



INSTRUCTIONS

GEK-86728

**TOTAL LOAD MANAGEMENT
LOAD CONTROL RECEIVER TESTER**

MODEL 8502

OPERATIONS MANUAL

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

GENERAL  ELECTRIC

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SECTION 1

GENERAL INFORMATION

1.1 DESCRIPTION

The Load Control Receiver (LCR) Tester is used to test the shed/restore load operation and to activate the optional remote self-test features of the Series 8100 LCR. It accomplishes this by injecting on the power line a command, addressed to the LCR to be tested, initiating either a shed-load or a restore-load action.

The LCR Tester comprises a carrier frequency (f_c) generator, a transmitter, logic circuitry to provide the LCR address and a shed-load or restore-load command, and a power supply.

1.2 CHARACTERISTICS AND SPECIFICATIONS

1.2.1 Functional Characteristics

- o The LCR Tester provides a command to shed load or restore load. This command is identical with that normally transmitted by the Substation Controller. This test helps establish whether or not a system malfunction is due to a faulty LCR.
- o LCR Tester commands can be addressed to one specific group of LCRs, or (if there is reason to do so) to several groups of LCRs simultaneously, or to all LCRs within communications range.

1.2.2 Electrical Specifications

- o Power Input: 120 VAC \pm 10%, 60 \pm 1 Hz
- o Carrier Frequency f_c : 5180 Hz

1.2.3 Environmental Specifications

- o Storage Temperature: -50° to $+85^\circ$ C (-58° to $+185^\circ$ F)
- o Operating Temperature: 0° to 60° C ($+32^\circ$ to 140° F)
- o Relative Humidity: 0 to 100%
- o Operating Altitude: Sea level to 3048 m (Sea level to 10,000 ft.)

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

1.2.4 Physical Specifications

- o **Size:** 234.95 mm x 215.9 mm x 88.9 mm
(9.25 in. x 8.5 in. x 3.5 in.)
- o **Weight:** 2.72 kg (6 lb)
- o **Material and Finish:** Aluminum; wood-grain finish on case; front and rear panels, polished aluminum with silk screening

1.2.5 Functional Description

Figure 1 shows all of the controls on the front plate of the LCR. The power on/off switch, the only remaining control, is located on the rear plate. (Power Light indicates Tester is turned on.) The functions of these controls are as follows:

- o Address thumbwheel switches are used to set the LCR range group address (00-63) and select the Service Mode if the LCR is equipped with this option.
- o HIGH GROUP (63 max.) programs the LCR Tester to command all LCRs in the range between that address and LOW GROUP (00 min.). If only one LCR group is to be tested at a time, set its address in both the HIGH and LOW GROUP thumbwheels.
- o Service Mode is used to address only the LCR which is enabled by a magnet placed on a specific LCR and not all LCRs within the selected address group. This mode is selected by setting a 99 in the HIGH GROUP and the specific LCR group address in the LOW GROUP, or a 99 in both HIGH and LOW GROUPS to select all LCR groups' addresses.
- o The TRANSMIT push button is depressed to start the selected LCR Tester function. This switch will light during the actual transmission of a command on the power line.
- o The CYCLE-RESTORE/SHED-TEST rocker switch is used in conjunction with the AUTO/MANUAL rocker switch to select the operations described below:
 - Auto + Cycle = Tester will send continuous cycle of an immediate-shed command, followed by a delayed-restore command, and a 3 minute delay.
 - Auto + Cycle (In Service Mode) = Tester will send continuous cycle of an immediate-shed command, a 3 minute delay, and an immediate-restore command.
 - Auto + Test = Tester will send one self-test command.
 - Manual + Restore = Tester will send one immediate restore command.
 - Manual + Shed = Tester will send one immediate shed command.

NOTE

SERVICE MODE is an effective means of controlling only a specific LCR if it is equipped with the yellow Status LED option. Enable this mode by setting the LCR Tester switches to **AUTO + CYCLE**, and the **HIGH GROUP** address thumbwheel switches to 99. The **LOW GROUP** address thumbwheels specify which group address the Tester will transmit, or by setting this address to 99 the Tester will transmit to all addresses (00-63); only the LCR(s) with a magnet placed near the Hall-effect transistor (Refer to **LCR Installation and Maintenance Manual GEK-86700**) will receive the command from the Tester when the **TRANSMIT** button is pushed.

The selection of **SELF-TEST** mode (**AUTO + TEST**) will cause all the Status LED-equipped LCRs specified by the address thumbwheel switches to perform a self-test and pulse the yellow Status LED in the single pulse mode (Refer to **GEK-86700 Manual** for details of Status LED).

SECTION 2**SETUP AND OPERATION****2.1 GENERAL**

Two setup and operating procedures are described in the following paragraphs. The shop test procedure described in paragraph 2.2 is used only for testing LCRs in a depot or other repair shop. The field test procedure described in paragraph 2.3 is used for checking the operation of an LCP installed at a customer site.

2.1.1 Modification for Reduced Signal

In cases where it is undesirable for an LCR Tester to shed and restore loads outside an approximately one-square-block area, it may be found advisable to modify the Tester to prevent this. The simple procedure to accomplish this modification is described below. For more detailed information, call GE Field Service. (For LCR's equipped with the yellow Status LED option, Service Mode operation is recommended instead of this modification.)

- A. Loosen back panel of LCR Tester (6 screws) and slide off top cover.
- B. Locate C13 (5uF 220 VAC) near edge of PC board.
- C. Unsolder back lead of C13.
- D. Solder a new 2.0uF, 220 VAC capacitor (Sprague 441P205X9220Q5L) in series with C13. Sleeve the leads as required to keep from shorting to sides or cover.
- E. Reinstall cover and back, and verify that unit operates as required.
- F. Install a tape marker at the bottom right corner of the front panel. The marker should read "REDUCED SIGNAL OUT".

2.2 SHOP TEST PROCEDURE

The following procedure is used to bench test an LCR in the shop. Test equipment required in addition to the LCR Tester is listed in Table 2-1.

Table 2-1. Recommended Test Equipment.

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>MODEL</u>	<u>MANUFACTURER</u>
1	1	Multimeter	630	Triplett *
1	1	Transformer, 120/240V	Type S	Square D *

* Or equivalent.

2.2.1 Bench Setup

- A. In the LCR, check the address strapping at S1 through S6, and note which straps have been cut. With this information, refer to Table 2-2, Address Strapping, to determine the address of the LCR under test.

NOTE

Several LCRs can be tested simultaneously, if each LCR is connected as shown in Figure 2-1. With the LOW GROUP thumbwheels on the Tester front panel, set the lowest address of the LCRs to be tested; and with the HIGH GROUP thumbwheels, set the highest address of the LCRs to be tested. The tester will check the load-shed/load-restore functions in both addressed LCRs, and in all LCRs whose addresses fall between the two set by the thumbwheels.

- B. Using the thumbwheel switches on the front panel of the LCR Tester, insert the address of the LCR to be tested. If just one LCR is to be tested at a time, set both the HIGH GROUP and the LOW GROUP thumbwheels to its address.
- C. Connect the LCR power cord, consisting of black, red and green pigtail wires, to the 240 VAC side of the transformer as shown in Figure 2-1.
- D. Plug the 120/240 VAC transformer into a bench source of 120 VAC (see Figure 2-1).
- E. With the On/Off switch on the rear plate of the Tester turned OFF, plug the power cord of the LCR Tester into a bench source of 120 VAC.

Table 2-2. Address Strapping.

NOTE: x indicates strap is cut.

<u>S6</u>	<u>S5</u>	<u>S4</u>	<u>S3</u>	<u>S2</u>	<u>S1</u>	<u>ADDRESS</u>
-	-	-	-	-	-	0
-	-	-	-	-	x	1
-	-	-	-	x	-	2
-	-	-	-	x	x	3
-	-	-	x	-	-	4
-	-	-	x	-	x	5
-	-	-	x	x	-	6
-	-	-	x	x	x	7
-	-	x	-	-	-	8
-	-	x	-	-	x	9
-	-	x	-	x	-	10
-	-	x	-	x	x	11
-	-	x	x	-	-	12
-	-	x	x	-	x	13
-	-	x	x	x	-	14
-	-	x	x	x	x	15
-	x	-	-	-	-	16
-	x	-	-	-	x	17
-	x	-	-	x	-	18
-	x	-	-	x	x	19
-	x	-	x	-	-	20
-	x	-	x	-	x	21
-	x	-	x	x	-	22
-	x	-	x	x	x	23
-	x	x	-	-	-	24
-	x	x	-	-	x	25
-	x	x	-	x	-	26
-	x	x	-	x	x	27
-	x	x	x	-	-	28
-	x	x	x	-	x	29
-	x	x	x	x	-	30

Table 2-2. Address Strapping (continued)

<u>S6</u>	<u>S5</u>	<u>S4</u>	<u>S3</u>	<u>S2</u>	<u>S1</u>	<u>ADDRESS</u>
-	X	X	X	X	X	31
X	-	-	-	-	-	32
X	-	-	-	-	X	33
X	-	-	-	X	-	34
X	-	-	-	X	X	35
X	-	-	X	-	-	36
X	-	-	X	-	X	37
X	-	-	X	X	-	38
X	-	-	X	X	X	39
X	-	X	-	-	-	40
X	-	X	-	-	X	41
X	-	X	-	X	-	42
X	-	X	-	X	X	43
X	-	X	X	-	-	44
X	-	X	X	-	X	45
X	-	X	X	X	-	46
X	-	X	X	X	X	47
X	X	-	-	-	-	48
X	X	-	-	-	X	49
X	X	-	-	X	-	50
X	X	-	-	X	X	51
X	X	-	X	-	-	52
X	X	-	X	-	X	53
X	X	-	X	X	-	54
X	X	-	X	X	X	55
X	X	X	-	-	-	56
X	X	X	-	-	X	57
X	X	X	-	X	-	58
X	X	X	-	X	X	59
X	X	X	X	-	-	60
X	X	X	X	-	X	61
X	X	X	X	X	-	62
X	X	X	X	X	X	63

2.2.2 Bench Test Procedure**CAUTION**

If the AUTO/MANUAL switch is set to AUTO when the power is turned on in the LCR Tester, improper operation results. Always check that this switch is in the MANUAL position before applying power to the Tester.

- A. On the rear panel of the LCR Tester, set the POWER switch to ON.

NOTE

Wait 15 seconds. On LCRs with a yellow Status LED, actuate the LED (by momentarily coupling an external magnet close to the position of the Hall-effect switch). The Status LED should come up in a "power interrupt" pattern, blinking at approximately 5 Hz. If the Status LED comes up in a constant "on" condition, the unit has failed its self-test, and should be removed for maintenance. (Refer to **LCR Installation and Maintenance Manual** for detailed pulsing patterns of Status LED.)

NOTE

The LCR under test is equipped either with one of two relays (K1/K2); or with both; and, as a result, with either one or two pair(s) of LCR control leads. Refer to Table 2-3, where the relay(s) and control leads are listed by LCR type dash number. To perform this test on LCRs equipped with two relays and two pairs of control leads, perform steps B. through J. (or K.) on the yellow leads first. Then go back and perform steps B. through J. (or K.) on the blue leads.

- B. Connect the ohmmeter across the LCR control leads, as shown in Figure 2-1.

NOTE

After a power up, the ohmmeter should initially indicate an open circuit, if the units are strapped for cold load pickup mode; otherwise the ohmmeter should indicate a short circuit.

- C. On the front panel of the LCR Tester, set the RESTORE/SHED switch to SHED.

NOTE

The AUTO/MANUAL switch on the front panel of the Tester has two settings. In the MANUAL setting, when the TRANSMIT switch is pressed, the Tester sends one message. In the AUTO setting, when the TRANSMIT switch is pressed, the Tester sends out message(s) according to the pattern indicated in section 1.2.5. This makes it possible, in setups that required it, to exercise various optional functions of the Tester.

- D. Set the AUTO/MANUAL switch on MANUAL.
- E. Press the TRANSMIT switch.

TABLE 2-3 INSTALLATION CONNECTIONS

Wire Color & Gage No.	Wire Hook-up		Function Notes	Used on Dash No. D60124
	Hook-up Point			
Blue/10 AWG	K1-1	30A load (K1)	-001	
Blue/10 AWG	K1-2	30A load (K1)		
Black/14 AWG	PCB-J1-2	240 VAC		
Red/14 AWG	PCB-J1-3	240 VAC		
Green/14 AWG	PCB-J1-6	Equip Gnd		
Black/14 AWG	PCB-J1-2	240 VAC	-002	
Red/14 AWG	PCB-J1-3	240 VAC		
Green/14 AWG	PCB-J1-6	Equip Gnd		
Yellow/18 AWG	PCB-J1-8	5A load (K2)		
Yellow/18 A G	PCB-J1-9	5A load (K2)		
Blue/10 AWG	K1-1	30A load (K1)	-003	
B'ue/10 AWG	K1-2	30A load (K1)		
Black/14 AWG	PCB-J1-2	240 VAC		
Red/14 AWG	PCB-J1-3	240 VAC		
Green/14 AWG	PCB-J1-6	Equip Gnd		
Yellow/18 AWG	PCB-J1-8	5A load (K2)		
Yellow/18 AWG	PCB-J1-9	5A load (K2)		
Blue/10 A G	K1-1	30A load (K1)	-004	
Blue/10 AWG	K1-2	30A load (K1)		
Blue/White/10 AWG	K3-1	30A load (K3)		
Blue/White/10 AWG	K3-2	30A load (K3)		
Black/14 AWG	PCB-J1-2	240 VAC		
Red/14 AWG	PCB-J1-3	240 VAC		
Green/14 AWG	PCB-J1-6	Equip Gnd		
Black/14 AWG	PCB-J1-2	240 VAC		-005
Red/14 AWG	PCB-J1-3	240 VAC		
Green/14 A	PCB-J1-6	Equip Gnd		
Yellow/18 AWG	PCB-J1-8	5A load (K2)		
Ye'low/18 AWG	PCB-J1-9	5A load (K2)		
Yellow/White/18 AWG	K4-4	5A Load (K4)		
Yellow/White/18 AWG	K4-5	5A Load (K4)		

- F. The ohmmeter across the LCR control leads should immediately indicate an open circuit. If it does, proceed to step G. If it does not, proceed directly to step K.
- G. Set the RESTORE/SHED switch to RESTORE.
- H. Press TRANSMIT switch.

- I. The ohmmeter across the LCR control leads should immediately indicate a short circuit. If it does, proceed to step J. If it does not, proceed directly to step K.
- J. Successful results at steps F and I above indicate that the shed/restore functions of the LCR(s) under test are operating correctly.
- K. Incorrect measurement results at either step F or step I, or both, indicate a probable malfunction in the LCR under test. Refer to the Maintenance Section of the **LCR Installation and Maintenance Manual**.

2.3 FIELD INSTALLATION OF AN LCR, INCLUDING TESTING WITH THE LCR TESTER

2.3.1 Field Installation Tools and Steps

Tools and Test Equipment

The tools and test equipment required, in addition to the LCR Tester, for field installation, test and maintenance of an LCR are listed in Table 2-4. Common hand tools normally carried by electric utility installation and maintenance personnel are not included. Equivalent test equipment may be used.

TABLE 2-4

TOOLS AND TEST EQUIPMENT FOR LCR INSTALLATION

ITEM	QUANTITY
Magnet, permag, ceramic No. 5, 3 x 1-5/8 x 5/8 inches (Not required for LCR without Status LED)	1
Multimeter, Triplett Model 680	1

LCR Installation Steps

Use bolts or screws to securely attach the LCR in the desired position at the customer site. Perform the following steps to connect the LCR hook-up wires. Refer to Table 2-3 and **LCR Installation and Maintenance Manual**.

1. Turn OFF the circuit breakers providing power to the units that are to be controlled by the LCR at the customer load center.
2. Make sure that the circuit breakers that are to provide power to the LCR are OFF.
3. Connect the black, red and green 14 AWG LCR hook-up wires according to Table 2-3 in accordance with local electrical codes.
4. Proceed to the next section, "Operational Testing".

2.3.2 Operational Testing

The LCR operational tests are accomplished as follows:

1. In the LCR, check the address strapping at S1 through S6, and note which straps have been cut. With this information, refer to Table 2-2, Address Strapping, to determine the address of the LCR under test.
2. Using the thumbwheel switches on the front panel of the LCR Tester, insert the address of the LCR to be tested. Set the LCR Tester HIGH GROUP address to 99 and the LOW GROUP address to the address of the LCR under test. If just one LCR is to be tested at a time, set both the HIGH GROUP and the LOW GROUP thumbwheels to its address.
3. Connect the LCR Tester power cord to a 120 volt AC outlet.

CAUTION

Set the LCR Tester AUTO/MANUAL switch to the MANUAL position before setting the POWER switch to the ON position. Otherwise improper LCR Tester operation will result.

4. Set the POWER switch to ON.
5. Open the junction box where the LCR hook-up wires terminate.

WARNING

WHEN CIRCUIT POWER IS ON, HAZARDOUS VOLTAGES ARE PRESENT IN THE LCR AND LCR HOOK-UP WIRES. OBSERVE STRINGENT SAFETY PRECAUTIONS AND APPROVED SAFETY PROCEDURES. WEAR ELECTRICALLY INSULATED RUBBER GLOVES WHEN ELECTRICAL SHOCK IS A HAZARD.

6. Turn on the circuit breakers powering the LCR.

NOTE

In cases where the LCR is not equipped with the yellow Status LED, perform steps 1 to 6 as stated above, and proceed to steps 7a-22a below.

7. Wait 15 seconds and actuate the LCR Status LED by momentarily coupling an external magnet close to the position of the Hall-effect switch. (Refer to **LCR Installation and Maintenance Manual**.) The Status LED should come up in a "POWER INTERRUPT" pattern, blinking at approximately 5 Hz. If the Status LED comes up in a constant "ON" condition, the unit has failed its self-test, and should be removed for maintenance.
8. Connect an ohmmeter between the blue 10A LCR conductors, if applicable. Connect the 18 AWG yellow wires to the ohmmeter if K2 relays are the only controlled load.
9. After a power-up, the ohmmeter should initially indicate an open circuit, if the units are strapped for cold load pickup mode. The LCR's red Load LED should be ON.
10. Set the LCR Tester switches to CYCLE/RESTORE and AUTO.

NOTE

The AUTO/MANUAL switch on the front panel of the Tester has two settings. In the MANUAL setting, when the TRANSMIT switch is pressed, the Tester sends one message. In the AUTO setting, when the TRANSMIT switch is pressed, the Tester sends out message(s) according to the pattern indicated in section 1.2.5. This makes it possible, in setups that require it, to exercise various optional functions of the Tester.

11. Depress the TRANSMIT switch.
12. Observe the ohmmeter while placing an external magnet close to the Hall-effect switch. Note that the ohmmeter should indicate a cyclic open-close circuit pattern as described in the Service Mode operation of section 1.2.5; otherwise, the LCR has failed the test and needs to be removed for maintenance.
13. Disconnect the ohmmeter leads from the blue conductors. Connect the ohmmeter leads between the yellow 18 A LCR conductors, or if applicable, between the other set of blue 10 AWG leads. If there are no other load wires, however, proceed to step 16.
14. Observe the ohmmeter while placing an external magnet close to the Hall-effect switch. Note that the ohmmeter should indicate a cyclic open-close circuit pattern as described in the Service Mode operation of section 1.2.5. otherwise, the LCR has failed the test and needs to be removed for maintenance.
15. Disconnect the ohmmeter.
16. Set the LCR Tester POWER switch to OFF.
17. Disconnect the LCR Tester.

WARNING

ALL ELECTRICAL WORK SHOULD BE ACCOMPLISHED IN ACCORDANCE WITH LOCAL ELECTRICAL CODES AND IN A MANNER CONSISTENT WITH APPROVED SAFETY PRACTICES.

18. Connect the blue 10 AWG and the yellow 18 AWG LCR conductors as shown in Table 2.3 to the load to be controlled.
19. Close the junction box.
20. Turn on the circuit breakers powering the loads which are to be controlled by the LCR.

Installation and Testing of LCR Without Yellow Status LED

- 7a. Wait 15 seconds.
- 8a. Connect an ohmmeter between the blue 10 A G LCR conductors, if applicable. Connect the 18 AWG yellow wires to the ohmmeter if K2 relays are the only controlled load.
- 9a. After a power-up, the ohmmeter should initially indicate an open circuit if the units are strapped for cold load pickup mode. If the LCR has a red Load LED, it should be ON.

- 10a. Set the LCR Tester RESTORE/SHED switch to RESTORE.
- 11a. Depress the TRANSMIT switch.
- 12a. Observe the ohmmeter while waiting for the Tester operation to be completed. Verify that the ohmmeter indicates a short circuit. The red Load LED should go OFF.
- 13a. Disconnect the ohmmeter leads from the blue conductors. Connect the ohmmeter leads between the yellow 18AWG LCR conductors, or if applicable, between the other set of blue 10 AWG leads. If there are no other load wires, however, proceed to step 15a.
- 14a. Observe the ohmmeter while waiting for the Tester operation to be completed. Verify that the ohmmeter indicates a short circuit. The red Load LED should go OFF.
- 15a. Set the LCR Tester RESTORE/SHED switch to SHED.
- 16a. Depress the TRANSMIT switch.
- 17a. Observe the ohmmeter while waiting for the Tester operation to be completed. Verify that the ohmmeter switches to an open circuit, and the red Load LED goes ON. If it does, proceed to step 15. If the ohmmeter does not switch to an open circuit, remove the unit for maintenance.
- 18a. Disconnect the ohmmeter leads from the blue conductors. Connect the ohmmeter leads between the yellow 18A LCR conductors, or if applicable, between the other set of blue 10 AWG leads. If there are no other load wires, however, proceed to step 21a.
- 19a. Observe the ohmmeter while waiting for the Tester operation to be completed. Verify that the ohmmeter switches to an open circuit, and the red Load LED goes ON. If it does, proceed to step 15. If the ohmmeter does not switch to an open circuit, remove the unit for maintenance.
- 20a. Disconnect the ohmmeter.
- 21a. Set the LCR Tester PO TR switch to OFF.
- 22a. Disconnect the LCR Tester.
- 23a. Connect the blue 10 AWG and the yellow 18 AWG LCR conductors, as shown in Table 2.3, to the load to be controlled.
- 24a. Close the junction box.
- 25a. Turn on the circuit breakers powering the loads which are to be controlled by the LCR.

2.4 MAINTENANCE TESTING OF INSTALLED LCRS

For LCRs with Status LED

1. Turn OFF the circuit breakers providing power to the units that are to be controlled by the LCR at the customer load center. Leave ON the circuit breaker providing power to the LCR.

WARNING

WHEN CIRCUIT POWER IS ON, HAZARDOUS VOLTAGES ARE PRESENT IN THE LCR AND LCR HOOK-UP WIRES. OBSERVE STRINGENT SAFETY PRECAUTIONS AND APPROVED SAFETY PROCEDURES. WEAR ELECTRICALLY INSULATED RUBBER GLOVES WHEN ELECTRICAL SHOCK IS A HAZARD.

2. In the LCR, check the address strapping at S1 through S6, and note which straps have been cut. With this information, refer to Table 2-2, Address Strapping, to determine the address of the LCR under test.
3. Using the thumbwheel switches on the front panel of the LCR Tester, insert the address of the LCR to be tested. Set the LCR Tester HIGH GROUP address to 99 and the LOW GROUP address to the address of the LCR under test. If just one LCR is to be tested at a time, set both the HIGH GROUP and the LOW GROUP thumbwheels to its address.
4. Connect the LCR Tester power cord to a 120 volt AC outlet.

CAUTION

Set the LCR Tester AUTO/MANUAL switch to the MANUAL position before setting the POWER switch to the ON position. Otherwise improper LCR Tester operation will result.

5. Set the POWER switch to ON.
6. Wait 15 seconds and actuate the LCR Status LED by momentarily coupling an external magnet close to the position of the Hall-effect switch. (Refer to **LCR Installation and Maintenance Manual**.) The Status LED should come up in a "POWER INTERRUPT" pattern, blinking at approximately 5 Hz. If the Status LED comes up in a constant "ON" condition, the unit has failed its self-test, and should be removed for maintenance.
7. Set the LCR Tester switches to CYCLE/RESTORE and AUTO.

NOTE

The AUTO/MANUAL switch on the front panel of the Tester has two settings. In the MANUAL setting, when the TRANSMIT switch is pressed, the Tester sends one message. In the AUTO setting, when the TRANSMIT switch is pressed, the Tester sends out message(s) according to the pattern indicated in section 1.2.5. This makes it possible, in setups that require it, to exercise various optional functions of the Tester.

8. Depress the TRANSMIT switch.
9. The LCR Status LED should come up in a cyclic pulsing pattern as described in the Service Mode operation of 1.2.5.5; otherwise, the LCR has failed the test and needs to be removed for maintenance.
10. Set the LCR Tester POWER switch to OFF.
11. Disconnect the LCR Tester.
12. Turn on the circuit breakers powering the loads which are to be controlled by the LCR.

For LCRs with No Status LED

1. Turn OFF the circuit breakers providing power to the units that are to be controlled by the LCR at the customer load center. Leave ON the circuit breaker providing power to the LCR.

WARNING

WHEN CIRCUIT POWER IS ON, HAZARDOUS VOLTAGES ARE PRESENT IN THE LCR AND LCR HOOK-UP WIRES. OBSERVE STRINGENT SAFETY PRECAUTIONS AND APPROVED SAFETY PROCEDURES. WEAR ELECTRICALLY INSULATED RUBBER GLOVES WHEN ELECTRICAL SHOCK IS A HAZARD.

2. In the LCR, check the address strapping at S1 through S6, and note which straps have been cut. With this information, refer to Table 2-2, Address Strapping, to determine the address of the LCR under test.
3. Using the thumbwheel switches on the front panel of the LCR Tester, insert the address of the LCR to be tested. Set the LCR Tester HIGH GROUP address to 99 and the LOW GROUP address to the address of the LCR under test. If just one LCR is to be tested at a time, set both the HIGH GROUP and the LOW GROUP thumbwheels to its address.
4. Connect the LCR Tester power cord to a 120 volt AC outlet.

CAUTION

Set the LCR Tester AUTO/MANUAL switch to the MANUAL position before setting the POWER switch to the ON position. Otherwise improper LCR Tester operation will result.

5. Set the POWER switch to ON.
- 7a. Wait 15 seconds.
- 8a. The LCR's red Load LED should be ON.
- 10a. Set the LCR Tester RESTORE/SHED switch to RESTORE.
- 11a. Depress the TRANSMIT switch.
10. The red Load LED should go OFF.
- 14a. Set the LCR Tester RESTORE/SHED switch to SHED.
- 15a. Depress the TRANSMIT switch.
13. The red Load LED should go ON.
- 18a. Set the LCR Tester POWER switch to OFF.
- 19a. Disconnect the LCR Tester.
- 22a. Turn on the circuit breakers powering the loads which are to be controlled by the LCR.

2.5 REFERENCE DRAWINGS

1-1 Load Control Receiver Tester

2-1 Bench Test Setup

2-4.1 LCR Tester schematic

2-4.2 LCR Tester PCB layout

2-4.3 LCR Tester components list

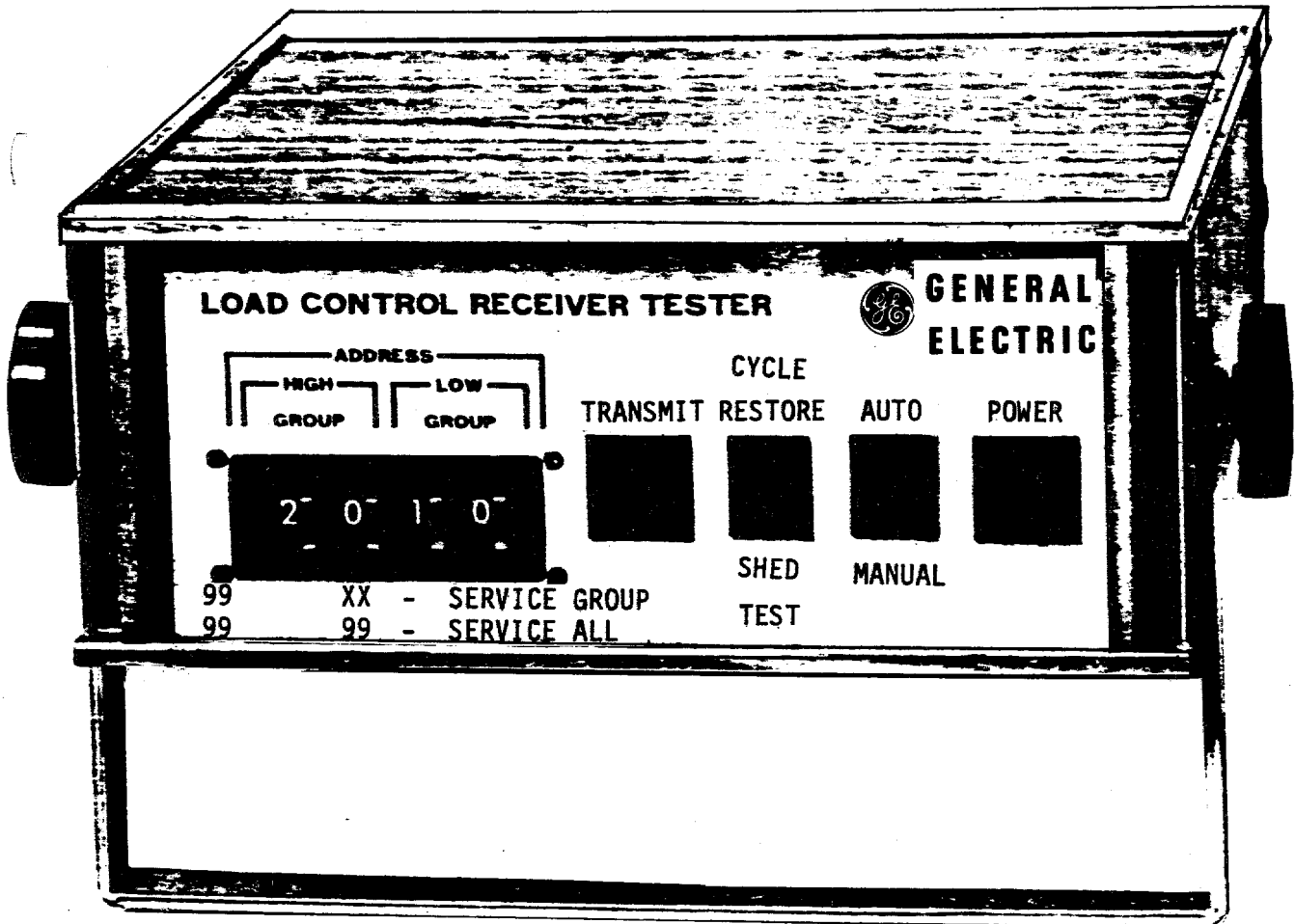


Figure 1-1 Load Control Receiver Tester

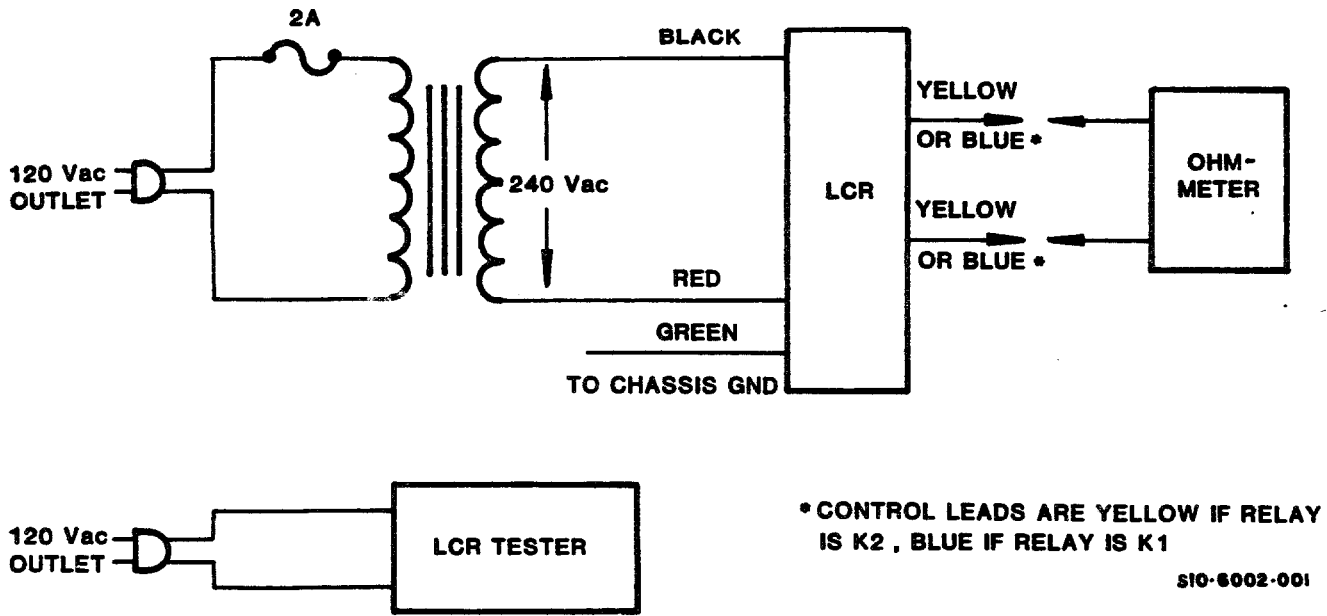
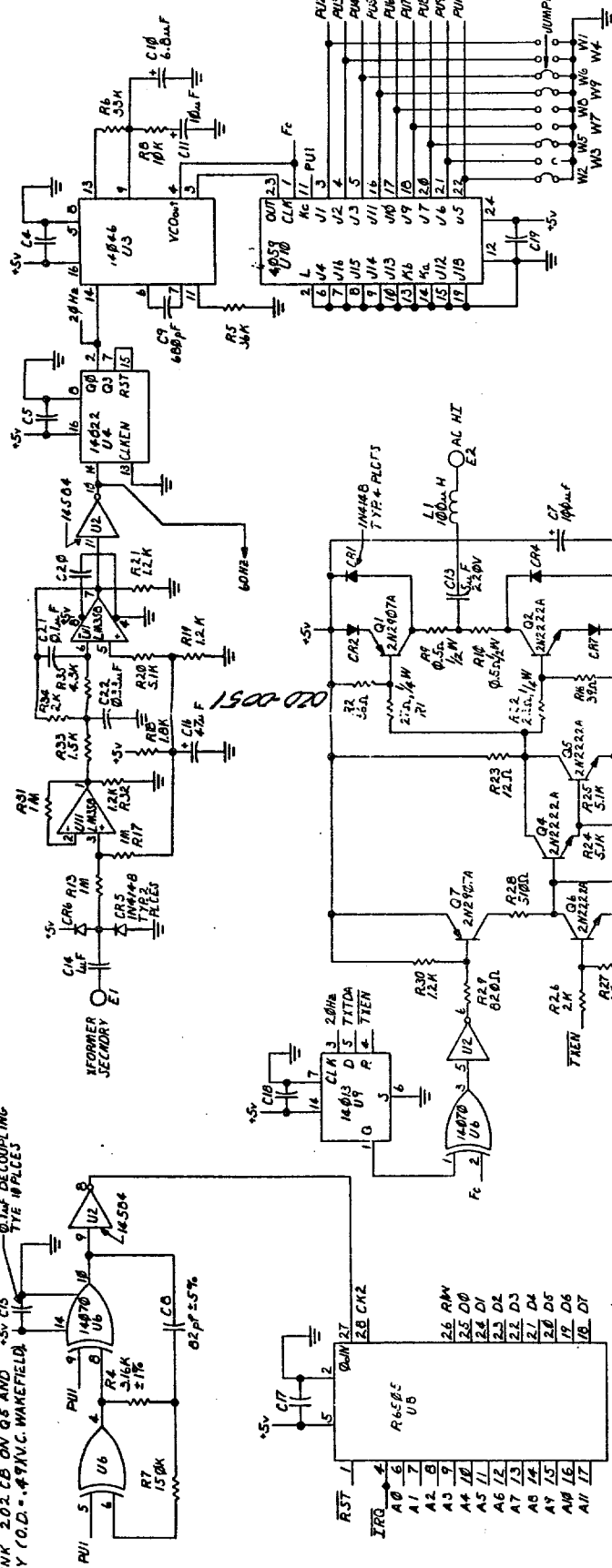


Figure 2-1. Bench Test Setup

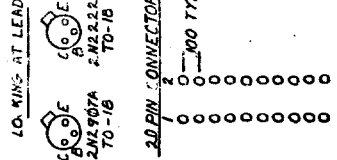
NOTES:
 1. ALL RESISTORS, 1/8W.
 2. HEATSINK 202 CB ON Q5 AND Q6 ONLY (O.D. = .49 IN. C. WAKEFIELD)

0.1μF DECOUPLING TIE #PLACES

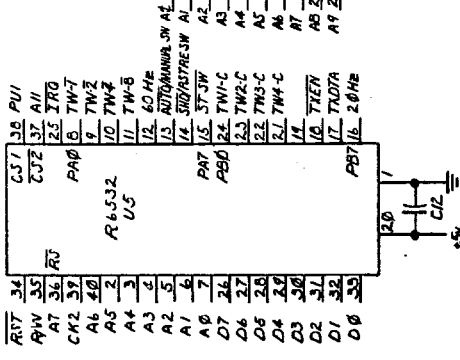
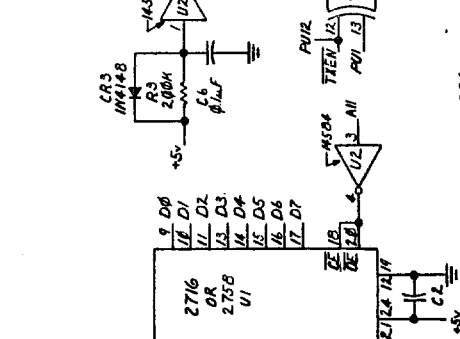
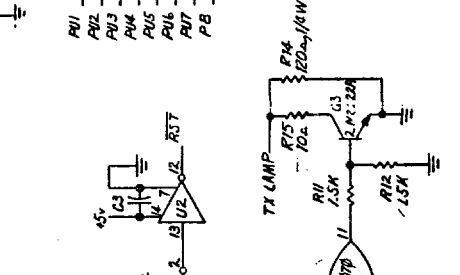
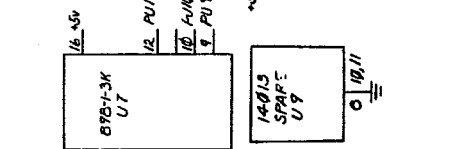


FREQUENCY STRAPPING CHART

STRAP	W1	W2	W3	W4	W5	W6	W7	W8	W9
Fc = 5280	X	X	X	X	X	X	X	X	X
Fc = 5280.7360	X	X	X	X	X	X	X	X	X
Fc = 5280.7360.6660	X	X	X	X	X	X	X	X	X



NO OF	IC	DRPPMS
UB	UB	2B
UI	UI	2A
U2	U2	1A
U3	U3	1A
U4	U4	1A
U5	U5	1A
U6	U6	1A
U7	U7	1A
U8	U8	1A
U9	U9	1A
U10	U10	1A
U11	U11	1A
U12	U12	1A
U13	U13	1A
U14	U14	1A
U15	U15	1A
U16	U16	1A
U17	U17	1A
U18	U18	1A
U19	U19	1A
U20	U20	1A

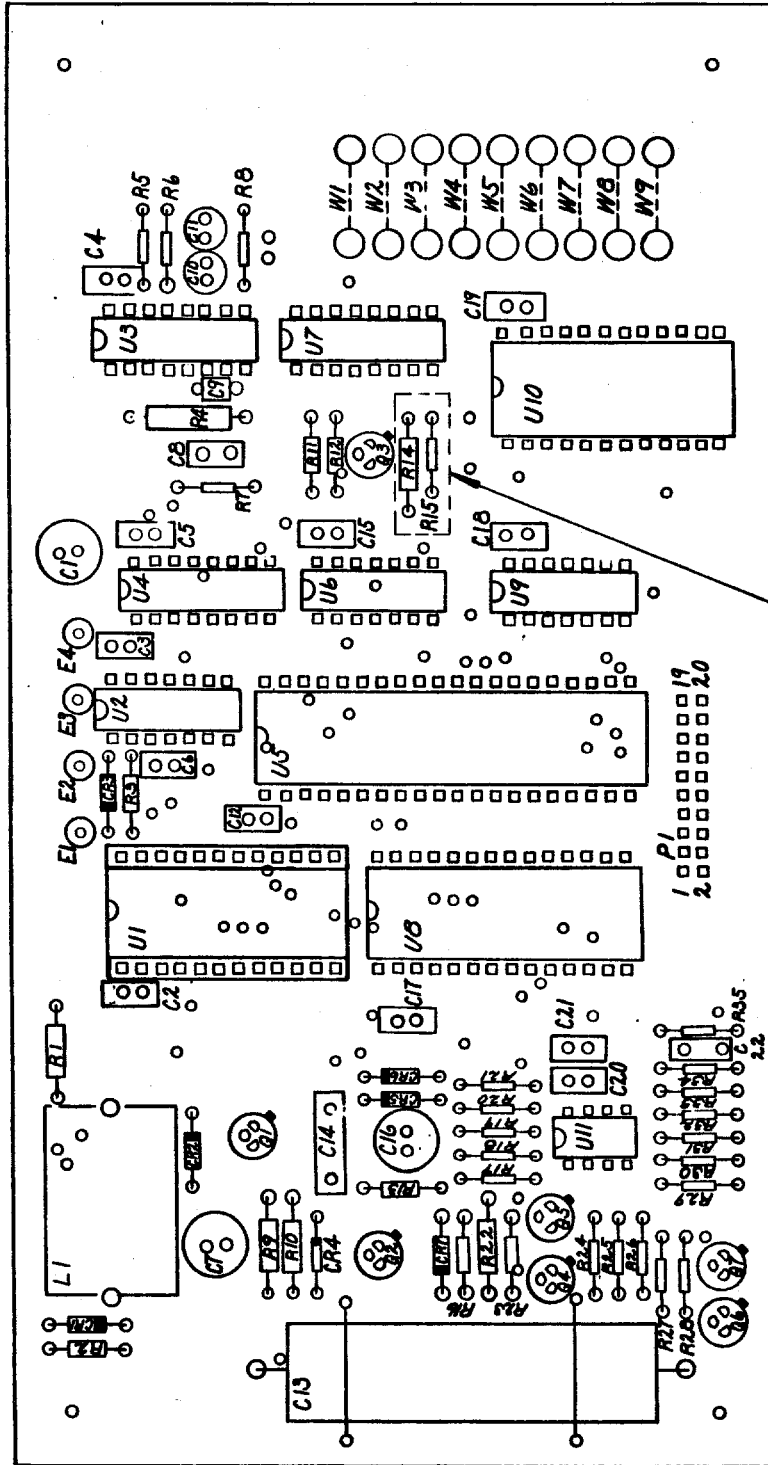


2-4.1 LCR Tester schematic

-001



DETAIL "A"



-001 AS SHOWN
-002 SEE DETAIL "A"

2.4.2 LCR Tester PCB layout

2-4.2 LCR Tester PCB layout

1.0	1.0	39	011-6604-154	RESISTOR, 150K, 1/4W, 5%	RCR05G154JS		R7	
1.0	1.0	38	011-6604-333	RESISTOR, 33K, 1/4W, 5%	RCR05G333JS		R6	
1.0	1.0	37	011-6604-363	RESISTOR, 36K, 1/4W, 5%	RCR05G363JS		R5	
1.0	1.0	36	011-6605-316	RESISTOR, 3.16K, 1%	RNC55H3161FM		R4	
1.0	1.0	35	011-6604-204	RESISTOR, 200K, 1/4W, 5%	RCR05G204JS		R3	
1.0	1.0	34	011-6604-560	RESISTOR, 560Ω, 1/4W, 5%	RCR05G560JS		R2	
1.0	1.0	33	011-6604-270	RESISTOR, 27Ω, 1/4W, 5%	RCR07G270JS		R1	
1.0	1.0	32	011-7631-010	I.C., DUAL OPAMP, LM358N			U11	
1.0	1.0	31	011-7532-010	I.C., COUNTER, CD4059AE			U10	
1.0	1.0	30	011-7522-010	I.C., DUAL FLIP-FLOP, CD4013BE	CMOS		U9	
1.0	1.0	29	011-7630-050	I.C., MOS MICROPROCESSOR, 6505			U8	
1.0	1.0	28	011-6651-332	RESISTOR PACK	4116R-002-332		U7	
1.0	1.0	27	011-7629-010	I.C., QUAD EXOR. GATE, CD477BE			U6	
1.0	1.0	26	011-7628-010	I.C., MCS RAM, R6532P			U5	
1.0	1.0	25	011-7518-010	I.C., COUNTER, CD4022BE, CMOS			U4	
1.0	1.0	24	011-7519-010	I.C., PHASE-LOCKED LOOP, CD4046BE	CMOS		U3	
1.0	1.0	23	011-7525-010	I.C., HEX SCHMITT-TRIGGER, CD40106BE, CMOS			U2	
1.0	1.0	22	011-7507-010	I.C., UV-FROM, 2716 OR 2758			U1	
7.0	7.0	21	011-0901-010	DIODE, 1N4003			CRI-CR7	
1.0	1.0	20	011-0618-334	CAPACITOR, .33μF, 50V	CM06BX334K/M		C22	
1.0	1.0	19	011-0633-476	CAPACITOR, 47μF, 10V	199D476X06R3DBI		C16	
1.0	1.0	18	011-0617-105	CAPACITOR, 1.0μF, 50V	CM05BX105K/M		C14	
1.0	1.0	17	011-0651-505	CAPACITOR, 5μF, 220V	44IP505X92207L		C13	
1.0	1.0	16	011-0633-106	CAPACITOR, 10μF, 10V	199D106X06R3DBI		C11	
1.0	1.0	15	011-0633-685	CAPACITOR, 6.8μF, 10V	196D685X9006HM		C10	
1.0	1.0	14	011-0665-681	CAPACITOR, 680PF, 50V	CM05BX681K/M		C9	
1.0	1.0	13	011-06-7-820	CAPACITOR (MWA-820), 82PF	CM04ED820J03		C8	
11.0	11.0	12	011-	CAPACITOR, 0.1μF	KC10Z5U104M050E		C2, C6, C12, C15, C17, C20, 3, 1	
2.0	2.0	11	11-0633-107	CAPACITOR, 100μF	199D107X06R3DBI		C1, C7	
5.0	5.0	10	011-6314-010	TRANSISTOR, NPN	2N2222A		Q2-Q6	
7.0	7.0	9	011-6306-010	TRANSISTOR, PNP	2N2907A		Q1, Q7	
4.0	4.0	8		TERMINAL POST	4509B		E1-E4	
1.0	1.0	7	011-3003-020	100μH INDUCTOR	1H-3		L1	
2.0	2.0	6	011-3733-010	HEAT SINK (TO-18 CASE)	202CB		REF Q1, Q2	
1.0	1.0	5	011-2432-024	24 PIN DIP SOCKET			REF U1	
1.0	1.0	4	011-2419-020	20 PIN DIP HEADER	3428-2003		P1	
1.0	1.0	3	064-0051-001	PRINTED WIRING BOARD	26750-717			
	0.0	2	020-0051-001	SCHEMATIC				
0.0	0.0	1	021-0051-001	PROFILE				
QTY	QTY	ITEM NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	REV LTR	SOURCE/CODE IDENT	NOTES	REF DESIGNATOR
-002	-001		DASH NO	PARTS LIST (US CUSTOMARY MEASUREMENTS ONLY)				

2-4.3 LCR Tester components list

0.0		58	020-0051-001	SCHEMATIC					
7.0	7.0	57	011-3734-018	PAD, TRANSISTOR, TO-18					
1.0	1.0	56	011-6604-432	RESISTOR, 4.3K, 1/4W, 5%	RCR056432JS				R35
1.0	1.0	55	011-6604-821	RESISTOR, 820 Ω , 1/4W, 5%	RCR056821JS				R29
1.0	1.0	54	011-6604-511	RESISTOR, 510 Ω , 1/4W, 5%	RCR056511JS				R28
1.0	1.0	53	011-6604-203	RESISTOR, 20K, 1/4W, 5%	RCR056203JS				R27
2.0	2.0	52	011-6604-202	RESISTOR, 2.0K, 1/4W, 5%	RCR056202JS				R26, R34
1.0	1.0	51	011-6604-120	RESISTOR, 12 Ω , 1/4W, 5%	RCR056120JS				R23
1.0	1.0	50	011-6604-220	RESISTOR, 22 Ω , 1/4W, 5%	RCR076220JS				R22
3.0	3.0	49	011-6604-512	RESISTOR, 5.1K, 1/4W, 5%	RCR056512JS				R20, R24, R25
4.0	4.0	48	011-6604-122	RESISTOR, 1.2K, 1/4W, 5%	RCR056122JS				R19, R21, R30, R32
1.0	1.0	47	011-6604-182	RESISTOR, 1.8K, 1/4W, 5%	RCR056182JS				R18
1.0	1.0	46	011-6604-390	RESISTOR, 39 Ω , 1/4W, 5%	RCR056390JS				R16
	1.0	45	011-6604-100	RESISTOR, 10 Ω , 1/4W, 5%	RCR056100JS				R15
1.0	1.0	44	011-6604-121	RESISTOR, 120 Ω , 1/4W, 5%	RCR076121JS				R14
3.0	3.0	43	011-6604-105	RESISTOR, 1.0M, 1/4W, 5%	RCR056105JS				R13, R17, R31
3.0	3.0	42	011-6604-152	RESISTOR, 1.5K, 1/4W, 5%	RCR056152JS				R11, R12, R33
2.0	2.0	41	011-	RESISTOR, 0.5 Ω , 1/2W	RWRB1SR46FM				R9, R10
1.0	1.0	40	011-6604-103	RESISTOR, 10K, 1/4W, 5%	RCR056103JS				R8
QTY	QTY	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	REV LTR	SOURCE/CODE IDENT	NOTES	REF DESIGNATOR	
-002	-001	DASH NO.			PARTS LIST (US CUSTOMARY MEASUREMENTS ONLY)				

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