INSTRUCTIONS AUTOMOTIVE HANDSET.

GENERAL

The Handset is a multi-functional tool to be used with GE Solid-State controls. The Handset consists of a Light Emitting Diode (LED) display and a keyboard for data entry.

PURPOSE:

The purpose of the Handset is to allow **authorized personnel** to perform the following functions:

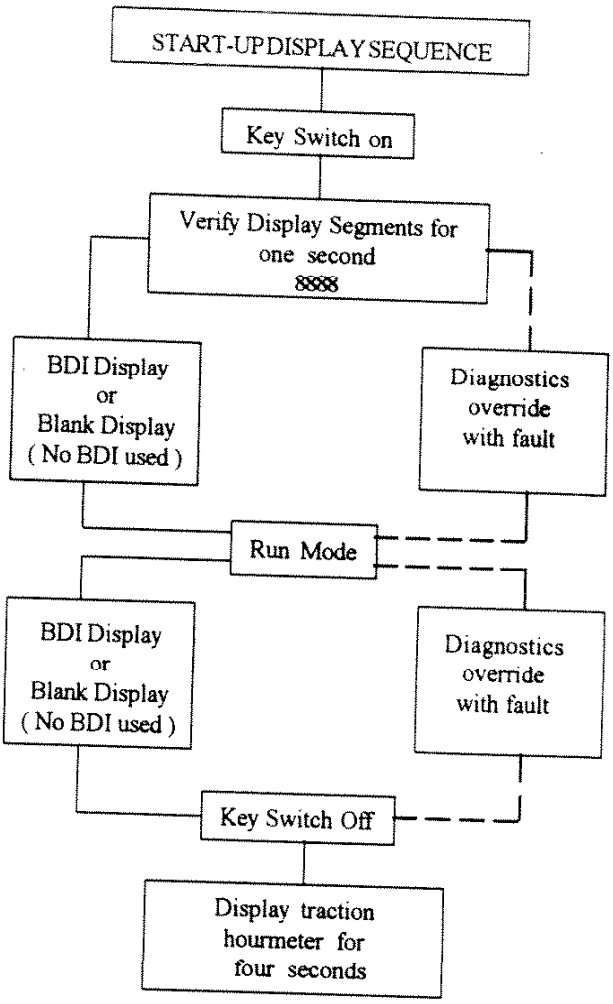
- Monitor existing system fault codes
- Monitor intermittent random fault code
- Monitor battery state of charge on systems with BDI
- Monitor hourmeter reading
- Monitor or adjust the following control functions:
  - Controlled Acceleration for the Armature Circuit.
  - Controlled Acceleration time for the Field Circuit.
  - Minimum Field Voltage Start
  - Regenerative Braking Current Limit and Disable
  - Minimum Field Current for Regenerative Braking
  - Current Limit for Armature Circuit
  - Minimum Field Current
  - Internal Resistance Compensation for Battery State of Charge Indication
  - Battery Voltage
- Selection of Card Operation Type.

OPERATION:

Warning : Before connecting or disconnecting the handset tool, turn off the key switch and place the vehicle in neutral.

NOTE: The vehicle can be operated with the handset connected. **however, the adjustment knob must be set fully clockwise to insure the control operates at top speed.**

At the control traction card, unplug the " Y plug " if the dash display is in use and plug in the handset to the plug location " Y " on the control card. After installing the handset tool , turn on the key switch. The following is the start-up display sequence that will occur:



FUNCTION SET-UP PROCEDURES:

Warning: Before making any adjustments to the control you must consult the operating and maintenance instructions supplied by the vehicle manufacturer. Failure to follow proper set up instructions could result in misoperation or damage to the control system.

With the Handset connected , hold down the CONT key and turn on the key switch. This will place you in the set up mode, ready to monitor or adjust control function settings.

NOTE: The term "push", means to depress key for approximately **one second**.

SET UP MODE

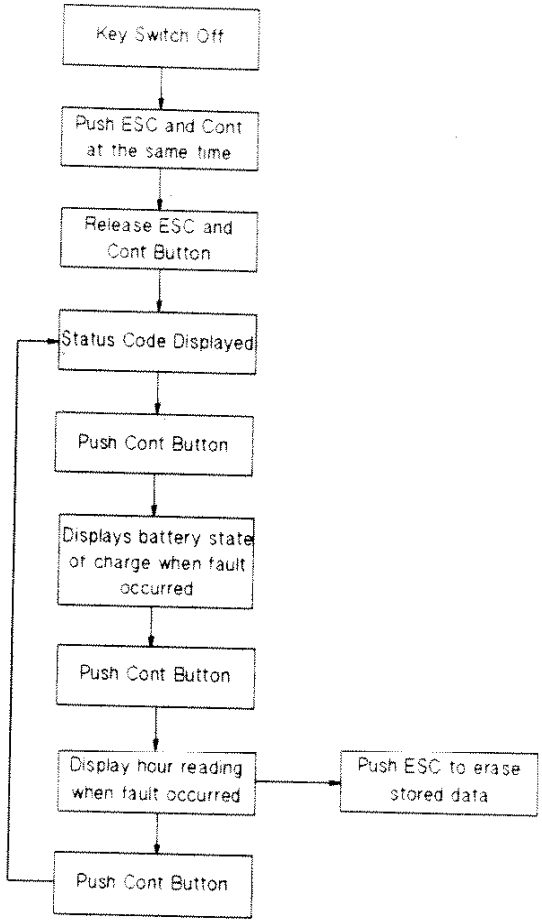
Action	Display shows	Remarks
Hold down CONT, turn on key	8888	Segment check displayed
Push function number	U 005	Selected function number is displayed
After one second time delay	085	Stored value for the function is displayed
Push CONT	085	Displayed value will blink
Change value with adjustment knob	125	Value changes while blinking
Push STORE	125	New value stored and blinking stops
Push ESC	8888	Segment check displayed

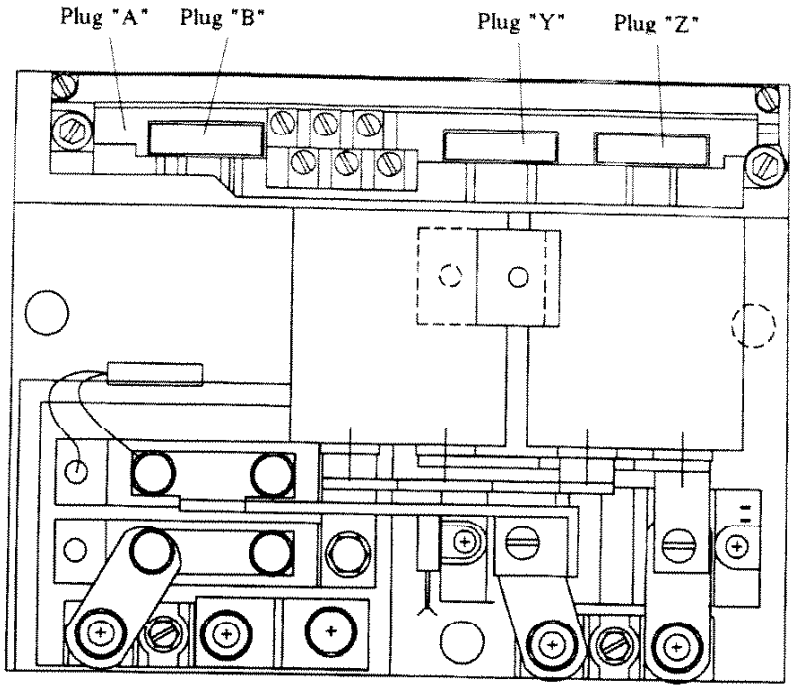
At this point another function can be monitored/changed by pushing another function number, or the vehicle can be placed in the run mode by holding the ESC key down for one second or longer. The display will return to either the diagnostics mode or the BDI display or a blank display (if BDI is not used and there are no fault codes). The vehicle can now be operated with the handset connected or the handset can be disconnected before operation.

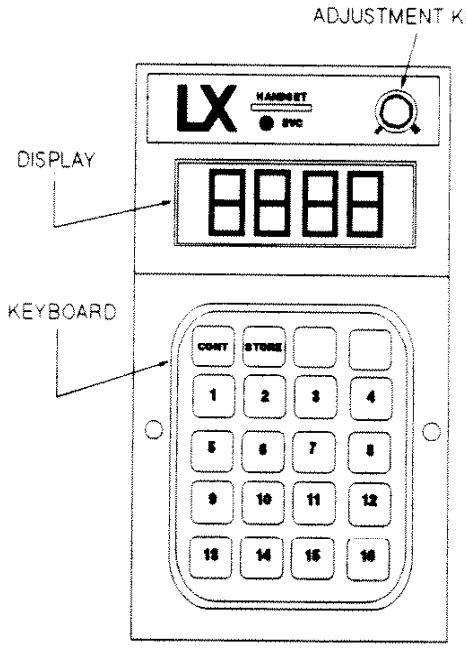
NOTE: You can return to the segment check mode at any time, by holding down the ESC key until 8888 appears in the display.

The controller furnishes a function register that contains the last 16 faults that shut down vehicle operation (PMT type fault that is reset by cycling the key switch) and the battery state of charge reading at the time the fault occurred. The first of the 16 status codes will be overwritten each time a new status code occurs. This stored status code register can be cleared from memory by using the handset.

The stored status codes can be accessed and cleared by using the following procedure.







HANDSET

Ordering Note:
Handsets with case, cable and instructions are available for either EV100/200/LX, EV-T15, SX Series or EV-T6. The Handset unit is the same device for all controls but the cable for the EV-T6 is different and the instructions are different for all controls.

IC3645LXHS1EC8 EV-100/200LX, EV-T15, EV-T100 and SX Series Handset, case & cable

DESCRIPTION OF FUNCTION NUMBERS:
Traction Control Logic Card

FUNCTION1 STORED FAULT CODE
(Push 1)

This function register contains the last fault that shut down vehicle operation (PMT type fault that is reset by cycling the key switch) . This fault code will be over written each time a new fault occurs and can be cleared from memory by adjusting the value to zero.

FUNCTION2 MIN. FIELD VOLTAGE START
(Push CONT 2)

This function allows for the adjustment of the starting field voltage level during acceleration.

Range	0 to 60% on time
Set	0 to 255
Resolution	.23 % on time per set unit

Example: Setting of 20 = 4.6 % on time

Important Note: The function is used to optimize motor and control performance and this setting will be determined by GE and OEM engineers at the time of vehicle development. This setting **must not be changed** by field personnel without the permission of the OEM.

FUNCTION3 ARMATURE CONTROLLED ACCELERATION
(Push 3)

This function allows for the adjustment of the rate of time it takes for the control to accelerate to 100% applied battery voltage to the motor on hard acceleration.

Range	.27 to 68.0 seconds
Set	0 to 255
Resolution	.27 seconds per set unit
Example:	Setting of 20 = 5.67 seconds C/A

FUNCTION4 ARMATURE CURRENT LIMIT
(Push 4)

This function allows for the adjustment of the armature current limit of the control. The rating of the control will determine the range of adjustment for this function. Please refer to the operating instructions for the control used in your vehicle.

Range	See control C/L curves
Set	0 to 255
Example:	0 = min. current, 255 = max. current

FUNCTION5 REGEN ARMATURE CURRENT RATE
(Push 5)

This function allows for the adjustment of the rate of time it takes for the control to apply Regen current to the motor armature.

Range	.018 to 4.59 seconds
Set	0 to 255
Resolution	.018 seconds per set unit

Example: Setting of 20 = .36 seconds

FUNCTION7 MIN. FIELD CURRENT
(Push 7)

This function allows the adjustment of the field weakening level in order to set the top speed of the motor. The function is enabled when the armature current is less than 85 amps and the accelerator input voltage is less than 1 volt.

Range	0 to 31 amps
Set	51 to 255
Resolution	.152 amps per set unit

Example Setting of 20 = 3.04 amps

Important Note: The function is used to optimize motor and control performance and this setting will be determined by GE and OEM engineers at the time of vehicle development. This setting **must not be changed** by field personnel without the permission of the OEM.

FUNCTION8 MAX. FIELD CURRENT
(Push 8)

This function allows for the adjustment of the maximum field current in order to obtain the maximum torque of the motor.

Range	0 to 31 amps
Set	51 to 255
Resolution	.152 amps per set unit

Example Setting of 20 = 3.04 amps

Important Note: The function is used to optimize motor and control performance and this setting will be determined by GE and OEM engineers at the time of vehicle development. This setting **must not be changed** by field personnel without the permission of the OEM.

FUNCTION9 REGEN BRAKING C/L
(Push 9)

This function allows for the adjustment of the Regen braking current limit. The higher the current the shorter the stopping distance.

Range	39 to 256 amps
Set	0 to 255
Resolution	.82 amps per set unit

Example Setting of 20 = 16.4 amps

FUNCTION 10 MAX FIELD CURRENT FOR REGEN
(Push 10)

This function allows for the adjustment of the minimum field current to be usewd during the regen braking mode.

Range	0 to 31 amps
Set	51 to 255
Resolution	.152 amps per set unit

Example Setting of 20 = 3.04 amps

Important Note: The function is used to optimize motor and control performance and this setting will be determined by GE and OEM engineers at the time of vehicle development. This setting **must not be changed** by field personnel without the permission of the OEM.

FUNCTION 14 INTERNAL RESISTANCE COMPENSATION
(Push 14)

This function is used when the Battery Discharge Indicator is present. Adjustment of this function will improve the accuracy of the BDI. In order to make this setting the voltage drop of the battery under load must first be determined by following the steps listed below.

1. Record open circuit voltage (V_O) by measuring the voltage at the control positive and negative power ter minals.
2. Load the traction motor to 100 amps in 1A and record the voltage (V_L) at the control positive and negative power terminal.
3. Calculate voltage drop (V_{Drop}) as follows:
   $V_{Drop} = V_O - V_L$
4. Use the table below to determine the setting using the calculated V_{Drop} as a reference.

INTERNAL RESISTANCE COMPENSATION TABLE

Setting	V_{Drop}	Setting	V_{Drop}
2	11.44	17	01.34
3	07.60	18	01.27
4	05.72	19	01.20
5	04.57	20	01.14
6	03.81	21	01.09
7	03.27	22	01.04
8	02.86	23	00.99
9	02.54	24	00.95
10	02.28	25	00.91
11	02.08	26	00.88
12	01.90	27	00.85
13	01.76	28	00.82
14	01.63	29	00.79
15	01.52	30	00.76
16	01.43	31	00.74

FUNCTION 15 BATTERY VOLTS
(Push 15)

This function allows for the adjustment of voltage range for controls equipped with the Battery Discharge Indication function. In order for the BDI to operate properly, the setting as shown in the table must be entered .

Battery volts	Set units
72 VDC	72
96 VDC	96
120 VDC	120
230 VDC	230

The following functions have function numbers larger than the numbers on the Handset keyboard. To access these function , push the CONT key and the number shown in the following instructions at the same time.

FUNCTION 18 FIELD CONTROLLED ACCELERATION
(Push CONT 3)

This function allows for the adjustment of the rate of time it takes for the field winding to accelerate to 100% applied battery voltage to the motor on hard acceleration.

Range	.27 to 68.0 seconds
Set	0 to 255
Resolution	.27 seconds per set unit

Example: Setting of 20 = 5.67 seconds

Warning: These settings must be changed by authorized personnel only, following instructions supplied by the manufacturer. Card type selection must be made within the capabilities of the control panel used and the supporting electro-mechanical devices. Failure to comply with proper application standards could result in misoperation or damage to the control and/or motors.