OPERATION AND SERVICE MANUAL

MODEL 7510DT HypotULTRA®II
MODEL 7512DT HypotULTRA®II

Electrical Dielectric Analyzers

AC or DC HIPOT TESTER including
RS-232 or Printer Port

SERIAL NUMBER

Models
7510DT/7512DT

13860 West Laurel Drive
Lake Forest, Illinois, 60045-4546
U.S.A.

Item 37987 ***Ver 1.16***

Printed January 13, 2005

Warranty Policies

Associated Research, Inc., certifies that the instrument listed in this manual meets or exceeds published manufacturing specifications. This instrument was calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST).

Your new instrument is warranted to be free from defects in workmanship and material for a period of (1) year from date of shipment. You must complete the on-line registration at www.asresearch.com/register or call 1-800-858-TEST ext. 210 to register over the phone

5-Year Program

AR recommends that your instrument be calibrated on a twelve-month cycle. Instruments purchased and used in North America only, may have their warranty extended in one year increments to a maximum of **(5) years** provided they are returned to AR at least **annually** for calibration and inspection. The annual calibration and inspection must be performed annually every year following receipt of instrument. Any instrument not calibrated and inspected annually will not be eligible for extended warranty status. This extended warranty is non-transferable and is offered only to the original purchaser. A return material authorization (RMA) must be obtained from AR before returning this instrument for warranty service. Please contact our Customer Support Center at 1-800-858-TEST (8378) to obtain an RMA number. It is important that the instrument is packed in its original container for safe transport. If the original container in not available please contact our customer support center for proper instructions on packaging. Damages sustained as a result of improper packaging will not be honored. Transportation costs for the return of the instrument for warranty service must be prepaid by the customer. AR will assume the return freight costs when returning the instrument to the customer. The return method will be at the discretion of Associated Research.

3-Year Program

A 3-Year warranty is also available for instruments purchased and used in North America. All costs for this warranty are paid with the initial purchase and include warranty coverage, annual calibration and standard ground return freight for three years. However, unlike our 5-year program annual calibration and inspection by Associated Research is not required.

Except as provided herein, Associated Research makes no warranties to the purchaser of this instrument and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

Any non-authorized modifications, tampering or physical damage will void your warranty. Elimination of any connections in the earth grounding system or bypassing any safety systems will void this warranty. This warranty does not cover batteries or accessories not of Associated Research manufacture. Parts used must be parts that are recommended by AR as an acceptable specified part. Use of non-authorized parts in the repair of this instrument will void the warranty.

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OPERATORS MANUAL

SAFETY PRECAUTIONS REQUIRED FOR HIGH VOLTAGE TESTING!

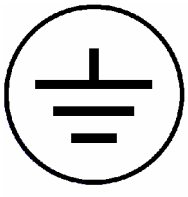
GENERAL:
This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.

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

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 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.

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. Schematics, when provided, are for reference only. Any replacement cables and high voltage components should be acquired directly from Associated Research, Inc. Refer servicing to an Associated Research, Inc. authorized service center.

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Service Interval

The instrument and its power cord, test leads, and accessories must be returned at least once a year to an Associated Research authorized service center for calibration and inspection of safety related components. Associated Research will not be held liable for injuries suffered if the instrument is not returned for its annual safety check and maintained properly.

User Modifications

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

TEST STATION

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."**

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.

Work Area

Perform the tests on a nonconducting 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.

TEST OPERATOR

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.

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.

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

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

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 7510DT, and 7512DT 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.

WARNING

NEVER TOUCH THE ITEM UNDER TEST OR ANYTHING CONNECTED TO IT WHILE HIGH VOLTAGE IS PRESENT DURING THE HIPOT TEST.

When testing with DC, always discharge the capacitance of the item under test and anything the high voltage may have contacted--such as test fixtures--before handling it or

disconnecting the test leads.

HOT STICK probes can be used to discharge any capacitance in the item under test as a further safety precaution. A hot stick is a nonconducting rod about two feet long with a metal probe at the end which is connected to a wire. To discharge the device under test, two hot sticks are required. First connect both probe wires to a good earth ground. Then touch one probe tip to the same place the return lead was connected. While holding the first probe in place, touch the second probe tip to the same place where the high voltage lead was connected.

KEY SAFETY POINTS TO REMEMBER:

- Keep unqualified and unauthorized personnel away from the test area.
- Arrange the test station in a safe and orderly manner.
- Never touch the product or connections during a test.
- In case of any problem, turn off the high voltage first.
- Properly discharge any item tested with DC before touching connections.

GLOSSARY OF TERMS

(as used in this manual)

Alternating Current, AC: Current which reverses direction on a regular basis, commonly in the U.S.A. 60 per second, in other countries 50 times per second.

Breakdown: The failure of insulation to effectively prevent the flow of current, sometimes evidenced by arcing. If voltage is gradually raised, breakdown will begin suddenly at a certain voltage level. Current flow is not directly proportional to voltage. Once breakdown current has flown, especially for a period of time, the next gradual application of voltage will often show breakdown beginning at a lower voltage than initially.

Conductive: Having a volume resistivity of no more than 10^3 ohm-cm or a surface resistivity of no more than 10^5 ohms per square.

Conductor: A solid or liquid material which has the ability to let current pass through it, and which has a volume resistivity of no more than 10^3 ohm-cm.

Current: The movement of electrons through a conductor. Current is measured in amperes, milliamperes, microamperes, nanoamperes, or picoamperes. Symbol = **I**

Dielectric: An insulating material which is positioned between two conductive materials in such a way that a charge or voltage may appear across the two conductive materials.

Direct Current, DC: Current which flows in one direction only. The source of direct current is said to be polarized and has one terminal which is always at a higher potential than the other.

Hipot Tester: Common term for dielectric-withstand test equipment.

Hypot®: Registered trademark of Associated Research, Inc., for its dielectric-withstand test equipment.

Insulation: Gas, liquid or solid material which has a volume resistivity of at least 10^{12} ohm-cm and is used for the purpose of resisting current flow between conductors.

Insulation Resistance Tester: An instrument or a function of an instrument capable of measuring resistance's in excess of 200 megohms. Usually employs a higher voltage power supply than used in ohmmeters measuring up to 200 megohms.

Leakage: Ac or DC current flow through insulation and over its surfaces, and AC current flow through a capacitance. Current flow is directly proportional to voltage. The insulation and/or capacitance is thought of as a constant impedance, unless breakdown occurs.

Resistance: That property of a substance which impedes current and results in the dissipation of power in the form of heat. The practical unit of resistance is the *ohm*. Symbol = **R**

Trip Point: The minimum current flow required to cause an indication of unacceptable performance during a dielectric voltage-withstand test.

Voltage: Electrical pressure, the force which causes current through an electrical conductor. Symbol = **V**

INTRODUCTION

The importance of testing... User safety
In an era of soaring liability costs, original manufacturers of electrical and electronic products must make sure every item is as safe as possible. All products must be designed and built to prevent electric shock, even when users abuse the equipment or by-pass built in safety features.

To meet recognized safety standards, one common test is the "dielectric voltage-withstand test". Safety agencies which require compliance safety testing at both the initial product design stage and for routine production line testing include: Underwriters Laboratories, Inc. (UL), the Canadian Standards Association (CSA), the International Electrotechnical Commission (IEC), the British Standards Institution (BSI), the Association of German Electrical Engineers (VDE) and (TÜV), the Japanese Standards Association (JSI). These same agencies may also require that an insulation resistance test and high current ground bond test be performed.

The Dielectric Withstand (Hipot) Test....
The principle behind a dielectric voltage - withstand test is simple. If a product will function when exposed to extremely adverse conditions, it can be assumed that the product will function in normal operating circumstances.

The most common applications of the dielectric-withstand test are:

- Design (performance) Testing.... determining design adequacy to meet service conditions.
- Production Line Testing.... detecting defects in material or workmanship during processing.
- Acceptance Testing.... proving minimum insulation requirements of purchased parts.
- Repair Service Testing.... determine reliability and safety of equipment repairs.

The specific technique varies with each product, but basically, during a dielectric voltage - withstand test, an electrical devise is exposed to a voltage significantly higher than it normally encounters. The high voltage is continued for a given period of time.

During the test, all "stray" current flow to ground is measured. If, during the time the component is tested, stray current flow remains within specified limits, the device is assumed to be safe under normal conditions. The basic product design and use of the insulating material will protect the user against electrical shock.
The equipment used for this test, a dielectric-withstand tester, is often called a "hipot" (for high potential tester). The "rule of thumb" for testing is to subject the product to twice its

normal operating voltage, plus 1,000 volts.

However, specific products may be tested at much higher voltages than 2X operating voltages + 1,000 volts. For example, a product designed to operate in the range between 100 to 240 volts, can be tested between 1,000 to 4,000 volts or higher. Most "double insulated" products are tested at voltages much higher than the "rule of thumb".

Testing during development and prototype stages is more stringent than production run tests because the basic design of the product is being evaluated. Design tests usually are performed on only a few samples of the product. Production tests are performed on each and every item as it comes off the production line.

The hipot tester must also maintain an output voltage between 100% and 120% of specification. The output voltage of the hipot must have a sinusoidal waveform with a frequency between 40 to 70 Hz and has a peak waveform value that is not less than 1.3 and not more than 1.5 times the root-mean-square value.

Advantages and Disadvantages of AC Testing and DC Testing....

Please check with the Compliance Agency you are working with to see which of the two type of voltages you are authorized to use. In some cases a Compliance Agency will allow either AC or DC testing to be done. However in other cases the Compliance Agency only allows for an AC test. If you are unsure which specification you must comply with please contact our CUSTOMER SUPPORT GROUP at 1-800-858-TEST (8378).

Many safety agency specifications allow either AC or DC voltages to be used during the hipot test. When this is the case the manufacturer must make the decision on which type of voltage to utilize. In order to do this it is important to understand the advantages and the disadvantages of both AC and DC testing.

AC testing characteristics

Most items that are hipot tested have some amount of distributed capacitance. An AC voltage cannot charge this capacitance so it continually reads the reactive current that flows when AC is applied to a capacitive load.

AC testing advantages

1. AC testing is generally much more accepted by safety agencies than DC testing. The main reason for this is that most items being hipot tested will operate at AC voltages and AC hipot testing offers the advantage of stressing the insulation alternately in both polarities which more closely simulates stresses the product will see in real use.
2. Since AC testing cannot charge a capacitive load the current reading remains consistent from initial application of the voltage to the end of the test. Therefore,

there is no need to gradually bring up the voltage since there is no stabilization required to monitor the current reading. This means that unless the product is sensitive to a sudden application of voltage the operator can immediately apply full voltage and read current without any wait time.

3. Another advantage of AC testing is that since AC voltage cannot charge a load there is no need to discharge the item under test after the test.

AC testing disadvantages

1. A key disadvantage of AC testing surfaces when testing capacitive products. Again, since AC cannot charge the item under test, reactive current is constantly flowing. In many cases the reactive component of the current can be much greater than the real component due to actual leakage. This can make it very difficult to detect products that have excessively high leakage current.

2. Another disadvantage of AC testing is that the hipot has to have the capability of supplying reactive and leakage current continuously. This may require a current output that is actually much higher than is really required to monitor leakage current and in most cases is usually much higher than would be needed with DC testing. This can present increased safety risks as operators are exposed to higher currents.

DC testing characteristics

During DC hipot testing the item under test is charged. The same test item capacitance that causes reactive current in AC testing results in initial charging current which exponentially drops to zero in DC testing.

DC testing advantages

1. Once the item under test is fully charged the only current flowing is true leakage current. This allows a DC hipot tester to clearly display only the true leakage of the product under test.

2. The other advantage to DC testing is that since the charging current only needs to be applied momentarily the output power requirements of the DC hipot tester can typically be much less than what would be required in an AC tester to test the same product.

DC testing disadvantages

1. Unless the item being tested has virtually no capacitance it is necessary to raise the voltage gradually from zero to the full test voltage. The more capacitive the item the more slowly the voltage must be raised. This is important since most DC hipots have failure shut off circuitry which will indicate failure almost immediately if the total

current reaches the leakage threshold during the initial charging of the product under test.

2. Since a DC hipot does charge the item under test it becomes necessary to discharge the item after the test.

3. DC testing unlike AC testing only charges the insulation in one polarity. This becomes a concern when testing products that will actually be used at AC voltages. This is a key reason that some safety agencies do not accept DC testing as an alternative to AC.

4. When performing AC hipot tests the product under test is actually tested with peak voltages that the hipot meter does not display. This is not the case with DC testing since a sinewave is not generated when testing with direct current. In order to compensate for this most safety agencies require that the equivalent DC test be performed at higher voltages than the AC test. The multiplying factor is somewhat inconsistent between agencies which can cause confusion concerning exactly what equivalent DC test voltage is appropriate.

The Insulation Resistance Test....
Some "dielectric analyzers today come with a built in insulation resistance tester. Typically the IR function provides test voltages from 500 to 1,000 volts DC and resistance ranges from kilohms to gigaohms. This function allows manufacturers to comply with special compliance regulations. BABT, TÜV and VDE are agencies that may under certain conditions require an IR test on the product before a Hipot test is performed. This typically is not a production line test but a performance design test.

The insulation resistance test is very similar to the hipot test. Instead of the go/no go indication that you get with a hipot test the IR test gives you an insulation value usually in Megohms. Typically the higher the insulation resistance value the better the condition of the insulation. The connections to perform the IR test are the same as the hipot test. The measured value represents the equivalent resistance of all the insulation which exists between the two points and any component resistance which might also be connected between the two points.

Although the IR test can be a predictor of insulation condition it does not replace the need to perform a dielectric withstand test.

TYPES OF FAILURES DETECTABLE ONLY WITH A HIPOT TEST

- Weak Insulating Materials
- Pinholes in Insulation
- Inadequate Spacing of Components
- Pinched Insulation

The Ground Bond Test

The Ground Bonding test determines whether the safety ground circuit of the product under test can adequately handle fault current if the product should ever become defective. A low impedance ground system is critical in ensuring that in the event of a product failure a circuit breaker on the input line will act quickly to protect the user from any serious electrical shock.

International compliance agencies such as CSA, IEC, TÜV, VDE, BABT and others, have requirements calling out this test. This test should not be confused with simple low current continuity tests that are also commonly called out in some safety agency specifications. A low current test merely indicates that there is a safety ground connection, it does not completely test the integrity of that connection.

Compliance agency requirements vary on how different products are to be tested. Most specifications call for test currents of between 10 and 30 amps. Test voltages at these currents are typically required to be less than 12 volts. Maximum allowable resistance readings of the safety ground circuit are normally between 100 and 200 milliohms.

The 7564SA provides up to 30 amps output current at any voltage between 3 and 8 volts through the safety ground of the product under test. Simultaneously the instrument measures the induced voltage across the safety ground circuit to determine the impedance of the ground connection. The meter displays the resistance reading of the ground circuit in milliohms.

The measured values are typically very low so it is extremely important to avoid reading the resistance of the test leads that are used to connect the test instrument to the product under test. If this is not done a device may be tagged as having a safety ground failure when it is actually the combined resistance of the DUT and the test leads that has caused the maximum resistance level to be exceeded. The 7564SA milliohm offset feature can be adjusted to disregard the resistance of the test leads.

IF YOU SHOULD HAVE ANY QUESTIONS RELATING TO THE OPERATION OF YOUR INSTRUMENT CALL 1-800-858-TEST(8378) IN THE U.S.A.

Model 7510DT
Functional Specifications

INPUT		
Voltage	115/230 VAC ± 15%, Single Phase, User selection	
Frequency	47 - 63 Hz	
Fuse	5 Amp 250V Slo-Blo	
DIELECTRIC WITHSTAND TEST MODE		
Output Rating	10 KV @ 10 mA	
Output Adjustment	Range:	0 - 10 KV AC
	Resolution:	10 volt/step
	Accuracy:	± (2% of setting + 10 volts)
HI-Limit	Range:	0.00 - 10.00 mA
	Resolution:	0.01 mA/step
	Accuracy:	± (2% of setting + 2 counts)
LO-Limit	Range:	0.000 - 9.999 mA
	Resolution:	0.001 mA/step
	Accuracy:	± (2% of setting + 2 counts)
Arc Detection	Range:	1 - 9
Failure Detector	Audible and Visual	
Voltage Display	Range:	0.00 - 10.00 KV Full Scale
	Resolution:	10 volt/step
	Accuracy:	± (2% of reading + 2 counts)
Current Display	Auto Range	
	Range 1:	0.000mA - 3.500mA
	Resolution:	0.001mA/step
	Range 2:	3.00 - 10.00 mA
	Resolution:	0.01 mA/step
	Accuracy:	± (2% of reading + 2 counts)
AC Output Wave Form	Sine Wave, Crest Factor = 1.3 - 1.5	
Output Frequency	Range:	60 or 50 Hz, User Selection
	Accuracy:	± 1%

Model 7510DT cont.

Output Regulation	± (1 % of setting + 5 volts) from no load to full load
Dwell Timer	Range: 0, 0.3 - 999.9 sec (0 = Constant) Resolution: 0.1 sec increments Accuracy: ± (0.1% + 0.05 sec)
Ramp Timer	Range: 0.1 - 999.9 sec Resolution: 0.1 sec increments Accuracy: ± (0.1% + 0.05 sec)
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 different test programs.
Security	Programmable 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.
Mechanical	Bench or rack mount with tilt up front feet.
Dimension	(W x H x D) 17 x 5.8 x 12 in. (432 x 147 x 305 mm)
Weight	42 lbs (19 Kgs)

Model 7512DT
Functional Specifications

INPUT		
Voltage	115/230 VAC ± 10%, Single Phase, User selection	
Frequency	47 - 63 Hz	
Fuse	5 Amp 250V Slo-Blo	
DIELECTRIC WITHSTAND TEST MODE		
Output Rating	12 KV DC @ 5 mA	
Output Adjustment	Range:	0 - 12 KV DC
	Resolution:	10 volt/step
	Accuracy:	± (2% of setting + 10 volts)
Ramp-HI	10mA peak maximum, 5mADC, ON/OFF selectable	
Charge-LO	Range:	0.0 - 350.0µA DC or Auto set
HI-Limit	Range:	0 - 5000µA
	Resolution:	1µA/step
	Accuracy:	± (2% of setting + 2 counts)
LO-Limit	Range:	0.0 - 999.9 µA
	Resolution:	0.1 µA/step
	Accuracy:	± (2% of setting + 2 counts)
Arc Detection	Range:	1 - 8
Failure Detector	Audible and Visual	
Voltage Display	Range:	0.00 - 12.00 KV Full Scale
	Resolution:	10 volt/step
	Accuracy:	± (2% of reading + 2 counts)
Current Display	Range 1:	0.0 µA - 350.0 µA
	Resolution:	0.1 µA/step
	Range 2:	300 µA - 3500 µA
	Resolution:	1 µA/step
	Range 3:	3000 µA - 5000 µA
	Resolution:	10 µA/step
	Accuracy:	± (2% of reading + 2 counts)

Model 7512DT cont.

DC Output Ripple	≤ 4% Ripple RMS at 6 KV DC @ 3.5 mA, Resistive Load
Output Regulation	± (1 % of setting + 5 volts) from no load to full load
Dwell Timer	Range: 0, 0.3 - 999.9 sec (0 = Constant) Resolution: 0.1 sec increments Accuracy: ± (0.1% + 0.05 sec)
Ramp Timer	Range: 0.4 - 999.9 sec Resolution: 0.1 sec increments Accuracy: ± (0.1% + 0.05 sec)
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 different test programs.
Security	Programmable 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.
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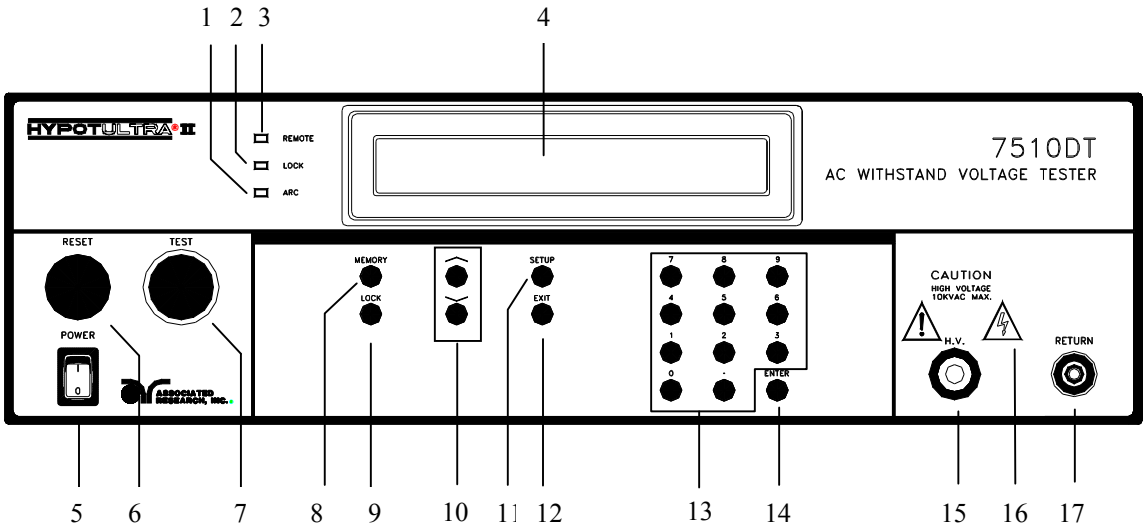
Dimension	(W x H x D) 17 x 5.8 x 12 in. (432 x 147 x 305 mm)
Weight	42 lbs (19 Kgs)

KEY FEATURES & BENEFITS SUMMARY: MODELS 7510DT & 7512DT

▪ **RS232 interfaces as standard features**	All the functions of the instrument can be programmed over the interface which makes the instrument adaptable to any type of automated production environment.
▪ **A single 2 x 20 LCD display provides a clear indication of all test results and setup parameters**	This single easy-to-view and simple-to-interpret LCD display allows the operator to monitor all test activity.
▪ **All setup parameters can be adjusted through a simple menu driven program**	The operator is provided with an easy and safe way to set trip currents and output voltages since all parameters are set without high voltage activated.
▪ **Storage of up to 50 setups**	A real benefit for manufacturers that test different products. Each memory can be configured to perform any of the safety tests.
▪ **Exclusive CHARGE LO and RAMP HI testing features allow for more effective DC Hipot testing (Model 7512DT)**	The RAMP HI feature allows the user to set a higher trip rate during the ramp to allow for quick charging of the product without nuisance tripping thereby increasing throughput when testing with DC. The CHARGE LO provides the user with the capability to ensure that the device under test is connected correctly.
▪ **Programmable security password system**	Avoids tampering with settings by only allowing authorized personnel with a user programmable security password to change test parameters.
▪ **Line and Load regulation**	Maintains the output voltage to within 1% of setting even if the load or the line voltage varies. This ensures that the test results remain consistent and within safety agency requirements.
▪ **PLC remote inputs & outputs**	This allows the instruments to be remotely monitored and set up completely through simple PLC control.
▪ **Digitally controlled arc detection system**	Allows the operator to select whether low level arcs should be detected and provides the operator with the ability to digitally select and program multiple sensitivity levels.

FRONT PANEL CONTROLS 7510DT, and 7512DT



1. **ARC LED:** This indicator will illuminate when the Arc Detector has detected an arcing condition. This indicator will function even when the Arc Fail has been disabled.

2. **LOCK LED:** When the Lock LED is on, the "password" software lockout has been enabled. This means that the users will be unable to access the "program" mode of the instrument to change any settings. When Memory-Lock is OFF the user can change memory locations.

3. **REMOTE LED:** This indicator will light when the instrument is in the Remote Control mode. When the Remote LED is ON the instrument is able to send and receive signals across the RS-232 bus.

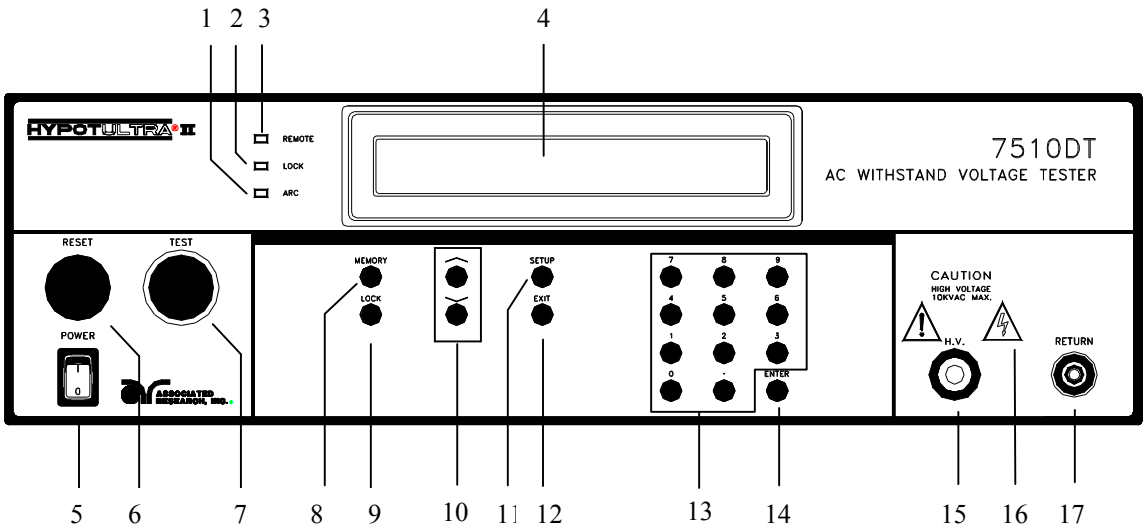
4. **LCD DISPLAY:** The 2x20 character display indicates test function, memory location, test parameter and failure type as well as test measurements during a test.

5. **POWER SWITCH:** Rocker-style switch with international ON (|) and OFF (0) markings.

6. **RESET BUTTON:** This is a momentary contact switch. If an out-of-range leakage current condition, an arc breakdown, HI-limit, or LO-Limit you will need to reset the system before you can proceed to the next test. Press and release the red RESET button.

7. **TEST BUTTON:** This is a momentary contact switch. Press the green button to turn on the high voltage output. Also illuminates to indicate a Pass condition.

8. **MEMORY:** Use this key to select one of the 50 memories to modify or run stored test parameters.



9. **LOCK:** Use this key to select key lockout mode. A password may be used when setup in the calibration mode.

10. **UP-DOWN ARROW KEYS:** Use these keys to enter and move through the function parameter menu for test parameter setup.

11. **SETUP:** Use this key to enter the setup menu and view or change the display contrast, alarm volume, and PLC remote settings.

12. **EXIT:** Use this key to exit any menu or to clear an unwanted entry in a parameter field. Use this key when you wish to go from the Remote operation of the instrument to the Local mode

13. **DATA ENTRY KEYS:** Use these keys to input numeric parameters followed by the ENTER key.

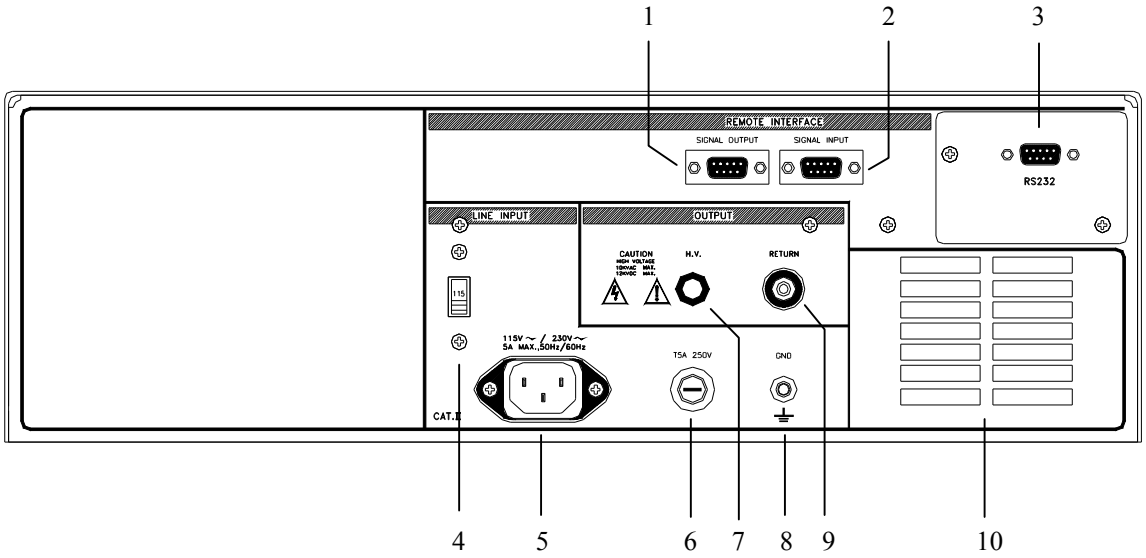
14. **ENTER:** Use this key as an ENTER key to accept numeric data for parameter settings.

15. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when the test lead is not being used.

16. **HIGH VOLTAGE ON INDICATOR:** This indicator flashes to warn the operator that high voltage is present at the high voltage output terminal.

17. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) return test lead. This lead is always used when performing a test.

REAR PANEL CONTROLS 7510DT and 7512DT



1. **REMOTE SIGNAL OUTPUT:** 9-Pin D subminiature female connector for monitoring PASS, FAIL, and PROCESSING output relay signals.

2. **REMOTE SIGNAL INPUT:** 9-Pin D subminiature male connector for remote control of test and reset functions as well as program memory selection 1, 2, or 3.

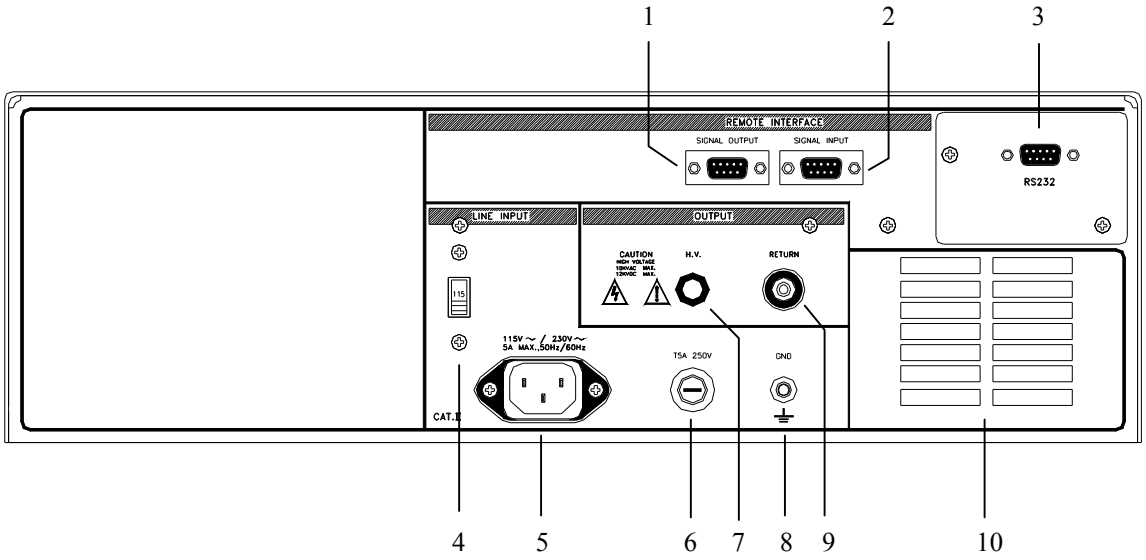
3. **BUS INTERFACE:** Standard connector for interconnection to the RS-232 interface.

4. **INPUT POWER SWITCH:** Line voltage selection is set by the position of the switch. In the up position it is set for 110-120 volt operation, in the down position it is set for 220-240 volt operation.

5. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.

6. **FUSE RECEPTACLE:** To change the fuse unplug the power (mains) cord and turn the fuse receptacle counter-clockwise. The fuse compartment will be exposed. Please replace the fuse with one of the proper rating.

7. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.



8. CHASSIS GROUND (EARTH) TERMINAL: This terminal should be connected to a good earth ground before operation.

9. RETURN OUTPUT JACK: For the connection of the detachable 5 foot (1.52 m) return test lead. This lead is always used when performing a test.

10. THERMAL COOLING FAN: Runs continuously to cool the instrument.

INSTALLATION

Introduction

This section contains information for the unpacking, inspection, preparation for use and storage of your Associated Research, Inc., product.

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 Associated Research 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.

Preparation for Use

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 micoamp range.

Power Requirements and Line Voltage Selection

This instrument requires a power source of either 115 volts AC ± 15%, 47-63 Hz single phase 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 (see page 20 for fuse changing instructions).

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.

NOTE

For operation at 115 and 230 Volts AC use a 5A slow-blow fuse.

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. The type of power cable shipped with each instruments depends on the country of destination.

Operating Environment

This instrument may be operated in temperatures from 32° - 113° F
(0° - 45° C).
Relative humidity of 0 to 95%.
Altitude up to 15,000 feet (4,600 meters).

STORAGE AND SHIPMENT

Environment

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

Temperature..... -40° to +75°C
Altitude..... 7,620 meters (25,000 feet)

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

Packaging

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. Contact our customer support department (1-800-858-8378) for a RMA (return material authorization) number. 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. Upon receipt your instrument will be issued an AR service number. Please refer to this number in all correspondence.

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.

6). Please refer in all correspondence to your AR service number.

Field Installation Of Options

There are no field installable options on this instrument.

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:

DEFAULTS

Function	Parameter	Value
7510DT	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
7512DT	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
Setup	PLC Remote	OFF
	Contrast	5
	Volume	5
Calibration	Password	0
	MR-Lock	ON

Quick Start Instructions Cont.:

a). 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.

WARNING b). 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.

CAUTION c). 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.

d). Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the instrument all LEDs on the Front Panel will be lit for visual inspection. For detailed instructions on setting up testing parameters refer to the OPERATION section.

e). If the instrument defaults are acceptable then be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect this safety ground to a suitable known good ground before energizing this instrument. 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. See the Installation section for details.

WARNING f). Please check your connections to be sure they are making good contact and that the test station or area is clear of debris and other personnel. DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED. To initiate the test press the green TEST button on the front panel. This is a momentary button and does not need to be held in the pressed position during the test. The instrument will then cycle ON and begin the automated test sequence using the defaults. If a failure occurs you will hear an audible alarm go off. To stop the alarm you must depress the red button marked “RESET” This will silence the alarm and reset the instrument to begin another 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 a RED arrow indicator located in the lower right side of the front panel near the high voltage connector will flash until the HIGH VOLTAGE is shut OFF. If the device under test PASSED the test then no audible alarm will sound. You will hear a brief BEEP to let you know the item was successfully tested and it PASSED. In the case of a FAIL condition the instrument will provide a memory of the test results on the display, that 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.

1. General Setup Procedures

1.1 Key Lock setting

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

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

To view the password or enter a new one refer to the calibration procedure. Use the Numeric Key to 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 light. 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

Use the ENTER key to select the Key Lock mode, then press the EXIT key. The program will switch the Key Lock function from LOCK to UNLOCK or UNLOCK to LOCK mode and advance the program to the Operation mode automatically. If the Key Lock function is in the Lock mode, the LOCK indicator on the front panel will light.

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 cannot be changed. The MR-Lock default is preset to ON at the factory. Please refer to the calibration procedure, on page 54, to set the MR-Lock mode .

1.2 Memory Program selection

Press the MEMORY key, the display will show:

Memory = X X Range : 1 - 50

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 this location and return to the operation mode automatically.

2. Function Parameters Setup Procedures

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

2.1 7510DT AC Withstand Voltage test setting

Press the ∨ arrow key and the display will show:

ACW Set	XXX.X s
MXX XX.XX KV	XX.XX mA

Note: X = Numeric

ACW Set : AC Withstand Voltage test setting screen
XXX.X s : Dwell Time setting
MXX : Memory Program number
XX.XX KV : AC Output Voltage setting
XX.XX mA : AC High-Limit current setting

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, and Arc Fail.

2.1.1 AC Output Voltage setting

Advance the menu to the Voltage parameter. The display will show:

Voltage = XX.XX KV
Range : 0 - 10.00

Use the Numeric keys to enter the voltage setting, then press the ENTER key. The program will store the voltage setting and advance to the High Limit parameter automatically. The unit is volt and 10 volt per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

2.1.2 HI-Limit Current setting

Advance the menu to the HI-Limit parameter. The display will show:

HI-Limit = XX.XX mA
Range : 0.00 - 10.00

Use the Numeric keys to enter the HI-Limit setting, then press the ENTER key. The program will store the HI-Limit setting and advance to the LO-Limit parameter automatically. The unit is mA and 0.01 mA per step.

Press the EXIT key to exit from the setting mode to the operation mode if all

parameters have been set.

2.1.3 LO-Limit Current setting

Advance the menu to the LO-Limit parameter. The display will show:

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

Use the Numeric keys to enter the LO-Limit setting, then press the ENTER key. The program will store the LO-Limit setting and advance to the Ramp Time parameter automatically. The unit is mA and 0.001 mA per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

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

2.1.4 Ramp Time setting

Advance the menu to the Ramp Time parameter. The display will show:

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

Use the Numeric keys to enter the Ramp Time setting, then press the ENTER key. The program will store the Ramp Time setting and advance to the Dwell Time setting automatically. The unit is second and 0.1 second per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

2.1.5 Dwell Time setting

Advance the menu to the Dwell Time parameter. 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 setting, then press the ENTER key. The program will store the Dwell Time setting and advance to the Frequency selection parameter automatically. The unit is second and 0.1 second per step. The display will show the elapsed time during the testing.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

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.

2.1.6 Frequency selection

Advance the menu to the Frequency parameter and 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 ∧ or ∨ key to advance to another test parameter or press the EXIT key to exit from the setting mode to the operation mode.

2.1.7 Arc Sensitivity setting and Arc Fail selection

Advance the menu to the Arc Sense parameter. The display will show:

Arc Sense = 1 - 9 Range : 1 - 9 9 = High

Use the Numeric keys to enter the Arc Sense setting, then press the ENTER key. The numeric value is proportional to the amount of sensitivity, i.e. 9 is the highest sensitivity. 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

Use the ENTER key to select the Arc Fail 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 the Arc Fail mode is set to ON, the program will indicate an arc failure when the arc current is over the setting. The program will shut down the test immediately and the ARC indicator on the front panel will light.

If the Arc Fail mode is set to OFF, the program will not indicate an arc failure when the arc current is over the setting. The program will not shut down the test but the ARC indicator on the front panel will light when arcing is present.

2.2 7512DT DC Withstand Voltage test setting

Press the ∨ arrow key and the display will show:

DCW Set	XXX.X s
MXX XX.XX KV	XXXXX μA

Note: X = Numeric

DCW Set : DC Withstand Voltage test Setting screen
XXX.X s : Dwell Time setting
MXX : Memory Program number
XX.XX KV : DC Output Voltage setting
XXXX μA : DC High-Limit current setting

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, Charge-LO, Ramp-HI, Arc Sense, and Arc Fail.

2.2.1 DC Output Voltage setting

Advance the menu to the Voltage parameter. The display will show:

Voltage = XX.XX KV
Range : 0 - 12.00

Use the Numeric keys to enter the voltage setting, then press the ENTER key. The program will store the voltage setting and advance to the HI-Limit parameter automatically. The unit is volt and 10 volt per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

2.2.2 HI-Limit Current setting

Advance the menu to the HI-Limit parameter. The display will show:

HI-Limit = XXXX μA
Range : 0 - 5000

Use the Numeric keys to enter the HI-Limit setting, then press the ENTER key. The program will store the HI-Limit setting and advance to the Low Limit parameter automatically. The unit is μA and 1μA per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

2.2.3 LO-Limit Current setting

Advance the menu to the LO-Limit parameter. The display will show:

LO-Limit = XXX.X μA Range : 0.0 - 999.9

Use the Numeric keys to enter the LO-Limit setting, then press the ENTER key. The program will store the LO-Limit setting and advance to the Ramp Time parameter automatically. The unit is μA and 0.001μA per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

The LO-Limit will be disabled during the Ramp Up period. If the LO-Limit is set to 0, the LO-Limit is disabled.

2.2.4 Ramp Time setting

Advance the menu to the Ramp Time parameter. The display will show:

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

Use the Numeric keys to enter the Ramp Time setting, then press the ENTER key . The program will store the Ramp Time setting and advance to the Dwell Time parameter automatically. The unit is second and 0.1 second per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

2.2.5 Dwell Time setting

Advance the menu to the Dwell Time parameter. 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, then press the ENTER key. The program will store the Dwell Time setting and advance to the Charge-LO parameter automatically. The unit is second and 0.1 second per step.

Press the EXIT key to exit from the setting mode to the operation mode if all parameters have been set.

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.

2.2.6 Charge-LO setting

Advance the menu to the Charge-LO parameter. 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.

This instrument 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 program 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. The unit is μA and 0.1μA per step.

To use Auto Set, 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 and connect the test cables and/or test fixture between the instrument and DUT. 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.

WARNING **Please be aware that the program will activate high voltage on the output connector while the Test button is pressed.**

The program 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

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 ∧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.

2.2.7 Ramp-HI selection

Advance the menu to the Ramp-High parameter. 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 ∧ 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.

The Ramp-HI function is active during the Ramp 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.

2.2.8 Arc Sensitivity setting and Arc Fail selection

Advance the menu to the Arc Sense parameter. The display will show:

Arc Sense = X Range : 1 - 8 8 = High

Use the Numeric keys to enter the Arc Sense setting, then press the ENTER key. The numeric value is proportional to the amount of sensitivity, i.e. 8 is the highest sensitivity. The program 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 ∧ 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 the Arc Fail mode is set to ON, the program will indicate an arc failure when the arc current is over the setting. The program will shut down the test immediately and the ARC indicator on the front panel will light.

If the Arc Fail mode is set to OFF, the program will not indicate an arc failure when the arc current is over the setting. The program will not shut down the test but the ARC indicator on the front panel will light only when arcing is present.

3. System Parameter Settings

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.

3.1 PLC Remote selection

Press the Setup key to advance to the PLC Remote parameter. 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.

After selecting PLC Remote mode, press the SETUP key to advance to the contrast setting, or press the EXIT key to exit from the PLC Remote selection to the operation mode. The instrument will store the selection of PLC Remote automatically.

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.

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.

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.

3.2 LCD Contrast setting

Press the Setup key to advance the menu to the Contrast parameter. 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 program 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, or press the EXIT key to exit from the LCD Contrast setting to the operation mode. The program will store the Contrast setting automatically.

The LCD Contrast level is from 1 - 9, a total of 9 levels. Level 1 is the lowest contrast and level 9 is the highest contrast.

3.3 Audible Alarm Volume setting

Press the Setup key to advance the menu to the Volume parameter. The display will show:

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

The Audible Alarm Volume range is from 0 - 9, a total 10 levels. 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 program 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 program, or press the EXIT key to exit from the Audible Alarm setting to the operation mode. The program will store the Volume setting automatically.

4. Operation Procedure

4.1 Setup

Before the operation of this instrument, make sure that all Test Parameters have been set properly according to the Test Parameters Setup Procedures. Also check the system setting of Remote Control, LCD Contrast , the Alarm Volume and Fail Stop.

Be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect the safety ground (on the rear panel) to a suitable known good ground before energizing this instrument. Then connect the return lead first to the test fixture or the DUT followed by the high voltage lead.
Check your connections to be sure they are making good contact and that the test station or area is clear of debris or other personnel.

WARNING **DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED.**

4.2 Power Up

Turn on the Input Power Switch. The display will show the Trade Mark, Model Number and Version Number first, as follows:

ARI HYPOTULTRA II
75XXDT VER : X.X

Note: X = Numeric.

Then, all status LEDs will light up, and the Scanner status LEDs will light sequentially if the internal scanner has been installed. The program will then recall the Memory and Step which was last executed.

4.3 Settings Screen

The settings screen will show parameter settings of the test that will be performed and the memory locations that they are stored in. This screen can be accessed after a test is Aborted or Passed by pressing the RESET button, or after a test failure by pressing the RESET button twice. The Function is indicated on the left side of the

first line and the mode, or test result, is indicated just to the right of the Function. The timer is always shown on the right side of the first line. The left side of the second line always indicates the Memory. The display will show:

ACW	Set	XXX.X s
M25	XX.XX KV	XX.XX mA

The following are examples of the Setting Screens for the 7510DT and 7512DT before any test has been executed.

7510DT AC Withstand test, the display will show:

ACW	Set	XXX.X s
M25	XX.XX KV	XX.XX mA

ACW Set : AC Withstand Voltage test setting screen
XXX.X s : Dwell Time setting
MXX : Memory Program number
XX.XX KV : AC Output Voltage setting
XX.XX mA : AC High-Limit current setting

7512DT DC Withstand test, the display will show:

DCW	Set	XXX.X s
M25	XX.XX KV	XXXX µA

DCW Set : DC Withstand Voltage test setting screen
XXX.X s : Dwell Time setting
MXX : Memory Program number
XX.XX KV : DC Output Voltage setting
XXXX µA : DC High-Limit current setting

5. Displayed Messages

5.2 Displayed messages for the 7510DT

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

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

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 - - . - - KV	- - . - - mA

or

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

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 - - . - - KV	- - . - - mA

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 XX.XX KV	XX.XX mA

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 XX.XX KV	XX.XX mA

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 - - . - - KV	- - . - - mA

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 XX.XX KV	XX.XX mA

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 XX.XX KV	> 10 mA

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 - - . - - KV	> 10 mA

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 XX.XX KV	> 10 mA

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 XX.XX KV	XX.XX mA

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 XX.XX KV	XX.XX mA

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 XX.XX KV	XX.XX mA

5.3 Displayed messages for the 7512DT

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

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

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 - - . - - KV - - - - µA

or

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

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 - - . - - KV - - - - µA

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 XX.XX KV XXXX µA

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 XX.XX KV XX.XX µA

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 - - . - - KV - - - - µA

If the Ramp-HI function is enabled and the leakage current during the Ramp cycle exceeds 5mA, then the display will show:

DCW Ramp-HI XXX.X s
MXX XX.XX KV >5000 µA

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 XX.XX KV XXX.X. µA

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 XX.XX KV XXXX µA

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 XX.XX KV	> 5000 µA

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 - - . - - KV	> 5000 µA

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 XX.XX KV	> 5000 µA

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 XX.XX KV	XXX.X µA

If the DUT 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 XX.XX KV	XX.X µA

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

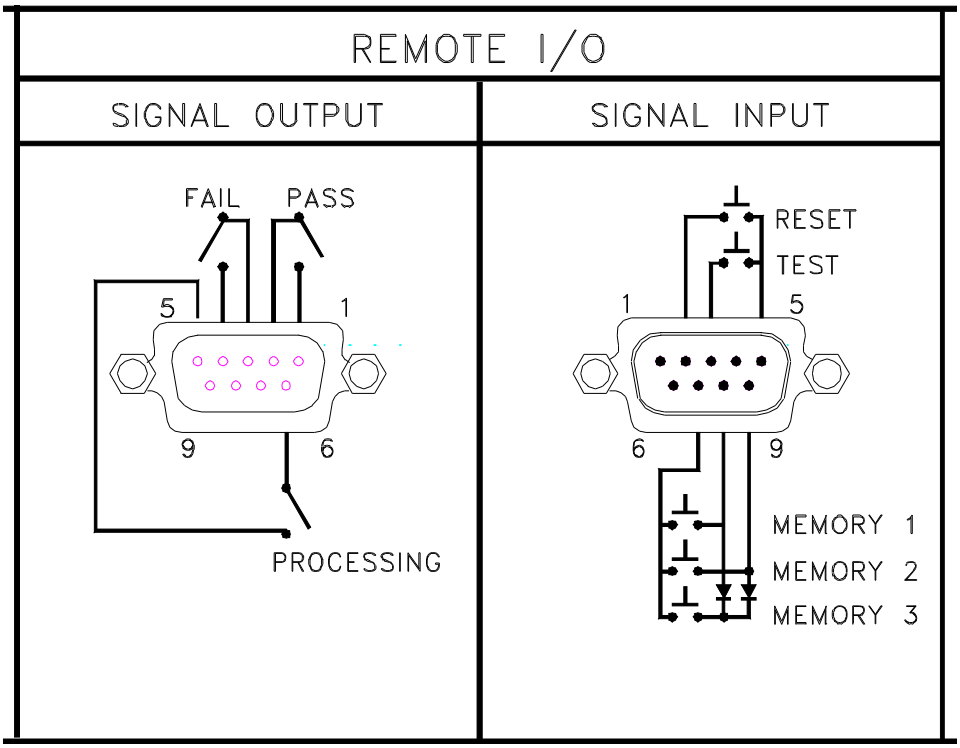
DCW Pass	XXX.X s
MXX XX.XX KV	XXXX µA

6. Connection Of 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. The output mates to a male (plug) connector while the input mates to a female (receptacle) connector. 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:



6.1 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 instrument 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.

6.2 Signal Inputs of Remote I/O and Memory Programs

The HypotULTRA II 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 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 HypotULTRA II 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 HypotULTRA II 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.

7. RS-232 Interface

This section provides information on the proper use and configuration of the RS-232 interface. The RS-232 interface is standard and a parallel printer port can be substituted.

7.1 Interface Functions

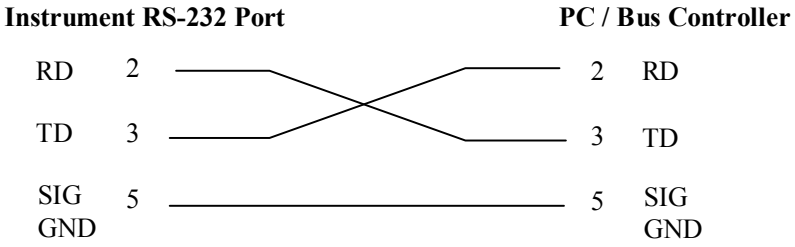
The capability of a device connected to the bus is specified by its interface functions. These functions provide the means for a device to receive, process, and send messages over the bus. The interface functions are listed in the chart below. All functions may be controlled over the bus except input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

RS-232 INTERFACE FUNCTIONS

CONTROLLABLE ITEMS	Test/Reset control Setting of test status/parameters for test Display Reading
DATA CODES	ASCII
DELIMITER	CR + LF (+ EOI)

7.2 RS-232 Interface

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 7). 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 instrument 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

7.3 Interface Bus 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.

Command	Function
FA	Test
FB	Reset
FI	ACW: 60Hz (model 7510DT only)
FJ	ACW: 50Hz (model 7510DT only)
FK	ACW: Arc Fail On (model 7510DT only)
FL	ACW: Arc Fail Off (model 7510DT only)
FM	DCW: Arc Fail On (model 7512DT only)
FN	DCW: Arc Fail Off (model 7512DT only)
FV	DCW: Auto Charge-LO (model 7512DT only)
F8	DCW: Ramp-HI On (model 7512DT only)
F9	DCW: Ramp-HI Off (model 7512DT only)

The following "S" commands will set test parameters on the instrument that require numeric or alphanumeric input.

ACW 7510DT only			
Command	Parameter	Value	Unit
SA	Voltage	0-10.00	KV
SB	HI-Limit	0.00-10.00	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 7512DT only			
Command	Parameter	Value	Unit
SI	Voltage	0-12.00	KV
SJ	HI-Limit	0 - 5000	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	-

General Operation			
Command	Function	Value	Unit
S5	Memory Select	1 - 50	Integer

When the Controller sends a correct “S" or “F" command the instrument will echo back the identical command string to the RS-232 controller’s input buffer. If an error occurs when the command is sent the instrument will send an ASCII code “15h".

The following functions will read data from the instrument when executed. The instrument will send data back to the RS-232 buffer at the controller after the command is sent to the instrument. The data should be retrieved from the data buffer with the appropriate controller commands that are relative to the program language

Command	Read Data Function	Read Bytes	Description
?B	DCW Charge-LO 7512DT only	5	Read the DCW Charge-LO Setting.
?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.

7.4 Example of communicating over the RS-232 bus

To write commands over the RS-232 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 RS-232 bus at 1240 volts 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 RS-232 bus at 10 seconds send the string **"SD 10.00".** This tells the instrument to set the AC Ramp Time at 10.00 seconds.

To read the 2 x 20 display, first send the string **"?K",** the instrument then sends data back to the RS-232 buffer at the controller. The instrument will send 40 bytes, one byte for each character on the display, including spaces.

7.5 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 is the memory location that will **NOT** write the parameter to non-volatile memory. Settings written to this location from RS-232 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.

Model 7510DT and 7512DT OPTIONS

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing.

Option Label

If your instrument has been modified with options, there will be an option label on the rear panel of the unit. The option label contains an option(s) code that may be cross-referenced to the Options List.

For example your options code would appear as follows:
fitted with option 04 ..... OPT: 04
fitted with option 04 and 06..... OPT: 0406

7510DT and 7512DT Options

Option List

Code	Description
04	Grounded Return
06	Dual Remote Test Switches
08	Printer Port
11	Remote Interlock

Description

04 Grounded Return

The Grounded Return option allows the user to perform tests on devices that have their chassis earth grounded by the test fixture or test environment. The standard configuration of the 7510DT and 7512DT provide a return connection that is not directly connected to Earth ground. This configuration allows monitoring of very low level leakage current without the stray leakage currents being measured and causing errors in the reading. The Grounded Return option will have some amount of internal leakage current that is proportional to the High Voltage output and can cause small amounts of error depending on the test voltage and physical environment.

06 Dual Remote Test Switches

The Dual Remote Test Switch option allows the user to configure dual palm switches for safe production line operation. The rear panel remote interface is reconfigured to allow two test switches instead of the standard reset and test inputs. The two test switches have to be pressed within 0.5 seconds to activate the test process. The two test switches must remain closed to continue the test. If either of the test switches are released, the process will be shut down immediately. The functions of the Test and Reset switches on the front panel will be disabled if the dual test switches are enabled with the menu selection of Remote On/Off. If the dual test switches are not enabled, the functions of front panel Test and Reset switches will remain the same as the standard instrument.

08 Printer Port Option

This option allows the instrument to generate hardcopy printout of the test results. The printout can be configured to print automatically with each test, or manually by pressing a front panel key. There is also capability to enter a serial number identifier to each test, that increments automatically after each test is performed. The test can be further configured to print only results from tests that have failed or to print all test results from every test performed.

The Printer Port is a parallel interface and should be compatible with most parallel printers. The printer port output uses simple ASCII characters and control codes. Simply connect the printer to the instrument and configure the printer output using the Setup menu. The following sections describe the setup procedures for configuring the printer output.

1. Auto Print

Please press the Setup key to enter the Setup menu. Press the setup key four more times to scroll to the Auto Print selection the screen will show:

AUTO Print = ON <ENTER> to Select

AUTO Print = OFF <ENTER> to Select

To configure Autoprinting press the ENTER key to change the selection. When Auto Print = ON the printer output will generate data every time the test has completed, and will also enable two other menus to configure the Print Mode and the Print Number. When Auto Print = OFF printer output can not be generated.

2. Print Mode

Please press the Setup key. This menu selection is only available when Auto Print has been enabled, when Auto Print = ON the screen will show:

Print Mode = All <ENTER> to Select	Print Mode = Fail <ENTER> to Select

The printer output will generate the 40 character LCD display test results when the test is complete. This selection will determines when the 40 character output will print. When Print Mode = All the printer output will print the test results from every test performed. When Print Mode = Fail only the test that have failed will be printed. The Print Number or Serial number will print for every test, followed by the appropriate test results depending on the Print Mode that has been selected.

3. Print Number

Please press the Setup key. This menu selection is only available when Auto Print has been enabled, when Auto Print = ON the screen will show:

Print NO. = 0 Range : 0 - 9999

The print number is used to identify each test result. The number can be set to match the exact serial number or some portion of actual serial number of the item under test or just used as an identifier or tracking number. Type in the desired starting number in the range from 0 -9999. This number will increment as each test is performed. The next number that will be used can be viewed from this menu at any time after a test has been completed. This number is not save as part of the non-volatile memory setup parameters. Therefore each time the power to the instrument is turned off, the number will be reset to 0.

4. Sample Printer Outputs

Sample printer output with the following setup:
Auto Print = ON and
Print Mode = All and
Print No. = 1000

```
NO. 1000
ACW Pass            1.0s
M 1_1  5.00KV  0.000mA

NO. 1001
ACW Hi-Limit        0.5s
M 1_1  5.00KV  10.21mA

NO. 1002
ACW Pass            1.0s
M 1_1  5.00KV  0.000mA

NO. 1003
ACW Pass            1.0s
M 1_1  5.00KV  0.000mA
```

Sample printer output of the same test results, but the
Print Mode = Fail. In this case the test number of every test is printed but fail result details are printed only when a failure occurs.

```
NO. 1000
NO. 1001
ACW Hi-Limit        0.5s
M 1_1  5.00KV  10.21mA

NO. 1002
NO. 1003
```

11 Remote Interlock

Option 11 is a Remote Interlock feature that inverts the present reset logic on the instrument from normally opened (must close contacts to activate the reset) to normally closed (must open contacts to activate the reset). Hardware and software have been reconfigured to provide the interlock connections on pins 4 and 5 of the Remote Interface, Signal Input port. This reset scheme is designed for use with an external safety interlock device that utilizes a "Fail-When-Open" configuration on its output interface. The instrument can still be used without the external reset device as long as the Interlock Connector 38037 (provided with unit) is plugged into the Remote Interface, Signal Input port. If there is nothing connected to the Remote Interface, Signal Input port to provide a connection to the interlock (reset), then the instrument will not function. Please refer to section “6. Connection of Remote I/O” (OPERATION) for further information about the remote interface.

SECTION 2
SERVICE MANUAL

CALIBRATION PROCEDURES

To 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.

MODEL 7510DT CALIBRATION PROCEDURE

1. 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.

2. 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.

3. AC Hipot, Voltage

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

ACW Voltage, 10KV <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 10KV to the output connectors and then press the TEST button, the program will automatically generate an output of about 10KVAC 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, 10KV OK <T E S T> t o C a l i b r a t e

4. AC Hipot, 10mA current range

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

AC 10mA, 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 10mA range for calibration and the display will show:

AC 10mA, 100KΩ OK <T E S T> t o C a l i b r a t e

5. AC Hipot, 3.5mA current range

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

AC 3.5mA, 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 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> t o C a l i b r a t e

MODEL 7512DT CALIBRATION PROCEDURE

1. 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.

2. 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.

3. DC Hipot, Voltage

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

DCW Voltage, 12KV <TEST> to Calibrate

Connect a DC standard voltage meter which can measure up to 12KV to the output connectors and then press the TEST button, the program will automatically generate an output of about 12KVDC 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, 12KV OK <TEST> to Calibrate

4. DC Hipot, 5mA current range

Press the ∨ key, the program will advance to the DC 5mA range calibration of the hipot test. The display will show:

DC 5mA, 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 5mA 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 500V/5mA 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 5mA range for calibration and the display will show:

DC 5mA, 100KΩ OK
<T E S T> t o C a l i b r a t e

5. DC Hipot, 3500μA current range

Press the ∨ key, the program will advance to the DC 3500μA range calibration of hipot 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 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 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 of hipot test and the display will show:

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

6. DC Hipot, 350μA current range

Press the ∨ key, the program will advance to the setting and reading of DC 320μA range calibration of the hipot 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 to the output leads. 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 of the hipot test and the display will show:

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

Replacement Parts List Model 7510DT and 7512DT

Rev. F 01/13/2005 ECO 5040-7

Part Number	Qty.	Reference Designator	Description
Model 7510DT, 7512DT			
37908	1	AMP-150	Main Power Amplifier Board
37742	1	CKB-03	Keypad Board
37743	1	CSW-04	Input Protection Board
37980	1	RS232	RS232 Interface Board
37940	1	CPR-01	Printer Port Parallel
37804	1	-	LCD Display 22 x 2 Characters
38469	1	IC12	IC Microcontroller 8-bit 89516, 64kb flash embedded
37807	1	-	Reset Switch, Red
37806	1	-	Test Switch, Green
37605	1	Reset	Replacement Bulb 33V
37854	1	Test	Replacement Bulb 28V
37984	1	T1	Input Transformer with ground shield
37857	1	-	Fuse 5.0A 250V Slow Blow 20mm
37781	1	-	Fuse Holder 20mm
37571	1	-	Earth Connector
37800	2	-	3U Rack Mount Bracket
37801	2	-	3U Rack Mount Handle
38101	1		Feet Kit w/o Rubber Inserts
38102	4		Rubber Insert
33189	1	-	Input Power Cable 10A/7Ft.
37478	2	-	High Voltage Connector
04040A-08	1	-	High Voltage Output Cable
35999	2	-	Black Banana Jacks
02100A-13	1	-	Return Cable
38069	1	-	Power Switch 2P 15A
Model 7510DT only			
38123	1	7440	Main Control Board ASSY B
38183	1	CHV-08	HV Control Board ASSY B
37985	1	T2	Output High Voltage Transformer 7510DT
Model 7512DT only			
38205	1	7440	Main Control Board ASSY D
38206	1	CHV-08	HV Control Board ASSY A
37986	1	T2	Output High Voltage Transformer 7512DT

SCHEMATIC INDEX

Drawing Number	Description	Reference Designator	Pages
S07510DT	Wiring Diagram 7510DT and 7512DT	-	1
S38123	Main Control Board	7440	4
S37990	HV Control Board	CHV-08	1
S37908	Main Power Amplifier Board	AMP-150	1
S37742	Keypad Board	CKB-03	1
S37743	Input Protection Board	CSW-04	1
S37744	Display LED Board	DSP-06	1
S37814	RS232 Interface Board	RS232	1
S37940	Printer Port Card	CRP-01	1