

SUPREME
MODEL 502 TUBE TESTER

.....

OPERATING DATA

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

STOCK No. 8727

ISSUED 7/25/37

MODEL 502 TUBE TESTER
ACCESSORIES PARTS
ORDER
TO
SUPREME INSTRUMENTS CORPORATION
GREENWOOD, MISSISSIPPI
U. S. A.

PLEASE SHIP TO
 STREET ADDRESS
 P. O. AND STATE

QUANTITY	STOCK NO.	DESCRIPTION	PRICE	TOTAL
.....	8309	BATTERY, 1.5 VOLT	0.23
.....	6744A	CONNECTOR, 4-FT. BLACK TEST PROBE WITH POINTED PIN PLUGS	0.39
.....	6745A	CONNECTOR, 4-FT. RED TEST PROBE WITH POINTED PIN PLUGS	0.39
.....	6986A	CONNECTOR, 4-FT. BLACK WITH ALLIGATOR TEST CLIP AND INSULATED PIN PLUG	0.39
.....	6987A	CONNECTOR, 4-FT. RED WITH ALLIGATOR TEST CLIP AND INSULATED PIN PLUG	0.39
.....	6288	CHART, ANALYSIS, PER PAD OF 50	0.25
.....	7552	LAMP, 110/125 VOLT 1-WATT NEON GLOW	0.36

IF THE DEPOSIT IS INSUFFICIENT TO COVER THE COSTS OF THE MERCHANDISE AND TRANSPORTATION CHARGES, YOU ARE REQUESTED TO MAKE SHIPMENT VIA C.O.D. EXPRESS FOR THE BALANCE DUE. IT IS UNDERSTOOD THAT YOUR QUOTED PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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OPERATING DATA FOR MODEL 502

THE PURPOSE OF THIS PAMPHLET IS TO ACQUAINT YOU WITH THE PROPER OPERATING PROCEDURE WHEN USING THE MODEL 502 TUBE TESTER. WE WANT YOU TO READ ALL THESE INSTRUCTIONS BECAUSE WE FEEL THAT THIS IS THE ONLY WAY YOU CAN BECOME FULLY FAMILIAR WITH YOUR NEW TEST INSTRUMENT AND UNDERSTAND THE POLICIES OF THE COMPANY WHICH MANUFACTURES IT.

REGISTRATION CARD

FIRST OF ALL, BEFORE YOU DO ANYTHING ELSE, PLEASE FILL OUT THE REGISTRATION CARD (A LITTLE 3" X 5" YELLOW CARD) ENCLOSED WITH THIS TESTER AND MAIL IT TO US. IF YOU FAIL TO DO THIS, YOUR INSTRUMENT IS NOT REGISTERED WITH US AND WE HAVE NO WAY OF KNOWING THAT YOU HAVE IT IN YOUR POSSESSION. IN CASE THE INSTRUMENT IS STOLEN, THIS REGISTRATION CARD MAY BE THE MEANS OF TRACING THE TESTER AND GETTING IT BACK FOR YOU. BESIDES, WE KNOW YOU WANT SOME PROOF OF YOUR GUARANTEE, SO, WHEN WE RECEIVE YOUR REGISTRATION CARD, WE WILL SEND YOU A PROOF OF GUARANTEE CARD WHICH YOU CAN FILE OR CARRY WITH YOU.

DON'T FORGET TO INCLUDE THE MODEL NUMBER AND SERIAL NUMBER OF YOUR TESTER. THE MODEL NUMBER IS "502" AND THE SERIAL NUMBER WILL BE FOUND STAMPED DIRECTLY BELOW THE "PRIMARY VOLTS ADJUSTER" SWITCH AT THE BOTTOM OF THE PANEL.

WE ARE ALSO, FOR A LIMITED TIME, SENDING OUT TO ALL NEW SUPREME USERS, A 13½" X 16½" WINDOW POSTER WHICH TELLS THE WORLD IN NO UNCERTAIN TERMS THAT YOU OWN THE BEST TEST INSTRUMENT MADE AND THAT YOU ARE AFTER REPAIR BUSINESS. SO SEND YOUR REGISTRATION CARD TO US AND RECEIVE THIS FREE, ATTRACTIVELY COLORED WINDOW POSTER AND YOUR PROOF OF GUARANTEE CARD.

WHAT THE TESTER WILL DO

WE'VE BUILT A LOT OF TUBE TESTERS, BUT IT IS OUR BELIEF THAT THE TUBE TESTING CIRCUIT USED IN THE MODEL 501 AND 502 IS THE BEST YET. THIS TESTS A TUBE FIVE WAYS (1) SHORTS BETWEEN ELEMENTS (2) LEAKAGES BETWEEN ELEMENTS (3) OPEN CIRCUITS IN ANY ELEMENT (4) QUALITY TEST OF ALL ELEMENTS (5) QUALITY TEST OF EACH SECTION OF ELEMENT OR EACH PLATE OF DIODES OR FULL WAVE RECTIFIERS. YOU CAN'T GO WRONG WITH AS COMPLETE A TEST AS THIS!

THE TUBE TESTER CIRCUIT IS VERY EASY TO OPERATE AS THERE ARE ONLY FIVE KNOBS AND THREE SPECIAL SWITCHES TO OPERATE BESIDES THE REGULAR ELEMENT SWITCHES.

LET'S EXAMINE EACH TUBE TEST CONTROL SO THAT WE WILL UNDERSTAND ITS PURPOSE. THE CONTROLS FOR MULTI-METER USES WILL BE DISCUSSED LATER.

PRIMARY VOLTS ADJUSTER

FIRST OF ALL, LET'S LOOK AT THE CONTROL MARKED "PRIMARY VOLTS ADJUSTER" WHICH IS JUST BELOW THE METER. AS YOU KNOW, POWER COMPANIES TRY TO KEEP THE SUPPLY VOLTAGE CONSTANT AT ALL TIMES, BUT SOMETIMES THIS SUPPLY VOLTAGE VARIES A DOZEN OR MORE VOLTS DURING THE DAY. IF WE HAD NO METHOD OF COMPENSATING FOR THIS VARIATION, OUR TUBE TESTER READINGS WOULD BE ERRONEOUS. THEREFORE, WE INCLUDE A TAPPED PRIMARY POWER TRANSFORMER IN THE MODEL 502 WHICH CAN BE ACCURATELY SET TO THE LINE VOLTAGE AT THE TIME OF TEST. THE NUMBERS ON THE PANEL CORRESPOND TO THE LINE VOLTAGE TAPS ON THE TRANSFORMER, AND RUN FROM 100 TO 139 VOLTS, WITH AN "OFF" POSITION IF YOU DESIRE TO KEEP THE TESTER DIRECTLY CONNECTED TO THE LINE.

"LINE ADJ." SWITCH (ON LEFT EDGE OF PANEL)

THIS IS THE SWITCH USED IN "LINE ADJUSTING" THE TUBE TESTER. BY THROWING THE SWITCH TO THE "LINE ADJ." POSITION, THE METER IS CONNECTED AS AN A.C. METER. THE "PRIMARY VOLTS ADJUSTER" SWITCH IS VARIED UNTIL THE METER READS HALF SCALE (IN THE MIDDLE OF THE ORANGE SECTION). THUS THE TESTER IS MATCHED TO THE LINE AND THE "LINE ADJUST" SWITCH IS THEN RETURNED TO THE "DOWN" POSITION. THE PANEL SHOULD BE CLEAR OF ALL TEST LEADS.

SOCKETS

YOU WILL NOTE SIX SOCKETS AT THE TOP OF THE PANEL. THERE IS NO CONFUSION, AS WITH SOME TESTERS, BECAUSE ONLY A FOUR PRONG TUBE WILL FIT THE FIRST SOCKET, A FIVE PRONG TUBE THE SECOND SOCKET, ETC.

"FIL. VOLTS" SWITCH

TUBE FILAMENT VOLTAGES VARY FROM 1.5 VOLTS TO 30 VOLTS, THEREFORE, WE INCLUDE THIS "FILAMENT VOLTS" SELECTOR SWITCH SO THAT YOU MAY APPLY THE CORRECT FILAMENT VOLTAGE TO EACH TUBE TYPE. THIS SWITCH IS ALSO USED IN ELECTROLYTIC CAPACITY MEASUREMENTS AS EXPLAINED LATER.

FILAMENT RETURN SELECTOR

ONE OF THE MOST AMAZING TESTER CIRCUITS BROUGHT OUT IN THE LAST FEW YEARS IS INCORPORATED IN YOUR TUBE TESTER. AS YOU KNOW, ALL FOUR PRONG TUBES HAVE THEIR FILAMENTS TERMINATING AT #1 AND #4 PRONGS, FIVE PRONG TUBES HAVE THEIR FILAMENTS TERMINATING AT #1 AND #5 PINS, AND SO FORTH, UP TO BUT NOT INCLUDING THE OCTAL OR EIGHT PRONG TUBES. HERE, FILAMENTS MAY TERMINATE AT THE #2, AND #8, #2 AND #7, #2 AND #3, #7 AND #8 OR, AS FAR AS THAT IS CONCERNED, A NEW TUBE MIGHT EVEN HAVE ITS FILAMENT TERMINATE AT ANY ONE OF ITS EIGHT PINS AND TOP CAP. THERE ARE ALSO TUBES WITH CENTER TAPPED FILAMENTS, THE CENTER TAP BEING TERMINATED ON STILL A THIRD PIN.

TO FORESTALL ANY POSSIBLE TUBE TESTER OBSOLESCENCE, SUPREME ENGINEERS HAVE DESIGNED THIS EXCLUSIVE FILAMENT SELECTOR CIRCUIT WHICH ALLOWS THE FILAMENT POTENTIAL TO BE APPLIED TO ANY TWO TUBE BASE PINS, OR, IN CASES WHERE A TUBE HAS THREE FILAMENT CONNECTIONS, IT APPLIES HALF THE FILAMENT POTENTIAL TO EACH HALF OF THE FILAMENT BY CONNECTING THE FILAMENT HALVES IN PARALLEL.

THE "FILAMENT RETURN" SWITCH ARM IS CONNECTED TO ONE SIDE OF THE APPLIED FILAMENT POTENTIAL. BY ROTATING THIS SWITCH, ONE SIDE OF THE FILAMENT POTENTIAL IS CONNECTED TO ANY ONE OF THE EIGHT PINS OR TOP CAP; ALSO, IT DISCONNECTS THAT PARTICULAR PIN CIRCUIT FROM ANY OTHER TEST CIRCUIT.

SWITCHES #1 TO #6 AND "T.C."

THESE SWITCHES ARE SINGLE POLE, DOUBLE THROW TYPES. THE ARM OF EACH SWITCH IS CONNECTED TO THE TUBE BASE PIN CORRESPONDING TO THE NUMBER UNDER THE SWITCH, I.E., SWITCH #1 IS CONNECTED TO EACH #1 TUBE BASE PIN ON ALL THE SOCKETS, #2 SWITCH TO ALL THE #2 TUBE BASE PINS, ETC.

ALL THE "UP" SIDES OF THE SWITCHES ARE CONNECTED TOGETHER AND RUN TO WHAT MIGHT BE TERMED THE "ANODE" OR "PLUS" SIDE OF THE POWER SUPPLY. ALL THE "DOWN" SIDES OF THE SWITCHES ARE CONNECTED TOGETHER AND RUN TO WHAT MIGHT BE TERMED THE "CATHODE" OR "MINUS" SIDE OF THE POWER SUPPLY (WHICH IS ALSO THE OTHER SIDE OF THE FILAMENT SUPPLY).

THEREFORE, AS A FILAMENT ON ANY 4 PRONG TUBE TERMINATES AT #1 AND #4 PINS, IT IS ONLY NECESSARY TO TURN THE "FILAMENT VOLTS SELECTOR" TO #1 AND LEAVE THE #4 SWITCH IN THE NORMAL "DOWN" POSITION AS THIS IS THE "CATHODE" - OR "MINUS" SIDE OF THE POWER SUPPLY, RESULTING IN SUPPLYING THE FILAMENT POTENTIAL TO THE RIGHT TUBE BASE PINS. BY THROWING ANY OF THESE SWITCHES (CONNECTED TO THE VARIOUS TUBE ELEMENTS) TO THE "UP" - "ANODE" - "PLUS" POSITION, YOU CONNECT THOSE ELEMENTS TO THE POSITIVE SOURCE OF SUPPLY. AS ALL THE NUMBERED AND "T.C." SWITCHES NORMALLY SHOULD BE KEPT IN THE "DOWN" POSITION, IT IS ONLY NECESSARY TO TURN THE "FIL. RET. SEL." SWITCH TO THE NUMBER CORRESPONDING TO ONE SIDE OF THE FILAMENT AND THE OTHER SIDE WILL BE CONNECTED AUTOMATICALLY THROUGH THE "DOWN" CONNECTION OF THE SWITCHES.

"METER CIRCUIT SELECTOR" SWITCH

BY SUPPLYING FILAMENT VOLTAGE TO THE RIGHT TUBE BASE PINS AND CONNECTING ONE SIDE OF THE FILAMENT TO THE "MINUS" SIDE OF THE POWER SUPPLY (AS WELL AS ANY CATHODE OR CATHODES IN THE TUBE) AND CONNECTING THE BALANCE OF THE ELEMENTS TO THE "POSITIVE" SIDE OF THE POWER SUPPLY A RECTIFIED CURRENT WILL BE CAUSED TO FLOW THRU THE METER, THE AMOUNT OF CURRENT DEPENDING UPON THE APPLIED POTENTIAL, THE EXTERNAL RESISTANCE CAUSED BY THE METER AND THE ELECTRON EMITTING ABILITY OF THE CATHODE. A GOOD TUBE WILL CAUSE A CERTAIN AMOUNT OF CURRENT TO PASS AND A TUBE WHICH IS NOT SO GOOD WOULD PASS A RELATIVELY SMALL CURRENT, ETC. IN OTHER WORDS, WE MEASURE THE TUBES "CONDUCTANCE" TO THE FLOW OF "ELECTRONS" - THEREFORE - THE TERM "ELECTRO-CONDUCTANCE" TUBE TESTER. THERE IS MUCH MORE TO THE THEORY OF THIS TEST, BUT ONLY SUFFICIENT INFORMATION WILL BE GIVEN HERE TO ENABLE YOU TO BASICALLY UNDERSTAND THE CIRCUIT.

SOME TUBES REQUIRE MORE APPLIED VOLTAGE THAN OTHERS AND EACH TAP ON THE "METER CIRCUIT SELECTOR" SWITCH APPLIES A DIFFERENT POTENTIAL TO THE TUBE AS WELL AS CONNECTS THE PROPER SHUNTS AND SERIES RESISTORS TO THE METER SO THAT IT WILL INDICATE CORRECTLY AND CANNOT BE DAMAGED.

"QUALITY SEL." POTENTIOMETER

THE "QUALITY SEL." POTENTIOMETER ALLOWS JUST THE RIGHT AMOUNT OF CURRENT TO BE PASSED BY A GOOD TUBE SO THAT IT WILL INDICATE IN THE "GOOD" AREA OF THE METER SCALE. TUBES WHICH ARE NOT AS GOOD AS A TRULY "GOOD" TUBE WILL RESULT IN THE METER NEEDLE'S NOT DEFLECTING AS FAR INTO THE "GOOD" AREA AND "QUESTIONABLE" OR "BAD" TUBES WILL RESULT IN STILL LESS CURRENT FLOWING THROUGH THE METER AND A CORRESPONDING METER INDICATION. THE CONTROL IS ALSO USED IN OHM-METER TESTS AS EXPLAINED LATER ON.

NEW SUPREME METER BY WESTINGHOUSE

WE BELIEVE THAT THIS NEW METER, BUILT TO OUR RIGID SPECIFICATIONS BY WESTINGHOUSE, IS THE FINEST METER AVAILABLE ON THE MARKET TODAY, WITHIN ITS PRICE RANGE. WE SOLD MANY THOUSANDS OF SUPREME INSTRUMENTS LAST YEAR WHICH CONTAINED WESTINGHOUSE METERS AND WE WERE REQUIRED TO REPLACE A NEGLIGIBLE QUANTITY. SO, IF YOU DO NOT ABUSE YOUR METER, IT WILL GIVE YOU YEARS OF SATISFACTORY SERVICE. OF COURSE, ANY METER CAN BE DAMAGED BY DROPPING, JARRING OR OVERLOADING, SO TRY TO BE AS CAREFUL AS POSSIBLE.

METER SENSITIVITY

THE METER INCORPORATED IN YOUR MODEL 502 TUBE TESTER HAS A SENSITIVITY OF 1000 OHMS PER VOLT, IN OTHER WORDS, A 1 M.A. MOVEMENT.

IF YOUR METER NEEDLE DOES NOT REST AT ZERO ON THE METER SCALE, IT MAY BE ADJUSTED BY SLOWLY TURNING THE BAKELITE SCREW (IN THE LOWER HALF OF THE METER CASE) IN THE PROPER DIRECTION.

NEON BULB

DIRECTLY ABOVE THE METER MAY BE SEEN THE NEON BULB WHICH IS USED FOR TESTING TUBE LEAKAGES. SOME TUBE TESTER MANUFACTURERS ADVERTISED THEIR TESTERS AS DETECTING TUBE LEAKAGES UP TO 2 MEGOHMS. HOWEVER, THE RADIO MANUFACTURERS' ASSOCIATION (OF WHICH ALL TUBE MANUFACTURERS ARE MEMBERS) DEFINITELY STATES THAT TUBE LEAKAGES ABOVE ABOUT 100,000 OHMS ARE ENTIRELY PERMISSIBLE AND WILL NOT HARM THE OPERATION OF THE TUBE IN ANY PRESENT RADIO CIRCUIT. THEREFORE, OUR TUBE ELEMENT LEAKAGE CIRCUIT IS LIMITED TO A VALUE CLOSE TO 100,000 OHMS. THIS CIRCUIT ALSO DETECTS ANY DIRECT SHORTS BETWEEN TUBES.

"TEST-LKG." SWITCH

THIS SWITCH, IN THE LOWER RIGHT CORNER OF THE PANEL, IS TO BE THROWN TO THE "TEST" POSITION FOR A "QUALITY" OR "OPEN ELEMENT" TEST AND TO THE "LKG." POSITION FOR A TUBE "LEAKAGE" OR "SHORT" TEST.

TUBE CARD IN CASE OF TESTER (#7333)

THIS TUBE CARD GIVES YOU THE PROPER CONNECTIONS AND SWITCHES TO THROW, FOR ABOUT 75% OF THE REPLACEMENT TUBE MARKET.

TUBE BOOKLET (ALSO SUPPLIED)

THIS TUBE BOOKLET (#8725) GIVES YOU THE PROPER CONNECTIONS AND SWITCHES TO THROW FOR ALL TUBE TYPES UP TO THE PRESENT WRITING. IN THE FIRST PORTION OF THE BOOKLET, A COMPLETE LIST OF TUBES, THEIR BASE CONNECTIONS AND TUBE TEST SETTINGS ARE GIVEN. IF A TUBE TYPE IS NOT

HUNDRED ADDITIONAL TUBE TYPES WHICH ARE IDENTICAL IN TUBE BASE CONNECTIONS AND TEST SETTINGS WITH SOME OTHER TUBE. A THIRD SECTION GIVES A LIST OF RESISTANCE OR "BALLAST" TUBES WHICH ARE NOT ACTUAL RECEIVER TUBES BUT REALLY GLASS OR METAL COVERED RESISTORS. ADDITIONAL TUBE DATA MAY BE OBTAINED FROM THE FACTORY. (ADDRESS "SERVICE ENGINEER", THE SUPREME INSTRUMENTS CORPORATION, GREENWOOD, MISSISSIPPI). IF A NEW CARD OR BOOKLET IS DESIRED, PLEASE ENCLOSE 15¢ FOR EACH.

POWER SUPPLY RATINGS

ABOUT 98% OF THESE TESTERS WILL BE USED IN CONNECTION WITH POWER SUPPLY POTENTIALS BETWEEN 100 TO 133 VOLTS (THE RANGE WHICH IS LETTERED AROUND THE "PRIMARY VOLTS ADJUSTER" CONTROL KNOB). TESTERS SUPPLIED FOR OTHER POWER SUPPLY POTENTIALS ARE OF SPECIAL DESIGN AND THE "PRIMARY VOLTS ADJUSTER" MARKINGS SHOULD BE INTERPRETED IN ACCORDANCE WITH THE FOLLOWING TABULATION:

ACTUAL MARKING ON PANEL	SPECIAL TESTERS FOR 137 TO 182 VOLTS POWER SUPPLY	SPECIAL TESTERS FOR 188 TO 250 VOLT POWER SUPPLIES
100	137	188
103	141	194
106	146	200
109	151	206
113	156	213
117	161	220
121	166	227
125	171	234
129	176	242
133	182	250
OFF	OFF	OFF

SPECIAL FREQUENCY RATINGS ARE ACCOMMODATED BY THE NECESSARY CHANGES IN TRANSFORMER CORE THICKNESS.

"6N5 - 6G5, 6E5" SWITCH

THIS IS A SWITCH WHICH IS USED IN THE TEST OF "TARGET" TYPE TUBES SUCH AS THE 6N5, 6G5, 6E5, ETC., AS EXPLAINED IN THE TUBE BOOKLET.

POWER SUPPLY ADJUSTMENTS

LET US NOW MAKE THE NECESSARY POWER SUPPLY ADJUSTMENTS. FIRST, CONNECT THE A.C. PLUG OF THE TESTER TO A CONVENIENT A.C. OUTLET. THEN, THROW THE "LINE ADJUST." SWITCH UPWARD AND, WHILE HOLDING IT IN THIS POSITION, ROTATE THE "PRIMARY VOLTS ADJUSTER" UNTIL A POINT IS REACHED AT WHICH THE METER NEEDLE WILL REST NEAREST THE CENTER MARKING OF THE METER SCALE. (CENTER OF ORANGE "?"). RELEASE "LINE ADJ." SWITCH. IT SOMETIMES MAY NOT BE POSSIBLE EXACTLY TO CENTER THE NEEDLE, BUT THE GREATEST POSSIBLE ERROR IS LESS THAN 2% AT ANY SETTING WHICH WILL CAUSE NO APPRECIABLE ERROR IN TUBE TESTING. THE PRIMARY WINDING OF THE TESTER TRANSFORMER IS NOW MATCHED TO THE LOCAL POWER SUPPLY POTENTIAL AND WILL NOT REQUIRE RESETTING UNLESS THE POWER SUPPLY POTENTIAL VARIES.

PRELIMINARY ADJUSTMENTS TO ANY TUBE TEST

WE ARE NOW READY TO TEST A TUBE. FOR OUR FIRST TEST, LET US TRY AN O1A TUBE, AS THIS SHOULD BE AVAILABLE IN ANY SHOP.

PROCEDURE

LOOK AT YOUR TUBE CARD IN THE COVER OF YOUR TESTER. THE O1A TUBE IS LISTED THEREON. TUBES NOT LISTED ON THE CARD MAY BE FOUND IN THE COMPLETE LISTING IN THE TUBE BOOKLET. OBSERVE THE "F.V.S." COLUMN AND SET THE "FILAMENT VOLTS" SELECTOR SWITCH TO THE INDICATED POSITION (5.0). OBSERVE THE "F.R.S." COLUMN AND SET THE "FIL. RET. SEL." SWITCH TO THE INDICATED POSITION (1). OBSERVE THE "C.S." COLUMN AND SET THE "CIRCUIT SELECTOR" SWITCH TO THE INDICATED POSITION. OBSERVE THE "QUAL. SEL." COLUMN AND SET THE "QUALITY SELECTOR" POTENTIOMETER TO THE INDICATED SETTING.

LEAKAGE AND SHORT TEST

NOTE THE NINE COLUMNS (MARKED "#1" TO "#8" AND "T.C." UNDER "SWITCHES UP") ON THE CARD OR IN THE TUBE BOOKLET. THE LETTER UNDER EACH NUMBER DENOTES THE MAJOR ELEMENT CONNECTED TO EACH CORRESPONDINGLY NUMBERED TUBE BASE PIN. ON THE O1A TUBE, #1 IS "F" OR FILAMENT, #2 IS "P" OR PLATE, #3 IS "G" OR GRID AND #4 IS "F" OR FILAMENT. THE SWITCHES WHICH SHOULD BE SUCCESSIVELY THROWN UP AND LEFT IN THE "UP" POSITION ARE SHOWN IN HEAVY, BOLD-FACE TYPE. IN THE O1A TUBE THESE SHOW AS "P" AND "G". THROW FIRST THE #2 AND THEN THE #3 SWITCH TO THE "UP" POSITION, LEAVING THEM IN THE "UP" POSITION, WHILE OBSERVING THE NEON LAMP.

IN ORDER TO MAKE THE NEON LAMP RESPONSIVE TO PERMISSIBLE TUBE LEAKAGES ONLY AND TO PREVENT ITS RESPONDING TO RECTIFIED POTENTIALS, THE LAMP IS CONNECTED IN SERIES WITH A "BLOCKING"

CAPACITOR. WHEN OPERATING THE SWITCHES DURING THESE LEAKAGE TESTS, IT WILL BE OBSERVED THAT, ON SOME TYPES OF TUBES, MOMENTARY FLASHES OF THE NEON LAMP WILL BE SEEN AS THESE SWITCHES ARE OPERATED. **DISREGARD THESE FLASHES!** A LEAKAGE OR SHORT WILL BE DISTINGUISHED FROM A FLASH BY A STEADY GLOW OF BOTH THE INNER AND OUTER NEON BULB ELECTRODE. WHEN A LEAKY OR SHORTED ELEMENT IS ENCOUNTERED, IT IS OFTEN OF INTEREST TO FIND OUT THE OTHER ELEMENT TO WHICH THE FIRST ELEMENT IS SHORTED OR LEAKING. TO DO THIS, CONTINUE WITH THE BALANCE OF THE SWITCHES UNTIL ANOTHER SWITCH IS ENCOUNTERED WHICH, WHEN THROWN, RESULTS IN THE NEON LIGHT GOING OUT. THE SHORT OR LEAK IS BETWEEN THESE TWO ELEMENTS. IF NO OTHER SWITCH IS ENCOUNTERED WHICH PUTS OUT THE NEON LIGHT, THE SHORT OR LEAK IS BETWEEN THE ELEMENT FIRST ENCOUNTERED AND THE TUBE'S FILAMENT OR CATHODE.

LET US USE PRACTICAL EXAMPLES. REMOVE THE O1A TUBE FROM THE TESTER AND CONNECT A SHORT PIECE OF WIRE BETWEEN #2 AND #3 PINS. THIS CORRESPONDS TO AN INTERNAL SHORT BETWEEN THESE TWO ELEMENTS. PROCEED WITH THE LEAKAGE CHECK AS PREVIOUSLY EXPLAINED. AS SOON AS THE #2 SWITCH IS PLACED IN THE "Up" POSITION, THE NEON TUBE WILL LIGHT. THIS SIGNIFIES THAT A SHORT OR LEAK HAS DEVELOPED BETWEEN THIS ELEMENT AND SOME OTHER ELEMENT. CONTINUE WITH THE TEST AND AS SOON AS THE #3 SWITCH IS THROWN UPWARD, THE NEON LIGHT WILL GO OUT. THEREFORE, THE SHORT IS BETWEEN THESE TWO ELEMENTS. REPLACE THE PIECE OF WIRE WITH A 100,000 OHM RESISTOR WHICH MIGHT REPRESENT AN INTERNAL LEAKAGE OF THIS VALUE. THE RESULT WILL BE THE SAME.

NOW, CONNECT THE SHORTING WIRE OR THE RESISTOR BETWEEN #2 PIN AND THE #1 OR #4 PIN (EITHER SIDE OF THE FILAMENT). THE NEON BULB WILL LIGHT ON #2, BUT NOT ON #3, SHOWING THAT THE SHORT OR LEAKAGE IS BETWEEN #2 AND THE FILAMENT. **DO NOT OPERATE THE SWITCH CORRESPONDING TO THE OTHER SIDE OF THE FILAMENT AS THIS WILL SHOW A SHORT AT ALL TIMES, BESIDES REMOVING THE FILAMENT POTENTIAL FROM THE TUBE.** IT IS ONLY NECESSARY TO THROW THE SWITCHES CORRESPONDING TO THE FIGURES IN HEAVY BLACK TYPE AND IN THE CASE OF TUBES WITH A CATHODE, THE CATHODE SWITCH OR SWITCHES AS EXPLAINED LATER.

REMEMBER, A STEADY GLOW IS AN INDICATION OF A SHORTED OR LEAKY ELEMENT. SUCH TUBES SHOULD BE DISCARDED REGARDLESS OF THEIR "QUALITY" READING.

QUALITY TEST

IF THE TUBE HAS PASSED THE "SHORT" AND "LEAKAGE" TEST, AND ALL SWITCHES ARE CORRECTLY SET ACCORDING TO THE TUBE LIST, A "QUALITY" TEST SHOULD BE UNDERTAKEN. THROW THE "TEST-LKG." SWITCH TO THE "TEST" POSITION WHICH SHOULD RESULT IN THE METER NEEDLE DEFLECTING TO SOME POSITION ON THE ENGLISH READING "BAD-?-GOOD" SCALE. IF THE NEEDLE RESTS IN THE "GOOD" PORTION, THE TUBE IS SATISFACTORY ON THE QUALITY TEST. IF IT RESTS IN THE "?" AREA, IT IS DOUBTFUL AND SHOULD BE REPLACED AS SOON AS POSSIBLE. IF THE METER INDICATION IS "BAD" THE TUBE SHOULD BE DISCARDED AT ONCE.

IF IT IS DESIRED TO MAKE CLOSE COMPARISONS OF QUALITY BETWEEN TUBES OF THE SAME TYPE, SUCH AS WHEN MATCHING AMPLIFIER TUBES, THE 0 TO 100 SCALE SHOULD BE USED - UNDER THE SAME PROCEDURE AND THE TUBES CHOSEN FOR THEIR ABILITY TO INDICATE MOST CLOSELY THE SAME DEFLECTION.

OPEN ELEMENT TEST

CONSIDERING THE NUMBER OF TUBES MANUFACTURED, TUBES WITH OPEN ELEMENTS ARE VERY RARELY ENCOUNTERED. HOWEVER, AN OPEN ELEMENT TEST WILL PROVE VERY HELPFUL IN SOME CASES AND THIS TESTER CAN BE USED TO INDICATE THE PRESENCE OF AN OPEN ELEMENT IN A TUBE. GENERALLY, AN OPEN ELEMENT WILL CAUSE THE TUBE TO INDICATE "BAD" ON A QUALITY TEST, BUT, IF THE OPEN CIRCUITED ELEMENT IS LOCATED SOME DISTANCE FROM THE ELECTRON EMITTING ELEMENT, IT MAY CAUSE A RELATIVELY SMALL VARIATION IN THE QUALITY READINGS. THIS IS NOT SURPRISING WHEN WE CONSIDER THAT, IN A QUALITY TEST, WE ARE TESTING THE ELECTRON EMITTING ABILITY OF THE CATHODE, NOT THE CONDITION OF ITS OTHER ELEMENTS.

PROCEDURE

AN OPEN ELEMENT TEST SHOULD BE CONDUCTED DIRECTLY AFTER THE "QUALITY" TEST. WITH ALL SWITCHES AND CONTROLS SET FOR A "QUALITY" TEST, AND WITH THE "TEST-LKG." SWITCH IN THE "TEST" POSITION, SUCCESSIVELY THROW EACH OF THE SWITCHES IN THE "Up" POSITION TO THE "DOWN" POSITION AND RETURN TO THE "Up" POSITION WHILE WATCHING THE METER NEEDLE. IN EACH CASE, WHEN THE SWITCH IS THROWN TO THE "DOWN" POSITION, THE NEEDLE SHOULD DROP BACK SOMEWHAT AND WHEN THE SWITCH IS RETURNED TO THE "Up" POSITION, THE NEEDLE SHOULD RESUME ITS FORMER POSITION.

USING THE O1A TUBE AS AN ILLUSTRATION, THROWING THE #3 SWITCH (GRID) TO THE "DOWN" POSITION RESULTS IN THE METER NEEDLE DROPPING BACK CONSIDERABLY WHEREAS, WHEN YOU THROW THE #2 SWITCH (PLATE) TO THE "DOWN" POSITION, THE NEEDLE DROPS BACK A RELATIVELY SMALLER AMOUNT.

IF, WHEN A SWITCH IS THROWN, THE NEEDLE DOES NOT MOVE BACKWARD, THE CORRESPONDING ELEMENT IS OPEN.

TESTING A CATHODE TYPE TUBE

IN TESTING CATHODE TYPE TUBES, DURING THE "LEAKAGE" TEST, DO NOT FORGET TO THROW ALSO TO THE "Up" POSITION THE SWITCH CORRESPONDING TO THE TUBE'S CATHODE AS WELL AS THE SWITCHES SHOWN ON THE TUBE LIST. THIS ALLOWS A LEAKAGE OR SHORT CHECK BETWEEN THE CATHODE AND HEATER WHICH IS A VERY POSSIBLE SOURCE OF SUCH TROUBLE. IF A TUBE HAS TWO CATHODES, THE SWITCHES CORRESPONDING TO EACH CATHODE SHOULD BE SUCCESSIVELY THROWN TO THE "Up" POSITION WHILE WATCHING THE NEON BULB. DO NOT FORGET TO RETURN IMMEDIATELY THESE SWITCHES TO THE DOWN POSITION. DO NOT LEAVE SWITCHES CORRESPONDING TO THE CATHODE OR CATHODES OF A TUBE, IN THE "Up" POSITION WHEN MAKING "QUALITY" TESTS AS YOU WILL NOT RECEIVE A CORRECT INDICATION AND, IN SOME INSTANCES WILL RESULT IN THE METER NEEDLE VIBRATING VIOLENTLY ABOUT ITS "ZERO" POSITION.

USING A 27 TYPE TUBE AS AN ILLUSTRATION, LET US ILLUSTRATE THE ABOVE EXPLANATION. SET THE "PRIMARY VOLTS ADJUSTER", "FIL. VOLTS SELECTOR", "FIL. RET. SEL." AND "QUALITY SELECTOR" TO POSITIONS AS GIVEN ON THE TUBE LIST. SEE THAT ALL NUMBERED AND "T.C." SWITCHES ARE IN "DOWN" POSITION, WITH "TEST-LKG." SWITCH IN "LKG." POSITION.

PROCEED TO THROW EACH OF THE "SWITCHES Up" SWITCHES TO THE "Up" POSITION, NOTING THE NEON BULB. LEAVE THEM IN THE "Up" POSITION. THEN THROW #4 SWITCH ("K" ON THE "SWITCHES Up" LIST AND CATHODE IN THE TUBE) TO THE "Up" POSITION, RETURNING IT TO THE "DOWN" POSITION AFTER NOTING WHETHER THE NEON BULB GLOWS. IF THE BULB GLOWS, THE TUBE HAS A LEAKAGE BETWEEN CATHODE AND FILAMENT AND SHOULD BE DISCARDED. FOR THE "QUALITY" TEST, MAKE SURE THAT THE "K" SWITCH OR SWITCHES, ARE IN THE "DOWN" POSITION AND PROCEED AS USUAL.

SLOW HEATING FILAMENTS

IT HAS BEEN FOUND THAT SOME TYPES OF TUBES OF THE FILAMENT OR NON-HEATER TYPES HAVE SLOW HEATING FILAMENTS, REQUIRING SOMETIMES AS MUCH AS TWO MINUTES TO REACH PROPER OPERATING TEMPERATURE. YOU SHOULD MAKE ALLOWANCES FOR SUCH TYPES WHICH MAY APPEAR DOUBTFUL WHEN FIRST TESTED, ALLOWING ABOUT THREE MINUTES FOR THE TUBE FULLY TO HEAT BEFORE AGAIN TAKING A "QUALITY" TEST.

THREE-HEATER PIN TYPE TUBES

TUBE MANUFACTURERS OFFER SEVERAL TYPES OF TUBES SUCH AS THE "6Z5", "12A5", "12Z5", ETC., WHICH MAY BE OPERATED ON EITHER 12 VOLTS OR 6 VOLTS, DEPENDING UPON THE CONNECTIONS TO THE HEATER FILAMENT. SUCH HEATERS ARE CENTER TAPPED AND THIS CONNECTION IS BROUGHT OUT TO A THIRD HEATER PIN ON THE TUBE BASE. BY CONNECTING THE CENTER TAP TO ONE SIDE OF THE FILAMENT SUPPLY 6.3 VOLT POTENTIAL AND BOTH ENDS OF THE FILAMENT TO THE OTHER SIDE OF THIS POTENTIAL, IT IS POSSIBLE TO CHECK SUCH TUBES IN THIS TESTER. IN SUCH CASES, THE "FILAMENT RETURN SELECTOR" SWITCH IS PLACED IN THE NUMERICAL POSITION CORRESPONDING TO THE TUBE'S HEATER CENTER TAP, AND BOTH ENDS OF THE HEATER ARE CONNECTED TO THE OTHER SIDE OF THE FILAMENT SUPPLY BY LEAVING THEIR RESPECTIVE SWITCHES IN THE "DOWN" POSITION FOR ALL TESTS.

SPECIAL TESTS FOR TARGET TYPE TUBES

IN ORDER THAT SUCH TARGET TYPE TUBES AS THE "6E5", "6G5", "2E5", "2G5", "6N5", ETC., BE PROPERLY TESTED, A SPECIAL SWITCH IS INCORPORATED IN THIS TESTER. THIS SWITCH IS TO THE RIGHT OF THE "QUALITY SELECTOR" AND SHOULD BE THROWN EITHER TO THE "6E5, 6G5" POSITION OR TO THE "6N5" POSITION WHEN TESTING TARGET TUBES, ACCORDING TO THE INSTRUCTIONS GIVEN ON THE TUBE LIST. THE PURPOSE OF THE SWITCH IS TO CONNECT THE ELEMENTS OF THE TUBE SO THE USER WILL BE ABLE TO OBSERVE THE VARIATIONS OF THE "TUNING EYE" ANGLE AND SO DETERMINE WHETHER THE TUBE OPERATES CORRECTLY. BY MOVING THE "FIL. VOLTS" SELECTOR TO SOME LOWER SETTING THAN NORMAL, THE ANGLE OF THE EYE SHOULD SLOWLY BECOME SMALLER AND, RETURNING THIS SWITCH TO ITS NORMAL POSITION SHOULD SLOWLY RESTORE THE ORIGINAL ANGLE OF THE EYE. IF THIS TEST HAS NO EFFECT ON THE ANGLE OF THE "TUNING EYE", THE TUBE SHOULD BE DISCARDED.

FULL WAVE DIODES, RECTIFIERS AND MULTI-ELEMENT SECTIONAL COMPARISONS

FOR THE SAKE OF SIMPLICITY FROM THE CUSTOMER'S VIEW-POINT, ALL ANODE ELEMENTS OF ALL TUBES ARE PARALLELED ON THE TUBE CARD MOUNTED IN THE COVER. HOWEVER, SEPARATE QUALITY TESTS ARE AVAILABLE IN THE TUBE BOOKLET FOR EACH SECTION OF MULTI-SECTION TUBES, EACH PLATE OF FULL WAVE RECTIFIERS AND EACH DIODE OF DUO-DIODE TUBES. THESE TESTS IN THE TUBE BOOKLET ARE DIFFERENTIATED FROM THE "ALL" ANODE ELEMENTS TEST BY THE CODE "DIO" FOR A DIODE SECTIONAL TEST, "TRI" FOR A TRIODE SECTIONAL TEST, "PEN" FOR A PENTODE SECTIONAL TEST, ETC. IN DUO-TRIODE TUBES, EACH TRIODE SECTION MAY BE TESTED AND THESE ARE GIVEN AS "TR.#1" AND "TR.#2". EACH PLATE OF FULL WAVE RECTIFIERS CAN BE TESTED SEPARATELY AND THESE ARE SHOWN AS "RP#2" AND "RP#3", ETC., THE NUMBER IN THIS CASE REFERRING TO THE NUMERICAL PIN TO WHICH THE INDIVIDUAL PLATE IS CONNECTED.

"TOP CAP" TUBES

ON ALL TUBES CONTAINING A "TOP CAP", CONNECT THE TOP CAP OF THE TUBE WITH THE "TOP CAP" PIN JACK IN THE UPPER LEFT CORNER OF THE PANEL BY MEANS OF THE SPECIAL CONNECTOR PROVIDED.

FUTURE TUBES

THE DESIGN OF THIS TESTER IS SUCH THAT YOU CAN ESTABLISH YOUR OWN SETTINGS FOR TUBES NOT LISTED ON THE "TUBE CARD" OR IN THE "TUBE BOOKLET", OR FOR TUBE TYPES WHICH, BECAUSE OF MANUFACTURERS' VARIATIONS OR OTHER CAUSES RESULT IN UNIFORMLY LOW OR HIGH READINGS FOR NEW, GOOD TUBES.

THIS PROCEDURE IS NOT DIFFICULT AND THE RESULTS ATTAINED SHOULD BE USED UNTIL MORE AUTHORITY SETTINGS ARE OBTAINED FROM THE FACTORY. (INFORMATION ON NEW TUBE TYPES IS AVAILABLE BY WRITING "SERVICE ENGINEER", SUPREME INSTRUMENTS CORPORATION, GREENWOOD, MISSISSIPPI, ENCLOSING 15d).

LET US ASSUME THAT A NEW TUBE TYPE HAS BEEN ANNOUNCED AND THAT YOU HAVE THREE NEW TUBES OF THIS TYPE. (ONE WILL SUFFICE, BUT MORE ACCURATE RESULTS WILL BE OBTAINED BY TESTING THREE OR MORE AND AVERAGING THE RESULTS.)

PROCEDURE

1. CONNECT THE TESTER TO A CONVENIENT POWER SUPPLY OUTLET AND ADJUST THE "PRIMARY VOLTS ADJUSTER" FOLLOWING THE PROCEDURE AS OUTLINED PREVIOUSLY.
2. GET A MANUFACTURER'S SPECIFICATIONS SHEET SHOWING, FILAMENT, VOLTAGE, BASE CONNECTIONS, ETC.
3. ROTATE THE "FIL. VOLTS" SELECTOR TO THE POSITION CORRESPONDING TO THE TUBE'S FILAMENT VOLTAGE RATING.
4. ROTATE THE "FIL. RET. SEL." TO THE POSITION CORRESPONDING TO ONE SIDE OF THE FILAMENT (USUALLY #1 FOR NON-OCTALS AND #2 FOR OCTALS). IF THE TUBE HAS A CENTER TAPPED HEATER, SET THE "FIL. RET. SEL." TO THIS POSITION, MAKING SURE THAT THE "FIL. VOLTS" SELECTOR IS SET TO THE VOLTAGE FOR THE FILAMENTS IN PARALLEL ($\frac{1}{2}$ THE VOLTAGE FOR THE FILAMENTS IN SERIES AND USUALLY 6.3 VOLTS).
5. PLACE THE "TEST CIRCUIT" SWITCH TEMPORARILY IN THE "C" POSITION.
6. PLACE THE "TEST-LKG." SWITCH IN THE "LKG." POSITION, INSERT THE TUBE AND LET IT HEAT FOR ABOUT 10 SECONDS.
7. NOTE THE TUBE'S BASE CONNECTIONS AND START THROWING TO THE "Up" POSITION EACH SWITCH CORRESPONDING TO ALL ELEMENTS OF THE TUBE EXCEPT THE HEATER, FILAMENT OR CATHODE PINS. WATCH THE NEON BULB FOR LEAKAGES.
8. THROW TO THE "Up" POSITION AND RETURN TO THE "DOWN" POSITION ALL SWITCHES CORRESPONDING TO THE CATHODE OR CATHODES OF THE TUBE. WATCH THE NEON BULB FOR LEAKAGE INDICATIONS.
9. IF THE TUBE APPEARS TO BE FREE OF LEAKAGES, OR SHORTS, THROW THE "TEST-LKG." SWITCH TO THE "TEST" POSITION AND ROTATE THE "QUALITY SELECTOR" CONTROL SO AS TO OBTAIN A READING OF "77" ON THE METER. IF THE NEEDLE CANNOT BE SO ADJUSTED, VARY THE "CIRCUIT SELECTOR" AND THE "QUALITY SELECTOR" UNTIL THIS IS ACCOMPLISHED.

10. RECORD THE SETTINGS ON A PIECE OF PAPER AND FOLLOW THE SAME TEST FOR A FEW ADDITIONAL TUBES OF THE SAME TYPE.
11. DIVIDE THE TOTAL OF THE "QUALITY SELECTOR" SETTINGS BY THE NUMBER OF TUBES TESTED TO OBTAIN AN AVERAGE "QUALITY SELECTOR" SETTING.
12. RECORD THESE SETTINGS IN THE TUBE LIST BOOKLET UNDER THE PROPER COLUMNS, RECORDING THE TYPE OF ELEMENT IN THE SWITCHES UP COLUMN AS WE HAVE PRINTED THEM FOR PRESENT TYPE TUBES, CIRCLING THE FIGURES CORRESPONDING TO THE SWITCHES WHICH SHOULD BE THROWN UP FOR A QUALITY TEST.

BRAND VARIATIONS

WHILE STANDARD TRANSCONDUCTANCE VALUES ARE ESTABLISHED FOR PRACTICALLY ALL TYPES OF TUBES, SOME VARIATIONS ARE TO BE EXPECTED WHEN DIFFERENT BRANDS ARE COMPARED BY USING THIS OR SIMILAR TESTERS. SUCH VARIATIONS MAY BE ATTRIBUTED TO A PRODUCTION PROCEDURE WHEREBY ONE MANUFACTURER MAY ALLOW HIS PRODUCTION OF TUBES TO RUN HIGHER THAN RATED VALUES, WHEREAS ANOTHER MANUFACTURER MAY HOLD HIS PRODUCTION VERY CLOSE TO RATED VALUES. A SIMILAR CONDITION MAY BE OBSERVED WHEN BUYING ORDINARY 45-VOLT "B" BATTERIES; ONE BRAND MAY TEST 47 VOLTS WHILE ANOTHER BRAND MAY TEST 52 VOLTS WHEN NEW. THE MERE FACT THAT ONE BRAND OF TUBES MAY TEST LOWER THAN ANOTHER, DOES NOT MEAN THAT ONE OF THE BRANDS IS NECESSARILY BETTER THAN THE OTHER, SO LONG AS BOTH BRANDS EQUAL OR EXCEED RATED VALUES OF TRANSCONDUCTANCE. WE DO NOT SAY THAT A BRAND OF 45-VOLT BATTERIES WHICH TESTS 52 VOLTS WHEN NEW IS NECESSARILY BETTER THAN A BRAND WHICH TESTS 47 VOLTS WHEN NEW, BECAUSE WE KNOW THAT THERE IS A TIME ELEMENT INVOLVED; WHEN BOTH BRANDS ARE SUBJECTED TO THE SAME SERVICE OVER A PERIOD OF TIME, ONE WHICH ORIGINALLY TESTED 52 VOLTS MAY THEN TEST 40 VOLTS WHEREAS THE BATTERY WHICH ORIGINALLY TESTED 47 VOLTS MAY THEN TEST 41 VOLTS. THE TEST LIMITS ESTABLISHED FOR THIS TESTER REPRESENT AVERAGE VALUES AS BETWEEN BRANDS, AND WHENEVER A BRAND IS ENCOUNTERED IN WHICH CERTAIN TYPES OF NEW TUBES TEST EITHER "OFF SCALE" OR BELOW THE "GOOD" SECTOR OF THE METER, THE USER SHOULD ESTABLISH HIS OWN "QUALITY TEST SELECTOR" SETTINGS FOR THESE TYPES OF TUBES BY FOLLOWING THE PROCEDURE OUTLINED HEREIN UNDER THE PARAGRAPH FOR "FUTURE TUBES".

GASEOUS TUBES

IN THE COURSE OF THE DEVELOPMENT OF THIS TESTER, IT WAS DEEMED MORE IMPORTANT TO PROVIDE FACILITIES FOR INDICATING LEAKAGES AND SHORT-CIRCUITED CONDITIONS BETWEEN ALL ELEMENTS OF ALL TUBES THAN TO PROVIDE A GAS TEST FOR AMPLIFIER TYPES OF TUBES. BOTH TESTS COULD NOT BE PROVIDED WITHOUT SERIOUSLY COMPLICATING THE OPERATION OF THE TESTER. FURTHERMORE, TUBE ENGINEERS ARE NOT GENERALLY AGREED AS TO THE TEST LIMITS OF GASEOUS CONTENT SO THAT THE USUAL GAS TEST OF A TUBE TESTER HAS VERY LITTLE MEANING IN PRACTICE. WHEN CERTAIN TUBES, EXCEPTING GASEOUS DETECTORS SUCH AS THE TYPE 900-A AND MERCURY VAPOR RECTIFIERS SUCH AS THE TYPE 82 AND 89, BECOME SO GASEOUS AS TO CAUSE A PURPLISH GLOW BETWEEN THE ELEMENTS DURING NORMAL OPERATING CONDITIONS THEY SHOULD UNQUESTIONABLY BE REPLACED. SUCH TUBES WILL USUALLY TEST LOW ON THE REGULAR "TUBE" TEST OF THE TESTER. PURPLE SPOTS OR IRREGULAR FIGURES, WHICH VARY OR COME AND GO WITH SIGNAL INTENSITY VARIATIONS, ARE SOMETIMES OBSERVED ON THE INSIDE SURFACE OF THE GLASS ENVELOPES OF POWER TUBES, BUT THESE ARE QUITE NATURAL AND SHOULD NOT BE INTERPRETED AS AN INDICATION OF A DETRIMENTAL GASEOUS CONDITION, UNLESS THERE BE DISTORTION OR AN UNNATURAL HISSING NOISE GENERATED BY THE TUBES.

KELLOGG TYPE TESTS

THE KELLOGG TYPES 401 AND 403 HAVE TOP HEATER TERMINALS, AND IT WILL BE NECESSARY TO CONNECT THE TOP HEATER TERMINALS, WITH SUITABLE CONDUCTORS, TO THE FILAMENT CONTACTS OF ONE OF THE UNOCCUPIED TUBE TESTER SOCKETS, AFTER PLACING ONE OF THESE TYPES IN THE 4-HOLE SOCKET. IF DESIRED, A SPECIAL ADAPTER FOR TESTING THOSE OBSOLETE TUBE TYPES MAY BE OBTAINED FROM THE ALDEN PRODUCTS COMPANY, 715 CENTER STREET, BROCKTON, MASSACHUSETTS.

LOAD POTENTIALS

ALL OF THE TRANSFORMER POTENTIAL VALUES APPLIED TO THE FILAMENT AND OTHER CIRCUITS OF TUBES WHICH ARE SUBJECTED TO TESTS IN THIS TESTER ARE NECESSARILY BASED ON NO-LOAD CONDITIONS BECAUSE EACH TUBE IMPOSES A DIFFERENT LOAD FROM EACH OTHER TUBE. WHEN A TUBE LOAD IS IMPOSED UPON THE TESTER, THE APPLIED POTENTIALS MAY BE EXPECTED TO DROP SOMEWHAT FROM THE NOMINAL VALUES, BUT THIS CONDITION SHOULD NOT BE CONFUSING BECAUSE THE TEST DATA ON THE "TUBE LIST" CARD IS BASED ON ACTUAL LOAD CONDITIONS.

TUBE TESTER ACCURACY

THE STANDARD PREFERRED TEST OF AMPLIFIER TYPES OF TUBES IS KNOWN AS THE MUTUAL CONDUCTANCE TEST, WHICH INVOLVES LABORATORY EQUIPMENT FOR MEASURING MUTUAL CONDUCTANCE IN TERMS OF MICRO-OHMS WITH SPECIFIED D.C. POTENTIALS APPLIED TO THE TUBES. OBVIOUSLY, SUCH ELABORATE EQUIPMENT IS IMPRACTICAL FOR FIELD USES BECAUSE OF THE COMPLEXITY OF THE "SET-UP" FOR EACH TYPE OF TUBE, AND BECAUSE OF THE PROHIBITIVE COST OF SUCH EQUIPMENT. ANY DEPARTURE FROM SUCH EQUIPMENT NECESSITATES SOME COMPROMISE IN ACCURACY FOR THE SAKE OF SIMPLICITY OF OPERATION AND LOWER UNIT COST PER TESTER, BUT PRACTICAL RADIO DEALERS AND THE PROFESSIONAL RADIOMEN FEEL THAT AN INVESTMENT OF \$50.00 WHICH PRODUCES AN ACCURACY OF 94% IS MORE PROFITABLE THAN AN INVESTMENT OF \$300.00 IN AN EFFORT TO OBTAIN AN ACCURACY OF 99%. IN ADDITION TO THE GREATER SIMPLICITY AND CUSTOMER COMPREHENSION OF THE LOWER PRICED TESTER, AN UNUSUALLY HIGH DEGREE OF ACCURACY IS ENABLED BY THE SUPREME TESTER BY REASON OF THE FACT THAT ALL TUBES ARE TESTED UNDER APPROXIMATELY FULL RATED LOAD CONDITIONS, AND A FIXED RATIO IS AUTOMATICALLY MAINTAINED BETWEEN THE TESTER CIRCUIT RESISTANCE AND THE EFFECTIVE INTERNAL RESISTANCE OF EACH TUBE WHICH IS SUBJECTED TO THE TEST. THE USER OF THIS TESTER, OR OF ANY OTHER TUBE TESTER OFFERED IN A SIMILAR PRICE CLASS, SHOULD APPRECIATE THE FACT THAT THE TESTER IS NOT A GRADUATED QUALITATIVE TESTER IN WHICH A TUBE WHICH TESTS AT A METER READING OF 80 IS NECESSARILY BETTER THAN A TUBE WHICH TESTS 75, BUT THAT THE TESTER IS USEFUL PRIMARILY AS A MEANS FOR SEPARATING "BAD" TUBES FROM "GOOD" TUBES. IN OTHER WORDS, A "BAD" OR VERY "BAD" TUBE MAY TEST ANYWHERE IN THE "BAD" OR "?" SECTIONS OF THE METER SCALE AND A "GOOD" OR VERY "GOOD" TUBE MAY TEST ANYWHERE IN THE "GOOD" SECTOR OF THE METER SCALE. THE FINAL VERDICT AS TO WHETHER A TUBE IS SATISFACTORILY OPERABLE IS WHETHER OR NOT THE TUBE OPERATES SATISFACTORILY IN AN OPERATIVE RADIO; AND, EVEN WITH SUCH A SIMPLE, PRACTICAL AND APPARENTLY CONCLUSIVE

CRITERION AS AN OPERATIVE RADIO, IT IS SOMETIMES FOUND THAT A TUBE WHICH IS ALMOST COMPLETELY INOPERATIVE IN ONE OPERATIVE RADIO CIRCUIT MAY BE FOUND QUITE SATISFACTORILY OPERATIVE IN ANOTHER OPERATIVE RADIO CIRCUIT. THE FACILITIES OF THE SUPREME TESTER FOR INDICATING INTER-ELEMENT LEAKAGES, SHORT-CIRCUITED CONDITIONS, AND OPEN ELEMENTS ARE UNEXCELLED BY ANY TESTER AT ANY PRICE AND, CONSTITUTE AN INVALUABLE AUXILIARY TEST FOR "WEEDING OUT" UNSATISFACTORY TUBES; IT IS OFTEN FOUND THAT MORE TUBES OF A PARTICULAR RADIO REQUIRE REPLACEMENT BECAUSE OF INTER-ELEMENT LEAKAGES THAN REQUIRE REPLACEMENT BECAUSE OF LOSS OF TRANSCONDUCTANCE (MUTUAL CONDUCTANCE) INCIDENTAL TO THE DEPRECIATION OF THE ELECTRON-EMITTING QUALITIES OF THE TUBES INVOLVED. THIS TESTER IS AN INVALUABLE "SELLING TOOL" FOR THE RADIO DEALER, AND A VERY USEFUL ITEM IN THE EQUIPMENT OF THE PROFESSIONAL RADIOMAN WHOSE PRACTICAL MIND NECESSITATES HIS QUICKLY APPROXIMATING A PRACTICAL SOLUTION FOR EVERY TUBE AND SERVICE PROBLEM WHICH CONFRONTS HIM IN HIS DAILY ROUTINE.

MULTIMETER FUNCTIONS OF THE MODEL 502

HAVING GIVEN YOU ALL THE INFORMATION ON THE TUBE TESTING FUNCTIONS OF THE MODEL 502, LET US NOW EXPLAIN ITS MULTIMETER FUNCTIONS AND RANGES.

YOU WILL NOTE THAT THE "METER CIRCUIT SELECTOR" HAS NOT ONLY 7 LETTERED POSITIONS FROM "A" TO "G" (FOR TUBE TESTING) BUT ALSO HAS 4 ADDITIONAL POSITIONS, MARKED "D.C.V.", "A.C.V.", "OHMS" AND "ELECTROLYTIC". THESE CORRESPOND TO THE MULTIMETER FUNCTIONS OF THE TESTER. YOU WILL NOTE THAT THE "QUALITY SEL." SWITCH IS ALSO MARKED "ZERO OHMS" AND THIS CONTROL IS USED IN OHMMETER MEASUREMENTS AS EXPLAINED LATER.

THE "A.C. VOLTS" SWITCH IS LOCATED SECOND FROM THE LEFT ALONG THE BOTTOM EDGE OF THE PANEL. THIS SWITCH IS USED IN A.C. VOLTS MEASUREMENTS AND, FOR CANADIAN USERS ONLY, IT IS USED IN MEGOHMS AND ELECTROLYTIC AND ELECTROSTATIC TESTS.

THE "MEG OHMS-OHMS" SWITCH WHICH IS THIRD FROM THE RIGHT, ALONG THE BOTTOM EDGE OF THE PANEL, IS USED IN "MEG OHMS" AND "OHMS" TESTS AS EXPLAINED LATER.

THERE ARE NINE PIN JACKS ON EACH SIDE OF THE PANEL. STARTING FROM THE TOP ON THE LEFT SIDE, THE FIRST TWO PIN JACKS ARE USED IN ELECTROSTATIC CAPACITOR LEAKAGE MEASUREMENTS, THE NEXT TWO PIN JACKS ARE USED IN ELECTROLYTIC CAPACITY LEAKAGE MEASUREMENTS AND THE NEXT FIVE PIN JACKS ARE USED IN BOTH A.C. AND D.C. VOLTAGE MEASUREMENTS. THE BOTTOM PIN JACK IN THIS GROUP OF FIVE IS USED AS COMMON (NEGATIVE) IN D.C. VOLTS MEASUREMENTS AND IS USED IN CONJUNCTION WITH ONE OF THE OTHER FOUR PIN JACKS ACCORDING TO THE RANGE DESIRED - AS EXPLAINED LATER.

STARTING FROM THE TOP OF THE RIGHT SIDE LINE OF PIN JACKS, WE HAVE TWO JACKS MARKED "T.C." EITHER PIN JACK MAY BE USED FOR A TOP CAP CONNECTION DURING TUBE TESTS. THE NEXT THREE PIN JACKS ARE ASSOCIATED WITH THE MEGOHMS MEASURING FUNCTION. THE LAST FOUR PIN JACKS ARE ASSOCIATED WITH THE OHMS MEASURING CIRCUITS.

THUS WE HAVE EXPLAINED THE BALANCE OF THE CONTROLS, SWITCHES AND PIN JACKS WHICH ARE USED FOR MULTIMETER FUNCTIONS.

TEST LEADS

NOW LET US MAKE SOME ACTUAL MEASUREMENTS USING EACH FUNCTION OF THE TESTER. TO DO THIS IT IS NECESSARY TO OBTAIN A SET OF TEST LEADS WITH POINTED ENDS WHICH WILL FIT INTO THE PIN JACK.

WE DID NOT SUPPLY TEST LEADS WITH THIS TESTER BECAUSE WE FELT THAT MOST SERVICEMEN HAD ONE OR MORE SETS OF LEADS ALREADY AND THEREFORE WE DROPPED THE PRICE OF THE TESTER BY THE COST OF THESE LEADS AND PASSED THE SAVING ON TO YOU. IF, BY CHANCE, YOU DO NOT HAVE A SUITABLE SET OF TEST LEADS, THEY MAY BE OBTAINED FROM US BY USING THE ATTACHED ACCESSORY PARTS ORDER.

D.C. VOLTS MEASUREMENTS

IT IS SUGGESTED THAT THE SIMPLE TESTS AS GIVEN IN THIS OPERATING DATA BE MADE, FOLLOWING THE DIRECTIONS GIVEN, SO THAT YOU WILL BECOME FULLY FAMILIAR WITH YOUR TEST INSTRUMENT.

FOR THE FIRST D.C. VOLTS MEASUREMENT, OBTAIN A SMALL 4½ VOLT "C" BATTERY OR SOME OTHER LIKE UNIT AS WE ARE GOING TO MEASURE ITS POTENTIAL.

PROCEDURE

PLACE THE "METER CIRCUIT SELECTOR" IN THE "D.C.V." POSITION. SEE THAT ALL TOGGLE SWITCHES ALONG THE BOTTOM OF THE PANEL ARE "DOWN". PLACE A SET OF LEADS IN THE "VOLTS-" AND "7" PIN JACKS. CONNECT THE OTHER END OF THE LEAD (RUNNING TO THE "VOLTS-" PIN JACK) TO THE MINUS POST ON THE 4.5 VOLT BATTERY AND THE OTHER END OF THE OTHER LEAD TO THE PLUS POST ON THE BATTERY. THE METER NEEDLE SHOULD NOW DEFLECT TO SOME POSITION TO THE RIGHT OF CENTER SCALE. FIND THE 0 TO 7 SCALE ON THE METER AND NOTE WHERE THE NEEDLE DEFLECTS WITH RESPECT TO THIS SCALE. AS EACH DIVISION DENOTES 0.2 VOLTS, IF THE NEEDLE RESTS AT THE THIRD INDICATION PAST "4", THE BATTERY'S VOLTAGE WOULD REGISTER AS 4.6 VOLTS.

DO NOT TRY TO MAKE MEASUREMENTS OF ANY ONE VOLTAGE, CURRENT OR RESISTANCE ON MORE THAN ONE RANGE BECAUSE YOU WILL PROBABLY NOT RECEIVE THE SAME ANSWER. ALWAYS MAKE YOUR MEASUREMENTS ON THE RANGE WHICH RESULTS IN THE METER NEEDLE DEFLECTING FURTHEST WITHOUT GOING OFF SCALE. LIKEWISE, WHEN THE APPROXIMATE VOLTAGE IS NOT KNOWN, IT IS ALWAYS GOOD PRACTICE TO SET THE SELECTOR CONTROL TO THE HIGHEST RANGE AND THEN BACK IT DOWN UNTIL A SUITABLE RANGE IS FOUND.

FOR THE SECOND D.C. VOLTAGE MEASUREMENT OBTAIN TWO 45 VOLT BATTERIES AND HOOK THEM UP IN SERIES SO AS TO HAVE A SOURCE OF D.C. VOLTAGE AROUND 90 TO 100 VOLTS. A "B" SUPPLY OF ANY RECEIVER WILL PROBABLY PROVE SATISFACTORY IF YOU MAKE YOUR CONNECTION BETWEEN SCREEN GRID AND CATHODE OF A SCREEN GRID TUBE.

PROCEDURE

DISCONNECT LEADS FROM 4.5 VOLT BATTERY. CHANGE TEST LEAD FROM "7" PIN JACK TO "140" PIN JACK. CONNECT OTHER END TO PLUS SIDE OF BATTERY. CONNECT OTHER LEAD RUNNING FROM "VOLTS-" PIN JACK TO MINUS SIDE OF OTHER BATTERY. CONNECT OPEN PLUS AND MINUS POST ON EACH BATTERY TOGETHER, LEAVE ALL OTHER CONNECTIONS AS IS.

THE NEEDLE SHOULD NOW DEFLECT TO SOME POINT TO THE RIGHT OF CENTER SCALE. (IF THE "B" BATTERIES ARE FRESH). FIND THE 0 TO 140 SCALE ON THE METER (LOWEST SCALE) AND NOTE WHERE THE NEEDLE RESTS WITH RESPECT TO THIS SCALE. AS EACH SCALE DIVISION NOW INDICATES 4 VOLTS, IF THE NEEDLE RESTS AT THE THIRD DIVISION AFTER 80 VOLTS, IT INDICATES THAT THE VOLTAGE MEASURED IS 92 VOLTS.

FOR THE NEXT D.C. VOLTS TEST USE A POTENTIAL AROUND 250 VOLTS (THE VOLTAGE APPLIED TO THE AVERAGE OUTPUT TUBE'S PLATE WILL SUFFICE). CHANGE THE TEST PROBE IN THE "140" PIN JACK TO THE "350" PIN JACK. CONNECT OTHER ENDS OF LEADS ACROSS POTENTIAL TO BE MEASURED. LEAVE EVERYTHING ELSE AS IS.

OBSERVE POLARITY WHEN CONNECTING TEST LEADS TO VOLTAGE UNDER TEST. READ VOLTAGE ON 0-350 SCALE (BOTTOM SCALE).

FOR THE LAST D.C. VOLTS RANGE, A HIGH VOLTAGE SOURCE OF SUPPLY SHOULD BE USED, IF AVAILABLE, AROUND 800 VOLTS.

ALL CONNECTIONS REMAIN THE SAME EXCEPT THAT THE LEAD IN THE "350" PIN JACK SHOULD BE CHANGED OVER TO THE "1400" PIN JACK.

A.C. VOLTS MEASUREMENTS

A.C. VOLTS MEASUREMENTS ARE MADE EXACTLY THE SAME AS D.C. VOLTS EXCEPT THAT (1) NO POLARITY OF THE TEST LEADS NEED BE OBSERVED (2) THE "METER CIRCUIT SELECTOR" SWITCH SHOULD BE ROTATED TO THE "A.C.V." POSITION AND (3) AFTER ALL CONNECTIONS HAVE BEEN MADE, THE "A.C. VOLTS" MOMENTARY TOGGLE SWITCH SHOULD BE THROWN TO THE "A.C. VOLTS" POSITION, THE READING TAKEN AND THIS SWITCH RELEASED BEFORE BREAKING OR CHANGING ANY CONNECTIONS. THIS LAST SENTENCE IS IMPORTANT SO PLEASE READ IT AGAIN!

TO ALLOW A NORMAL D.C. MOVEMENT METER TO REGISTER A.C. VOLTS, A SMALL COPPER OXIDE RECTIFIER IS USED WHICH CHANGES THE ALTERNATING CURRENT TO DIRECT CURRENT. THE AVERAGE AC METER OF THIS TYPE USES WHAT IS KNOWN AS AN OFF-SET OR STAGGERED SCALE, THE SCALE BEING NON-LINEAR OR CROWDED AT ONE END AND VERY DIFFICULT TO READ. SUPREME ENGINEERS HAVE GIVEN YOU IN THE MODEL 502 TUBE TESTER A PERFECTLY LINEAR A.C. VOLTS SCALE AND THIS IS ACCOMPLISHED BY THE USE OF SMALL CONDENSERS IN PARALLEL WITH THE USUAL SERIES DROPPING RESISTORS. AT THE INSTANT A VOLTAGE IS APPLIED TO THE METERING CIRCUIT, THE CONDENSERS ARE COMPLETELY DISCHARGED AND HAVE A NEGLIGIBLE RESISTANCE TO THE FLOW OF CURRENT. BEING CONNECTED IN PARALLEL WITH THE NORMAL SERIES DROPPING RESISTORS, THEY ACT AS A SHORT ACROSS THESE UNITS AND, FOR THE INSTANT IT REQUIRES TO CHARGE THEM, ALLOW A RELATIVELY LARGE CURRENT TO PASS THROUGH THE RECTIFIER. THESE COPPER OXIDE RECTIFIERS ARE PERFECTLY SATISFACTORY UNDER NORMAL USAGE, BUT THEY WILL NOT STAND MORE THAN ABOUT TWICE OVERLOAD AND IF A HEAVY CURRENT IS ALLOWED TO PASS THROUGH THEM, USUALLY INCREASE IN RESISTANCE WHICH RESULTS IN LOWER VOLTAGES BEING INDICATED THAN CORRECT. TO SAFEGUARD THE RECTIFIER (AND THE USER'S POCKET-BOOK) SUPREME ENGINEERS HAVE INCORPORATED A SHORTING SWITCH ACROSS THE INPUT TO THE RECTIFIER WHICH, IN ITS "NORMAL" POSITION, REMAINS CLOSED. THIS BY-PASSES ANY DAMAGING INSTANTANEOUS SURGES AND ALLOWS THE CONDENSERS THEIR MOMENT TO CHARGE UP. THE SAFETY SWITCH MAY THEN BE OPENED WITHOUT HARM TO THE RECTIFIER. SO, WHEN YOU USE THIS SWITCH, REMEMBER THAT IT WAS PLACED THERE FOR YOUR TESTER'S PROTECTION AND NEVER PRESS THE SWITCH BEFORE YOU HAVE ALL YOUR A.C. VOLTAGE CONNECTIONS MADE, RELEASING THE SWITCH BEFORE CHANGING RANGES OR REMOVING LEADS. IF YOUR METER SUDDENLY READS ALL A.C. VOLTAGE MEASUREMENTS 30% TO 50% LOW, YOU CAN BE SURE THAT ON SOME PREVIOUS A.C. VOLTAGE TEST YOU FAILED TO FOLLOW THE FOREGOING PRECAUTIONS.

THE 7 VOLT A.C. VOLTAGE RANGE MAY BE TESTED BY CONNECTING IT ACROSS THE FILAMENT OF AN A.C. SUPPLIED 6.3 VOLT TUBE. REMEMBER THAT TUBE FILAMENT POTENTIALS USUALLY READ SOMEWHAT LOWER THAN SPECIFIED, ESPECIALLY IN THE SMALLER, CHEAPER SETS.

THE 140 VOLT A.C. POTENTIAL RANGE MAY BE TESTED BY CONNECTING IT ACROSS YOUR 110 VOLT A.C. HOUSE SUPPLY, KEEPING IN MIND THE FACT THAT, IN SOME COMMUNITIES, THIS VOLTAGE MAY VARY FROM AS LOW AS 95 VOLTS AT SOME HOURS OF THE DAY TO AS HIGH AS 135 VOLTS. A CONDITION AS BAD AS THIS SHOULD BE REMEDIATED AS HOUSE SUPPLY VOLTAGES SHOULD NOT VARY MORE THAN ABOUT 5 VOLTS PLUS OR MINUS FROM 115 VOLTS.

THE 350 AND 1400 A.C. VOLT RANGES CAN BE TESTED BY CONNECTING THE TESTER FIRST ACROSS ONE SIDE OF THE PLATE SUPPLY WINDING OF A RECEIVER'S POWER TRANSFORMER PUTTING OUT ABOUT 250 D.C.V. AND THEN FROM PLATE TO PLATE OF THE RECTIFIER TUBE.

RESISTANCE MEASURING RANGES

THERE ARE A TOTAL OF FIVE RESISTANCE MEASURING RANGES - 200 - 2,000 - 20,000 - 2 MEG. AND 20 MEG. THE FIRST THREE RANGES UTILIZE AN INTERNAL 1.5 VOLT BATTERY WHICH SHOULD BE REPLACED WHEN THE METER NEEDLE WILL NO LONGER "ZERO ADJUST" AS EXPLAINED LATER. TO REPLACE THE BATTERY, MERELY REMOVE THE SCREWS HOLDING THE PANEL AND CAREFULLY REMOVE THE INSTRUMENT FROM ITS CASE, BRINGING THE BATTERY INTO VIEW. THE 2 MEG. AND 20 MEG. RANGES REQUIRE AN OUTSIDE SOURCE OF LINE SUPPLY FROM AN ORDINARY HOUSE OUTLET. AN INTERNAL POWER SUPPLY TRANSFORMER AND RECTIFIER TUBE RECTIFIES THE A.C. VOLTAGE AND SUPPLIES ABOUT 45 VOLTS FOR THE 2 MEG. RANGE AND 450 VOLTS FOR THE 20 MEG. RANGE. SO, WHEN USING THESE TWO RANGES, IT IS NECESSARY TO PLUG THE A.C. LINE CORD INTO A CONVENIENT A.C. OUTLET.

200 OHMS RANGE

BY UTILIZING A UNIQUE CIRCUIT, SUPREME ENGINEERS HAVE DEVISED A LOW OHMS RANGE IN THIS MODEL 502 WHICH MEASURES A RESISTANCE VALUES DOWN TO 0.1 OHM. THIS MAKES THE TESTER INVALUABLE FOR CHECKING THE RESISTANCE OF SPEAKER VOICE COILS, R.F. COILS AND SMALL R.F. CHOKES.

FOR OUR FIRST TEST WE WILL REQUIRE A LOUDSPEAKER VOICE COIL OF LOW RESISTANCE.

PROCEDURE

SET THE "METER CIRCUIT SELECTOR" TO "OHMS". PLACE THE TEST LEADS IN THE "OHMS" PIN JACK AND THE "200" PIN JACK. MAKE SURE "MEG OHMS-OHMS" TOGGLE SWITCH IS IN "OHMS" POSITION. SHORT THE OTHER ENDS OF THE TEST LEADS TOGETHER WHICH WILL RESULT IN THE METER NEEDLE DEFLECTING TO SOME POINT AROUND FULL SCALE. ADJUST "ZERO OHMS ADJUSTER" UNTIL METER NEEDLE RESTS OVER 0 ON "OHMS" SCALE (TOP SCALE ON METER). RELEASE THE TEST LEADS AND CONNECT THEM ACROSS LOUSPEAKER VOICE COIL. METER NEEDLE WILL DEFLECT TO SOME POSITION ON SCALE. THE BASIC OHMS SCALE IS FROM ZERO TO 2000 OHMS OR ACTUALLY "INFINITY" WHICH IS REPRESENTED BY A FIGURE RESEMBLING A FIGURE 8 TO THE LEFT OF THE "2M" MARK. THIS BASIC SCALE SHOULD BE DIVIDED BY 10 FOR READING TAKEN IN THE 200 OHM RANGE, I.E., IF THE METER NEEDLE DEFLECTS TO "30" ON THE SCALE, DIVIDING BY 10 RESULTS IN AN ACTUAL OHMS READING OF 3 OHMS. IF THE NEEDLE DEFLECTS TO "5" ON THE SCALE, DIVIDING BY 10 RESULTS IN 0.5 OHM READING. THE FIRST DIVISION FROM ZERO IS 0.1 OHM, SECOND DIVISION 0.2 OHMS, ETC. IF, WHEN MAKING THE ABOVE LOUSPEAKER TEST, THE NEEDLE SHOULD DEFLECT TO THE SECOND DIVISION TO THE RIGHT OF "20" ON THE SCALE, THE RESULTING READING WOULD BE 1.8 OHMS. REMEMBER THAT THIS IS THE VOICE COIL'S D.C. RESISTANCE, NOT ITS A.C. IMPEDANCE WHICH IS QUITE ANOTHER THING, NECESSITATING MUCH MORE COMPLEX MEASURING INSTRUMENTS.

IT IS SUGGESTED THAT RESISTANCE UP TO ABOUT 10 OHMS BE TESTED ON THE 200 OHM RANGE, AND RESISTANCE ABOVE 10 OHMS AND BELOW 100 OHMS SHOULD BE TESTED ON THE NEXT HIGHER, OR 2000 OHMS RANGE.

2000 OHMS RANGE

FOR THIS RANGE WE WILL TEST A RESISTOR HAVING A VALUE OF ABOUT 40 OHMS.

PROCEDURE

LEAVE "METER CIRCUIT SELECTOR" IN THE "OHMS" POSITION. SHIFT TEST LEAD FROM "200" PIN JACK TO "2M" PIN JACK. LEAVE "MEG OHMS-OHMS" SWITCH IN "OHMS" POSITION. SHORT TEST LEADS TOGETHER AT OTHER END AND VARY "ZERO OHMS ADJUSTER" UNTIL METER NEEDLE RESTS OVER "ZERO" ON OHMS SCALE. RELEASE SHORTS AND APPLY LEADS ACROSS RESISTOR TO BE TESTED. NOTE METER NEEDLE POSITION WITH RESPECT TO OHMS SCALE AND READ THIS SCALE DIRECT, I.E., IF NEEDLE DEFLECTS TO "40" ON OHMS SCALE, RESISTOR'S RESISTANCE IS 40 OHMS. IF NEEDLE DEFLECTS TO "20", RESISTOR'S RESISTANCE IS 20 OHMS. AS EACH SCALE DIVISION BETWEEN "30" AND "20" REPRESENTS 2 OHMS (ON THIS RANGE) IF NEEDLE DEFLECTS TO SECOND DIVISION TO RIGHT OF 30, RESISTANCE IS 26 OHMS. RESISTORS ABOVE 100 OHMS AND BELOW 2000 OHMS SHOULD BE TESTED ON THE NEXT RANGE (20,000 OHMS).

20,000 OHM RANGE

FOR THIS TEST WE WILL CHECK A 500 OHM RESISTOR.

PROCEDURE

KEEP THE "METER CIRCUIT SELECTOR" IN THE "OHMS" POSITION. SHIFT TEST LEAD FROM "2M" PIN JACK TO "20M" PIN JACK. KEEP "MEG OHMS-OHMS" SWITCH IN "OHMS" POSITION. SHORT LEADS TOGETHER AT FREE ENDS AND VARY "ZERO OHMS ADJUSTER" UNTIL METER NEEDLE RESTS OVER ZERO ON OHMS SCALE. RELEASE SHORT AND APPLY TEST LEADS ACROSS RESISTOR UNDER TEST. MULTIPLY INDICATION ON METER BY 10 (ADD ONE ZERO), I.E., IF METER NEEDLE DEFLECTS TO 50, MULTIPLYING BY 10 WOULD GIVE AN ACTUAL RESISTANCE OF 500 OHMS. IF THE NEEDLE DEFLECTS TO THE THIRD INDICATION PAST "50" (500 OHMS) AS EACH DIVISION BETWEEN "70" AND "50" EQUALS "5" (50 OHMS) THE ACTUAL RESISTANCE WOULD BE INDICATED AS 650 OHMS.

FOR ALL RESISTANCE MEASUREMENTS FROM 2000 TO 100,000 OHMS USE THE 2 MEG. RANGE.

2 MEG. RANGE

FOR OUR 2 MEG. RANGE TEST LET US CHOOSE A VALUE OF RESISTOR AROUND 50,000 OHMS.

PROCEDURE

PLUG THE A.C. CORD INTO A CONVENIENT SUPPLY OUTLET AS THIS RANGE USES THE INTERNAL "B" PACK. LEAVE THE "METER CIRCUIT SELECTOR" SWITCH IN THE "OHMS" POSITION. REMOVE BOTH TEST LEADS AND PLACE ONE IN THE "MEG OHMS" PIN JACK AND ONE IN THE "2" PIN JACK. THROW "MEG OHMS-OHMS" SWITCH TO "MEG OHMS" POSITION.

SHORT FREE ENDS OF TEST LEAD TOGETHER AND VARY "ZERO OHMS ADJUSTER" UNTIL METER NEEDLE RESTS OVER ZERO ON THE METER SCALE. RELEASE TEST LEADS AND APPLY ACROSS RESISTANCE TO BE TESTED. NOTE WHERE NEEDLE RESTS WITH RESPECT TO OHMS SCALE AND MULTIPLY RESULT BY 1000 (ADD THREE ZEROS TO RESULT), I.E., IF METER NEEDLE DEFLECTS TO "50" ON SCALE, MULTIPLYING BY 1000 (ADDING THREE ZEROS) RESULTS IN AN ACTUAL RESISTANCE READING OF 50,000 OHMS. AS EACH DIVISION BETWEEN "40" AND "50" ON DIAL REPRESENTS "2" (2000 OHMS) IF THE NEEDLE DEFLECTS TO THE FIRST DIVISION TO THE RIGHT OF "50", THE ACTUAL RESISTANCE READING WOULD BE 48,000 OHMS.

FOR ALL RESISTANCE VALUES BETWEEN 100,000 OHMS AND 20 MEGS., USE THE 20 MEG. RANGE.

20 MEG. RANGE

FOR OUR 20 MEG. TEST, LET US TEST A RESISTOR HAVING A VALUE AROUND 500,000 OHMS.

PROCEDURE

LEAVE A.C. SUPPLY PLUG IN SOCKET. LEAVE "METER CIRCUIT SELECTOR" IN "OHMS" POSITION. LEAVE "MEG OHMS-OHMS" SWITCH IN "MEG OHMS" POSITION. LEAVE ONE TEST LEAD IN "MEG OHMS" PIN JACK AND PLACE OTHER TEST LEAD IN "20" JACK. SHORT LEADS TOGETHER AND ROTATE "ZERO OHMS ADJUSTER" UNTIL METER NEEDLE RESTS OVER ZERO ON OHMS SCALE. CANADIAN USERS WILL FIND THAT FOR THIS RANGE IT IS ALSO NECESSARY TO THROW THE "A.C. VOLTS" SWITCH TO THE "A.C. VOLTS" POSITION, BEFORE THE INTERNAL VOLTAGE IS APPLIED TO THE CIRCUIT AND THE NEEDLE INDICATES. AFTER "ZERO ADJUSTING" CIRCUIT, RELEASE SHORT AND APPLY LEADS ACROSS RESISTOR TO BE MEASURED. NOTE METER NEEDLE DEFLECTION AND MULTIPLY RESULT BY 10,000 (ADD FOUR ZEROS), I.E., IF THE METER NEEDLE DEFLECTED TO "50" ON THE OHMS SCALE, MULTIPLYING BY 10,000 (ADDING FOUR ZEROS) WOULD RESULT IN AN ACTUAL

RESISTANCE OF 500,000 OHMS. IF THE NEEDLE DEFLECTED TO THREE DIVISIONS PAST "70", AS EACH DIVISION BETWEEN "70" AND "50" IS EQUAL TO "5" OR 50,000 OHMS, THE ACTUAL RESISTANCE WOULD BE 850,000 OHMS.

RESUME OF POINTS TO REMEMBER WHEN MAKING RESISTANCE TESTS.

1. THE A.C. PLUG SHOULD BE CONNECTED TO CONVENIENT SOCKET WHEN MAKING 2 AND 20 MEG. TESTS AND THE "MEG OHMS-OHMS" SWITCH IN THE "MEG OHMS" POSITION.
2. FOR THE 200, 2,000, 20,000 OHM RANGES USE THE "OHMS" PIN JACK AND THE "200", "2M" AND "20M" PIN JACKS RESPECTIVELY.
3. FOR THE 2 AND 20 MEG. RANGES USE THE "MEG OHMS" PIN JACK AND THE "2" AND "20" PIN JACKS RESPECTIVELY.
4. ALWAYS ZERO ADJUST EACH RANGE BEFORE USING IT, I.E., IF YOU ARE USING ONE RESISTANCE RANGE AND WANT TO CHANGE TO ANY OTHER RESISTANCE RANGE, ALWAYS ZERO ADJUST THE OTHER RANGE BEFORE ATTEMPTING TO MEASURE WITH IT.
5. CANADIAN USERS WILL HAVE TO THROW THE "A.C. VOLTS" TOGGLE SWITCH TO THE "A.C. VOLTS" POSITION WHEN MAKING 20 MEG OHM TESTS. THIS IS A REQUIREMENT OF THE CANADIAN HYDRO COMMISSION.
6. WHEN TESTING THE RESISTANCE OF ELECTROLYTIC CONDENSERS ALWAYS OBSERVE POLARITY BY CONNECTING THE "MINUS" SIDE OF THE CONDENSER TO THE "OHMS" PIN JACK.
7. NO ONE RESISTANCE VALUE WILL ORDINARILY TEST THE SAME ON ANY TWO RANGES. THIS IS ALSO TRUE OF VOLTAGE AND CURRENT RANGES. WE GIVE BELOW THE PROPER RANGES TO USE FOR VARIOUS RESISTOR VALUES SO AS TO GET THE MOST ACCURATE RESULTS.

FOR 0-10 OHMS USE THE 0/200 OHM RANGE
 FOR 10-100 OHMS USE THE 0/2,000 OHM RANGE
 FOR 100-2,000 OHMS USE THE 0/20,000 OHMS RANGE
 FOR 2000-100,000 OHMS USE THE 0/2 MEG. RANGE.
 FOR 100,000-20 MEG. USE THE 0/20 MEG. RANGE.

OUTPUT MEASUREMENTS

DUE TO THE UNUSUAL A.C. VOLTAGE CIRCUIT INCORPORATED IN THE MODEL 502, THE A.C. VOLTAGE FUNCTION AND RANGES MAY BE USED FOR MAKING OUTPUT MEASUREMENTS. THE PROCEDURE IS EXACTLY THE SAME AS WHEN MAKING A.C. VOLTAGE MEASUREMENTS AND THE TEST LEADS ARE CONNECTED ACROSS (1) THE LOUDSPEAKER VOICE COIL, (2) THE SECONDARY OF THE OUTPUT TRANSFORMER, (3) THE PRIMARY OF THE OUTPUT TRANSFORMER OR (4) BETWEEN THE OUTPUT TUBE'S PLATE AND FILAMENT, CATHODE; GROUND OR CHASSIS OF THE RECEIVER.

ALTHOUGH SOME OUTPUT METERS REQUIRE AN EXTERNAL FIXED CAPACITOR IN SERIES WITH ONE LEAD THIS IS RENDERED UNNECESSARY IN THE MODEL 502 BY REASON OF THE INTERNAL CIRCUIT WHICH INCORPORATES A SERIES CAPACITOR AT ALL TIMES.

ALWAYS REMEMBER NOT TO PUSH THE "A.C. VOLTS" SWITCH UNTIL ALL CONNECTIONS ARE MADE AND TO RELEASE THE "A.C. VOLTS" SWITCH BEFORE ANY CONNECTIONS ARE BROKEN.

ELECTROLYTIC FILTER CAPACITOR LEAKAGE MEASUREMENTS

THE MODEL 502 ALLOWS THE TESTING OF ELECTROLYTIC FILTER CAPACITORS FOR LEAKAGE. THIS IS READ ON THE "GOOD CAPACITOR - BAD CAPACITOR" ENGLISH READING METER SCALE.

LET US TRY TESTING AN ELECTROLYTIC FILTER CAPACITOR HAVING AT LEAST 450 WORKING VOLT RATING. INASMUCH AS THERE ARE RELATIVELY FEW CAPACITORS USED HAVING LESS THAN A 450 W.V. RATING, NO PROVISION HAS BEEN MADE TO TEST THESE LOW VOLTAGE FILTER CAPACITORS. IN GENERAL, IT IS GOOD PRACTICE MERELY TO REPLACE THESE LOW VOLTAGE-HIGH CAPACITY CAPACITORS IF THEY ARE SUSPECTED OF BEING DEFECTIVE.

PROCEDURE FOR TESTING LEAKAGE OF 450 W.V. OR OVER CAPACITORS

TEST THE CAPACITOR FOR A DIRECT SHORT, USING THE REGULAR "OHMMETER" PROCEDURE. FOR THIS, YOU ROTATE THE "METER CIRCUIT SELECTOR" TO "20M" OHMS, CONNECT LEADS TO "OHMS" AND "20M" PIN JACKS AND SEE THAT "MEG OHMS-OHMS" SWITCH IS IN "OHMS" POSITION. "ZERO ADJUST" METER. RELEASE LEADS. CONNECT LEAD FROM "OHMS" PIN JACK TO "MINUS" SIDE OF ELECTROLYTIC CAPACITOR AND CONNECT LEAD FROM "20M" TO "PLUS" SIDE OF ELECTROLYTIC. IF CAPACITOR IS SHORTED, NEEDLE WILL FULLY DEFLECT. IN THIS CASE, REPLACE CAPACITOR WITHOUT FURTHER TEST. IF CAPACITOR IS NOT DEEMED TO BE SHORTED, PROCEED WITH ACTUAL LEAKAGE TEST.

CONNECT SUPPLY PLUG OF TESTER TO CONVENIENT OUTLET. SET "METER CIRCUIT SELECTOR" TO THE "ELEC." POSITION. CONNECT "ELECTROLYTIC PLUS" PIN JACK WITH TEST LEAD TO "PLUS" SIDE OF ELECTROLYTIC. CONNECT "ELECTROLYTIC MINUS" PIN JACK WITH TEST LEAD TO "MINUS" SIDE OF ELECTROLYTIC. SET "ELEC. CAP." SELECTOR SWITCH TO THE CLOSEST CAPACITY VALUE MARKING (IN OUTER RING OF FIGURES AROUND SWITCH) CORRESPONDING TO THE CAPACITY VALUE UNDER TEST. YOU WILL NOTE THAT THIS SWITCH USES 11 CONTACTS FOR ITS "FIL. VOLTS" FUNCTIONS. THESE ARE 1.5, 2.0, 2.5, 3.3, 5.0, 6.3, 7.5, 12.6, 14 (OR 20 ON FOREIGN UNITS), 25 AND 30 VOLTS. THE "ELEC. CAPACITOR" FUNCTIONS USE 7 CONTACTS STARTING WITH 1 MFD. OPPOSITE 2.5 VOLTS AND RUNNING 2.4, 6.8, 10 AND 12 MFD. THESE ARE THE FIGURES YOU SHOULD USE FOR YOUR "ELECTROLYTIC" TEST. ANY CAPACITOR BELOW 1.5 MFD. SHOULD BE TESTED ON THE 1 MFD. POSITION, ANY CAPACITOR BETWEEN 1.5 AND 3 SHOULD BE TESTED ON THE 2 MFD. POSITION. ANY CAPACITOR BETWEEN 3 AND 5 MFD. SHOULD BE TESTED ON THE 4 MFD. POSITION, ETC.

AFTER SETTING THE "ELEC. CAP." SELECTOR TO THE PROPER POSITION, THE NEEDLE SHOULD DEFLECT TO SOME READING ON THE "BAD CAPACITOR-GOOD CAPACITOR" SCALE. IF THE READING FALLS WITHIN THE "RED" AREA, THE CAPACITOR HAS AN OBJECTIONABLE LEAKAGE AND SHOULD BE DISCARDED. IF THE READING FALLS WITHIN THE "GREEN" AREA, THE CAPACITOR IS STILL OPERABLE AND SHOULD BE RETAINED. DISCONNECT ALL LEADS FROM PANEL AND DISCHARGE CAPACITORS.

CANADIAN USERS MUST THROW "A.C. VOLTS" SWITCH TO "A.C. VOLTS" POSITION WHEN MAKING THIS TEST. THIS SWITCH HAS BEEN INCORPORATED IN THE "ELECTROLYTIC LEAKAGE" MEASURING CIRCUIT TO COMPLY WITH CANADIAN HYDRO COMMISSION SPECIFICATIONS.

ELECTROSTATIC CAPACITOR LEAKAGE MEASUREMENTS

NO POLARITY NEED BE OBSERVED AS TO CONNECTIONS TO THE PIN JACK TERMINALS MARKED "ELECTROSTATIC". ELECTROSTATIC (PAPER AND MICA) CAPACITORS ARE TESTED ON THE NEON BULB FOR

LEAKAGES.

PROCEDURE

ROTATE "METER CIRCUIT SELECTOR" TO "ELEC." POSITION. CONNECT CAPACITOR UNDER TEST BY MEANS OF LEADS TO THE "ELECTROSTATIC" PIN JACKS. OBSERVE INDICATION ON NEON LAMP. IF NEON LAMP DOES NOT GLOW MOMENTARILY, THE CAPACITOR IS OPEN AND SHOULD BE DISCARDED. IF THE NEON LAMP GLOWS INTERMITTENTLY, THAT IS, THE GLOW COMES AND GOES AT REGULAR INTERVALS, THE CAPACITOR IS LEAKY AND SHOULD BE DISCARDED. THE INTERVAL OF TIME BETWEEN EACH GLOW WILL BE DETERMINED BY THE CAPACITY OF THE CAPACITOR AND BY THE AMOUNT OF ITS LEAKAGE. IF THE NEON DULB GLOWS CONTINUALLY ON ONE ELEMENT, THE CAPACITOR IS SHORTED AND SHOULD BE REPLACED. IF THE NEON DULB GLOWS MOMENTARILY AND THEN INDEFINITELY REMAINS UNILLUMINATED, THE CAPACITOR IS GOOD AND SHOULD BE RETAINED. THIS MOMENTARY GLOW MAY NOT OCCUR AT THE INSTANT THE CAPACITOR IS CONNECTED.

CANADIAN USERS WILL HAVE TO PRESS THE "A.C. VOLTS" SWITCH WHEN MAKING THIS TEST. THIS SWITCH IS INCORPORATED TO PASS CANADIAN HYDRO COMMISSION REGULATIONS. SO THAT OPEN CAPACITORS MAY BE SHOWN AS SUCH, IT IS SUGGESTED THAT CANADIAN USERS PRESS THE "A.C. VOLTS" SWITCH BEFORE CONNECTING A CAPACITOR ACROSS THE "ELECTROSTATIC" PIN JACKS. THIS WILL CHARGE THE INTERNAL CAPACITOR AND WILL PREVENT THE GLOW RESULTING FROM THE CHARGE OF THE INTERNAL CAPACITOR FROM GIVING A FALSE READING ON AN OPEN CAPACITOR. WHEN THE CAPACITOR IS CONNECTED TO THE PROPER PIN JACKS, THE "A.C. VOLTS" SWITCH SHOULD AGAIN BE PRESSED AND, IF THE CAPACITOR IS OPEN, NO GLOW WILL OCCUR. IF THE CAPACITOR IS GOOD IT WILL RESULT IN A MOMENTARY FLASH, ETC.

MISCELLANEOUS SUGGESTIONS

IT IS BEYOND THE PROVINCE OF THIS OPERATING DATA TO INCLUDE AN ACTUAL TEST PROCEDURE FOR RADIO SERVICING WORK OR ANY DIAGRAMS OR INFORMATION ON ACTUAL RECEIVERS, THEIR I.F. PEAKS, VOLTAGES, CURRENTS, ETC.

FOR THE SERVICEMAN WHO IS JUST STARTING IN THE BUSINESS OR FOR STUDENTS WHO DESIRE A GOOD FOUNDATION OF THE THEORY AND PRACTICE OF RADIO IN GENERAL, WE CAN RECOMMEND MR. ALFRED GHIRARDI'S "RADIO PHYSICS COURSE". FOR THOSE WHO DESIRE DEFINITE INFORMATION IN RADIO SERVICE WORK, LET US SUGGEST MR. GHIRARDI'S "MODERN RADIO SERVICING" AND "RADIO FIELD SERVICE DATA", TWO EXCELLENT, PRACTICAL BOOKS. THERE ARE ALSO SEVERAL AVAILABLE BOOKS ON SPECIFIC RADIO SUBJECTS SUCH AS RESISTANCE, A.C. VOLTAGE, AUTOMATIC VOLUME CONTROL, ETC., WRITTEN AND PUBLISHED BY MR. JOHN RIDER. WE CAN RECOMMEND THESE AS WELL AS "SERVICING SUPERHETROYNES" AND "THE CATHODE RAY TUBE AT WORK" BY THE SAME AUTHOR.

MANY SERVICEMEN WRITE US ABOUT RECEIVER DIAGRAMS. WE BELIEVE THAT THERE IS NO BETTER OR MORE COMPLETE SOURCE OF INFORMATION ON RECEIVER CIRCUITS, CONSTANTS, SERVICE DATA, ETC., THAN "RIDER'S MANUALS", A SERIES OF SEVEN VOLUMES WHICH SHOULD BE ON EVERY SERVICEMAN'S SHELF.

THE BOOKS AS RECOMMENDED BY US ABOVE ARE, IN OUR ESTIMATION, VITAL TO YOUR SUCCESSFUL DEVELOPMENT. WE DO NOT SELL THEM BUT WE KNOW THEY ARE ALL OBTAINABLE FROM YOUR LOCAL JOBBER OR FROM THE PUBLISHERS:-

JOHN F. RIDER, 1440 BROADWAY, NEW YORK, N. Y.

RADIO & TECHNICAL PUBLISHING COMPANY (ALFRED GHIRARDI)
45 ASTOR PLACE, NEW YORK, N. Y.

THERE ARE MANY OTHER BOOKS WHICH MAY PROVE INTERESTING AND WORTH STUDYING. THESE ARE LISTED BELOW:-

"ELEMENTS OF RADIO COMMUNICATION" - JOHN H. MORECROFT
"EXPERIMENTAL RADIO ENGINEER" - JOHN H. MORECROFT
- JOHN WILEY & SONS, INC.
440 WEST 4TH AVENUE, NEW YORK, N. Y.

"SOUND MOTION PICTURES RECORDING AND REPRODUCTION"
"SERVICING SOUND EQUIPMENT"
"PUBLIC ADDRESS SYSTEMS"
- BY JAMES R. CAMERON
CAMERON PUBLISHING COMPANY
WOODMONT, CONN.

"PROJECTION SOUND PICTURES" - AARON NADELL
- MCGRAW HILL PUBLISHING COMPANY
330 WEST 42ND STREET
NEW YORK, N. Y.

TRANSPORTATION DAMAGES

THE OFFICE OF ORIGIN OF THE TRANSPORTATION AGENCY WHICH ACCEPTED THIS TESTER FOR THE ORIGINAL SHIPMENT ASSURED THE SHIPPER AGAINST EXTERNAL AND CONCEALED DAMAGES IN TRANSIT. IF THE TESTER BE RECEIVED IN A DAMAGED CONDITION, OR IF SOME PART OF THE TESTER BE DAMAGED IN TRANSIT, THE USER OF THE TESTER SHOULD ASK THE TRANSPORTATION AGENCY, WHICH DELIVERED THE TESTER, FOR A CONCEALED DAMAGE REPORT, WHICH SHOULD BE FORWARDED TO THE FACTORY, WITH THE RETURN REGISTRATION CARD, FOR FACTORY INSTRUCTIONS AS TO THE PROCEDURE WHICH SHOULD BE FOLLOWED FOR EFFECTING THE NECESSARY REPAIRS OR REPLACEMENTS. IF THE DESTINATION OFFICE OF THE TRANSPORTATION AGENCY REFUSES TO FURNISH A "CONCEALED DAMAGE REPORT" THAT FACT SHOULD BE REPORTED IN A LETTER TO THE FACTORY WITH THE RETURN OF THE REGISTRATION CARD.

SUPREME SERVICE STATIONS

FOR THE PURPOSE OF EFFECTING PROMPT REPAIR OF DAMAGES SUSTAINED BY INADVERTENT MISUSE, OR FOR ANY OTHER REASON, THE ADDRESSES OF THE SUPREME SERVICE STATIONS MAY BE OBTAINED FROM THE SUPREME FACTORY OFFICES. IF IT SHOULD BE NECESSARY TO SHIP A TESTER TO THE FACTORY OR TO A SERVICE STATION, THE SHIPMENT SHOULD BE MADE VIA EXPRESS - NEVER VIA PARCEL POST - AND A LETTER SHOULD BE WRITTEN AND FORWARDED SEPARATELY ADVISING OF THE SHIPMENT AND INCLUDING COMPLETE INSTRUCTIONS AS TO THE DESIRED HANDLING AND DISPOSITION OF THE MERCHANDISE; OTHERWISE, THE MERCHANDISE WILL BE REFUSED BY THE CONSIGNEE.

IF A SEPARATE LETTER IS RECEIVED BY THE FACTORY, AHEAD OF THE TESTER'S ARRIVAL, THE PROPER ACCEPTANCE FORMS WILL BE MADE OUT BY THE FACTORY, THE TESTER WILL BE RECEIVED AND USUALLY REPAIRS WILL BE EFFECTED AT ONCE AND THE TESTER RE-SHIPED. IF THE TESTER IS NOT WITHIN THE 90 DAY GUARANTEE PERIOD, REPAIRS WILL BE MADE UP TO \$5.00 WITHOUT SENDING THE USER AN ESTIMATE UNLESS WE RECEIVE SPECIFIC INSTRUCTIONS TO SEND AN ESTIMATE IN ANY CASE. IF THE NECESSARY REPAIRS TOTAL MORE THAN \$5.00, AN ESTIMATE WILL BE SENT IN ANY CASE, UNLESS THE FACTORY HAS RECEIVED SPECIFIC INSTRUCTIONS TO REPAIR THE TESTER REGARDLESS OF COST.

WHEN THE USER SENDS HIS REGISTRATION CARD TO THE FACTORY WITHIN 10 DAYS AFTER RECEIPT OF THE TESTER, HE WILL BE FURNISHED WITH A POCKET SIZE "GUARANTEE CARD" WHICH SHOULD BE INCLUDED WITH THE TESTER SHIPMENT TO EITHER THE FACTORY OR AN AUTHORIZED SERVICE STATION IF THE TESTER IS STILL WITHIN THE 90 DAY PERIOD.

WHEN REPAIRS ARE REQUESTED OF THE FACTORY OR A SERVICE STATION BY A CUSTOMER HAVING A "GUARANTEE CARD" AND INCLUDING SAME IN THE SHIPMENT AND THE GUARANTEE IS FOUND TO BE STILL IN EFFECT, THE FACTORY OR AUTHORIZED SERVICE STATION WILL MAKE THE REPAIRS IN ACCORDANCE WITH THE GUARANTEE POLICY HEREIN STATED AND WILL RETURN THE TESTER TO THE USER WITHOUT CHARGE WITH THE EXCEPTION OF (1) AN INSTRUMENT RECTIFIER REPLACEMENT (INSTRUMENT RECTIFIERS ARE NOT GUARANTEED) AND (2) TRANSPORTATION CHARGES WHICH MUST BE BORNE BY THE CUSTOMER.

OUR SERVICE STATIONS ARE NOT AUTHORIZED TO MAKE NO-CHARGE REPAIRS ON SUPREME TESTERS UNLESS THE "GUARANTEE CARD" (FURNISHED THE USER BY THE FACTORY UPON RETURN OF THE USER'S REGISTRATION CARD) ACCOMPANIES THE TESTER AND THE TESTER IS RETURNED BEFORE THE EXPIRATION OF THE 90 DAY PERIOD.

ALL DISPUTES REGARDING REPAIR CHARGES SHOULD BE REFERRED TO THE "SERVICE ENGINEER" AT THE FACTORY.

REPLACEMENT PARTS, ETC.

IF SOME PART OF THE TESTER BE DAMAGED IN SERVICE, OR IF THE USER SHOULD WANT TO ORDER CIRCUIT DRAWINGS, ANALYSIS CHARTS, TEST LEADS, OR OTHER ACCESSORIES, THE USER SHOULD CORRESPOND WITH THE "SERVICE ENGINEER" AT GREENWOOD, MISSISSIPPI, AT ONCE. IF AN ORDER BE ACCOMPANIED BY A DEPOSIT WHICH DOES NOT COVER THE COST OF THE MERCHANDISE AND TRANSPORTATION CHARGES, THE SHIPMENT WILL BE MADE VIA EXPRESS C.O.D. FOR THE BALANCE DUE. A LIST OF REPLACEMENT PARTS MAY BE OBTAINED UPON REQUEST.

INSTRUMENT RECTIFIERS

WE DO NOT RECOMMEND THE INSTALLATION OF INSTRUMENT RECTIFIERS BY THE USER AS THIS INVARIABLY LEADS TO DIFFICULTIES WITH THE FACTORY. SERVICEMEN DO NOT HAVE PROPER STANDARDS OF CALIBRATION BY WHICH THE A.C. RANGES CAN BE RECALIBRATED. INSTRUMENT RECTIFIERS ARE VERY LIABLE TO DAMAGE BY INEXPERIENCED REPAIRMEN AND ARE, THEREFORE, NOT GUARANTEED IN ANY MANNER, EVEN WHEN NEW. INSTRUMENT RECTIFIERS SHOULD BE REPLACED BY THE FACTORY OR AN AUTHORIZED SERVICE STATION.

GUARANTEE

THE TESTER IS NOT GUARANTEED UNLESS THE OWNERSHIP THEREOF IS PROPERLY REGISTERED. WHEN THE USER REGISTERS HIS OWNERSHIP OF THIS TESTER WITHIN 10 DAYS AFTER HE RECEIVES IT, HE WILL RECEIVE, IN RETURN, A "GUARANTEE CARD" STATING THAT THE TESTER WILL BE GUARANTEED TO BE FREE FROM DEFECTS IN MATERIAL OR WORKMANSHIP. ANY SUCH DEFECT IN MATERIAL OR WORKMANSHIP WILL BE CORRECTED WITHOUT CHARGE WHEN THE TESTER, TOGETHER WITH THE "GUARANTEE CARD" IS DELIVERED TO THE SUPREME INSTRUMENTS CORPORATION, GREENWOOD, MISSISSIPPI, OR TO ANY AUTHORIZED SERVICE STATION, WITHIN 90 DAYS AFTER ITS RECEIPT BY THE USER; PROVIDED THAT (1) THE FREE REPAIR OR REPLACEMENT OF MATERIALS SHALL NOT INCLUDE THE COST OF THE INSTALLATION OF INSTRUMENT RECTIFIERS WHICH ARE INCAPABLE OF WITHSTANDING APPRECIABLE OVERLOADS AND ARE NOT THEREFORE GUARANTEED BY THE MANUFACTURERS, AND (2) THE USER ACCEPTS THE OBLIGATION OF THE PAYMENT OF ALL TRANSPORTATION COSTS INVOLVED IN THE CORRECTIONS EFFECTED UNDER THE CONDITIONS OF THIS GUARANTEE POLICY, IN ACCORDANCE WITH THE STANDARD PRACTICES OF THE RADIO MANUFACTURERS' ASSOCIATION.

SUPREME INSTRUMENTS CORPORATION

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