OPERATION AND SERVICE MANUAL

MODEL **7440/ 7430/ 7420 /7410**

Electrical Safety Compliance Analyzer

AC/DC HIPOT WITH INSULATION RESISTANCE TESTER, GROUND BOND, CONTINUITY TESTER AND RS-232 INTERFACE

SERIAL NUMBER

Models
74XX

Extech Electronics Ltd.,Co. 2001
4F,NO.252,Nan Yang Street, Shih Chih City,
Taipei Hsien,Taiwan,R.O.C.

TABLE OF CONTENTS

CHAPTER 1 : INTRODUCTION

1.1 SAFETY PRECAUTIONS

1.1.1 General

This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).
Before applying power, please verify that the instrument is set to the correct line voltage (110V or 220V) and the correct fuse is installed.

1.1.2 Safety Symbols

INSTRUCTION MANUAL SYMBOL. PLEASE REFER TO THE INSTRUCTION MANUAL FOR SPECIFIC WARNING OR CAUTION INFORMATION TO AVOID PERSONAL INJURY OR DAMAGE TO THE PRODUCT

INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

CHASSIS GROUND SYMBOL.

WARNING CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.

CAUTION CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE DAMAGE TO EQUIPMENT OR PERMANENT LOSS OF DATA.

WARNING**: A Hipot tester produces voltages and currents which can cause** harmful or fatal

electric shock. **To prevent accidental injury or death, these safety procedures must be strictly observed when handling and using the test instrument.3 Service And Maintenance**

User Service

To prevent electric shock do not remove the instrument cover. There are no user serviceable parts inside. Routine maintenance or cleaning of internal parts is not necessary. Any external cleaning should be done with a clean dry or slightly damp cloth. Avoid the use of cleaning agents or chemicals to prevent any foreign liquid from entering the cabinet through ventilation holes or damaging controls and switches, also some chemicals may damage plastic parts or lettering. Any replacement cables and high voltage components should be acquired directly from Extech Electronics Co. or its distributor.

EXTECH ELECTRONICS CO., LTD. 4F., NO. 5, LANE 194, HUAN HO STREET, SHIH CHIH, TAIPEI HSIEN, TAIWAN, R.O.C.	**☎PHONE: 886-2-26943030 FAX: 886-2-26945563 E-MAIL : extech@ms1.hinet.net**

User Modifications

Unauthorized user modifications will void your warranty. Extech Electronics will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by Extech Electronics . Instruments returned to Extech Electronics with unsafe modifications will be returned to their original operating condition at your expense.

1.2 TEST STATION

1.2.1 Location

Select an area away from the main stream of activity which employees do not walk through in performing their normal duties. If this is not practical because of production line flow, then the area should be roped off and marked for **HIGH VOLTAGE TESTING**. No employees other than the test operators should be allowed inside.

If benches are placed back-to-back, be especially careful about the use of the bench opposite the test station. Signs should be posted: **"DANGER - HIGH VOLTAGE TEST IN PROGRESS - UNAUTHORIZED PERSONNEL KEEP AWAY."**

1.2.2 Power

Dielectric Voltage-Withstand Test Equipment must be connected to a good ground. Be certain that the power wiring to the test bench is properly polarized and that the proper low resistance bonding to ground is in place.

Power to the test station should be arranged so that it can be shut off by one prominently marked switch located at the entrance to the test area. In the event of an emergency, anyone can cut off the power before entering the test area to offer assistance.

1.2.3 Work Area

Perform the tests on a non-conducting table or workbench, if possible. If you cannot avoid using a conductive surface, be certain that it is securely grounded to a good earth ground and insulate the high voltage connection from the grounded surface.

There should not be any metal in the work area between the operator and the location where products being tested will be positioned. Any other metal in the work area should be connected to a good ground, never left "floating".

Position the tester so the operator does not have to reach over the product under test to activate or adjust the tester. If the product or component being tested is small, it may be possible to construct guards or an enclosure, made of a non-conducting material such as clear acrylic, such that the item being tested is within the guards or enclosure during the test, and fit them with switches so that the tester will not operate unless the guards are in place or the enclosure closed.

Keep the area clean and uncluttered. All test equipment and test leads not absolutely necessary for the test should be removed from the test bench and put away. It should be clear to both the operator and to any observers which product is being tested, and which ones are waiting to be tested or have already been tested.

Do not perform Hipot tests in a combustible atmosphere or in any area where combustible materials are present.

1.3 TEST OPERATOR

1.3.1 Qualifications

This instrument generates voltages and currents which can cause **harmful or fatal electric shock** and must only be operated by a skilled worker trained in its use.

The operator should understand the electrical fundamentals of voltage, current, and resistance. They should recognize that the test instrument is a variable high-voltage power supply with the return circuit directly connected to earth ground and therefore, current from the high-voltage output will flow through any available ground path.

1.3.2 Safety Procedures

Operators should be thoroughly trained to follow these and all other applicable safety rules and procedures before they begin a test. Defeating any safety system should be treated as a serious offense and should result in severe penalties, such as

removal from the Hipot testing job. Allowing unauthorized personnel in the area during a test should also be dealt with as a serious offense.

1.3.3 Dress

Operators should not wear jewelry which could accidentally complete a circuit.

1.3.4 Medical Restrictions

This instrument should not be operated by personnel with heart ailments or by personnel wearing devices such as pacemakers.

1.4 TEST PROCEDURES

NEVER PERFORM A HIPOT TEST ON ENERGIZED CIRCUITRY OR EQUIPMENT!

If the instrument has an external safety ground connection be sure that this is connected. Then Connect the return lead **first** for any test regardless of whether the item under test is a sample of insulating material tested with electrodes, a component tested with the high voltage test lead, or a cord-connected device with a two or three prong plug.

Plug in the high voltage test lead only when it is being used. Handle its clip only by the insulator---**never touch the clip directly.** Be certain that the operator has control over any remote test switches connected to the Hipot. Double check the return and high voltage connections to be certain that they are proper and secure.

CAUTION

On Models 7440 and 7430, the return lead of the instrument is not grounded (earthed). This allows for the monitoring of very low leakage levels of current. It is therefore important that the **device under test is never grounded (earthed)** or the current meter will essentially be bypassed and you will get incorrect current meter readings.

1.5 UNPACKING AND INSPECTION

Your instrument was shipped in a custom foam insulated container that complies with ASTM D4169-92a Assurance Level II Distribution Cycle 13 Performance Test Sequence.

If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches or broken meters. If the instrument is damaged, notify the carrier and the Extech Electronics customer support department immediately. Please save the shipping carton and packing material for the carriers inspection. Our customer support department will assist you in the repair or replacement of your instrument. Please do not return your product without first notifying us and receiving an RMA (return material authorization) number.

1.6 STANDARD ACCESSORIES

The standard accessories should include the following items :

1. Power Cable x 1 pc
2. Instruction Manual x 1 set
3. Fuse x 2 pcs
4. Test Leads x 1 set,

	Test Lead
Model 7410 & 7420	Model 1101 x 1, Model 1102 x 1
Model 7430	Model 1101 x 1, Model 1102 x1
Model 7440	Model 1101 x1, Model 1103 x1, Model 1104 x 1

1.7 PREPARATION FOR USE

1.7.1 Instrument Return Connection to DUT

CAUTION The output power supplies of this instrument are referenced directly to earth ground. Any conductor that completes a path between the high voltage and earth ground will form a completed circuit. However, the Return lead of instrument is not connected directly to earth ground to eliminate monitoring stray leakage currents that flow to earth ground. The metering circuit monitors only leakage current flowing from the DUT through the Return test lead to the Return connector. Therefore it is crucial that the DUT does not make direct contact with earth ground or the metering circuit and leakage fail detectors will be **Bypassed.**

If the DUT grounding can not be avoided, please consult the factory for information regarding reconfiguring the instrument for Grounded Return. When the instrument Return in grounded, internal and external stray leakage will be monitored due to currents that flow from High Voltage to earth grounded (such as from HV to the chassis of the instrument). This current can not be avoided and will cause errors when trying to monitor very low leakage currents in the microamp range.

1.7.2 Power Requirements and Line Voltage Selection

This instrument requires a power source of either 115 volts AC ± 15%, or 230 volts AC ±15%, 47-63 Hz single phase. Please check the rear panel to be sure the proper switch setting is selected for your line voltage requirements before turning your instrument on. In addition please be sure the correct fuse is selected and installed while the instrument is in the off position.
.

CAUTION **Do not switch the line voltage selector switch located on the rear panel while the instrument is on or operating. This may cause internal damage and represents a safety risk to the operator.**

Fuse

The fuse used is 6.3A slow-blow fuse for Model 7440, 7430, 7420 and 5.0A for 7410.

Power Cable

WARNING **BEFORE CONNECTING POWER TO THIS INSTRUMENT, THE PROTECTIVE GROUND (EARTH) TERMINALS OF THIS INSTRUMENT MUST BE CONNECTED TO THE PROTECTIVE CONDUCTOR OF THE LINE (MAINS) POWER CORD. THE MAIN PLUG SHALL ONLY BE INSERTED IN A SOCKET OUTLET (RECEPTACLE) PROVIDED WITH A PROTECTIVE GROUND (EARTH) CONTACT. THIS PROTECTIVE GROUND (EARTH) MUST NOT BE DEFEATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING).**

This instrument is shipped with a three-wire power cable. When this cable is connected to an appropriate AC power source, this cable connects the chassis to earth ground.

1.8 OPERATING, STORAGE AND SHIPMENT ENVIRONMENT

1.8.1 Operating Environment

This instrument may be operated in temperatures from 0° - 40° C. and Relative humidity of 0 to 90%.

1.8.2 Storage Environment

This instrument may be stored or shipped in environments with the following limits:

Temperature..... -40° to +55°C

The instrument should also be protected against temperature extremes which may cause condensation within the instrument.

1.8.3 Shipment Environment

Original Packaging: Please retain all original packaging materials that you originally received. If you are returning your instrument to us for servicing please repackage the instrument in its original container. Please enclose the instrument with all options, accessories and test leads. Indicate the nature of the problem or type of service needed. Also, please mark the container "FRAGILE" to insure proper handling.

Other Packaging: If you do not have the original packaging materials please follow these guidelines:

1). Wrap the instrument in a bubble pack or similar foam. Enclose the same

information as above.

2). Use a strong double-wall container that is made for shipping instrumentation. 350 lb. test material is adequate.

3). Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the instrument. Protect the control panel with cardboard.

4). Seal the container securely.

5). Mark the container "FRAGILE" to insure proper handling.

1.9 Field Installation Of Options

There are no field installable options on this instrument.

CHAPTER 2 : SPECIFICATIONS, FRONT & REAR PANEL DESCRIPTIONS

2.1 FUNCTIONAL SPECIFICATIONS

Model 7440/ 7430/ 7420 /7410

INPUT		
Voltage	115/230 VAC ± 15%, Single Phase, User selection	
Frequency	47 - 63 Hz	
Fuse	6.3A (Model 7440/30/20), 5.0A (Model 7410)	
DIELECTRIC WITHSTAND TEST MODE		
Output Rating	5 KV AC @ 40 mA (Model 7440/30), 30mA(Model 7420/10) 6 KV DC @ 10 mA	
Output Adjustment	Range:	0 - 5 KV AC 0 - 6 KV DC
	Resolution:	1 volt/step
	Accuracy:	± (1% of setting + 5 volts)
Ramp-HI (DC)	12mA peak maximum, ON/OFF selectable	
Charge-LO (DC)	Range:	0.0 - 350.0 μA DC or Auto set
HI-Limit AC	Range:	0.00 - 40.00 mA
	Resolution:	0.01 mA/step
	Accuracy:	± (1.5% of setting + 3 counts)
DC	Range:	0 - 3500 μA / 3000 - 9990 μA
	Resolution:	1μA per step / 10μA per step
	Accuracy:	± (1.5% of setting + 3 counts)
LO-Limit AC	Range:	0.000 - 9.999 mA
	Resolution:	0.001 mA/step
	Accuracy:	± (1.5% of setting + 3 counts)
DC	Range:	0.0 - 999.9 μA
	Resolution:	0.1 μA/step
	Accuracy:	± (2% of setting + 2 counts)
Arc Detection	Range:	1 - 9 (most sensitive)
Failure Detector	Audible and Visual	

Voltage Display	Range:	0.00 - 6.00 KV Full Scale
	Resolution:	10 volt/step
	Accuracy:	± (1% of reading + 1 counts)
Current Display	Auto Range	
AC	Range:	0.000 - 3.500 mA
	Resolution:	0.001 mA/step
	Accuracy:	± (1.5% of reading + 3 counts)
	Range:	3.00 mA - 40.00 mA
	Resolution:	0.01 mA/step
	Accuracy:	± (1.5% of reading + 3 counts)
DC	Range:	0.0 - 350.0 / 300 - 3500 / 3000 -9990 μA
	Resolution:	0.1 μA, 1μA , 10μA per step
	Accuracy:	± (1.5% of reading + 3 counts)
Offset	AC : 0 - 2.000 mA or AUTO set	
	DC : 0 - 200 μA or AUTO set	
DC Output Ripple	≤ 4% Ripple RMS at 6 KV DC @ 3.5 mA, Resistive Load	
AC Output Wave Form	Sine Wave, Crest Factor > 1.3, and < 1.5	
Output Frequency	Range:	60 or 50 Hz, User Selection
	Accuracy:	± 100 PPM
Output Regulation	± (0.8 % of setting + 3 volts) from no load to full load	
Dwell Timer	Range:	0.4 - 999.9 sec (0 = Constant)
	Resolution:	0.1 sec increments
	Accuracy:	± (0.1% + 0.05 sec)
Ramp Timer	Range:	AC 0.1 - 999.9 sec
		DC 0.1 - 999.9 sec
	Resolution:	0.1 sec increments
	Accuracy:	± (0.1% + 0.05 sec)
INSULATION RESISTANCE TEST MODE		
Output Voltage	Range:	100 - 1000 Volts DC
	Resolution:	1 volt/step
	Accuracy:	± (1% of setting + 3 volts)

Voltage Display	Range:	0 - 1000 V
	Resolution:	1 volt/step
	Accuracy:	± (1% of reading + 3 counts)
Resistance Display	Range:	1 - 9999 MΩ (4 Digit, Auto Ranging)
	Accuracy:	± (2% of reading + 2 counts) at test voltage 500 - 1000V and 1 - 1000 MΩ ± (8% of reading + 2 counts) at test voltage 500 - 1000V and 1000 - 9999 MΩ ± (8% of reading + 2 counts) at test voltage 100 - 500V and 1 - 1000 MΩ
Charge-LO	Range:	0.000 - 3.500μA or Auto Set
HI-Limit	Range:	1 - 9999 MΩ (0 = Off)
LO-Limit	Range:	1 - 9999 MΩ
Delay Timer	Range:	0.5 - 999.9 sec (0 = Constant)
	Resolution:	0.1 sec/step
	Accuracy:	± (0.1% + 0.05 sec)
Ground Check (Model 7430 only)	Current :	DC 0.1A ± 0.01A, fixed 1Ω ±0.1Ω, fixed
GROUND CONTINUITY TEST MODE		**Model 7440 only**
Output Voltage (Open Circuit Limit)	Range:	3.00 - 8.00 Volts AC
	Resolution:	0.01 volt/step
	Accuracy:	± (1 % of Setting + 0.03V) O.C. Condition
Output Frequency	Range:	60 or 50 Hz, User Selection
	Accuracy:	±100 PPM
Output Current	Range:	3.00 - 30.00 Amps AC, 0.01 Amp/step
	Resolution:	0.01 Amp/step
	Accuracy :	± (1 % of Setting + 0.03 A)
Current Display	Range:	0.00 - 35.00 Amps
	Resolution:	0.01 Amp/step
	Accuracy:	± (1 % of Reading + 0.03 A)
Resistance Display	Range:	0 - 600 mΩ
	Resolution:	1 mΩ/step
	Accuracy:	± (1 % of Reading + 1 mΩ)

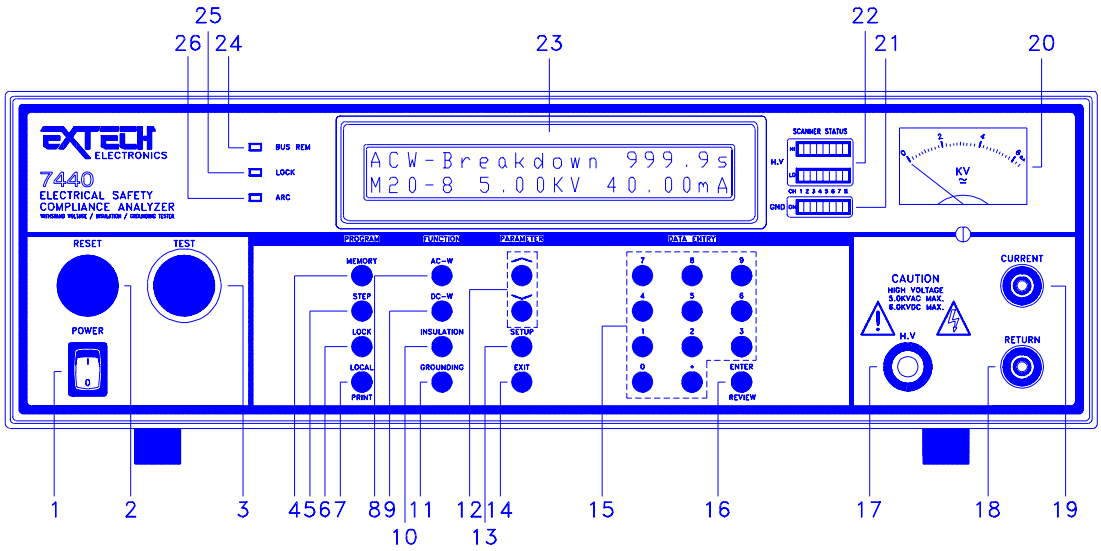
HI-Limit	Range:	0 - 600 mΩ for 3 - 10 A
		0 - 150 mΩ for 3 - 30 A
	Resolution:	1 mΩ/step
	Accuracy:	± (1 % of Setting + 1 mΩ), 10-30A
		± (1 % of Setting + 2 mΩ), 3 - 10A
LO-Limit	Range:	0 - 600 mΩ for 3 - 10 A
		0 - 150 mΩ for 3 - 30 A
	Resolution:	1 mΩ/step
	Accuracy:	± (1 % of Setting + 1 mΩ), 10-30A
		± (1 % of Setting + 2 mΩ), 3 - 10A
Dwell Timer	Range:	0.5 - 999.9 sec (0 = Constant)
	Resolution:	0.1 sec/step
	Accuracy:	± (0.1% + 0.05 sec)
Milliohm Offset	Max. Offset Capability:	200 mΩ
	Resolution:	1 mΩ / step
	Accuracy:	± (1 % of Setting + 1 mΩ)
GENERAL SPECIFICATIONS		
PLC Remote Control	Input - Test, Reset, Recall memory # 1, # 2 and # 3 Output - Pass, Fail, Test-in-Process	
Memory	Allows storage of up to 50 groups different test programs and 8 step/each memory.	
Security	User definable 4-Digit password lockout capability to avoid unauthorized access to test set-up program.	
LCD Contrast Setting	9 ranges set by the numeric keys on the front panel.	
Buzzer Volume Setting	10 ranges set by the numeric key on the front panel.	
Calibration	Software and adjustments are made through front panel.	
Scanner Port	Two Port Maximum including the built-in scanner.	
Scanner Built-in Option	High Voltage x 8 Ports (7440A and 7430) Ground Continuity x 8 Ports (7440 only)	
Dimension/ weight: Model 7440	EIA 3Ux 500 mm(D), 22 Kg.	

Model 7430 Model 7420 Model 7410	EIA 3Ux 500 mm(D), 22.0 Kg. EIA 3Ux 500 mm(D), 18.0 Kg. EIA 3Ux 300 mm(D), 11.5 Kg.
Operating Temperature/ RH	0 - 40 ° C , 0 - 90% RH

Product specifications are subject to change without notice

2.2 FRONT PANEL LAYOUT

2.2.1 FRONT PANEL OF MODEL 7440

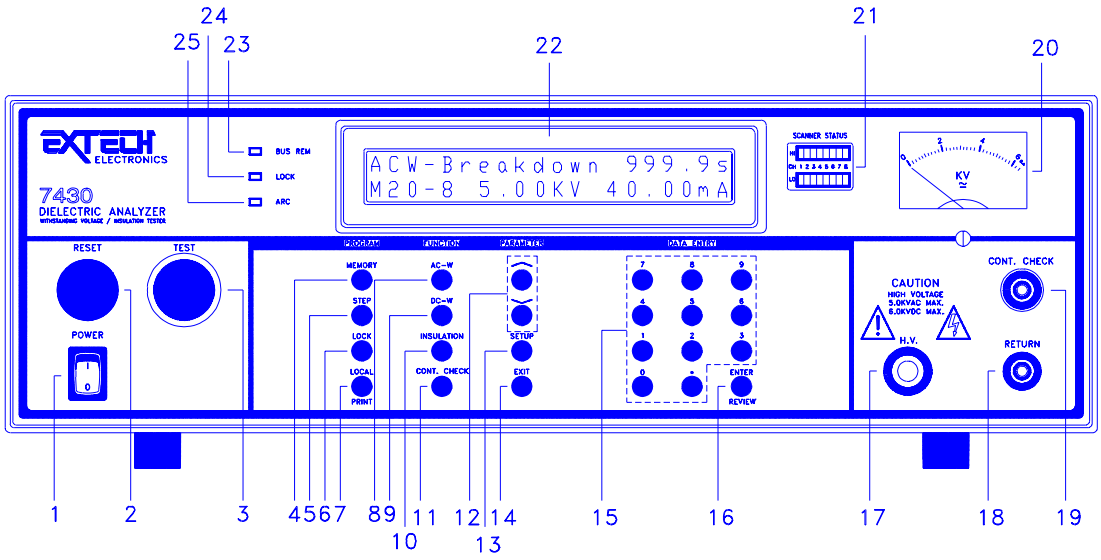


1. **POWER SWITCH:** Rocker-style switch
2. **RESET BUTTON:** Reset the system before you can proceed to the next test
3. **TEST BUTTON:** Press to start the test.
4. **MEMORY KEY:** To select one of the 50 memories location.
5. **STEP KEY:** To select one of the 8 steps within each memory.
6. **LOCK KEY:** To select key lockout mode.
7. **LOCAL/PRINT KEY:** To change the operation of the instrument from Remote to the Local mode. When Printer Port Card is installed, press this key will output test data to a printer.
8. **AC-W KEY:** To select AC Withstand Test
9. **DC-W KEY:** To select DC Withstand Test
10. **INSULATION KEY:** To select Insulation Resistance Test
11. **GROUNDING KEY:** To select Ground Continuity Test
12. **UP-DOWN ARROW KEYS:** To scroll the display through the function parameter menus
13. **SETUP KEY:** To enter the setup menu and view or change the GPIB address, display contrast, alarm volume, PLC remote settings, or the stop on fail setting.
14. **EXIT KEY:** To exit any menu or to clear an unwanted entry in a parameter field.
15. **DATA ENTRY KEYS:** To input numeric parameters.
16. **ENTER/REVIEW KEY:** To accept numeric data for parameter settings. or to review up to 8 connected test results after a test has been completed.
17. **HIGH VOLTAGE OUTPUT JACK:** HV output, use the high voltage test lead, model 1101
18. **RETURN OUTPUT JACK:** Use the Return test lead, model 1104. This jack carries high current.
19. **CURRENT OUTPUT JACK:** Use the high current output lead model 1103.
20. **ANALOG METER :** To indicate the High Voltage at the output jack 17

21. **SCANNER STATUS LED's:** These LED's indicate the status of the 8 Ground continuity

22. **SCANNER STATUS LED's:** These LED's indicate the status of the 8 HV channels
23. **LCD DISPLAY:** The 2x20 character display
24. **BUS REMOTE LED:** To indicate the instrument is in the Remote Control mode.
25. **LOCK LED:** To indicate the keys are locked, the user will be unable to change any settings.
26. **ARC LED:** To indicate Arc Detector detects an arcing condition. This indicator will function even when the Arc Fail has been disabled

2.2.2 FRONT PANEL OF MODEL 7430

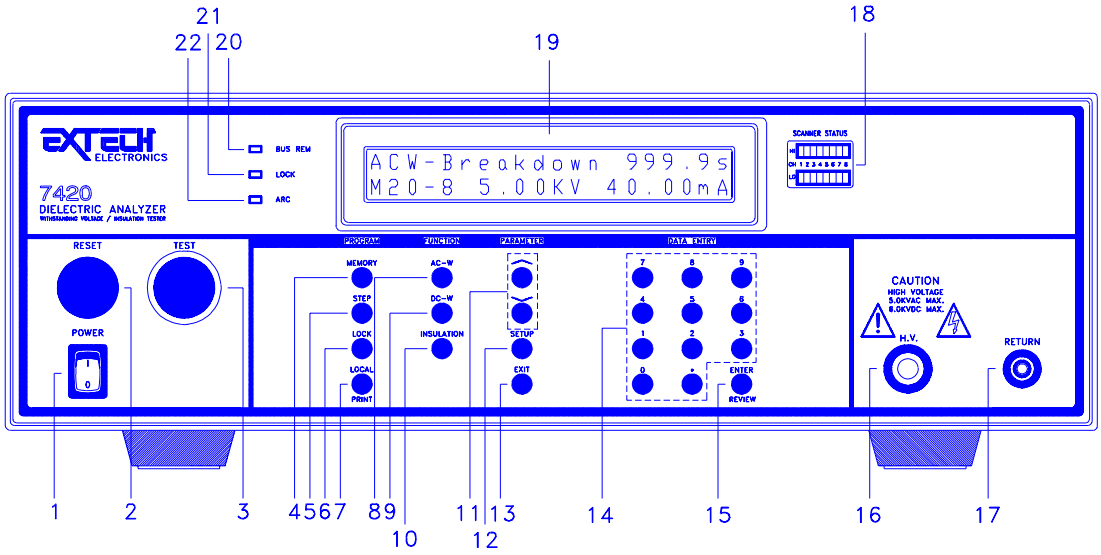


1. **POWER SWITCH:** Rocker-style switch
2. **RESET BUTTON:** Reset the system before you can proceed to the next test
3. **TEST BUTTON:** Press to start the test.
4. **MEMORY KEY:** To select one of the 50 memories location.
5. **STEP KEY:** To select one of the 8 steps within each memory.
6. **LOCK KEY:** To select key lockout mode.
7. **LOCAL/PRINT KEY:** To change the operation of the instrument from Remote to the Local mode. When Printer Port Card is installed, press this key will output test data to a printer.
8. **AC-W KEY:** To select AC Withstand Test
9. **DC-W KEY:** To select DC Withstand Test
10. **INSULATION KEY:** To select Insulation Resistance Test
11. **GROUND CHECK KEY:** To select Ground Check Test
12. **UP-DOWN ARROW KEYS:** To scroll the display through the function parameter menus
13. **SETUP KEY:** To enter the setup menu and view or change the GPIB address, display contrast, alarm volume, PLC remote settings, or the stop on fail setting.
14. **EXIT KEY:** To exit any menu or to clear an unwanted entry in a parameter field.
15. **DATA ENTRY KEYS:** To input numeric parameters.
16. **ENTER/REVIEW KEY:** To accept numeric data for parameter settings. or to review up to 8 connected test results after a test has been completed.
17. **HIGH VOLTAGE OUTPUT JACK:** HV output, use the high voltage test lead, model 1101
18. **RETURN OUTPUT JACK:** Use the Return test lead, model 1102
19. **GROUND CHECK OUTPUT JACK:** Use the Return test model 1102
20. **ANALOG METER :** To indicate the High Voltage at the output jack 17

21. **SCANNER STATUS LED's:** These LED's indicate the status of the 8 H.V. channel

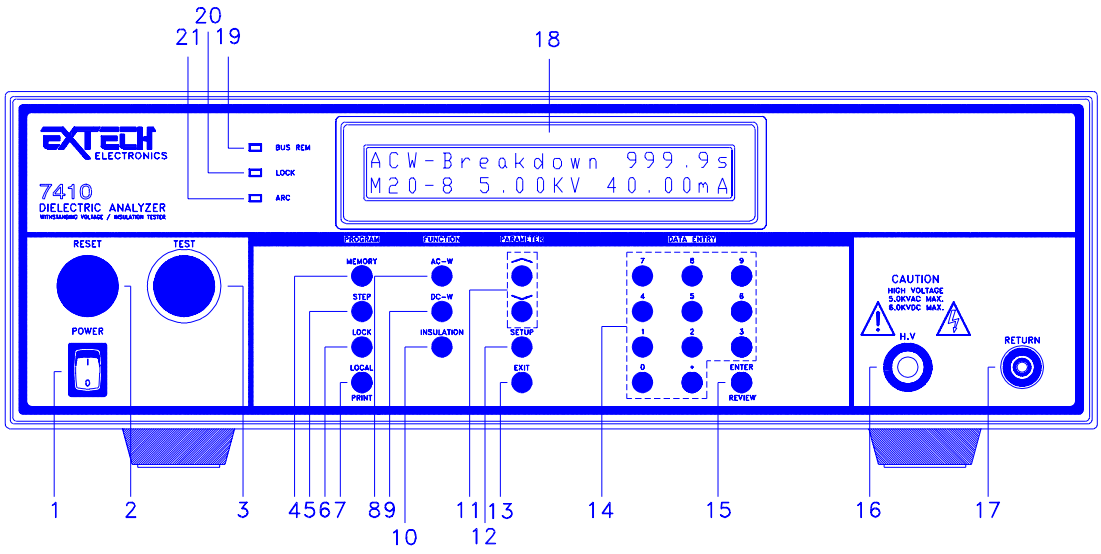
22. **LCD DISPLAY:** The 2x20 character display
23. **BUS REMOTE LED:** To indicate the instrument is in the Remote Control mode.
24. **LOCK LED:** To indicate the keys are locked, the user will be unable to change any settings.
25. **ARC LED:** To indicate Arc Detector detects an arcing condition. This indicator will function even when the Arc Fail has been disabled

2.2.3 FRONT PANEL OF MODEL 7420



1. **POWER SWITCH:** Rocker-style switch
2. **RESET BUTTON:** Reset the system before you can proceed to the next test
3. **TEST BUTTON:** Press to start the test.
4. **MEMORY KEY:** To select one of the 50 memories location.
5. **STEP KEY:** To select one of the 8 steps within each memory.
6. **LOCK KEY:** To select key lockout mode.
7. **LOCAL/PRINT KEY:** To change the operation of the instrument from Remote to the Local mode. When Printer Port Card is installed, press this key will output test data to a printer.
8. **AC-W KEY:** To select AC Withstand Test
9. **DC-W KEY:** To select DC Withstand Test
10. **INSULATION KEY:** To select Insulation Resistance Test
11. **UP-DOWN ARROW KEYS:** To scroll the display through the function parameter menus
12. **SETUP KEY:** To enter the setup menu and view or change the GPIB address, display contrast, alarm volume, PLC remote settings, or the stop on fail setting.
13. **EXIT KEY:** To exit any menu or to clear an unwanted entry in a parameter field.
14. **DATA ENTRY KEYS:** To input numeric parameters.
15. **ENTER/REVIEW KEY:** To accept numeric data for parameter settings. or to review up to 8 connected test results after a test has been completed.
16. **HIGH VOLTAGE OUTPUT JACK:** HV output, use the high voltage test lead, model 1101
17. **RETURN OUTPUT JACK:** Use the Return test lead, model 1102
18. **SCANNER STATUS LED's:** These LED's indicate the status of the 8 H.V. channel
19. **LCD DISPLAY:** The 2x20 character display
20. **BUS REMOTE LED:** To indicate the instrument is in the Remote Control mode.
21. **LOCK LED:** To indicate the keys are locked, the user will be unable to change any settings.
22. **ARC LED:** To indicate Arc Detector detects an arcing condition. This indicator will function even when the Arc Fail has been disabled.

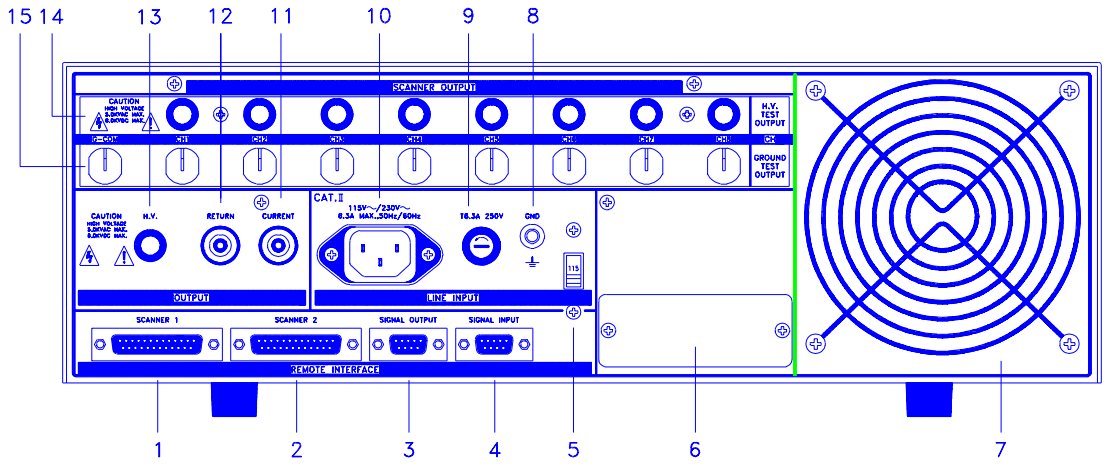
2.2.4 FRONT PANEL OF MODEL 7410



1. **POWER SWITCH:** Rocker-style switch
2. **RESET BUTTON:** Reset the system before you can proceed to the next test
3. **TEST BUTTON:** Press to start the test.
4. **MEMORY KEY:** To select one of the 50 memories location.
5. **STEP KEY:** To select one of the 8 steps within each memory.
6. **LOCK KEY:** To select key lockout mode.
7. **LOCAL/PRINT KEY:** To change the operation of the instrument from Remote to the Local mode. When Printer Port Card is installed, press this key will output test data to a printer.
8. **AC-W KEY:** To select AC Withstand Test
9. **DC-W KEY:** To select DC Withstand Test
10. **INSULATION KEY:** To select Insulation Resistance Test
11. **UP-DOWN ARROW KEYS:** To scroll the display through the function parameter menus
12. **SETUP KEY:** To enter the setup menu and view or change the GPIB address, display contrast, alarm volume, PLC remote settings, or the stop on fail setting.
13. **EXIT KEY:** To exit any menu or to clear an unwanted entry in a parameter field.
14. **DATA ENTRY KEYS:** To input numeric parameters.
15. **ENTER/REVIEW KEY:** To accept numeric data for parameter settings. or to review up to 8 connected test results after a test has been completed.
16. **HIGH VOLTAGE OUTPUT JACK:** HV output, use the high voltage test lead, model 1101
17. **RETURN OUTPUT JACK:** Use the Return test lead, model 1102
18. **LCD DISPLAY:** The 2x20 character display
19. **BUS REMOTE LED:** To indicate the instrument is in the Remote Control mode.
20. **LOCK LED:** To indicate the keys are locked, the user will be unable to change any settings.
21. **ARC LED:** To indicate Arc Detector detects an arcing condition. This indicator will function even when the Arc Fail has been disabled

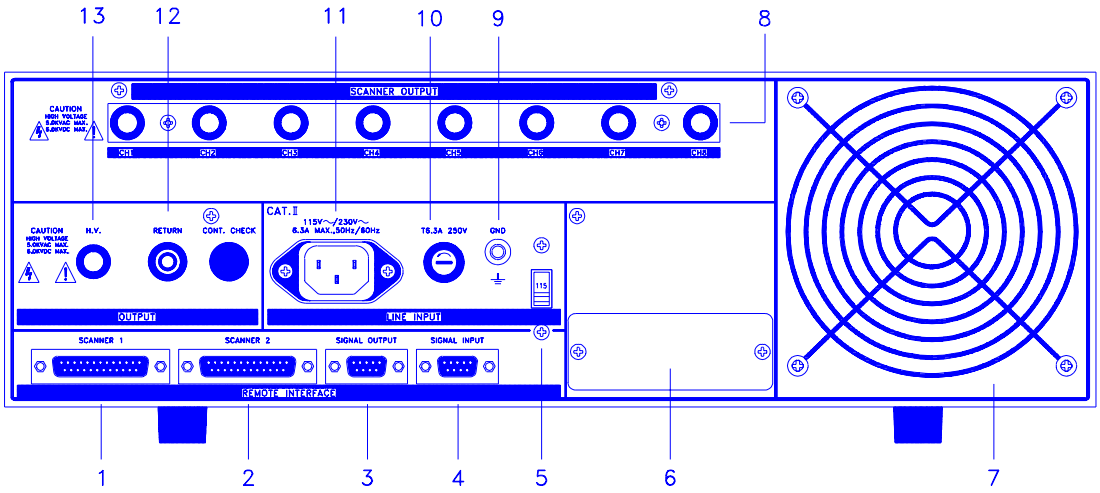
2.3 REAR PANEL LAYOUT

2.3.1 REAR PANEL OF MODEL 7440



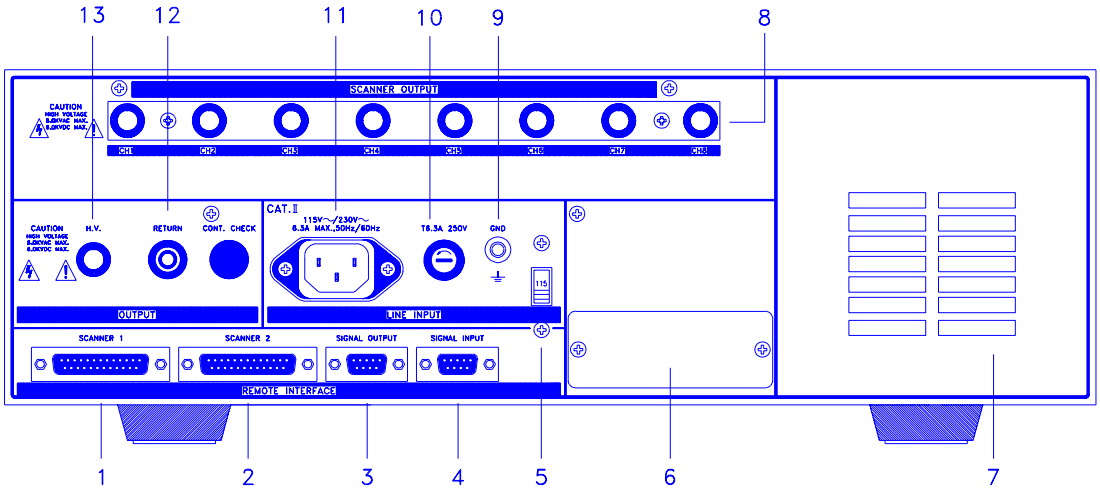
1. **SCANNER 1 CONNECTOR:** For connection of first External Scanner Model 7002.
2. **SCANNER 2 CONNECTOR:** For connection of second External Scanner Model 7002
3. **REMOTE SIGNAL OUTPUT:** 9-Pin D subminiature male connector for remote control of TEST and RESET functions; and program memory selection 1, 2, or 3.
4. **REMOTE SIGNAL INPUT:** 9-Pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING signals. (relay output.)
5. **INPUT POWER SWITCH:** Line voltage selection for 110V or 230V operation.
6. **INTERFACE:** Standard interface is RS232, factory installed. For GPIB user, order a GPIB card, model 1117 and substitute the RS232 card.
7. **THERMAL COOLING FAN:** Runs continuously to cool the instrument.
8. **CHASSIS GROUND (EARTH) TERMINAL:** This terminal should be connected to a good earth ground before operation.
9. **FUSE RECEPTACLE:**. Please replace the fuse with correct rating.
10. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.
11. **CURRENT OUTPUT JACK:** For the connection of the high current output lead used for the ground continuity test, model 1103. This lead is only used for the ground continuity test.
12. **RETURN OUTPUT JACK:** For the connection of the Return test lead, model 1104. This jack will carry high current for the Ground Continuity test.
13. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the high voltage test lead, model 1101
14. **8 CHANNEL HIGH VOLTAGE OUTPUT JACK:** Scanner output. For the connection of the high voltage test lead, model 1109 to UUT(Unit Under Test).
15. **8 CHANNEL GROUND CONTINUITY TERMINALS:** Scanner output. For the connection of Ground wire to UUT.

2.3.2 REAR PANEL OF MODEL 7430



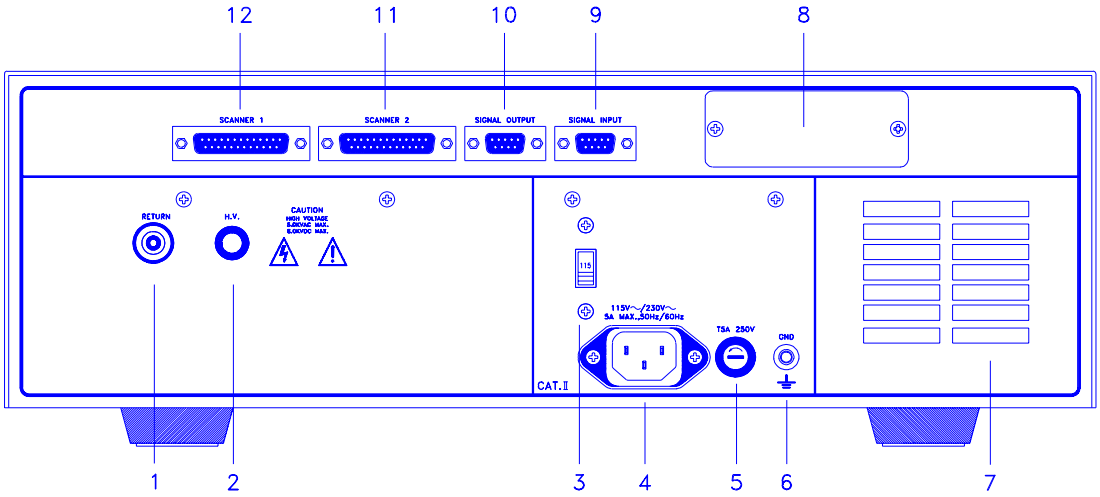
1. **SCANNER 1 CONNECTOR:** For connection of first External Scanner Model 7002.
2. **SCANNER 2 CONNECTOR:** For connection of second External Scanner Model 7002
3. **REMOTE SIGNAL OUTPUT:** 9-Pin D subminiature male connector for remote control of TEST and RESET functions; and program memory selection 1, 2, or 3.
4. **REMOTE SIGNAL INPUT:** 9-Pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING signals. (relay output.)
5. **INPUT POWER SWITCH:** Line voltage selection for 110V or 230V operation.
6. **INTERFACE:** Standard interface is RS232, factory installed. For GPIB user, order a GPIB card, model 1117 and substitute the RS232 card.
7. **THERMAL COOLING FAN:** Runs continuously to cool the instrument.
8. **8 CHANNEL HIGH VOLTAGE OUTPUT JACK:** Scanner output. For the connection of the high voltage test lead, model 1109 to UUT(Unit Under Test).
9. **CHASSIS GROUND (EARTH) TERMINAL:** This terminal should be connected to a good earth ground before operation.
10. **FUSE RECEPTACLE:**. Please replace the fuse with correct rating.
11. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.
12. **RETURN OUTPUT JACK:** For the connection of the Return test lead, model 1102.
13. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the high voltage test lead, model 1101

2.3.3 REAR PANEL OF MODEL 7420



1. **SCANNER 1 CONNECTOR:** For connection of first External Scanner Model 7002.
2. **SCANNER 2 CONNECTOR:** For connection of second External Scanner Model 7002
3. **REMOTE SIGNAL OUTPUT:** 9-Pin D subminiature male connector for remote control of TEST and RESET functions; and program memory selection 1, 2, or 3.
4. **REMOTE SIGNAL INPUT:** 9-Pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING signals. (relay output.)
5. **INPUT POWER SWITCH:** Line voltage selection for 110V or 230V operation.
6. **INTERFACE:** Standard interface is RS232, factory installed. For GPIB user, order a GPIB card, model 1117 and substitute the RS232 card.
7. **THERMAL COOLING FAN:** Runs continuously to cool the instrument.
8. **8 CHANNEL HIGH VOLTAGE OUTPUT JACK:** Scanner output. For the connection of the high voltage test lead, model 1109 to UUT(Unit Under Test).
9. **CHASSIS GROUND (EARTH) TERMINAL:** This terminal should be connected to a good earth ground before operation.
10. **FUSE RECEPTACLE:**. Please replace the fuse with correct rating.
11. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.
12. **RETURN OUTPUT JACK:** For the connection of the Return test lead, model 1102.
13. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the high voltage test lead, model 1101

2.3.4 REAR PANEL OF MODEL 7410



1. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the high voltage test lead, model 1101
2. **RETURN OUTPUT JACK:** For the connection of the Return test lead, model 1102.
3. **INPUT POWER SWITCH:** Line voltage selection for 110V or 230V operation.
4. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.
5. **FUSE RECEPTACLE:**. Please replace the fuse with correct rating.
6. **CHASSIS GROUND (EARTH) TERMINAL:** This terminal should be connected to a good earth ground before operation.
7. **THERMAL COOLING FAN:** Runs continuously to cool the instrument.
8. **INTERFACE:** Standard interface is RS232, factory installed. For GPIB user, order a GPIB card, model 1117 and substitute the RS232 card.
9. **REMOTE SIGNAL INPUT:** 9-Pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING signals. (relay output.)
10. **REMOTE SIGNAL OUTPUT:** 9-Pin D subminiature male connector for remote control of TEST and RESET functions; and program memory selection 1, 2, or 3.
11. **SCANNER 2 CONNECTOR:** For connection of second External Scanner Model 7002
12. **SCANNER 1 CONNECTOR:** For connection of first External Scanner Model 7002

2.4 QUICK START

This quick start guide assumes the operator has some familiarity with automated testing and desires to use the **"default"** settings on the instrument. The default settings shown will remain in memory unless you choose to override them with your own test program. The instrument default settings that appear in memories 1-40 are as follows:

2.4.1 DEFAULTS

Function	**Parameter**	**Value**
ACW	Voltage	1240VAC
	HI-Limit	10.00mA
	LO-Limit	0.000mA
	Ramp Time	1.0s
	Dwell Time	1.0s
	Frequency	60Hz
	Arc Sense	5
	Arc Fail	OFF
	Scanner	OOOOOOOOOOOOOOO
	Connect	OFF
	Continuity (7430 only)	OFF

DCW	Voltage	1500VDC
	HI-Limit	3500μA
	LO-Limit	0.0μA
	Ramp Time	1.0s
	Dwell Time	1.0s
	Ramp-HI	OFF
	Charge-LO	0.0μA
	Arc Sense	5
	Arc Fail	OFF
	Scanner	OOOOOOOOOOOOOOO
	Connect	OFF
	Continuity (7430 only)	OFF

IR	Voltage	1000VDC
	Charge-LO	0.000μA
	HI-Limit	0MΩ
	LO-Limit	10MΩ
	Delay	1.0s
	Scanner	OOOOOOOOOOOOOOO
	Connect	OFF

Defaults continue

Function	Parameter	Value
GND	Current	25.00A
	Voltage	6.00V
	HI-Limit	100mΩ
	LO-Limit	0mΩ
	Dwell	1.0s
	Frequency	60Hz
	Scanner	0
	Offset	0mΩ
	Connect	OFF

Setup	PLC Remote	OFF
	Address (GPIB only)	8
	Contrast	5
	Volume	5
	Fail Stop	ON

Calibration	Password	0
	MR-Lock	ON

2.4.2 OPERATION

Step 1- Unpacking

Unpack the instrument from its special shipping container. Be sure to save all packaging materials in case you need to return it to the factory for service. Check the accessories supplied against the packing list inside the box. If there is any discrepancy, please contact Extech or its authorized distributor.

Step 2- Setup

WARNING Locate a suitable testing area and be sure you have read all safety instructions for the operation of the instrument and suggestions on the test area set-up in the Safety section. Locate a three prong grounded outlet. Be sure the outlet has been tested for proper wiring before connecting the instrument to it.

Step 3- Check Input Power

CAUTION Check to be sure the correct input line voltage has been selected on the rear panel. Either 115 volts AC or 230 volts AC. Connect the power input plug into its socket on the rear panel of the instrument. Connect the male end of the plug to the outlet receptacle. Please be sure that the safety ground on the power line cord is not defeated and that you are connecting to a grounded power source.

Step 4- Power Up

Turn on the POWER switch located on the lower left hand side of the front panel. All LEDs on the Front Panel will be lit for visual inspection.

Connect the appropriate test leads to the device under test (DUT) or test fixture. Then connect the Return Lead first (black) to the test fixture or item followed by the High Voltage Output lead (red). Note: The Return Lead of this instrument is not connected directly to Earth Ground. **The DUT must not contact Earth Ground directly**.

Step 5- Test

WARNING DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED. Press the GREEN test button on the front panel once. The instrument will begin the automated test sequence using the defaults. If a failure occurs you will HEAR an audible alarm. Press the RED button marked "RESET" to stop the alarm This will silence the alarm and reset the instrument ready for the next test. This "RESET" button may also be used as a safety button to quickly ABORT a test and cut off the HIGH VOLTAGE.

When HIGH VOLTAGE is present, the RED arrow indicator located in the lower right side of the front panel near the high voltage connector will flash. If the device under test passes the test then you will hear a brief BEEP to let you know the item was successfully tested and it PASSED. In the case of device under test fails the test, the instrument will display the test results on the LCD display and it will remain until the next test is initiated. Depressing the "RESET" button will prepare the instrument for the next test but will not clear the display until the next test is started or another reset is executed.

Step 6- Result

The result of the test is displayed in 2x20 LCD. Please refer to Chapter 3 for explanation of message.

CHAPTER 3 : MANUAL OPERATIONS

3.1 PROGRAM KEYS

3.1.1 MEMORY KEY

Each memory location contains 8 steps which can be connected sequentially to the next consecutive step. Only one function can be selected for each step. The following memory map illustrates the separate locations for each function.

Memory 1	Step 1	Step 2	. . . .	Step 8
Select one function only for each step	ACW DCW IR G-Continuity	ACW DCW IR G-Continuity		ACW DCW IR G-Continuity

Memory 2	Step 1	Step 2	. . . .	Step 8
Select one function only for each step	ACW DCW IR G-Continuity	ACW DCW IR G-Continuity		ACW DCW IR G-Continuity

.
.
.

Memory 50

Note: On model 7430, 7420 and 7410 disregard the location for G-Continuity parameters. For model 7430, the Continuity Check parameter is stored within the ACW and DCW functions as a single setting for both modes.

Press the "**MEMORY**" key, the display will show:

Memory = X X Range : 1 - 50

To recall the memory, use the Numeric Key to enter the Memory location number, and then press the "ENTER" key. The program will recall the test parameters stored in that location and return to the operation mode..

3.1.2 STEP KEY

Press the "STEP" key, the display will show the test parameters of the functions selected for that step, i.e. the parameters of AC Withstand Voltage , DC Withstand Voltage, Insulation Resistance or Ground Bond test. Pressing the step key again will advance to the next step in sequence with step 1 following step 8.

Note: When the step is connected you will see an underbar character on the display just after the step number, M25-1. The following display indicates that after running Memory 25 Step 1, the tester will continue to run Memory 25 Step 2.

ACW Set	XXX.X s
M25-1_ X.XX KV	XX.XX mA

3.1.3 LOCK KEY

Press the "LOCK" key. If the Password is Enabled, the display will show:

Password = _ _ _ _
Range : 0 - 9 9 9 9

Enter the password and then press the "ENTER" key. The program will switch the Key Lock function from "LOCK" to "UNLOCK" or "UNLOCK" to "LOCK" mode and advance the program to Operation mode automatically. If the instrument is in the Lock mode, the "LOCK" indicator on the front panel will lit. If the wrong password is entered, the program will give a warning sound and the display will show:

Password = ERROR
Range : 0 - 9 9 9 9

And then the program will return to the original screen and wait to enter the new password.

If the Password is Disabled (Password is set "0"), the display will show:

Key Lock = O N <ENTER> to Select	or	Key Lock = O F F <ENTER> to Select

Press "ENTER" key to select the Key Lock mode ON or OFF, then press the "EXIT" key to advance the program to the Operation mode. This will toggle the Key Lock function from "LOCK" to "UNLOCK" or vice versa. When the tester is in LOCK mode, the "LOCK" indicator on the front panel will lit.

If the Memory Lock function (MR-Lock) is selected to "ON", the Memory selection Menu will be disabled when in the Lock Mode. If the MR-Lock is selected to "OFF", the Memory selection Menu will be enabled when in the Lock Mode. Different memories can be recalled but the test parameters or steps cannot be changed. The MR-Lock default is preset to "ON" at the factory.

3.1.4 LOCAL/PRINT KEY

When the analyzer is under remote operation, GPIB or RS232, the BUS REMOTE LED is lit. All the keys are inactive except Local Key. Press the Local Key will return the analyzer to manual operation.

When Printer Port Card is installed, a 80-column RS232 printer can be connected to the analyzer. Press the Local/Print button will output the test data to the printer.

3.2 FUNCTION KEYS

Before going to setup the Test Parameters, make sure that the analyzer is in the "Unlock" mode, then follow this procedures to setup the Test Parameters.

3.2.1 AC-W KEY

Press the "ACW" key will enter the setting mode of AC Withstanding Voltage test and the display will show:

ACW Set XXX.X s MXX-X X.XX KV XX.XX mA	Note: X = Numeric

ACW Set : AC Withstand Voltage test setting screen
XXX.X s : Dwell Time setting in 0.1 sec.
MXX : Memory Program number (1-50)
- X : Test Step number(1-8)
X.XX KV : AC Output Voltage setting in 0.01 KV
XX.XX mA : AC High-Limit current setting in 0.01 mA

Use the "∧" or "∨" arrow keys to progress through the test parameters menu. The "∨" key will advance forward and "∧" key will advance backward. The sequential forward menu items are Voltage, HI-Limit, LO-Limit, Ramp Time, Dwell Time, Frequency, Arc Sense, Arc Fail, Scanner Set, Offset, Connect.

3.2.1.1 AC Output Voltage setting

Press "∨" key and advance to the display below:

Voltage = XXXX V Range : 0 - 5000

Use the "Numeric" keys to enter the AC voltage desired in 1 Volt step, then press the "ENTER" key to confirm. The analyzer will store the voltage setting and advance to the High Limit parameter automatically.

3.2.1.2 HI-Limit Current setting
The display will show:

HI-Limit = XX.XX mA Range : 0.00 - 40.00

Use the "Numeric" keys to enter the maximum leakage current allowed for HI-Limit setting in 0.01 mA step, then press the "ENTER" key. The program will store the HI-Limit setting and advance to the LO-Limit parameter automatically.

3.2.1.3 LO-Limit Current setting
The display will show:

LO-Limit = X.XXX mA Range : 0.000 - 9.999

Use the "Numeric" keys to enter the minimum leakage current allowed for LO-Limit setting in 0.01 mA step, then press the "ENTER" key. The program will store the LO-Limit setting and advance to the Ramp Time parameter automatically.

Note : If the LO-Limit is set to "0", the LO-Limit judgment is disabled.

3.2.1.4 Ramp Time setting
The display will show:

Ramp Time = XXX.X s Range : 0.1 - 999.9

Use the "Numeric" keys to enter the Ramp Up Time required in 0.1 sec. step, then press the "ENTER" key. The analyzer will store the Ramp Time setting and advance to the Dwell Time setting automatically

3.2.1.5 Dwell Time setting
The display will show:

Dwell Time = XXX.X s Range : 0.3 - 999.9 0 = Constant

Use the "Numeric" keys to enter the Dwell Time required in 0.1 sec. step, then press the "ENTER" key. The program will store the Dwell Time setting and advance to the Frequency selection parameter automatically.

If the Dwell Time is set to "0", the timer will continue to count to the maximum test time then reset to "0" and start over automatically. The test will continue until a reset is executed or a failure occurs.

Note : For model 7420 and 7410, the maximum duty cycle is 70% at rated output. Therefore it cannot be used continuously at 30mA output.

3.2.1.6 Frequency Selection
The display will show:

Frequency = 60 Hz <ENTER> to Select	or	Frequency = 50 Hz <ENTER> to Select

Use the "ENTER" key to select the Output Frequency, then press the "∨" key to advance to Arc Sensitivity setting.

3.2.1.7 Arc Sensitivity setting and Arc Fail selection
The display will show:

Arc Sense = X.XX mA Range : 2.00 - 20.00 mA

Use the "Numeric" keys to enter the current sensitivity desired for Arc Sense setting in 0.01 mA step, then press the "ENTER" key.. The program will store the Arc Sense setting and advance to the ARC Fail mode selection automatically. The display will show:

Arc Fail = O N <ENTER> to Select	or	Arc Fail = O F F <ENTER> to Select

If the Arc Fail mode is set to "ON", the analyzer will indicate an arc failure when the arc current is over the setting. The analyzer will stop the test immediately and the ARC indicator on the front panel will lit and alarm.

If the Arc Fail mode is set to "OFF", the analyzer will not indicate an arc failure when the arc current is over the setting. The analyzer will not stop the test but the ARC indicator on the front panel will lit when arcing is present.
Use the "ENTER" key to select the Arc Fail mode, then press the "∨" key to advance the program to scanner channel setting display.

3.2.1.8 Scanner Channel setting
The display will show:

Scanner Set CH = 1 - 16 XXXXXXXXXXXXXXX	Note: X = H, O or L.

If the Scanner is not installed, you may skip this step by pressing the "∨" key.

Use the "Numeric" keys to enter the status of High, Open or Low for each scanner channel, then press the "ENTER" key. The analyzer will store the Scanner Channel status and advance to the Offset setting automatically. The table below is the cross reference of the numeric keys, which are used for the Scanner channel setting.

Channel Status	Numeric Key	Description
H (High)	1	Connected to High Voltage Output
L (Low)	0	Connected to Return
O (Open)	•	Not connected to High Voltage or Return

The Channel setting will start from Channel 1 on the left end and stop at Channel 16 on the right end. The analyzer will set any unassigned channel(s) to OPEN after pressing the "ENTER" key and advance to Offset parameter setting. The Scanner Status LED will lit according to the channel selected. When more than 8 channels of AC Withstand test are required, an external scanner is used, the channel status are shown on the external scanner.

For example, you wish to set Channel 1 and 5 to High and Channel 3, 6 and 7 to Low, you will press "1","."."0","."."1","0","0" and the display will show :
"H0L0HLL".

3.2.1.9 Offset setting

The display will show:

Offset = X.XXXmA <Test> to Auto Set

If you do not wish to offset the leakage current of the test leads and fixture, you may skip this function by pressing the "∨" key. The analyzer will advance to the Step Connection setting automatically.

You may use the "Numeric" keys to enter the offset value of the leakage current or press "Test" button for the analyzer to make a measurement and saved the measured value as an offset.

3.2.1.10 Step Connection setting

The display will show:

Connect = O N <ENTER> to Select	or	Connect = O F F <ENTER> to Select

If Connect is set to "ON", the next step in the sequence will be executed. If Connect is set to "OFF", the test sequence will stop at this step.

Use the "ENTER" key to select the Step Connection mode, then press "∨" key. The display will return to AC Output Voltage Setting which is similar to 2.1.1. showing the value of the voltage keyed earlier.

This is the end of parameter setting for AC Withstand Test. Use the "∧" or "∨" key to scroll the display to check for setting error. When a error is found, just simply enter the correct setting and process.

Press the "EXIT" key to exit from the setting mode to operation mode. Now the analyzer is ready to perform AC Withstand Voltage Test to the DUT.

Note : If Step 8 is set to "ON" the test process will be connected to the first step of the next Memory.

3.2.2 DC-W KEY

Press the "DCW" key will enter the setting mode of DC Withstanding Voltage test and the display will show:

DCW Set XXX.X s MXX-X X.XX KV XXXXX μA	Note: X = Numeric

DCW Set : DC Withstand Voltage test Setting screen
XXX.X s : Dwell Time setting in 0.1 sec.
MXX : Memory Program number (1-50)
- X : Test Step number(1-8)
X.XX KV : DC Output Voltage setting in 0.01 KV
XXXX μA : DC High-Limit current setting

Use the "∨" arrow keys to progress through the test parameters menu. The "∨" key will advance forward and "∧" key will advance backward. The sequential forward menu items are Voltage, HI-Limit, LO-Limit, Ramp Time, Dwell Time, Charge-LO, Ramp-HI, Arc Sense, Arc Fail, Scanner Set, Offset, Connect.

3.2.2.1 DC Output Voltage setting

The display will show:

Voltage = XXXX V Range : 0 - 6000

Use the "Numeric" keys to enter the DC withstand voltage desired in 1 volt step, then press the "ENTER" key. The analyzer will store the voltage setting and advance to the HI-Limit parameter automatically.

3.2.2.2 HI-Limit Current setting

The display will show:

HI-Limit = XXXX μA Range : 0 - 9999

Use the "Numeric" keys to enter the upper limit of leakage current in 1μA step, then press the "ENTER" key. The analyzer will store the HI-Limit setting and advance to the Low Limit parameter automatically.

3.2.2.3 LO-Limit Current setting

The display will show:

LO-Limit = XXX.X μA Range : 0.000 - 9.999

Use the "Numeric" keys to enter the minimum leakage current desired in 0.1μA step. then press the "ENTER" key. The analyzer will store the LO-Limit setting and advance to the Ramp Time parameter automatically

If the LO-Limit is set to "0", the LO-Limit is disabled.

3.2.2.4 Ramp Time setting
The display will show:

Ramp Time = XXX.X s Range : 0.4 - 999.9

Use the “Numeric” keys to enter the time desired for the voltage to ramp up from 0 to the required voltage, then press the “ENTER” key . The analyzer will store the Ramp Time setting and advance to the Dwell Time parameter automatically.

3.2.2.5 Dwell Time setting
The display will show:

Dwell Time = XXX.X s Range : 0.5 - 999.9 0 = Constant

Use the “Numeric” keys to enter the time you wish to hold the voltage after the required voltage is reached, then press the “ENTER” key. The analyzer will store the Dwell Time setting and advance to the Charge-LO parameter automatically.

If the Dwell Time is set to “0”, the timer will continue to count to the maximum test time then reset to “0” and start over automatically. The test will continue until a reset is executed or a failure occurs.

Note : For model 7420 and 7410, the maximum duty cycle is 70% at rated output. Therefore it is not advisable to use “0” at 10 mA output.

3.2.2.6 Charge-LO
The display will show:

Charge-LO = XXX.X μA <TEST> to Auto Set

The Charge-LO function is used to check if the test cables are connected properly at the beginning of a test. A capacitive DUT will draw charging current on the DC Withstand Voltage test when the Output is activated. If the charging current was lower then the setting, the test cables may not be connected properly.

ALL 7400 series analyzer can set the Charge-LO value manually or automatically. To set the Charge-LO value manually, use the numeric keys to enter the Charge-LO current setting and then press the ENTER key . he analyzer will store the Charge-LO setting and advance to the Ramp-HI parameter. The setting range of Charge-LO is from 0.0 to 350.0 μA in 0.1μA step.

WARNING **Please be aware that the following procedure will activate high voltage on the output connector once the Test button is pressed.**

To use Auto Set, connect the test cables and/or test fixture between the instrument and DUT. Be sure that the test parameter of Output Voltage and Ramp Time have been set to the values that will be used for the Final test. If the scanner is to be used then the scanner channel must also be set, and then press the TEST button. The instrument will apply the voltage that has been entered for this memory-step selection.

The analyzer will read the charging current of DUT and set the Charge-LO current at approximately one half (1/2) of the reading. The display will show:

Charge-LO = XXX.X μA <TEST> to Auto Set

Note : The value showing on the display is the Charge-LO setting and is not the reading of the charging current of the DUT.

Then press the "∨" key to advance to Ramp-Hi test parameter.

3.2.2.7 Ramp-HI

The display will show:

Ramp-HI = ON <ENTER> to Select	or	Ramp-HI = OFF <ENTER> to Select

Use the "ENTER" key to select the Ramp-HI mode, then press the "∨ " key to advance to Arc Sense parameter setting.

The Ramp-HI function is active during the Ramp Up period only. Ramp-HI will allow current higher than the normal HI-Limit current setting of the DC Withstand Voltage test to avoid false failure due to charging current.

3.2.2.8 Arc Sensitivity setting and Arc Fail selection

The display will show:

Arc Sense = X.XX mA Range : 2.00 - 20.00

Use the "Numeric" keys to enter the desired Arc Sense sensitivity setting in 0.01 mA step, then press the "ENTER" key.. The analyzer will store the Arc Sense setting and advance to the ARC Fail mode selection automatically. The display will show:

Arc Fail = ON <ENTER> to Select	or	Arc Fail = OFF <ENTER> to Select

Use the "ENTER" key to select the Arc Fail mode, then press the "∨" key to advance to Scanner Channel setting.

If the Arc Fail mode is set to "ON", the program will indicate an arc failure when the arc current is over the setting. The analyzer will shut down the test immediately and the ARC indicator on the front panel will lit.

If the Arc Fail mode is set to "OFF", the analyzer will not indicate an arc failure when the arc current is over the setting. The analyzer will not stop testing but the ARC indicator on the front panel will lit only when arcing is present.

3.2.2.9 Scanner Channel setting

. The display will show:

Scanner Set CH = 1 - 16 XXXXXXXXXXXXXXX

Note: X = H, O or L.

If the Scanner is not installed, you may skip this step by pressing the "∨" key.

Use the "Numeric" keys to enter the status of High, Open or Low for each scanner channel, then press the "ENTER" key. The analyzer will store the Scanner Channel status and advance to the Offset setting automatically. The table below is the cross reference of the numeric keys, which are used for the Scanner channel setting.

Channel Status	Numeric Key	Description
H (High)	1	Connected to High Voltage Output
L (Low)	0	Connected to Return
O (Open)	•	Not connected to High Voltage or Return

The Channel setting will start from Channel 1 on the left end and stop at Channel 16 on the right end. The analyzer will set any unassigned channel(s) to OPEN after pressing the "ENTER" key and advance to Offset parameter setting. The Scanner Status LED will lit according to the channel selected. When more than 8 channels of DC Withstand test are required, an external scanner is used, the channel status are shown on the external scanner.

For example, you wish to set Channel 1 and 5 to High and Channel 3, 6 and 7 to Low, you will press "1","."."0","."."1","0","0" and the display will show :
"H0L0HLL".

3.2.2.10 Offset setting
The display will show:

WARNING **Please be aware that the following procedure will activate high voltage on the output connector once the Test button is pressed.**

Offset = X.X μA <Test> to Auto Set

If you do not wish to offset the leakage current of the test leads and fixture, you may skip this function by pressing the "∨" key. The analyzer will advance to the Step Connection setting automatically.

You may use the "Numeric" keys to enter the offset value of the leakage current or press "Test" button for the analyzer to make a measurement and saved the measured value as an offset.

3.2.2.11 Step Connection setting
The display will show:

Connect = ON <ENTER> to Select	or	Connect = OFF <ENTER> to Select

If Connect is set to "ON", the next step in the sequence will be executed. If Connect is set to "OFF", the test sequence will stop at this step.

Use the "ENTER" key to select the Step Connection mode, then press "∨" key to advance the analyzer to the beginning display of Voltage setting which is shown in 2.2.1.

This is the end of parameter setting for DC Withstand Test. Use the "∧" or "∨" key to scroll the display to check for setting error. When a error is found, just simply enter the correct setting and process.

Press the "EXIT" key to exit from the setting mode to operation mode. Now the analyzer is ready to perform DC Withstand Voltage Test to the DUT.

Note : If Step 8 is set to "ON" the test process will be connected to the first step of the next Memory.

3.2.3 INSULATION KEY

Press the "INSULATION" key and the display will show:

IR Set XXX.X s MXX-X XXXX V XXXXX MΩ

Note: X = the numeric

IR Set : Insulation Resistance test setting screen
XXX.X s Delay Time setting in 0.1 sec step.
MXX : Memory Program number (1-50)
-X : Test Step number(1-8)
XXXX V: DC Output Voltage
XXXX MΩ: Low-Limit of Insulation Resistance

Use the "∨" arrow keys to progress through the test parameters menu. The sequential forward menu items are Voltage, Charge-LO, HI-Limit, LO-Limit, Delay Time, Scanner Set, Connect.

3.2.3.1 Output Voltage setting

The display will show:

Voltage = XXXX V Range : 100 - 1000

Use the "Numeric" keys to enter the desired voltage setting in 1 volt step, then press the "ENTER" key. The analyzer will store the voltage setting and advance to the Charge-LO parameter automatically.

3.2.3.2 Charge-LO
The display will show:

Charge-LO = X.XXX μA <TEST> to Auto Set

The Charge-LO function is used to check if the test cables are connected properly at the beginning of a test. A capacitive DUT will draw charging current on the DC Withstand Voltage test when the Output is activated. If the charging current was lower then the setting, the test cables may not be connected properly.

ALL 7400 series analyzer can set the Charge-LO value manually or automatically. To set the Charge-LO value manually, use the numeric keys to enter the Charge-LO current setting and then press the ENTER key . The analyzer will store the Charge-LO setting and advance to the HI-Limit parameter setting. The setting range of Charge-LO is from 0.0 to 350.0 μA in 0.1μA step.

WARNING **Please be aware that the following procedure will activate high voltage on the output connector once the Test button is pressed.**

To use Auto Set, connect the test cables and/or test fixture between the instrument and DUT. Be sure that the test parameter of Output Voltage has been set to the values that will be used for the Final test. If the scanner is to be used then the scanner channel must also be set, and then press the TEST button. The instrument will apply the voltage that has been entered for this memory-step selection.

The analyzer will read the charging current of DUT and set the Charge-LO current at approximately one half (1/2) of the reading. The display will show:

Charge-LO = XXX.X μA <TEST> to Auto Set

Note : The value showing on the display is the Charge-LO setting and is not the reading of the charging current of the DUT.

Then press the "∨" key to advance to HI-Limit parameter setting.

3.2.3.3 HI-Limit Current setting
The display will show:

HI-Limit = XXXX MΩ Range : 0 - 9999 0=OFF

Use the "Numeric" keys to enter the desired HI-Limit setting in 1MΩ step, then press the "ENTER" key. The analyzer will store the HI-Limit setting and advance to the LO-Limit parameter automatically. Enter "0" if no judgment is required.

3.2.3.4 LO-Limit Current setting
The display will show:

LO-Limit = XXXX MΩ Range : 1 - 9999

Use the "Numeric" keys to enter the LO-Limit setting in 1MΩ step, then press the "ENTER" key. The analyzer will store the LO-Limit setting and advance to the Delay Time setting automatically.

3.2.3.5 Delay Time setting
The display will show:

Delay Time = XXX.X s Range : 0.5 - 999.9 0 = Constant

Use the "Numeric" keys to enter the Delay Time setting in 0.1 second step, then press the "ENTER" key. The analyzer will store the Delay Time setting and advance to the Scanner Channel setting automatically.

Note : Delay Time sets the time when should the analyzer compare measured readings to the HI-Limit and LO-limit settings. This delay allows charging current to stabilize before a test judgment is made. The capacitance of the DUT will dictate what delay setting is required to perform an accurate IR measurement.

If the Delay Time is set to "0", the analyzer will continue until the "RESET" button is pressed. The display will show the measured readings during the test. The timer will count the total test time and then will reset to "0" if "RESET" button is pressed again and the analyzer is ready for the next test.

3.2.3.6 Scanner Channel setting
The display will show:

Scanner Set CH = 1 - 16 XXXXXXXXXXXXXXX

Note: X = H, O or L.

If the Scanner is not installed, you may skip this step by pressing the "∨" key.

Use the "Numeric" keys to enter the status of High, Open or Low for each scanner channel, then press the "ENTER" key. The analyzer will store the Scanner Channel status and advance to the Connecting setting automatically. The table below is the cross reference of the numeric keys, which are used for the Scanner channel setting.

Channel Status	Numeric Key	Description
H (High)	1	Connected to High Voltage Output
L (Low)	0	Connected to Return
O (Open)	•	Not connected to High Voltage or Return

The Channel setting will start from Channel 1 on the left end and stop at Channel 16 on the

right end. The analyzer will set any unassigned channel(s) to OPEN after pressing the "ENTER" key and advance to Offset parameter setting. The Scanner Status LED will lit according to the channel selected. When more than 8 channels of IR testing are required, an external scanner is used, the channel status are shown on the external scanner.

For example, you wish to set Channel 1 and 5 to High and Channel 3, 6 and 7 to Low, you will press "1","."."0","."."1","0","0" and the display will show :
"H0L0HLL".

3.2.3.7 Step Connection setting
The display will show:

Connect = ON <ENTER> to Select	or	Connect = OFF <ENTER> to Select

If Connect is set to "ON", the next step in the sequence will be executed. If Connect is set to "OFF", the test sequence will stop at this step.

Use the "ENTER" key to select the Step Connection mode, then press "∨" key to advance the analyzer to the beginning display of Voltage setting which is shown in 2.3.1.

.This is the end of parameter setting for IR Test. Use the "∧" or "∨" key to scroll the display to check for setting error. When a error is found, just simply enter the correct setting and process.

Press the "EXIT" key to exit from the setting mode to operation mode. Now the analyzer is ready to perform IR Test to the DUT.

Use the "ENTER" key to select the Step Connection mode, then press the "∧" or "∨" key to advance the program to another test parameter or press the "EXIT" key to exit from the setting mode to the operation mode.

If Step 8 is set to "ON" the test process will be connected to the first step of the next Memory.

3.2.4 GROUNDING KEY (Model 7440 only)

Press the "GROUNDING" key and the display will show:

GND Set XXX.X s MXX-X XX.XX A XXX mΩ

Note: X = the numeric

GND Set: Ground Bond test setting screen
XXX.X s: Dwell Time setting in 0.1 second step.
MXX : Memory Program number(1-50)
-X : Test Step number(1-8)
XX.XX A: AC Output Current setting in 10mA step
XX.XX mΩ: Ground Continuity Resistance in 0.01 mΩ step.

Use the "∨" arrow keys to progress through the test parameters menu. The sequential forward menu items are Current, Voltage, HI-Limit, LO-Limit, Dwell Time, Frequency, Scanner Set, Offset, Connect.

3.2.4.1 Output Current setting
The display will show:

Current = XX.XX A Range : 3.00 - 30.00

Use the "Numeric" keys to enter the Current setting, then press the "ENTER" key. The analyzer will store the Current setting in 0.01A step and advance to the Output Voltage parameter automatically.

3.2.4.2 Output Voltage setting
The display will show:

Voltage = X.XX V Range : 3.00 - 8.00

Use the "Numeric" keys to enter the voltage setting, then press the "ENTER" key. The analyzer will store the Voltage setting in 0.01 volt step and advance to the HI-Limit parameter automatically. This setting controls the open circuit voltage and does not take effect when the current is being regulated at the Output Current setting.

3.2.4.3 HI-Limit Ground Resistance setting
The display will show:

HI-Limit = XXX mΩ Range : 0 - 600

Use the "Numeric" keys to enter the HI-Limit setting in 1 mΩ step, then press the "ENTER" key. The analyzer will store the HI-Limit setting and advance to the LO-Limit parameter automatically.

3.2.4.4 Low Limit Ground Resistance setting
The display will show:

LO-Limit = XXX mΩ Range : 0 - 600 0=OFF

Use the "Numeric" keys to enter the LO-Limit setting in 1 mΩ step, then press the "ENTER" key. The program will store the LO-Limit setting and advance to the Dwell Time parameter automatically.
Note :If the LO-Limit is set to "0", the LO-Limit judgment is disabled.

3.2.4.5 Dwell Time setting
The display will show:

Dwell Time = XXX.X s Range : 0.5 - 999.9 0 = Constant

Use the "Numeric" keys to enter the Dwell Time setting in 0.1 second step, then press the "ENTER" key. The analyzer will store the Dwell Time setting and advance to the Frequency selection parameter automatically.

Note :If the Dwell Time is set to "0", the timer will continue to count to the maximum test time then reset to "0" and start over automatically. The test will continue until "RESET" button is pressed or a failure occurs.

3.2.4.6 Frequency Selection
The display will show:

Frequency = 60 Hz <ENTER> to Select	or	Frequency = 50 Hz <ENTER> to Select

Use the "ENTER" key to select the Output Frequency, then press "∨" key to advance to Scanner Channel setting.

3.2.4.7 Scanner Channel setting
The display will show:

Scanner CH = X Range: 1-16 0 = OFF

If the Scanner is not installed, it is not necessary to enter this parameter. Press "∨" key to advance to Offset parameter.

Use the "Numeric" keys to enter the scanner channel number, then press the "ENTER" key. The analyzer will store the scanner channel number and advance to the Offset parameter automatically. The Scanner Status LED will lit according to the channel selected.. When more than 8 channels of grounding test are required, an external scanner is used, the channel status are shown on the external scanner.

Note :To operate from the front panel output connectors with the Scanner option installed, the Scanner Channel must be set to "0" to receive accurate readings.

3.2.4.8 Offset setting
The display will show:

Offset = XXX mΩ <TEST> to Auto Set

This instrument can set the mΩ offset value by Manual Offset and Auto Offset.

For Manual Offset, use the "Numeric" keys to enter the mΩ Offset value in 1mΩ step and then press the "ENTER" key. The analyzer will store the mΩ Offset setting and advance to the Connect setting. The range of mΩ Offset is from 0 to 200 mΩ.

For Auto Offset, setup the test parameter of Output Voltage, Current and Frequency and connect the test cables and/or test fixture to the instrument first. Then short circuit the ends of the test cables. If the scanner is being used, the scanner channel has to be set. Then press the "TEST" button. The program will activate the test current and frequency that has been set for this memory-step. The display will show:

Offset = XXX mΩ <TEST> to Auto Set

The display will show the measured mΩ Offset value and the program will use this value for the Offset setting. Each step has its own individual Offset value and must be set separately. This allows the user to compensate for different lead lengths when using a scanner or external fixturing for Ground Continuity testing.

Then press "∨" key to advance to Step Connect setting.

3.2.4.9 Step Connection setting
The display will show:

Connect = ON <ENTER> to Select	or	Connect = OFF <ENTER> to Select

If Connect is set to "ON", the next step in the sequence will be executed. If Connect is set to "OFF", the test sequence will stop at this step.

Use the "ENTER" key to select the Step Connection mode, then press "∨" key to advance the analyzer to the beginning display of Current setting which is shown in 2.4.1.

.This is the end of parameter setting for GROUND CONTINUITY Test. Use the "∧" or "∨" key to scroll the display to check for setting error. When a error is found, just simply enter the correct setting and process.

Press the "EXIT" key to exit from the setting mode to operation mode. Now the analyzer is ready to perform GROUND CONTINUITY Test to the DUT.

3.3 PARAMETER KEYS

Use the "SETUP" key to progress through the menu of System Parameters. Successive key presses will advance the menu forward. The sequential forward menu items are: PLC Remote, Address, Contrast, Volume, Fail Stop.

The setting of system parameters affect the operating conditions of the instrument and are separate from the functional settings. The system settings are also global and are not specific to any memory location.

3.3.1 PLC REMOTE SELECTION

Press the Setup key and the display will show:

PLC Remote = ON <ENTER> to Select	or	PLC Remote = OFF <ENTER> to Select

Use the "ENTER" key to select the mode PLC Remote Control.

If the Remote Control is set to "ON", the test function will be controlled by the "Remote Control" via the remote connectors located on the rear panel. The

"TEST" button on the front panel is disabled but the "RESET" button is still enabled.

If the Remote Control is set to "OFF", the operation of the instrument will be controlled by the local "TEST" and "RESET" buttons on the front panel.

The remote Memory Program recall functions can be performed only when the PLC Remote is set "ON". In addition, when the PLC remote is set to ON the remote TEST signal input is active while in the Bus Remote Mode.

After selecting PLC Remote mode, press the "SETUP" key again. If the GPIB Interface Card is installed on this analyzer. the analyzer will advance to GPIB addressing setting. If this instrument does not have the GPIB interface card installed, the analyzer will advance to the contrast setting. The instrument will store the selection of PLC Remote automatically.

3.3.2 GPIB ADDRESS SETTING

If the GPIB interface card is not installed on this instrument, this setup program will not appear on the setup menu.

The display will show:

Address = XX Range : 0 - 30

Use the "Numeric" keys to enter the GPIB Address, then press the "ENTER" key and the display will show the current address immediately.

Press the "SETUP" key to advance to the Contrast setting. The program will store the address setting automatically.

3.3.3 LCD CONTRAST SETTING

The display will show:

Contrast = X Range : 1 - 9 9 = High

Use the "Numeric" keys to enter the LCD Contrast level, then press the "ENTER" key. The analyzer will change the LCD Contrast immediately when the "ENTER" key is pressed, so the setting can be viewed.

Change the LCD Contrast again or press the "SETUP" key to advance to the Volume setting. The program will store the Contrast setting automatically.

The LCD Contrast level is from 1 - 9 for Level 1 is the lowest contrast and level 9 is the highest contrast.

3.3.4 Audible Alarm Volume setting

The display will show:

Volume = X Range : 0 - 9 0 = OFF 9 = High

The Audible Alarm Volume level is from 0 - 9 for level 0 is used to disable the Audible Alarm, level 1 is the lowest volume and level 9 is the loudest.

Use the "Numeric" keys to enter the Audible Alarm level, then press the "ENTER" key. The analyzer will provide a sample sound for checking immediately when the "ENTER" key is pressed.

Change the Volume again or press the "SETUP" key to forward to the Fail Stop selection. The program will store the Volume setting automatically.

3.3.5 FAIL TO STOP/CONTINUE SELECTION

The display will show:

Fail Stop = ON <ENTER> to Select	or	Fail Stop = OFF <ENTER> to Select

Use the "ENTER" key to select the mode of Fail Stop.

This function is used when multiple steps have been connected. If the Fail Stop mode is set "ON", the test process will stop at the step that fails, or at the end of test process. When there are unfinished steps to be completed, pressing the "TEST" button will continue the test process at the next step. Pressing the "RESET" button and then the "TEST" button will start the test process from the first step.

After the selection of Fail Stop mode, press the "SETUP" key to advance to the beginning of the menu (PLC Remote), or press the "EXIT" key to exit from the Fail Stop selection to the operation mode. The Program will store the selection of Fail Stop automatically.

If the Fail Stop is set to "OFF", the analyzer instrument will continue to complete the entire test process even if there were failed steps during the test. The display will show the results of each step at the end of test process, as follows:

Test	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**	**P**	**F**
Step	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

First Memory Program **Second Memory Program**

The pass or fail status is indicated by the letter F (Fail) or P (Pass). The Pass/Fail status of the first memory Program will show on the left end and the second one will be on the right. The pass/fail status of the first 16 steps can be displayed. A maximum of 16 steps will be saved. If more than 16 steps are executed in sequence. Results from those steps greater than 16 cannot be retrieved from memory.

Press "ENTER/REVIEW' key to review the test result of each step, up to maximum of 8 steps.

3.3.6 AUTO PRINTER SETTING

After the setting of Fail Stop, press "SETUP" key will enter AUTO Print setting.:

AUTO Print = ON <ENTER> to Select	or	AUTO Print = OFF <ENTER> to Select

Use "Enter" key to set AUTO Print mode to "ON" or "OFF".

If AUTO Print = ON, The printer will print a Print Number and the result of every Step when the "TEST" key is pressed. . The Print Number will be incremented by "1" every time the "TEST" key is pressed. This will keep track of the number of DUT tested.

If AUTO Print = OFF, printing will be manual. After the testing is completed, the user can print the information of the display by pressing "EXIT/PRINT key.

3.3.7 PRINT MODE SETTING

After AUTO Print mode, press "SETUP" will enter Print Mode Setting

Print Mode = ALL <ENTER> to Select	or	Print Mode = Fail <ENTER> to Select

Use "ENTER" key to select ALL or Fail.

Print Mode = ALL will print the information on the display after every step, regardless of DUT passes or fails the test.

Print Mod = Fail will only print the information on the display when DUT fails the test. No information will be printed when the DUT passes the test.

After Print Mode setting, press "SETUP" key will enter Print Code Number Setting mode.

3.3.8 PRINT NUMBER

Print NO = 0
Range : 0 - 9999

The Print NO will start from 0 when the tester is turned On. The number will increase by 1 when "TEST" button is pressed until 9999 and loop back to 0. The user can set the starting Print NO by entering the number in this mode. Enter the starting Print NO and press "ENTER" key. When the tester is turned OFF, the Print NO will be reset to 0.

When the "SETUP" key is pressed, the display will loop back to 3.3.1 PLC REMOTE SELECTION or press "EXIT" to exit parameter setting mode.

3.4 DISPLAYED MESSAGES

3.4.1 AC WITHSTAND VOLTAGE TEST:

3.4.1.1 Abort

3.4.1.1.1 If the test in process is Aborted with the "RESET" button or remote control, the display will show:

ACW Abort XXX.X s
MXX-X X.XX KV XX.XX mA

3.4.1.1.2 If the test in process is Aborted with the "RESET" button or remote control before the meter readings are taken, the display will show:

ACW Abort XXX.X s MXX-X - . - - KV - - . - - mA	or	ACW Abort XXX.X s MXX-X X.XX KV - - . - - mA

3.4.1.2 Ramp

3.4.1.2.1 At the beginning of AC Withstand Voltage test when the voltage begins to ramp but before the meter readings are taken, the display will show:

ACW Ramp XXX.X s
MXX-X - . - - KV - - . - - mA

3.4.1.2.2 During the AC Withstand Voltage test when the values are being updated in real time during the ramp cycle, the display will show:

ACW Ramp XXX.X s
MXX-X X.XX KV XX.XX mA

3.4.1.3 Dwell

3.4.1.3.1 During the AC Withstand Voltage test when the values are being updated in real time during the dwell cycle, the display will show:

ACW Dwell	XXX.X s
MXX-X X.XX KV	XX.XX mA

3.4.1.3.2 If the ramp time is very short and the program has not read the meter readings, the display will show:

ACW Dwell	XXX.X s
MXX-X - . - - KV	- - . - - mA

3.4.1.4 HI-Limit

3.4.1.4.1 If the DUT current exceeds the HI-Limit of AC Withstand Voltage test and the leakage current is within the metering range, the display will show:

ACW HI-Limit	XXX.X s
MXX-X X.XX KV	XX.XX mA

3.4.1.4.2 If the DUT current exceeds the HI-Limit of AC Withstand Voltage test and the leakage current is not within the metering range, the display will show:

ACW HI-Limit	XXX.X s
MXX-X X.XX KV	> 40 mA

3.4.1.5 Short

3.4.1.5.1 If the DUT current is well beyond the metering range of AC Withstand Voltage test the instrument assumes that the failure is due to a short circuit, the display will show:

ACW Short	XXX.X s
MXX-X - . - - KV	> 40 mA

3.4.1.6 Breakdown

3.4.1.6.1 If the DUT current is well beyond the metering range of AC Withstand Voltage test and an Arcing condition beyond the Arc Sense limit is indicated, the display will show:

ACW Breakdown	XXX.X s
MXX-X X.XX KV	> 40 mA

3.4.1.7 LO-limit

3.4.1.7.1 If the DUT current falls below the LO-Limit of AC Withstand Voltage test the display will show:

ACW LO-limit	XXX.X s
MXX-X X.XX KV	XX.XX mA

3.4.1.8 Arc-Fail

3.4.1.8.1 If the DUT current is within the metering range of the AC Withstand Voltage test and an Arcing current exceeds the Arc-Sense limit and the Arc function is set to "ON", then an Arc failure has occurred and the display will show:

ACW Arc-Fail	XXX.X s
MXX-X X.XX KV	XX.XX mA

3.4.1.9 Pass

3.4.1.9.1 When the DUT passed the AC Withstand Voltage test, when the test process is complete the display will show:

ACW Pass	XXX.X s
MXX-X X.XX KV	XX.XX mA

3.4.2 DC WITHSTAND VOLTAGE TEST:

3.4.2.1 Abort

3.4.2.1.1 If the test in process is Aborted with the "RESET" button or remote control, the display will show:

DCW Abort	XXX.X s
MXX-X X.XX KV	XXXX μA

3.4.2.1.2 If the test in process is Aborted with the "RESET" button or remote control before the meter readings are taken, the display will show:

DCW Abort	XXX.X s
MXX-X - . - - KV	- - - - μA

or

DCW Abort	XXX.X s
MXX-X X.XX KV	- - - - μA

3.4.2.2 Ramp

3.4.2.2.1 At the beginning of DC Withstand Voltage test when the voltage begins to ramp but before the meter readings are taken, the display will show:

DCW Ramp	XXX.X s
MXX-X - . - - KV	- - - - μA

3.4.2.2.1 During the DC Withstand Voltage test when the values are being updated in real time during the Ramp cycle, the display will show:

DCW Ramp	XXX.X s
MXX-X X.XX KV	XXXX μA

3.4.2.3 Dwell

3.4.2.3.1 During the DC Withstand Voltage test when the values are being updated in real time during the Dwell cycle, the display will show:

DCW Dwell	XXX.X s
MXX-X X.XX KV	XX.XX μA

3.4.2.3.2 If the Ramp time is very short and the program has not read the meter readings, the display will show:

DCW Dwell	XXX.X s
MXX-X - . - - KV	- - - - μA

3.4.2.4 Ramp-Hi

3.4.2.4.1 If the Ramp-HI function is enabled and the leakage current during the Ramp cycle exceeds 10mA, then the display will show:

DCW Ramp-HI	XXX.X s
MXX-X X.XX KV	>9999 μA

3.4.2.5 Charge-LO

3.4.2.5.1 If the leakage current during the Ramp cycle falls below the Charge -LO setting, then the display will show:

DCW Charge-LO	XXX.X s
MXX-X X.XX KV	XXX.X. μA

3.4.2.6 HI-Limit

3.4.2.6.1 If the DUT current exceeds the HI-Limit of DC Withstand Voltage test and the leakage current is within the metering range, the display will show:

DCW HI-Limit	XXX.X s
MXX-X X.XX KV	XXXX μA

3.4.2.6.2 If the DUT current exceeds the HI-Limit of DC Withstand Voltage test and the leakage current is not within the metering range, the display will show:

DCW HI-Limit	XXX.X s
MXX-X X.XX KV	> 9999 μA

3.4.2.7 Short

3.4.2.7.1 If the DUT current is well beyond the metering range of DC Withstand Voltage test the instrument assumes that the failure is due to a short circuit, the display will show:

DCW Short	XXX.X s
MXX-X - . - - KV	> 9999 μA

3.4.2.8 Breakdown

4.2.8.1 If the DUT current is well beyond the metering range of DC Withstand Voltage test and an Arcing condition beyond the Arc Sense limit is indicated, the display will show:

DCW Breakdown	XXX.X s
MXX-X X.XX KV	> 9999 μA

3.4.2.9 LO-Limit

3.4.2.9.1 If the DUT current falls below the LO-Limit of DC Withstand Voltage test and the leakage current is within the metering range, the display will show:

DCW LO-Limit	XXX.X s
MXX-X X.XX KV	XXX.X μA

3.4.2.10 Arc-Fail

3.4.2.10.1 If the DC current within the metering range of the DC Withstand Voltage test and an Arcing current exceeds the Arc-Sense limit and the Arc functions is set to ON then an Arc failure has occurred and the display will show:

DCW Arc-Fail	XXX.X s
MXX-X X.XX KV	XX.X μA

3.4.2.11 Pass

3.4.2.11.1 When the DUT passed the DC Withstand Voltage test, when the test process is complete the display will show:

DCW Pass	XXX.X s
MXX-X X.XX KV	XXXX μA

3.4.3 INSULATION RESISTANCE TEST

3.4.3.1 Abort

3.4.3.1.1 If the test in process is Aborted with the “RESET” button or remote control, the display will show:

IR Abort	XXX.X s
MXX-X XXXX V	XXXX MΩ

3.4.3.1.2 If the test in process is Aborted with the “RESET” button or remote control before the meter readings are taken, the display will show:

IR Abort	XXX.X s
MXX-X - - - - V	- - - - MΩ

or

IR Abort	XXX.X s
MXX-X XXXX V	- - - - MΩ

3.4.3.2 Delay

3.4.3.2.1 At the beginning of Insulation Resistance test when the voltage begins to ramp but before the meter readings are taken, the display will show:

IR Delay	XXX.X s
MXX-X - - - - V	- - - - MΩ

3.4.3.2.2 During the Insulation Resistance test when the values are being updated in real time during the Delay cycle, the display will show:

IR Delay	XXX.X s
MXX-X XXXX V	XXXX MΩ

3.4.3.3 Charge-LO

3.4.3.3.1 If the leakage current during the Ramp cycle falls below the Charge -LO setting, then the display will show:

IR Charge-LO	XXX.X s
MXX-X - - - - V	- - - - MΩ

3.4.3.4 HI-Limit

3.4.3.4.1 If the DUT current exceeds the HI-Limit of Insulation Resistance test and the resistance is within the metering range, the display will show:

IR HI-Limit	XXX.X s
MXX-X XXXX V	XXXX MΩ

3.4.3.4.2 If the DUT current exceeds the HI-Limit of Insulation Resistance test and the resistance is not within the metering range, the display will show:

IR HI-Limit		XXX.X s
MXX-X	XXXX V	> 9999 MΩ

3.4.3.5 LO-Limit

3.4.3.5.1 If the DUT current falls below the LO-Limit of Insulation Resistance test and the resistance is within the metering range, the display will show:

IR LO-Limit		XXX.X s
MXX-X	XXXX V	XXXX MΩ

4.3.5.2 If the DUT current falls below the LO-Limit of Insulation Resistance test and the resistance is below the metering range, the display will show:

IR LO-Limit		XXX.X s
MXX-X	XXXX V	< 1MΩ

3.4.3.6 Pass

3.4.3.6.1 When the DUT passed the Insulation Resistance test, when the test process is complete the display will show:

IR Pass		XXX.X s
MXX-X	XXXX V	XXXX MΩ

3.4.4 GROUND CONTINUITY TEST (model 7440 only)

3.4.4.1 Abort

3.4.4.1.1 If the test in process is Aborted with the "RESET" button or remote control, the display will show:

GND Abort		XXX.X s
MXX-X	XX.XX A	XXX mΩ

3.4.4.1.2 If the test in process is Aborted with the "RESET" button or remote control before the meter readings are taken, the display will show:

GND Abort		XXX.X s
MXX-X	- - . - - A	- - - mΩ

or

GND Abort		XXX.X s
MXX-X	XX.XX A	- - - mΩ

3.4.4.2 Dwell

3.4.4.2.1 At the beginning of the Ground Continuity test, before the meter readings are taken, the display will show:

GND Dwell	XXX.X s
MXX-X - - . - - A	- - - mΩ

3.4.4.2.2 During the Ground Continuity test, when the values are being updated in real time, the display will show:

GND Dwell	XXX.X s
MXX-X XX.XX A	XXX mΩ

3.4.4.3 HI-Limit

3.4.4.3.1 If the DUT failed the HI-Limit of the Ground Continuity test and the ground continuity resistance is within the metering range, the display will show:

GND HI-Limit	XXX.X s
MXX-X XX.XX A	XXX mΩ

3.4.4.3.2 If the DUT failed the HI-Limit of the Ground Continuity test and the ground continuity resistance is beyond the metering range, the display will show:

GND HI-Limit	XXX.X s
MXX-X 0.00 A	> 600 mΩ

3.4.4.4 LO-Limit

3.4.4.4.1 If the DUT resistance falls below the LO-Limit of the Ground Bond test, the display will show:

GND LO-Limit	XXX.X s
MXX-X XX.XX A	XXX mΩ

3.4.4.5 Pass

3.4.4.5.1 When the DUT passed the Ground Bond test when the test process is complete, the display will show:

GND Pass	XXX.X s
MXX-X XX.XX A	XXX mΩ

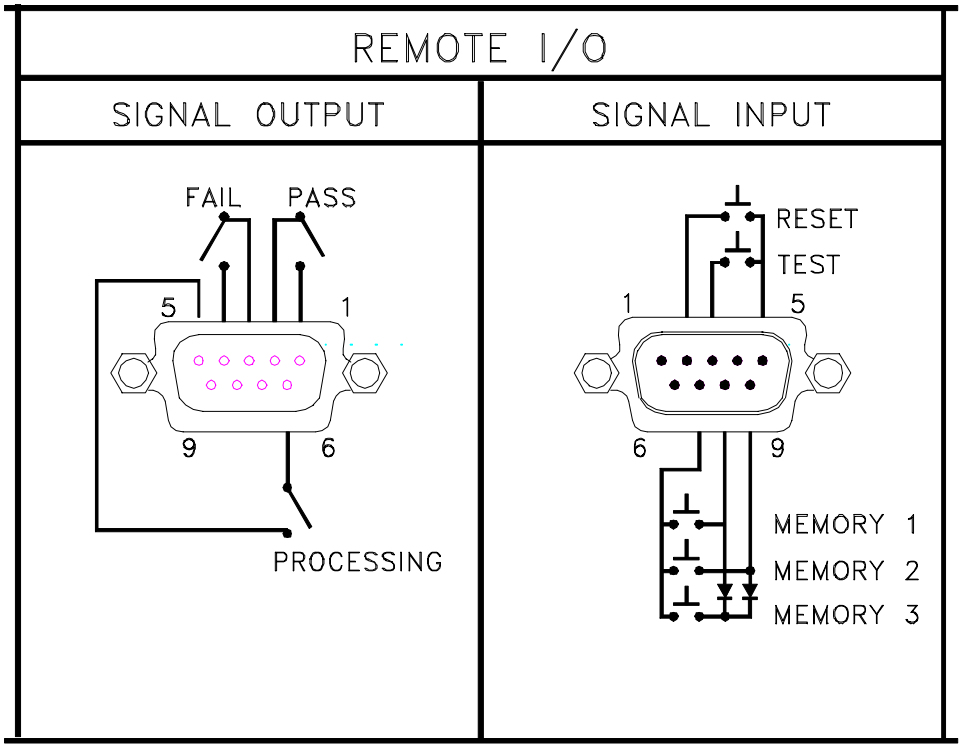
3.5 REMOTE I/O

Two 9 pin “D” type connectors are mounted on the rear panel which provide REMOTE-INPUT-OUTPUT control and information. These connectors mate

with standard 9 pin “D” subminiature connector provided by the user.. For best performance a shielded cable should be used. To avoid ground loops the shield should not be grounded at both ends of the cable. Suggested AMP part numbers for interconnecting to the Remote I/O are shown below.

205204-4	PLUG SHELL WITH GROUND INDENTS
205203-3	RECEPTACLE SHELL
745254-7	CRIMP SNAP-IN PIN CONTACT (for plug)
745253-7	CRIMP SNAP-IN SOCKET CONTACT (for receptacle)
745171-1	SHIELDED CABLE CLAMP (for either plug or receptacle)
747784-3	JACKSCREW SET (2)

Remote Interface Rear Panel:



3.5.1 Signal Outputs on Remote I/O

The rear panel connector provides output signals to remotely monitor PASS, FAIL, and PROCESSING conditions. These signals are provided by three normally open internal relays that switch on to indicate the current condition of the tester. These are normally open free contacts and will not provide any voltage or current. The ratings of the contacts are 1A / 250 VAC (0.5 ADC). The signal outputs are provided on the 9 pin female type D connector. Below is a listing that indicates what conditions activate each pin. When a terminal becomes active the relay closes thereby allowing the external voltage to operate an external device.

Pins 1 and 2 provide the PASS signal.

Pins 3 and 4 provide the FAIL signal.
Pins 5 and 6 provide the PROCESSING signal.
Pins 7, 8, and 9 are blank.

The following describes how the relays operate for each test condition.

PROCESSING - The relay contact closes the connection between pin (5) and pin (6) while the analyzer is performing a test. The connection is opened at the end of the test.

PASS - The relay contact closes the connection between pin (1) and pin (2) after detecting that the item under test passed all tests. The connection is opened when the next test is initiated or the reset function is activated.

FAIL - The relay contact closes the connection between pin (3) and pin (4) after detecting that the item under test failed any test. The connection is opened when the next test is initiated or the reset function activated.

3.5.2 Signal Inputs of Remote I/O and Memory Programs

The Signal Input remote connector enables remote operation of the TEST and RESET functions or allows the operator to select one of three pre-programmed tests. When the remote function is (ON) the "TEST" switch on the front panel will be disabled to prevent a test from being activated through the test switch. A normally open momentary switch can then be wired across pins 3 and 5 to allow remote operation of the TEST function. A normally open momentary switch can also be wired across pins 2 and 5 which allows remote operation of the RESET function. For safety reason, the front panel "RESET" switch remains active even when a remote "RESET" switch is connected so that high voltage can be shut down from either location.

The 7400 series analyzers also allow access to three MEMORY PROGRAMS through the remote control connector. This gives the user the capability to quickly change parameters and initiate a test remotely. The 7400 series analyzers basically operates in a PLC mode by responding to simple switch or relay contact closures. The built in memory programs of the instrument are used to accomplish this. Three internal memory programs can be accessed, by connecting terminals 7, 8 and 9 in different combinations.

WARNING ACTIVATING MEMORY PROGRAM FUNCTIONS THROUGH THE REMOTE CONNECTOR, SELECTS THE PROGRAM AND STARTS THE TEST WHICH IS PREPROGRAMMED INTO THAT MEMORY

CAUTION DO NOT CONNECT VOLTAGE OR CURRENT TO THE SIGNAL INPUTS, THIS COULD RESULT IN DAMAGE TO THE CONTROL CIRCUITRY.

MEMORY ONE - Momentarily connecting terminal 7 to 8 signals the instrument to immediately begin the test program that is stored in memory one.

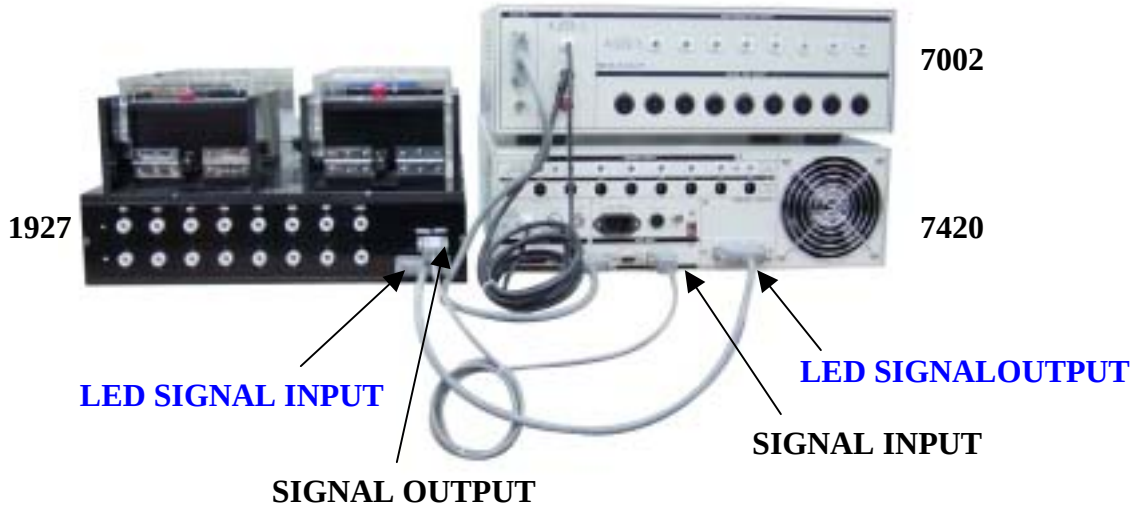
MEMORY TWO - Momentarily connecting terminal 7 to 9 signals the instrument to immediately begin the test program that is stored in memory two.

MEMORY THREE - Momentarily connecting terminal 7 to terminals 8 and 9 signals the instrument to immediately begin the test program that is stored in memory three.

3.6 Jig A/B Testing System (for 7410/7412/7420/7430/7440)

Jig A/B Testing System is Due to high demand from the transformer manufacturer, an automatic test system with safer, high testing speed and accuracy is designed especially to increase the productivity in the production. This method of testing has considered the user safety purpose with safety covers included on the Jig A/B Testing System. A transformer is connected to one of the fixture, and is known as "Fixture A". The system will start testing as soon as the safety cover is closed. Another fixture known as "Fixture B" is use to connect the other transformer. Upon closing the cover of this Fixture B, it is now on Standby condition, and waits until the Fixture A has passed the test and then it will proceed testing automatically on this transformer of Fixture B. In the meanwhile, the cover of Fixture A is opened to remove the tested transformer and connect the next transformer to be tested. After that, the cover is closed and the Fixture A is now on Standby condition. It waits until the Fixture B has passed and then proceeds the testing automatically on the Fixture A again. This process is repeated and very single piece of the transformer are guarantee tested. When one of the tests has failed then system will lockout and will not continue testing until the system is reset. **Opt.727:JigA 8CH /JigB 8CH Matrix Scanner,Opt.728 JigA 4CH /JigB 4CH Matrix Scanner**。

MODEL7420 + Opt.727 (JigA 8CH /JigB 8CH Matrix Scanner)+1927Test fixture



3.6.1 Signal input 9 Pin D-type (MODEL 7420 at Rear anel SIGNAL INPUT socket)

(A) control Pin 7,8

(B) control Pin 7,9

3.6.2 LED Signal Output 25 Pin D-Type(MODEL 7420 at Rear panel INTERFACE socket)

1. A-TEST Pin-2 (Yellow)	4.B-TEST Pin-6 (Yellow)
2. A-TEST Pin-3 (Green)	5.B-TEST Pin-7 (Green)
3. A-TEST Pin-4 (Red)	6.B-TEST Pin-8 (Red)
7. GND Pin-25	

CHAPTER 4: RS232 & GPIB INTERFACE

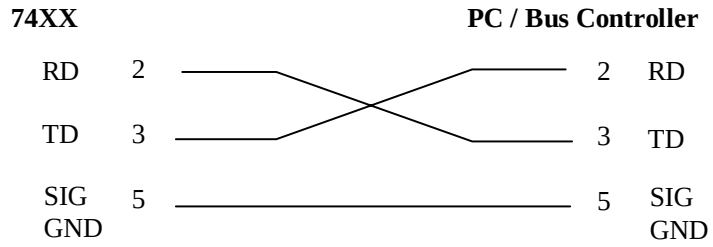
4.1 BUS REMOTE INTERFACE RS232/GPIB

This section provides information on the proper use and configuration of the RS232 and GPIB remote interface. The command list are the same for both RS232/GPIB interface, except SRQ function is unique to GPIB interface. For 7440 and 7430, RS232 interface is standard. RS232 or GPIB interface capability are available for all 7400 series analyzers as option.

4.1.1 RS232 INTERFACE

4.1.1.1 Introduction

The RS232 cabling should be configured as follows for a 9 pin serial port interface:



The COM port should have the following configuration. 9600 baud, 8 data bits, 1 stop bit, no parity. This interface does not support XON/XOFF protocol or any hardware handshaking. The controller should be configured to ignore the handshaking lines DTR (pin 4), DSR (pin 6) CTS (pin 8) and RTS (pin 9). If the port can not be configured through software to ignore the lines then the handshake lines should be jumpered together in two different sets. Pins 4 and 6 jumpered together and pins 7 and 8 jumpered together at the controller end of the cable.

When sending command over the RS232 bus the 7400 series analyzers will echo a response string identical to the string that was sent if the transfer was recognized and accepted by the instrument. This allows for software handshaking, to monitor and control data flow. If there is an error with the command string that is sent, the instrument will respond with 15h or the "NAK" ASCII control code. When requesting data from the instrument, it automatically send the data to the controller input buffer. The controller input buffer will accumulate data being sent from the instrument including the echo response string, until it is read by the controller.

4.1.2 RS232/ GPIB Interface Command List

The following commands are used to toggle ON/OFF functions or menu selection items. No other values or parameters are needed to execute these commands. However when using commands that are usable for a certain function only (function specific), the appropriate function select command FC, FD, FE, or FF must be executed first, to access the parameter for that function.

Command	Function	Function Specific
FA	Test	
FB	Reset	
FC	ACW Function Select	
FD	DCW Function Select	
FE	IR Function Select	
FF	GND Function Select (7440 only)	
FG	ACW/DCW: Continuity On (7430 Only)	x
FH	ACW/DCW: Continuity Off (7430 Only)	x
FI	ACW: 60Hz	x
FJ	ACW: 50Hz	x
FK	ACW: Arc Fail On	x
FL	ACW: Arc Fail Off	x
FM	DCW: Arc Fail On	x
FN	DCW: Arc Fail Off	x
FO	GND: 60Hz (7440 only)	x
FP	GND: 50Hz (7440 only)	x
FQ	Connect On	
FR	Connect Off	
FS	Fail Stop On	
FT	Fail Stop Off	
FU	GND: Auto Offset (7440 only)	x
FV	DCW: Auto Charge-LO	x
FW	IR: Auto Charge-LO	x
FX	ACW: Auto Offset	x
FY	DCW: Auto Offset	x
F0	Enable "All Pass" SRQ	
F1	Disable "All Pass" SRQ	
F2	Enable "Fail" SRQ	
F3	Disable "Fail" SRQ	
F4	Enable "Abort" SRQ	
F5	Disable "Abort" SRQ	
F6	Enable "Error Command" SRQ	
F7	Disable "Error Command" SRQ	
F8	DCW: Ramp-HI On	x
F9	DCW: Ramp-HI Off	x

The following "S" commands will set test parameters on the instrument that require numeric or alphanumeric input. To execute these commands, the appropriate function must first be selected with the above Function Select command FC, FD, FE, or FF, to have access to the parameter menu.

ACW			
Command	Parameter	Value	Unit
SA	Voltage	0-5000	V

SB	HI-Limit	0.00-40.00	mA
SC	LO-Limit	0.000-9.999	mA
SD	Ramp Time	0.1 - 999.9	S
SE	Dwell Time	0, 0.3 - 999.9	S
SF	Arc Sense	1 - 9	-
SG	Scanner	H=Hi,L=Low,O=Open up to 16 channels	-

DCW			
Command	Parameter	Value	Unit
SI	Voltage	0-6000	V
SJ	HI-Limit	0 - 3500	μA
SK	LO-Limit	0.0 - 999.9	μA
SL	Ramp Time	0.4 - 999.9	S
SM	Dwell Time	0, 0.3 - 999.9	S
SO	Charge-LO	0.0 - 350.0	μA
SP	Arc Sense	1 - 9	-
SQ	Scanner	H=Hi,L=Low,O=Open up to 16 channels	-

IR			
Command	Parameter	Value	Unit
SS	Voltage	100 - 1000	V
ST	Charge-LO	0.000 - 9.999	μA
SU	HI-Limit	0 - 9999	MΩ
SV	LO-Limit	1 - 9999	MΩ
SW	Delay-Time	0, 0.5 - 999.9	S
SX	Scanner	H=Hi,L=Low,O=Open up to 16 channels	-

GND (7440 only)			
Command	Parameter	Value	Unit
SY	Current	3.00 - 30.00	A
SZ	Volt	3.00 - 8.00	V
S0	HI-Limit	0 - 600	mΩ
S1	LO-Limit	0 - 600	mΩ
S2	Dwell Time	0.5 - 999.9	S
S3	Scanner	1 - 16	Channel
S4	Offset	0 - 200	mΩ

General Operation			
Command	Function	Value	Unit
S5	Memory Select	1 - 50	Integer
S6	Step Select (1-8)	1 - 8	Integer

When the Controller sends a correct “S" or “F" command the analyzer will echo back the identical command string if a GPIB read command is sent after the command string.

If an error occurs when the command is sent the instrument will send an ASCII code “15h" after the read command is sent.

The following functions will read data from the instrument when executed. For every command written, a corresponding read command of the appropriate byte length (shown below) must be executed to retrieve the data from the instrument.

Command	Read Data Function	Read Bytes	Description
?1	Step Buffer 1	40	Read the 2 x 20 display results of the first test executed.
?2	Step Buffer 2	40	Read the 2 x 20 display results of the second test executed.
?3	Step Buffer 3	40	Read the 2 x 20 display results of the third test executed.
?4	Step Buffer 4	40	Read the 2 x 20 display results of the fourth test executed.
?5	Step Buffer 5	40	Read the 2 x 20 display results of the fifth test executed.
?6	Step Buffer 6	40	Read the 2 x 20 display results of the sixth test executed.
?7	Step Buffer 7	40	Read the 2 x 20 display results of the seventh test executed.
?8	Step Buffer 8	40	Read the 2 x 20 display results of the eighth test executed.
?A	Ground Bond Offset	5	Read the Ground Offset Setting G-Bond mode must be active.
?B	DCW Charge-LO	5	Read the DCW Charge-LO Setting. DCW mode must be active.
?C	IR Charge-LO	5	Read the IR Charge-LO Setting IR mode must be active.
?D	Remote Reset Status	1	01 hex = Reset ON 00 hex = Reset OFF
?K	LCD Display	40	Read the 2 x 20 display in real time or after the test.

If an error occurs when the command is sent the instrument will send an ASCII code “15h" after the read command is sent.

4.1.2 GPIB INTERFACE FUNCTIONS

The capability of a device connected to the bus is specified by its interface functions. These functions provide the means for a device to receive, process, and send messages over the bus. The interface functions are listed in the chart below. All functions may be controlled over the bus except input voltage which is Selectable on the rear panel.

GPIB INTERFACE FUNCTIONS

IEEE-488 INTERFACE	Complete handshake capability Talker/Listener functions Service request capability No remote/local capability No parallel poll capability No device clear capability No device trigger capability No controller capability 3 state driver
CONTROLLABLE ITEMS	Test/Reset control Setting of test status/parameters for test Display Reading Results Reading
DATA CODES	ASCII
DELIMITER	CR + LF (+ EOI)

4.1.2.1 GPIB Address

Each device on the GPIB (IEEE-488) interface must have a unique address. You can set the address of the 7440 or 7430 to any value between 0 and 30. The address is set to " 8 " when the instrument is shipped from the factory. The address can only be set from the front panel. The address is stored in non-volatile memory and does not change when the power has been off or after a remote interface reset.

4.1.2.2 Example of communicating over the IEEE bus

To write commands over the IEEE bus you must enter the code that is specific to the software language you are using. Then follow the example below:

To set the output voltage across the IEEE bus at 1240 volts do the following. First select the ACW mode by sending the string **"FC"** then send the string **"SA 1240"**:

This tells the instrument to set the AC voltage at 1240 volts. A string is a list of ASCII characters, octal or hex bytes or special symbols, enclosed in double quotes.

If the Test Function has already been selected to ACW mode and you wish to set the ramp time of the ACW test across the IEEE bus at 10 seconds, do the following, send the string **"SD 10.00".** This tells the instrument to set the AC Ramp Time at 10.00 seconds.

To set outputs 1 & 2 of the scanner to High, outputs 3 & 4 to Low and outputs 4-8 to Off type in the following string, **"SGHHLLOOOO"**, after the ACW Test Function has been selected. All ports not being specifically set will automatically be set to "O" open.

To read the 2 x 20 display, first send the string **"?K"** then send the GPIB command to read 40 bytes. The instrument will send 40 bytes, one byte for each character on the display, including spaces.

4.1.2.3 Non Volatile Memory

The instrument saves each parameter in non-volatile memory when the parameter is changed. The non-volatile memory has a limited write cycle life, therefore there is a special volatile memory location that is available for programmers who wish to send all parameters before executing each test. Memory 50, step 8 is the memory location that will **NOT** write the parameter to non-volatile memory. Settings written to this location from GPIB mode will be lost when power is shut down. Parameter changes to this location is unlimited and will not effect the life of the internal non-volatile memory chip.

FOR MORE INFORMATION ON IEEE (GPIB) PLEASE CONTACT:

The Institute of Electrical and Electronic Engineers, Inc.
345 East 47th Street,
New York, NY 10017

☎ 1-212-705-7018 (Communications Society of IEEE)

Internet: http://www.ieee.org

CHAPTER 5 : CALIBRATION

See **APPENDIX A** for information on instrument needed for calibration.

5.1 ENTER THE CALIBRATION MODE

Press the "0"and "1" keys simultaneously and then turn the input power switch on. The program will automatically enter to the calibration mode and the display screen will show:

Calibration Mode ∨ : Forward ∧ : Backward

Use the "∨" (Forward) and "∧" (Backward) keys to move through the calibration menu. The following instructions follow the sequential Forward scrolling through the menu.

5.2 PASSWORD SETTING

Press the "∨" key, the program will advance to the Password setting mode. The display will show:

Password = 0 Range : 0 - 9 9 9 9

or

Password = X X X X Range : 0 - 9 9 9 9

The Password can be any four (4) digit number. If the Password is set to "0", the keyboard lock out will be selected by the LOCK key on the front panel without a Password. The Password default is preset to "0" at the factory.

5.3 MEMORY LOCK SELECTION

Press the "∨" key, the program will advance to the Memory Lock selection mode. The display will show:

MR-Lock = O N <ENTER> to Select

or

MR-Lock = O F F <ENTER> to Select

If the MR-Lock is selected "ON", the Memory selection Menu will be disabled when in Lock Mode. If the MR-Lock is selected "OFF", the Memory selection Menu will be enabled when in Lock Mode. Different memories can be recalled but the test parameters or steps can not be changed. The MR-Lock default is preset to "ON" at the factory.

5.4 ACW VOLTAGE CALIBRATION

Press the "∨" key, the program will advance to the AC Voltage calibration of the ACW test. The display will show:

ACW Voltage,5000V
<T E S T> t o C a l i b r a t e

Connect an AC standard voltage meter which can measure up to 5000V to the output connectors and then press the "TEST" button, the program will automatically generate an output of about 5000VAC and the display will show:

HI-Voltage = V
Enter Standard V-out

Use the Numeric keys to enter the standard value of voltage, unit "V", and then press the "ENTER" key to store the standard value of AC hipot voltage for calibration and display will show:

ACW Voltage,5000V OK
<T E S T> t o C a l i b r a t e

5.5 DCW VOLTAGE CALIBRATION

Press the "∨" key, the program will advance to the DC Voltage calibration of the DCW test. The display will show:

DCW Voltage, 6000V
<TEST> to Calibrate

Connect a DC standard voltage meter which can measure up to 6000V to the output connectors and then press the "TEST" button, the program will automatically generate an output of about 6000VDC and the display will show:

HI-Voltage = V
Enter Standard V-out

Use the Numeric keys to enter the standard value of voltage, unit "V", and then press the "ENTER" key to store the standard value of DC hipot voltage for calibration and the display will show:

DCW Voltage, 6000V OK
<TEST> to Calibrate

5.6 IR VOLTAGE CALIBRATION

Press the "∨" key, the program will advance to the DC Voltage calibration of the IR test. The display will show:

IR Voltage, 1000V
<T E S T> t o C a l i b r a t e

Connect a DC standard voltage meter which can measure up to 1000V to the output connectors and then press the "TEST" button, the program will automatically generate an output of about 1000VDC and the display will show:

IR-Voltage = V
Enter Standard V-out

Use the Numeric keys to enter the standard value of DC voltage, unit "V", and then press the "ENTER" key to store the standard value of IR test voltage for calibration and the display will show:

IR Voltage, 1000V OK
<T E S T> t o C a l i b r a t e

5.7 AC CURRENT, 40mA RANGE, CALIBRATION

Press the "∨" key, the program will advance to the AC 40mA range calibration of the ACW test. The display will show:

AC 40mA, 100KΩ
<T E S T> t o C a l i b r a t e

Connect a resistor about 100KΩ/10W in series with a AC standard Ammeter which can measure up to 10mA to the output leads. The Ammeter should be connected to the return lead, then press the "TEST" button, the program will automatically generate an output of about 1000V/10mA and the display will show:

Current = mA
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit "mA", and then press the "ENTER" key to store the standard value of AC 40mA range for calibration and the display will show:

AC 40mA, 100KΩ OK
<T E S T> t o C a l i b r a t e

5.8 AC CURRENT, 3.5mA RANGE, CALIBRATION

Press the "∨" key, the program will advance to the AC 3.5mA range calibration of the ACW test. The display will show:

AC 3.5mA, 100KΩ
<T E S T> to Calibrate

Connect a resistor about 100KΩ/10W in series with a AC standard Ammeter which can measure up to 3mA to the output leads. The Ammeter should be connected to the return lead, then press the "TEST" button, the program will automatically generate an output on the output connectors about 300V/3mA and the display will show:

Current = mA
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit "mA", and then press the "ENTER" key to store the standard value of AC 3.5mA range of the hipot test and the display will show:

AC 3.5mA, 100KΩ OK
<T E S T> to Calibrate

5.9 DC CURRENT, 10 mA RANGE, CALIBRATION

Press the "∨" key, the program will advance to the DC 10mA range calibration of the DCW test. The display will show:

DC 10mA, 100KΩ
<T E S T> to Calibrate

Connect a resistor about 100KΩ/10W in series with a DC standard Ammeter which can measure up to 10mA. The Ammeter should be connected to the return lead, then press the "TEST" button, the program will automatically generate an output of about 1000V/10mA and the display will show:

Current = mA
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit "mA", and then press the "ENTER" key to store the standard value of DC 10mA range and the display will show:

DC 10mA, 100KΩ OK
<T E S T> to Calibrate

5.10 DC CURRENT, 3500μA RANGE, CALIBRATION

Press the "∨" key, the program will advance to the DC 3500μA range calibration of DCW test. The display will show:

DC 3500μA, 100KΩ
<T E S T> t o C a l i b r a t e

Connect a resistor about 100KΩ/10W in series with a DC standard Ammeter which can measure up to 3000μA. The Ammeter should be connected to the return lead, then press the "TEST" button, the program will automatically generate an output of about 300V/3000μA and the display will show:

Current = μA
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit "μA", and then press the "ENTER" key to store the standard value of DC 3500μA range and the display will show:

DC 3500μA, 100KΩ OK
<T E S T> t o C a l i b r a t e

5.11 DC CURRENT, 350μA RANGE, CALIBRATION

Press the "∨" key, the program will advance to the setting and reading of DC 320μA range calibration of the DCW test. The display will show:

DC 350μA, 1MΩ
<T E S T> t o C a l i b r a t e

Connect a resistor about 1MΩ/0.25W in series with a DC standard Ammeter which can measure up to 300μA. Connect the Ammeter to the return leads, then press the "TEST" button, the program will automatically generate an output of about 300V/300μA and the display will show:

Current = μA
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit "μA", and then press the "ENTER" key to store the standard value of DC 350μA range and the display will show:

DC 350μA, 1MΩ OK
<T E S T> t o C a l i b r a t e

5.12 IR RESISTANCE, XXX.XMΩ RANGE, CALIBRAITON

Press the "∨" key, the program will advance to the XXX.XMΩ range calibration of the IR test. The display will show:

XXX.XMΩ,STD 50MΩ
<T E S T> t o C a l i b r a t e

Connect a 50MΩ/0.25W/1000VDC standard resistor to the output connectors, then press the "TEST" button, the program will automatically calibrate the XXX.X MΩ range of IR test and the display will show:

XXX.XMΩ,STD 50MΩ OK
<T E S T> t o C a l i b r a t e

5.13 IR RESISTANCE, XXXXMΩ RANGE, CALIBRATION

Press the "∨" key, the program will advance to the XXXXMΩ range calibration of the IR test. The display will show:

XXXXMΩ,STD 50MΩ
<T E S T> t o C a l i b r a t e

Connect a 50MΩ/0.25W/1000VDC standard resistor to the output connectors, then press the "TEST" button, the program will automatically calibrate the XXXX MΩ range of IR test and the display will show:

XXXXMΩ,STD 50MΩ OK
<T E S T> t o C a l i b r a t e

5.14 GROUND CONTINUITY, AC VOLTAGE CALIBRAITON (Model 7440 only)

Press the "∨" key, the program will advance to the AC Voltage calibration of the Ground continuity test. The display will show:

Ground V, 7V
<T E S T> t o C a l i b r a t e

Connect a AC standard voltage meter which can measure up to 10VAC to the High current and Return output leads, then press the "TEST" button, the program will automatically generate an output of about 7VAC and the display will show:

G-Voltage = V
Enter Standard V-out

Use the Numeric keys to enter the standard value of voltage, unit “V”, and then press the “ENTER” key to store the standard value of AC Ground Continuity voltage and display will show:

Ground V, 7V OK
<T E S T> t o C a l i b r a t e

5.15 GROUND CONTINUITY, AC CURRENT CALIBRATION (Model 7440 Only)

Press the “∨” key, the program will advance to the AC Current calibration of the Ground continuity test. The display will show:

Ground A, 30A
<T E S T> t o C a l i b r a t e

Connect a AC standard Ammeter which can measure up to 30AAC to the High current and Return output leads, then press the “TEST” button, the program will automatically generate an output on the output leads of about 30AAC and the display will show:

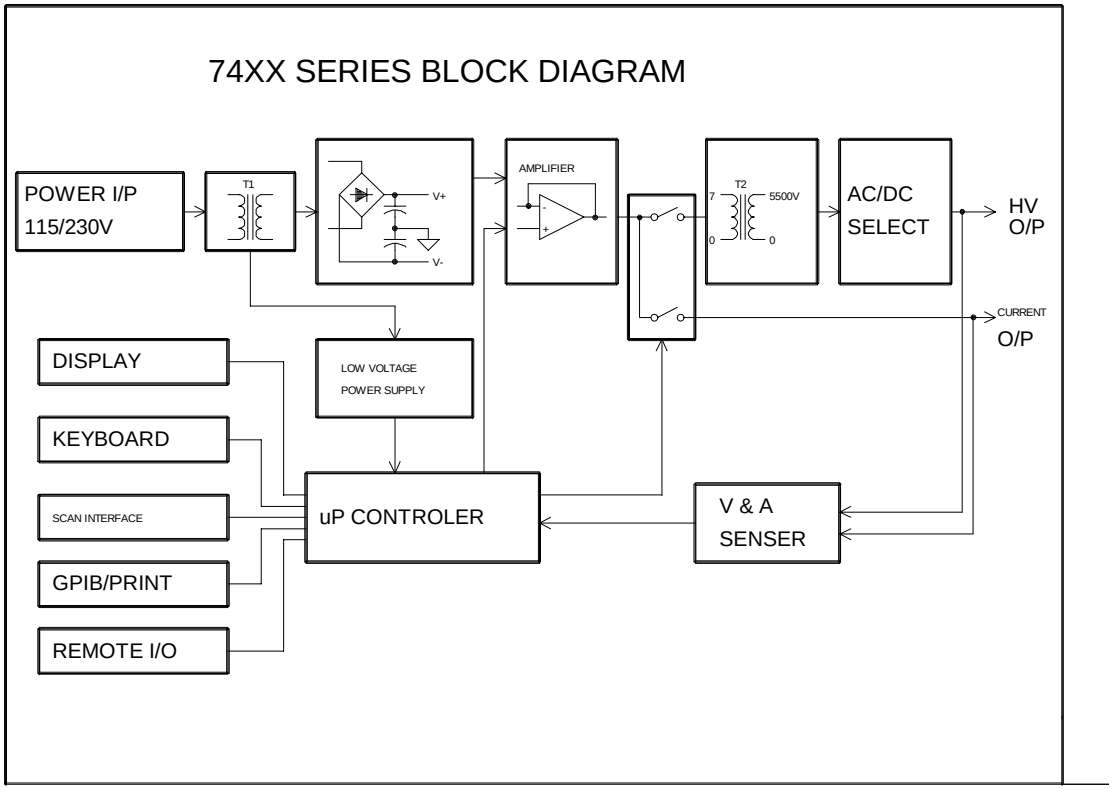
G- Current = A
Enter Standard I-out

Use the Numeric keys to enter the standard value of current, unit “A”, and then press the “ENTER” key to store the standard value of AC Ground Continuity current and display will show:

Ground A, 30A OK
<T E S T> t o C a l i b r a t e

CHAPTER 6 : SERVICE MAINTENANCE

6.1 THEORY OF OPERATION



The 74XX series Safety Analyzers are microprocessor controlled instruments. The external user interface to the microprocessor controller are display, keyboard, Remote I/O, GPIB and Scanner.

For ACW, the controller send a 50 or 60 Hz sine wave to the amplifier for signal amplification. T2 will step up the output voltage to 5,000 volts.

For DCW, the controller sends a 600 Hz sine wave to the amplifier for signal amplification. T2 will step up the output voltage to 6,000 volts and pass through rectifier to obtain DC high voltage output..

For IR, it is the same principle as DCW. But the output voltage is limited to 1000 volts.

For Ground Continuity, the controller sends a 50/60 Hz sine wave to the amplifier. After amplification, the signal is directed to Current O/P.

The output voltage and current are measured by the voltage and current sensors. The measured values are fed back to the Controller via A/D converters. There are separate V & A sensors for ARC, Leakage and Overload. The microprocessor controller will base on these information to make comparison with inputs data to make judgment, deciding PASS and Fail conditions. All these information are then display to the 20x2 LCD display.

6.2 TROUBLESHOOTING

Please note that the analyzer has one year warranty for manufacturing defects. Extech will repair the analyzer free of charge. Please return the analyzer to Extech office or the authorized local distributor. The warranty is void if the analyzer is opened by unauthorized person.

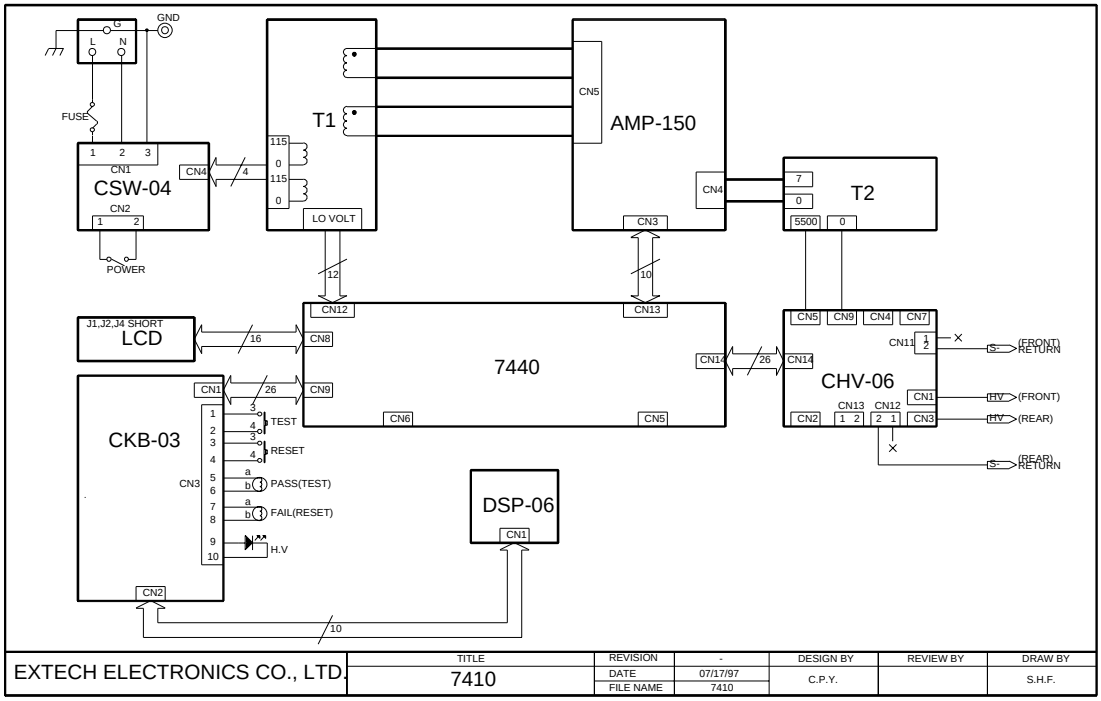
WARNING **THE ANALYZER SHOULD ONLY BE REPAIRED BY QUALIFIED ENGINEERS AND TECHNICIANS. MAKING REPAIR WITHOUT PROPER TRAINING COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.**

Symptom	Possible Causes/Solutions
Turn on Power, LCD is not lit or any sign of power on.	1. Check input AC voltage setting, 115V/230VAC 2. Check and make sure proper fuse is used.
Analyzer is working, but no LCD display	1. Check PCB 7440 crystal for 7.372 Mhz oscillation. a. If no signal output, check IC20 or XTAL. b. If there is signal output, check IC12 2. Check PCB 7440 TP27 for +5VDC. a. If no +5VDC, check IC46 or D22 or D23 3. Check the cable connecting CN8 on PCB 7440 to LCD CN1. 4. LCD display board faulty.
Front Panel Keys inactive	1. LOCK LED is lit. Keyboard Lock function activated. Press LOCK key and enter password to unlock. 2. Check the cable connecting CN9 on PCB7440 to CKB-03 CN1. 3. Check PCB 7440 IC13 and IC 24.
Display shows 0.00 KVAC	1. Check PCB 7440 TP12 for sine wave output. a. if no output, check IC21, IC41, IC36 and IC33 b. if there is output, possible PCB AMP-270 faulty 2. Check PCB AMP-270 +, - voltage, a. if no output, check REC-17 BR1, BR2 b, if there is output, check AMP-270 TP1 for output i. TP1 has no output, check Q1-Q18, R1-R26, IC1 ii. TP1 has output, T2 may be faulty. iii. If T2 has output, check RY1, R2, R1 on PCB CHV-06.

	3. Check IC18 Pin 9 for voltage output. If no output, check IC18, IC21, IC2, IC17. 4. If CSU-105 has no HV output, check High Voltage Relay RY
Display shows OFL	1. Check PCB 7440 TP13. If the waveform is not correct, check IC28, IC29.
Inaccurate Display of Current	1. Perform calibration 2. IC 36 on PCB 7440 faulty
Voltage Display - HI FAIL	1. TP18 on PCB 7440 has high voltage output before TEST. Check IC34, IC35, IC38, IC39, IC48, IC49.
Voltage Display different Set value	1. Perform calibration. 2. Check IC 36 on PCB 7440.
No sound from Buzzer	1. If TP3 on PCB 7440 is LO, BZ1 faulty. If TP3 is HI, check IC3.
PASS, FAIL not lighted	1. On PCB 7440, Pin 11 & 12 on IC10 is LO, Check LED. If they are HI, check IC10.

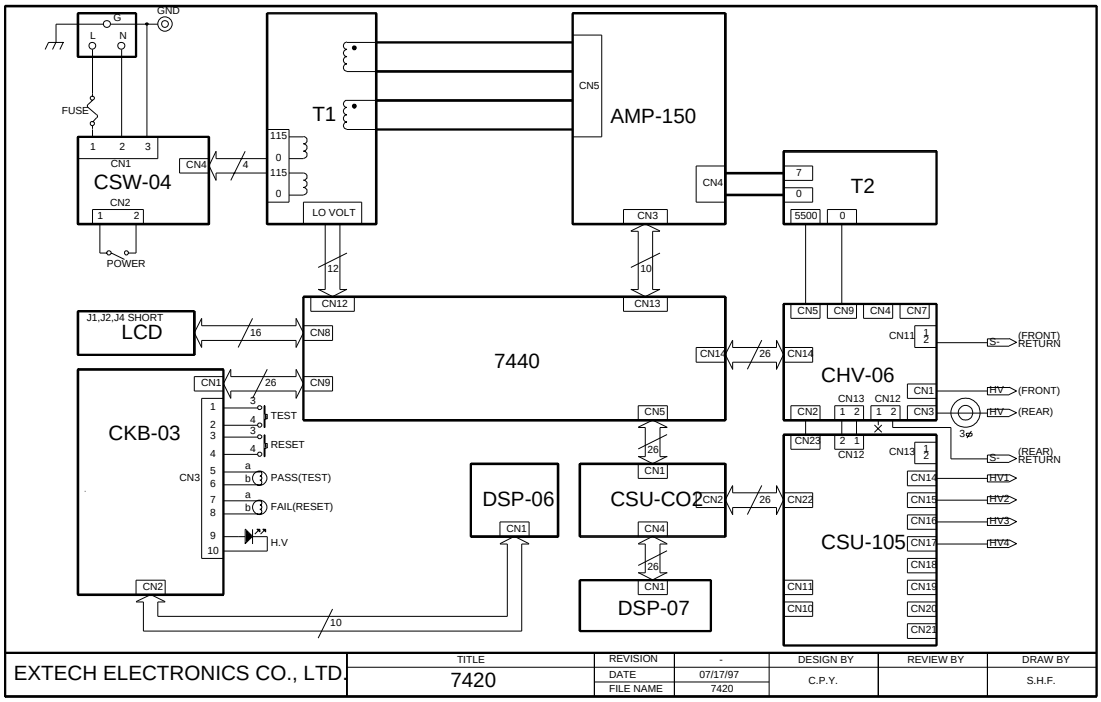
6.3 SCHEMATIC BLOCK DIAGRAM

6.3.1 Model 7410



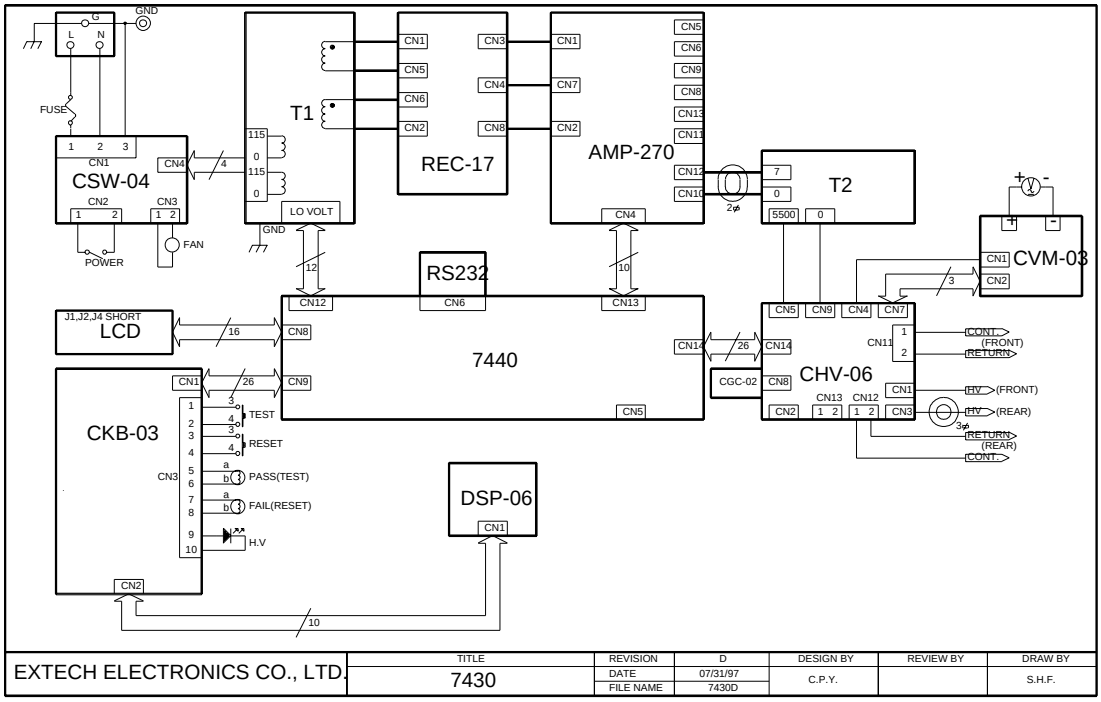
EXTECH ELECTRONICS CO., LTD.	TITLE	REVISION	-	DESIGN BY	REVIEW BY	DRAW BY
	7410	DATE	07/17/97	C.P.Y.		S.H.F.
		FILE NAME	7410			

6.3.2 Model 7420

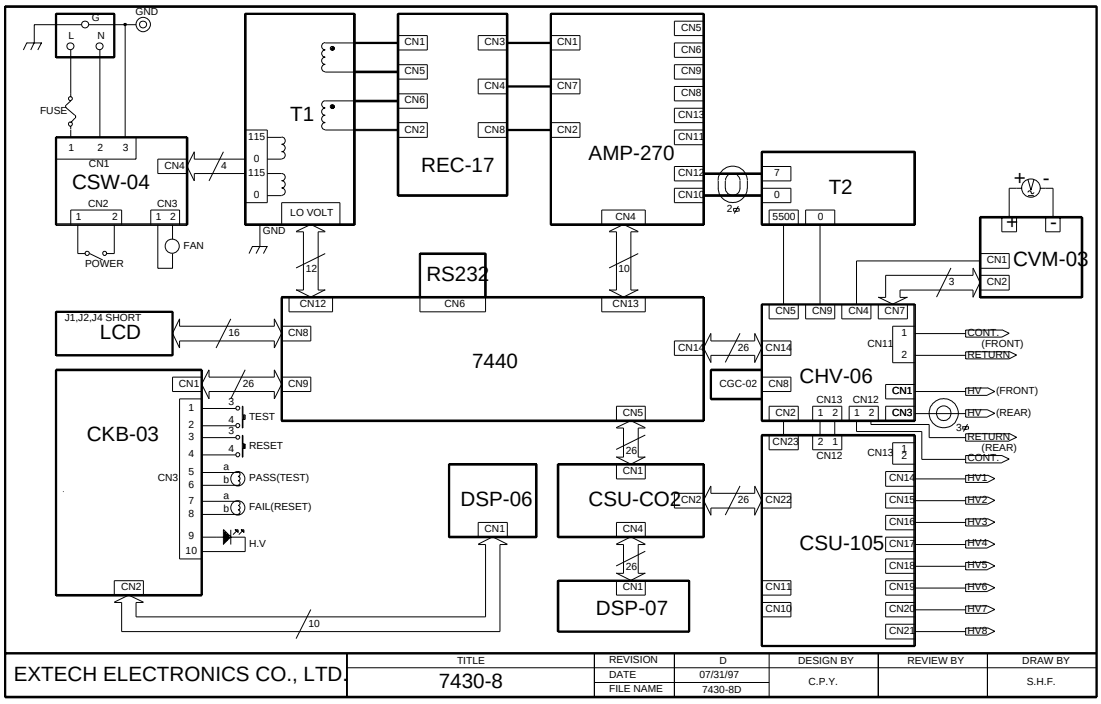


EXTECH ELECTRONICS CO., LTD.	TITLE	REVISION	-	DESIGN BY	REVIEW BY	DRAW BY
	7420	DATE	07/17/97	C.P.Y.		S.H.F.
		FILE NAME	7420			

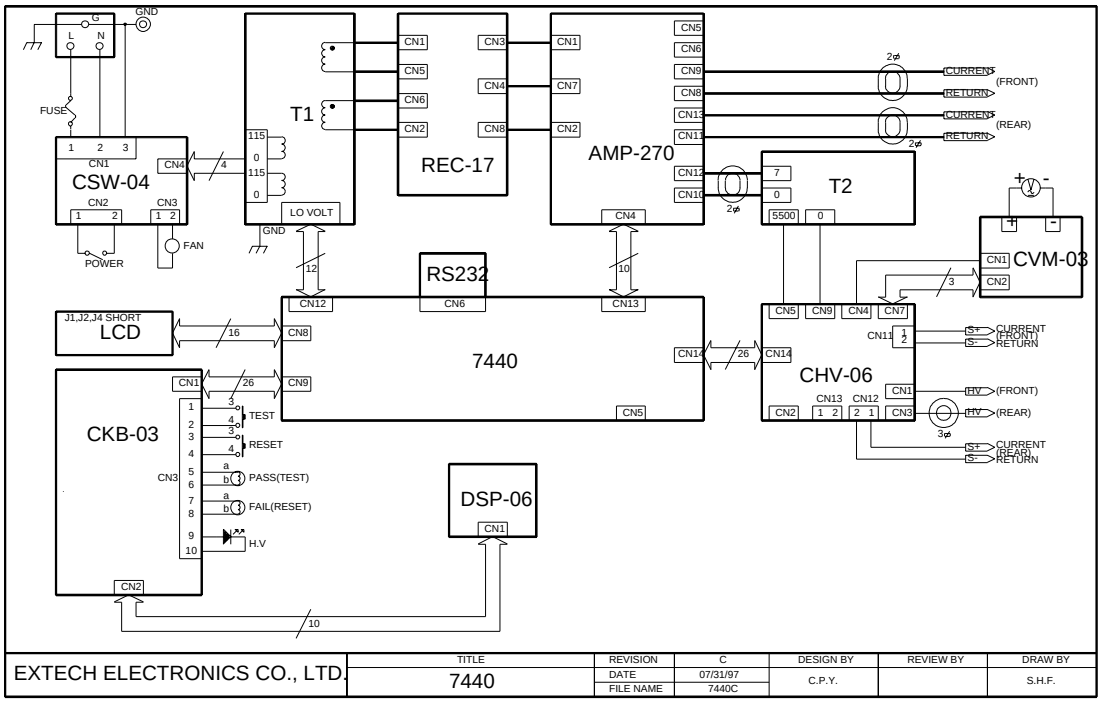
6.3.3 Model 7430 Schematic Block Diagram



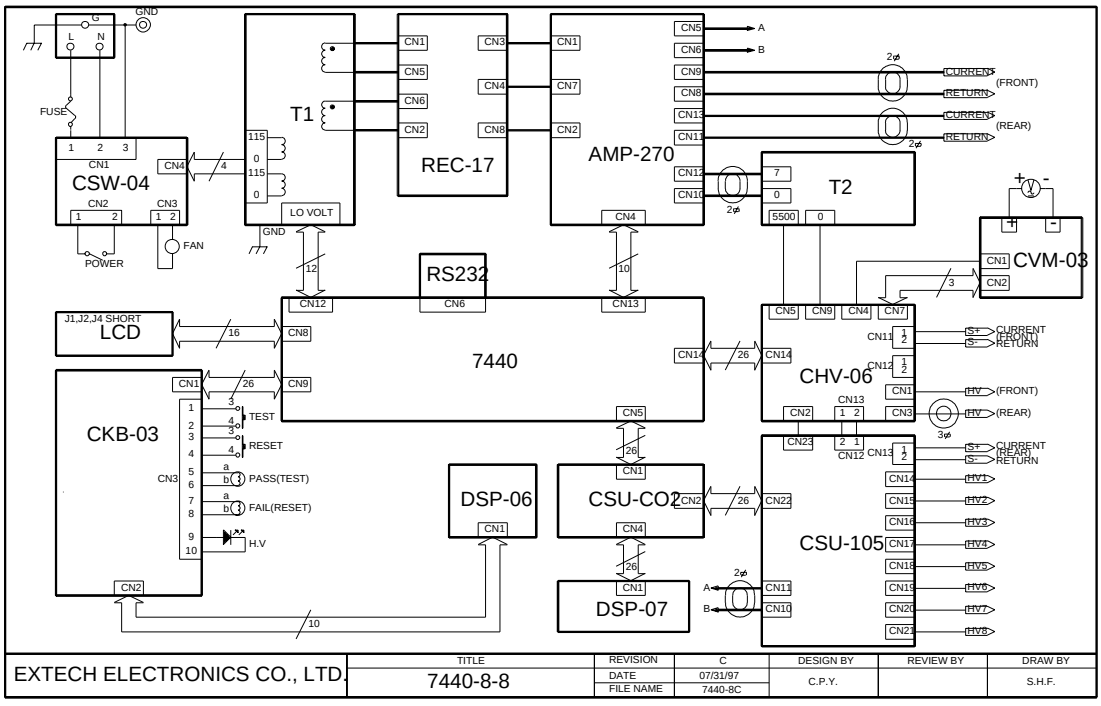
6.3.4 Model 7430 with Built-in Scanner Option 004 Schematic Block Diagram



6.3.5 Model 7440 Schematic Block Diagram



6.3.6 Model 7440 with Built-in Scanner Option 002 Schematic Block Diagram



6.4 REPLACEMENT PARTS & ACCESSORIES LIST

xx - denotes version number of PC Board
Y - denotes version number of Transformers

Part Number	Qty.	Reference Designator	Description
2PCB-7440-Axx	1	7440	Main Control Board
2PCB-CHV-06-Axx	1	CHV-06	HV Control Board
2PCB-CKB-03-Axx	1	CKB-03	Keypad Board
2PCB-CSW-04-Axx	1	CSW-04	Input Protection Board
4PCB-DSP-06-Kxx	1	DSP-06	Display LED Board
2PCB-DSP-07-Axx	1	DSP-07	Scanner Display Board for 7440, 7430 & 7402
2PCB-CSU-C02-Axx	1	CSU-CO2	Scanner Control Board
2PCB-CSU-105-Cxx	1	CSU-105C	Scanner Matrix Board for 7430
2PCB-CSU-105-Axx	1	CSU-105A	Scanner Matrix Board for 7440
2PCB-REC-17-Axx	1	REC-17	Rectifier Board
2PCB-AMP-270-Axx	1	AMP-270	Main Power Amplifier Board
2PCB-AMP-150-Axx	1	AMP-150	Main Power Amplifier Board for 7420 & 7410
2PCB-CVM-03-Axx	1	CVM-03	Analog Meter Board
2PCB-CGC-02-Axx	1	CGC-02	Ground Continuity Check Board
LCD-2002	1	-	LCD Display 20 x 2 Characters
SW-D16-R-B-L	1	-	Reset Switch, Red
SW-D16-G-B-L	1	-	Test Switch, Green
SW-2-10	1	-	Power Switch 2P 10A/250V
IC89C52	1	IC12	IC Microcontroller 8-bit 20Mhz 89C52
T-7440-T1-Y	1	T1	Input Transformer for 7440 & 7430
T-7420-T1-Y		T1	Input Transformer for 7420
T-7410-T1-Y	1	T1	Input Transformer for 7410
T-7440-T2-Y	1	T2	Output High Voltage Transformer for 7440 & 7430
T-7420-T2-Y		T2	Output High Voltage Transformer 7420 & 7410
ACCESSORIES			
H-3U	2	-	3U Rack Mount Bracket

HB-3U	2	-	3U Rack Mount Handle
1101	1	-	High Voltage Test Lead
1102	1	-	Return Test Lead
1103	1	-	High Current Test Lead
1104	1	-	High Current Return Test Lead (7440 only)
1105	1	-	High Voltage Cable, Scanner Link to
1106	1	-	High Current Cable, Scanner Link to 7440
1107	1	-	High Current Return Cable, Scanner Link
1108	1	-	Return Cable, Scanner Link to 7430
1109	1	-	High Voltage Cable, Scanner Link to UUT
1110	1	-	Remote TEST/RESET Controller
1111	1		Scan Bus Cable
1112	1	-	Hipot/IR Test Cable Fixture for 7430
1113	1	-	Hipot/IR Test Cable Fixture for 7440
1114	1		Remote G Test Probe
1115	1	-	Printer Port Card
1116	1	-	RS232 Interface Card
1117	1	-	GPIB Interface Card

6.5 SPARE PART KIT FOR 7400 SERIES

Recommended spare part kit for 7440 and 7430 is listed below. Please contact Extech customer support for price enquiry.

Part Number	Qty.	Reference Designator	Description
2PCB-7440-Axx	1	7440	Main Control Board
2PCB-CHV-06-Axx	1	CHV-06	HV Control Board
2PCB-CKB-03-Axx	1	CKB-03	Keypad Board
2PCB-CVM-03-Axx	1	CVM-03	Analog Meter Board
TR-1148	14		Transtitor
RY-3392	1		High Voltage Relay

Customer Support Department

Tel : 886-2-6943030 x 202
Fax : 886-2-6945563
email : maint202@extech.com.tw
website : www.extech.com.tw

****