

SERVICE REPAIR

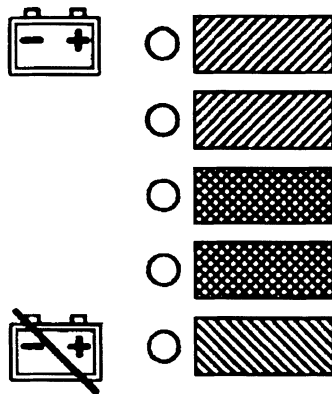
MANUAL

Hyster A218 (W40XT) Forklift

HYSTER

BATTERY INDICATORS

ALL ELECTRIC LIFT TRUCKS



HM010000

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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<p>This section is for the following models:</p> <p>All Electric Lift Trucks</p>
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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.

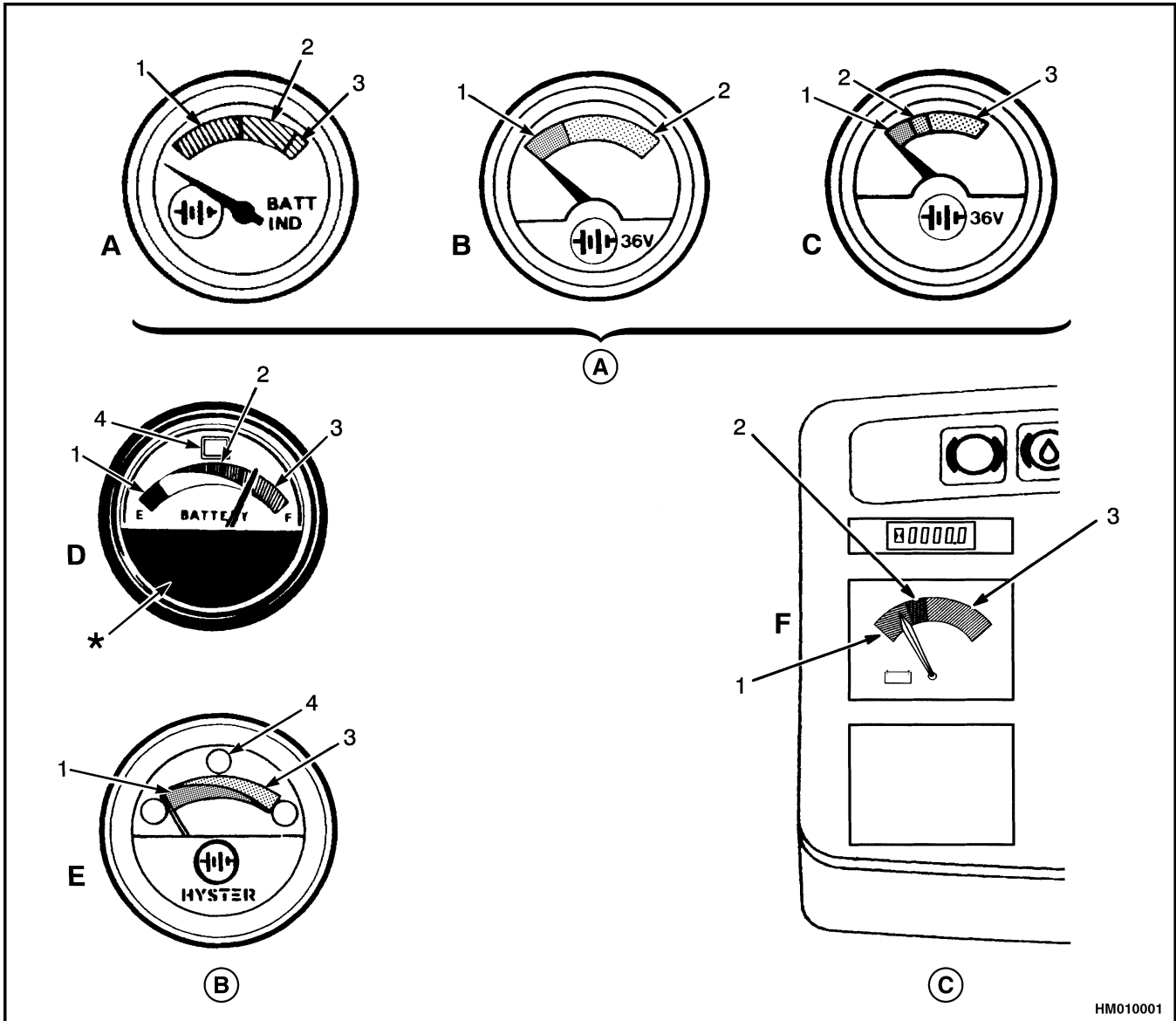
INDICATORS WITH METER MOVEMENTS

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

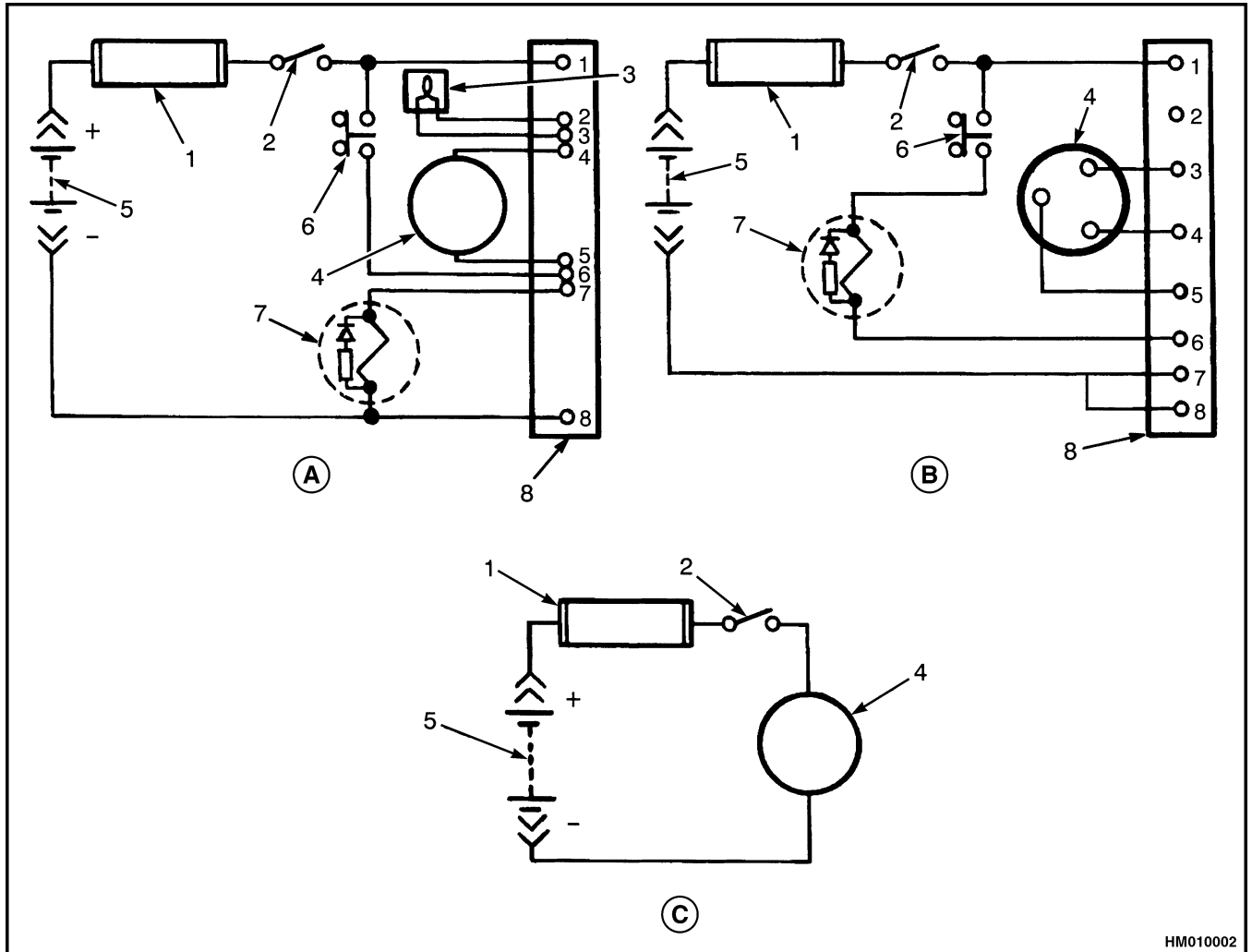
- C. BATTERY INDICATOR WITHOUT LIFT INTERRUPT

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



HM010002

- 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

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.

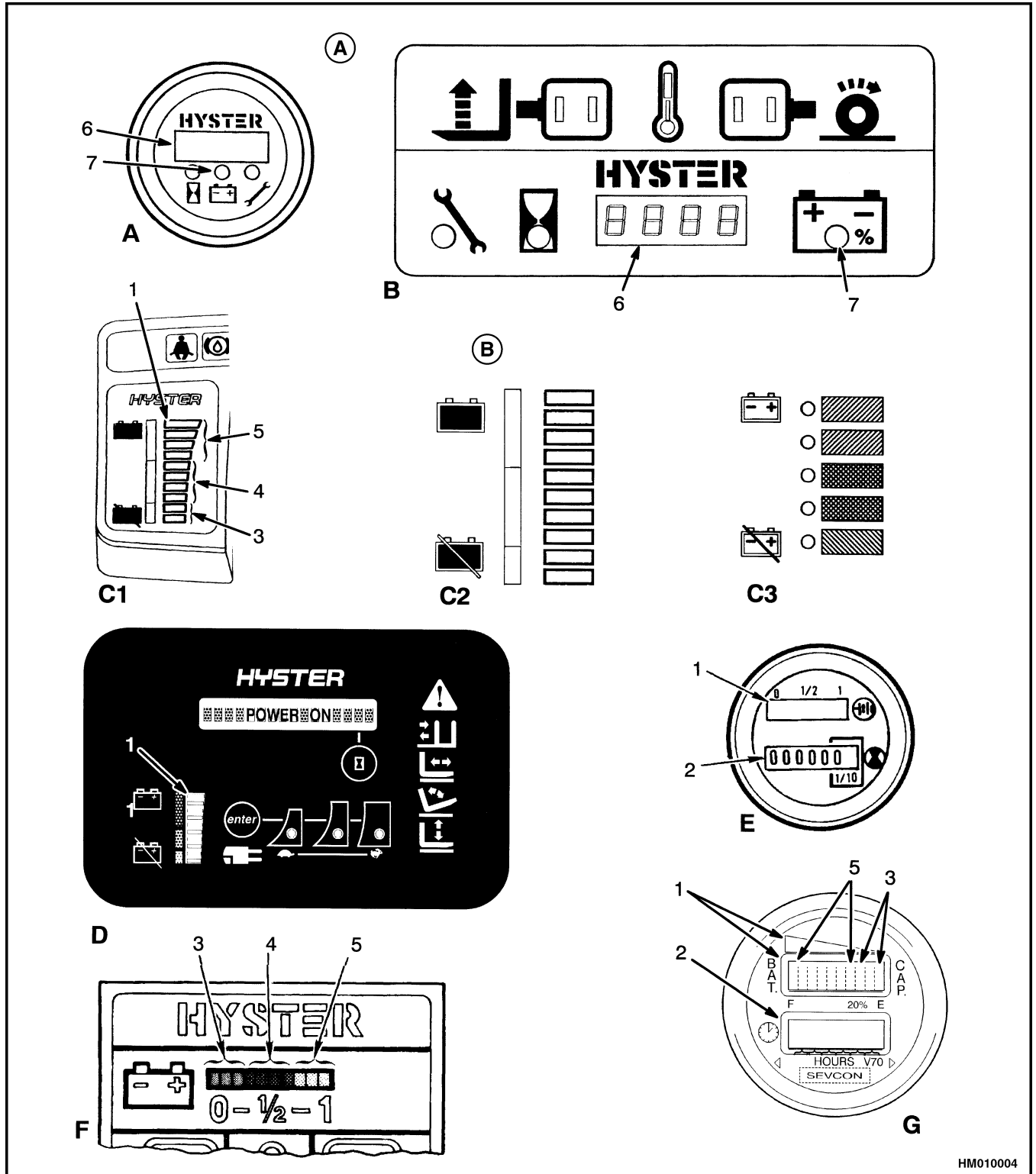


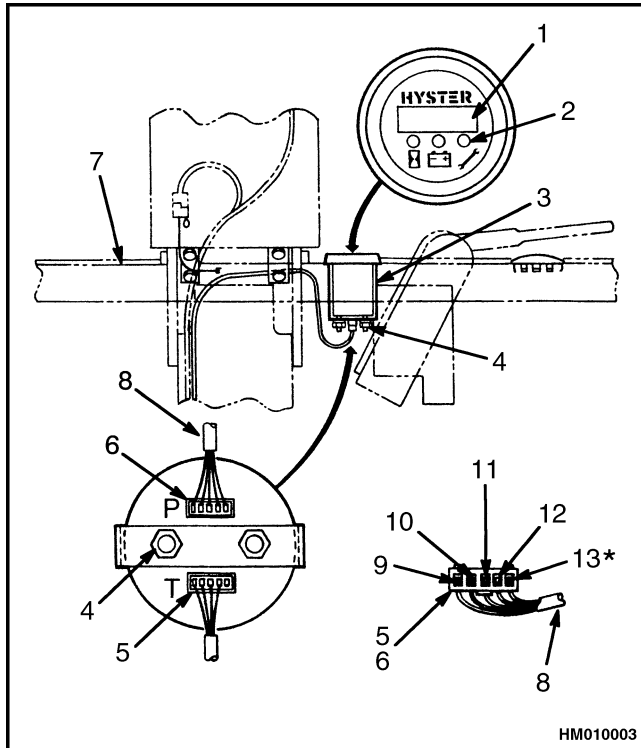
Figure 3. Battery Indicators with LCD or LED Displays (ZX, SEVCON, or Earlier Motor Controllers)

Legend for Figure 3

- A. BATTERY INDICATORS WITH LIQUID CRYSTAL DISPLAYS (LCD)
- B. BATTERY INDICATORS WITH LIGHT EMITTING DIODES (LEDS)

- 1. BATTERY INDICATOR LED DISPLAY
- 2. HOURMETER DISPLAY
- 3. RED LEDES
- 4. YELLOW LEDES

- 5. GREEN LEDES
- 6. LIQUID CRYSTAL DISPLAY
- 7. LIGHT TO INDICATE DISPLAY IS FOR BATTERY



- 1. FOUR-DIGIT DISPLAY
- 2. GREEN FUNCTION INDICATORS
- 3. MOUNT BRACKET
- 4. MOUNT NUTS
- 5. TRACTION PLUG
- 6. PUMP PLUG
- 7. INSTRUMENT PANEL
- 8. TO CONTROL CARD
- 9. GRN
- 10. BARE
- 11. BLK
- 12. NTRL
- 13. RED*

*TRACTION PLUG ONLY

Figure 4. LX Series Instrument Panel Display Battery Indicator

CAUTION

Do not try to adjust the battery indicator function or any other function without following

the procedures in section EV-100/200 LX Series Diagnostic Motor Controller and Handset 2200 SRM 460. Damage to the control card or battery can occur if the handset is not connected and used correctly.

Adjustment of the battery indicator is part of the other adjustments of the control card. These adjustments must be made using the handset for the LX Series motor controllers. The operation of the handset and the adjustment of this and other functions is in the section EV-100/200 LX Series Diagnostic Motor Controller and Handset 2200 SRM 460.

SEM Display Panels Description

These SEM Display Panels are on the instrument panel (dash) to the right of the steering column. Both SEM Display Panels (Standard and Premium) have an LCD screen. See Figure 5. The screen is a display for the operator and is the display for the battery indicator. The Battery Discharge Indicator (BDI) uses a bar graph as a fuel gauge for the battery state-of-charge. See Figure 6. As the battery discharges, the bar gets shorter to show less fuel. The green band near the bar shows the normal operating range for the battery. The yellow band is the area in which the battery can still be operated without damage. This band is yellow to indicate the battery is nearing the point of discharge where it can be damaged with continued hard use. The red band indicates the discharge condition where battery damage can occur. The battery indicator symbol will come on at this time. Charge the battery immediately to prevent battery damage. Continued operation will cause lift interrupt (if enabled) to occur to help prevent battery damage. At lift interrupt, the last two segments of the bar graph are the only ones shown and are alternately ON and OFF. The lift pump motor will not operate and there will be a reduction of travel speed.

Light Emitting Diode Displays



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.

These battery indicators use Light Emitting Diodes (LEDs) of different colors to show the battery condition. There can be a round (meter style) indicator that includes the Battery Indicator Function and separate hourmeter function. See E in Figure 3. There can also be several styles of display panels that include the battery indicator function. These display panels are used on the XL and XM series of lift trucks with the EV-100/200LX, EV-100ZX, and EV-T100ZX motor controllers. The control card of the ZX motor controllers have the Lift Interrupt feature, which can be programmed on or off by qualified personnel using the correct equipment.

Description LX Series

This battery indicator has a band of LEDs that operate when the battery is connected. See F in Figure 3. If the LED at the far right is the only LED illuminated, the battery has a full charge. As the battery discharges, the next LED to the left will go on and the previous LED will go off. When the battery needs charging, the next-to-last LED will flash. If the last two LEDs are flashing alternately, the battery is discharged to the point where damage can occur. Continued operation with the LEDs flashing can damage the battery, motors, or the contactors. The system will automatically reset when a charged battery is connected.

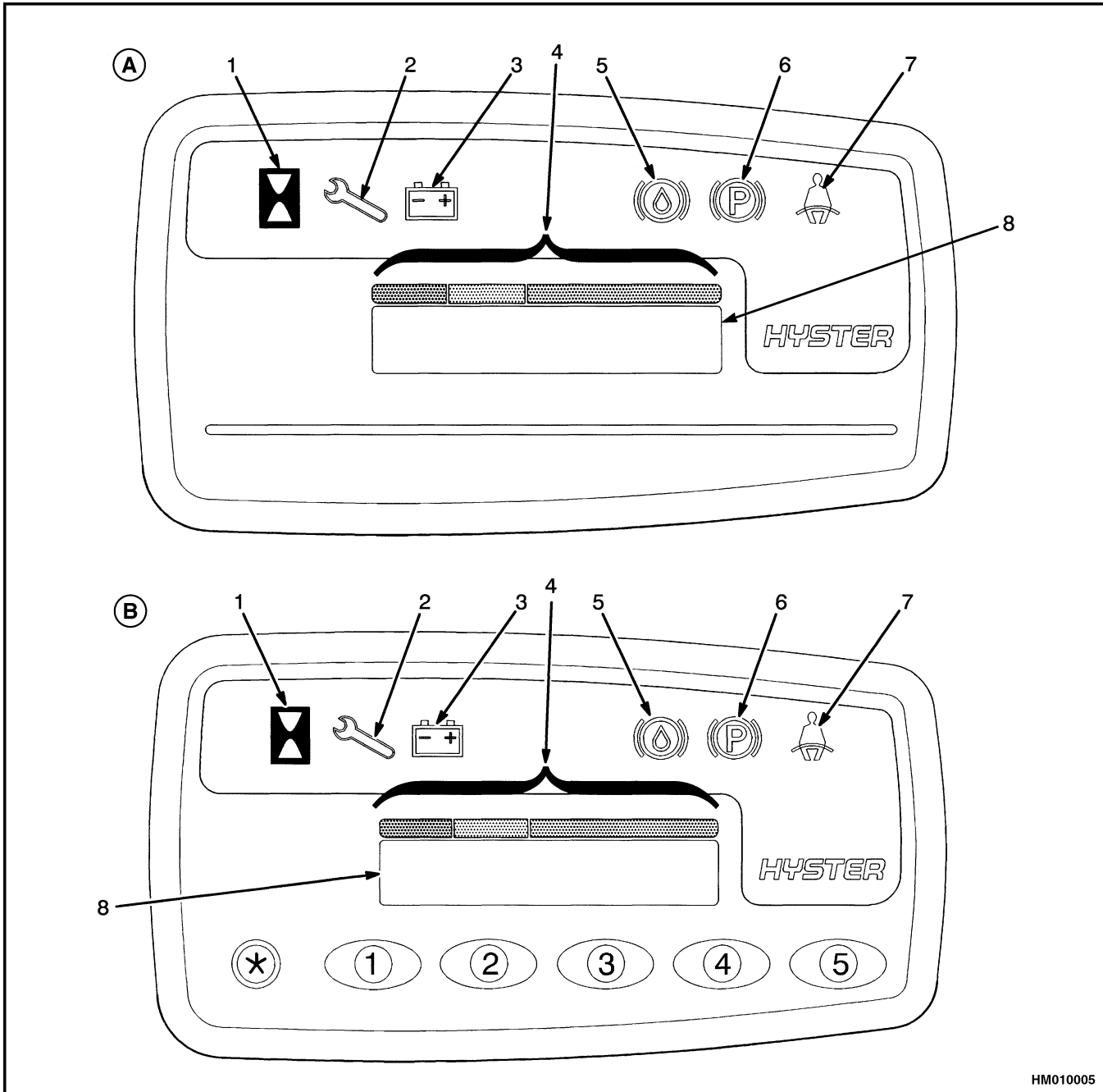
The display panel with the horizontal LED display is installed on some lift trucks with the LX series of motor controller. This battery indicator is a scale with a

series of 10 LEDs in three colors (green, yellow, red). As the battery voltage decreases during operation, different LEDs illuminate to indicate a discharged battery. No more than two LEDs are illuminated at one time. When the battery is fully charged, the two green LEDs at the end of the scale are illuminated. When the battery discharges during operation, the LEDs illuminate from right to left (green to red). All lift trucks with this type of warning indicator display have a lift interrupt. When the battery is discharged to the red section of the battery discharge indicator, the last two LEDs begin to flash just before the lift interrupt is enabled. When the last two LEDs are illuminated continuously, the controller for the battery discharge indicator stops the power to the hydraulic pump motor. 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.

With a fully charged battery, the controller provides approximately a 5-volt signal at terminal 4 to the display. As the battery discharges, the signal at terminal 4 decreases toward zero voltage. When the last red LED begins to flash, the battery is approximately 70% discharged (specific gravity is approximately 1.150). The controller for the battery indicator opens the circuit to the hydraulic pump when the battery is 80% discharged (specific gravity is approximately 1.140).

The controller for the battery discharge indicator for this LED display panel is in the same case as the controllers used for other Hyster Company lift trucks, but will not operate the same. The adjustments for the controller are set by the manufacturer and normally are not changed. If adjustments are required, see the Battery Indicators Replacement section for the instructions on adjustments. The adjustment procedure for this controller is the same as the other controllers used in Hyster Company lift trucks.

NOTE: If the controller must be replaced, make sure Hyster part number 372036 is used. Controllers with other part numbers will not operate correctly.



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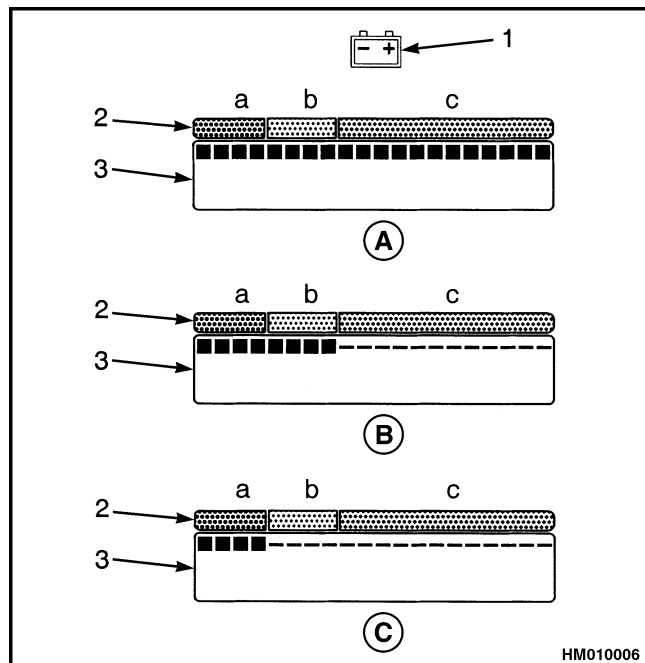
A. STANDARD DISPLAY PANEL

- 1. HOURMETER INDICATOR SYMBOL
- 2. SERVICE REMINDER INDICATOR
- 3. LOW BATTERY INDICATOR
- 4. BATTERY DISCHARGE INDICATOR (BDI)

B. PREMIUM DISPLAY PANEL

- 5. BRAKE FLUID TOO LOW SYMBOL
- 6. PARKING BRAKE SYMBOL
- 7. SEAT BELT SYMBOL
- 8. LCD SCREEN

Figure 5. Battery Indicator With SEM Display Panel



- A.** FULLY CHARGED
B. DISCHARGED TO YELLOW AREA
C. DISCHARGED TO RED AREA
1. BATTERY SYMBOL
 2. COLOR BAR
 A. RED
 B. YELLOW
 C. GREEN
 3. LCD SCREEN WITH SEGMENTS ON

Figure 6. Battery Discharge Display of SEM Display Panels

ZX Series Display Panels Description

The EV-100 ZX Series motor controller can have an instrument panel display that includes two types of Battery Indicators. The earlier Basic Display Panel has a battery indicator without lift interrupt (voltmeter). This meter has a green, yellow, and red band on the meter face to indicate the voltage of the battery. See F in Figure 1. The needle starts in the green band with a fully charged battery and moves to the red band as the battery discharges.

Later basic display panels have a battery indicator that is a scale with a series of five round LEDs in three colors (green, orange, red). See C3 of Figure 3. There are two green LEDs and bars at the top, two orange LEDs and bars in the center, and a red LED and bar at the bottom. As the battery voltage decreases during operation, different LEDs illuminate to indicate a discharged battery. No more than two

LEDs are illuminated at one time. When the battery is fully charged, the two green LEDs of the scale are illuminated. When the battery discharges during operation, the LEDs illuminate from top to bottom (green to red).

All lift trucks with this type of warning indicator display have a lift interrupt. When the battery is discharged to the red section of the battery discharge indicator, the red LED begins to flash just before the lift interrupt is enabled. When the red LED is illuminated continuously, the controller for the battery discharge indicator stops the power to the hydraulic pump motor. 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.

The Performance display panel has a battery indicator with a series of 10 LEDs in three colors (green, orange, red) that have a rectangular shape. See C1 and C2 in Figure 3. As the battery voltage decreases during operation, different LEDs illuminate to indicate a discharged battery. No more than two LEDs are illuminated at one time. When the battery is fully charged, the two green LEDs at the top of the scale are illuminated. When the battery discharges during operation, the LEDs illuminate from top to bottom (green to red). All lift trucks with this type of warning indicator display have a lift interrupt. When the battery is discharged to the red section of the battery discharge indicator, the last two LEDs begin to flash just before the lift interrupt is enabled. When the last two LEDs are illuminated continuously, the controller for the battery discharge indicator stops the power to the hydraulic pump motor. 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.

With these Performance display panels, when the battery is discharged to approximately 70 to 75%, the red LED bars are illuminated and the lift interrupt function will not permit operation of the hydraulic motor. The battery must be charged or a charged battery must be installed before lift truck operation can continue. The top green bar will be illuminated when the battery is more than 90% charged.

The battery charge indicator uses the traction control shunt to measure the current during operation. The current and battery voltages are checked at the same time for an accurate reading of battery voltage with

a load (during use). This method permits better use of the battery charge.

The controller 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 15. The battery voltage can be too high or too low. A status code of -16 (voltage too high) or -15 (voltage too low) will indicate on the digital display. A battery with the correct voltage can also be deeply discharged from use or other reasons and can have a voltage that is less than the minimum rated range.

Batteries that have different ampere 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 of the EV-100ZX motor controller so the weakest battery is not damaged. Follow the procedure for adjusting traction Function 14 in the section **EV-100ZX™ Motor Controller** 2200 SRM 557 or the section **EV-T100™ Motor Controller** 2200 SRM 581.

SEVCON POWERGAUGE™ Battery Display Panel Description

The SEVCON POWERGAUGE™ has been designed to display battery capacity by employing an electronic microprocessor. This microprocessor recognizes the state-of-charge of the battery and has a compensating characteristic to obtain maximum accuracy.

This display panel utilizes a 10-bar LED display (seven green, three red) to indicate the state-of-charge of the battery. See item G in Figure 3. When the battery is fully charged, the green

LED next to the F symbol is illuminated to its highest point (there are seven stages of green that can be highlighted). As the battery voltage decreases during operation, different LEDs illuminate to indicate a discharged battery. When the battery reaches 20% of the charge level, the first red LED lights up. If no action is taken to charge the battery, it will continue to discharge and the second and third red LEDs will illuminate. These last two red LEDs will flash alternately to alert the operator for the need to recharge the battery. Once this point is reached, and after a period of 30 seconds of no electrical activity, power to the hydraulic controls is interrupted. This is known as Lift Interrupt or Lift Lockout. 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.

The lower window on the display panel shows a six-digit LCD hourmeter counter indicating hours and tenths of hours. The hourmeter will operate automatically every time a voltage variation occurs. It will operate for 30 seconds by the last voltage variation before stopping. A flashing clock symbol will then alert the operator that the hourmeter has been activated. The hourmeter requires no additional wiring.

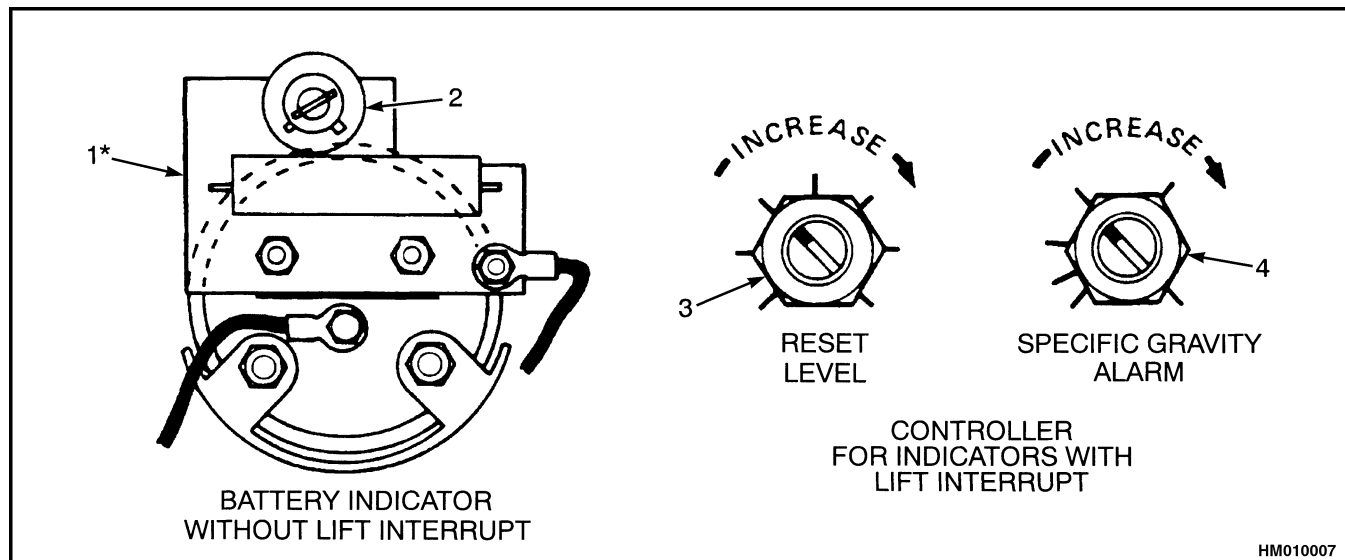
The unit is multi-voltage and automatically recognizes 24-36-48 and 72 volts. The 80-volt models require a simple connection between pins 1 and 4. The unit automatically resets itself when the battery voltage goes above 2.09 volts per cell. Specific Gravity is set at 1.210.

Battery Indicators Without Lift Interrupt Adjustment (Early Models)

The indicator is set at the factory for a specific gravity. This reference voltage is for a battery discharged to a specific gravity of approximately 1.130. This voltage will be different for certain batteries, conditions, capacity, or temperature. Specific applications can cause different settings. The setting must not be below the discharge point. See the battery manufacturer for the discharge point. Adjust the indicator as follows:

NOTE: It is important that the battery is at the exact specific gravity for adjustment. This setting is the reference voltage for indicator adjustment.

1. Check specific gravity of battery during operation of the lift truck until battery discharges to 1.130 (or value needed).
2. Find screwdriver slot on printed circuit board for calibration potentiometer. See Figure 7.
3. Operate hydraulic system at relief setting and hold at this position.
4. Adjust calibration potentiometer so needle is in center of red band.



1. PRINTED CIRCUIT BOARD
2. CALIBRATION POTENTIOMETER

3. RESET POTENTIOMETER
4. SPECIFIC GRAVITY ALARM POTENTIOMETER

*NOT USED ON ALL INDICATORS.

Figure 7. Battery Indicator (Early Models)

Battery Indicators With Lift Interrupt Adjustment (Early Models)

The controller for the battery indicator has two factory-set adjustments. The adjustments are made with the RESET potentiometer and the SPECIFIC GRAVITY ALARM potentiometer. See Figure 7.

RESET POTENTIOMETER

The RESET potentiometer determines the level to which the battery must be charged before the indicator indicates fully charged. The RESET potentiometer is set at the factory to C. The RESET function operates only when a battery has been disconnected for at least 15 seconds and another battery connected. The replacement battery must be charged to at least 90% of its capacity.

Turning the RESET potentiometer from C toward G (clockwise) increases the voltage at which the battery is accepted. The specific gravity of the battery must be more than 1.245.

Turning the RESET potentiometer from C toward A decreases the voltage at which the battery is accepted. The specific gravity of the battery is less than 1.245.

If a battery that is connected does not have the correct specific gravity, the indicator will remain in its original position.

SPECIFIC GRAVITY ALARM

The SPECIFIC GRAVITY ALARM potentiometer determines the level at which the LIFT interrupt function occurs. The potentiometer is set at the factory to N. The N setting is equal to 1.73 volts per cell.

Turning the SPECIFIC GRAVITY ALARM potentiometer from N toward K lets the battery discharge more before lift interrupt occurs.

Turning the SPECIFIC GRAVITY ALARM potentiometer from N toward P lets the battery discharge less before lift interrupt occurs.

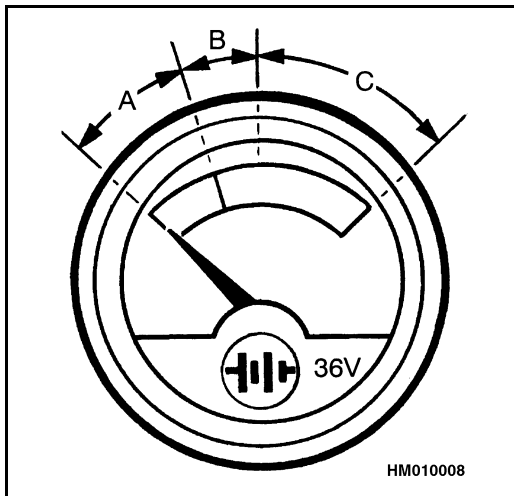
Battery Indicators Without Lift Interrupt Check (Later Models)

There is no adjustment for these indicators. The voltage range, however, can be checked. Check the voltage settings as shown in Table 1. When the hydraulic system is at the relief setting, the indicator is set to

indicate a specific gravity of 1.150. At this time the needle is in the middle of the red band. Replace the indicator if it does not operate correctly.

Table 1. Battery Indicator (Later Models)

Type	Voltage Range		
	A	B	C
12V	8.5 volts	10 volts	13 volts
24V	17 volts	20 volts	26 volts
36V	25 volts	30 volts	40 volts
48V	34 volts	40 volts	52 volts
72V	51 volts	60 volts	78 volts
80V	57 volts	67 volts	87 volts



Battery Indicators With Lift Interrupt Adjustment (Later Models)

The following procedures for the battery indicator apply to both the gauge type LED indicator and the LED display indicator, shown as E and F in Figure 3.

The controller for the battery indicators has two factory-set adjustments. The adjustments are made with the RESET potentiometer and the DISCHARGE potentiometer. See Figure 8.

RESET POTENTIOMETER

The RESET potentiometer determines the level to which the battery must be charged before the indicator indicates fully charged. The RESET potentiometer is set at the factory to C. The RESET function operates only when a battery has been disconnected for at least 15 seconds and another battery connected. The replacement battery must be charged to at least 90% of its capacity.

The RESET potentiometer increases the voltage at which the battery is accepted when turned from C toward G (clockwise). The specific gravity of the battery must be more than 1.245.

The RESET potentiometer decreases the voltage at which the battery is accepted when turned from C toward A. The specific gravity of the battery is less than 1.245.

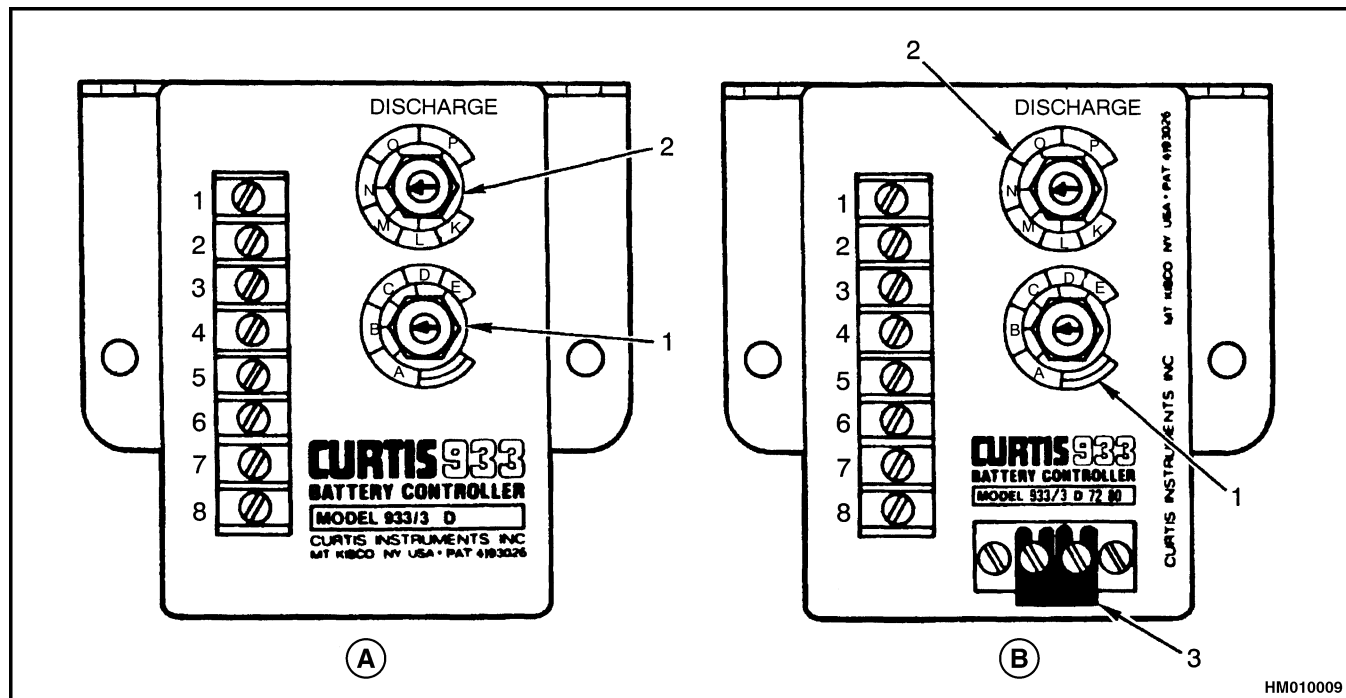
If a battery that is connected does not have the correct specific gravity, the indicator will remain in its original position.

DISCHARGE POTENTIOMETER

The DISCHARGE potentiometer determines the level at which the LIFT interrupt function occurs. The potentiometer is set at the factory to N. The N setting is equal to 1.73 volts per cell.

Turning the DISCHARGE potentiometer from N toward K lets the battery discharge MORE before LIFT interrupt occurs.

Turning the DISCHARGE potentiometer from N toward P lets the battery discharge LESS before LIFT interrupt occurs.



A. 36/48 VOLT

1. RESET POTENTIOMETER
2. DISCHARGE POTENTIOMETER

B. 72/80 VOLT

3. JUMPER (REMOVED FOR 80-VOLT OPERATION)

Figure 8. Battery Indicator Controller (Later Models)

LED Display With Lift Interrupt

NOTE: If battery negative and battery positive are not connected, the display will not operate.

To check the LEDs of the display (F in Figure 3), connect battery negative to terminal 13B and battery

positive to terminal 71, then connect two volts to terminal 72. The second yellow LED will illuminate. Connect four volts to terminal 72. The second green LED will illuminate. With zero volts or an open at wire 72, the first red LED will flash.

Curtis 933-1 Meter Check and Adjustment

CHECK

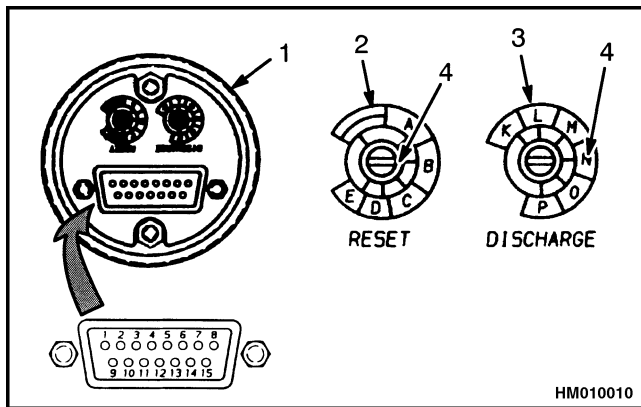
NOTE: This meter has several functions and internal electronic circuits. See A of Figure 3. To make sure the meter is correctly connected and operating correctly, it is necessary to do the following checks. It is only necessary to do these checks if the meter operation is not correct when the adjustments are correctly set. Make sure RESET is set to B and DISCHARGE is set to N. Also make sure there is no jumper installed at the 15-pin meter connector for 48-volt units. There MUST be a jumper wire connected between pins 15 and 4 for 36-volt units.

It is necessary to remove the meter assembly from the display panel to do most of the following checks. Remove the display panel and meter assembly as described in of this section. Hold or fasten the meter and display panel so damage does not occur to the devices or electrical connections. Connect the 15-pin connector to the back of the meter. Connect the 18-pin connector to the back of the display panel.

Access to the connector pins is at the back of the 15-pin connector. The front view of the connector is shown in Figure 9. Make sure the voltmeter probes are touching the correct connector pins.

Reset Check

This check will find out if the meter will reset to Full after a charged battery is connected. Two different checks can be used: Open Circuit (used with a partially charged battery) or High Voltage (used with a fully charged battery). Make sure the meter RESET adjustment is set to B before doing either check. See Figure 9.



15-Pin Connector* (Circuit Board to Meter)	
Pin	Function
1	Battery Positive (B+)
2	Key Switch
3	No Connection
4	Jumper from #15
5	No Connection
6	Lockout (+)
7	Lockout (-)
8	Battery Negative (-)
9-11	Hourmeter
12	No Connection
13	No Connection
14	No Connection
15	Jumper to 34 for 36 or 72 volt operation. No jumper for 12, 48, or 80 volt operation

1. BACK OF METER
2. RESET ADJUSTMENT
3. DISCHARGE ADJUSTMENT
4. SLOT

Figure 9. Curtis 933-1 Meter Reset and Discharge Adjustments

CAUTION

Make sure the meter probes do not damage the connector pins or other components. Make sure the meter probes touch only the correct connector pins.

Open Circuit

Disconnect the battery at the battery connector, then connect the battery again. Measure the voltage between pins 1 and 8 using a digital voltmeter. This voltage must be 2.09 volts minimum per cell.

Example - 36 V battery: 18 cell truck battery × 2.09 volts
= 37.62 volts minimum

Example - 48 V battery: 24 cell truck battery × 2.09 volts
= 50.16 volts minimum

If the voltage is less than the minimum, the meter must not reset. Do the check again using a battery with a higher charge. If the voltage measured is more than the minimum voltage and the meter will not reset, the meter has a malfunction.

If the voltage is less than the minimum and the meter does reset to Full, the internal battery (memory battery) of the meter can be discharged. The meter will still show a correct discharge condition IF a charged battery is connected and is not disconnected during the life of that battery's charge.

NOTE: New meters have a Full reading in their memories. The first connection to a battery will always show a Full charge. After the first connection, the meter will indicate normally according to the battery that is connected.

High Voltage

The meter must reset to Full if the voltage between pins 1 and 8 is 2.35 volts per cell for 6 minutes or more continuously.

Example - 36 V battery: 18 cell truck battery × 2.35 volts
= 42.3 volts minimum

Example - 48 V battery: 24 cell truck battery × 2.35 volts
= 56.4 volts minimum

The voltage must be above the minimum voltage continuously for at least 6 minutes. If the meter will not reset to Full, the meter has a malfunction.

Discharge Check

This check will find out if the meter correctly shows the discharge of the battery. The meter checks the charge condition of the battery when the battery is