

MAINTENANCE MANUAL

PORTABLE TEST SET MODEL 4EX3A11
COMBINATION NUMBERS TM11, 12, 13, 16, 17 & TM1C
(INCLUDES OPTION 9099)



SPECIFICATIONS *

DESCRIPTION

Model used in test set

Sensitivity

Internal resistance

Sampling factor

Response time

Accuracy

Overload protection

Controlled metering functions

Test selector

Range selector

Polarity switch

Hgh. Sensitivity Switch

Identification

WAVE TEST **

AUDIO JAKES

PHONE Jack

DC voltmeter functions

Range selector

Polarity Switch

Operating Temp Range

Size (L x W x H)

Weight

Portable meter for aligning and troubleshooting two-way radios which have controlled metering facilities. In addition, the test set can be used as 20 V rms-per-Volt voltmeter.

3-1/2" panel meter with parallel pivot, off-center zero

50 and 450 microamperes full scale. External resistors added to make mobile meter drive 0.5 and 11.0 Volt full scale (at 50 K ohms-per-Volt).

1070 ohm rms

30 nominal

1.4 seconds nominal

±2% of full scale

Meter movement protected by diodes

With test cable connected to transmitter output,

With test cable connected to receiver

Selects circuits to be metered

Selects 1 Volt or 3-Volt meter range

Reverses meter polarity

Provides a 110-millivolt full scale meter range

Key transmitter

For connecting audio signal generator to mobile unit

For testing of VFO modulating AMP with mike or handset and monitoring RFV with headset

Using test probe

Selects 1, 5, 15, 30, 100, 300 or 1000-Volt meter range (with test selector in "A" position)

Reverses polarity of meter

0° to +50°C (32°F to 125°F)

WGV 835

6.1" x 12.1" x 3.4"

3.5 pounds

Deposits waveform test circuits "B" or "C" to measure discriminator or detector

For connecting RFV output to audio and meter or discriminator

For monitoring RFV wave handset

OPTIONAL INFO

6.4" x 12.0" x 3.2"

3.5 pounds

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

** In MODEL 13, Executive II and Custom K7P, these functions are available from the red plug of the test cable plugged into System Board independent of the black selector plug.

EX-3-A

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COMBINATION NUMBER INDEX

COMBINATION NUMBER	USED WITH
TM11 Includes: 4EX3A11 with 19D402466G1 Cable and Test Probe Assembly	Porta-Mobile, MASTR [®] Professional, MASTR [®] Imperial, Executive Series and MTS.
TM12 Includes: 4EX3A11 with 19D402466G1 & G2 Cables and Test Probe Assembly	Porta-Mobile, MASTR Professional, MASTR Imperial, Executive Series, MTS and IMTS.
TM13 Includes: 4EX3A11 with 19D402466G2 Cable and Test Probe Assembly	IMTS
TM16 Includes: 4EX3A11 with 19D416576G1 Cable and Test Probe Assembly	MASTR [®] II
TM17 Includes: 4EX3A11 with 19D402466G1, and 19D416576G1 Cables and Test Probe Assembly	Porta-Mobile, MASTR Professional, MASTR Imperial, Executive Series, MTS and MASTR II.
TM1C Includes: 4EX3A11 with 19C850590G1 Cable and Test Probe Assembly	MASTR [®] DELTA

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

Test Set Model 4EX3A11 is designed to facilitate servicing General Electric Two-Way Radios. For equipment with centralized metering facilities, a Test Cable connects the Test Set to the transmitter or receiver being serviced. For equipment which does not employ centralized metering, the set may be used as a 20,000 ohms-per-Volt DC voltmeter.

The off-center zero on the meter scale permits both positive and negative discriminator voltages to be measured, without changing the polarity. At the same time it preserves maximum scale lengths, so that readings can be made easily and accurately.

The steel case of the Test Set has a carrying handle and four rubber feet, which protect surfaces on which it is laid. All controls are located on the front panel; test jacks (except for the test probe jacks) are located on the ends of the set.

CARRYING CASE (Option 7445)

A two section metal carrying case is available for storing and carrying the Test Set. The set slides into the front section of the case, where it is protected from shock by rubber pads. A test cable can be left connected to the meter, draped over the dividing partition, and stored in the rear section of the case with the test probes. Space is also available for storing additional test cables.

OPERATION

All controls on the Test Set are conveniently located on the front panel. The microphone jack and the AUDIO test jacks for MASTR Professional, MASTR Imperial, Executive Series, MASTR Mobile Telephone systems, and IMTS Mobile Telephone systems are located on the right end of the set beneath the 32-pin test cable jack. The microphone jack and the AUDIO test jacks for MASTR II Executive II and Custom MVP are located on the left end of the set.

NOTE

Before transporting the Test Set, always place the RANGE SELECTOR switch in the OFF position to damp the meter movement.

CENTRALIZED METERING

When servicing two-way radios with centralized metering jacks, connect the proper test cable from the Test Set to the metering jack on the transmitter or receiver.

The TEST SELECTOR switch can then be used to select the circuit which is to be metered. A label is normally provided near the centralized metering jacks to indicate which circuits are metered with the TEST SELECTOR switch in positions "A" through "K". Alignment instructions for transmitters and receivers with centralized metering also indicate the metering positions to be used.

In tubed MASTR Professional and Executive transmitters, the PA plate current can be measured by placing the TEST SELECTOR switch in position "G" and the RANGE SELECTOR switch in the "TEST 1" position. The PA plate voltage can be measured by moving the RANGE SELECTOR switch from the TEST 1 to the 1000 (Volt) position.

NOTE

Since many transmitters designed for centralized metering are adjusted for a PA PLATE loading of 0.7 Volt (position "G"), a red mark has been provided on the meter scale at this reading.

In MASTR Royal Professional, MASTR Imperial, MASTR II, Royal Executive, Executive II and Custom MVP transmitters, the PA current can be metered by placing the TEST SELECTOR switch in position "G" and pressing the HIGH SENSITIVITY switch. The PA voltage (V_{ac}) can be measured by placing the TEST SELECTOR switch in "G" position, the POLARITY REVERSING switch in the "-" position, and the RANGE SELECTOR switch in the 15 (Volt) position.

CAUTION

Do not press the HIGH SENSITIVITY switch when metering tubed transmitters. This may apply the high B+ directly across the meter, damaging the Test Set. Use the HIGH SENSITIVITY switch only where directed in Royal Professional, MASTR Imperial, MASTR II, Royal Executive, Executive II and Custom MVP Maintenance Manuals.

Range-Selector Switch

In TEST 1 position, this switch sets the meter range for 1 Volt full scale; in TEST 3 position, it sets the range for 3 Volts. For centralized metering, this switch should normally be in the TEST 1 position.

Polarity-Reversing Switch

If the needle on the meter should deflect to the left end of the scale, this switch can be used to reverse the polarity of the meter and bring the reading on-scale. While metering PortaMobile, MASTR Executive,

MASTR II, Executive II, Custom MVP and Imperial equipment, it should normally be in the "+" position; for MASTR Professional equipment it should normally be in the "-" position. It may be necessary to switch the polarity of the meter while checking FIL voltage, depending upon whether the radio is installed in a vehicle with a positive-ground or negative-ground battery.

High Sensitivity Switch

This switch permits the driver and PA current to be metered in Royal Professional, Royal Executive, MASTR II, Executive II, Custom MVP and MASTR Imperial transmitters.

With the range selector switch in the 1-Volt position, pressing the high sensitivity switch (S6) bypasses R1 (16.2K ohms) and R2 (2430 ohms) with potentiometer R9 (25-500 ohms) and R10 (390 ohms). The lower resistance in the meter input circuit permits 100-millivolt full scale meter reading.

DISCRIMINATOR Switch

Pushing the DISC button instantly switches the meter from test positions "B" through "K" back to the discriminator circuit (position "A"). This feature eliminates the need for a second meter to monitor the discriminator voltage.

KMTR TEST Switch

When servicing a transmitter, the transmitter can be easily keyed by pressing the KMTR TEST switch.

AUDIO Jacks

While the Test Set is connected to a transmitter, the AUDIO test jacks, on each end of the set, provide a convenient place to connect an audio oscillator for modulating the transmitter. This facilitates setting transmitter modulation levels. With the Test Set connected to a receiver, the receiver audio output can be measured across the AUDIO test jacks.* An audio voltmeter or distortion analyzer can be easily connected here for receiver quieting or SINAD measurements. Note that these jacks are properly spaced to accept a standard dual-banana plug, and are labeled for MASTR and MASTR II (including Executive II and Custom MVP).

Microphone Jack

The microphone jacks on the ends of the Test Set provide convenient places to connect a microphone or handset for keying or voice-modulating a MASTR transmitter. The audio output of the receiver can also be monitored by a handset connected to these jacks.

DC VOLTMETER MEASUREMENTS

To use the Test Set as a DC voltmeter, just place the TEST SELECTOR switch in the "VM" position. Use the RANGE SELECTOR switch to select the desired voltage range: 1, 3, 15, 30, 100, 300 or 1000 Volts. Connect the test probes to the red and black jacks beneath the meter on the front of the Test Set.

With the polarity-reversing switch in the "-" position, the red test probe jack will be positive and the black jack will be negative. To quickly change the polarity of the test probes, just flip the switch to the "-" position.

CIRCUIT ANALYSIS

The voltage range desired is selected by RANGE SELECTOR switch S3, which connects meter M1 to TEST SELECTOR switch S2 through a series string of precision resistors (R3 through R8). S3 switches the positive and negative sides of the meter to eleven floating pins on S2, which selects the circuit to be metered.

Diodes CR1 and CR2 limit the meter overload to approximately six times the rated current of the meter, with less than 0.5% full-scale compression. As a 1-Volt instrument, the meter is protected for a 1000 to 1 overload. However, under this condition, one or more of the meter resistors may be damaged.

CAUTION

Due to the lower resistance in the meter circuit, the meter is more susceptible to damage when using the high sensitivity (HS) switch. Always check the meter reading before pressing the high sensitivity switch.

DISASSEMBLY

To service the Test Set, simply remove the four screws holding the rubber feet and lift off the back plate.

CALIBRATION PROCEDURE

If meter M1 is ever replaced, potentiometer R9 must be reset according to the following procedure.

1. Remove the back plate from the Test Set.

* In Porta-Mobile receivers before Rev. A, the LO side of the receiver audio output will appear at the AUDIO HI jack on the Test Set and the HI side will appear at the AUDIO LO jack.

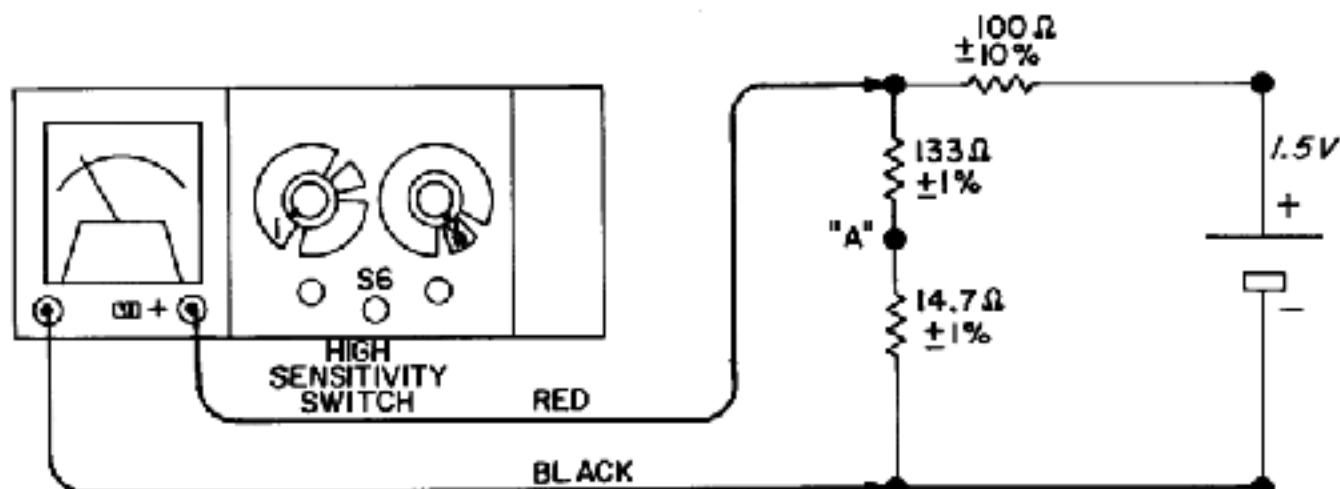
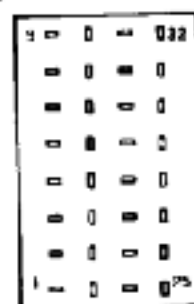
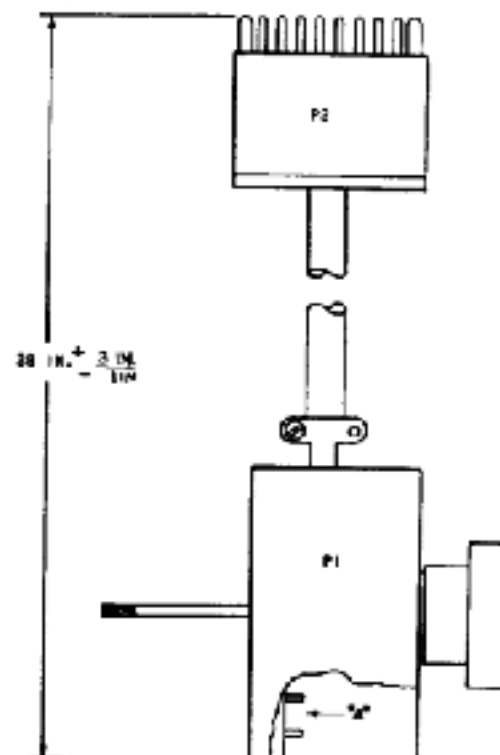
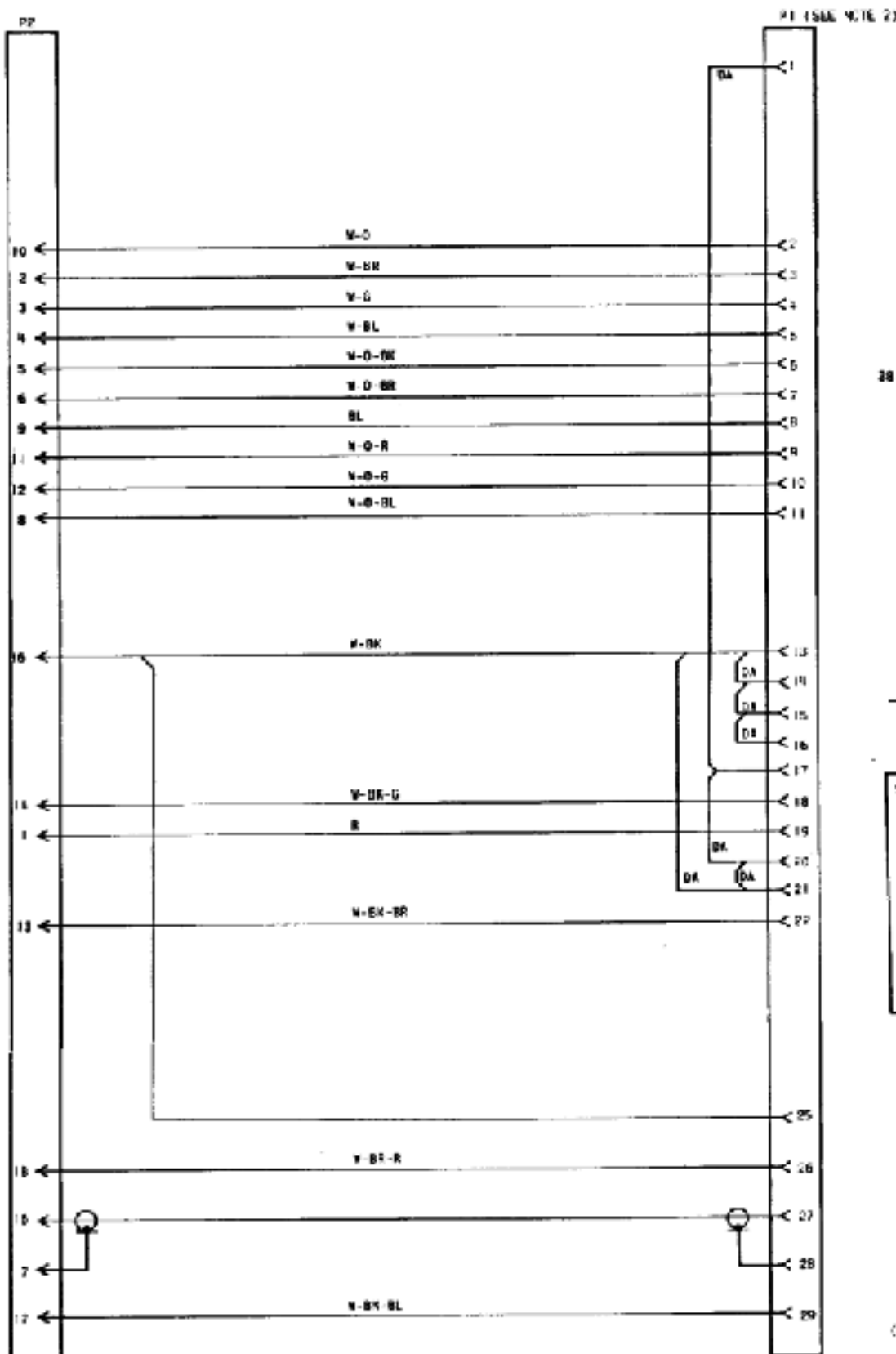


Figure 1 - Calibration Setup

- Place the Test Selector switch in the VM position, the Meter Sensitivity switch in the 1-Volt position, and the Polarity switch in the "+" position.
- Connect the three calibration resistors and a fresh 1-1/2-Volt "D" cell as shown in Figure 1.
- Apply the test probes as shown and note the exact meter reading (should be approximately 90 on the top meter scale).
- Now move the positive test probe to point "A" (junction of 133-ohm and 14.7-ohm resistors). Then, hold down the HIGH SENSITIVITY switch and adjust R9 for the exact reading obtained in Step 4. Repeat Steps 4 and 5 until meter readings are the same, and replace the back plate.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
 WORLD HEADQUARTERS • SYCAMORE, VIRGINIA 22907 U.S.A.

GENERAL  ELECTRIC
 U.S.A.



VIEW "A"

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART

(19D404466, Rev. 5)

PARTS LIST

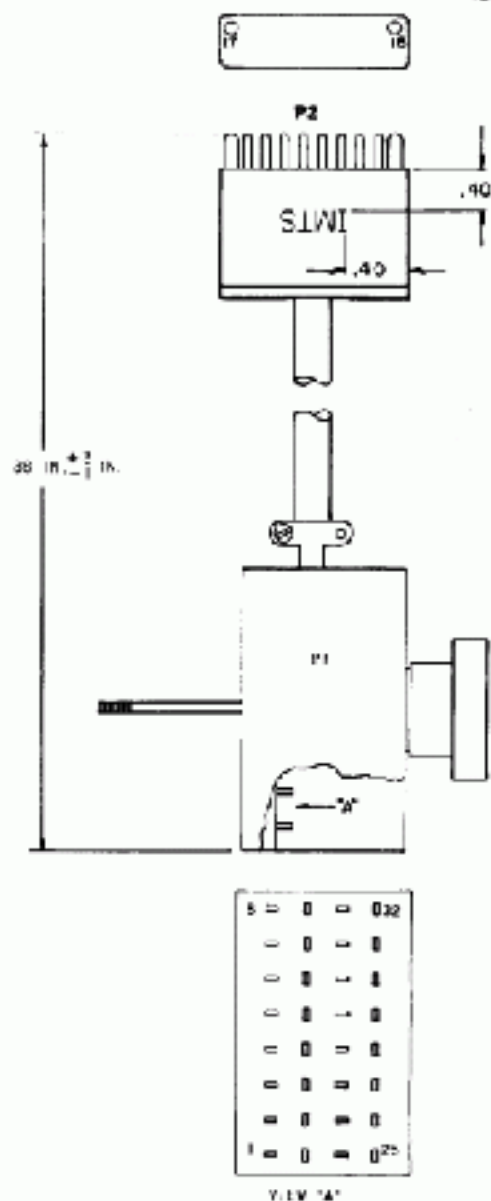
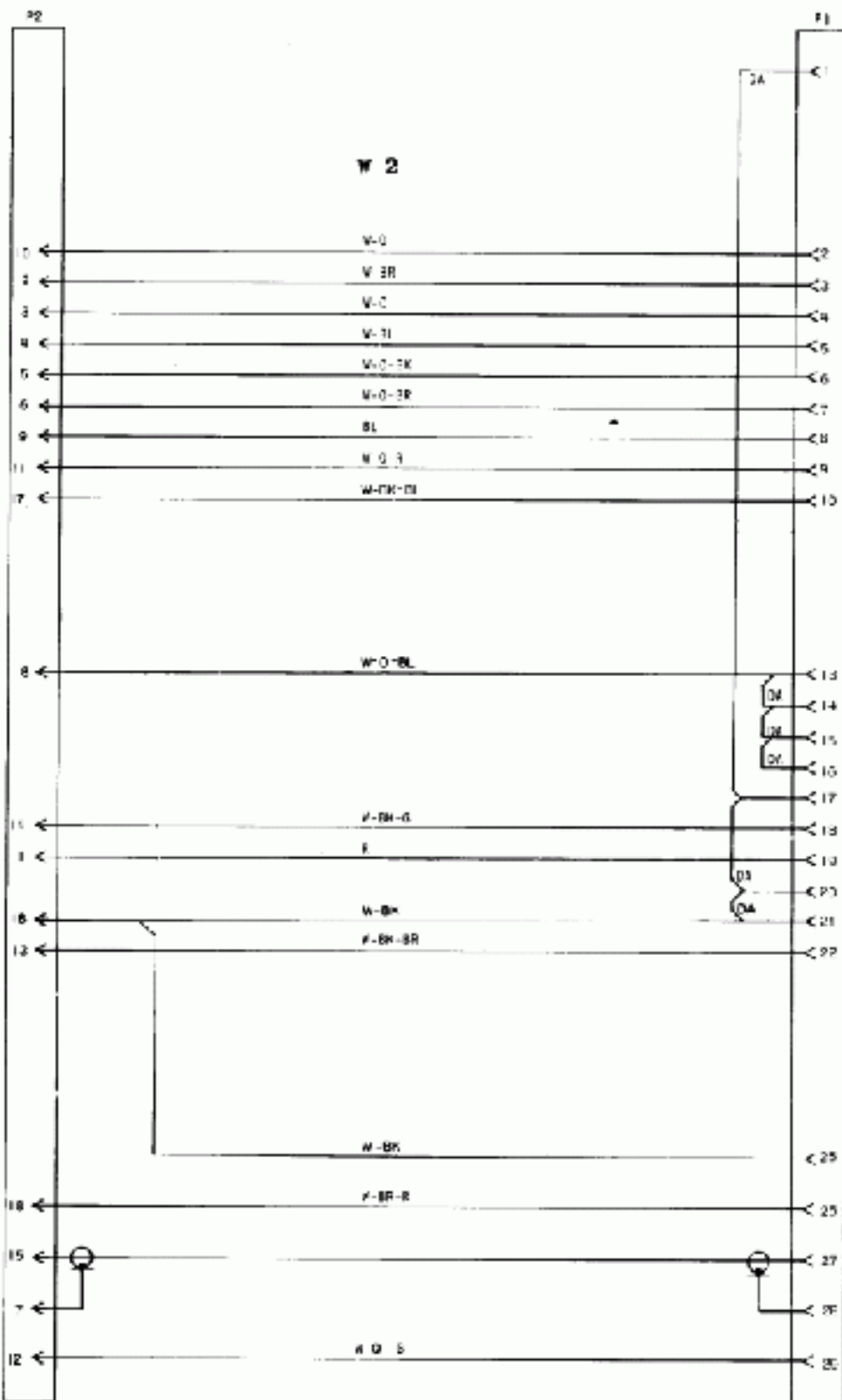
BI4454B

TEST SET
Model 4454B11

SYMBOL	GE PART NO.	DESCRIPTION
----- CAPACITORS -----		
C1	5484481P12	Ceramic disc: 1000 pF $\pm 10\%$, 1000 VDC; sim to RMC Type JF Discap.
C2	5486387P10	Tantalum: 22 pF $\pm 10\%$, 15 VDC; sim to Sprague Type 1500.
C3 and C4	198700901P7	Ceramic, disc: 1000 pF $\pm 50\%$, 50 VDC.
----- DIODES AND RECTIFIERS -----		
CR1 and CR2	5484822P1	Silicon; sim to type 1N456.
----- JACKS AND RECEPTACLES -----		
J1	198300128P3	Connector: 32 male contacts, black phenolic, 9 amps at 125 Vrms; sim to Glen 01-2231-122-004-101.
J2	198115041P2	Connector, included:
	198115041P2	Receptacle: 4 female contacts; sim to Amphenol Type 91-PHJ-1000.
	198115041P4	Lockwasher.
	198115041P6	Nut, knurled.
J3	198200128P3	Jack, tip: black nylon body; sim to EF Johnson 108-903.
J4	198200128P3	Jack, tip: red nylon body; sim to EF Johnson 108-903.
J5	198200128P4	Jack, tip: dark green nylon body; sim to EF Johnson 108-904.
J6	198200128P3	Jack, tip: black nylon body; sim to EF Johnson 108-903.
J7	198200128P3	Jack, tip: dark blue nylon body; sim to EF Johnson 108-903.
J8	198100128P3	Jack, tip: black, sim to E.F. Johnson 108-903.
J9	198200128P1	Connector: 8 contacts.
J10	198200128P4	Jack, tip: dark green nylon body; sim to EF Johnson 108-904.
J11	198200128P3	Jack, tip: black nylon body; sim to EF Johnson 108-903.
----- METERS -----		
M1	5481848P11	Meter, panel: special scale, -10/0/+10 μ A, 1070 ohm $\pm 1\%$ movement; sim to GE Type 80-01.
----- RESISTORS -----		
R1	19820125P31G22	Metal film: 16,200 ohm $\pm 1\%$, 1/2 W.
R2	19820125P32431	Metal film: 2430 ohm $\pm 1\%$, 1/2 W.
R3	19820125P34002	Metal film: 40,000 ohm $\pm 1\%$, 1/2 W.
R4	19820125P32403	Metal film: .24 megohm $\pm 1\%$, 1/2 W.
R5	19820125P33011	Metal film: 301,000 ohm $\pm 1\%$, 1/2 W.
R6	5481848P115	Deposited carbon: 1.4 megohm $\pm 1\%$, 1/2 W; sim to Texas Instrument C214248.
R7	5486943P158	Deposited carbon: .4 megohm $\pm 1\%$, 1/2 W; sim to Texas Instrument C2142.
R8	5486943P168	Deposited carbon: .14 megohm $\pm 1\%$, 2 W; sim to Texas Instrument C2142.

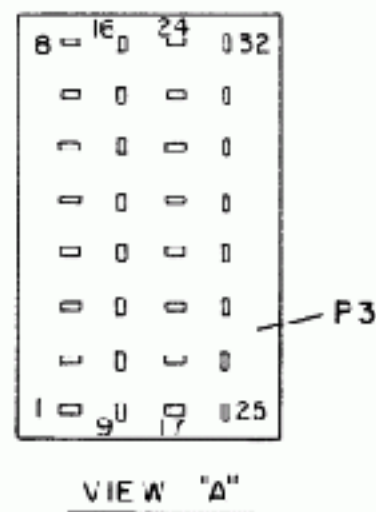
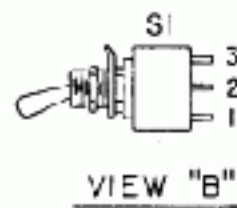
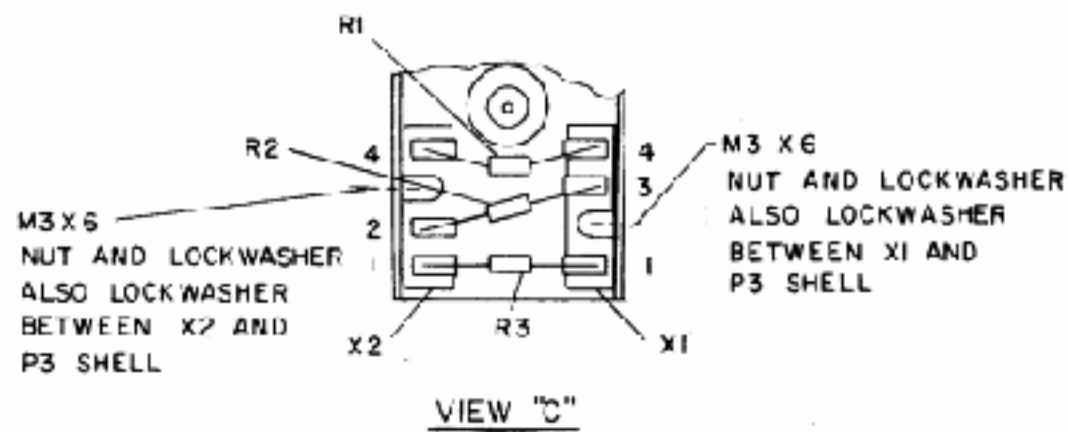
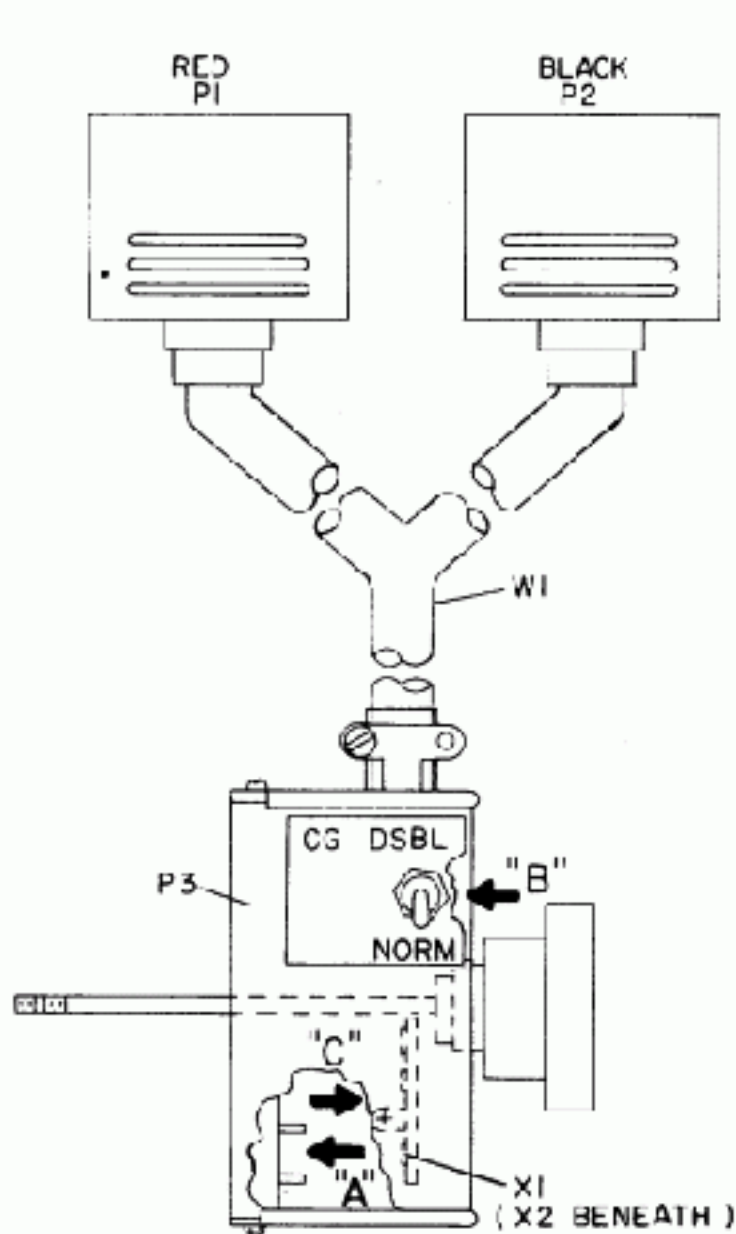
SYMBOL	GE PART NO.	DESCRIPTION
R9	5487324P6	Variable, composition: 100 ohm $\pm 20\%$, 2.22 W; sim to Allen-Bradley Type 1.
R10	5487322P17	Composition: 100 ohm $\pm 2\%$, 1/2 W.
----- SWITCHES -----		
S1	4032200P1	Slide: DPDT, 1 amp at 125 VAC, 0.5 amp at 125 VDC; sim to USD Electronics S7152.
S2	198200128P2	Rotary: 2 sections, 2 poles, 12 positions, non-shorting contacts; sim to Oak 115585-02.
S3	198200128P1	Rotary: 2 sections, 2 poles, 10 positions, non-shorting contacts; sim to Oak 115584-02.
S4	5481108P4	Push Button (black): DPDT, momentary contact, 5 form C contacts, 3 amps at 150 VAC; sim to Switchcraft 4004.
S5	198200128P4	Push Button (white): SPDT, normally open, sim to Grayhill 10Y12045-2.
S7	1981108P1P1	Push Button (red): DPDT, momentary contact; sim to Grayhill 44-232.
----- TERMINAL BOARDS -----		
TB1	198800688P6	Miniature, phen: 1 terminal.
TB2	7773004P38	Phen: 6 terminals.
----- MISCELLANEOUS -----		
	198200128P1	High sensitivity board. (Includes R2, R10, S6).
	198200128P2	Chassis assembly: 8.5 x 10.75 x 4.7 inches, gray phenolic coated steel.
	198200128P1	Cover: 18 x 4.75 x 3.06 inches, gray aluminum.
	198115041P2	Button: 0.5 x 3.25 x 0.125 inches, black rubber; sim to Atlantic Rubber 1304.
	198115041P1	Knob, set screw: 1.325 x 0.003 x 0.005 inches, black styrene, aluminum insert; sim to Raytheon R85-1-2. (Used with S2 and S3).
	198200128P3	Handle, bow: 1.562 x 0.85 x 0.281 inches, black vinyl; sim to Philadelphia Handle 4M25.
	198201074P304	Top screw, Phillips Pozidriv® No. 0-29 x 3/8. (Secures rubber bumpers).
	7115130P2	Lockwasher: sim to Shakespeare 1220-1. (Part of S2, S3).
	7115130P11	Lockwasher: sim to Shakespeare 1222-1. (Part of S2, S4).
	7115130P2	Set screw, hex: No. 0-29 x 3/8. (Part of S2, S3).
	4032200P1	Nut, knurled, (used with S6).
	198200128P487	Rivet: .125 dia. (Secures handle).
	5481108P1	Nut, knurled, (used with S7).
----- ASSOCIATED CABLES -----		
C1		CABLE ASSEMBLY MATH 11 198414826P1
C1 and C2		(Part of 198414826P1 cable).
C3		CONNECTOR: 32 female contacts, black phenolic, 9 amps at 175 Vrms, with blue phenolic knob and blue steel band; sim to Glen 01-2231-167-001-101.
C4		Cable: approx 2 feet long. Includes C1 and C2.
C5		CABLE ASSEMBLY PORTA MATH, MATH PRO, MATH AND MATH 198414826P1
C6		CONNECTOR: 32 female contacts, black phenolic, 9 amps at 175 Vrms, with blue phenolic knob and blue steel band; sim to Glen 01-2231-167-001-101.
C7		CONNECTOR: includes 16 pin plug cable, 198700128P1 30 inches long.

SYMBOL	GE PART NO.	DESCRIPTION
W2		CABLE ASSEMBLY INTS 18D40244002
P1	18A701942P1	Connector: 32 female contacts, black phenolic, 9 amps at 125 VAC, with blue phenolic bush and blind steel hood; sin to Elec 01-4212-107-001-101.
P2	18C303508P1	Connector: includes 18 pin plug cable, approx 36 inches long.
		- - - - - MISCELLANEOUS - - - - -
	18M243308	Sample plate. (Faceplate).
	18H20483501	Test Probe Assembly: Red test lead.
	18H20483502	Test Probe Assembly: Black test lead.
		CALIBRATION RESISTORS (Not Part of Test Set)
	5485044P17	Resistor, deposited carbon: 10.7 ohm $\pm 1\%$, 1/2 W; sin to Texas Instrument C01/24H.
	5485044P13	Resistor, deposited carbon: 133 ohm $\pm 1\%$, 1/2 W; sin to Texas Instrument C01/24H.
	5485044P10	Resistor, composition: 100 ohm $\pm 10\%$, 1/2 W. (brown-black-brown-gold-gold bands).



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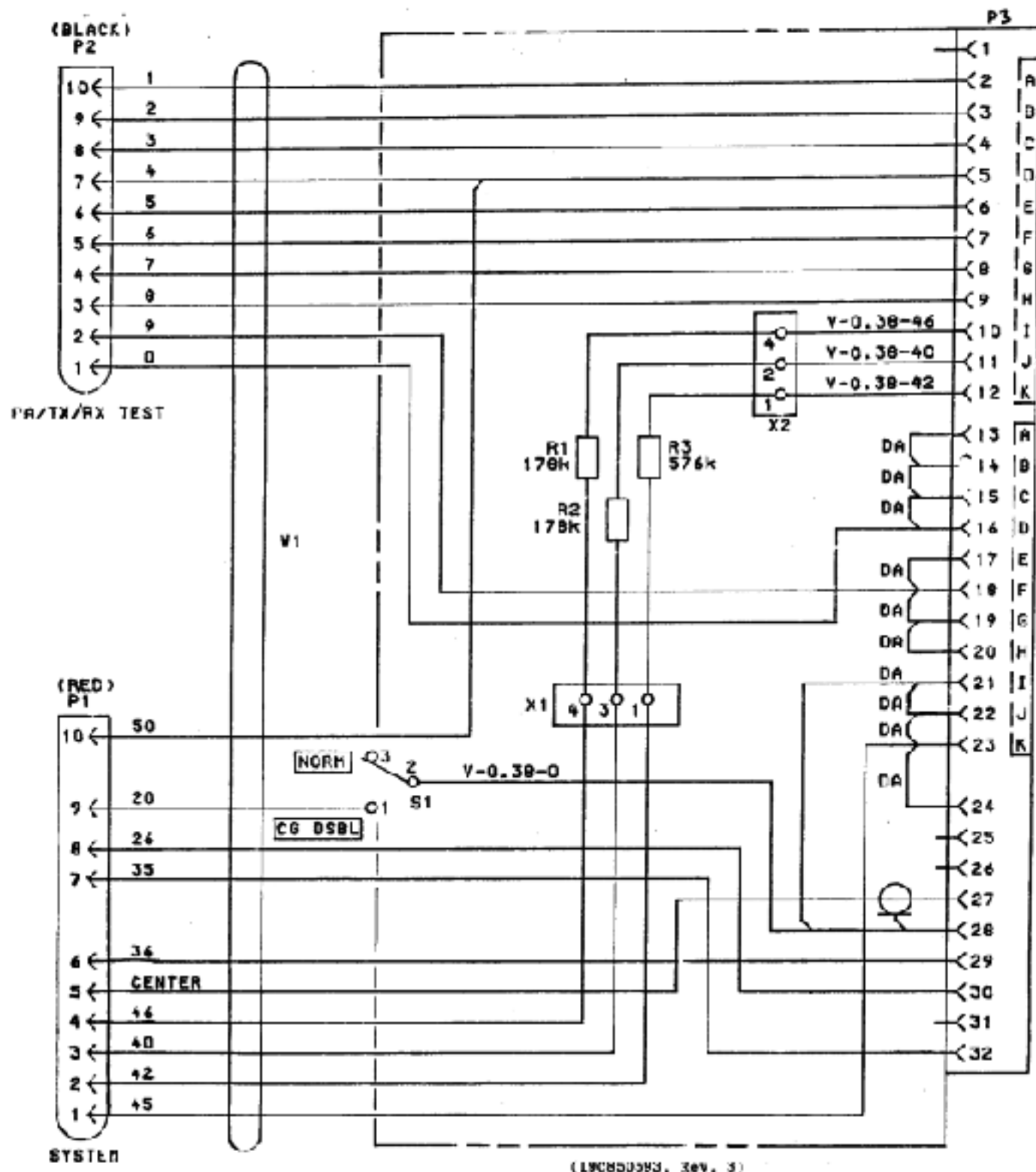
TEST CABLE 19D402466G2
(FOR INTS MOBILE SYSTEMS)



OUTLINE DIAGRAM

MASTR DELTA TEST CABLE

(LDC800943, Rev. 0)



ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER μ , n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ .

SCHEMATIC DIAGRAM

MASTR DELTA TEST CABLE

Issue 2

9

SYMBOL	GE PART NO.	DESCRIPTION
P1 and P2		----- PLUGS ----- (Part of W1).
P3	19A701244C1	Jackscrew: 32 CONTACTS, 9 amp (75 VWS); size to Elec 01-4232-107-001-101.
R1 and R2	19A701250P425	----- RESISTORS ----- Metal film: 170K ohms $\pm 1\%$, 1/4 w.
R3	19A701250P473	Metal film: 570K ohms $\pm 1\%$, 1/4 w.
S1	19A700189W1	----- SWITCHES ----- Toggle: SPDT, 5 amps at 28 VDC or 115 VAC; size to C and K Components 7102G.
W1	19D800080P1	Water cable. (includes P1 & P2).
X1 and X2	19B800038P1	----- SOCKETS ----- Miniature: 3 terminal with ground lug.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES