OPERATION AND SERVICE MANUAL

MODEL 5002D

GROUND BONDING TEST SET

Associated Research, Inc.
13860 West Laurel Drive
Lake Forest IL 60045-4546

A.

FOR TECHNICAL ASSISTANCE
PHONE: 1 (800) 858-TEST

PART NUMBER 37274

REV. B

TABLE OF CONTENTS

SECTION I

OPERATORS MANUAL

SAFETY PRECAUTIONS REQUIRED FOR HIGH VOLTAGE TESTING

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.

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.

Some testers incorporate monitor circuits which check the connections to the power line and ground. The lights on these line

monitors show at a glance if the wiring is correct or if the polarity is wrong, ground missing, etc. If the line monitor shows a fault condition, turn off and unplug the tester and do not use it until the wiring is repaired.

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.

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 accidently 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!

Connect the return (ground) 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.

Before turning on the Hipot, rotate the voltage control to its maximum counterclockwise position. Double check the return (ground) and high voltage connections to be certain that they are proper and secure.

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

At the end of a test, once again rotate the voltage control to its maximum counterclockwise position and check the meter to be sure the voltage across the item under test has dropped to zero before disconnecting the test leads. 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. Again, check the meter to be sure the voltage has dropped to zero.

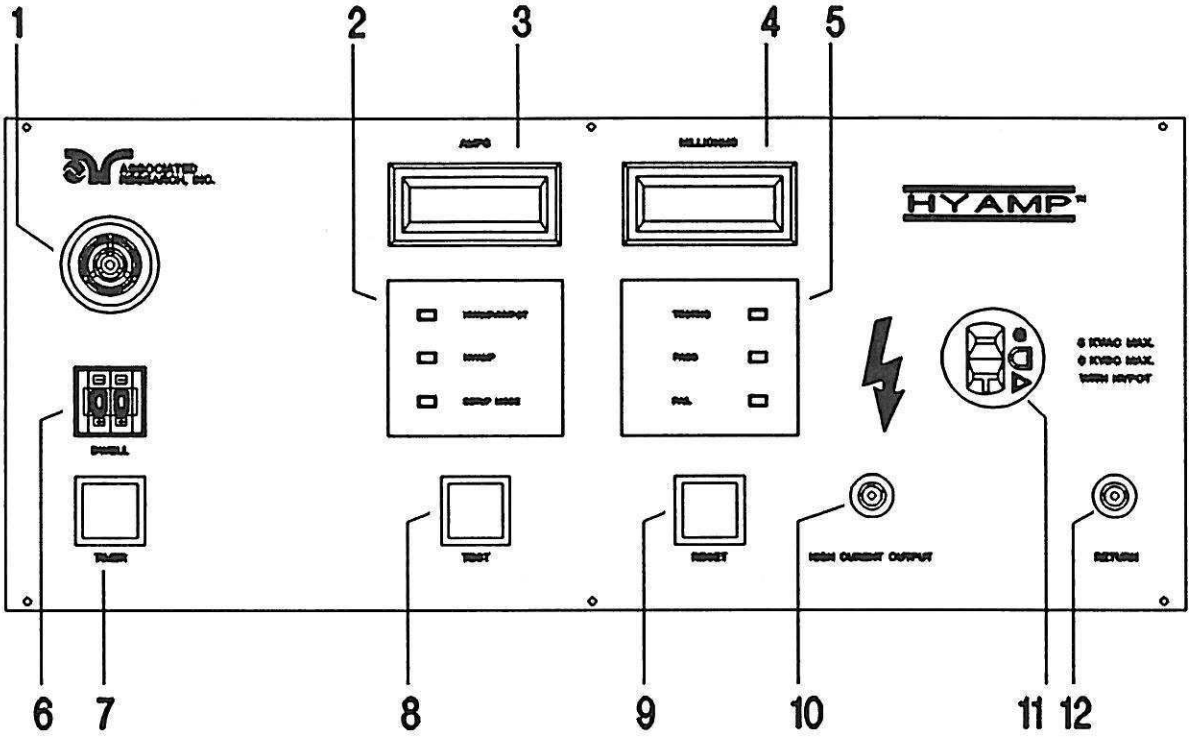
WHY PERFORM A GROUND BONDING TEST

Ground bond testing is done to insure that a low resistance path exists between the safety ground pin of a three-wire line cord and exposed metal of the item under test.

If a live wire inside the item under test came loose and contacted the chassis, the fault current would flow through the low resistance safety ground, and protect the user.

The need for high current bonding (25 amps) as apposed to low current go-no go type testers, results from the nature of line voltage breakers' high current characteristics. The need to verify the integrity of the grounding circuit at high currents insures that the line breaker will open before the wires within the grounding circuit fail.

FEATURES OF MODEL 5002D



FRONT PANEL FEATURES

Front Panel Controls

1. **Alarm** sounds to warn the operator that a failure has occurred.

2. **Mode Indicator.** This series of lights provides information on the set up status of the instrument. Modes of operation are:

   HYAMP/HYPOT - This indicates the instrument is set to be coupled to a Hipot tester.

   HYAMP - This indicates that the instrument is set up to work in a stand alone mode.

   SET UP MODE - This indicates that the instrument is in the parameter set up mode.

3. **Digital Amp Meter.** This meter provides a direct read out of the applied current during a test.

4. **Digital Milliohm Meter.** This meter provides a direct read out of the measured resistance in the safety ground circuit.

5. **Test Status Indicator.** This series of lights provides

information on test results. Test results indicated are:

TESTING - This indicates that the instrument is in the process of performing a test.

PASS - This indicates that the item under test has passed the test.

FAIL - This indicator lights along with the reset switch to indicate that the device under test has failed the ground bond test.

6. **Dwell Time Select Switch.** When a timed test is selected, this switch varies the dwell time from 0 to 99 seconds in 1 second intervals.

7. **Timer ON-OFF Switch.** This switch selects Timed Testing in the ON position and Manual Testing in the OFF position. The switch is ON when the white button is pushed in and the lamp is lit.

8. **Test Switch.** Pressing this switch activates the ground bond tester. For manual tests, press and hold the switch. For Timed tests, press and release the switch.

9. **Reset Switch.** This is a lamp combined with a momentary contact switch. If excessive ground resistance is detected, the red failure lamp will light. To reset the system for the next test, press and release the red reset button.

10. **High Current Connection.** The 5002D is also provided with a front panel high current test lead that can be used instead of the front panel receptacle. This cable would be used to test devices that are not terminated in a standard line cord. When using this connection the 5002D measures the resistance between this lead and the return lead.

11. **Front Panel Receptacle.** The 5002D is provided with a front panel receptacle so that products terminated in a line cord can be plugged directly into the tester. When testing through the receptacle it is important to note that the resistance of the input cord of the device under test is included in the results.

12. **Return Connection.** This return should be connected to the chassis of the product under test. The 5002D measures resistance between the safety ground connection and the point where the return lead is connected.

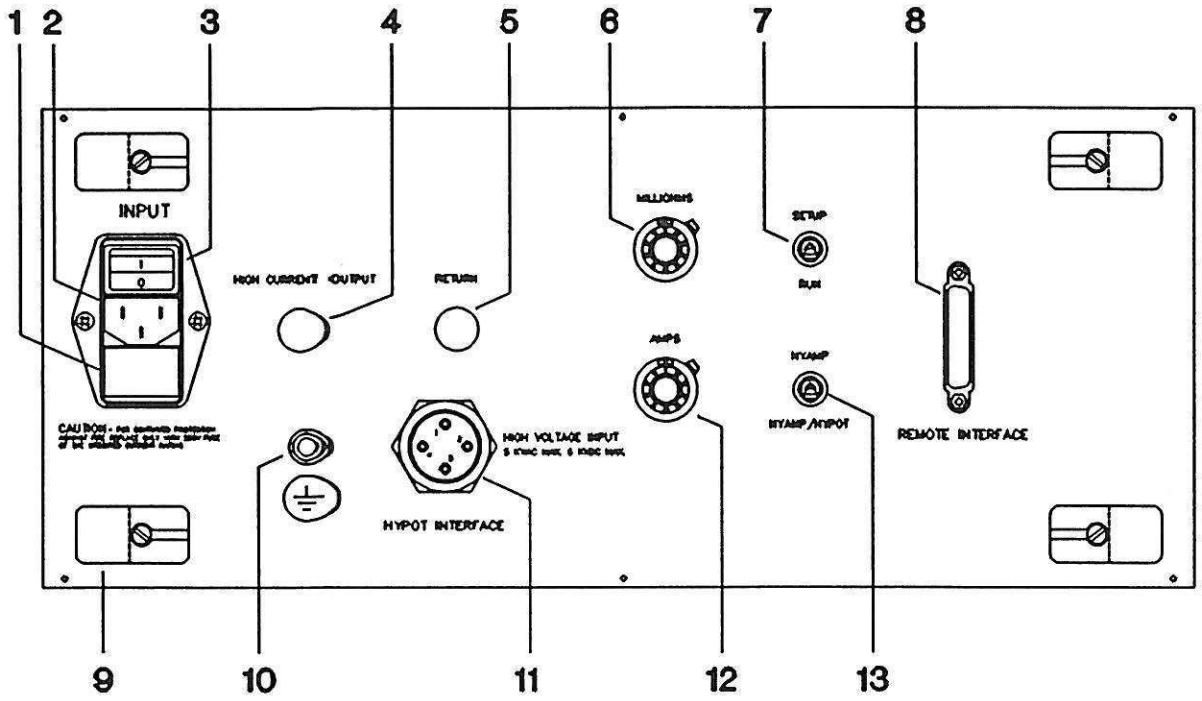
Kelvin Method - The cables and the receptacle of the 5002D use this four wire technique of measurement so that the resistance of the

test lead wires are not included in the test results.

13. **Detachable 5 foot (1.52 m) High Current Lead** for testing devices without a line cord.

14. **Receptacle for Testing Cord-connected Devices.** The line and neutral terminals of this receptacle are **BOTH** connected to the high voltage output. The ground terminal is isolated from ground.

15. **Detachable 5 foot (1.52 m) Return (ground) Lead.** This lead is always used in making a test. It is grounded for safety during the test. When testing a device with a three-wire cord, continuity is measured between the device's chassis ground pin and the return lead.



REAR PANEL FEATURES

1. **Line fuse and voltage changer** integrated with power connector. To change the fuse unplug power cord and insert a screwdriver into the slot to slide open fuse the compartment.

   Line voltage selection is set by the position of the fuse compartment. For 110-120V operation align the 110V arrow on the fuse compartment with the arrow on the body of the power module and slide it into place.

   For 220-240V operation align the 220V arrow on the fuse compartment with the arrow on the body of the power module and slide it into place.

2. **Standard IEC 320 connector** with detachable 7½ foot (2.29 m) power cord.

3. **Power Switch.** Rocker-style switch with international ON (1) and OFF (0) markings.

4. **Rear Panel High Current Output.** The 5002D may have optional rear panel connectors for high current and return to make it simple to build into a test system.

5. **Rear Panel Return Output.** The 5002D may have optional rear panel connectors for high current and return to make it simple

to build into a test system.

6. **Milliohm Trip Adjust.** This 10 turn pot adjusts the maximum allowable resistance that the instrument will consider to be an acceptable test result. The range is 50 to 200 milliohms.

7. **Setup Switch.** This toggle switch changes the mode of operation from run to setup. In the set up mode the meters will display the settings for test current and trip point. These settings can be adjusted without any load by using the 10 turn pots on the rear panel. To return to the operating mode the switch must be set to the run position.

8. The **Remote Interface** provides a convenient way to connect the hipot to an automatic test system. The interface connector is an industry standard 25-pin "D" subminiature female receptacle. See page 14 for a complete description of the remote interface connector signals and guidelines for connection to an automatic test system.

9. **Cord Wrap** for line cord storage. Plug inserts into center slot.

10. **Chassis Ground Terminal** will accept banana plug, spade lug, or stripped wire connection. This terminal should be connected to a good earth ground before using the test instrument.

11. **Hypot Interface Connection.** A high voltage interface connection is provided on the rear panel and allows the 5002D to be directly connected to our HypotPLUS to form an automated test system to perform both the ground bond and Hipot tests.

12. **Amps Adjust.** This 10 turn pot adjusts the maximum output test current of the instrument. The range is 3 to 25 amperes.

13. **Interface Switch.** This toggle switch changes the mode of operation between HYAMP only and HYAMP/HYPOT. If the tester will be used while connected to a Hypot this switch will allow the Hyamp to initiate a test when set to HYAMP/HYPOT position and the ground bond test has passed. Setting to HYAMP mode defeats the initiation signal to the Hypot.

SETTING UP TEST PARAMETERS

Setting the output current

Setting the output current can be easily and quickly done using the rear panel 10 turn control. The rear panel set up switch must be in the setup position. While in this mode the front panel current meter displays the output current setting. To change the setting the operator must adjust the rear panel current adjust control until the meter reads the desired current. The 10 turn control can now be locked in this position. The setup switch must be returned to the run position to return the instrument back to an active test mode. The range of the 5002D is 3 to 25 amperes which meets all IEC, CSA, VDE and other safety agency specifications.

Setting the resistance trip level

In order to meet various specification requirements the 5002D has been designed with a flexible, simple to calibrate maximum resistance trip adjustment. The rear panel setup switch must be in the setup position. While in this mode the front panel resistance meter displays the maximum resistance trip level. To change the setting the operator must adjust the rear panel resistance adjust control until the meter reads the desired trip level. The 10 turn control can now be locked in this position. The setup switch must be returned to the run position to return the instrument back to an active test mode. The 5002D will now monitor the safety ground circuit and if it exceeds this setup level it will indicate that the test item failed the ground bond test.

Setting test time

A front panel adjustment clearly shows the setting for test time. By changing the thumbwheel switch the operator can adjust the test time anywhere between 1 and 99 seconds. In order to activate the timed test mode the timer switch must be depressed which will cause it to light.

OPERATING THE 5002D IN THE STAND ALONE MODE

The 5002D can be set up to operate as a stand alone instrument. If the Hyamp is to be used independently as a safety ground bond tester the rear panel mode switch can be set to either the HYAMP position or the Hymap/Hypot position. The dwell timer should be set to hold the test current for the desired test time required by safety agency specifications. The test current and maximum current trip point should also be set to meet agency requirements.

The return cable must be connected to the chassis of the device under test. If the device under test is terminated in a line cord the product can be directly plugged into the front panel receptacle

of the 5002D in order to test the complete product including the input cord. If the product is not terminated in a line cord or if you wish to bypass testing the line cord the 5002D comes with a separate high current connection lead that can be connected directly to the point on the device under test where the safety ground is terminated.

Once the test switch is pressed the HYAMP will apply the test current and provide a digital reading indicating the resistance of the safety ground circuit. If the device under test reads less resistance than the trip setting a pass light will light at the end of the test cycle. If the resistance level exceeds that of the trip point the HYAMP will provide a visual and audible indication of failure and you will be required to manually reset the instrument before the next test can be performed.

INTERCONNECTING THE HYAMP WITH A HYPOT

CAUTION: To insure operator safety, review and follow the Safety Precautions for High Voltage Testing at the beginning of this manual before performing any high voltage tests.

HYAMP can be interconnected with either the Associated Research model 5400DT or the 5450DT. By interconnecting the two instruments, both the hipot and the ground bond test can be performed through a single connection to the HYAMP. The HYAMP also automatically initiates the hipot test so the operator only needs to activate a single switch on the HYAMP to begin the sequence of tests.

In order to interconnect the instruments the HYAMP mode switch must be set in the HYAMP/HYPOT position. A special cable can be provided to interconnect the high voltage output of the HypotPLUS to the rear panel connector of the HYAMP. A second cable will connect the control circuitry of HYAMP and HypotPLUS through the rear panel 25 pin connectors. The cable is marked indicating which end connects to the HypotPLUS and which end connects to the HYAMP, be careful not to reverse the cable since that will cause the system to operate improperly.

Set up of the HYAMP is identical to the procedure that is followed for the stand alone mode. In addition to the HYAMP setup, the HypotPLUS should be preset for the necessary outputs and test times. In order to use the HYAMP in the automated mode the device under test must be plugged into the 5002D's front receptacle in order to allow the high voltage of the Hypot to interconnect through the HYAMP. Once connected the complete system is initiated by pressing the test switch on the HYAMP tester.

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

The High Voltage can still be initiated from the Hipot to perform an individual Hipot test through the Hyamp in the cases of setup or troubleshooting. It is important to use the HYAMP Return lead for Hypot tests, as the receptacle safety ground pin is floating with reference to the HYAMP chassis ground.

If the device under test passes the ground bond test the HYAMP will give a pass indication and automatically initiate the hipot test. If the device under test fails the bond test, the HYAMP will indicate failure and it will not initiate the hipot test. This interconnected mode provides the user with a safe and quick way to perform both safety tests.

The Hyamp/Hypot switch is provided to allow Hypot initiation to be disabled without disconnecting the interconnecting cables. By placing the switch to Hyamp only mode with all other cables still connected, the Hyamp tester can be initiated to perform an individual ground bond test.

HYAMP High Voltage input pins are defined as follows:

PIN 1 - HIGH VOLTAGE
PIN 2 - HIGH VOLTAGE RETURN
PIN 3 - NO CONNECT
PIN 4 - HIGH VOLTAGE SHIELD

REMOTE INTERFACE

The remote interface provides the user with a convenient way to connect the Hyamp to a wide variety of test equipment ranging from a simple footswitch for hands-free test initiation to a complex computer-based automatic test system for statistical process control.

Through the remote interface, the test system can start and stop the Hyamp test, set the current applied to the item under test, measure the actual test current and resistance during the test, and monitor fault conditions which may occur while the test is in process.

Each of the interface functions is described below, followed by a table showing the signals assigned to each contact of the interface connector.

Input Switches

Three user-provided switches can be connected to the Hyamp. Either a dry-closure relay contact or an optically-isolated open collector transistor can be used. The transistor must be capable of sinking 1 ma at .2VDC with 5VDC collector-emitter breakdown.

TEST SWITCH: Closing the Test switch initiates a test. If the Hyamp is set to manual mode the test will continue until a failure is detected or the switch is opened, whichever occurs first.

If the Hyamp is set to timed mode, the test will continue until a failure is detected or the dwell cycle time expires, whichever occurs first. If the Test switch stays closed at the end of a timed test, the next test cannot begin until the Test switch is first opened.

The Timer switch on the front panel is in the OFF position for manual mode or in the ON position for timed mode.

RESET SWITCH: Closing the Reset switch terminates any test in process and turns off the failure alarm, front panel failure indicators, and remote failure relays. The Hyamp remains in the reset state until the Reset switch is released.

SELECT SWITCH: Closing the Select switch disables the voltage control on the front panel and enables the test voltage to be set from an external DC voltage source connected to the Remote Set inputs.

Output Relays

Six relays monitor and report the results of the Hyamp test. The relays have normally open contacts rated for 24VDC, .25A RESISTIVE loads such as logic gates, optoisolators, and solid-state relays. Do not use the remote relays to switch inductive loads such as relay coils which can damage the contacts.

TEST IN PROCESS: The Test in Process relay closes at the start of a test, remains closed during the entire test cycle, and opens when the test cycle ends. The Test in Process relay closes 25 msec. before the high current output is energized.

PASS: The Pass relay closes if the item under test passes the Hyamp test. The relay remains closed until another test is started with the Test switch or until the Reset switch is closed.

FAIL: The Fail relay closes if the actual resistance exceeds the High Resistance Trip Point during the Hyamp test. The relay stays closed until the Reset switch is closed.

END OF TEST: The End of Test relay closes if the Hyamp is set to Hyamp\Hypot mode and the test finishes without failure. The relay stays closed momentarily for 100 ms.

RESET OUT: The Reset Out relay closes if the Reset button in pressed. The relay stays closed until the Reset switch is released. It will also be closed during SETUP mode.

Remote Current Set

When the Select switch is closed, the high current output is controlled by the voltage applied to the Remote Current Set inputs. A 0 to 10VDC input voltage will set the high current output from near zero to its maximum output level.

Remote Meter Outputs

The remote meter outputs generate a DC voltage proportional to the actual test current and resistance present at the item under test. These outputs are useful for monitoring actual test conditions in a computer-controlled test system. These outputs are floating relative to the Hymap chassis. The input resistance of the measuring device (multimeter, analog-to-digital converter, etc) should be at least 100K.

AMMETER: These outputs generate a DC voltage proportional to the output current. The scale factor is .20 VDC = 1 A with a maximum output of 5 VDC = 25 A.

MILLIOHM METER: These outputs generate a DC voltage proportional to the load current. The scale factor is .50 VDC = 10 mOHMS with a maximum output of 10 VDC = 200 mOHMS.

Interface Connector

The interface connector is an industry standard 25-pin "D" subminiature female connector. The signal assigned to each contact of the interface connector is shown in table below:

#	FUNCTION	DESCRIPTION
1	Test Switch +	Switch input, signal
14	Test Switch -	Switch input, reference
2	Reset Switch +	Switch input, signal
15	Reset Switch -	Switch input, reference
3	Test in Process C	Relay output, common
16	Test in Process NO	Relay output, normally open
4	Pass C	Relay output, common
17	Pass NO	Relay output, normally open
5	Fail C	Relay output, common
18	Fail NO	Relay output, normally open
6	End of TEST C	Relay output, common
19	End of Test NO	Relay output, normally open
7	Reset Out C	Relay output, common
20	Reset Out NO	Relay output, normally open
8	No Connect	
21	No Connect	
9	Select Switch +	Switch input, signal
22	Select Switch -	Switch input, reference
10	Remote Voltage Set +	Input voltage, positive
23	Remote Voltage Set -	Input voltage, negative
11	Milliohm Meter +	Output voltage, positive
24	Milliohm Meter -	Output voltage, negative
12	Ammeter +	Output voltage, positive
25	Ammeter -	Output voltage, negative
13	No connection	

Mating Connector:
The interface connector mates with a 25-pin "D" subminiature male connector provided by the user. For maximum noise immunity the mating connector should have a metallic shell and cable clamp. Suggested AMP part numbers are shown below; equivalent parts may be substituted.

207464-2 PLUG SHELL WITH GROUND INDENTS
755254-7 CRIMP SNAP-IN PIN CONTACT
745173-1 SHIELDED CABLE CLAMP
747784-3 JACKSCREWS (SET OF 2)

Interface Cable:
For maximum noise immunity, use #24AWG twisted pair cable with an overall foil shield and drain wire to interconnect the hipot remote interface and the remote controller. **TO AVOID GROUND LOOPS, THE SHIELD SHOULD NOT BE CONNECTED TO GROUND AT BOTH ENDS OF THE CABLE.** The preferred place to ground the cable shield is at the remote controller. If this is not possible, then ground the shield to the connector shell at the hipot. The maximum length for the interface cable is 100 feet.

The suggested 25-conductor interface cable is shown below; equivalent cable may be substituted.

CABLE TYPE:	BELDEN 9684
TWISTED PAIRS:	12½
WIRE GAGE:	24AWG
CHARACTERISTIC IMPEDANCE:	100 OHMS
NOMINAL DC RESISTANCE:	24 OHMS/1000 FT
NOMINAL CAPACITANCE:	15.5 PF/FT
NOMINAL O.D.:	.508 IN

SPECIFICATIONS

MODEL	5002D
DESCRIPTION	Ground Bonding Test Set
PRIMARY APPLICATION	Manufacturing and production line testing of commercial and consumer products to meet UL, CSA, and other safety agency requirements where Ground Bonding test are specified.
INPUT	115VAC, 50/60Hz, Single phase, 5A Max. 230VAC, 50/60Hz, Single phase, 2.5A Max. User selectable.
FUSE	3AG 5AMP 250V SLO BLO
OUTPUT CURRENT	3-25A Load regulated to 5% from 50 to 200 mOHMS. User adjustable with no load
OUTPUT VOLTAGE	6V AC max.
TRIP RESISTANCE RANGE	50 to 200 Milliohms, .1 Milliohm Resolution. 1% of Panel Meter Reading
FAILURE DETECTOR	Audible and visual
DWELL TIMER	0-99 Seconds in 1 second increments
MILLIOHM METER	050.0-199.9 digital. accuracy ±(3% of reading + 1 Least Significant Digit).
AMMETER	03.00-19.99 digital. accuracy ±(3% of reading + 1 Least Significant Digit).
SIZE (W X H X D)	17 X 7.5 X 14.5 inches. 431.8 x 190.5 x 368.3 mm
WEIGHT	23 pounds. (10.43kg)
CABINET	Standard 19" Bench Top Style, Optional rack Mount Kit Available

INDEX

To order replacement parts, refer to the Replacement Parts List for your particular model on the following pages. If you need assistance, call our Technical Support Hotline 1-800-858-TEST.

SECTION II

REPLACEMENT PARTS LIST

ASSOCIATED RESEARCH INC.	**REPLACEMENT PARTS LIST** MODEL 5002D	S/N 113 TO 134 REVISION A ECO 4528 DATE 7-21-93 PAGE 1 OF 12

SYM	PART #	DESCRIPTION	QTY
05002D GROUND BONDING TEST SET			
	05002D-24	CABLE ASSY HIGH CURRENT	1
	05002D-37	CABLE ASSY RETURN	1
	33189	CABLE INPUT CORDSET USA BLK 7.5 FT	1
05002D-01 FINAL ASSY			
	05002D-35	TRANSFORMER POWER TOROID 30A ASSY	1
	05400DT-18	HARNESS ASSY POWER SUPPLY	1
	05400DT-33	CLAMP ASSY CABLE	1
	36722	POWER SUPPLY	1
	36983	SCREW 2.5MM X 10MM PH ZINC PLATED	12
	37271	FAN 14 CFM 12VDC	1
05002D-02 PANEL ASSY CONTROL			
	05002D-08	RECEPTACLE ASSY HV	1
	05002D-11	HARNESS ASSY HIGH CURRENT RETURN	1
	05002D-15	PCB ASSY INDICATOR	1
	05002D-34	HARNESS ASSY HIGH CURRENT	1
	05400DT-09	HARNESS ASSY PANEL CONTROL	1
	05400DT-13	SWITCH ASSY THUMBWHELL	1
	35467	LAMP INCANDESCENT 6.3	2
D604-608	36362	DIODE LED RED RECTANGULAR	2
D600-603	36364	DIODE LED GREEN RECTANGULAR	4
	35449	SWITCH SPDT PUSH BUTTON MOMENTARY	2
	35450	SWITCH DPDT PB ALTRNT ACTION	1
	35451	LENS RED SQUARE	1
	35453	LENS GREEN SQUARE	1
	36623	ALARM	1
	36624	LENS WHITE SQUARE	1
	36755	METER DIGITAL 2V FS	2
	37236	"GROMMET RED, PLASTIC"	2
	37237	"GROMMET BLACK, PLASTIC"	1

SYM	PART #	DESCRIPTION	QTY
	37239	"RECEPTACLE, LEMO"	2
05002D-03 PANEL ASSY REAR			
	05002D-23	HARNESS ASSY SET POT'S	1
	05002D-38	HARNESS ASSY HV INPUT REAR	1
	05002D-39	HARNESS ASSY SETUP SWITCH	1
	05400DT-12	HARNESS ASSY GROUND	1
	05400DT-17	MODULE ASSY INPUT	1
	36627	TERMINAL POST GROUND	1
	36628	DIAL TURNS-COUNTING	2
	36637	CORD WRAP	4
	17760	FUSE 5 AMP 3AG SLOW BLOW	2
05002D-04 PCB ASSY MOTHER BOARD			
C2,4-7,9,11,13	36673	CAPACITOR CERAMIC .1MF 50V	8
C8,12	18427	CAPACITOR ELECTROLYTIC 1MFD 50VDC	2
C10	34514	CAPACITOR ELEC 10MFD 16 VOLT	1
D1-4	34513	DIODE SIL 75PIV 10MA 1N4148	4
D5-10	34933	DIODE SIL 1000PIV 1A 1N4007	6
K1-6	35434	RELAY DPDT DIP 5 VOLTS DC 2	6
P1-3	36779	CONNECTOR MALE 80 PIN PCB MOUNT.	3
P4,5	36762	TERMINAL HEADER 12 CONTACTS	2
P6	36780	CONNECTOR MALE 20PIN SIP PCB MOUNT	1
P7	36681	CONNECTOR MALE DIP 20 POS. .1 IN	1
P8	36781	CONNECTOR MALE 26PIN DIP PCB MOUNT	1
P9,10,12,14,15	35670	CONNECTOR MALE HEADER 10 CIRCIUT	5
P13	36378	CONNECTOR MALE 6 POST HDR	1
R1,R4	36785	RESISTOR FIXED 10K 1/4W 1%	2
R2,3	36647	RESISTOR FIXED 33 1/4 W 5%	2
R5	36654	RESISTOR FIXED 5.1K 1/4 W 5%	1
R6,7	36650	RESISTOR FIXED 100 1/4 W 5%	2
TP1-7	35644	TERMINAL STRIP ONE MALE HDR	7

SYM	PART #	DESCRIPTION	QTY
U1	36738	IC QUAD OP AMP TL084ACN	1
U2	36782	IC VOLTAGE REFERENCE 10 V	1
05002D-05 PCB ASSY LOGIC			
C100,105,125, 127,131	35635	CAPACITOR POLY FILM .1 MFD 100V 5%	5
C101	36844	CAPACITOR FILM .001 MF 50 VOLT MIN	1
C102,103, 106-108,111-122, 126,128-130,132, 133,135-140	36673	CAPACITOR CERAMIC .1MF 50V	29
C104	36902	CAPACITOR FILM .56 UF 50 VDC	1
C123	36753	CAPACITOR ELECTROLYT 22 MF 16 VDC	1
C124	34514	CAPACITOR ELEC 10MFD 16 VOLT	1
D100-102	34513	DIODE SIL 75PIV 10MA 1N4148	3
J100	36726	CONNECTOR 80 PIN FEMALE PCB MOUNT.	1
R100	36985	RESISTOR VARIABLE 5M 1/4W 10%	1
R101	36987	RESISTOR FIXED 7.5M 1/4W 5%	1
R102	18375	RESISTOR FIXED 1K 1/4W 5%	1
R103	36655	RESISTOR FIXED 6.8K 1/4 W 5%	1
R104	36799	RESISTOR FIXED 1.6K 1/4W 5%	1
R105,106	36904	RESISTOR FIXED 620K 1/4W 5%	2
R107	36647	RESISTOR FIXED 33 1/4 W 5%	1
R108	36880	RESISTOR FIXED 220K 1/4 W 5 %	1
R109-117,123	35206	RESISTOR FIXED 220 1/4W 5%	10
R118	35645	RESISTOR FIXED 9.1M 1/4W 5%	1
R119	35630	RESISTOR FIXED 47K 1/4W 5%	1
R120	36883	RESISTOR FIXED 1.5M 1/4 W 5 %	1
R121	36656	RESISTOR FIXED 10K 1/4 W 5%	1
R122	36898	RESISTOR FIXED 178K 1/4W 1%	1
RN100-104	36817	RESISTOR FIXED SIP 10K 2 %	5
RN105	36671	RESISTOR DIP PACK 10K TYPE 1	1

SYM	PART #	DESCRIPTION	QTY
S100	37248	SWITCH DIP 8 POSITIONS	1
TP100-111	35644	TERMINAL STRIP ONE MALE HDR	12
U100	35576	IC TIMER CMOS 7250	1
U101-103,120	35251	IC TIMER 555	4
U104-U106	36605	IC DRIVER 7 CHANNEL SN75468	5
U107	05400DT-27	PROGRAMMABLE LOGIC ASSY SEQUENCER	1
U108	05400DT-26	PROGRAMMABLE LOGIC ASSY FAIL LATCH	1
U110	36677	IC 75452	1
U111	36675	IC 74HC109	1
U112-115,119	36368	IC 74HC14	5
U116-118,121, 122	36674	IC 74HC32	5
FOR U107,108	35724	SOCKET IC 24 PIN 0.3 CNTRS	2
05002D-06 PCB ASSY ANALOG			
C300,301	17175	CAPACITOR FILM .22MFD 100V	2
C302-312, 315-320,326, 327,330	36673	CAPACITOR CERAMIC .1MF 50V	20
C313,314,328	18427	CAPACITOR ELECTROLYTIC 1MFD 50VDC	4
C321	36802	CAPACITOR FILM .01 UF 100 V 10%	1
C322	36905	CAPACITOR FILM 1 UF 50V 5%	1
C323-325	36753	CAPACITOR ELECTROLYT 22 MF 16 VDC	3
D300-305	34513	DIODE SIL 75PIV 10MA 1N4148	6
J300	36726	CONNECTOR 80 PIN FEMALE PCB MOUNT.	1
R300,301,323, 325,326	36827	RESISTOR FIXED 5.11K 1/4 W 1 %	5
R302,306	35120	RESISTOR FIXED 2.2K 1/4W 1%	2
R303-305,309, 317,319,332	36828	RESISTOR FIXED 1.0K 1/4W 1%	7
R310,316,320	36794	RESISTOR FIXED 2K 1/4W 1%	3
R311,315	35645	RESISTOR FIXED 9.1M 1/4W 5%	2

SYM	PART #	DESCRIPTION	QTY
R312,322	36785	RESISTOR FIXED 10K 1/4W 1%	2
R313	37222	RESISTOR FIXED 49.3K 1/4W 1%	1
R314	37206	RESISTOR FIXED 4.42K 1/4W 1%	1
R318	36667	RESISTOR FIXED 100K 1/4 W 1%	1
R321	36786	RESISTOR FIXED 200K 1/4W 1%	1
R324	36833	RESISTOR FIXED 34.0K 1/4W 1%	1
R330,331	36756	RESISTOR VARIABLE 1K RT.ANGLE 10%	2
R333,328	36758	RESISTOR VARIABLE 10K RT.ANGLE 10%	2
RN300-302	37200	RESISTOR DIP 10K TYPE 3 .1% MATCHED	3
U300,301	36984	IC AD704 QUAD OP AMP	2
U302	36738	IC QUAD OP AMP TL084ACN	1
U303,305	36737	IC ANALOG SWITCH DUAL SPDT	2
U304	36680	IC LM339	1
U306,307	37062	IC AD620 INSTRUMENT AMP	2
U308	37197	IC DIVIDER AD538BD	1
U309	36368	IC 74HC14	1
05002D-07 PCB ASSY DRIVER			
C200,202-208, 211,213-218 220-223,244, 248-251	36673	CAPACITOR CERAMIC .1MF 50V	24
C209,241,255	36801	CAPACITOR FILM .047 UF 100V 10 %	3
C210, 254	36902	CAPACITOR FILM .56 UF 50 VDC	2
C212	35635	CAPACITOR POLY FILM .1 MFD 100V 5%	1
C224-226	36806	CAPACITOR 1.0 MF 35 VOLT TANT 10 %	3
C227	36805	CAPACITOR .68 MF 35 VOLT TANT 10 %	1
C228, 229	36807	CAPACITOR 3.3 MF 35 VOLT TANT 10 %	2
C230	36808	CAPACITOR 4.7 MF 35 VOLT TANT 10%	1
C231-233,252	36810	CAPACITOR 10.0 MF 25 VOLT TANT 10%	4
C234,239	36809	CAPACITOR 6.8 MF 25 VOLT TANT 10%	2

SYM	PART #	DESCRIPTION	QTY
C235,236,253	36811	CAPACITOR 33.0 MF 10 VOLT TANT 10%	3
C237	36812	CAPACITOR 47.0 MF 6 VOLT TANT 10 %	1
C238	36800	CAPACITOR CERAMIC 100 PF 100 V 5%	1
C239	36844	CAPACITOR FILM .001 MF 50 VOLT MIN	1
C242	36905	CAPACITOR FILM 1 UF 50V 5%	1
C243	36917	CAPACITOR 270 PF 100 V 5%	1
C245	34514	CAPACITOR ELEC 10MFD 16 VOLT	1
C246, 247	18427	CAPACITOR ELECTROLYTIC 1MFD 50VDC	2
D200	34513	DIODE SIL 75PIV 10MA 1N4148	1
J200	36726	CONNECTOR 80 PIN FEMALE PCB MOUNT.	1
K200	34978	RELAY REED 2PST	1
P201,202	36379	CONNECTOR MALE 2 POST HDR	2
R200,201, 203-205,257,273	36758	RESISTOR VARIABLE 10K RT.ANGLE 10%	7
R202, 252	36244	RESISTOR VARIABLE 2M 1/4W 10%	2
R206	36942	RESISTOR VARIABLE 50K .25W 10%	1
R207	36985	RESISTOR VARIABLE 5M 1/4W 10%	1
R208-211, 218-221	36859	RESISTOR FIXED 12K 1/4W 5%	8
R212, 215	36908	RESISTOR FIXED 1.3K 1/4W 5%	2
R213,214,286	36828	RESISTOR FIXED 1.0K 1/4W 1%	3
R216,222,226, 229,284,285	18375	RESISTOR FIXED 1K 1/4W 5%	6
R217	36929	RESISTOR FIXED 43K 1/4W 5%	1
R223, 225, 250	36666	RESISTOR FIXED 20K 1/4 W 5%	3
R227	35094	RESISTOR FIXED 15K 1/4W 1%	1
R228,263	36909	RESISTOR FIXED 68K 1/4W 5%	2
R230,231,241, 248,251,260-262	36654	RESISTOR FIXED 5.1K 1/4 W 5%	11
R238, 272 R268,278,290	36912	RESISTOR FIXED 2K 1/4W 5%	2
R232	36864	RESISTOR FIXED 82K 1/4W 5%	1

SYM	PART #	DESCRIPTION	QTY
R233	36795	RESISTOR FIXED 330 1/4W 5%	1
R236	35631	RESISTOR FIXED 1M 1/4W 5%	1
R237,276,277, 280,283	36656	RESISTOR FIXED 10K 1/4 W 5%	5
R239	36863	RESISTOR FIXED 62K 1/4W 5%	1
R242	36916	RESISTOR FIXED 825K 1/4W 1%	1
R243, 244	36785	RESISTOR FIXED 10K 1/4W 1%	2
R245	36987	RESISTOR FIXED 7.5M 1/4W 5%	1
R246, 247, 253-256, 266	36647	RESISTOR FIXED 33 1/4 W 5%	7
R249	35222	RESISTOR FIXED 680 1/4W 5%	1
R256	37220	CAPACITOR TANTALUM 68UF 16V	1
R258,259,264, 274,281,282	36914	RESISTOR FIXED 100K 1/4W 5%	6
R265	36653	RESISTOR FIXED 3.3K 1/4 W 5%	1
R269	36862	RESISTOR FIXED 75 1/4W 5%	1
R279	36915	RESISTOR FIXED 9.1K 1/4W 5 %	1
R287	36783	RESISTOR FIXED 10 1/4W 1 %	1
R288	36651	RESISTOR FIXED 130 1/4 W 5%	1
R289	36832	RESISTOR FIXED 681K 1/4W 1%	1
RN200	36817	RESISTOR FIXED SIP 10K 2 %	1
TP200-208	35644	TERMINAL STRIP ONE MALE HDR	9
U200, 201	36816	IC LINEAR FOUR QUAD MULTIPLIER	2
U202	36813	IC OSCILLATOR VOLTAGE CONTROLLED	1
U203, 216	36737	IC ANALOG SWITCH DUAL SPDT	2
U204-206	36738	IC QUAD OP AMP TL084ACN	3
U207	36814	IC 8-BIT MAGNITUDE COMPARATOR	1
U208	35576	IC TIMER CMOS 7250	1
U209, 210, 217	36368	IC 74HC14	3
U211	36867	IC NAND BUFFER 74LS26	1
U212, U222	34519	TRANSISTOR PNP 2N3906	2
U213,214,219	36815	IC HEX BUFFER W/HV OUTPUTS	3

SYM	PART #	DESCRIPTION	QTY
U215	36680	IC LM339	1
U218	36907	IC 74HC573 OCTAL TRANS LATCH	1
U220	36906	IC 74HC30 8-INPUT NAND GATE	1
U221	36674	IC 74HC32	1
U223	34518	TRANSISTOR NPN 2N3904	1
	05400DT-36	"RECEPTACLE ASSY, MODIFIED"	1
05002D-15 PCB ASSY INDICATOR			
C600,602,603	36673	CAPACITOR CERAMIC .1MF 50V	3
C604,C605	36810	CAPACITOR 10.0 MF 25 VOLT TANT 10%	2
J600-601	36773	CABLE STRIP FLAT 2 IN	2
J602	36774	CABLE STRIP FLAT 7 IN	1
P602,P603, P605,P606	36379	CONNECTOR MALE 2 POST HDR	4
R602	36887	RESISTOR FIXED 150 1/4W 5%	1
05002D-16 PCB ASSY HV POWER AMPLIFIER			
BR400	37205	RECTIFIER BRIDGE 8A 600V	1
BR401	36842	RECTIFIER BRIDGE 1.5A 50PIV	1
C400,401	36837	CAPACITOR ELECT. 470 MF 200 VDC	2
C402,403	36846	CAPACITOR ELECTROLYT 330 MF 50VDC	2
C404,405	36847	CAPACITOR ELECTROLYT 100 MF 25VDC	2
C406,413	36845	CAPACITOR FILM 4.7 MF 50 VOLTS	2
C407,419	36840	CAPACITOR ELEC 4700 MF 10VDC	2
C408,410	36838	CAPACITOR CERAMIC 270 PF 1.0 KV	2
C409,412	36839	CAPACITOR FILM .0022 MF 63 VOLTS	2
C411	36918	CAPACITOR 4700 PF	1
C414	36927	CAPACITOR FILM 0.022MF 50V 5%	1
C415,416	36801	CAPACITOR FILM .047 UF 100V 10 %	2
C417	36905	CAPACITOR FILM 1 UF 50V 5%	1
C418	36802	CAPACITOR FILM .01 UF 100 V 10%	1
D400-403	36848	DIODE FAST RECOVERY MUR460	4

ASSOCIATED RESEARCH INC.	**REPLACEMENT PARTS LIST** MODEL 5002D	S/N 113 TO 134 REVISION A ECO 4528 DATE 7-21-93 PAGE 9 OF 12

SYM	PART #	DESCRIPTION	QTY
D404	34933	DIODE SIL 1000PIV 1A 1N4007	1
D409,410	34513	DIODE SIL 75PIV 10MA 1N4148	2
D411	36925	DIODE ZENER 1N4740 10V 1W	1
J400	35665	CONNECTOR FEMALE 10 POS DIP	1
FOR J400	36770	HEADER PCB 10 POS. DIP	1
K400	35432	RELAY SPDT 5 VOLTS DC 5A	1
L400	37201	INDUCTOR TOROID 1 MH 6 AMP	1
P401	36754	CONNECTOR LOCKING HEADER 3 PIN	1
P402	36765	CONNECTOR 7 CIRCUIT END MALE	1
Q400,401	37132	TRANSISTOR FET MTW14N50E	2
FOR Q400,401	35462	SCREW 6/32 X 3/8 SEMS PHILLIPS	2
Q402	36964	TRANSISTOR NPN 2N2222	1
R400,401	35112	RESISTOR FIXED 100K 1W 5%	2
R402	36833	RESISTOR FIXED 34.0K 1/4W 1%	1
R403	35630	RESISTOR FIXED 47K 1/4W 5%	1
R405,406	36647	RESISTOR FIXED 33 1/4 W 5%	2
R407,408	37204	RESISTOR FIXED .03 OHM 3W 3%	2
R409	36669	RESISTOR FIXED 39K 1/4W 5%	1
R410	36831	RESISTOR FIXED 47.0 1W 5%	1
R412	36785	RESISTOR FIXED 10K 1/4W 1%	1
R413	36656	RESISTOR FIXED 10K 1/4 W 5%	1
R414	36859	RESISTOR FIXED 12K 1/4W 5%	1
T400	36850	TRANSFORMER INPUT	1
T401	36851	TRANSFORMER POWER	1
TH400,401	37135	THERMISTOR CL60	2
TP400	35644	TERMINAL STRIP ONE MALE HDR	1
U400	36691	IC 7815	1
U401	36692	IC 7915	1
U402	36991	IC OPTOCOUPLER 4N35T /VDE/	1
FOR BR400	37267	SCREW 6/32 X 1/4 HEX HEAD	1
	37203	PCB POWER AMPLIFIER	1
	37217	TAPE THERMALSIL 2.875"	1

SYM	PART #	DESCRIPTION	QTY
	18347	TUBE HEAT SHRINK 3/8	1
	35625	CABLE RIBBON 10 CONDUCTOR	1
	36723	BRACKET POWER AMPLIFIER	1
05002D-19 PCB ASSY SHUNT INTERFACE			
P505-511	37255	TERMINAL TAB CONNECTOR .250 PCB	7
R500, 501, 503	36650	RESISTOR FIXED 100 1/4 W 5%	3
R502	37268	RESISTOR FIXED 6.19 1/4W 1%	1
T500	37265	TRANSFORMER CURRENT	1
FOR J500	35625	CABLE RIBBON 10 CONDUCTOR	1
FOR J500	35665	CONNECTOR FEMALE 10 POS DIP	1
FOR J500	36770	HEADER PCB 10 POS. DIP	1
05002D-25 INTERFACE ASSY REMOTE I/O			
C700-704, 708-735	36673	CAPACITOR CERAMIC .1MF 50V	33
C705,706, 740,741	36810	CAPACITOR 10.0 MF 25 VOLT TANT 10%	4
C707	36801	CAPACITOR FILM .047 UF 100V 10 %	1
C736,737	18427	CAPACITOR ELECTROLYTIC 1MFD 50VDC	2
C738,739	36753	CAPACITOR ELECTROLYT 22 MF 16 VDC	2
D700,701,703, 704	34513	DIODE SIL 75PIV 10MA 1N4148	4
D702,705,706	36932	DIODE SIL ZENER 11V 1N4741A	3
J702	36778	CONNECTOR FEM 25 PIN SUB D PCB MTG	1
PART OF J701	35625	CABLE RIBBON 10 CONDUCTOR	1
PART OF J701	35665	CONNECTOR FEMALE 10 POS DIP	1
PART OF J701	35777	CONNECTOR FEMALE 26 CONT RIBBON	1
PART OF J701	35783	CABLE RIBBON 26 CONDUCTOR	1
PART OF J701	36770	HEADER PCB 10 POS. DIP	1
PART OF J701	35798	CONNECTOR TRANSITION 26 CONT	1
R700,701,	36758	RESISTOR VARIABLE 10K RT.ANGLE 10%	4

SYM	PART #	DESCRIPTION	QTY
704,706			
R702,705	36654	RESISTOR FIXED 5.1K 1/4 W 5%	2
R703,707,712, 715,716,731,732	36650	RESISTOR FIXED 100 1/4 W 5%	7
R708-711	36647	RESISTOR FIXED 33 1/4 W 5%	4
R713,714	36656	RESISTOR FIXED 10K 1/4 W 5%	2
R717	36666	RESISTOR FIXED 20K 1/4 W 5%	1
RN700	36668	RESISTOR DIP PACK 1K TYPE 3	1
TP1-4	35644	TERMINAL STRIP ONE MALE HDR	4
U700,701	36738	IC QUAD OP AMP TL084ACN	2
U702	36931	IC VOLTAGE REGULATOR -5 V	1
U703	36930	IC VOLTAGE REGULATOR +5 V	1
05400DT-31 PCB ASSY GATE DRIVE			
D412-417	34513	DIODE SIL 75PIV 10MA 1N4148	6
Q403,404	36964	TRANSISTOR NPN 2N2222	2
R419,423	18375	RESISTOR FIXED 1K 1/4W 5%	2
R420,424	35206	RESISTOR FIXED 220 1/4W 5%	2
R421,425	36825	RESISTOR FIXED 27.0K 1/4W 5%	2
R422,426	36795	RESISTOR FIXED 330 1/4W 5%	2
T402,403	05400DT-30	TRANSFORMER ASSY GATE DRIVE	2
	36820	PCB GATE DRIVE	1
	36922	CONNECTOR MALE 10 PS. RT. ANGLE	1
05400DT-32 PCB ASSY ANALOG/PWM			
C409,425	36917	CAPACITOR 270 PF 100 V 5%	2
C419,420, 423,426,427	36673	CAPACITOR CERAMIC .1MF 50V	5
C421,424	36905	CAPACITOR FILM 1 UF 50V 5%	2
C422	36844	CAPACITOR FILM .001 MF 50 VOLT MIN	1
D418	36849	DIODE SIL ZENER 6.8V 1N4736B	1
D419	35688	DIODE SIL ZENER 4.7V 1N5230B	1

ASSOCIATED RESEARCH INC.	**REPLACEMENT PARTS LIST** MODEL 5002D	S/N 113 TO 134 REVISION A ECO 4528 DATE 7-21-93 PAGE 12 OF 12

SYM	PART #	DESCRIPTION	QTY
R414	36833	RESISTOR FIXED 34.0K 1/4W 1%	1
R426	36834	RESISTOR FIXED 3.32K 1/4W 1%	1
R427	36832	RESISTOR FIXED 681K 1/4W 1%	1
R428,433, 436,437	36828	RESISTOR FIXED 1.0K 1/4W 1%	4
R429,432	36829	RESISTOR FIXED 1.2K 1/4W 5%	2
R430,434	36827	RESISTOR FIXED 5.11K 1/4 W 1 %	2
R431	35094	RESISTOR FIXED 15K 1/4W 1%	1
R435	36830	RESISTOR FIXED 560 1/4W 5%	1
R438	35222	RESISTOR FIXED 680 1/4W 5%	1
R439	36795	RESISTOR FIXED 330 1/4W 5%	1
Q405	36964	TRANSISTOR NPN 2N2222	1
Q406	36852	TRANSISTOR PNP 2N2907	1
U403	36854	IC PWM SG3731	1
U404	36855	IC COMPARATOR LM311N	1
	36923	CONNECTOR MALE 7 POS. RT. ANGLE	1
	36822	PCB ANALOG-PWM	1

FOREWORD

This calibration and test procedure is written as a single document that can be used to check individual pcb assemblies, as well as calibrate each assembly as part of a complete unit.

The steps in this procedure that are marked with an asterisk (*), are steps used for qualifying the assembly as a functioning assembly. Once the assemblies have been qualified, a chassis with a complete set of functioning pcb assemblies can be properly calibrated by following the steps marked with an ampersand (@). The and sign (&) denotes steps used to verify that a unit is within specified calibration or if the unit needs calibration.

Before any calibration or calibration checking can be performed, a warmup time of approximately 20 minutes is required for a fully assembled chassis.

POWER AMPLIFIER ASSEMBLY

EQUIPMENT REQUIRED:

Fluke DVM
Hypot unit (5400DT or equivalent)
250k ohm load resistor
Hyamp test leads
oscilloscope
working 5002D with calibrated Driver Board Assembly

TEST PROCEDURE

* 1. Short all four terminals of the PA unit under test power input connector P402 together. Connect the hypot high voltage cable to P402. Connect the hypot return lead to the PA heatsink bracket.

* 2. Perform an AC hypot test on the HVPA unit under test. The unit must withstand 1500VAC for 60 seconds, and leakage must be below 5 ma. Do not exceed 1500 volts during this test. Shut off the hypot unit and disconnect the unit under test. Remove the shorting jumpers from P402.

*@ 3. Install the PA into the 5002D chassis. Connect the power input module assembly to the PA under test. Verify that the power module is set for 115VAC operation and that it has a good 5A slow blow fuse installed.

* 4. Connect the cable from the power transformer to P401 (OUTPUT) of the PA. Connect the power transformer secondary to the 200 milliohm load resistor.Connect the oscilloscope across the load. Set the scope to observe 60 Hz sine waves. Turn on power to the 5002D. Set the current control to minimum.

* 5. Press the TEST button. Slowly increase the current while watching the oscilloscope. Observe a sine wave across the test load. Verify that no noise bursts or ringing are present on the rising or falling edges of the waveform. (Small 'bumps' are acceptable). If noise is seen, note at what voltage and where on the waveform it was seen. Noise on the output is reason for rejection. Otherwise, verify that the output can reach 25A across 200 milliohms without distortion.

MOTHERBOARD ASSEMBLY

EQUIPMENT REQUIRED:

5002D Chassis
Test and jumper Leads
Keithley DVM or equivalent

TEST PROCEDURE

* 1. Plug power supply connector into mother board P13.

* 2. When there are no plug in board assemblies present in the 5400DT chassis, plug in dummy load card extender into driver board slot.

* 3. Check voltage with DVM between +5 test point TP2 and DGND test point TP3 for voltage between +4.9V and +5.2V.

* 4. Check voltage with DVM between +10 test point TP7 and AGND test point TP4 for voltage between +9.9V and +10.10V.

* 5. Check voltage with DVM between -10 test point TP6 and AGND test point TP4 for voltage between -9.70V and -10.30V.

* 6. Check voltage with DVM between +15 test point TP1 and AGND test point TP4 for voltage between +13.50V and +16.50.

* 7. Check voltage with DVM between -15 test point TP5 and AGND test point TP4 for voltage between -14.55V and -15.45V.

LOGIC PCB ASSEMBLY

EQUIPMENT REQUIRED:

5002D Chassis
5002D Extender Card
14-pin and 16-pin DIP Test Clips
Jumper wires with clips
Digital multimeter (Fluke Model 83 or equivalent)
Digital counter/timer (Sanwa 8100LG or equivalent)

INITIAL TEST SETUP

* 1. Turn off the Timer switch.

* 2. Set the Dwell timer to 01.

*@& 3. Set S100 dip switch as indicated on PCB for HYAMP operation. Switches 1 through 5 "ON", and 6 through 8 "OFF"

*@ 4. Insert the card extender into the 5400DT chassis and plug the Logic PCB Assembly into the card extender.

*@ 5. Attach a 14-pin DIP clip to U114 (see Note 1 below).

*@ 6. Connect U114-1 (EOR) to U114-7 (GND) with a jumper (see Note 1 below).

NOTE 1: If the driver board is installed, skip steps 6 and 7 above.

TEST PROCEDURE

* 1. Turn on the power. The READY indicator should light.

* 2. Check for +4.75 to 5.25 VDC from TP100 (+5) to TP101 (DGND).

* 3. Press and hold the TEST switch.
The TESTING indicator should light.

* 4. Release the TEST switch.
The TESTING indicator should turn off.
The PASS indicators should light.

* 5. Turn the Timer switch ON.
The white indicator should light.

* 6. Press and release the TEST switch.
The DWELL indicator should light for about 1 sec. and then turn off.

The TESTING indicator should light.
The PASS indicator should light when DWELL turns off.

* 7. Connect the 14-pin DIP clip to U112 and connect U112-9 (HD) to U112-7 (GND).

* 8. Press TEST.
ALARM, MASTER FAIL, and FAIL should light.
Press RESET to turn them off.
Disconnect U112-9.

DWELL TIMER CALIBRATION

*@ 1. Plug the SANWA frequency counter/timer line cord into a 115V outlet and turn on the power switch.

*@ 2. Set the frequency counter/timer for INTERVAL measurement.

*@ 3. Connect the Red test lead into channel 1 and the black test lead into channel 2.

*@ 4. Set Channel 1 to NONINVERT mode. Set Channel 2 to INVERT mode.

*@ 5. Set the MANU/AUTO switch to MANU mode.

*@ 6. Set the Red Time switch IN and the Blue Frequency switch OUT.

*@ 7. Set the time range for 0.000 sec.

*@ 8. Connect the Red and Black test clips together and connect them to TP108 (DWELL). Connect -COM to TP101 (DGND).

*@ 9. Set the Timer switch ON and DWELL TIME for 1 seconds.

*@ 10. Press and release the MEASURE switch on the SANWA counter/timer to initialize the elapsed time to 0.000.

*@& 11. Press and release the Test switch. The SANWA counter/timer will measure the DWELL time interval. Adjust R100 (TIMER) CW to increase the time or CCW to decrease the time. Repeat steps 10 and 11 until the DWELL time is 1.000 + 1% seconds.

*@& 12. Check DWELL time at the 2,4,8,10,20,40 and 80 second settings. The measured time should be + 1% of that indicated on the DWELL TIME switch.

*@ 13. Apply glyptal to R100.

*@ 14. END OF TEST. Turn off the power and remove the DIP clips and jumpers.

*@ 15. Remove extender card and replace logic board in chassis.

DRIVER PCB ASSEMBLY

EQUIPMENT REQUIRED:

Extender card
14 pin dip test clip
Test leads with clips
DVM FLUKE model 83 or equivalent
Oscilloscope with isolated ground line cord

CALIBRATION PRESET

*@ 1. Disconnect PWR AMP cable J400 from mother board connector P14.

*@ 2. Remove Driver Board from chassis and place in extender card.

*@ 3. Install jumper on P201.

*@ 4. Turn power switch on.

*@ 5. Monitor voltage at pins indicated with reference to AGND test point TP208 and trim associated null pot to 0.00 V +/- .01 V DC.

IC Pins	Null pots
U200-12	1XNL R200
U200-8	1YNL R201
U201-12	2XNL R203
U201-8	2YNL R273

*@ 6. Turn off power. Remove Driver Board from extender card and replace into chassis.

*@ 7. Remove Analog board and place into extender card. Install dip clip on U309 and jumper pins 7 to 3.

*@ 8. Turn on power

*@ 9. Connect test leads and short them together.

RAMP MULTIPLIER ADJUSTMENT

*@ 1. Set timer switch "ON", and DWELL TIME for 5 second.

*@ 2. Set current adjust on the rear panel to maximum clockwise position.

*@ 3. Monitor SETPT test point TP202 with DC DVM, with reference to AGND test point TP208.

*@ 4. Rotate MAX OUT, AC trim pot R257 to full clockwise position .

*@ 5. Voltage should be between -6.0V and -9.0V DC.

*@ 6. Set current adjust on the rear panel to maximum counterclockwise (MIN) position.

*@ 8. Monitor voltage at RMP OUT testpoint TP204 and adjust RMP MULT pot R205 for a voltage between -100.0 mV and -300.0 mV.

*@& 9. Monitor voltage at RMP OUT testpoint TP204 and adjust 1XNL pot, R200. Note reading before TEST. Press Test button. Check reading during DWELL cycle and adjust R200 for the reading that was noted before the test.

@& 10. Repeat STEP 9 until voltage before test and during DWELL cycle are equal +/- 1 mV.

@& 11. With DC DVM, monitor RMP OUT test point TP204 when unit is in the idle state. Note voltage reading with current control at maximum counterclockwise (MIN) position. Rotate current control to maximum clockwise then adjust 1YNL trimpot, R201 for the voltage noted at MIN position.

*@ 12. Repeat STEP 11 until voltage at min and max positions are equal +/- 1 mV.

*@ 13. Repeat step 9 through 12 until you can return to this step having made no further adjustments.

*@ 14. If ANALOG BOARD is not installed in HYAMP a jumper will be needed for the following STEPS. Jumper from AGND testpoint TP208 to U205-5. If ANALOG BOARD is installed continue with procedure.

*@& 15. Monitor voltage at SUM test point, TP205 with DC DVM and adjust RMP MULT pot R205 for smallest positive voltage. Note the smallest voltage that is reached. Take care not to overrotate trimpot in counterclockwise direction.

*@& 16. Set DWELL TIME for 2 seconds and current control at MIN position.

*@& 17. Set DVM to mV scale.

*@& 18. Press test button and check for any change in voltage noted during STEP 15. Voltage should remain constant throughout the DWELL test cycle, within 2mV.

*@ 19. Trim any deviation larger than 2 mV seen in STEP 19 by rotating RAMP MULT pot R205, counterclockwise one eighth of a turn and repeat STEP 18.

@ 20. Recheck STEP 18 and 19 for proper adjustment.

OSCILLATOR ADJUSTMENT

*@& 1. Monitor OSC test point TP206 with a frequency counter and adjust AC HZ, 60, pot R252 for a frequency of 60 Hz +/- .1 Hz.

AC MULTIPLIER ADJUSTMENT

*@ 1. Monitor voltage at PADRV test point TP207 with AC DVM.

*@ 2. Adjust 2XNL trimpot R203 for minimum voltage on the DVM. Note as R203 is rotated in one direction the voltage will decrease, reach a minimum and then begin to increase.

*@ 3. Monitor voltage at PADRV test point TP207 with DC DVM. Set DVM to mV scale.

*@ 4. Adjust AC MULT trimpot R206 for 000 mV dc +/- 10 mV.

*@ 5. Set timer switch "ON", and DWELL TIME for 30 seconds

*@ 6. Set current control on rear panel to MIN position.

*@ 7. Monitor voltage at PADRV test point TP207 with AC DVM.

*@ 8. Press test button and rotate rear panel current control clockwise until an AC voltage of 7.5 to 8.0V on DVM is reached, if voltage control is rotated to far clockwise the voltage will begin to decrease.

*@ 9. While test is still in process, switch DVM to DC V scale and adjust 2YNL trimpot R273 for 0.000 V DC +/- .050 V.

@ 10. Return to STEP 1. and recheck adjustment. Recalibrate where necessary.

*@& 11. Turn off power and remove jumper on P201.

@ 12. Replace PWR AMP cable J400 to mother board connector P14.

@ 13. Glyptal all pots except for MAX OUT AC.

ANALOG PCB ASSEMBLY

EQUIPMENT REQUIRED:

HIGH POWER LOAD BANK
25 AMP AC AMMETER

TEST PROCEDURE
PRESET

*@ 1. Rotate R328 (Max MO Trip) and R333 (OV Trip) to full clockwise position.

*@ 2. Connect output leads to Hyamp. Turn on power.

*@& 3. Attach 5002D output leads to approximately a 200 milliohm but not greater that 200 milliohm load resistor.

*@& 4. Connect a AC DVM standard across the load.

*@& 5. Rotate the DRIVER board R257 (MAX OUT AC) trimpot to full clockwise position.

*@ 6. Rotate rear panel current adjust to a full CCW position (MIN).

*@ 7. Rotate resistance trip to full clockwise position.

OVER VOLTAGE TRIP ADJUSTMENT

*@ 1. Press the test button and rotate the rear panel current adjust clockwise until 6.05V is reached on the DVM.

*@ 2. Rotate R333 (OV TRIP) counterclockwise until failure occurs.

*@ 3. Press reset button.

*@ 4. Back the rear panel adjust a few turns CCW.

*@& 5. Press test and raise the current to verify that a failure does not occur until voltage on DVM is between 6.0 and 6.1V.

FULL SCALE METER ADJUSTMENTS
DRIVER BOARD ASSEMBLY MAXIMUM CURRENT ADJUSTMENT

*@ 1. Set the Standard Ammeter to measure 25 A AC. Connect the 5002D leads to the ammeter input.

*@& 2. Rotate MAX OUT AC trimpot R257 to its full counterclockwise position. Rotate rear panel current control to its full

clockwise (MAX) position. Press test button and adjust MAX OUT AC trimpot R257 for maximum output +4% on the standard. If max output 25 A, set to 26.0 Amps. Press reset.

AMMETER FULL SCALE ADJUST

*@ 1. Press the TEST button and adjust the output current to maximum on the ammeter DVM. Adjust R331 (A FS) for the same value on the 5002D front panel ammeter. Press the RESET switch.

*@& 2. Check tracking at other points from 3 to 25 amps every 10 amps. Readings should be +/- (3% of reading + 1LSD)

MO METER SCALING ADJUSTMENT

*@ 1. Set Dwell time for 10 sec. and output current to 11A

*@ 2. Attach output leads to the standard resistor of approximately 100 milliohms (+/- 10%).

*@ 3. Rotate rear panel milliohm trip to maximum clockwise position.

*@ 4. Press test button and adjust R330 (MO FS) for the measured value of the standard +/- .1 milliohms

*@& 5. Set current to 3A and check reading at 50 mOHM and 200Mohm. The front panel milliohm meter on 5002D should be +/- (3% of reading + 1 LSD) of standard value.

*@& 6. Set current to 25A and check reading at 50 mOHM and 200Mohm. The front panel milliohm meter on 5002D should be +/- (3% of reading + 1 LSD) of standard value.

MAXIMUM TRIP POINT ADJUST

*@& 1. Rotate rear panel milliohm trip to full clockwise position.

*@& 2. Set 5002D to setup mode. If milliohm meter is overloaded adjust R328 (MAX MO TRIP) counterclockwise until a reading is seen on the meter.

*@& 3. Adjust R328 (MAX MO TRIP) clockwise until 199.9 milliohms is reached. Then rotate trimpot an additional 1 turn clockwise or until maximum rotation is reached. This will adjust the max trippoint between 200.0 and 208.0 milliohms.

*@ 4. Switch to the RUN mode.

TRIP POINT VERIFICATION

* 1. Connect the 50 mOHM load resistor to the 5002D test cables. Adjust the rear panel Milliohm trip adjustment pot full clockwise. Press the TEST button.

* 2. Slowly adjust the milliohm trip adjustment pot counterclockwise until the FAIL indicator illuminates. Note the indicated resistance before the failure.

* 3. Switch to SETUP mode, the meter reading in setup mode should be +/- 1% of that noted on the panel meter before the failure.

* 4. Check failure at other values approximately every 50 milliohms from 50 to 200 milliohms.

MINIMUM CURRENT SET VERIFICATION

* 1. Switch to SETUP mode.

* 2. Adjust rear panel current adjust for full CCW (min) position.

* 3. Verify that minimum set current is between 1 and 3 Amps.

* 4. Switch to RUN mode.

REAR PANEL ADJUSTMENTS

REMOTE INTERFACE PCB ASSEMBLY

EQUIPMENT REQUIRED:

DVM FLUKE model 83 or equivalent
0-12V DC POWER SUPPLY

REMOTE MO METER ADJUSTMENT

*@ 1. Monitor KV(+) test point TP1 to KV(-) test point TP2 with DC DVM.

*@ 2. With Hyamp in idle state and front panel MO meter reading of 00.0 +/- 1 LSD, adjust KV ZERO trim pot R706 for 0.000v on the DVM.

*@ 3. Set timer switch "ON", and DWELL TIME for 99 seconds.

*@ 4. Connect load of approximately 200 milliohms.

*@ 5. Switch to setup mode and adjust current to 25 Amps and ohm trip to maximum then return to run mode.

*@ 6. Press test button and adjust KV FS trim pot R700 for .05 times the front panel reading (ie. front panel 200 milliohms set DVM to 10V).

*@& 7. Repeat steps 2 through 6 and check for proper adjustment.

@& 8. Check tracking at 25 milliohm increments. Reading on DVM should be .05 times that on front panel +/- 1%.

REMOTE AMMETER ADJUSTMENT

*@ 1. Monitor MA(+) test point TP3 to MA(-) test point TP4 with DC DVM.

*@ 2. With Hyamp in idle state and front panel Ammeter reading of 0.00 +/- 1lsd, adjust MA ZERO trim pot R704 for 0.000v on the DVM.

*@ 3. Set timer switch "ON", set DWELL TIME for 99 seconds.

*@ 4. Short the output leads together, press the test button and adjust current on front panel ammeter for 25.0 A.

*@ 5. Adjust MA FS trim pot R701 for 5.00 V on DVM.

*@& 6. Repeat steps 2 through 5 and check for proper adjustment.

@& 7. Check tracking at 10 amp increments down to 3 amps. Readings on DVM should be .2 times that on front panel +/- 1%.

REMOTE CURRENT SET INPUT TEST

* 1. Set timer switch "ON", and DWELL TIME for 99 seconds.

* 2. Jumper Remote Select inputs on rear panel Interface Connector pins 9 and 22.

3. Short the output leads together.

* 4. Press the test button and rotate the current control clockwise. Check to see that the rear panel current adjustment has been disabled by viewing the ammeter.

* 5. Connect a 0 to 12 volt dc power source to the Remote Voltage Set inputs pins, positive pin 10 and negative pin 23.

* 6. Set voltage for 0 volts dc.

* 7. Press test button and raise voltage to 10.00Vdc, output current of Hyamp should reach maximum specified current.

AC FACTORY SETTINGS

(Note: Factory settings should be done as a last step when calibration and specification data are checked)

1. Switch to setup mode.

2. Adjust current for 25 amps and resistance trip for 100 milliohms. Return to run mode. Unit should also be switched to hyamp only mode and timer off.

FINAL TEST PROCEDURE
USE SPECIFICATION DATA SHEET WHEN FOLLOWING THIS PROCEDURE

HIPOT TEST

A. EQUIPMENT NEEDED:

1. 5400DT AC Hypot Test Set.

B.INITIAL SETUP

1. Plug the hipot test set into a 115VAC outlet and turn on the power. Let the hipot warm up for 10 minutes.

2. Set high voltage output to 1500VAC.

3. Set high current trip point to 12.5 ma.

4. Set low current trip point to .5 ma.

5. Set Ramp timer to 1 sec.

6. Set Dwell timer to 60 sec.

7. Set the Continuity Switch and Timer Switch to the ON position.

C. TEST PROCEDURE

1. Plug the line cord of the Item Under Test (IUT) into the high voltage receptacle on the hipot test set.

2. Connect the return lead from the hipot test set to the IUT chassis ground post located on the rear panel.

3. Set the IUT power switch to the ON position.

4. Press and release the hipot Test Switch. There should be no arc breakdown, leakage or continuity failures indicated.

LINE REGULATION

A. EQUIPMENT NEEDED

1 100-260VAC variable voltage source
2. Line voltage meter
3. Clamp-on current meter
4.

B. INITIAL SETUP

1. Connect the IUT to the variable voltage AC source
2. Connect the line voltage meter across the output of the AC source.
3. Connect the clamp-on line current meter to the AC source.
4. Connect the load resistor across the output of the IUT.
5. Set the rear panel current control of the IUT for minimum output.

C. TEST PROCEDURE

1. Set the AC source for 115VAC.
2. Check the voltage selection on the IUT to be sure it is set for 110-120VAC operation. Turn on the IUT.
3. Press the Test switch and set the output to 25.0 A noted in the table and record the current in the space for set current on the data sheet.
4. Measure the line current.
5. Decrease the AC voltage to 100VAC.
6. Press the Test Switch and measure the line current and output current, and record on the data sheet.
7. Increase the AC voltage to 130VAC and repeat step 6.
8. Turn off the IUT power switch.
9. Unplug the line cord from the power entry module and set the IUT for 220-240VAC operation. Plug the line cord into the power entry module.
10. Set the AC source for 230VAC.
11. Repeat step 3 and 4.
12. Decrease the AC voltage to 200VAC and repeat step 6.
13. Increase the AC voltage to 260VAC and repeat step 6.
14. Turn off the IUT power switch. Unplug the line cord and reset the IUT for 110-120VAC operation. Plug the line cord into the power entry module.

LOAD REGULATION

A EQUIPMENT NEEDED

1 100-260VAC variable voltage source
2. Line voltage meter
3. Multiple resistor load box

B. INITIAL SETUP

1. Set the AC source for 115VAC.
2. Connect the IUT to the variable voltage AC source
3. Check the voltage selection on the IUT to be sure it is set for 110-120VAC operation.
4. Connect the line voltage meter across the output of the AC source. Turn on IUT.
5. Connect the load resistor which is equal to or less than 200 milliohm in series with the output of the IUT.

6. Switch to SETUP mode. Set the output current control of the IUT for 25.0 A output.
7. Switch to RUN mode.

C. TEST PROCEDURE

1. Press the Test switch and set the output to 25 amps.
2. Press reset button and take care to leave voltage control setting at position from step 1.
3. Replace load across the output of the IUT with 50 milliohms.
4. Press test button and record current measured with the new load.
5. Press reset button to deenergize the output.
6. Set AC source for 230VAC.
7. Turn off IUT. Remove voltage selection block from input module and replace it in the 230VAC position. Turn on IUT.
8. Repeat steps 1 through 5.

AMMETER (front panel and remote)

A. EQUIPMENT NEEDED

1. Standard Ammeter
2. DVM

B. INITIAL SETUP

1. Connect ammeter to output of IUT.
2. Connect DVM to remote Ammeter output terminals 11 (+) and 24 (-).
3. Set current control to minimum.
4. Set timer switch "ON", and DWELL TIME for 99.

C. TEST PROCEDURE

1. Press test button and adjust current on front panel for currents indicated in table. Record currents from ammeter standard and remote DVM in table.

MILLIOHM METER (front panel and remote)

A. EQUIPMENT NEEDED

1. Multiple resistance load bank
2. DVM

B. INITIAL SETUP

1. Connect the first load indicated in the table to the output of the IUT.

2. Connect DVM to remote KV meter output terminals 12 (+) and 25 (-).
3. Set current control to minimum.
4. Set timer switch "Off".

C. TEST PROCEDURE

1. Press the test button and raise the current until the desired current, indicated in the table, is reached on the front panel.
2. Record readings from the standard resistance bank, the indicated front panel resistance, and the remote DVM in the table.
3. Continue raising the current and recording readings until a load resistance change is required.
4. Repeat procedure for all loads indicated.

SET RESISTANCE TRIP

A. EQUIPMENT NEEDED

1. Multiple resistance power load box

B. INITIAL SETUP

1. Connect the load resistor to the 5002D test cables. Adjust the rear panel Milliohm trip adjustment pot fully clockwise.
2. Turn rear panel RESISTANCE trip pot to maximum clockwise position.
3. Switch to SETUP mode. Set current to 25.0 A.
4 Return to RUN mode.

C. TEST PROCEDURE

1. Press the TEST button.

2. Slowly adjust the milliohm trip adjustment pot counterclockwise until the FAIL indicator illuminates. Note the indicated resistance before the failure.

3. Switch to SETUP mode, the meter reading in setup mode should be +/- 1% milliohms of that noted before the failure.

4. Check failure at other values approximately every 50 milliohms from 50 to 200 milliohms.

SET CURRENT

A. EQUIPMENT NEEDED

1. Multiple resistance power load bank

B. INITIAL SETUP

1. Connect test leads to approximately a 200 mOHM.
2. Set timer "ON" and DWELL time for 60 seconds.
3. Switch to SETUP mode and adjust output current for 3.0 A.
4. Switch to run mode.

C. TEST PROCEDURE

1. Press test button and record run mode current in the table.
2. Press Reset.
3. Switch to SETUP mode and adjust to next value in the table.
4. Switch to RUN mode.
5. Repeat steps 1. to 3. for all values.

DWELL TIME

A. EQUIPMENT NEEDED

1. Stop Watch

B. INITIAL SETUP

1. Set Timer "ON", RAMP TIME 00, DWELL TIME 01.

C. TEST PROCEDURE

1. Press test button and start stop watch simultaneously. Stop the stop watch when the DWELL light goes out on completion of TEST.
2. Compare times with those in the table.

REMOTE INTERFACE

A. EQUIPMENT NEEDED

1. Interface cable test fixture
2. DMM with ohms
3. 0-12V DC Power supply

B. INITIAL SETUP

1. Plug in the test fixture to the 25pin D subminiature socket on the rear panel.
2. Turn timer "OFF".

C. TEST PROCEDURE

1. Generate a switch closure between pins 1 and 14. See that test has initialized.
2. Remove switch closure.
3. Turn timer "ON". current control at minimum.
4. Set Dwell Time for 10 seconds.
5. Press Test.
6. Generate switch closure between pins 2 and 15. See that test has deenergized.
7. Connect ohmmeter between Pins 5 to 18 leave output of IUT open and press test button. See that before the failure the ohmmeter shows an open circuit. After the failure the meter should indicate a short. Press reset.
8. Short output leads together.
9. Connect ohmmeter between Pins 6 to 19 turn timer off. Set to the HYAMP\HYPOT mode. Press and release the test button. See that on release of the test button the ohmmeter should indicate a short for about one tenth of a second.
10. Connect ohmmeter between Pins 7 to 20 and press the reset button. See that before the button press the ohmmeter shows an open circuit. After the button press the meter should indicate a short. Release the reset.
11. Connect the ohmmeter between pins 4 and 17.
12. Press and release test button generating no failures. The Pass light on the front panel should illuminate. The ohmmeter should indicate a short.
13. Connect the ohmmeter between pins 3 and 16.
14. Meter should indicate open circuit.
15. Press Test and note TESTING light on front panel. Ohmmeter should show short circuit. Release Test.
16. Set timer switch "ON", and DWELL TIME for 99 seconds.
17. Jumper Remote Select inputs on rear panel Interface Connector pins 9 and 22.
18. Press the test button and rotate the current control clockwise. Check to see that the rear panel current adjustment has been disabled by viewing the ammeter.
19. Connect a 0 to 12 volt dc power source to the Remote Voltage Set inputs pins, positive pin 10 and negative pin 23.
20. Set voltage for 0 volts dc.
21. Raise voltage to those specified in the table and record output current from the front panel ammeter.

AGING TEST
Stand Alone mode

A. EQUIPMENT NEEDED:

1. HYAMP IUT

B. INITIAL SETUP

1. Switch to Setup mode and set current to 25A and resistance to maximum. Return to Run mode.

2. Set timer switch to "off".

3. Install output leads and short them together.

C. TEST PROCEDURE

1. Install jumper in remote interface Remote Test inputs pins 1 to 14 to start test.

2. Record start time and current and run test for 30 minutes.

3. Observe unit for any abnormal operation.

4. After 30 minutes remove remote test jumper.

AGING TEST
Interconnected mode

A. EQUIPMENT NEEDED:

1. 5400DT AC Hypot Test Set.

2. HV Load resistor 1M ohm.

3. HV output receptacle test leads.

B. INITIAL SETUP

1. Connect Hypot to Hyamp with HV interconnect cable and control cable that is fitted with a additional Hyamp Test inputs.

2. Install HV test leads to the Hyamp front panel receptacle and connect to a 1M ohm load.

C. TEST PROCEDURE

1. Set Hypot timer to "off", press test button and raise voltage to 5KV AC to verify high voltage output from the Hyamp by

viewing the Hypot ma meter for aproximately 5ma. Release test switch.

2. Remove High voltage test lead from Hyamp and set Hypot timer to "on" Ramp for 0 sec and Dwell for 2 sec.

3. Set Hyamp timer "on" and Dwell time for 2 sec. Set output to 25 A.

4. Short test leads of Hyamp together.

5. Switch to HYAMP\HYPOT mode.

6. Connect Hyamp Remote test inputs to a timer that initializes a test every 5 to 6 seconds.

7. Start timer. Hyamp should start and run a 2 second 25A test, then the Hypot should initialize and run a 2 second 5KV test out to the Hyamp output receptacle.

8. Let this cycle repeat for 30 minutes observing unit for any abnormal operation.

9. Record data and start time. After 30 minutes stop the timer and proceed with factory settings.

SECTION III

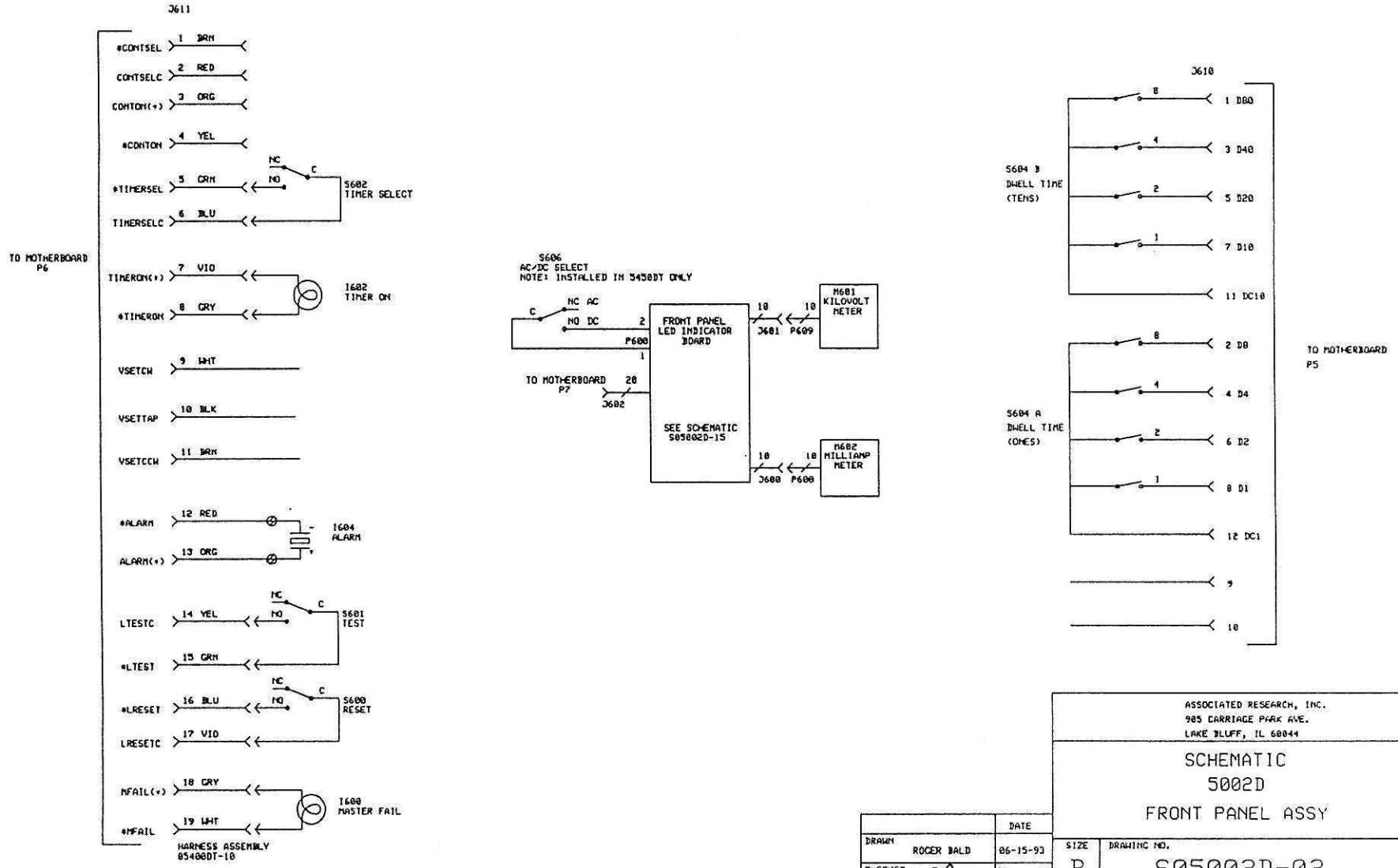
CALIBRATION PROCEDURE

SECTION IV

SCHEMATIC

MODEL 5002D

SIZE	DOCUMENT #	PGS	DOCUMENT DESCRIPTION
A	S05002D	1	SCHEMATIC INDEX 5002D
A	S05002D-02	2	CONTROL PANEL ASSEMBLY
A	S05002D-03	2	REAR PANEL ASSEMBLY
A	S05002D-04	3	MOTHER BOARD ASSEMBLY
A	S05002D-05	4	LOGIC ASSEMBLY
A	S05002D-06	3	ANALOG ASSEMBLY
A	S05002D-07	4	DRIVER ASSEMBLY
A	S05002D-15	1	INDICATOR ASSEMBLY
A	S05002D-16	1	POWER AMPLIFIER ASSEMBLY
A	S05002D-19	1	SHUNT INTERFACE ASSEMBLY
A	S05002D-25	2	REMOTE INTERFACE ASSEMBLY
A	S05400DT-31	1	GATE DRIVE ASSEMBLY
A	S05400DT-32	1	ANALOG/PWM ASSEMBLY



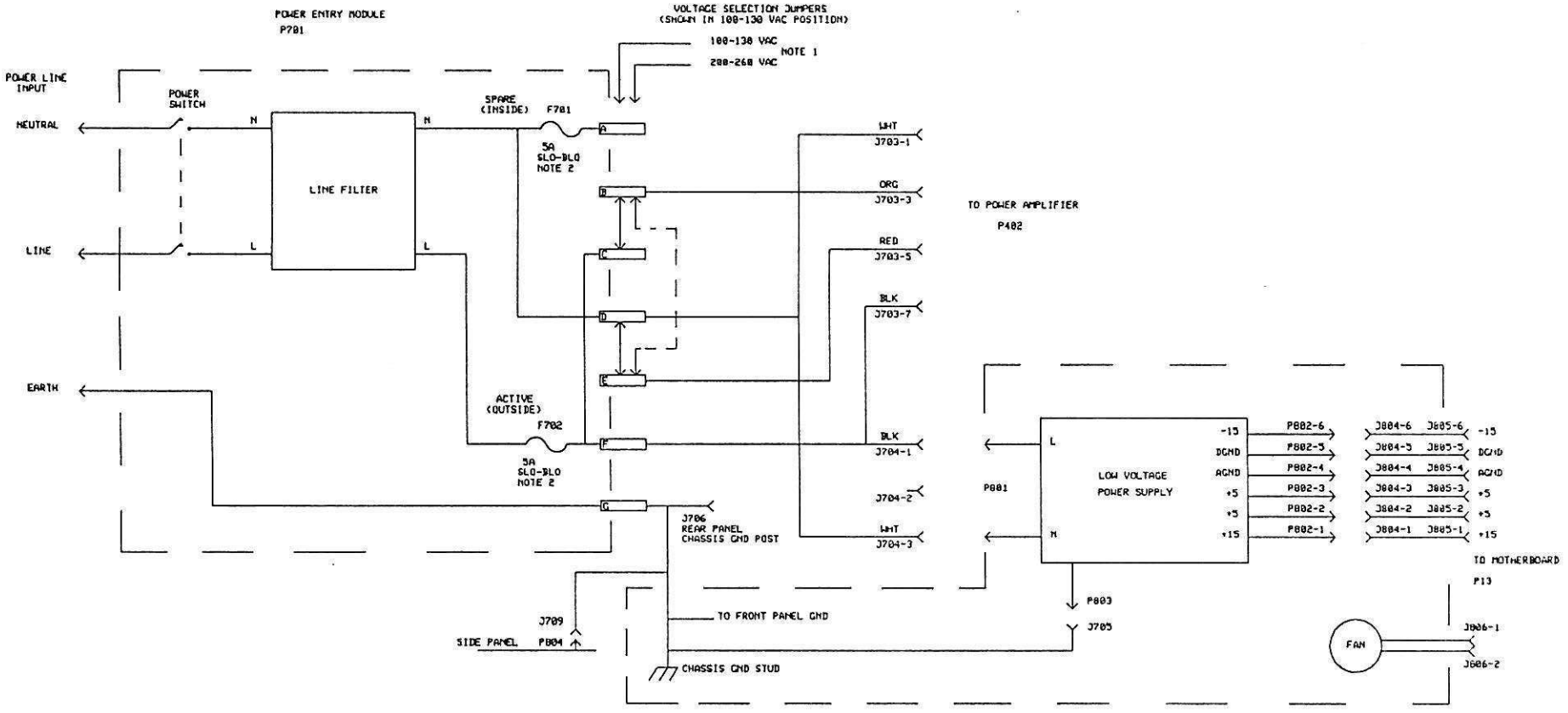
		DATE
DRAWN	ROGER BALD	06-15-93
CHECKED	RB	9-1-93
APPROVED	RCB	9-8-93

ASSOCIATED RESEARCH, INC.
985 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC
5002D
FRONT PANEL ASSY

SIZE	DRAWING NO.	REV.
B	S05002D-02	–

SCALE | FILE: 5002D-02.FSH | SHEET 1 OF 2



NOTE: LOW VOLTAGE POWER SUPPLY AND CABLE ARE SHOWN FOR REFERENCE ONLY. THEY ARE NOT PART OF THE REAR PANEL ASSEMBLY.

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC
5002D
REAR PANEL ASSY

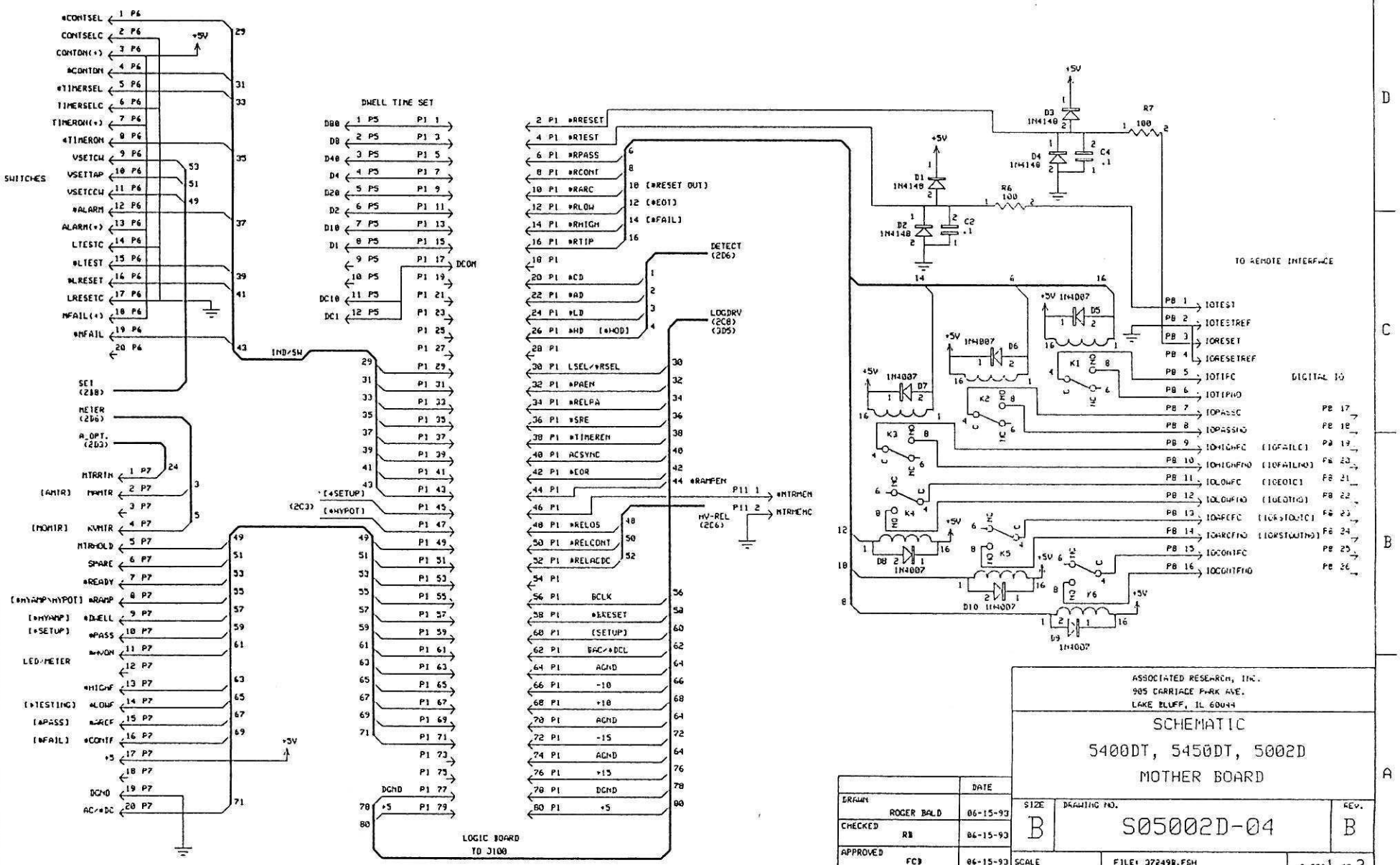
		DATE
DRAWN	ROGER BALD	06-14-93
CHECKED	RB	9-1-93
APPROVED	RCB	9-8-93

SIZE	DRAWING NO.	REV.
B	S05002D-03	-

SCALE | FILE: 5002D-03.FSH | SHEET 1 OF 2

D C B A

8 7 6 5 4 3 2 1



	DATE
DRAWN ROGER BALD	06-15-93
CHECKED RB	06-15-93
APPROVED FCD	06-15-93

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC

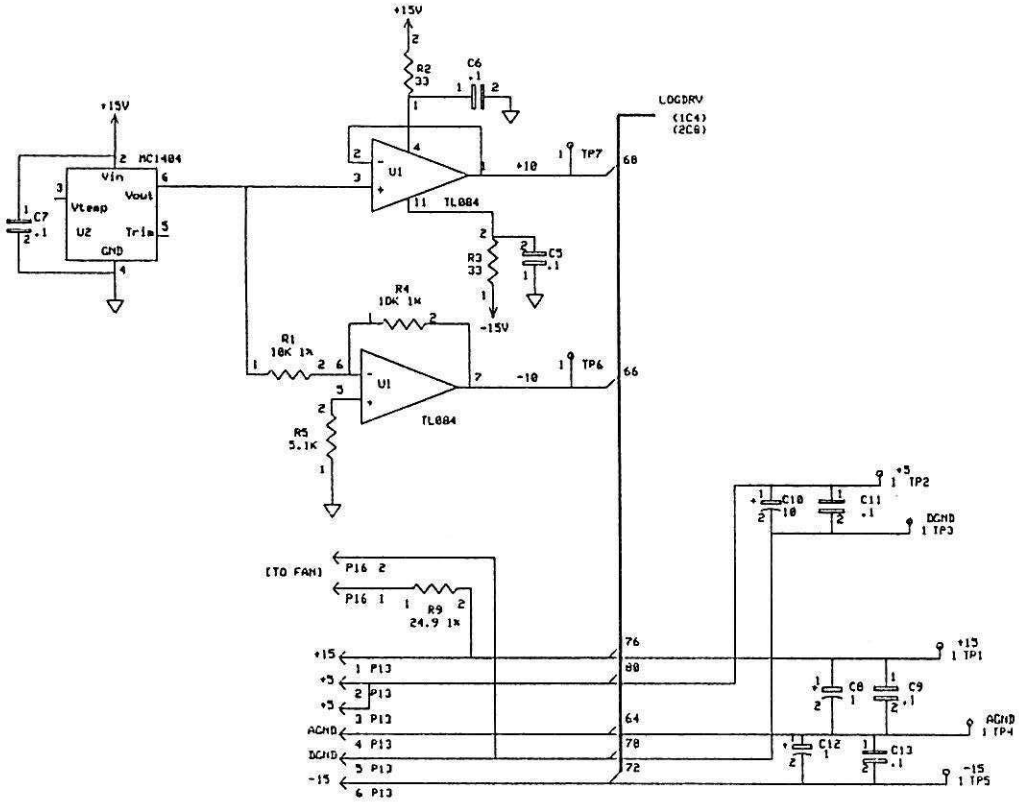
5400DT, 5450DT, 5002D

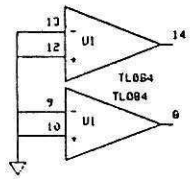
MOTHER BOARD

SIZE	DRAWING NO.	REV.
B	S05002D-04	B

SCALE | FILE: 372498.FSH | SHEET 1 OF 3

REVISION					
REV.	DESCRIPTION	ECO	DATE	APR.	CHK.
-	COPIED 5400DT-04 REV. B SCHEMATIC AND ADDED SIGNALS FOR 5002D, ADDED R8, R9, P16.	-	06-15-93	RB	RB
A	DELETED C TO NO JUMPERS ON K1-K6 AND UPDATED PCB TO REV A.	4530	07-29-93	RB	FCB
B	DELETED R8	4528	09-03-93	RB	FCB





NOTES:

1. UNLESS OTHERWISE NOTED ALL CAPACITOR VALUES ARE IN uF AND RESISTORS ARE 1/4W 5%.
2. BRACKETED SIGNAL NAMES [ ] REFERENCE 5002D, OTHERS ARE COMMON TO ALL MODELS OR 5400DT ONLY.

REFERENCE DESIGNATORS

LAST USED		NOT USED
C13	R9	C1
D18	TP7	C3
K6	U2	R8
P16		

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC

5400DT, 5450DT, 5002D

MOTHER BOARD

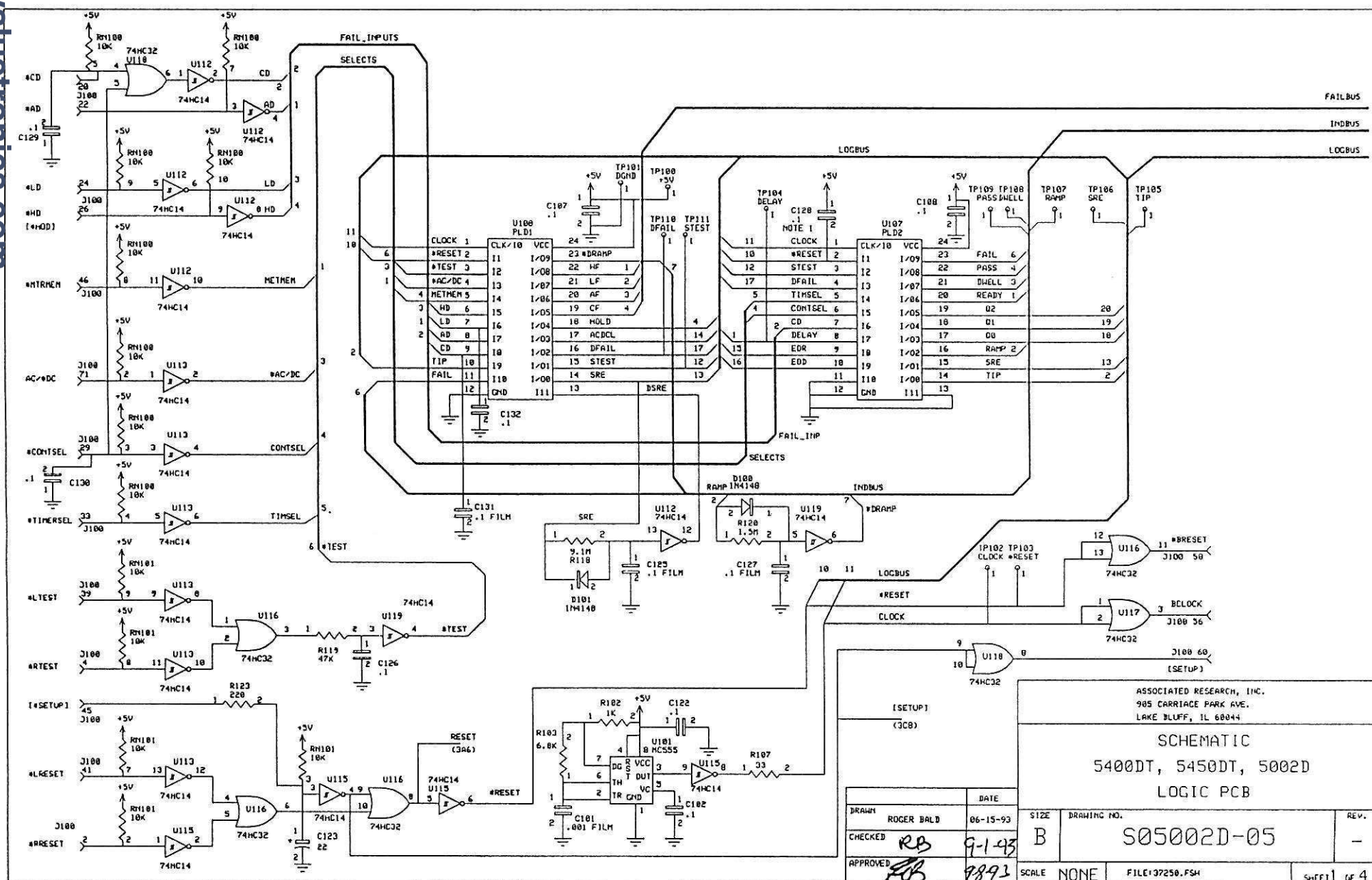
		DATE
DRAWN	ROGER BALD	06-15-93
CHECKED	RB	06-15-93
APPROVED	FCB	06-15-93

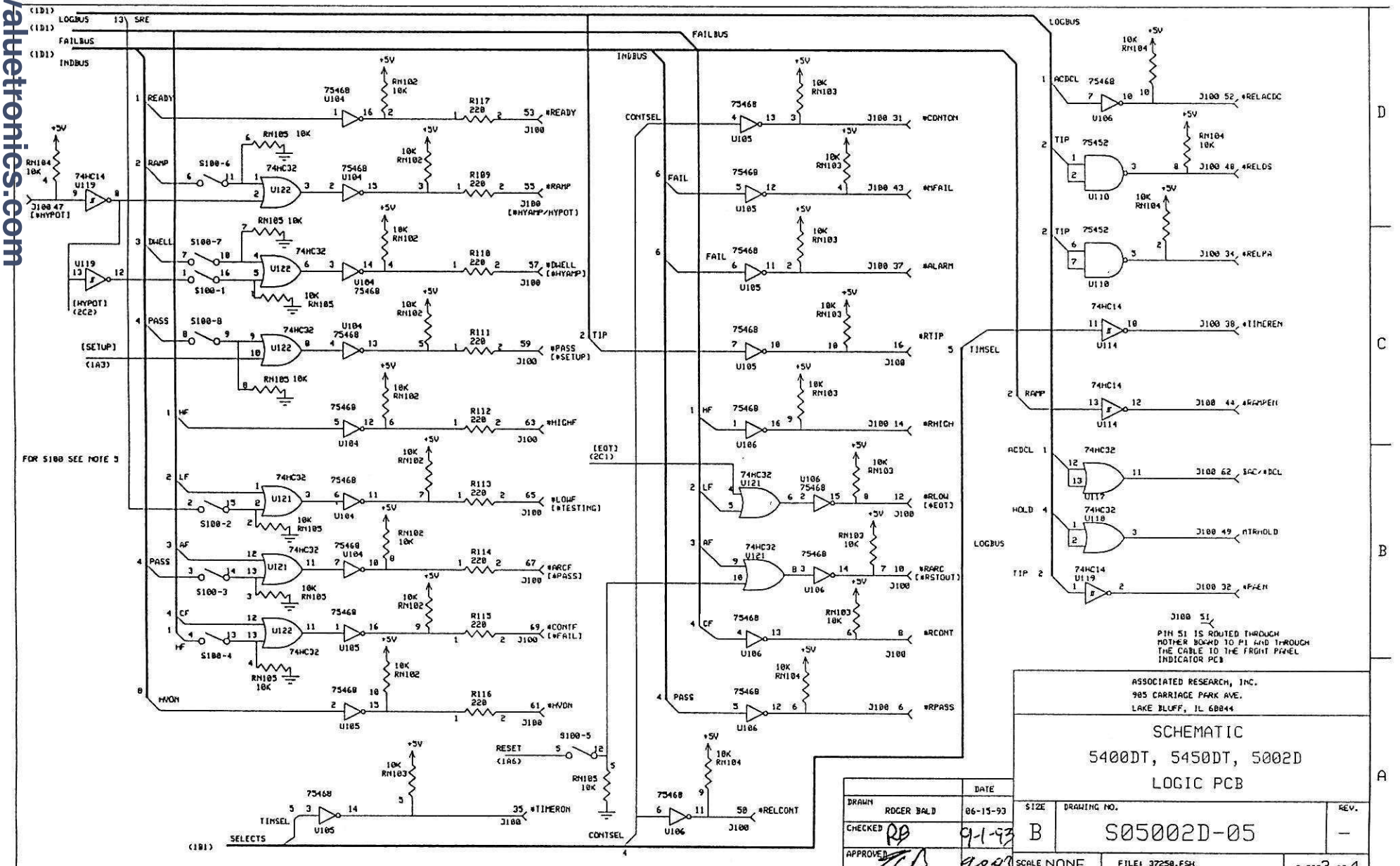
SIZE	DRAWING NO.	REV.
B	S05002D-04	B

SCALE | FILE: 372490.FSH | SHEET 3 OF 3

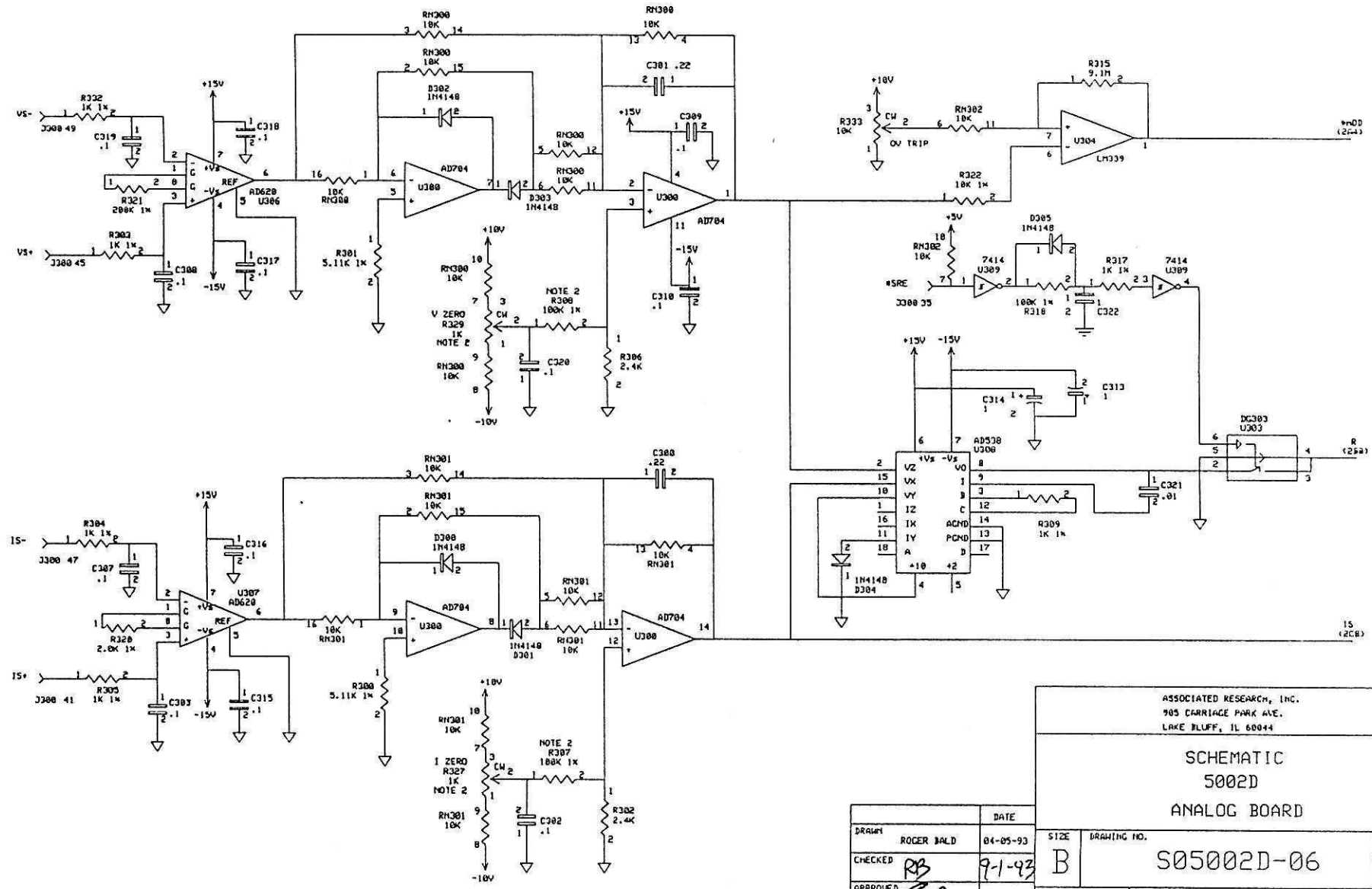
8 7 6 5 4 3 2 1

D C B A



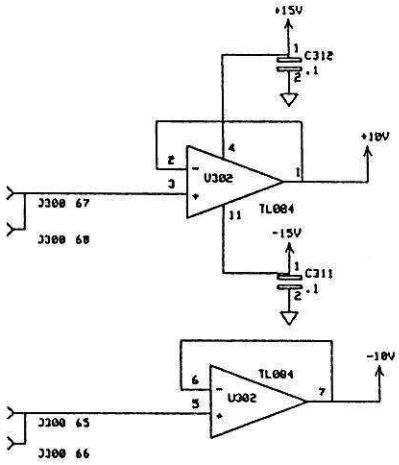


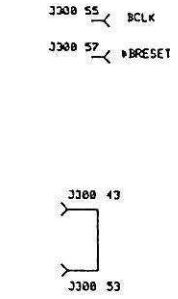
ASSOCIATED RESEARCH, INC. 905 CARRIAGE PARK AVE. LAKE BLUFF, IL 60044		
SCHEMATIC 5400DT, 5450DT, 5002D LOGIC PCB		
DRAWN ROGER BALD	DATE 06-15-93	SIZE B
CHECKED RB	9-1-93	DRAWING NO. S05002D-05
APPROVED	9/8/93	REV. -
SCALE NONE	FILE: 37250.FSH	SHEET 3 OF 4

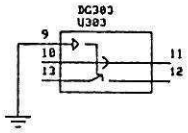


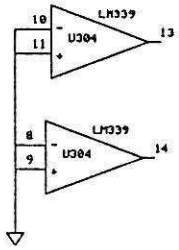
ASSOCIATED RESEARCH, INC. 965 CARRIAGE PARK AVE. LAKE BLUFF, IL 60044		
SCHEMATIC 5002D ANALOG BOARD		
DRAWN ROGER BALD	DATE 04-05-93	SIZE B
CHECKED RB	9-1-93	DRAWING NO. S05002D-06
APPROVED	9-8-93	REV. —
SCALE	FILE: 37202.FSH	SHEET 1 OF 3

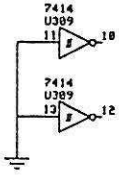
REVISION					
REV.	DESCRIPTION	ECO	DATE	APR.	CHK.

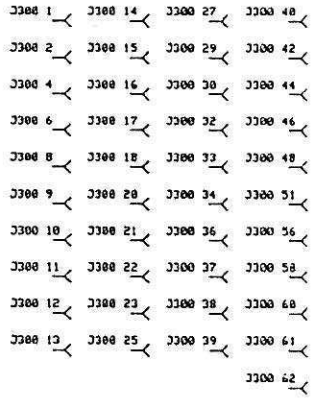






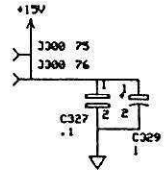


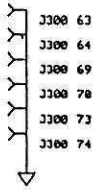


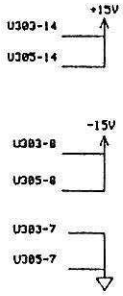


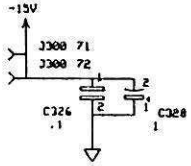
LAST USED

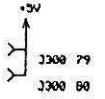
C330
D305
J300
R333
RM302
U309

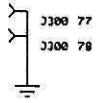


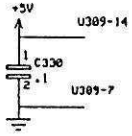












NOTES:

1. UNLESS OTHERWISE NOTED ALL CAPACITORS ARE IN uF AND RESISTORS ARE 1/4W 5%. RESISTOR NETWORKS ARE .1W .5% AND .1% MATCHED.
2. R307, R308, R327, AND R329 ARE NOT INSTALLED SHOWN ONLY FOR REFERENCE.

		DATE
DRAWN	ROGER BALD	04-05-93
CHECKED	RB	9-1-93
APPROVED	RB	9-8-93

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

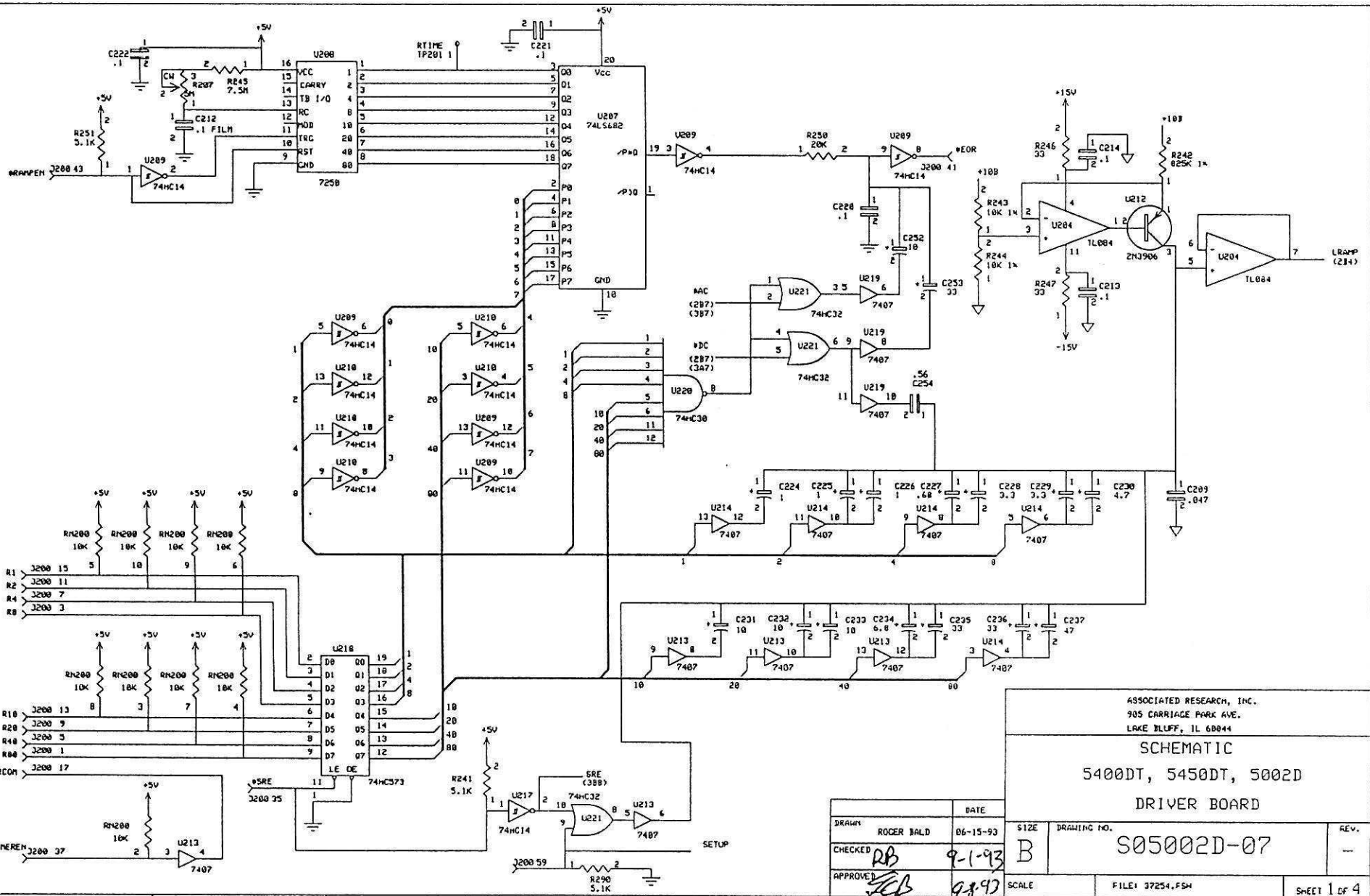
SCHEMATIC
5002D
ANALOG BOARD

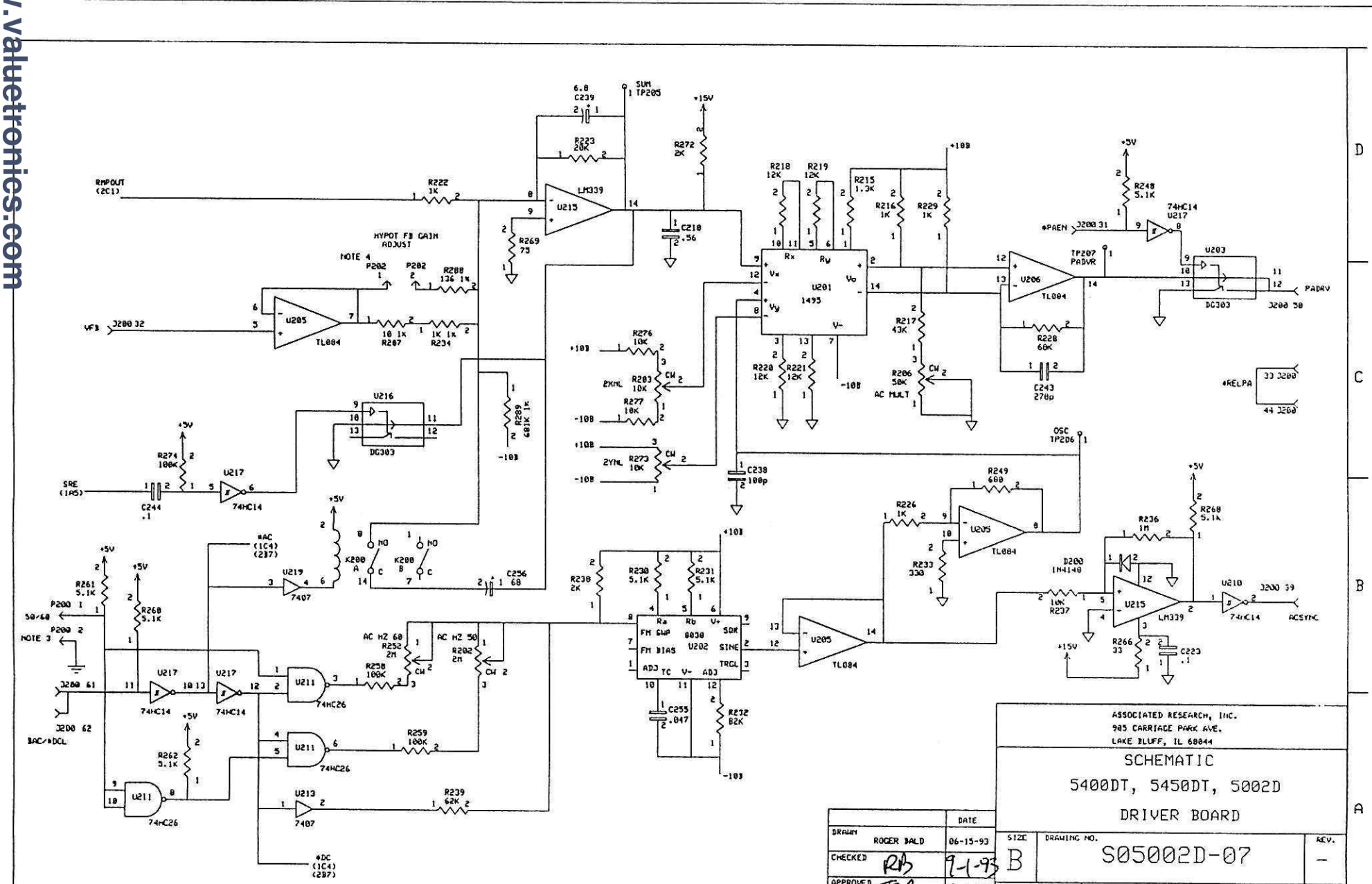
SIZE	DRAWING NO.	REV.
B	S05002D-06	–

SCALE	FILE: 37202.FSH	SHEET 3 OF 3

8 7 6 5 4 3 2 1

D C B A





ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC

5400DT, 5450DT, 5002D

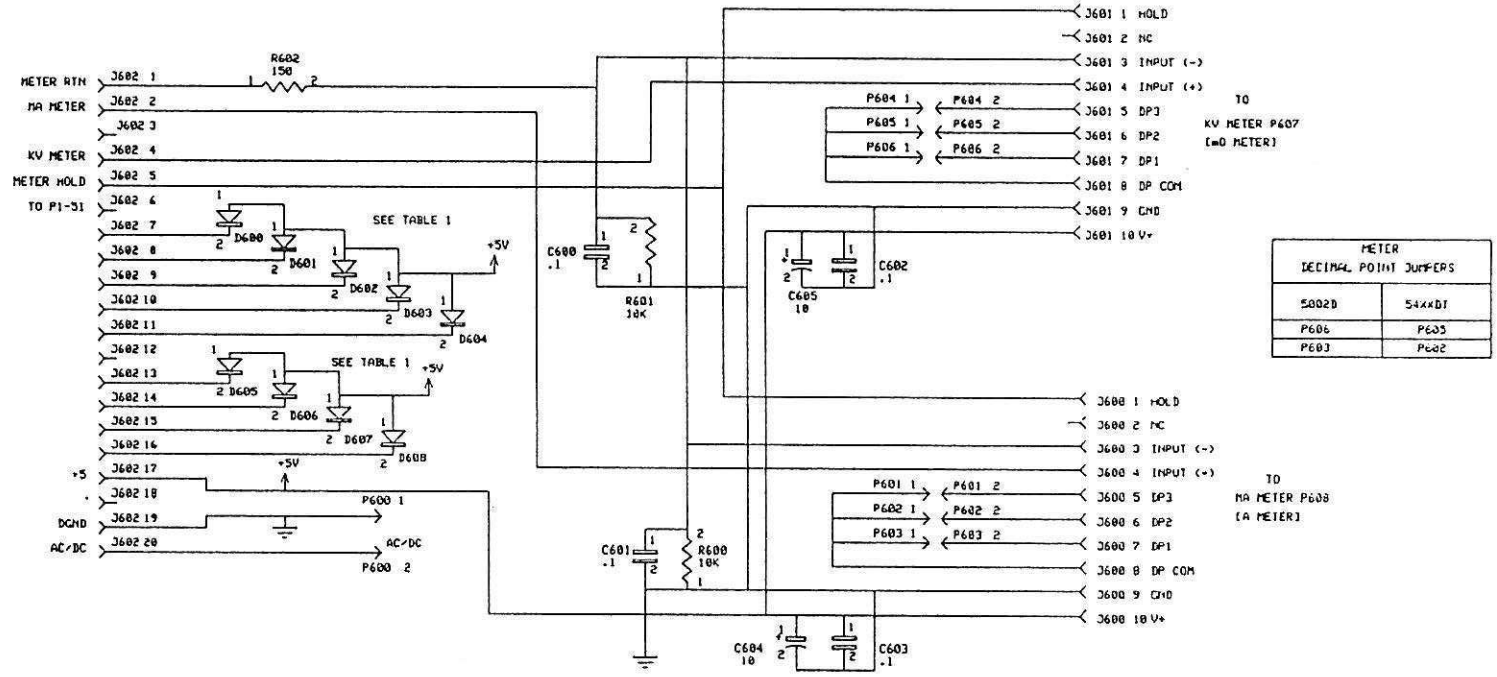
DRIVER BOARD

		DATE
DRAWN	ROGER BALD	06-15-93
CHECKED	RB	9-1-93
APPROVED	JCB	9-8-93

SIZE B | DRAWING NO. S05002D-07 | REV. -

SCALE | FILE: 37254.FSH | SHEET 3 OF 4

REVISION					
REV.	DESCRIPTION	ECO	DATE	APR.	CHK.
—	COPIED S05400DT-15 REV - AND MODIFIED	-	06-15-93	RB	RB



TO
MOTHER BOARD P7

TABLE 1		
LED	54XXDT	5002D
D600	READY	N/A
D601	RAMP	HVAMP/HYPOT
D602	DWELL	HVAMP
D603	PASS	SETUP
D604	HV	N/A
D605	HIGH	N/A
D606	LOW	TESTING
D607	ARC	PASS
D608	CONT.	FAIL

METER DECIMAL POINT JUMPERS	
5002D	54XXDT
P606	P603
P603	P602

REFERENCE DESIGNATORS

LAST USED	NOT USED
C603	C601
D608	R600
J602	R601
P606	
R602	

NOTES:

1. UNLESS OTHERWISE NOTED ALL CAPACITOR VALUES ARE IN uF AND RESISTORS ARE 1/4W, 5%.
2. BRACKETED SIGNAL NAMES [ ] REFERENCE 5002D, OTHERS ARE COMMON TO ALL MODELS OR 54XXDT ONLY.

		DATE
DRAWN	ROGER BALD	06-15-93
CHECKED	RB	9-1-93
APPROVED		9-8-93

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

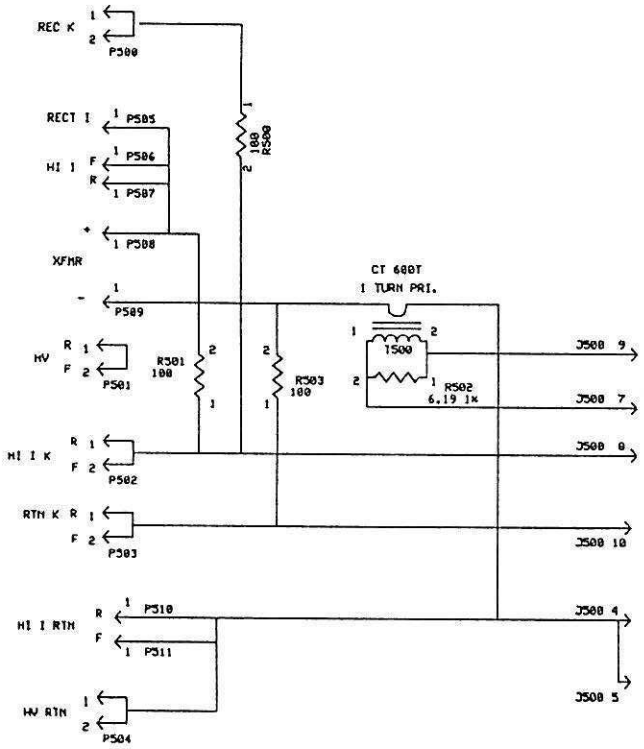
SCHEMATIC
5400DT, 5450DT, 5002D
FRONT PANEL
LED INDICATOR BOARD

SIZE	DRAWING NO.	REV.
B	S05002D-15	-
SCALE	FILE: 37251.FSH	SHEET 1 OF 1

8 7 6 5 4 3 2 1

D C B A

REVISION					
REV.	DESCRIPTION	ECO	DATE	APR.	CHK.



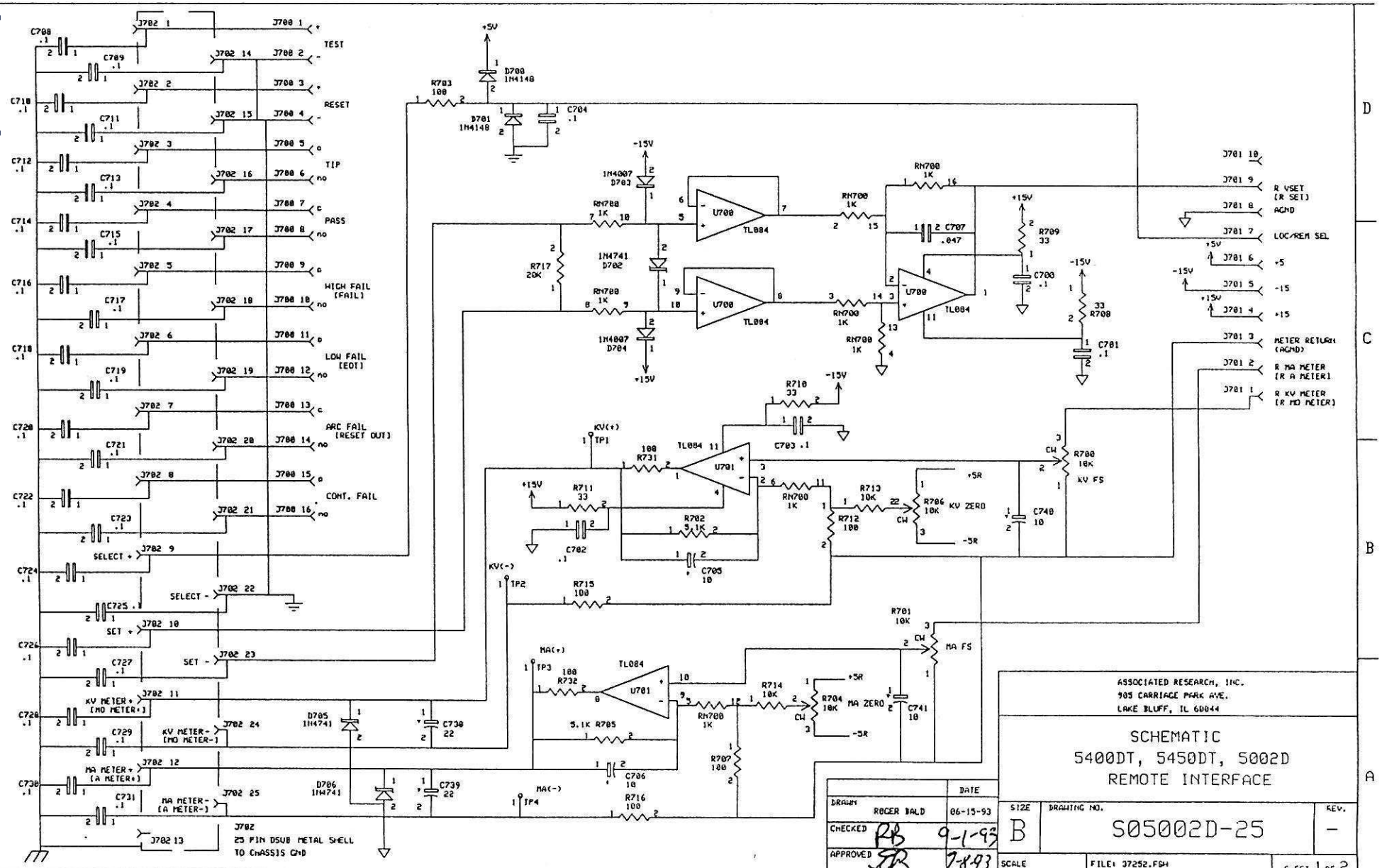
	DATE
DRAWN R. BALD	06-14-93
CHECKED RB	9-1-93
APPROVED JCB	9-8-93

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC
5002D
SHUNT INTERFACE

SIZE	DRAWING NO.	REV.
B	S05002D-19	-

SCALE | FILE: 37253.FSH | SHEET 1 OF 1



ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

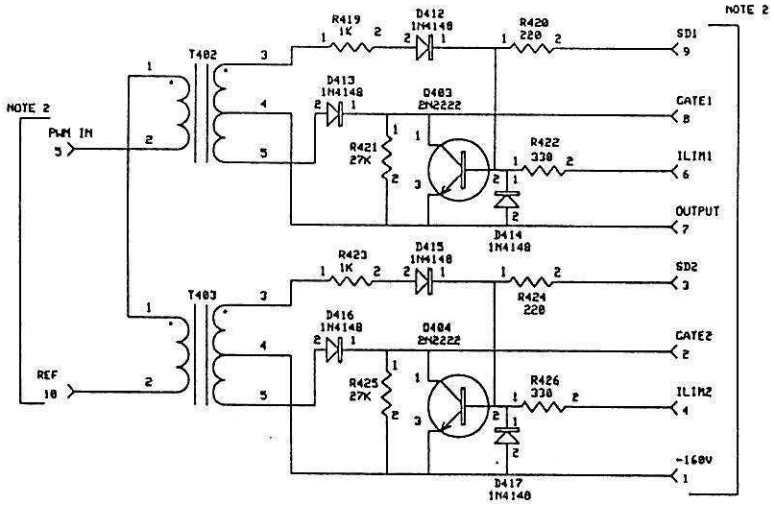
SCHEMATIC
5400DT, 5450DT, 5002D
REMOTE INTERFACE

		DATE
DRAWN	ROGER BALD	06-15-93
CHECKED	RB	9-1-93
APPROVED		7-8-93

SIZE	DRAWING NO.	REV.
B	S05002D-25	-

SCALE | FILE: J7252.FSH | SHEET 1 OF 2

REVISION					
REV.	DESCRIPTION	ECO	DATE	APR.	CHK.
-	PRE-PRODUCTION PC BOARDS	-			
A	FIRST PRODUCTION PC BOARDS	-	06-05-91		



REFERENCE DESIGNATORS:

LAST USED	NOT USED
D 417	
Q 404	
R 426	
T 403	

NOTES:

1. UNLESS OTHERWISE NOTED, ALL RESISTORS ARE 1/4W 5%, IN OHMS, ALL CAPACITORS ARE IN uF.
2. TO HV POWER AMPLIFIER. SEE SCHEMATIC S05400DT-16.

		DATE
DRAWN	C. A. KUECKER	5-8-91
CHECKED		5-8-91
APPROVED		5-8-91

ASSOCIATED RESEARCH, INC.
985 CARRIAGE PARK AVE.
LAKE BLUFF, IL 60044

SCHEMATIC
GATE DRIVE ASSY

SIZE	DRAWING NO.	REV.
B	S05400DT-31	A

SCALE NONE SHEET 1 OF 1