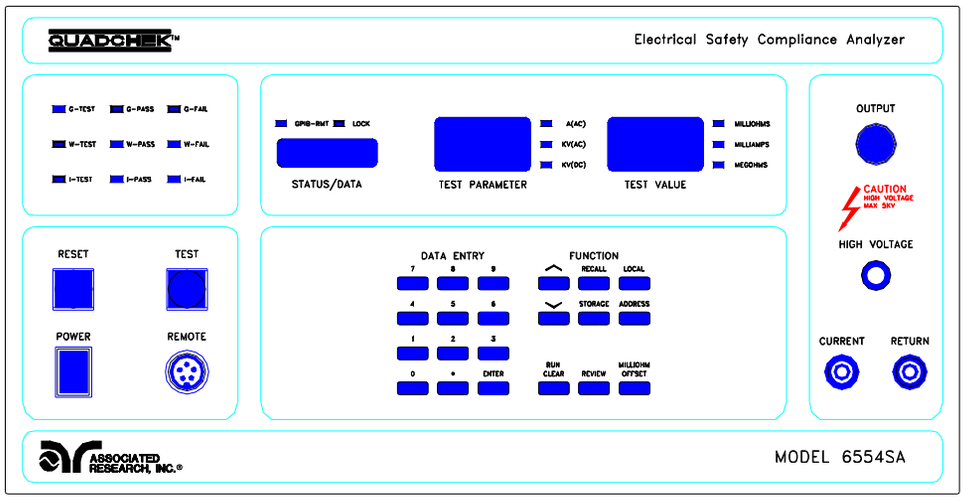
ASSOCIATED RESEARCH, INC.

OPERATION AND SERVICE MANUAL

MODEL 6554SA



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Item # 37484

5 YEAR WARRANTY POLICY

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 return the "Owners Registration Card" provided within (15) days from receipt of your instrument.

AR recommends that your instrument be calibrated on a twelve month cycle. This instrument may have its warranty extended in one year increments to a maximum of **(5) years** provided it is returned to AR at least **annually** for calibration and inspection. The annual calibration and inspection must be performed annually each and 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 goods authorization (RGA) 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 RGA number. It is important that the instrument is packed in its original contained 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 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.

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 by-passing 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.

OPERATION AND SERVICE MANUAL

MODEL 6554SA QUADCHEK™

Electrical Safety Compliance Analyzer

AC/DC HIPOT WITH INSULATION RESISTANCE TESTER, GROUND BOND TESTER AND IEEE-488 (GPIB) INTERFACE

SERIAL NUMBER

905 Carriage Park Avenue, Lake Bluff, Illinois, 60044-2248 U.S.A.

Item # 37484

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SECTION 1
OPERATORS MANUAL

SAFETY PRECATIONS 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. Refer servicing to an Associated Research, Inc. authorized service center. Schematics, when provided, are for reference only.

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 lead 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.

On Models 6550DT and 6554SA the return side 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), 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 and VDE are two 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, 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 6554SA provides up to 30 amps output current at any voltage between 5 and 12 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 6554SA 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 6554SA Functional Specifications

DIELECTRIC WITHSTAND TEST MODE

INPUT	115 VAC (±15%), 47-63 Hz, Single Phase 230 VAC (±15%), 47-63 Hz, Single Phase User Selectable
FUSE	115 VAC - 10 Amp, 230 VAC - 5 Amp
OUTPUT RATING	5kV @ 40 mAAC & 40mADC
OUTPUT ADJUSTMENT	0 - 5kV (AC & DC), 10 volt/step
HIGH TRIP RANGE	0.1 - 40.0mA AC & DC Accuracy ± (2% of setting + 0.02 mA)
LOW TRIP RANGE	0.0 - 39.9mA AC & DC Accuracy ± (2% of setting + 0.02 mA)
FAILURE DETECTOR	Audible & Visual
VOLTAGE DISPLAY	0.00 to 5.00kV Full Scale, LED Display Accuracy - Reading ± (2% of reading + 1 count) Setting ± (2% of setting + 5 volts)
CURRENT DISPLAY	0.05 to 9.99mA, 10.0 to 40.0mA, LED Display Accuracy -Reading ± (2% of reading + 0.02mA)
DC OUTPUT RIPPLE	≤ 4% ripple RMS (5kVDC, 40mA)
AC OUTPUT WAVE FORM	Sine wave, Distortion ≤ 1%
AC OUTPUT FREQUENCY	50 or 60Hz ± 100 PPM, User Selectable
OUTPUT REGULATION	1% of setting from no load to full load
DWELL TIMER	1 - 999 seconds in 1 second increments or continuous. Accuracy ± 0.1 seconds
RAMP TIMER	0 - 99 seconds in 1 second increments. Accuracy ± 0.1 seconds

Model 6554SA Functional Specifications Cont'd

INSULATION RESISTANCE TEST MODE

OUTPUT VOLTAGE RANGE	500 - 1000 Volts, 1 volt/step
VOLTAGE METERING	3 Digits, 0.00 - 1.00kV Accuracy - ± (2% of reading + 1 count)
RESISTANCE METERING	3 Digits, 9.99GΩ Full Scale Accuracy (500 - 1000VDC) 0.00 MΩ - 1.99 GΩ ± (3% of reading +.3 MΩ) 2.00 GΩ - 9.99 GΩ ± 15% of reading
LIMIT RANGES	HI-Limit range = 0 - 9999MΩ LO-Limit range = 0 - 9999MΩ
DWELL TIMER	1 - 999 seconds in 1 second increments Accuracy ± 0.1 seconds

GROUND BOND TEST MODE

OUTPUT VOLTAGE	Adjustable (5.0 to 12.0 volts AC, 0.1 volt/step) Setting Accuracy - ± (1% of setting + 0.1 volt)
OUTPUT FREQUENCY	50 or 60Hz, User Selectable
OUTPUT CURRENT	Adjustable (10.0 to 31.0 amps, 0.1 amp/step)
CURRENT DISPLAY	3 digits, 31.0A Full Scale, LED Display Accuracy - ± (1% of reading + 1 count)
RESISTANCE DISPLAY	3 digits, 600mΩ Full Scale, LED Display Accuracy - ± (1% of reading + 1 count) Auto Offset function to disregard lead resistance
TRIP RANGE	0 - 600mΩ @ 15 amps or less 0 - 200mΩ @ 15 - 31 amps
DWELL TIMER	1 - 999 seconds in 1 second increments or continuous. Accuracy ± 0.1 seconds

Model 6554SA Functional Specifications Cont'd

GENERAL SPECIFICATIONS

INTERFACE CAPABILITY	1.	GPIB (IEEE 488) Control of all parameters(AC & DC test voltages, HI & LO trip current, 50/60 Hz mode, Dwell Timer, Ramp time, HI & LO Resistance trip, Storage & Recall of memorized setups, Test & Reset, Ground Bond current, Ground Bond resistance, Ground Bond voltage, Arc on/off,Milliohm Offset.
	2.	Basic Remote control:Inputs -Test, Reset, Memory FunctionsOutputs -Pass, Fail, Remote Alarm, Test-in-Process
	3.	Special port for connection to optional Scanning system to test up to 8 items simultaneously.
MEMORY		Allows storage of up to 15 different test programs.
TEST SET-UP DISPLAY		A separate LED displays the test set-up parameters.
REVIEW		All readings in all modes can be reviewed after the test to monitor test results.
SECURITY		Password lockout capability to avoid unauthorized access to test set-up program.
LINE CORD		Detachable 7 ft. (2.13m) power cable terminated in a three prong grounding plug.

Model 6554SA Functional Specifications Cont'd

TERMINATION'S	5 ft. (1.52m) high voltage, return and current output leads with clips.
MECHANICAL	Bench or rack mount with tilt up front feet Dimensions (w x h x d) (17 x 8.75 x 20in) (432 x 222 x 508mm) Weight 70 lbs (31.75kg) net
ENVIRONMENTAL	Operating Temperature - 32° - 113°F (0° - 45°C) Relative Humidity - 0 to 95%
CALIBRATION	Traceable to National Institute of Standards and Technology (NIST). Calibration controlled by software. Adjustments are made through front panel keypad in a restricted access calibration mode. Calibration information stored in non-volatile memory.

KEY FEATURES & BENEFITS SUMMARY COVERING MODEL 6554SA

1. The **only** complete 4 in 1 system that includes an AC hipot, DC hipot, Insulation Resistance Tester, Ground Bond Tester and IEEE interface in a single rack mount style cabinet.
   This allows the user to perform most of the electrical safety tests required by agencies such as UL, CSA, IEC, VDE and others with a single instrument which takes up less rack space and makes the connections much simpler.

2. Full IEEE programmability comes as a standard feature in the 6554SA.
   All functions of the instrument can be programmed over the IEEE bus which makes the instrument adaptable to an automated system which can control the instrument and retrieve all test results.

3. Up to 40mA of current available in the AC and DC hipot modes.
   This makes this instrument a true hipot tester with enough output current to test even highly capacitive loads.

4. All parameters for the setups can be adjusted through a simple menu driven program by using a front panel keypad .
   This provides the operator with an easy and safe way to set trip currents and output voltages since all parameters are set without the high voltage activated. The easy to follow menu makes sure that the operator properly sets up each test mode.

5. Front panel LED's display test parameters and results.
   3 e*asy to view front panel LED's allows the operator to monitor the test. A review mode allows the operator to quickly check the test results of each mode after the test has been completed.*

6. Electronic ramp and dwell settings.
   This electronic ramp control helps keep test results consistent as well as reduce damage to sensitive products by providing a method to gradually bring up the test voltage and eliminate any high voltage spikes. The dwell timer also has a count down feature so the operator can clearly see how much time is left on the test.

7. Hi and Low limits on both the hipot and insulation test modes.
   This capability makes it possible to ensure that a test item was properly connected since the 6554SA can be set to look for minimum and maximum levels of current and resistance during the hipot and insulation resistance tests.

8. Line and load regulation.
   This system maintains the setting of the output voltage to within 1% even if the load or the line voltage vary to ensure that test results remain consistent and within safety agency requirements..

9. Built in basic remote control.
   This makes the 6554SA versatile enough to allow for remote control operation of the test even when it is not used in the IEEE interface mode.

10. Storage of up to 15 different test programs.
    A real benefit for manufacturers that test different products. This makes it possible to store all the various test parameters required and quickly recall them for each of the different products that needs to be tested. Each program can store all the parameters of either the hipot or the insulation resistance test so you can quickly switch between different types of tests. Program memories can also be accessed through the remote control port so that a manufacturer can quickly toggle through the various programs without even going into the set up menu.

11. Security password system.
    This makes it possible to limit user access to the setup screens so that only authorized personnel with a security password can change test parameters. This ensures that the required test parameters can not be tampered with.

12. Optional scanning system available for use with the model 6554SA.
    The optional scanning system can cycle through up to 8 high voltage tests and 4 ground bond tests to help manufacturers increase throughput in the final test area.

13. Software calibration control.
    The 6554SA is calibrated through the front panel keypad. All calibration information is stored in non-volatile memory. This allows the 6554SA to be completely calibrated without removing any covers and exposing the technician to hazardous voltages.

14. User activated arc detection system.
    Many tests require the monitoring of arcing levels even if they do not exceed the maximum trip current level. The 6554SA allows the operator to select whether low level arcs should be detected which makes this instrument flexible enough to test any product.

15. User selectable output voltage frequencies of 50 or 60 hertz.
    The 6554SA was designed for the global market. This feature makes it simple for the user to select the output frequency on the AC hipot test and the Ground Bond test so that products can be tested at the same frequency they will be used at.

16. The LED display allows monitoring of current down to 10 microamps.
    Many tests only allow a very low level of acceptable leakage current. The 6554SA has the reading resolution to monitor and set trip points at these low levels.

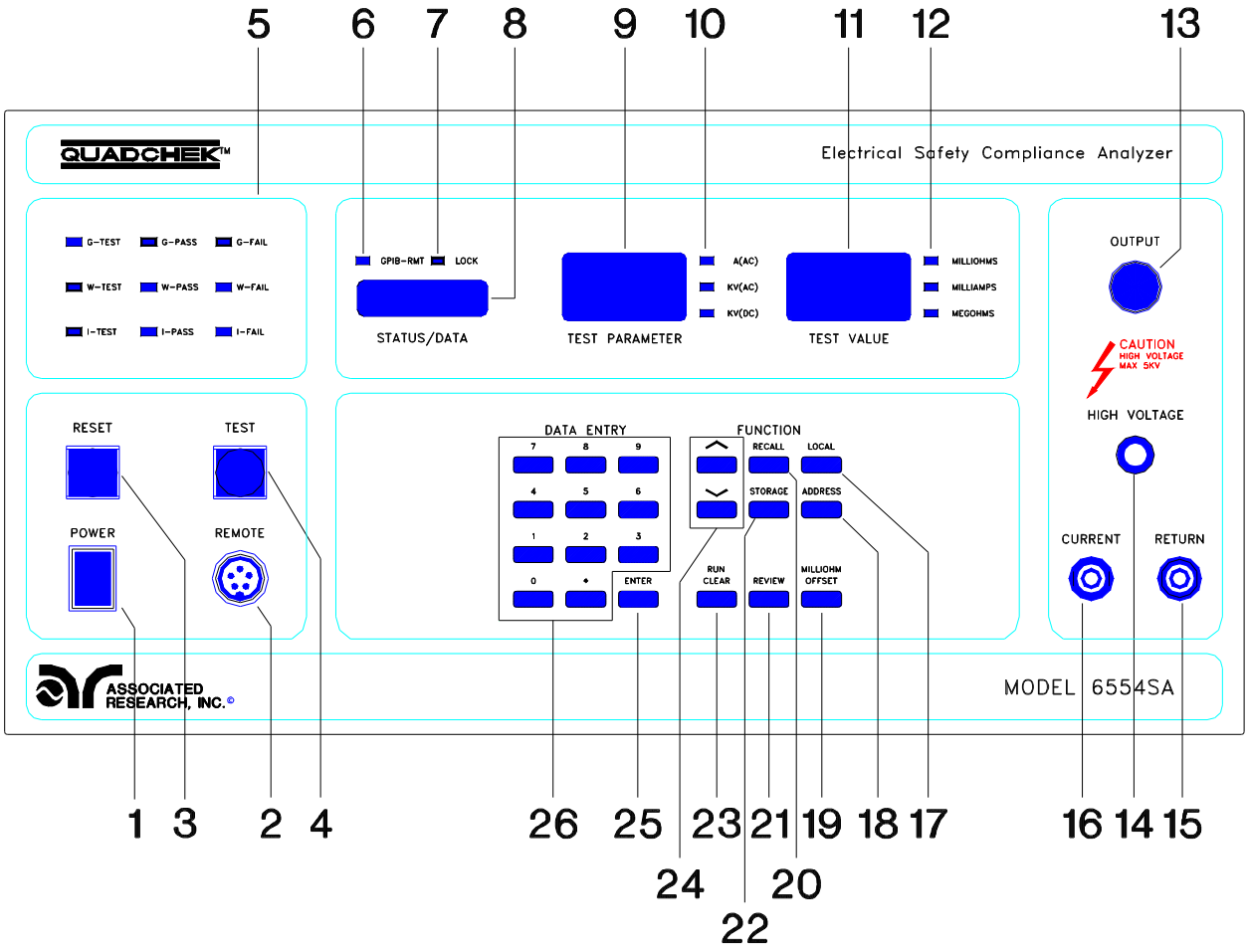
17. Output voltage fine adjustment.
    To make the 6554SA usable in all types of applications, a feature was added to allow the operator to manually bring the voltage up or down in 10 volt increments by simply pressing the up and down arrow keys. This makes it very easy to adjust the output voltage even while the 6554SA is in the dwell mode so you can analyze test results at different voltages.

18. Heavy duty color coded switches.
    The 6554SA uses the same rugged switches that AR has used on other models of hipots for over 10 years which have proven to withstand even the roughest manufacturing environment. The switches are also color coded so that the operator can quickly distinguish between the TEST and RESET switch at a glance.

19. Milliohm offset capability in the Ground Bond mode.
    The 6554SA includes an offset function so that the resistance of the test leads can be easily eliminated from the test results during a Ground Bond test. This system allows the use of longer test leads and test fixtures without compromising the test results.

20. Adjustable output current, output voltage and trip current on the Ground Bond test mode.
    This capability makes the 6554SA versatile enough to meet various safety agency specifications for the ground bond test requirements.

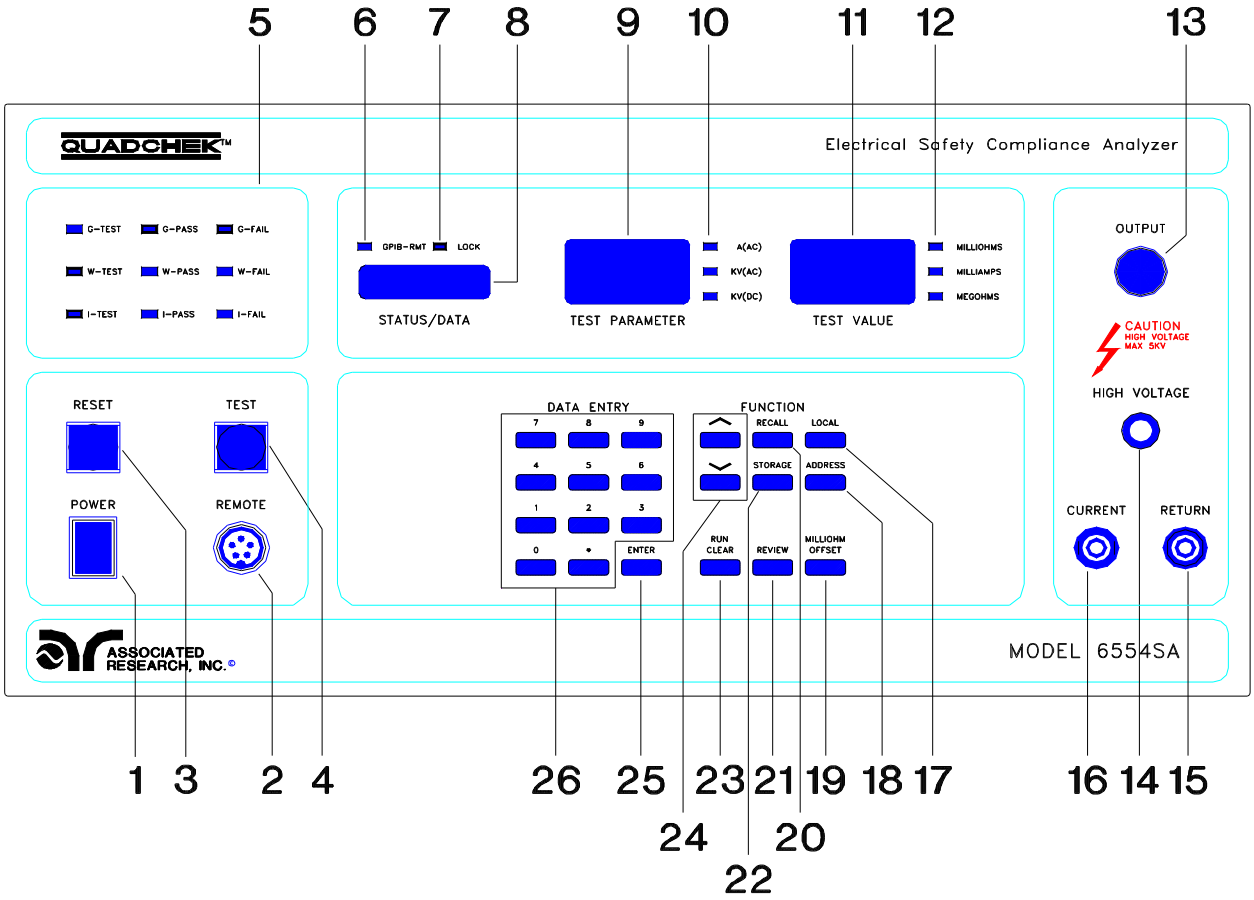
FRONT PANEL CONTROLS



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

2. REMOTE CONNECTOR: The remote interface provides a convenient way to connect the instrument to a remote system for limited remote control capability. See page 42 for a complete description of the remote interface connector signals and guidelines for connection to a test system.

3. RESET SWITCH: This is a momentary contact switch. If an out-of-range leakage current condition, an arc breakdown, a Hi-limit or LO-Limit failure or ground bond failure occur you will need to reset the system before you can proceed to the next test. Press and release the red Reset switch. See PASS/FAIL LED PANEL #5.



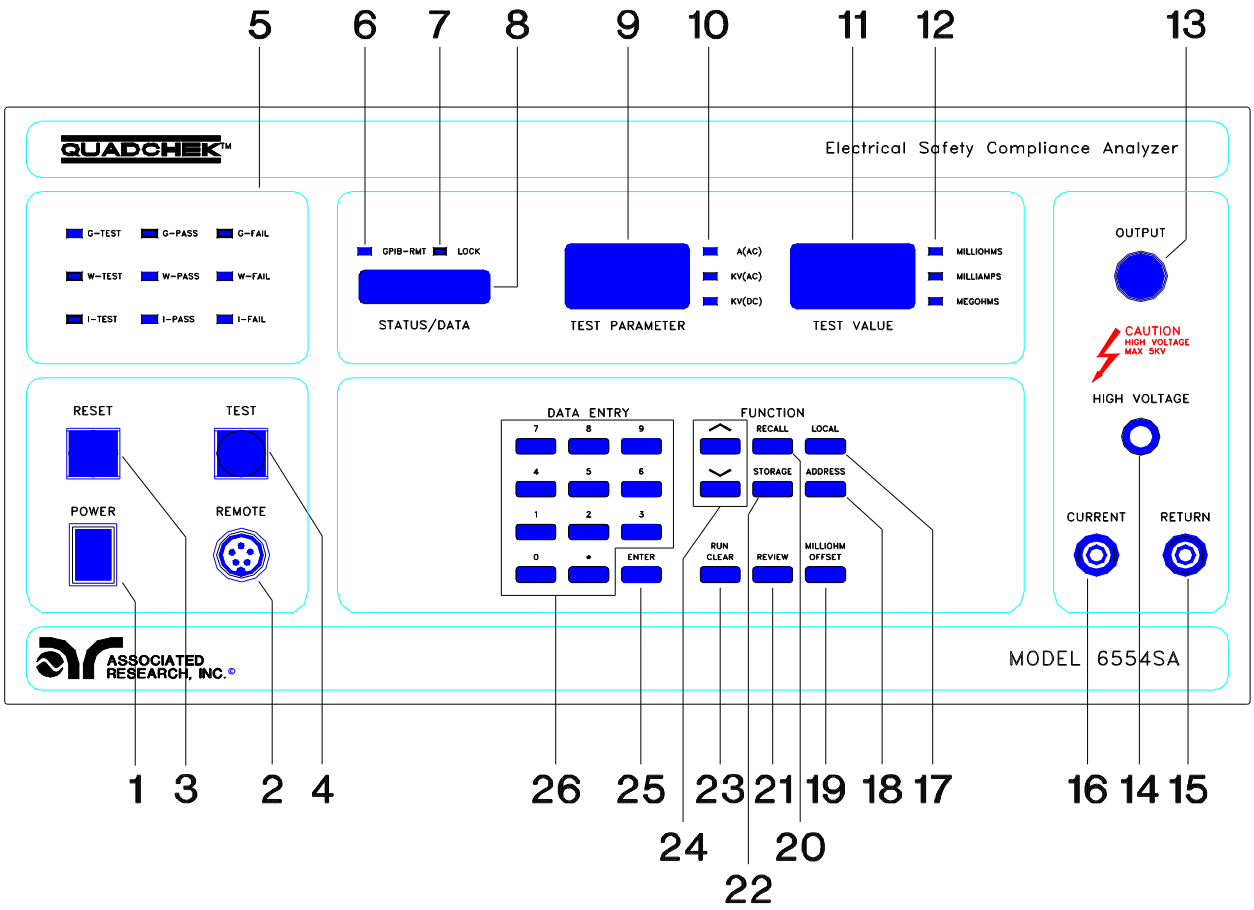
4. TEST SWITCH: This is a momentary contact switch. Press the blue switch to turn on the high voltage output.

5. PASS|FAIL LED PANEL: This panel gives an indication of which mode; G-Ground Bond, W-Withstand Voltage , or R-Resistance mode you are in . In addition it shows via a “RED” led a failure for each mode or a “PASS” for each mode.

6. GPIB REMOTE LED: This indicator will light when the 6554SA is in the "Remote" connection vs. the "local" connection. When the GPIB Remote is on the 6554SA is able to send and receive signals across the GPIB IEEE-488 bus.

7. KEY LOCKOUT LED: When the Key Lockout light 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.

8. STATUS\DATA LED WINDOW: Test abbreviations as well as “DATA” that you enter in the instrument via the numeric keypad are displayed here. See page 30 for a complete list of abbreviations.



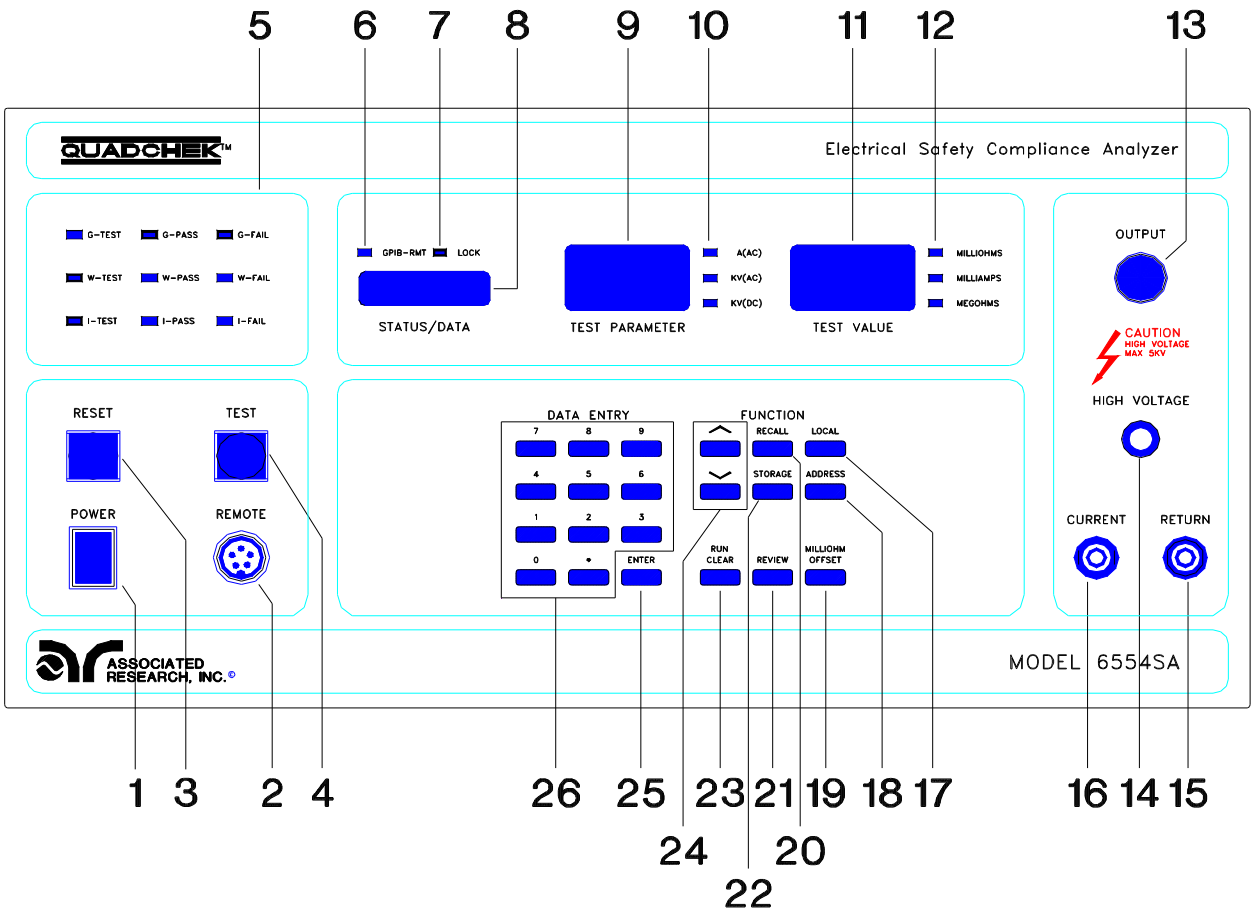
9. **TEST PARAMETER LED WINDOW:** This is a numeric display of test parameters or results for ac current, ac voltage or dc voltage.

10. **TEST PARAMETER LED'S:** There are three led's to the right of the "TEST PARAMETER" window. Depending on the mode you are in an led will light up for ac current, ac voltage or dc voltage.

11. **TEST VALUE LED DISPLAY WINDOW:** An led numeric display of the test values are displayed here. These numeric display will vary depending upon which of the three test modes you are in; milliohms, milliamps, or megohms.

12. **TEST VALUE LED'S:** There are three led's to the right of the "TEST VALUE" window. Depending on the mode you are in an led will light up for Milliohms, Milliamps, or Megohms.

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



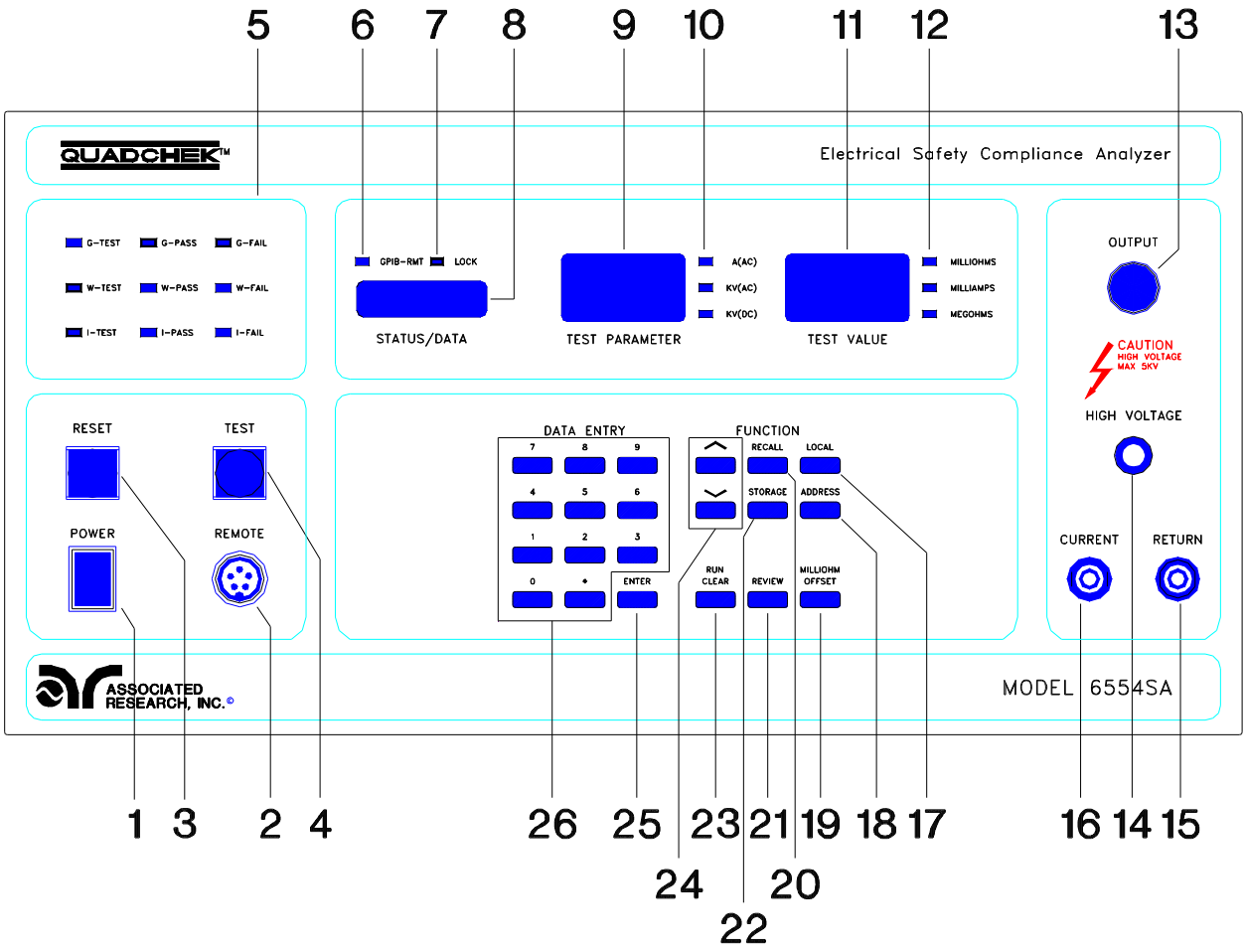
14. HIGH VOLTAGE OUTPUT JACK: For the connection of the detachable 5 foot (1.52 m) high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

15. 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.

16. CURRENT OUTPUT JACK: For the connection of the detachable 5 foot (1.52 m) current output lead used for the ground bond test. This lead is only used for the ground bond test.

17. LOCAL: (FUNCTION KEY) Use this key when you wish to go from the Remote operation of the instrument to the Local mode.

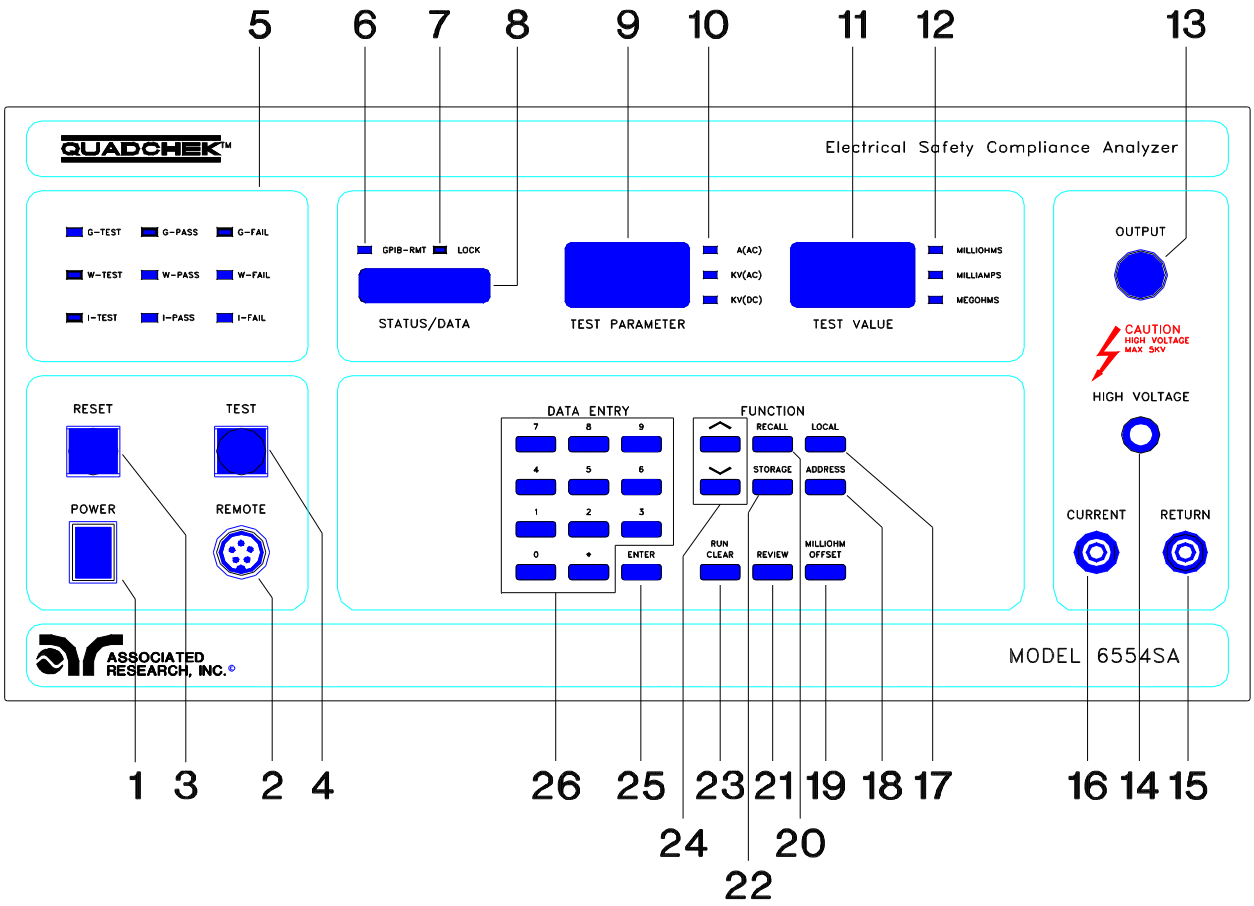
18. ADDRESS: (FUNCTION KEY) Use this key when you desire to change the address location for your GPIB (IEEE-488) remote control activities, or if you wish to set the instrument into lockout mode using a special code number see 32.



19. MILLIOHM OFFSET: This key is used when performing a ground bond test. It offsets the resistance of the test leads and fixtures to more accurately read the true resistance during the ground bond test. The operator must first connect the test connections together at the point they contact the DUT. Pressing the Milliohm Offset button will calibrate the 6554SA to disregard connection resistance from all further tests. Re-setting the 6554SA to disregard only it's test lead resistance can be done by connecting the leads together and pressing the Milliohm Offset key again.

20. RECALL: (FUNCTION KEY) Depress this key when you wish to recall from memory a previously stored test setup. You then simply select the memory number you wish to recall and press enter.

21. REVIEW: Use this key to review the results of a test after it has been performed or to review the test set-up parameters you have set and which memory number you are in.



22. STORAGE: (FUNCTION KEY**)** Depress this key when in the memory function to store a test program setup. Adjust or enter test parameters then press "RUN/CLEAR" key then press "STORAGE" and select a memory (1-15) then press "ENTER" key.

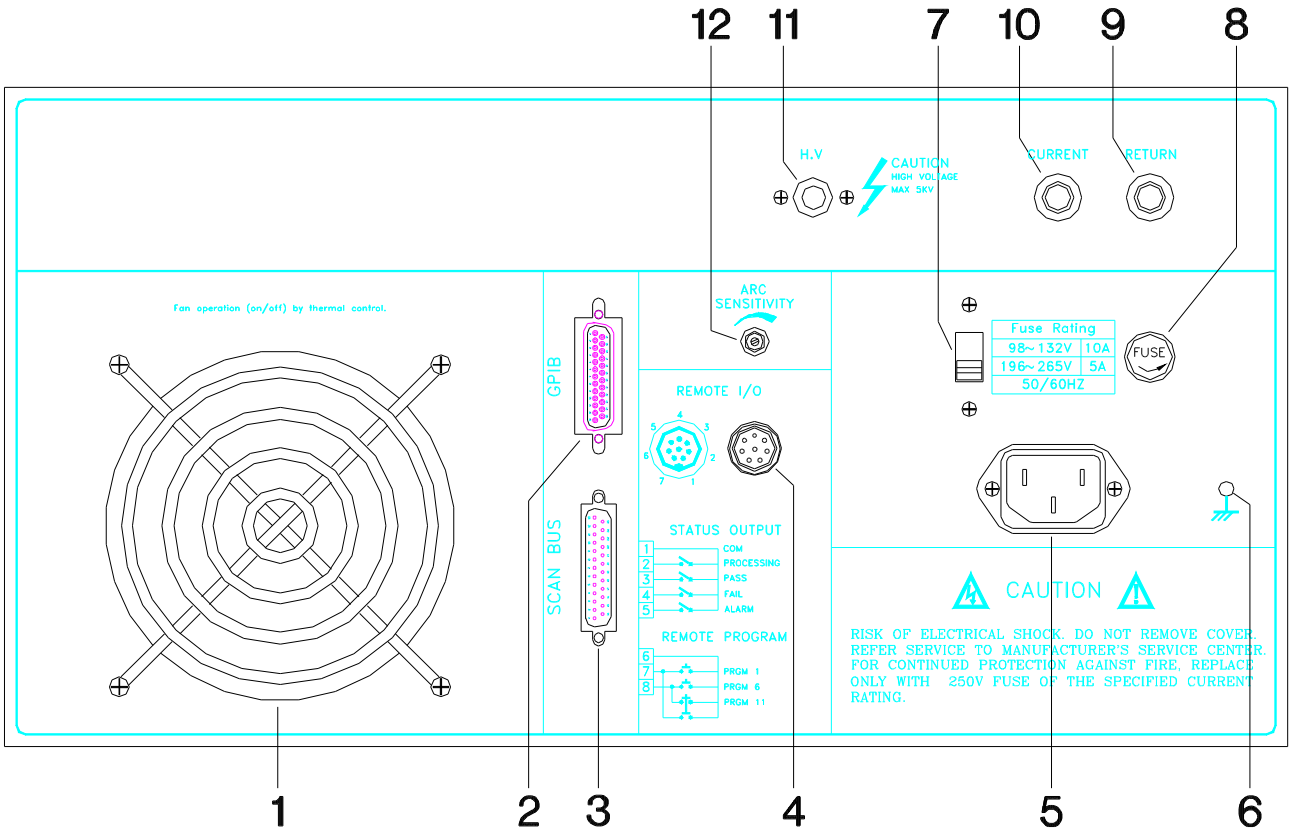
23. RUN/CLEAR (FUNCTION KEY): Use this key when you desire to enter the Run Mode to initiate a test or use this key when you enter numeric data during a setup routine and you wish to clear the information.

24. UP ARROW ↑: (FUNCTION KEY) Use this key to advance through the setup screens. **DOWN ARROW ↓**: (FUNCTION KEY) Use this key to advance through the setup screens.

25. KEYPAD-ENTER: Use the enter button after entering new data through the keypad to save it or to advance the program to its next routine. Enter will also toggle between certain selections.

26. DATA ENTRY NUMERIC KEYPAD: For numeric entry or change of testing parameters during the "setup" mode. Keypad entry is unavailable if the Key Lockout indicator on the front panel is on.

REAR PANEL CONTROLS



1). THERMAL COOLING FAN: Automatically cycles on\off.

2). IEEE-488 (GPIB) CONNECTOR: See page 46.

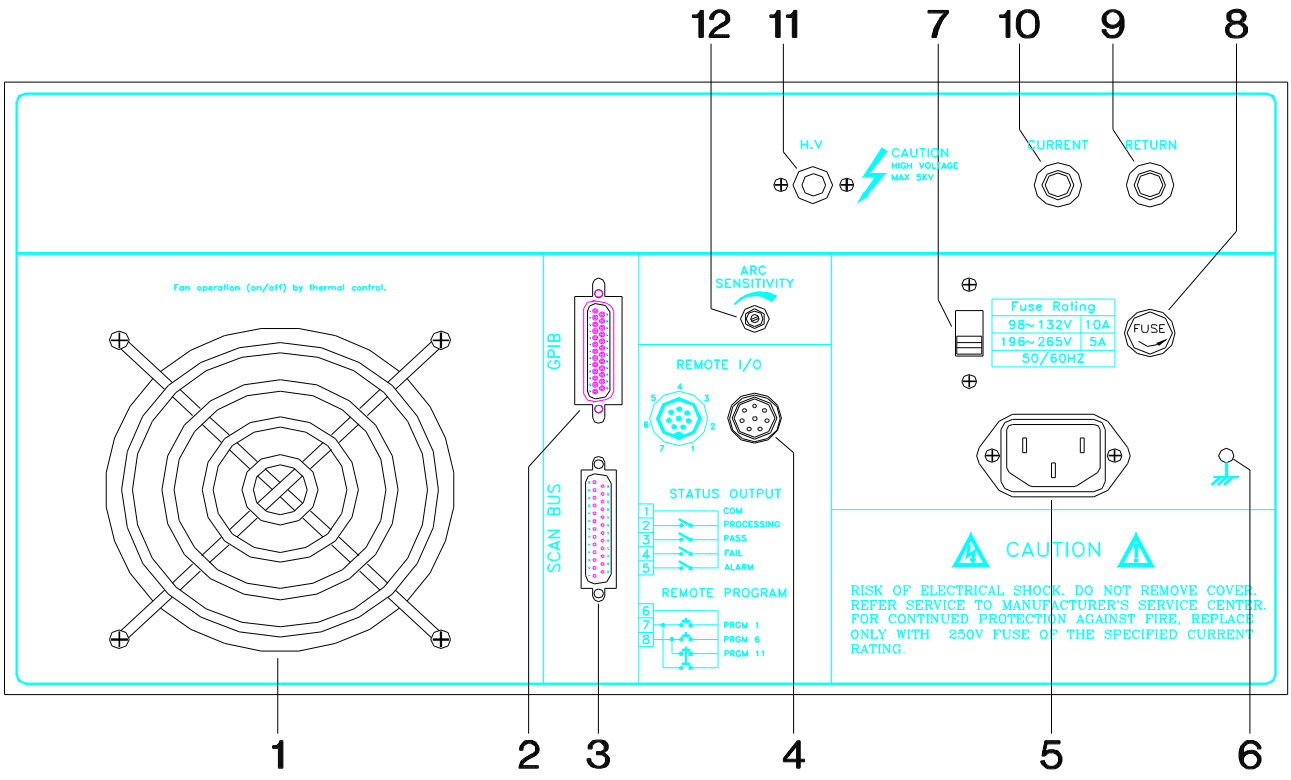
3). SCAN BUS CONNECTOR: For connection of optional 8 channel Scanning Bus Matrix.

4). REMOTE I/O: See page 42.

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

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

7). 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.



8). 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.

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). CURRENT OUTPUT JACK: For the connection of the detachable 5 foot (1.52 m) current output lead used for the ground bond test. This lead is only used for the ground bond test.

11). 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.

12). ARC SENSITIVITY ADJUSTMENT: When the arc detection in the setup menu is on, this adjustment will increase or decrease its sensitivity to an arcing condition. See page 40.

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 RGA (return goods authorization) number.

Preparation for Use

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 26 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 Volts AC use a 10A fast-blow fuse.
For operation at 230 Volts AC use a 5A fast-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 RGA (return goods 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.

ABBREVIATIONS:

The following abbreviations are used in the "STATUS/DATA" window..

Abbreviation	Description	Parameters	Defaults
G	**Ground Bond Test Selection**	ON/OFF	ON
GVS	GBT output voltage selection	5.0 - 12.0V 0.1V/STEPS	6 VOLTS
GAS	GBT output current selection	10.0 - 31.0A 0.1A/STEPS	25 AMPS
GRS	GBT resistance selection	0 - 600mΩ 1mΩ/STEPS	100 mΩ
GTS	GBT test timer selection	0 - 999 SEC 1SEC/STEPS	1 SECOND
GHZ	GBT frequency selection	50/60 Hz	60 Hz
GCH	Scanning Unit G- Test Channels	1-4	0
W	**Withstand Test Selection**	ON/OFF	ON
WVS	WT output voltage selection	0 - 5000V 10V/STEPS	1240 VOLTS
WHA	WT high current trip point selection	0.0 - 40.0mA 0.1mA/STEPS	10mA
WLA	WT low current trip point selection	0.0 - 39.9mA 0.1mA/STEPS	0
WTS	WT dwell timer selection	0 - 999 SEC 1SEC/STEPS	1 SECOND
WRT	WT ramp time selection	0 - 99 SEC 1SEC/STEPS	1 SECOND
WMD	WT output voltage mode	AC/DC	AC
WHZ	WT output voltage frequency	50/60hZ	60 Hz
ARC	WT arc detection selection	ON/OFF	ON
WCH	Scanning Unit W-Test Channels	High, Low, Off	00000000
R	**Insulation Resistance Test**	ON/OFF	OFF
RVS	IR test output voltage	200 - 1000V 1V/STEPS	-
RHR	IR test high trip point selection	0 - 9999 MΩ 1 MΩ/STEPS	-
RLR	IR test low trip point selection	0 - 9999 MΩ 1 MΩ/STEPS	-
RTS	IR test dwell time selection	0 - 999 SEC 1SEC/STEPS	-
RCH	Scanning Unit R-Test Channels	High, Low, Off	00000000
CON	To connect memories 1-15 in sequence for multiple tests	ON/OFF	OFF

All entries above that require a numeric value use the "NUMERIC KEYPAD" for entry and then the "ENTER" key.

Other entries with only two choices such as AC or DC mode or 50 and 60Hz use the "ENTER" key to toggle between choices and the ↓down arrow key to advance or "RUN/CLEAR" key to return to the Run Mode.

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 are as follows:

DEFAULTS

Withstand Test:

- **Input Voltage:** 115 volts AC (rear panel switch selectable)
- **Communications:** local (front panel key selectable)
- **Mode:** set-up
- **Voltage Output:** 1,240 volts AC
- **Voltage Type:** AC
- **Ramp Time:** 1 second
- **Dwell Timer:** 1 second
- **Arc detector:** on
- **Current Trip:** High Trip: 10 mA
LO Trip: off
- **AC Output Frequency:** 60Hz
- **Withstand Test Scanner:** all off (00000000)

Insulation Resistance Test:

- **Insulation Resistance Test:** off
- **Insulation Resistance Scanner:** all off (00000000)

Ground Bond Test:

- **Ground Bond Test:** on

- **Ground Bond Test Current:** 25 amps
- **Ground Bond Test Timer:** 1 second
- **Ground Bond Test Frequency:** 60 Hz
- **Ground Bond Test output voltage:** 6 volts
- **Ground Bond Test resistance:** 100 mΩ
- **Ground Bond Scanner:** off (0)
- **CONNECT:** off

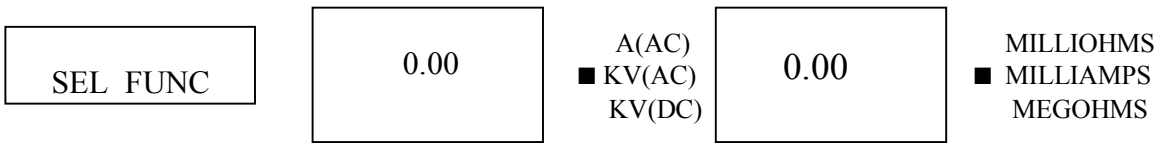
Quick Start Instructions Con't:

a). Unpack the QuadChek Model 6554SA 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 SECTION I. Locate a three prong grounded outlet. Be sure the outlet has been tested for proper wiring before connecting the Model 6554SA 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 up a POWER ON SELF TEST (POST) will be automatically be performed. This test will check for the condition of the led indicators. All of the front panel led's will light temporarily then go out. In addition you will see the Associated Research name, ARI appear in the "STATUS/DATA" window and the main LED'S will return to a ready state 0.00 as depicted below.



If you wish to not use any one of these parameters you must overwrite the memory1 position or change your parameters and save them in a different memory such as memory position 2. For detailed instructions on setting up testing parameters and saving them to memory refer to the OPERATION section "Types of Tests".

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).

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 BLUE 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 indicator located in the upper right side of the front panel will glow and remain ON until the HIGH VOLTAGE is 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 condition results on the LED display that will remain until the next test is initiated. Depressing the reset button will not prepare the instrument for the next test but will not clear the meter memory until the next test is started.

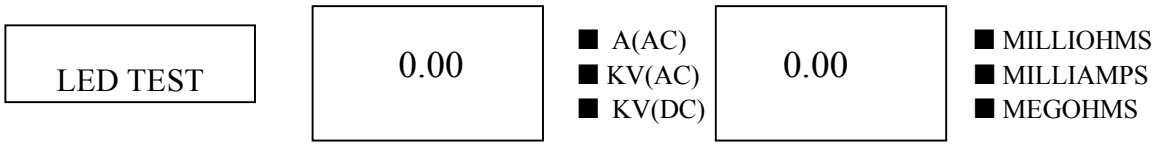
MAIN MENU SELECTIONS

When you need to access the program set-up mode you must be sure that the "lockout" LED on the front panel is not lit. If it is lit you must first take the instrument out of "lockout" before beginning to change or enter new test set-up information. To exit or enter "lockout" mode see the instructions for the "lockout" on page 40.

The keys that are used when navigating around in the setup mode are ↑ up arrow moves you BACKWARD by one selection or ↓ down arrow moves you FORWARD by one selection. An over-range condition will be displayed on any "numeric" selection as an **"ERROR" in the "STATUS/DATA" LED display area.** The instrument will then revert back to the previously saved value. Another condition is "OFL". This occurs during an actual test a stands for OUTSIDE FULL LIMIT. This means the measured value was outside the full limit of the instruments range.

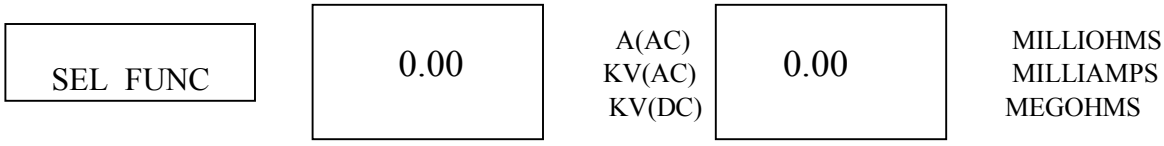
1). **INITIAL POWER ON STATE:**

■ G-TEST	■ G-PASS	■ G-FAIL
■ W-TEST	■ W-PASS	■ W-FAIL
■ R-TEST	■ R-PASS	■ R-FAIL



2). **READY FOR TEST STATE:**

G-TEST	G-PASS	G-FAIL
W-TEST	W-PASS	W-FAIL
R-TEST	R-PASS	R-FAIL



PASS/FAIL LED INDICATION PANEL:

The pass\fail indication panel will display the test mode you are currently in such as ground bond, withstand or insulation resistance. It will also display the status of your test whether you have a "PASS" condition or a "fail" condition. This LED sequence changes automatically when you select one or more tests to be sequenced.

TYPE OF TEST	PASS INDICATION	FAIL INDICATION	TEST DESC.
G-TEST	G-PASS	G-FAIL	GROUND BOND
W-TEST	W-PASS	W-FAIL	WITHSTAND
R-TEST	R-PASS	R-FAIL	RESISTANCE

TYPES OF TESTS:

A). Perform a test using the "DEFAULTS". **NOTE:** Your instrument will always return to the last test used upon power up.

B). Enter a NEW TEST or CHANGE an existing test.

C). Recall an existing test to use.

A). Perform a test using the "DEFAULTS".

If the instrument defaults that are setup in "memory 1" are correct for your testing situation you may then proceed right to performing your test. After the proper connection to the DUT (device under test) you simply power on the instrument until it comes into the "ready for test state" as shown on the previous page. Then depress the blue "TEST" button. Your test (s) will the automatically be performed. If you wish to review the "DEFAULT" test parameters before initiating your test you can review the defaults as listed on page 31, or do the following.;

How to Review Test Parameters:

From the "ready to Test State" depicted above press the ↓ down arrow key. This will move you through each of the test parameters that you can accept or change. Some entries require a numeric value to be keyed into the instrument, others require you to toggle the "ENTER" key. For a complete list of possible entries and their values see page 30.

In addition some menus will turn off if the test is not chosen in the setup routine. For example: Upon entering the setup mode you have a choice of performing an G test (ground bond) and W test (withstand) or an R test (insulation resistance). If R=OFF in the "STATUS/DATA" window you will not see the parameters of this test menu. To see them the Insulation Resistance Test must be set to on, R=ON. You can change this parameter by using the "ENTER" key to toggle between ON/OFF.

After you have reviewed the test parameters of the "MEMORY 1" position you can then press "RUN/CLEAR" key and perform your test.

B). To enter a NEW test.

You may elect to leave the defaults as they are and stored in memory position 1, or you may change memory 1 parameters or any other memory position 1-15. To enter a new test sequence do the following;

1). Press the recall and enter the memory position for the memory you wish to review, change or enter. Use the numeric keypad and enter the memory position 1-15. Press the "ENTER" key. You will then be returned to the normal test ready state.
2). Use the ↓ down arrow and review the parameters you wish to change. Make your changes using the numeric keypad entry for "numeric" values or the "ENTER" key for toggling a test ON/OFF.

3). After you have made all your changes press the "RUN/CLEAR" key to return to the ready state for your test. You should then see "SEL FUNC" in the "STATUS/DATA" LED window.

4). If you wish to keep this changed test or new test for reuse at a later time then you must store it in memory. If you only wish to use these parameters until power is shut off you may then bypass the storage and go right into your testing. To store the new parameters press the "STORAGE" key. You will then see displayed in the "STATUS/DATA" window STO= __. The number shown in place of the underline will be whatever stored program you are currently in. Please enter the number of the memory you wish to store this program under from the numeric keypad. Then press "ENTER" key. The test parameters you entered or changed will now be stored in the selected memory position for reuse at a later time.

C). Recalling an Existing Test to Use.

If you wish to use the test you just stored then you may proceed by simply pressing the "TEST" button. To recall and use a different test then press "RECALL". Enter the number for the test you desire using the numeric keypad. Press "ENTER" key. You will be returned to the Ready Test State. You are now ready to perform your test.

D). To connect test setups.

If you wish to link setups so that they execute in sequence you must activate the CONNECT mode within the setup you wish to connect to the next by using the enter key to toggle between off and on.

The REVIEW key:

The REVIEW key may be used after you have completed a test sequence. Here you can see the results of any "FAIL" or "PASS" condition. When you depress the "REVIEW" key each time it will move from :

R-REVIEW: review of the Insulation Resistance Test Results.

G-REVIEW: review of the Ground Bond Test Results.

W-REVIEW: review of the Withstand Voltage Test Results.

The TEST PARAMETER LED display and the TEST VALUE LED display will either show a value for the appropriate test or a - - - in the display if that particular test was not selected. In addition as you press the "REVIEW" key you will see the LED'S to the right of each display move to their appropriate settings. See examples below:

G-TEST	G-PASS	G-FAIL
W-TEST	W-PASS	W-FAIL
R-TEST	■ R-PASS	R-FAIL

This example depicts a “PASS” condition on a Insulation Resistance Test that is in the “REVIEW” mode. If this was the only test being performed than the G-TEST review display and the W-TEST review display would look as follows;

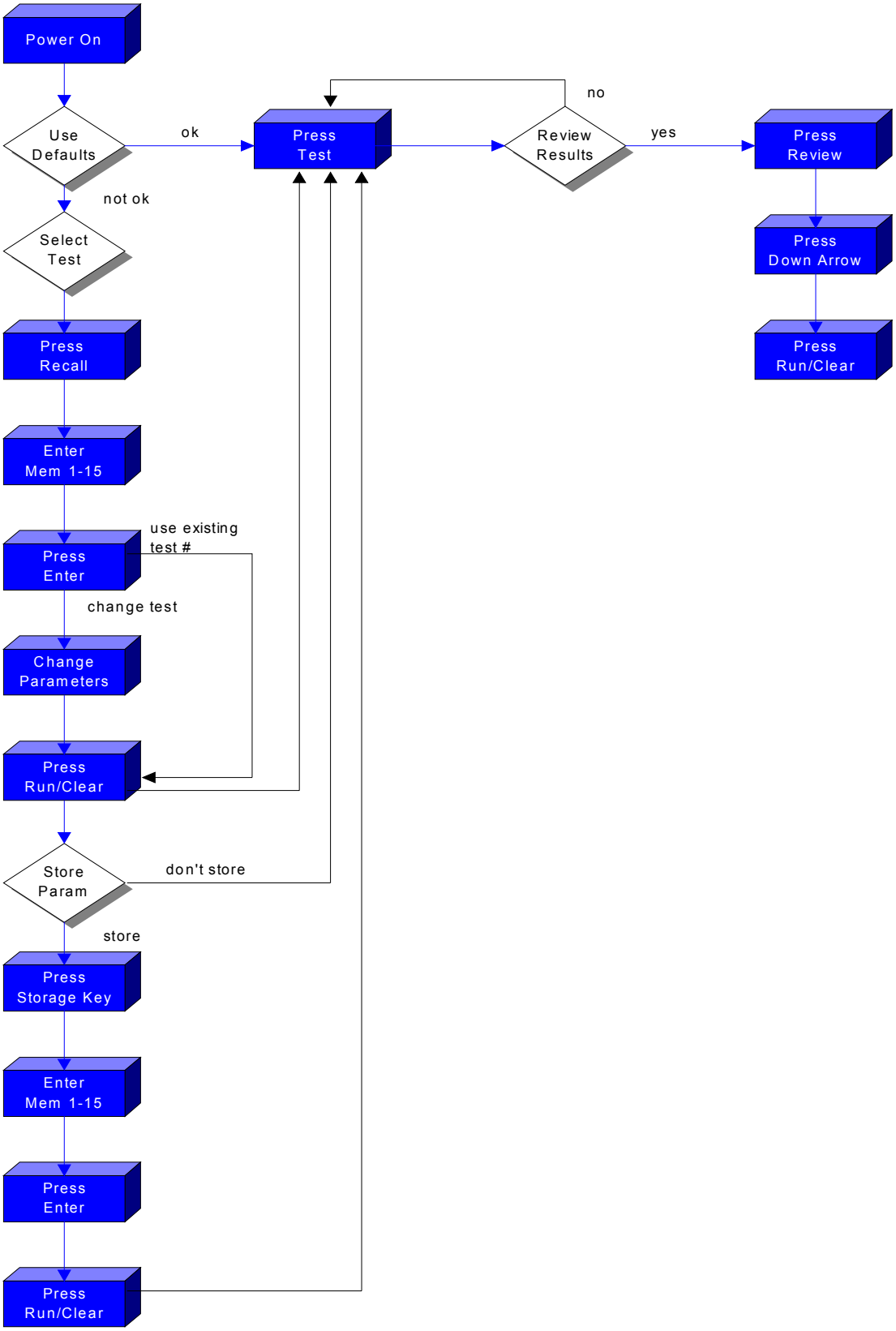
G-TEST	G-PASS	G-FAIL
W-TEST	W-PASS	W-FAIL
R-TEST	■ R-PASS	R-FAIL

G-REVIEW	– – –	A(AC) KV(AC) ■ KV(DC)	_ _ _	MILLIOHMS MILLIAMPS ■ MEGOHMS

G-TEST	G-PASS	G-FAIL
W-TEST	W-PASS	W-FAIL
R-TEST	■ R-PASS	R-FAIL

W-REVIEW	– – –	A(AC) KV(AC) ■ KV(DC)	_ _ _	MILLIOHMS MILLIAMPS ■ MEGOHMS

Flow Chart of QuadChek Menu Selections:



SETUP MODE LOCKOUT CODE

The Model 6554SA is supplied with a lockout code feature that is intended to prevent an unauthorized user from entering the **set-up mode.** The lockout is active when the front panel LED (# 7) is lit. To enter the "lockout mode" press the "address" front panel key # 18. Use the numeric keypad and enter the number **6473**. Then press front panel key # 25 "enter". This will turn on the keylock and also turn it off.

KEYS	ACTION REQUIRED
ADDRESS	Press **ADDRESS** key
6, 4, 7, 3	Press numeric keys 6,4,7, 3
ENTER↵	Press **ENTER**↵ key

CALIBRATION MODE LOCKOUT CODE

To enter the calibration mode you must hold down the 0 and the 1 on the numeric keypad at the same time while you power up the instrument. The screen will display "ARI" in the "STATUS/DATA" LED display area then will go through a front panel LED test. When completed you will see the normal "READY" state as depicted below. You are then in the calibration mode. No LED'S in the "PASS/FAIL" LED PANEL should be on. See the SERVICE section of this manual for detailed calibration information.

CAL. MODE	0.00	A(AC) KV(AC) KV(DC)	0.00	MILLIOHMS MILLIAMPS MEGOHMS

ARC SENSITIVITY ADJUSTMENT

The arc sensitivity control is located on the rear panel control # 11. The software allows you to turn the arc detection circuit on/off by toggling the "enter" key. You can, when the arc detector is set to "ON" also adjust its sensitivity. With the arc detector set to OFF you

will be able to draw arcing conditions as long as the current you draw is lower than the HIGH TRIP LEAKAGE setting in your setups. Example: Set the HIGH TRIP LEAKAGE to the maximum of the instrument, 40mA. You will then be able to (with the addition of a resistor value in series with the high voltage test lead) create an arcing condition without the instrument going into failure. You should determine the acceptable leakage values of your devices and then set the arc sensitivity to the proper threshold for a failure condition.

CONNECT PROGRAM

This instrument has the capability of linking memorized setups together so that they can automatically be performed in sequence. While configuring each setup the operator can elect to turn CONNECT "on" in the setup they are currently programming to have the instrument proceed after successful completion of the first test program and automatically run the next setup program. If CONNECT is left "off" the instrument will only run the current setup program once the test is initiated.

Once the operator has linked all the setups they wish to perform as a single test they must RECALL the first setup of the sequence in order to begin the sequence that has been setup. The instrument will automatically stop when it reaches the last setup that has CONNECT turned "off". If the operator initiates the test again the instrument will once again begin the program from the first setup that the test was originally initiated from.

Several multiple setup programs can be stored into the instrument. As an example the operator could configure the setups as follows:

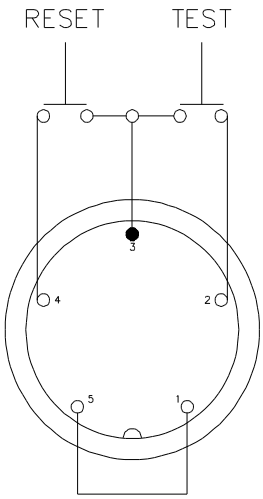
setup #1 CON = "on"
setup #2 CON = "on"
setup #3 CON = "off"
setup #4 CON = "on"
setup #5 CON = "on"
setup #6 CON = "off"

If the test is started while in setup #1 the instrument would proceed up to setup #3 before stopping if all tests passed. If started while in memory #4 the instrument would proceed to setup #6 before stopping if all tests passed. In the event that any test would fail the instrument will indicate failure and stop the test sequence. If the reset button is pushed to clear the failure and the test is again initiated the instrument will begin testing from the first test setup in the sequence once again.

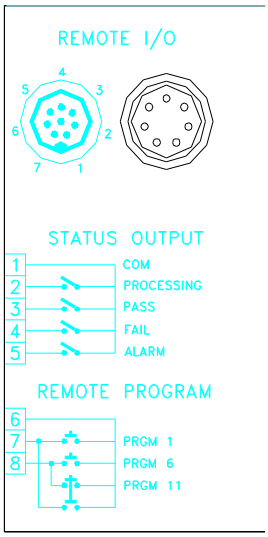
REMOTE INTERFACE CONFIGURATION

REMOTE INTERFACES FRONT & REAR PANEL:

Front Panel Remote Interface



Rear Panel Remote Interface



FRONT PANEL REMOTE INTERFACE

The 6554SA front panel remote connector (2) allows remote operation of the TEST and RESET functions. In order to activate the remote connector a jumper must first be wired across pins 1 and 5. The matching female connector to attach to the front panel connector is provided with the 6554SA. Any type of momentary switch can then be wired across pins 2 and 3 to allow remote operation of the TEST function. When the remote connector is activated the front panel TEST switch (4) is deactivated. A momentary switch can also be wired across pins 3 and 4 which allows remote operation of the RESET function. For safety the front panel RESET switch (3) remains active even when a remote reset switch is connected so that high voltage can be shut down from either location.

REAR PANEL REMOTE INTERFACE

The 6554SA can operate in a basic remote control function even when GPIB control is not utilized. The rear panel connector provides output signals to remotely monitor PASS, FAIL, PROCESSING and ALARM conditions. These signals are provided by four normally open internal relays that switch on to indicate the current condition of the tester. A common terminal is provided so that an external voltage can be applied to the remote connector to operate external devices. The maximum contact rating of the internal relays

are 220VAC at 3 amps. Below is a listing that indicates what conditions activate each pin. When a terminal becomes active the relay closes and connects that terminal to the common terminal thereby allowing the external voltage to operate an external device.

PIN ONE - COMMON
PIN TWO - PROCESSING
PIN THREE - PASS
PIN FOUR - FAIL
PIN FIVE - ALARM

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

PROCESSING - The relay contact closes the connection between the common pin (1) and pin (2) while the instrument is performing a test. The connection is opened at the end of the test.

PASS - The relay contact momentarily closes the connection between the common pin (1) and pin (3) after detecting that the item under test passed all tests.

FAIL - The relay contact closes the connection between the common pin (1) and pin (4) after detecting that the item under test failed any test. The connection is opened when the next test is initiated.

ALARM - The relay contact closes the connection between the common pin (1) and pin (5) after detecting that the failure alarm has sounded. The connection is opened when the instrument is reset and the alarm is deactivated.

REMOTE INPUTS

The 6554SA also allows access to its setup programs through a remote control connection. This gives the user the capability to quickly change parameters remotely even when the GPIB mode is not utilized. The 6554SA basically operates in a PLC mode by responding to simple relay contact closures. The built in memory programs of the instrument are used to accomplish this. The internal memory programs are arranged into three groups. By connecting terminal 6,7 and 8 in different combinations the user can select which memorized test setups to activate.

The following describes how each program is activated and what memorized test setups are run.

PROGRAM ONE - Momentarily connecting terminal 6 to 7 signals the instrument to immediately begin the test program that is stored in memory one. If this memory is linked to the next memory it will also move on to perform the next test setup until it reaches a memory that is not linked or until it reaches memory five which is the last memory in this group.

PROGRAM TWO - Momentarily connecting terminal 6 to 8 signals the instrument to immediately begin the test program that is stored in memory six. If this memory is linked to the next memory it will also move on to perform the next test setup until it reaches a memory that is not linked or until it reaches memory ten which is the last memory in this group.

PROGRAM THREE - Momentarily connecting terminals 6, 7 and 8 together signals the instrument to immediately begin the test program that is stored in memory eleven. If this memory is linked to the next memory it will also move on to perform the next test setup until it reaches a memory that is not linked or until it reaches the last memory of the instrument.

This section provides information on the proper use and configuration of the remote interface (GPIB) IEEE-488.

A Brief History of IEEE-488....

Hewlett-Packard designed in 1965 the Hewlett-Packard Interface Bus (HP-IB) to connect their line of programmable instruments to computers. This bus had high transfer rates (nominally 1 Mbytes/s), and thus quickly gained acceptance. Later, it was accepted as the IEEE Standard 488-1975 and has since evolved into ANSI/IEEE Standard 488.1-1987.

IEEE-488 has expanded over the years and is used with many more types of computers and instruments than just HP. Because of this it is usually referred to as the General Purpose Interface Bus, (GPIB).

GPIB Messages

There are typically two types of messages that GPIB devices use to communicate with other interconnected GPIB devices;

Interface messages: often called commands or command messages and Device dependent messages often called data or data messages.

Data Messages: contain information such as programming instructions or measurement results.
Command Messages perform functions such as initializing the bus and addressing and unaddressing devices.

Functions:

A GPIB device can be a Listener, Talker and/or Controller. A Talker sends data messages to one or more Listeners, which receive data. A Controller manages the information flow on the GPIB by sending commands to all devices. The GPIB bus is much like a computer bus except a computer has circuit cards connected via a backplane and the GPIB has stand alone devices connected via a cable.

Signals and Lines:

The GPIB consists of 16 signal lines and 8 ground-return or shield drain lines. The 16 signal lines are grouped into 8 data lines, 3 handshake lines and 5 interface management lines.

Data Lines: The eight data lines, DI01 through DI08 carry data and command messages. The 7-bit ASCII or ISO code set is used and the eighth bit DI08 is unused.

Handshake Lines: The transfer of message bytes between devices is done via three asynchronously control lines. Referred to as three-wire interlocked handshake. This guarantees that message bytes on the data lines are sent and received without transmission error.

NRFD (not ready for data) indicates when a device is ready or not ready to receive a message byte.

NDAC (not data accepted) indicates when a device has or has not accepted a message byte.

DAV (data valid) tells when the signals on the data lines are stable (valid) and can be accepted safely by devices.

Interface Management Lines: Five lines are used to manage the flow of information across the interface.

ATN (attention) ATN is driven true by the controller when it uses the data lines to send commands, and drivers ATN false when a Talker can send data messages.

IFC (interface clear) IFC is driven by the system controller to initialize the bus and become CIC.

REN (remote enable) The REN line is driven by the controller which is used to place devices in remote or local program mode.

SRQ (service request) The SRQ line can be driven by any device to asynchronously request service from the Controller.

EOI (end or identify) This line has two purposes- the Talker uses this line to mark the end of a message string, and the Controller uses it to tell devices to identify their response in a parallel poll.

GPIB Connector:

Connection is usually accomplished with a 24-conductor cable with a plug on one end and a connector at the other end. Devices may be connected in a linear, star or a combination configuration.

The standard connector is the Amphenol or Cinch Series 57 Microribbon or AMP CHAMP type. The GPIB uses negative logic with standard transistor-transistor login (TTL) levels. When DAV is true, for example, it is a TTL low level (≤ 0/8 V), and when DAV is false, it is a TTL high level (≥ 2.0 V).

Restrictions and Limitations on the GPIB

A maximum separation of 4 m between any two devices and an average separation of 2 m over the entire bus.

A maximum total cable length of 20 m.

No more than 15 device loads connected to each bus, with no less than two-thirds powered on.

Note: A bus extender which is available from numerous manufacturers is available to overcome these limitations.

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 of the Model 6554SA are listed in the chart below. All functions may be controlled over the bus except ARC sensitivity and input voltage which are Selectable on the rear panel see rear panel drawing on page 25.

GPIB INTERFACE FUNCTIONS

IEEE-488 INTERFACE	SH1: Complete source handshake capability. AH1: Complete acceptor handshake capability. T6: Talker function. L4: Listener function. SRO: No service request capability. RL1: Complete remote/local capability. PPO: No parallel poll capability. DCO: No device clear capability. DTO: No device trigger capability. CO: No controller capability. E2: 3 state driver.
CONTROLLABLE ITEMS	Test/Reset control. Setting of test status/parameters for test.
DATA CODES	ASCII
DELIMITER	CR + LF (+ EOI)

GPIB ADDRESS

Each device on the GPIB (IEEE-488) interface must have a unique address. You can set the 6554SA'S address to any value between 1 and 29. The address is set to " 8 " when the instrument is shipped from the factory. The 6554SA address is displayed when you depress the "Address: button on the front panel keypad #18.

The address can only be set from the front panel. The address is stored in non-volatile memory and does not change when the power has been off or after a remote interface reset.

6554SA IEEE COMMAND LIST

TYPE	COMMAND	EXPLANATION
Binary Status	?0	Binary status. If the 6554SA talks after reception of the "?0" command, it will output four bytes which indicates the current programmed stats, the first two bytes are empty. The meaning of the last two bytes is: Byte 3: Status Bits Bit 7 = 1 an ERROR COMMAND occurred Bit 6 = 1 Bit 5 = 1 the INSULATION RESISTANCE test FAILED Bit 4 = 1 the WITHSTANDING VOLTAGE test FAILED Bit 3 = 1 the GROUND BOND test FAILED Bit 2 = 1 ALL TESTS were PASSED Bit 1 = 1 an OVER LOAD failure occurred Bit 0 = 1 an ARC failure occurred Byte 4: Status Bits Bit 7 = 1 the WITHSTANDING VOLTAGE test is in DC mode Bit 6 = 1 the voltage of WITHSTANDING VOLTAGE TEST is RAMPING Bit 5 = 1 the INSULATION RESISTANCE test PASSED Bit 4 = 1 the WITHSTANDING VOLTAGE test PASSED Bit 3 = 1 the GROUND BOND test PASSED Bit 2 = 1 the INSULATION RESISTANCE is PROCESSING Bit 1 = 1 the WITHSTANDING VOLTAGE is PROCESSING Bit 0 = 1 the GROUND BOND is PROCESSING

Feedback Value	?1	GROUND BOND TEST current. If the 6554SA talks after reception of the "?1" command, it will output four bytes which indicates its currently measured value. (unit: Amps)
	?2	GROUND BOND TEST resistance. If the 6554SA talks after reception of the "?2" command, it will output four bytes which indicates its currently measured value. (unit: milliohms)
	?3	WITHSTANDING VOLTAGE TEST voltage. If the 6554SA talks after reception of the "?3" command, it will output four bytes which indicates the current measured value. (unit: KILOVOLTS)
	?4	WITHSTANDING VOLTAGE TEST current.If the 6554SA talks after reception of the "?4" command, it will output four bytes which indicates the current measured value. (unit: MILLIAMPS)
	?5	INSULATION RESISTANCE TEST voltage.If the 6554SA talks after reception of the "?5" command, it will output four bytes which indicates the current measured value. (unit: KILOVOLTS)
	?6	INSULATION RESISTANCE TEST value. If the 6554SA talks after reception of the "?6" command, it will output four bytes which indicates the current measured value. (unit: MEGOHMS)
	?7	TIMER counter. If the 6554SA talks after reception of the "?7" command, it will output four bytes which indicates the current counter value. (unit: Seconds)

Operation Function	F0	Start automatic test program (TEST)
	F1	Stop automatic test program (RESET)
Operation Status Function	F2	Enable GROUND BOND test mode
	F3	Disable GROUND BOND test mode
	F4	Set the output of GROUND BOND test to 60 Hz
	F5	Set the output of GROUND BOND test to 50 Hz
	F6	Enable WITHSTANDING VOLTAGE test mode
	F7	Disable WITHSTANDING VOLTAGE test mode
	F8	Set the output of WITHSTANDING VOLTAGE AC mode
	F9	Set the output of WITHSTANDING VOLTAGE DC mode
	FA	Set the output of WITHSTANDING VOLTAGE test to 60 Hz
	FB	Set the output of WITHSTANDING VOLTAGE test to 50 Hz
	FC	Enable INSULATION RESISTANCE test
	FD	Disable INSULATION RESISTANCE test
	FE	Enable CONNECT mode to run next program
	FF	Disable CONNECT mode to run single program only
	FG	Enable ARC DETECT mode
	FH	Disable ARC DETECT mode
	FI	Actuate Milliohm Offset

Parameter Set Function	S0	Set GROUND BOND maximum test voltage (5.0 - 12.0V, 0.1V/step)
	S1	Set GROUND BOND test current (10.0 - 31.0A, 0.1A/step)
	S2	Set GROUND BOND high resistance limit (0 - 199m, 1m/step)
	S3	Set GROUND BOND test time (0 - 999Sec, 1Sec/step)
	S4	Set voltage of WITHSTANDING VOLTAGE test (0-5000v, 10v/STEP)
	S5	Set upper limit of leakage current of WITHSTANDING VOLTAGE test current. (0.0 - 40.0mA, 0.1mA/STEP)
	S6	Set lower limit of leakage current of WITHSTANDING VOLTAGE test current (0.0-39.9mA, 0.1mA/STEP)
	S7	Set time of WITHSTANDING VOLTAGE test (0-999Sec., 1 Sec/STEP)
	S8	Set ramp time of WITHSTANDING VOLTAGE test (0-99 Sec 1 Sec/STEP)
	S9	Set voltage of INSULATION RESISTANCE test (200 - 1000v, 1v/STEP)
	SA	Set upper limit of RESISTANCE ON INSULATION test (0-2000 Megohms, 1 Megohm/STEP)
	SB	Set lower limit of RESISTANCE ON INSULATION test (0-2000 Megohms, 1 Megohm/STEP)
	SC	Set judgment delay time of INSULATION RESISTANCE (0-999Sec, 1Sec/STEP)

Storage & Recall	SD	Store all status and parameters to memory bank (1-15)
	SE	Recall a memory from bank to controller (1-15)
Scanning Unit Control	SF	Set GROUND BOND test channel of scanning unit (1-4)
	SG	Set WITHSTAND VOLTAGE test channel of scanning unit (H= High, L= Low, O= Off)
	SH	Set INSULATION RESISTANCE test channel of scanning unit (H= High, L= Low, O= Off)

EXAMPLE OF SETTING VOLTAGE OVER THE IEEE BUS

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

To set the output voltage across the IEEE bus at 1240 volts do the following;
Type in the following string, **" S4 1240"** (ENTER↵): This tells the instrument you are setting the voltage at 1240 volts. A string is a list of ASCII characters, octal or hex bytes or special symbols, enclosed in double quotes.

To set the ramp time of the Withstand Voltage test across the IEEE bus at 10 seconds do the following; Type in the following string, **"S8 10"** (ENTER↵): This tells the instrument you are setting the ramp time at 10 seconds.

To set outputs 1 & 2 of the scanner to High, outputs 3 & 4 to Low and outputs 4-8 to Off type in the following string, **"SGHHLL0000"**.

FOR MORE INFORMATION ON IEEE (GPIB) PLEASE CONTACT:

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

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

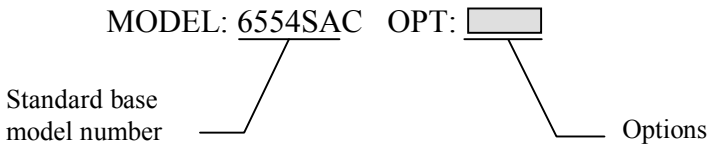
Model 6554SA OPTIONS

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing. The list of options contains an option code number which can be referenced on the data plate on the rear panel of the unit.

Data Plate

The option code is contained in the OPT field. The complete model number will include the standard base model number and end with the letter "C" when options are present.



For example your data plate would appear as follows:

standard model (no options)	MODEL: 6554SA
fitted with option 02	MODEL: 6554SAC OPT: 02
fitted with option 02 and 03.....	MODEL: 6554SAC OPT: 0203

6554SA Options

Option List

Code	Description
01	High Current Output (50 mA)
02	Limited Output (20mAAC 10mADC)
03	8 Port Ground Bond Scanner Menu
04	1-3A Continuity Test
05	Lockout w/ Memory Recall
06	Dual Remote Test Switch
07	Remote Reset GPIB status
08	High Resolution Current Meter (1uA)
09	DC Charge Low Limit

Description

01 High Current Output

The High Current Output option gives the user the capability to perform Dielectric Withstand Test on devices that may require greater than the standard 40 mA of test

current. This option effects only the Dielectric Withstand Test mode and allows an increased 50 mA of output current in both AC and DC mode. The high and low current trip settings are also increased accordingly. The revised Dielectric Withstand Test mode specifications are as follows.

DIELECTRIC WITHSTAND TEST MODE SPECIFICATIONS
(High Current Output option -01)

INPUT	115 VAC (±15%), 47-63 Hz, Single Phase 230 VAC (±15%), 47-63 Hz, Single Phase
FUSE	115 VAC - 10 Amp, 230 VAC - 5 Amp
OUTPUT RATING	5kV @ 50 mAAC & 50mADC
OUTPUT ADJUSTMENT	0 - 5kV (AC & DC), 10 volt/step
HIGH TRIP RANGE	0.1 - 50.0mA AC & DC Accuracy ± (2% of setting + 0.02 mA)
LOW TRIP RANGE	0.0 - 49.9mA AC & DC Accuracy ± (2% of setting + 0.02 mA)
FAILURE DETECTOR	Audible & Visual
VOLTAGE DISPLAY	0.00 to 5.00kV Full Scale, LED Display Accuracy - Reading ± (2% of reading + 1 count) Setting ± (2% of setting + 5 volts)
CURRENT DISPLAY	0.05 to 9.99mA, 10.0 to 50.0mA, LED Display Accuracy -Reading ± (2% of reading + 0.02mA)
DC OUTPUT RIPPLE	≤ 4% ripple RMS (5kVDC, 40mA)
AC OUTPUT WAVE FORM	Sine wave, Distortion ≤ 1%
AC OUTPUT FREQUENCY	50 or 60Hz ± 100 PPM, User Selectable
OUTPUT REGULATION	1% of setting from no load to full load
DWELL TIMER	1 - 999 seconds in 1 second increments or continuous. Accuracy ± 0.1 seconds
RAMP TIMER	0 - 99 seconds in 1 second increments. Accuracy ± 0.1 seconds

02 Limited Output

The Limited Output option limits the maximum output current levels of the Dielectric Withstand Test. This option effects only the Dielectric Withstand Test mode. The high and low current trip settings are also decreased accordingly. The revised Dielectric Withstand Test mode specifications are as follows.

DIELECTRIC WITHSTAND TEST MODE SPECIFICATIONS
(Limited Output option -02)

INPUT	115 VAC (±15%), 47-63 Hz, Single Phase 230 VAC (±15%), 47-63 Hz, Single Phase User Selectable
FUSE	115 VAC - 10 Amp, 230 VAC - 5 Amp
OUTPUT RATING	5kV @ 20 mAAC & 10mADC
OUTPUT ADJUSTMENT	0 - 5kV (AC & DC), 10 volt/step
HIGH TRIP RANGE	0.1 - 20.0mA AC &10.0mA DC Accuracy ± (2% of setting + 0.02 mA)
LOW TRIP RANGE	0.0 - 19.9mA AC & 9.99mA DC Accuracy ± (2% of setting + 0.02 mA)
FAILURE DETECTOR	Audible & Visual
VOLTAGE DISPLAY	0.00 to 5.00kV Full Scale, LED Display Accuracy - Reading ± (2% of reading + 1 count) Setting ± (2% of setting + 5 volts)
CURRENT DISPLAY	0.05 to 9.99mA, 10.0 to 20.0mA, LED Display Accuracy -Reading ± (2% of reading + 0.02mA)
DC OUTPUT RIPPLE	≤ 4% ripple RMS (5kVDC, 40mA)
AC OUTPUT WAVE FORM	Sine wave, Distortion ≤ 1%
AC OUTPUT FREQUENCY	50 or 60Hz ± 100 PPM, User Selectable
OUTPUT REGULATION	1% of setting from no load to full load

(Limited Output option -02) cont'd

DWELL TIMER	1 - 999 seconds in 1 second increments or continuous. Accuracy ± 0.1 seconds
RAMP TIMER	0 - 99 seconds in 1 second increments. Accuracy ± 0.1 seconds

03 8 Port Ground Bond Scanner Menu

The 8 Port Ground Bond Scanner Menu option enables the Quadchek to interface with an HS-8 Scanner that has been modified to include four additional Ground Bond Ports. This menu allows inputs from 1 through 8 for the Scanning Unit G-Test Channel parameter (GCH). See page 30 for standard menu parameters.

04 1-3A Continuity Test

The 1-3A Continuity Test option enables the Quadchek to make measurments in a higher range of resistance but with a limited output Current. All other test specifications are unchanged. See page 12 for standard specifications. The modified Ground Bond test specifications are as follows:

Continuity Test

OUTPUT VOLTAGE	Adjustable (5.0 to 12.0 volts AC, 0.1 volt/step) Setting Accuracy - ± (1% of setting + 0.1 volt)
OUTPUT FREQUENCY	50 or 60Hz, User Selectable
OUTPUT CURRENT	Adjustable (1.0 to 3.1 amps, 0.1 amp/step)
CURRENT DISPLAY	3 digits, 03.1A Full Scale, LED Display Accuracy - ± (1% of reading + 2 count)
RESISTANCE DISPLAY	3 digits, 1.20Ω Full Scale, LED Display Accuracy - ± (1% of reading + 1 count) Auto Offset function to disregard lead resistance
TRIP RANGE	0.00 - 1.20Ω
DWELL TIMER	1 - 999 seconds in 1 second increments or continuous. Accuracy ± 0.1 seconds

05 Lockout with Memory Recall

The Lockout with Recall Memory option allows users to enter different parameters in various memory locations for testing multiple products that might require separate set-ups. Once the memories are set up and stored , the user can lock out the front panel set-up mode (See page 40 of this manual). With this option, while in the Lockout mode, the user can select different memories but the parameters within the memory can not be changed.

06 Dual Remote Test Switch

The Dual Remote Test Switch option allows the user to configure dual palm switches for safe production line operation. The front 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 Switch 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 Test and Reset switches on the front panel will be disabled while the dual Test switches are connected to the Control Ports. If the dual Test switches are not connected to the Control Ports, the functions of Test and Reset switches will remained the same as the standard instrument.

07 Remote Reset GPIB status

The Remote Reset GPIB status option allows the user to monitor the remote reset input (see page 42 of this manual for remote operation) through the GPIB interface bus. This allows the remote reset to be configured as a safety interlock for test fixturing. The status command "?0" will respond with the state of the Remote Reset at byte 3, bit 6 of the status bytes that are read back after the "?0". Binary 1 (high) indicates Reset active and Binary 0 (low) indicates Reset inactive see page 48 for other status bit information.

08 High Resolution Current Meter (1uA)

The High Resolution Current Meter option allows the user to monitor leakage current with 1uA resolution. The range however is limited to 4mA maximum. The specifications that are changed by this option are listed as follows. All other specifications remain unchanged. Please see page 12 for detail on other specifications.

High Resolution Current Meter
DIELECTRIC WITHSTAND TEST MODE

OUTPUT RATING	5kV @ 4 mAAC & 4mADC
OUTPUT ADJUSTMENT	0 - 5kV (AC & DC), 10 volt/step
HIGH TRIP RANGE	1 - 4000uA AC & DC Accuracy ± (2% of setting + 2 uA)
LOW TRIP RANGE	0 - 3999uA AC & DC Accuracy ± (2% of setting + 2 uA)
CURRENT DISPLAY	005 to 999uA, 1.00 to 4.00mA, LED Display Accuracy -Reading ± (2% of reading + 2 counts)

09 DC Charge Low Limit

The DC Charge Low Limit option allows the user to use the low limit function in DC mode when the load is almost completely capacitive. This condition yields very little steady state leakage current but substantial charging current during test voltage ramping. This option modifies the DC Lo-Limit function only(WLA), the AC operation remains unchanged. See pages 12 and 30 for specifications and menu settings.

The Lo-Limit setting will set the low trip level to a value that is checked at approximately 100mS after the test has started. If the charging current has exceeded the set level the test continues and no further low limit checking is performed. This allows the steady state current to fall below the WLA setting without causing a failure condition but still verifies that all test connections were completed and a test was performed.

SECTION 2
SERVICE MANUAL

CALIBRATION PROCEDURES

This instrument has been fully calibrated at the factory in accordance to our published specifications. It has been calibrated to NIST. You will find in this manual a copy of the "Certificate of Calibration". It is recommended that you have this instrument recalibrated and a safety check done at least once per year. AR recommends you use "Calibration Standards" with an accuracy of ≤ 0.5% to keep this instrument within published specifications. Calibration adjustments can only be made in the Calibration mode, calibration checks can only be made in a Test mode of operation.

Calibration Equipment Required:

The following equipment will be needed to properly calibrate your instrument. Please be sure that you use instruments with an accuracy of ≤ **0.5%** .

1). Digital Multimeter with the following minimum ranges;
ac voltage: 1,000 volts
dc voltage: 1,050 volts
ac current: 30 amps
dc resistance: 20µA, 200µA, and 30 mA ranges.

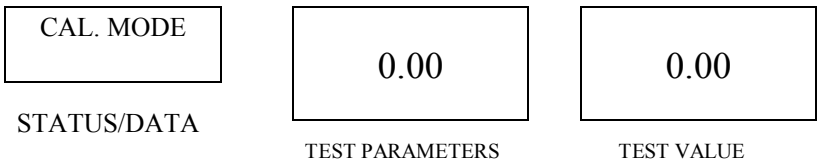
2). 125KΩ/10Watt resistor

3). 10KΩ/¼Watt resistor

4). 110MΩ/¼Watt resistor

TO ENTER CALIBRATION MODE:

In order to enter the calibration of this instrument you must depress the 0 and the 1 on the numeric keypad and at the same time you power up the instrument. You do not need to continue holding these keys. You may release them when you see the “LED” panel lights go on. Upon power up you will briefly see the “ARI” name in the “STATUS\DATA” window. It will then change to “CAL. MODE”. You are then in the “Calibration Mode”. The displays should look similar to those below. There should be no ‘LED’S” lit at this time. If there is press the “Run/Clear” button then the “Reset” button. This will return you to the status as shown below.



There are essentially three main areas that are addressed in the calibration of the 6554SA;

I). Calibration of the Withstand Voltage Measuring Circuit: high voltage and leakage current. All adjustments are done in DC mode. The AC calibration is automatically adjusted through the microprocessor by using the DC value.

II). Calibration of the Insulation Voltage Measuring Circuit: high range and low range.

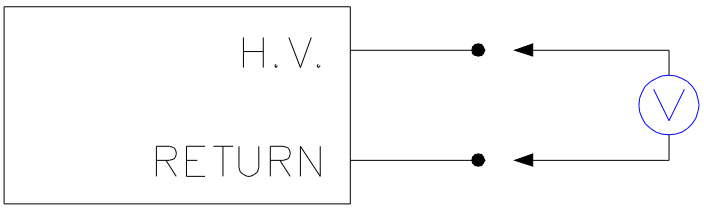
III).Calibration of the Ground Bond Measuring Circuit: ac voltage and ac current.

Note: You may selectively calibrate a single function or all functions.

I). Calibration of the Withstand Voltage measuring circuit:

a). High Voltage

Connect a standard DC voltmeter between the "H.V." and the "RETURN" terminal. Please be sure that the measuring range of the DC voltmeter is set to a range of at least 1050 volts and the polarity of "H.V." and "RETURN" is "+" and "-". Press the numeric keypad number 2. The instrument will then automatically provide aprox., 1000 volts across the voltmeter. Upon entering the number "2" from the numeric keypad the ■ W-TEST led will activate and the HV warning light will come on indicating you are calibrating the high voltage of the dielectric withstand circuit. Please enter the reading of the DC Voltmeter into the instrument using units of 1 volt. For example: If the reading on the voltmeter is 985 volts you would key in 9 8 5 and press the ENTER↵ key. The high voltage is then calibrated and you are returned the main calibration screen..

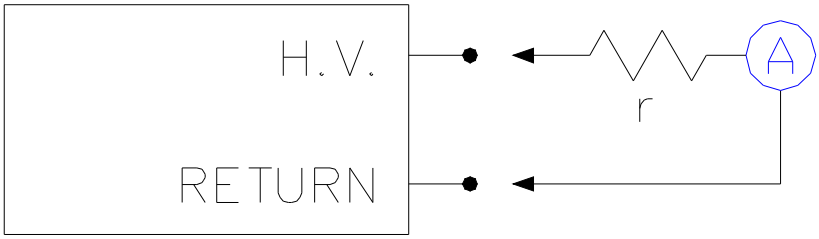


After proper connection to the DC voltmeter per the previous diagram the LED display will show the following.

HVO=	1.00	A(AC) KV(AC) ■ KV(DC)	0.03	MILLIOHMS ■ MILLIAMPS MEGOHMS

b). Leakage Current

Connect a resistor with a value of about 125KΩ, 10 watts in series with a standard DC ammeter with its range set to at least 30mA between the "H.V." terminals and the "RETURN". Press the numeric keypad number 3. The ■ W-TEST led will come on as will the HV indicator light. The instrument will provide aprox., 1000 volts automatically across the resistor in series with the ammeter. See connection diagram below:



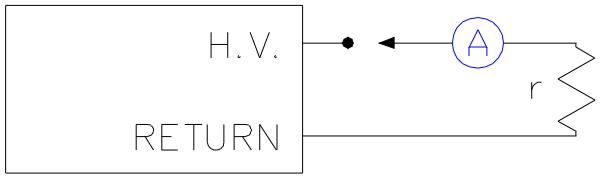
After proper connection entering number 3 on the numeric keypad the display will look similar to that below:

Current will then flow through the ammeter. Please enter the reading of the ammeter into the instrument in units of 0.01 mA. For example: If the reading of the ammeter is 8.27 mA, then you would enter 8 2 7 ENTER ↵. The leakage current is then calibrated and you will be returned to the main calibration screen.

II). Calibration of the Insulation Voltage Measuring Circuit

a). Low Resistance

Connect a 10KΩ standard resistor in between the "H.V." terminal and "RETURN" and a DC Ammeter in series with the "H.V." output as shown in the next diagram.



Press the numeric keypad number 4. This will enter you into the low resistance calibration mode. The ■ R-TEST led will come on as will the HV ON Light. The main LED displays will look as follows:

RAH=	1.01	A(AC) KV(AC) ■ KV(DC)	0.2	MILLIOHMS MILLIAMPS ■ MEGOHMS

Key in the reading on the DC Ammeter display using units of 0.1 µA. For example; If the reading is 99.7 µA then you would enter 9 9 7 ENTER↵. Then the low range of the resistance measuring circuit is calibrated and you are returned to the main calibration menu.

b). High Resistance Range

Connect a resistor with a value of about 110MΩ in series with a standard microammeter between the "H.V." and the "RETURN" terminals as in the diagram above. Press the numeric keypad 5. The ■ R-TEST led will come on as well as the HV indicator. You will then be in the high resistance range calibration mode and the display will show as below:

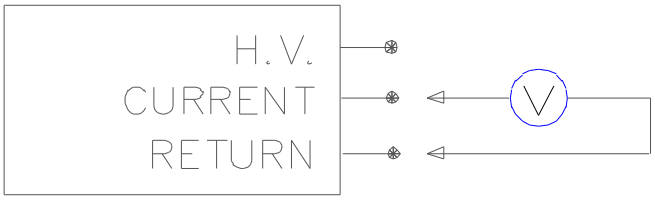
RAL=	1.01	A(AC) KV(AC) ■ KV(DC)	114	MILLIOHMS MILLIAMPS ■ MEGOHMS

Please enter the reading on the micoammeter into the instrument in units of 0.01 µA. For example: If the reading is 9.92 µA then enter 9 9 2 ENTER ↵. The high range of the insulation measuring circuit is calibrated and you are returned to the main calibration screen.

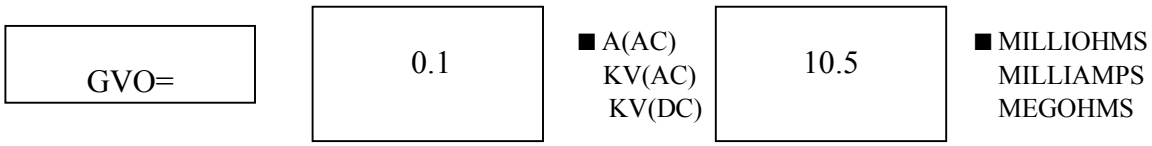
III). Calibration of the Ground Bond Measuring Circuit:

a). AC Voltage

Connect a standard AC Voltmeter between the "RETURN" terminal and the "CURRENT" terminal per the drawing below.



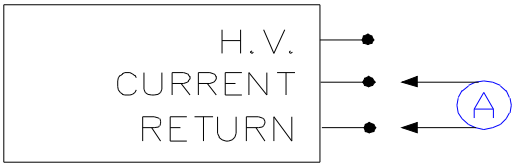
The instrument will automatically provide 10 volts AC across the voltmeter upon pressing the 0 key on the numeric keypad. The ■ G-TEST led will come on. The displays will then be similar as below:



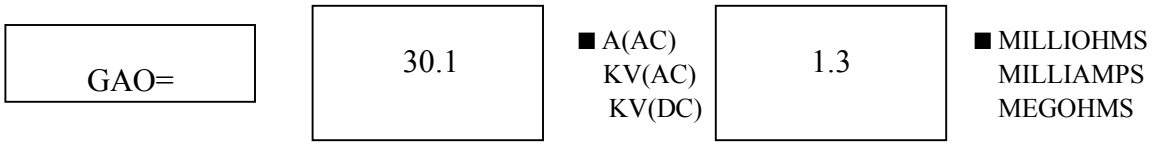
Please key in the reading on the Voltmeter into the instrument via the numeric keypad in units of 10mV. For example: If the reading on the Voltmeter 1s 10.12 volts you would press 1 0 1 2 ↵ "ENTER". The AC Voltage is then calibrated. You will be returned to the main calibration display.

b). AC Current

Connect a standard AC Ammeter between the "CURRENT" terminal and the "RETURN" terminal. Place an Ammeter in series with the "CURRENT" lead per the following drawing:



Please press from the numeric keypad the number 1. The ■ G-TEST led will come on and the main led displays will look similar to those below:



Please key in through the numeric keypad the reading on the Ammeter using units of 10mA. For example: If the Ammeter reads 29.35A, please key in 2 9 3 5 ↵ ENTER. The current is then calibrated and you are returned to the main calibration screen.

Note: Using "Ohms Law" R=V/I, it is not necessary to calibrate the resistance because the voltage and current are calibrated.

These abbreviations will appear in the **STATUS/DATA** window during calibration.

ABBREVIATION	DESCRIPTION
HVO	High Voltage Calibration
WAO	Withstand Current Calibration
RAL	Resistance High Range Calibration
RAH	Resistance Low Range Calibration
GVO	Ground Bond Voltage Calibration
GAO	Ground Bond Current Calibration

- The **RUN/CLEAR** key may be used for clearing an error after entry and to exit from a specific calibration set up screen to the main calibration menu. Then press **RESET** key to exit out of the calibration.

- The instrument **must be turned off** after calibration in order for the calibration to be stored into the EPROM, or to return to the testing or test set-up mode.

PARTS LIST: MODEL 6554SA QuadCHEK

FOR SERVICE INFORMATION IN THE U.S.A. PLEASE CALL 1-800-858-8378
OUTSIDE U.S.A. CALL 1-847-295-3312

When ordering replacement parts please provide us with the following information;

- Model Number
- Serial Number
- Item Number
- Quantity Required

ITEM NUMBER	DESCRIPTION	QTY
37505	MAIN AMPLIFIER ASSEMBLY, INCLUDES R/C-5-0.2, AND TR-3773	1
37506	RESISTOR 0.2 Ω 5W	14
37507	POWER TRANSISTOR	14
37488	KEYBOARD ASSEMBLY	1
37508	MOTHER BOARD	1
37509	MAIN CONTROL BOARD	1
37510	DISPLAY ASSEMBLY BOARD	1
37511	BRIDGE DIODE	2
37512	CURRENT TRANSFORMER	1
37513	ELECTROLYTIC CAPACITOR	2
37514	FUSE 250V/10A 30MM, FAST BLOW	1
37493	FUSE HOLDER	1
37504	INPUT POWER RECEPTACLE	1
37515	INPUT PROTECTION BOARD	1
37516	POWER RELAY	4
37497	RESET SWITCH	1
37500	TEST SWITCH	1
37498	POWER ON/OFF SWITCH	1
37517	SLIDE SWITCH	1
37518	POWER TRANSFORMER	1
37519	HIGH VOLTAGE TRANSFORMER	1
37503	ARC SENSITIVITY POTENTIOMETER	1
04040A-08	HIGH VOLTAGE OUTPUT CABLE	1
33189	LINE CORD (MAINS)	1
05400DT-34	HIGH VOLTAGE OUTPUT JACK	2
37239	HIGH CURRENT RETURN JACK	2
37239	HIGH CURRENT OUTPUT JACK	2
05002D-24	CABLE ASSEMBLY HIGH CURRENT OUTPUT	1
05002D-37	CABLE ASSEMBLY HIGH CURRENT RETURN	1

SCHEMATIC INDEX

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S37508	PCB Mother Board	1
S37515	Input Protection Board	1
S37510	PCB Display Assy	1