROLLER TERMINAL STRIP |

Figure 2. Electrical Circuits for Battery Indicators With Meter Movements

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

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BATTERY INDICATORS WITH LCD OR LED DISPLAYS

NOTE: The Lift Interrupt function on lift trucks that have the EV-100ZX or the EV-T100 motor controllers is part of the control card. These lift trucks also have one of three display panels. The early Basic Display Panel has a mechanical meter for a battery indicator (voltmeter). See Figure 1. Later basic display panels have a set of vertical LEDs beside colored bars. The Performance Display Panel has a bar scale of Light Emitting Diodes (LEDs) for the battery indicator. See Figure 3. The battery indicators discussed here do not use mechanical meters to show the battery charge.

There are battery indicators that are parts of display panels or meter faces that include other indicators. See the section **Instrument Panel Indicators and Senders** 2200 SRM 143 for these other indicators.

Some of these battery indicators also have the Lift Interrupt function to help prevent damage to motors, contactors, and batteries. Lift Interrupt prevents motor operation of the main (lift) hydraulic pump when the battery discharges to a value too low for continued operation.

Some of the battery indicators have a Liquid Crystal Display (LCD) to show the state of charge of the battery. Others have red, yellow, and green LEDs to show the state of charge.

Liquid Crystal Displays

Display Panels Description (ZX or Earlier Motor Controllers)

These battery indicators use LCDs, using numeric digits to show the battery condition. This same LCD also shows other functions. See the section **Instrument Panel Indicators and Senders** 2200 SRM 143 for the other functions. The function that is being displayed is indicated by a light at the symbol for that function. The symbol for the battery indicator function is a battery.

The EV-100/200 LX Series motor controller can have a display panel that includes the Battery Indicator Function. There can also be a round (meter style) indicator that includes the Battery Indicator Function. The battery indicator reading is shown on the

four-digit LCD display when the function LED indicator at the battery symbol is illuminated. See Figure 3. Also see Figure 4.

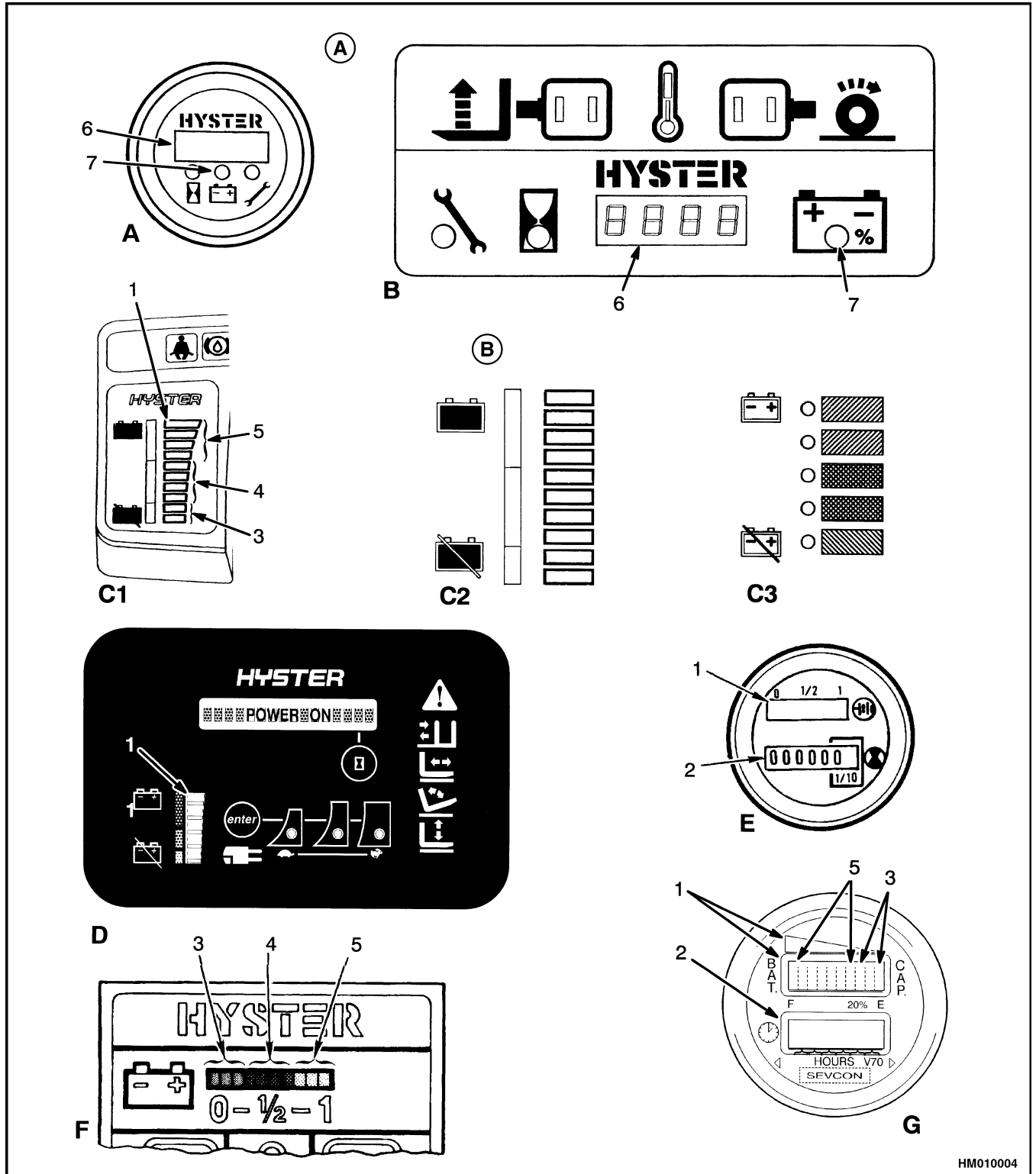
There is one indicator that has a round face, green LED function indicators for the hourmeter, and service and battery indicator, as well as an LCD display. See Figure 4. The LCD display shows the value for each of the three functions when that function's LED is illuminated. This battery indicator is a voltmeter without LIFT interrupt and is installed on some lift trucks with the LX series of motor controller.

This battery indicator uses the traction control shunt to measure the current during operation. This current and battery voltage is checked at the same time for an accurate reading of battery voltage with a load (during use). By employing such a method, a more accurate reading is provided than from previous battery indicators used on earlier lift trucks. This method can also make operation of the lift truck different when the battery is low or when a different battery is connected because it generates more usage of the battery.

The battery indicator function shows the battery charge represented by numbers between 0 and 100. The digital display will flash when the digital 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 traction function of the control card. The battery voltage can be too high or too low. A status code of -16 (too high) or -15 (too low) will show on the instrument panel display. A battery with the correct voltage can also be over discharged from use or for other reasons and can have a voltage that is less than the minimum rated range.

Batteries that have different amp hour ratings or are of different ages can sometimes be used in the same lift truck. It can be necessary to adjust traction function 14 so the weakest battery is not damaged.



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Figure 3. Battery Indicators with LCD or LED Displays (ZX, SEVCON, or Earlier Motor Controllers)