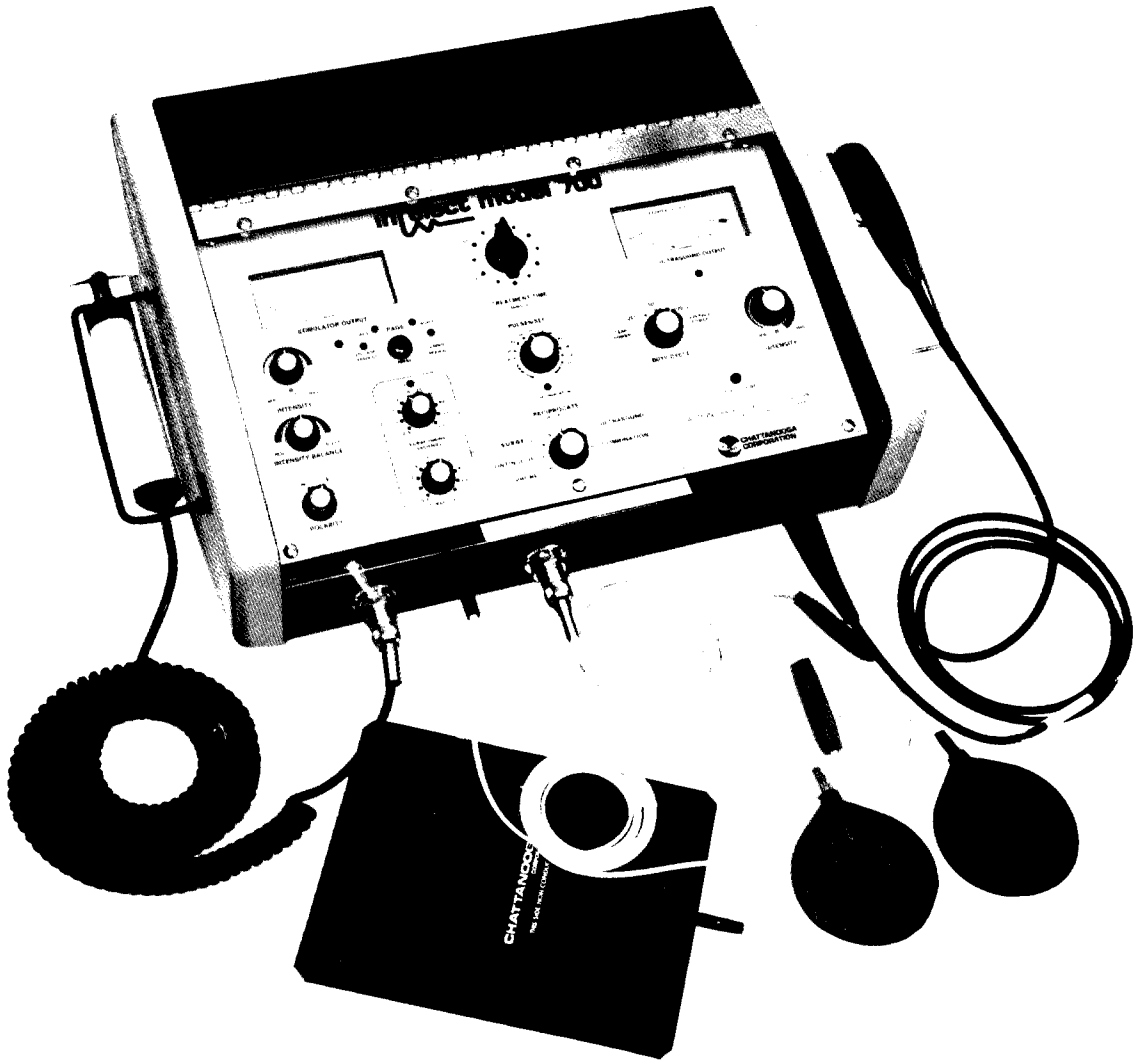
INSTRUCTIONS FOR USE AND OPERATION OF THE

intelect™ model 700



CHATTANOOGA CORPORATION

Form 73297 12/83

foreword

This manual has been prepared for the owners and operators of Intelect Model 700™. It contains general instructions on operation, safety practices, maintenance and parts information. In order to obtain maximum life and efficiency from your Model 700™ and to aid in the safe operation of the unit, read and understand this manual thoroughly and become totally familiar with the controls on the panel and the various electrodes that come with the unit before operating it. The specifications put forth in this manual were in effect at the time of publication. However, owing to Chattanooga Corporation's policy of continuous improvement, changes to these specifications may be made at any time without obligation on the part of Chattanooga Corporation.

safety instruction

1. Read, understand and practice the safety and operating instructions. Know the limitations and hazards associated with Ultrasound. Observe the safety and operational decals placed on the unit.
2. Grounding — Make certain that the unit is electrically grounded by plugging into an electrical outlet with a ground terminal receptacle (U-ground outlet). Follow the National Electrical Code.
3. Intelect 700™ should not be connected to any other electrical device when in use.
4. **CAUTION:** Federal law restricts this device to sale by, or on the order of, a physician or licensed practitioner.
5. The generator should be routinely checked before each use to determine that all controls function normally; especially that the INTENSITY control does properly adjust the intensity of ultrasonic power output in a stable manner. Also determine that the TREATMENT TIME control does actually terminate ultrasonic output power when the control is turned to zero time (off).
6. "**CAUTION** — Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to ultrasonic energy."

full one year warranty

Chattanooga Corporation ("Company") warrants that Intelect Model 700™("Product") is free of defects in material and workmanship.

This warranty shall remain in effect for one (1) year from the date of the original consumer purchase of this Product and extends to any owner of the Product during the warranty period. If this Product fails to function during the one year warranty period because of a defect in material and workmanship, Company or the selling dealer will replace or repair the Product without charge within a period of 30 days from the date on which the defective product is returned to the Company or the dealer. Company or the dealer will ship the replacement or the repaired product to the consumer's residence.

THIS WARRANTY DOES NOT COVER:

1. Replacement parts or labor furnished by anyone other than Company, the dealer or an approved Company service agent.
2. Defects or damage caused by labor furnished by someone other than Company, the dealer or an approved Company service agent.
3. Any malfunction or failure in the Product while it is in the possession of the owner during the warranty period if the malfunction or failure is not caused by a defect in material and workmanship or if the malfunction or failure is caused by the unreasonable use, including the failure to provide reasonable and necessary maintenance.

COMPANY SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES TO PROPERTY OR BUSINESS

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

TO OBTAIN SERVICE from Company or the selling dealer under this warranty, the owner must do or abide by the following:

1. A written claim must be made within the warranty period to Company or the selling dealer. If the claim is made to Company, the written claim should be sent to P.O Box 4287, 101 Memorial Dr., Chattanooga, Tennessee, 37405.
2. The Product must be returned to Company or the selling dealer by the owner.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Company does not authorize any person or representative to create for it any other obligation or liability in connection with the sale of this Product. Any representative or agreement not contained in the warranty shall be void and of no effect.

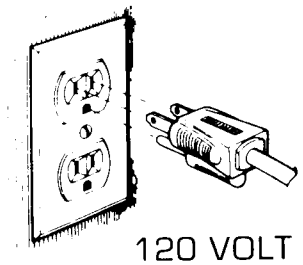
installation

Remove the Intelect Model 700™ and any additional items ordered with the unit from the carton and inspect for damage that may have occured during shipment.

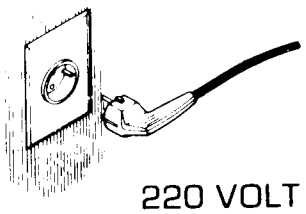
The following is a list of accessories that should be included with the unit as standard accessories:

Qty.	Description	Catalog No.
1	Hand-Held Probe	79001
1	Rectangular Applicator for Probe	79008
1	Sponge for Rectangular Electrode	79062
1	Spot Applicator for Probe	79005
1	Sponge for Spot Electrode	79059
1	Active Electrode Pad, 4" Red Round	72851
1	Active Electrode Pad, 4" Black Round	72850
1	Dispersive Electrode Pad 8" x 10"	72854
1	Active Lead, Red and Black (72")	72951
1	Dispersive Lead (72")	72955
1	Active Lead, Red Bifurcated (18")	72849
1	Active Lead, Black Birurcated (18")	72855
2	Active Electrode Pads, 3" Red Round	72853
2	Active Electrode Pads, 3" Black Round	72852
1	Active Lead, Red (18")	72953
1	Active Lead, Black (18")	72954
2	Short Nylatex Straps 2.5" x 24"	10648
1	Long Nylatex Strap 2.5" x 48"	10832
2	Weight Bags	79036
1	Instruction Booklet	73297
1	Ultrasound Gel	72201

Check the voltage rating on the serial plate located on the back of the unit. Plug the unit into a 120 Volt or 220 Volt A.C. outlet as required. DO NOT attempt to use direct current. Follow the procedures indicated in the safety instructions. DO NOT attempt to use the unit if it is not properly grounded.

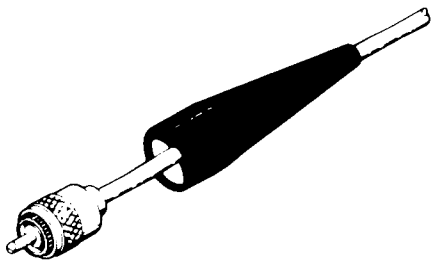


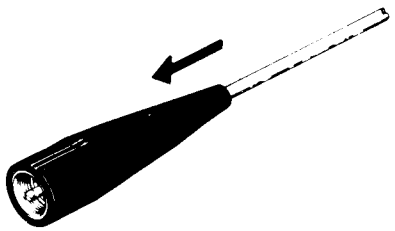
120 VOLT HOSPITAL GRADE



220 VOLT

Plug in 2-lead cable into the 3-terminal connector receptacle. Both of these receptacles are located at the front of the unit. Also, plug in the hand-held probe into the 4-terminal receptacle. These connectors will not mate incorrectly.





Plug the ultrasound applicator cable into the cable connector on the right front of the cabinet. Make sure the threaded connector is securely tightened. Slide the rubber covering (boot) over the metal connector.

By activating the timer, the functions of the stimulator and ultrasound can be checked out as per operating instructions in the following sections.

control pan

PULSES/SECOND CONTROL - This knob selects the pulse rate, from one pulse per second (1 pps) to a maximum of 120 pulses per second (120 pps).

INTENSITY METER - This meter indicates the intensity of either voltage or current, as selected. Voltage is read on the upper scale from 0 to 500 volts. Peak current is read on the lower scale from 0 to 2500 milliamps.

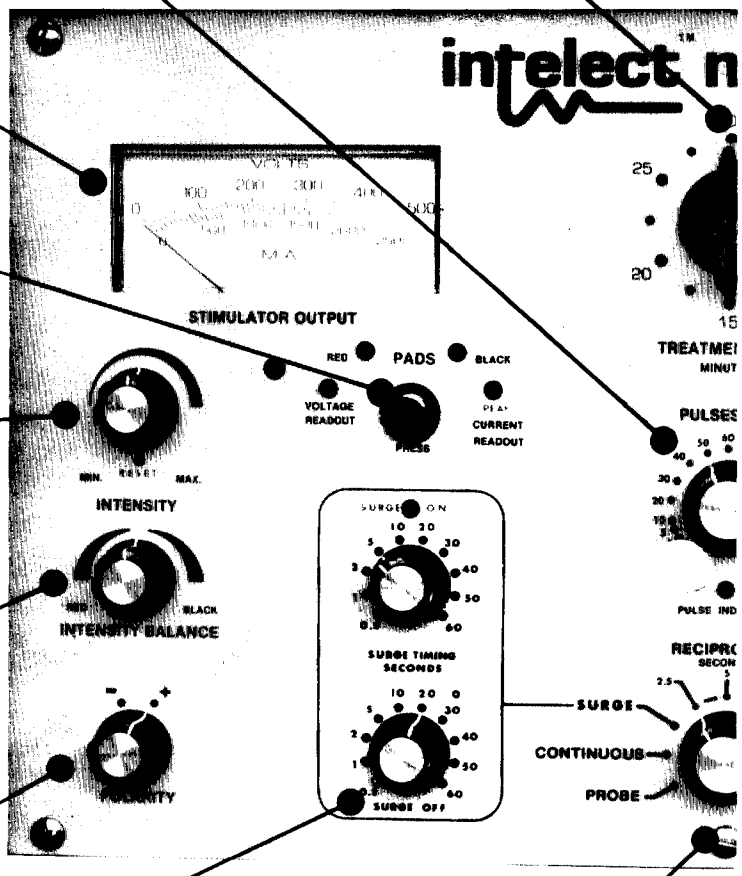
METER SELECTOR BUTTON - Depressing this button selects whether the meter reads in volts, as indicated by the voltage readout light (green); or milliamps, as indicated by the current readout light (red).

INTENSITY/RESET CONTROL - Any time the Function Switch is operated, e.g. switching from Probe to Continuous, the Intensity Control must be reset by rotating counterclockwise until a click is heard (or felt) at the end of rotation. Output will remain at zero unless this control is reset properly.

INTENSITY BALANCE - This knob controls relative individual electrode pad intensity IN THE RECIPROCATE MODE ONLY. If the knob is turned to black, the black active electrode becomes relatively stronger by lessening the intensity of the red electrodes and vise versa. At the beginning of each treatment the knob should be centered to equalize pad intensities.

POLARITY SWITCH - This switch selects positive (+) or negative (-) polarity of the active electrode pads or probe.

TREATMENT TIMER - This control is both POWER ON/OFF switch and TIMER (i.e., a Ti



SURGE MODE - The new independently timed SURGE ON and SURGE OFF functions allow for greater flexibility in application of high voltage stimulation. By setting the Surge On time to a longer or shorter period than the Surge Off time, the user can achieve various degrees of muscle fatigue. NOTE: The Surge On and Surge Off control knobs work only when the FUNCTION SELECTOR SWITCH is in the SURGE position. The Surge controls are inoperative when the Function Selector Switch is in the Probe, Continuous or Reciprocate 2.5, 5, or 10 second positions.

SURGE ON - Both electrode pads or sets of pads are activated for the time indicated around the knob from 0.5 seconds to 60 seconds. An "ON SURGE RAMP" up is included in this interval and the duration of the ramp is a 1 to 3 ratio of Surge On time selected. EXAMPLE: A Surge On time of 10 seconds creates a 3.3 second ramp up from 0 intensity to maximum intensity.

SURGE OFF - The rest period between surges is independently selected by this control. Surge Off intervals range from 0.5 seconds to 60 seconds.

FUNCTION SELECTOR SWITCH - This control knob selects the means of treatment—either with the hand-held probe or with the active electrode pads.

When the knob is in the "Probe" position, the output is through the hand-held probe. Output is on continuously and intensity is controlled remotely at the probe only.

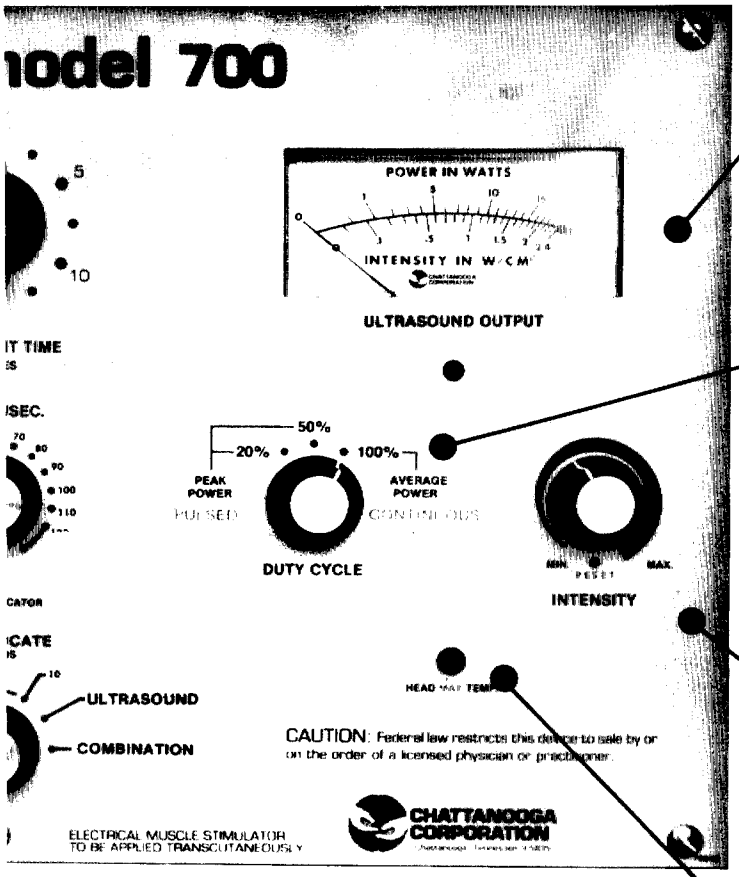
In the Continuous and Reciprocate positions the output is through the electrode pads and intensity is controlled by the Int sity knob on the panel.

In the Continuous position both pads or sets of pads are on continuously.

The Reciprocate mode includes three selections: 2.5, 5, or 10 seconds. These three positions determine the amount of time that one of the two active electrodes is

el operation

wer Switch). This control functions to apply and nove line input power to the generator circuitry. It electrically connects both sides of the incoming power line.



OUTPUT METER - This control is an analog-indicating meter which provides the user with accurate information pertaining to the level of ultrasound power available at the transducer at any given time during the treatment interval. The meter has one arc with dual calibrations of Power in watts and Intensity in W/cm^2.

DUTY CYCLE SELECTOR - This control determines the type of ultrasound output waveform. The three (3) types of output available are: 100% duty cycle, 50% duty cycle, and 20% duty cycle.

In the "100%" Mode, the ultrasound output is a CONTINUOUS sinusoidal waveform at a frequency of 1 MHz nominal.

In the "50%" Mode, the ultrasound output is pulsed at 100 PULSES/SECOND, with the MARK/SPACE ratio being 1. This produces an output pulse of 1 MHz ultrasound energy having a duration of 5 milliseconds, with an off-time of 5 milliseconds between pulses. The pulse shape is true-rectangular in nature, to allow precise measurement of ultrasound intensity.

In the "20%" Mode, the ultrasound output is again pulsed at 100 PPS, with the MARK/SPACE ratio being 4, to produce rectangular pulses of 2 milliseconds duration with an off-time of 8 milliseconds between pulses.

INTENSITY/RESET CONTROL - This control is continuously variable to produce the desired level of ultrasound power from 1 to 20 watts, corresponding to INTENSITIES from 0.1 WATT/CM^2 to 2.4 W/CM^2 as indicated on the OUTPUT METER.

on while the other is off. At each 2.5, 5, or 10 second interval, as selected, the electrode pad that is on will switch off and the off pad will switch on. This alternate switching continues throughout the total treatment period as set on the timer.

In the Surge mode both pads or sets of pads are cyclied on and off together at rates selected by the Surge On and Surge Off controls.

the Ultrasound mode you may select pulsed modes (20% or 50% duty cycle), or the continuous (100% duty cycle) mode of operation.

In the Combination mode both ultrasound and high voltage stimulation are transmitted by the applicator head.

HEAD MAX. TEMP. CONTROL - This indicator is included as an additional measure of patient safety.

While the head temperature remains at 140° F. or above, the generator output remains completely off and the HEAD MAX. TEMP. indicator light remains on. The OUTPUT METER indication returns to zero also, to clearly indicate the condition of zero output energy.

A. INDICATIONS FOR THERAPY

The Intelect 700™ is a combination ultrasound and electrical muscle stimulator designed to deliver therapeutic deep heat and muscle stimulation. These treatment modalities can be delivered simultaneously in the combination mode or separately in their respective modes.

B. CONTRAINDICATIONS OF ULTRASOUND THERAPY ✲

Ultrasound should not be used over the eyes or the reproductive organs.

Ultrasound should not be used over a pregnant uterus.

Other contraindications include acute infection or sepsis, deep vein thrombosis, or arterial disease, and over anesthetized areas or conditions that cause impairment of sensations, such as chemotheraphy.

Ultrasound is not to be used over cancerous lesions.

C. CONTRAINDICATIONS OF HIGH VOLTAGE THERAPY

This device should not be used on patients with cardiac pacemakers.

This device should not be used over the carotid sinus area.

This device is not to be used transcerebrally.

This device should not be used to relieve pain syndromes until etiology has been established.

This device should not be used over a pregnant uterus.

This device should not be used over or near cancerous malignancy.

✲ REF: Lehmann, J.F., Therapeutic Heat and Cold; 13: 367 - 378; 1972.

D. OPERATING PROCEDURE

This section is divided into three sections: high voltage, ultrasound and combination.

a. HIGH VOLTAGE OPERATION

The controls for this mode are located on the left side of the front panel.

1. Dial the Function Selector Switch in the lower left of the panel to the desired setting: either Probe, Continuous, Surge, Reciprocate 2.5 secs., Reciprocate 5 secs., or Reciprocate 10 secs.
2. Set the polarity switch to Positive (+) or Negative (-).
3. Dial the Pulses/Sec to the determined rate.
4. Attach the moistened dispersive pad to the patient.
5. Attach the moistened active pad or pads to the patient unless you are going to use the probe with the roller electrodes. If you are using the roller electrodes use a conductive gel on the area of the patient where high voltage is going to be used.
6. Turn Treatment Time Knob to the determined total time of the treatment. Intensity will remain at zero if treatment timer is not turned on.
7. Turn Intensity Balance control to center position.
8. Turn Intensity control counterclockwise to below Min to the Reset position where a click will take place. After this, slowly turn clockwise until patient feels sensation, and continue to desired level of tolerance.

9. If patient has more sensory perception of electrical stimulation in one active electrode pad or pads over the others, or if a stronger muscle contraction occurs under one electrode pad or pads and not the other, then the Intensity Balance control can be used to readjust relative strengths with the mode selector switch in Reciprocate 2.5, 5 or 10 only. The active pads are color-coded for easy identification. The Intensity Balance control will adjust the relative intensity of each pad individually, by turning the Intensity Balance control in the direction corresponding to the weaker color pad. Example: If the red pad feels weaker than the black pad, turn the Intensity Balance control counterclockwise toward the red a slight amount, then readjust the Intensity control as permitted by patient tolerance.
10. When the treatment is complete, remove pads or pad, return probe (if used) to its holder and return intensity control to reset.

b. ULTRASOUND OPERATION

The controls for this mode are generally located on the right side of the control panel.

1. Set the function selector switch to the ultrasound position.
2. Set INTENSITY control fully counterclockwise to the RESET position then the the MIN position. A normal, low output of approximately one watt is present, as indicated by the OUTPUT meter.

   CAUTION: Do not attempt to adjust the OUTPUT meter mechanical zero when the unit is on.
3. Select desired mode of ultrasound output. PULSED ultrasound in the 20% or 50% DUTY CYCLE position, or CONTINUOUS ultrasound in the 100% DUTY CYCLE position of the selector switch.
4. Turn TREATMENT TIME control to the desired preset time. For settings of 5 minutes or less, turn knob past 5 minutes and then return to the desired time.
5. Begin normal treatment by applying INTELECT ULTRASOUND GEL to the treatment area of patient's body. Contact the applicator to the patient's body with firm, uniform pressure. Adjust the desired treatment INTENSITY while continuously moving the applicator over the affected area. Do not maintain the applicator stationary over any given area for extended time periods. This may result in hazardous exposure to ultrasonic energy.
6. Continue procedure described in Step 5 above for duration of treatment time. Insure adequate coupling by adding sufficient gel as required. Inadequate coupling is apparent by noting variations in the intensity meter indication while moving the applicator.
7. When treatment is complete, return setting of INTENSITY control to RESET, then store applicator in the holder.

c. COMBINATION OPERATION

1. Set the function selector switch to the combination position.
2. Attach the moistened dispersive pad to the patient.
3. Set the polarity switch to Positive (+) or Negative (-).
4. Dial the Pulses/Sec to the determined rate.
5. Turn Intensity Balance control to center position.
6. Turn both the high voltage and the ultrasound intensity switches to the RESET position.

7. Select desired mode of ultrasound output. PULSED ultrasound in the 20% or 50% DUTY CYCLE position, or CONTINUOUS ultrasound in the 100% DUTY CYCLE position of the selector switch.
8. Turn TREATMENT TIME control to the desired preset time. For setting of 5 minutes or less, turn knob past 5 minutes and then return to the desired time.
9. Begin normal treatment by applying INTELECT ULTRASOUND GEL to the treatment area of patient's body. Contact the applicator to the patient's body with firm, uniform pressure. Adjust the desired treatment INTENSITIES, ✲ first the Ultrasound and then the High Voltage, while continuously moving the applicator over the affected area. Do not maintain the applicator stationary over any given area for extended periods. This may result in hazardous exposure to ultrasonic energy.

✲ It is possible that high voltage stimulation may have significant pain reduction effect, to the point where the patient may have no appreciable response to an over-dosage condition of the ultrasound energy. Therefore, it is suggested to apply the ultrasound first, then the stimulation.

10. Continue procedure described in Step 9 above for duration of treatment time. Insure adequate coupling by adding sufficient gel as required. Inadequate coupling is apparent by noting variations in the intensity meter indication while moving the applicator.
11. When treatment is complete, return settings of INTENSITY controls to RESET, then store applicator in the holder.

E. MAINTENANCE PROCEDURES

The following equipment must be available to perform service and calibration adjustments outlined below in Section E.

1. RADIOMETER; 0-20 WATTS minimum (ULTRASONIC WATTMETER, for use with applicator coupled through water).
2. WIDE-BAND OSCILLOSCOPE; 10 MHz minimum frequency response.
3. LO-CAPACITANCE OSCILLOSCOPE probe.
4. FREQUENCY COUNTER; 1% accuracy or better, required. Range at least 10 MHz.
5. VOLTMETER; AC and DC ranges, at least 20 Kilohms/Volt. DVM preferred.
6. LEAKAGE CURRENT TESTER - 100 uA. AC-RMS range, 50/60 Hz.
7. HIGH POTENTIAL TESTER - 2500 VOLTS RMS.
8. Additional requirement - source of de-oxygenated water (< 5ppm) for use in the wattmeter, as required. Distilled, degassed water is to be used when measuring ultrasound power output.

F. SERVICE INSTRUCTIONS, ULTRASOUND

To fully maintain compliance with Federal Regulation Title 21 (21CFR) this unit must be recalibrated annually. It is also recommended that all Chattanooga Corporation ultrasonic products be returned to the factory or authorized servicing dealer for repairs or recalibration (see SECTION D. for equipment requirements.)

Measure the ultrasound power output utilizing a suitable wattmeter of known accuracy. If required, recalibration can be attained in the following sequence.

1. Couple the transducer through water to the wattmeter. Place front panel controls as follows: TREATMENT TIME to 30 minutes; DUTY CYCLE selector to 100%; INTENSITY control to MAX.
2. Adjust TEMP. CAL. - P8 fully clockwise (located on the CONTROL BOARD).

3. Adjust INTENSITY CAL. - P1 for maximum voltage at C4, negative side. Reduce this maximum setting by 2 VOLTS.
4. Set DUTY CYCLE selector to 50%. Connect oscilloscope probe (10:1) to J3-pin 3. Adjust scope sweep for one full cycle of the 100 PPS nominal pulse repetition rate. Adjust 50% DUTY CYCLE calibration P7 for exactly 50% DUTY CYCLE of the pulse.
5. Set DUTY CYCLE selector to 20%. Adjust 20% DUTY CYCLE calibration P6 to exactly 20% duty cycle.
6. Adjust OSCILLATOR TUNING adjustment for maximum output as indicated by the external wattmeter. Set DUTY CYCLE selector to 100%. Set indicated wattmeter power to 20 watts using the front panel INTENSITY control. Calibrate the front panel OUTPUT meter to full scale using the 100 M. CALIBRATION control P3.
7. Set the front panel INTENSITY control fully clockwise and the incoming line voltage at 120 VAC. Adjust the INTENSITY CAL. - P1 for a full scale indication on the OUTPUT meter.
8. Set DUTY CYCLE selector to 50%. Adjust indicated wattmeter power to 10 watts using the INTENSITY control. Calibrate OUTPUT meter to full scale using the 50 M. CAL - P4.
9. Set DUTY CYCLE to 20%. Adjust indicated wattmeter power to 4 watts using INTENSITY control. Calibrate OUTPUT meter to full scale using 20 M. CAL - P5.
10. Place the applicator in a 140 degrees Fahrenheit water bath. Adjust the TEMP. CAL - P8 until the HEAD MAX TEMP. light just comes on. This calbrates the temperature at which ultrasound power is terminated should the transducer overheat for any reason. The ultrasound generator is now fully calibrated, and ready for normal use.

    "**CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to ultrasonic energy."

G. SPECIFICATIONS, ULTRASOUND

Frequency - 1.0 MHz ± 5% 950,000 — 1,050,000

Duty Cycle - 100% (continuous mode)
50% ± 10% (pulse mode)
20% ± 10% (pulse mode)

Pulse Repetition Rate - 100 Hz ± 20%

Ultrasonic Power - Variable from 1 watt to 20 watts.

Output Meter Accuracy - ± 20% (for any output above 10% of maximum)

Temporal Peak/Average Intensity Ratio - 2:1 ± 20% for 50% D.C.
5:1 ± 20% for 20% D.C.

Output:
1. Continuous - 1 MHz signal that is on as long as the timer is running.
2. Pulse - 1 MHz signal modulated 100% by the 100 Hz rectangular wave with the selected Duty Cycle.

Timer Accuracy:

1. Less than 0.5 seconds for settings less than 5 minutes
2. 10% for settings from 5 minutes to 10 minutes
3. 1 minute for settings greater than 10 minutes

Applicator:

1. Effective radiating area - 8.5 cm^2 ± 1.5 cm^2
2. Maximum beam non-uniformity ratio - 6.0:1
3. Beam type - Collimating

✲ Input Power Requirements:

(Domestic) 120V/60 Hz ± 10%, 1.25 Amps
(Export) 220V/50 Hz ± 10%, .8 Amps

✲ Voltages in parentheses in the procedure are for 220VAC units—e.g., 108(198)VAC indicates 108VAC for 120V unit, and 198VAC for a 220V unit.

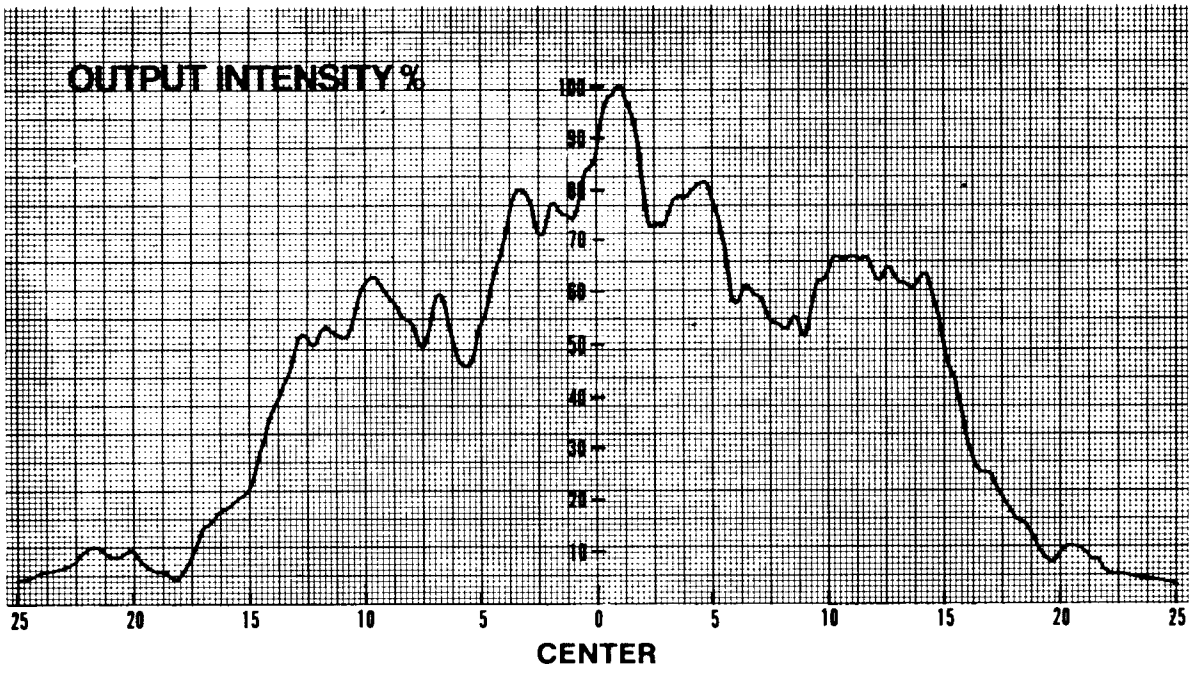
H. DESCRIPTION OF ULTRASONIC FIELD

The spatial distribution of the radiated field is essentially a collimated beam of ultrasonic energy having a cross-sectional area of 9.5 CM^2 when measured at a poing 5 millimeters from the tranducer face.

The energy distribution within the radiated field is 2.0 W/CM^2 maximum, and takes a generally conic shape having decreasing intensity at progressively increasing distance from the face of the transducer.

This field distribution applies for the radiation emitted into the equivalent of an infinite medium of distilled degassed water at 30° C. and with line voltage variations in the range of ± 10 percent of 120 VOLTS RMS.

PLOT OF ULTRASONIC FIELD SPATIAL DISTRIBUTION



I. HIGH VOLTAGE SYSTEM DESCRIPTION

Pulse Charge - approximately 14 microcoulombs per twin peak.

Pulse Frequency - One pulse per second to 120 pulses per second.

Output - 0 to 500 volts.

Output Current - 0 to 2500 milliamps peak.

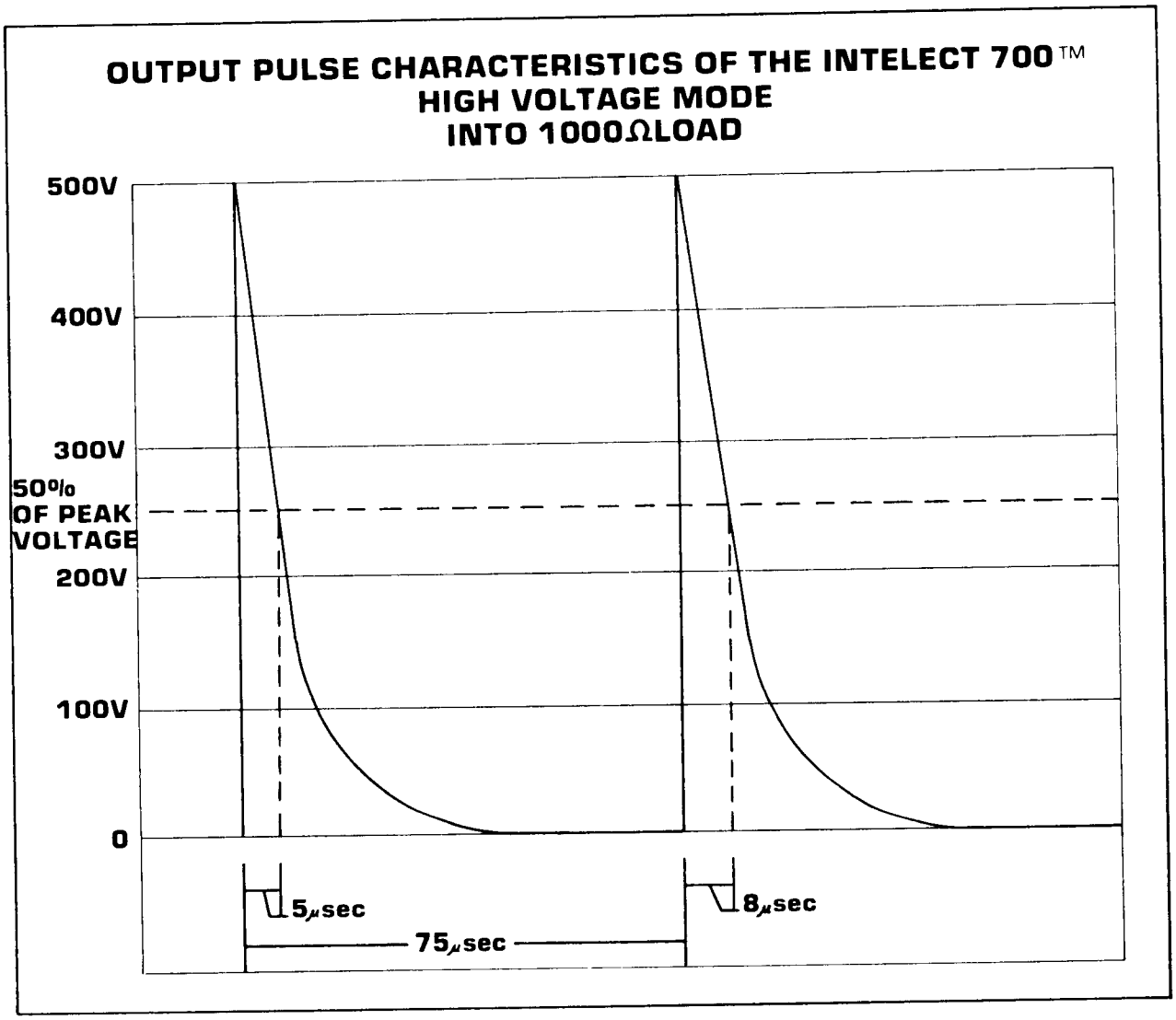
Average Current - Approximately 1.5 milliamps at 120 pulses per second.

Area of Conducting Surface of Electrodes

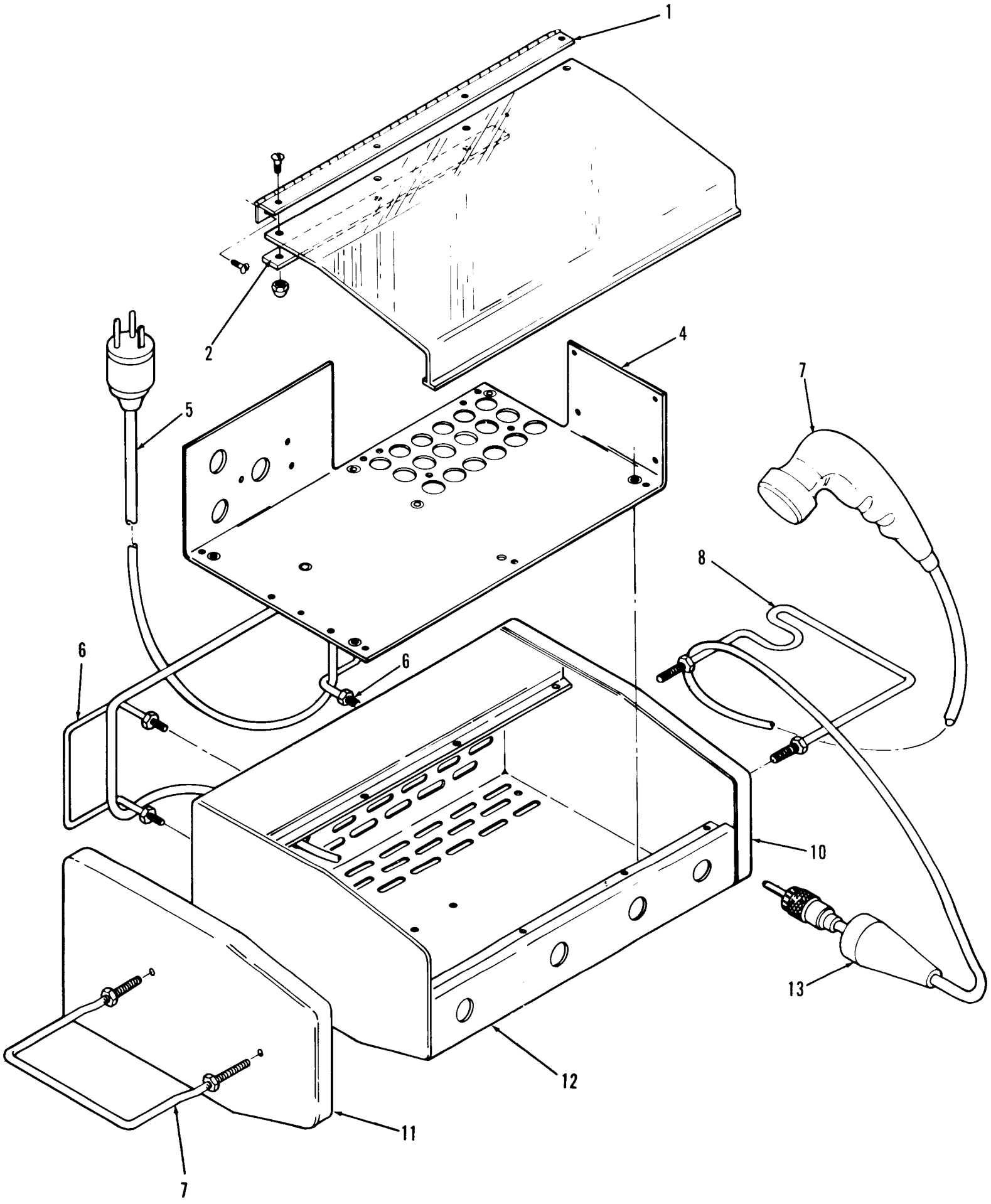
4-inch active electrodes: 3.75" dia. = 11.04 in^2 (7.125mm^2)

3-inch active electrodes: 3.12" dia. = 7.64 in^2 (4,932mm^2)

Dispersive electrodes: 7.5" x 9.5" = 71.25 in^2 (46,000mm^2)



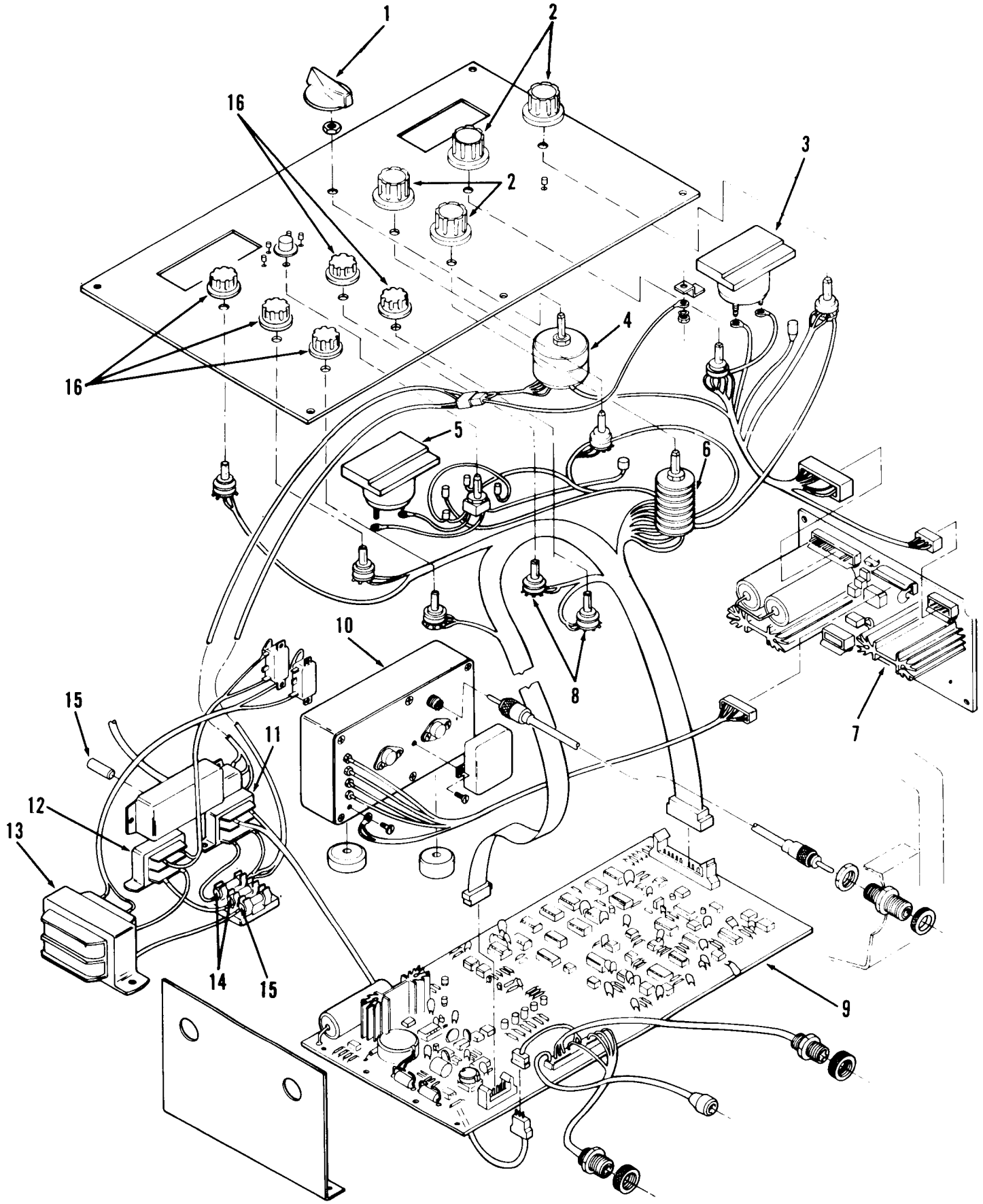
SECTION J. EXPLODED VIEW



SECTION J.

REF. NO.	PART NO.	DESCRIPTION	QTY.
1	70882	Hinge Intelect 700	1
2	70881	Hinge Intelect 700	1
3	72098	Cover Dust Intelect 700	1
4	70879	Bracket Power Supply	1
5	60157	Cord Set 183 SJT	1
6	79102	Holder, Cord	2
7	70430	Ultrasound Applicator	1
8	90678	Probe Holder	1
9	79113	Holder Probe Intelect 500	1
10	79088	Cover End Right Side	1
11	79089	Cover End Left Side	1
12	70919	Cabinet Intelect 700	1
13	73247	Insulator Black Rubber	1

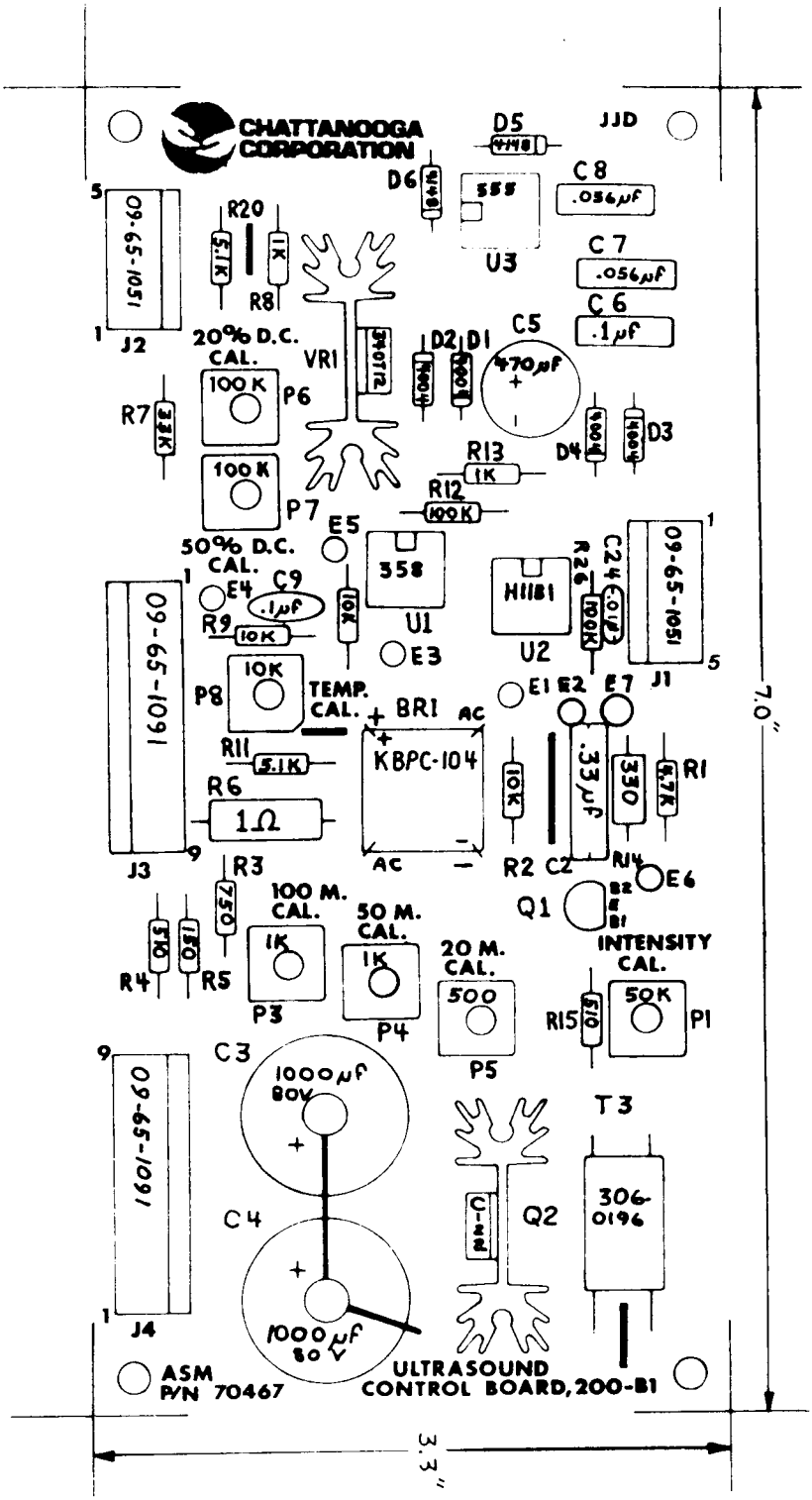
SECTION K. EXPLODED VIEW



SECTION K.

REF. NO.	PART NO.	DESCRIPTION	QTY.
1	70335	Knob, Timer Rhodes	1
2	70334	Knob Alco	4
3	70436	Meter, Ultrasound	1
4	72139	Timer Rhodes, 30 min.	1
5	72355	Meter, Intelect 500	1
6	72740	Switch Rotary CTS I-700	1
7	70127	Board PC Intelect 200-B1 (See page 15 for Board Layout)	1
8	72687	Switch Rotary Surge Time	2
9	72518	Board PC Intelect 500	1
10	72806	Oscillator Sub-Assembly	1
11	72437	Transformer 241-5-20	1
12	70417	Transformer 241-5-16	1
13	70415	Transformer 241-8-1757	1
14	71766	Fuse .25 Amp ABC	2
15	70843	Fuse MDL 1¼	2
16	72097	Knob Alco	5

CONTROL BOARD LAYOUT
200-B1



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ULTRASOUND SPECIFICATIONS

Frequency - 1.0 MHz + 5%

Duty Cycle - 100% (continuous mode)
50% + 10% (pulse mode)
20% + 10% (pulse mode)

Pulse Repetition Rate - 100 Hz ± 20%

Ultrasonic Power - Variable from 1 watt to 20 watts

Ultrasound Output Meter Accuracy - ± 20% (for any output above 10% of maximum)

Temporal Peak/Average Intensity Ratio - 2:1, + 20% for 50% D.C.
5:1, + 20% for 20% D.C.

Output:
1. Continuous - 1MHz signal that is on as long as the timer is running
2. Pulse - 1MHz signal modulated 100% by the 100Hz rectangular wave with the selected Duty Cycle

Timer Accuracy:
1. Less than 0.5 minutes for settings less than 5 minutes
2. 10% for settings from 5 minutes to 10 minutes
3. 1 minute for settings greater than 10 minutes

Applicator:
1. Effective radiating area - 8.5 cm^2 ± 1.5 cm^2
2. Maximum beam non-uniformity ratio - 6.0:1
3. Beam type - collimating

*Input Power Requirements:
(Domestic) 120V/60Hz ± 10%, 1.25 amps
(Export) 220V/50Hz ± .8 amps

*Voltages in parentheses in the procedure are for 220VAC units; e.g., 108(198)VAC indicates 108VAC for 120V unit and 198VAC for a 220VAC unit.

ULTRASOUND CALIBRATION

TEST EQUIPMENT REQUIRED·

1. Power line monitor (expanded scale voltmeter for rated line voltage ± 10%), VIZ model WV-120B or equivalent for 120VAC line.

2. Autotransformer, adjustable from 90% to 110% of rated line voltage, 150 watts or greater.

3. Ultrasound Power Meter, Ohmic Instruments Model UPM-30 or equivalent.

4. Oscilloscope, Tektronix T922 or equivalent.

5. Probe, voltage, X10, Scope, low capacitance.

6. Probe, current, Hewlett Packard Model 1110 or equivalent

7. Voltmeter, Digital, 3-1/2 digits, Simpson Model 461 or equivalent

8. Probe, temperature, Fluke Model 80T-150 or equivalent.

9. Source of approximately 1/2 gallon of distilled de-oxygenated (<5 PPM) water at 30 degrees Celsius for use in UPM-30 power meter (Item 3).

10. Counter, frequency, 10MHz, Triplett 7000 or equivalent.

11. Stopwatch, Siliconix Model 705 or equivalent.

12. Applicator current transformer adapter.

PROCEDURE:

I. Instrument Preparation:
   A. Make certain that all power is removed from the cabinet.
   B. Disconnect the applicator cable from the front cabinet connector.
   C. Remove the five #8 truss head screws that attach the front panel to the cabinet.
   D. Tilt the top of the front panel toward the front of the cabinet.
   E. Remove the following connectors which attach the front panel to the circuitry inside the cabinet: 16 pin connector with ribbon cable, 20 pin connector with ribbon cable, 9 pin power connector, 2 each 5 pin flat connectors and 9 pin flat connector.
   F. Remove front panel from cabinet.
   G. Disconnect the following connectors which attach power supply bracket to cabinet: 2 pin flat connector, 12 pin flat connector, coaxial jumper with UHF connector on each end and the strain relief on the line cord.
   H. Remove the eight #8 flat head phillips screws which attach the power supply bracket to the cabinet, in the bottom of the cabinet.
   J. Remove the power supply bracket from the cabinet.
   K. Reattach the connectors which are coming from the front panel to the circuitry on the power supply bracket.
   L. Connect applicator current transformer adapter to the UHF connector on the oscillator box and connect the applicator cable to the applicator current transformer adapter.

II. Power Supply and Duty Cycle Adjustment:
   A. Set the front panel controls:
      ULTRASOUND INTENSITY - fully CW
      DUTY CYCLE - 100% (continuous)
      TREATMENT TIME - 0

   B. Pre-set the internal adjustments:
      INTENSITY CAL. (P1) - fully CW
      50% D.C. CAL. (P7) - center of travel
      20% D.C. CAL. (P7) - center of travel
      100M CAL. (P3) - fully CCW
      50M CAL. (P4) - fully CCW
      20M CAL. (P5) - fully CCW
      TEMP. CAL. (P8) - fully CW

      50% INT. CAL. (P9) - fully CCW
      20% INT. CAL. (P10) - fully CCW

C. Connect the test set-up in Figure 1:
   1. Set AC input voltage with the autotransformer to 120(220)VAC line monitor.
   2. See OHMIC INSTRUMENTS clinical engineering notes AN-330 for operation of the UPM-30 U.S. Power Meter.
   3. Connect the digital voltmeter between common, (+) terminal of BR1, and either side of resistor R6 to measure 0 - 70VDC.

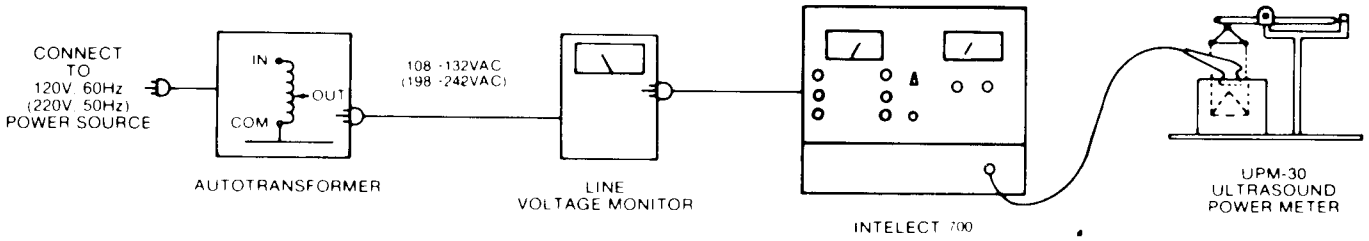


FIGURE 1

D. Set the TREATMENT TIME to either 30 minutes or lock down the dial knob so that the unit is on continuously.
   1. Observe:
      (a) Ultrasound Power Meter on Intelect 700 moves up-scale from zero.
      (b) Digital voltmeter indicates between -5VDC and -70VDC.

E. Adjust INTENSITY CAL. (P1 on the control board) in the CCW direction until the digital voltmeter indicates a maximum voltage (approx. -70VDC) and starts to decline. Turn P1 in the CW direction past maximum voltage to the position where the voltmeter indicates 2 volts less than the maximum voltage reading.

F. Connect the voltage probe from the oscilloscope to pin #3 of U3 on the control board.
   2. Observe: Voltage displayed on the scope is less than +1VDC.

G. Set the DUTY CYCLE selector switch on the front panel to 50%.
   1. Observe: A rectangular wave 100 Hz ± 20% signal operating between 1V and +12V approx.

H. Set the time base on the oscilloscope for 10.0 divisions horizontal display of one cycle of the 100 Hz signal.
   1. Adjust 50% D.C. CAL. on the control board for 5.0 divisions horizontal display of the signal at the +12V level.

I. Set the DUTY CYCLE selector switch to 20%.
   1. Observe: Rectangular wave 100 Hz ± 20% signal operating between 1V and +12V.

J. Repeat Step H above; preset time base only.

K. Adjust 20% D.C. CAL. on the control board for 8.0 divisions horizontal display of the signal at the +12V level.

L. Remove oscilloscope probe and voltmeter.

III. Oscillator Peaking and Output Power Adjustment:
A. Set the front panel controls:
   ULTRASOUND INTENSITY - fully CW
   DUTY CYCLE - 100%
   TREATMENT TIME - fully CW (ON)

B. Connect the voltage probe from the oscilloscope to the oscillator output at the applicator current transformer adapter.

C. Connect the current probe from the scope around the center conductor of the applicator current transformer adapter.
   1. Observe: With the scope set for dual channel display, the voltage and current waveforms should not be more than 90 degrees out of phase. If the phase displacement is more than 90 degrees, reverse the current probe connection or invert Channel 2 display on the scope. The displacement should now be less than 90 degrees.

D. Align the U.S. applicator in the UPM-30 per the power meter manufacturer's notes, AN-330.

E. Adjust OSC TUNING ADJUSTMENT (tuning slug in transformer T4) through access in bottom of the oscillator enclosure for a peak power indication on the UPM-30.
   1. Observe:
      (a) The voltage and current waveforms on the scope should now be in phase.
      (b) The peak power reading should be 23 watts or greater.

F. Connect the frequency counter to the oscillator output (applicator current transformer adapter) and measure the oscillator frequency.
   1. Observe: The frequency should be 1.0 MHz ± 5%.

G. Set the DUTY CYCLE selector on the front panel to 50% and vary the INTENSITY control on the front panel from fully CCW to fully CW.
   1. Observe:
      (a) The voltage and current waveforms on the scope remain in phase over the full intensity range.
      (b) A modulation envelope of the 1 MHz output modulated 100% by the 100 Hz rectangular wave signal with 50% duty cycle.

H. Set the DUTY CYCLE selector on the front panel to 20% and vary the INTENSITY control on the front panel from fully CCW to fully CW.
   1. Observe:
      (a) The voltage and current waveforms on the scope remain in phase over the full intensity range.
      (b) A modulation envelope of the 1 MHz output modulated 100% by the 100 Hz rectangular wave signal with 20% duty cycle.

I. Disconnect the voltage probe, current probe and frequency counter from the ultrasound output.

J. Set the DUTY CYCLE selector to 100% and the Ultrasound INTENSITY control fully CW.

K. Check the peak power on the UPM-30 and readjust the OSC TUNING ADJUSTMENT (tuning slug in transformer T4) if necessary for a maximum power indication.

L. Set the Ultrasound INTENSITY control on the front panel for a power indication of 20 watts on the UPM-30 power meter.
   1. Adjust 100M CAL. (P3 on the I-200 B1 Board) for a 20W indication on the I-200 output meter on the front panel.

M. Rotate the INTENSITY control fully CW.
   1. Adjust INTENSITY CAL. (P1 on the I-200 B1) for an indication of 23 watts on the I-700 ultrasound output power meter.

N. Increase the AC input voltage to the INTELECT 700 from 120(220)VAC to 132(242)VAC.
   1. Observe: The power indicated on the UPM-30 power meter should be no more than 28.5 watts.

O. Check the accuracy of the I-700 ultrasound output meter by comparing its indication to the power indicated on the UPM-30 with the line voltage at 108(198)VAC, 120(220)VAC, and 132(242)VAC.
   1. Observe: The following readings at all line voltages:

I-700 Meter Reading Peak Power	**UPM-30 Indication** Average Power	
	Minimum	**Maximum**
2.0 W	1.72 W	2.28 W
5.0 W	4.30 W	5.70 W
10.0 W	8.60 W	11.40 W
15.0 W	12.90 W	17.10 W
20.0 W	17.20 W	22.80 W

P. Return the line voltage to 120(220)VAC and set the DUTY CYCLE selector on the front panel to 50%.

Q. Set the Ultrasound INTENSITY control on the front panel for a power indication of 10 watts on the UPM-30 power meter.
   1. Adjust 50M CAL. (~~P5~~ P4 on the control board) for a 20 watt reading on the I-200 output power meter. NOTE: UPM-30 meter indication = DUTY CYCLE (50%) x I-200 reading. Average power is indicated on the UPM-30 and peak power is indicated on the I-200 meter in either of the pulse modes (50% or 20% D.C.).

R. Rotate the Ultrasound INTENSITY control fully CW.
   1. Adjust the 50% INT. CAL. (P9 on the pulse int. cal. board, located on the back of the meter) for a reading of 23 watts on the I-200 output meter.

S. Check the accuracy of the I-700 output meter by comparing its indication to the power indicated on the UPM-30 with the line voltage at 108(198)VAC, 120(220)VAC, and 132(242)VAC.
   1. Observe: The following readings at all line voltages:

I-700 Meter Reading	**UPM-30 Indication**	
	Minimum	**Maximum**
2.0 W	.86 W	1.14 W
5.0 W	2.15 W	2.85 W
10.0 W	4.30 W	5.70 W
15.0 W	6.50 W	8.50 W
20.0 W	8.60 W	11.40 W

T. Return the line voltage to 120(220)VAC and set the DUTY CYCLE on the front panel to 20%.

U. Set the Ultrasound INTENSITY control on the front panel for a power indication of 4 watts on the UPM-30 power meter.
   1. Adjust the 20M CAL. (P5 on the I-200 B1) for a 20W reading on the I-700 ultrasound output meter. NOTE: UPM-30 indication = DUTY CYCLE (20%) x I-700 reading.

V. Rotate the ultrasound INTENSITY control on the front panel fully CW.
   1. Adjust the 20% INT. CAL. (P10 on the PULSE INT. CAL. board, located on the back of the meter) for a reading of 23 watts on the I-700 ultrasound output meter.

W. Check the accuracy of the I-700 ultrasound output meter by comparing its indication to the power indicated on the UPM-30 with the line voltage at 108(198)VAC, 120(220)VAC and 132(242)VAC.
   1. Observe: The following readings at all line voltages:

I-700 Meter Reading Peak Power	**UPM-30 Indication** Average Power	
	Minimum	**Maximum**
2.0 W	.34 W	.46 W
5.0 W	.86 W	1.14 W
10.0 W	1.72 W	2.28 W
15.0 W	2.58 W	3.42 W
20.0 W	3.44 W	4.56 W

X. Disconnect the test setup.

IV. Adjustment of Head Maximum Temperature Trip.
   A. Connect the I-700 line cord to a 120(220)VAC power source.

   B. Place the applicator in a 140° F. water bath and monitor the temperature with the temperature probe or a thermometer that will accurately indicate 140° F.

   C. Set the front panel controls on the I-700 in the following positions:
      TREATMENT TIME - 30 minutes
      DUTY CYCLE - 100%
      ULTRASOUND INTENSITY - 10 W indication on the output meter

   D. Allow at least 5 minutes warm-up time after the front panel controls are set and power is applied.

   E. Adjust the TEMP. CAL. (P8 on the 200 B1) in the CCW direction until the HEAD MAX. TEMP. light on the front panel just turns on.

   F. Remove the applicator from the bath and allow the head to cool until the HEAD MAX. TEMP. light turns off.

   G. Replace the applicator in the water bath at 140° F. for 5 minutes. If the HEAD MAX. TEMP. light does not turn off, repeat Step E.

   H. Remove applicator from water bath and disconnect all equipment.

V. Timer Accuracy Check:
   A. Connect the Intelect 700 to a 120(220)VAC power source.

   B. Set the timer to 2.5 minutes and start the test stopwatch as the timer knob is released. (Turn past 5 and set to 2.5.)
      1. Observe: Time indicated on the stopwatch when the timer interrupts power to the unit is between 2.0 minutes and 3.0 minutes.

   C. Set the timer to 5 minutes and start the stopwatch as the timer knob is released.
      1. Observe: Time indicated on the stopwatch when the timer interrupts power to the unit is between 4.5 and 5.5 minutes.

   D. Set the timer to 10 minutes and start the stopwatch as the timer knob is released.
      1. Observe: Time indicated on the stopwatch when the timer interrupts power to the unit is between 9.0 and 11.0 minutes.

   E. Set the timer to 30.0 minutes and start the stopwatch as the timer knob is released.
      1. Observe: Time indicated on the stopwatch when the timer interrupts power to the unit is between 29.0 and 31.0 minutes.

ULTRASOUND CALIBRATION AND TESTING CHECKLIST

	BY	DATE
1. Adjust power supply output.		
2. Set duty cycles.		
3. Tune oscillator.		
4. At 120 volts adjust power as follows:		
100%		
50%		
20%		
5. Adjust intensity calibration at 108 volts (line).		
6. Check and record maximum intensity at 132 volts line:		
Setting Reading		
100%		
50%		
20%		
7. Check and record meter accuracy at the following (use 120V line):		
Setting Reading		
1 W		
5 W		
10 W		
15 W		
20 W		
8. Adjust head temperature to 140° F.		
9. Check and record timer accuracy at the following times:		
Time Set Actual Time		
15 min		
10 min		
5 min		
½ min		

HIGH VOLTAGE STIMULATION CALIBRATION PROCEDURE

EQUIPMENT NEEDED:

1. Oscilloscope - 10 MHz or greater bandwidth with 10:1 probe.
2. Frequency Counter with period function (1 sec.) and time interval function (10 sec.); i.e., Simpson 2725.
3. Digital Voltmeter (DVM).
4. Stop Watch.
5. Surge On and Off Indicator.

PRECALIBRATION SET-UP:

Adjust the following controls to the designated positions before applying power to the unit under test:

Designation	Description	Position
I-500 B1 Board:		
R90	Voltage Regulator Adjust	CCW
R2	1 Hz Adjust	Center
R1	120 Hz Adjust	Center
R18	Surge On Time Adjust	Center
R20	Surge Off Time Adjust	Center
R27	Surge Generator Zero Adjust	Center
R32	Surge Modulator Drive Adjust	N/A
R46	819 Hz Reciprocate Clock Adjust	Center
R14	Output Voltage Adjust	CCW
R68	Surge Modulator Zero Adjust	Center
R70	Meter Full Scale Adjust - Voltage	Center
R104	Meter Full Scale Adjust - Current	Center
R97	Meter Zero Adjust - Current	Center
Front Panel Controls:		
R118	Pulse Rate Control	60 pps
S7	Surge On Control	5 sec.
S8	Surge Off Control	5 sec.
R121	Intensity Control	Reset
S6	Treatment Timer	Zero
S5	Power Switch	Off
S2	Function Switch	Continuous
S3	Meter Range Selector	N/A
S4	Polarity Switch	Positive
R122	Intensity Balance Control	Center

CALIBRATION:

1. **Power Supply Voltage Adjustment -**
   Set DVM on 20 VDC range. Attach negative lead of meter to circuit common (negative side of C34) and positive lead to +15 volt supply (anode of D13). Plug Intelect 700 in, turn Power Switch on, and turn Treatment Timer on. The DVM should read less than 15 volts. Adjust R90 clockwise until DVM reads 15.00 volts ± .02 volts. Move positive lead of DVM to pin 14 of IC26 and check reference voltage. It should be 10 volts ± .4 volts.

2. **Meter Voltage Adjustment -**
   Set Meter Range Selector in "Volts" position. Adjust mechanical zero of meter with intensity at zero. Turn Intensity Control full clockwise. Adjust R70 until meter reads 500 volts. Also check collector of Q16 (Heat Sink) or emitter of Q17 with DVM. As intensity varies from 0 to 500 volts, this point should vary from 0 to 15 volts ± 1 volt. Return Intensity Control to reset position. NOTE: When Intensity Control is CCW, knob should point to reset.

3. **Reciprocate Time Adjustment -**
   Set frequency counter on 1 kHz range. Attach common lead to circuit common (negative side of C34) and attach other lead to TP1 (pin 3 of IC13). Adjust R46 until frequency counter reads 819 Hz ± 20 Hz. NOTE: This signal is a 15 volt pk-pk rectangular waveform with approximately 50% duty cycle.

4. **Pulse Rate Adjustment -**
   Set knob on shaft so that when control is CCW the pointer on the knob will point to the dot below 1 pps. Connect frequency counter to pin 3 of IC2 (or cathode of D1). Turn Pulse Rate Control to 120 pps. (Set pointer exactly on 120 pps). Adjust R1 until frequency counter reads 120 Hz. Put frequency counter in period mode. Turn Pulse Rate control CCW gradually. The period will increase as the control is rotated CCW until you reach the end of the electrical rotation, where the control will rotate further but the period will not increase. Then rotate the control slowly CW until the period just starts to decrease. Without changing the position of the shaft, set the pointer on the knob at exactly 1 pps on the dial and tighten the knob on the shaft. Set Pulse Rate control again in 120 pps position and adjust R1 for 120 Hz on counter. Return counter to period function and set Pulse Rate control to 1 pps and adjust R2 for a period of 1.00 seconds. Repeat 120 pps and 1 pps adjustments one more time, as there is a slight interaction between these adjustments. Also check that the Pulse LED is operating.

5. **Output Voltage Adjustment -**
   Set Pulse Rate control at 80 pps. Attach oscilloscope ground to Dispersive Pad and 10:1 probe to Active Pads. Turn Intensity control fully CW (500 volts). Adjust R14 for 500 volts peak output. Check the waveshape of the double pulse and the 75 μsec spacing between pulses. NOTE: Make sure that the oscilloscope probes are calibrated before this step. Then place a 200 ohm load across the output at 500 volts to check for single pulsing. If there is evidence of single pulsing, put oscilloscope into differential mode and attach inverted channel to Dispersive Pad and normal channel to Active Pads and check for single pulsing again with the 200 ohm load.

6. **Current Meter Calibration -**
   Disconnect oscilloscope probe. Push Meter Selector Switch until meter is in peak current readout mode. Adjust R97 (Current Zero Adjust) for zero reading on meter. Make sure that Intensity is at zero volts when adjusting zero. Turn Intensity control up to 500 volts and place 500 ohm 1% resistor across Intelect output. Then adjust R104 for a 1000ma reading on meter. Turn intensity to zero.

7. **Surge Calibration -**
   The surge circuit consists of two parts. The first part is a function generator which generates the complex surge waveform and will be abbreviated **S**urge **F**unction **G**enerator (SFG). The second part is a modulator which causes the D.C. intensity level to change at the same rate as the surge function. This modulator will be abbreviated as the **S**urge **M**odulator (SM). The SFG consists of Q3, 4, 5, 6, 8; IC7, 8, 9, 10, 11, 12; and Q24. The SM consists of Q7, IC18 and IC32.

   The SFG will be calibrated first. Place unit in SURGE mode. R18 calibrates the SURGE ON time. Set SURGE ON time to 10 seconds and SURGE OFF time to 1 second. Attach time interval counter to TP2 and with counter on 10 second range, adjust R18 until counter reads 10.0 $\pm$ 0.1 seconds. Check 1 second time with the counter $\pm$ 5%. Then set SURGE OFF time to 10 seconds and SURGE ON time to 1 second. Attach time interval counter to TP3 and with counter on 10 second range, adjust R20 to calibrate the SURGE OFF time to 10.0 $\pm$ 0.1 seconds. Check 1 second time with the counter $\pm$ 5%. Then attach the SURGE ON and OFF Indicator to the unit under test and check the 60 second SURGE ON and SURGE OFF times with the stopwatch.

   The surge function zero is adjusted by R27. Attach positive lead of DVM to the base of Q7 or pin 8 of IC7 and the negative lead to the negative side of C34. Set SURGE OFF time to 10 seconds and SURGE ON control to 1 second. Then during the time when the SURGE OFF LED is on, adjust R27 until DVM just reads a null (less than 0.1 volt). Do not adjust R27 past this point as it will cause an error in calibration.

   The SM is the second part of the surge calibration. Measure with the DVM the voltage at pin 7 of IC26 when the Intensity control is set at 500 volts. Record that voltage. Then attach DVM to pin 6 of IC32. Turn Intensity to zero and adjust R68 (Surge Modulator Zero Adjust) to a zero reading on DVM. Then turn Intensity control to 500 volts, SURGE ON to 10 seconds and SURGE OFF to 0.5 seconds. During SURGE ON time, as indicated by the SURGE ON and OFF indicator (at maximum voltage of ramp), adjust R32 (Surge Modulator Drive) until pin 6 of IC32 is the same as the voltage previously recorded at pin 7 of IC26.

This completes the adjustment phase of the calibration.

Make the following **Functional Checks:**

1. **Probe Mode -**
   Place the unit into the Probe Mode. Check to see that the Probe Intensity control varies the voltage on the intensity meter and the output from zero to 500 volts. Check the operation of the Polarity Switch. With a 500 ohm load, check the operation of the current meter in the probe mode.

2. **Continuous Mode -**
   Red and black pad LED's should be lighted. Check power-on-clear function. Check to see that intensity varies from zero to 500 volts. Check operation of current meter on the red and black pads with the 500 ohm load.

3. **Surge Mode -**
   Red and black pad LED's should be lighted. Surge On LED should work. with 500 ohm load check to see that current meter follows the surge waveform.

4. **Reciprocate Mode: 2.5, 5 and 10 seconds -**
   Visually check period of 2.5, 5 and 10 second reciprocate periods. Red and black pad LED's should light alternately starting with the red LED. Check the operation of the Intensity Balance control. The control should reduce the output into either pad from 500 volts to a maximum of 400 volts. Also check both red and black pad outputs on the current meter using the 500 ohm load.

5. **Reset -**
   Check to see that stimulator reset operates properly between all modes except while in reciprocate modes.

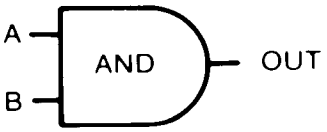
6. **Combination Mode -**
   Check Combination Mode.

HIGH VOLTAGE CALIBRATION AND TESTING CHECKLIST

Step:	BY	DATE
1. Power supply voltage adjust 15 volts ± .02 volts.	_____	_____
Reference voltage check 9.6 to 10.4 volts.	_____	_____
2. Meter voltage adjustment	_____	_____
Collector of Q16 check 0 to 15 volts ± 1 volt	_____	_____
3. Reciprocate time adjustment 819 Hz ± 20 Hz	_____	_____
4. Pulse rate calibrate:		
120 pps	_____	_____
1 pps	_____	_____
Pulse indicator LED	_____	_____
5. Output voltage adjustment 500 volts peak	_____	_____
Check waveform of output and 75 μsec spacing of pulses	_____	_____
6. Current meter calibration:		
Zero	_____	_____
1000 mA	_____	_____
7. Surge function generator: On Time	_____	_____
Off Time	_____	_____
Surge Function Zero	_____	_____
Surge Modulator: Zero	_____	_____
Drive	_____	_____
Functional Checks:		
1. Probe Mode	_____	_____
2. Continuous Mode	_____	_____
3. Surge Mode	_____	_____
4. Reciprocate Mode	_____	_____
5. Reset Check	_____	_____
6. Combination Mode	_____	_____
Safety Tests:		
1. Hi-Pot 2500 volts	_____	_____
2. Ground Resistance Test	_____	_____
3. Leakage Current Test	_____	_____

APPENDIX

Truth Tables for logic used in Intelect 700



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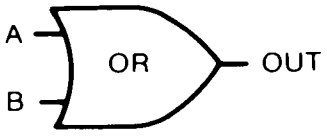

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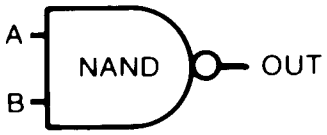

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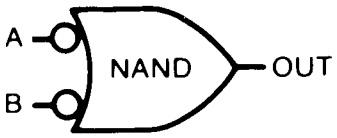

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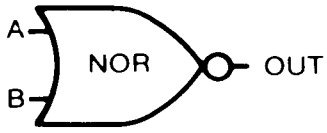
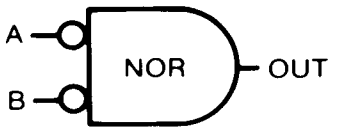
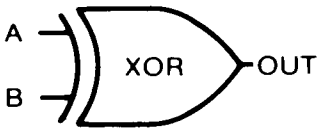


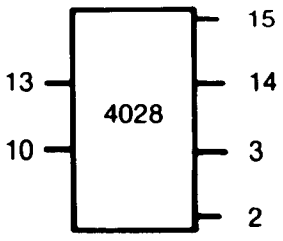
or



A	B	OUT
0	0	1
0	1	0
1	0	0
1	1	0

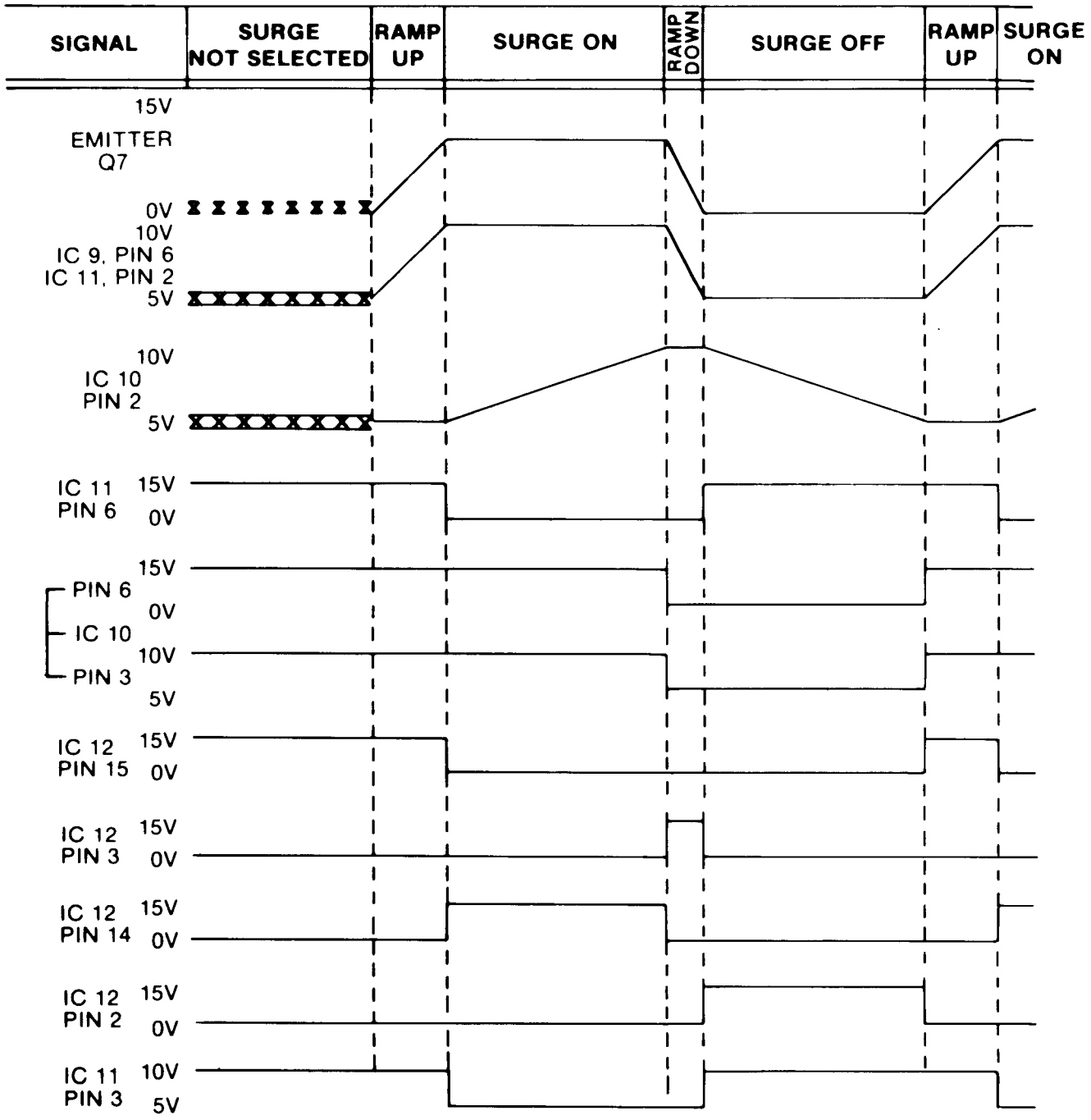


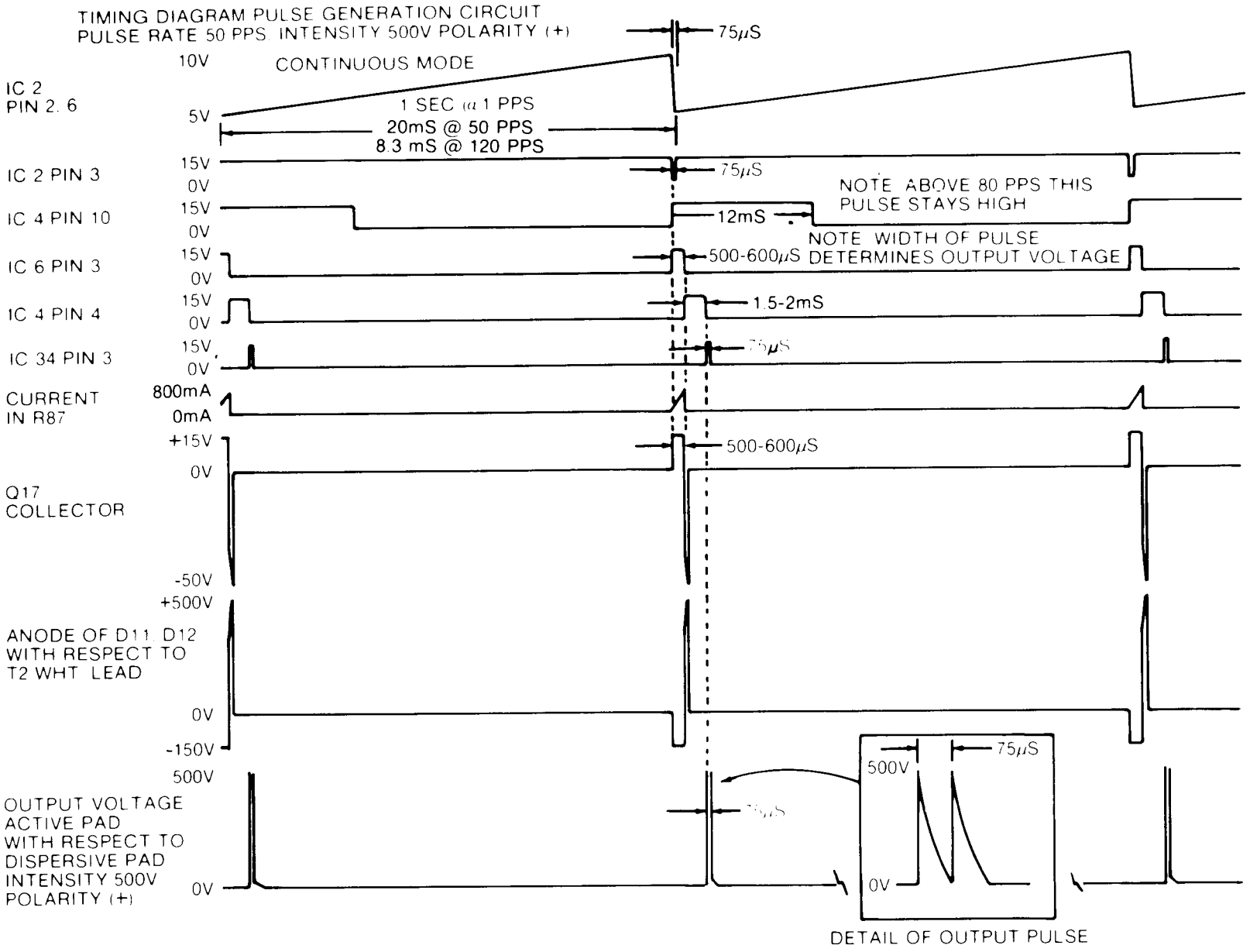
A	B	OUT
0	0	0
0	1	1
1	0	1
1	1	0



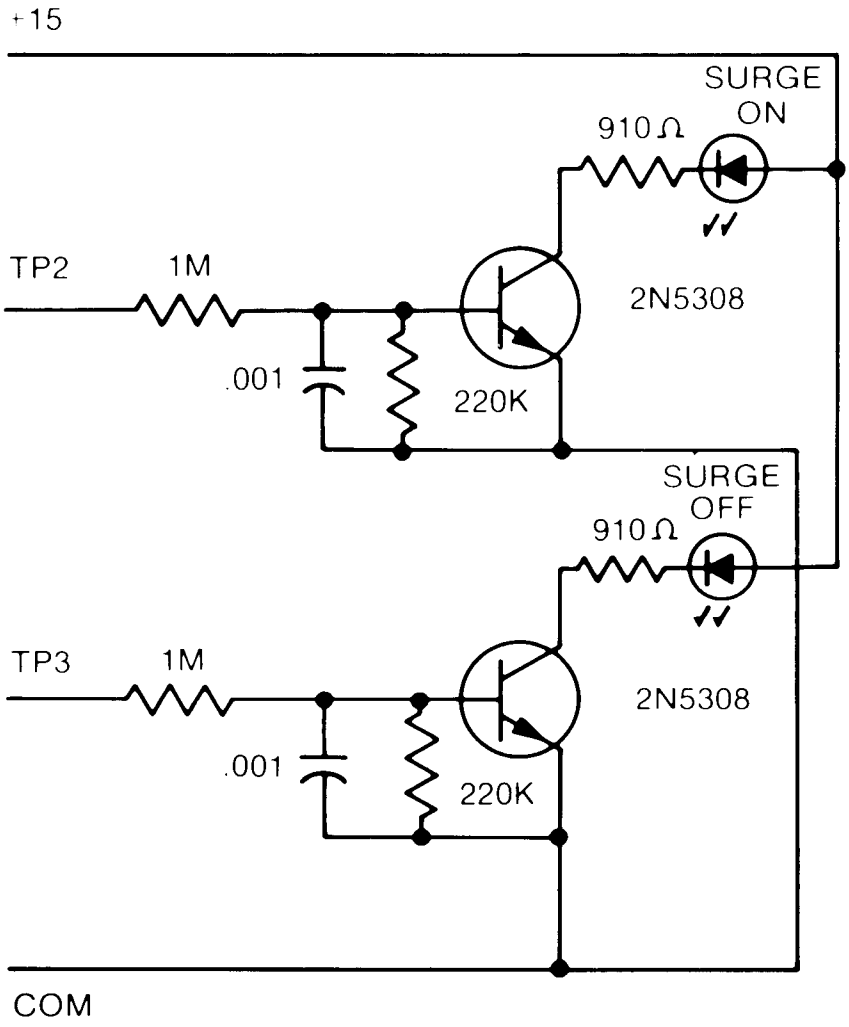
INPUTS		OUTPUTS			
13	10	15	14	3	2
1	1	1	0	0	0
0	1	0	1	0	0
0	0	0	0	1	0
1	0	0	0	0	1

TIMING DIAGRAM FOR SURGE CIRCUIT

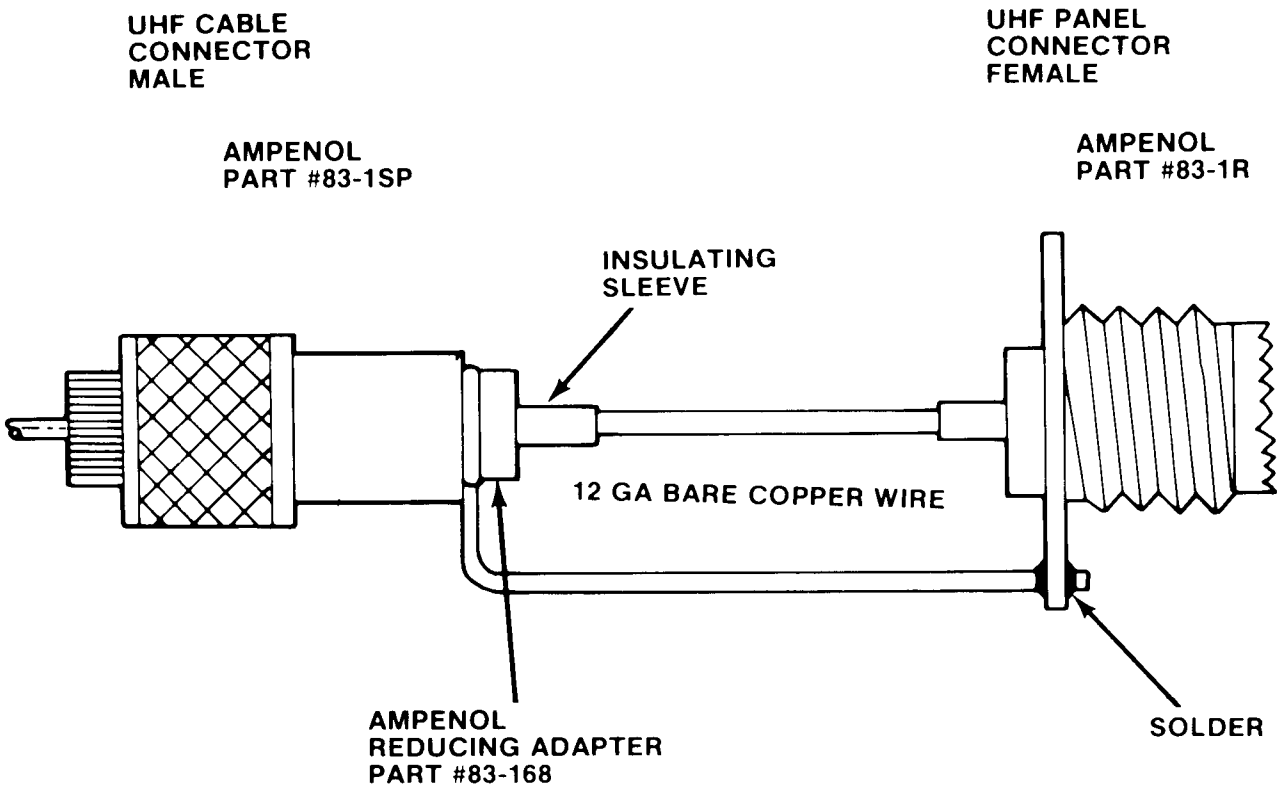



TIMING DIAGRAM PULSE GENERATION CIRCUIT
PULSE RATE 50 PPS. INTENSITY 500V POLARITY (+)
75μS
10V
CONTINUOUS MODE
IC 2
PIN 2. 6
5V
1 SEC @ 1 PPS
20mS @ 50 PPS
8.3 mS @ 120 PPS
IC 2 PIN 3
15V
0V
75μS
NOTE ABOVE 80 PPS THIS
PULSE STAYS HIGH
IC 4 PIN 10
15V
0V
12mS
NOTE WIDTH OF PULSE
IC 6 PIN 3
15V
0V
500-600μS DETERMINES OUTPUT VOLTAGE
IC 4 PIN 4
15V
0V
1.5-2mS
IC 34 PIN 3
15V
0V
75μS
CURRENT
IN R87
800mA
0mA
+15V
0V
500-600μS
Q17
COLLECTOR
-50V
+500V
ANODE OF D11. D12
WITH RESPECT TO
T2 WHT LEAD
0V
-150V
500V
OUTPUT VOLTAGE
ACTIVE PAD
WITH RESPECT TO
DISPERSIVE PAD
INTENSITY 500V
POLARITY (+)
0V
75μS
500V
75μS
0V
DETAIL OF OUTPUT PULSE

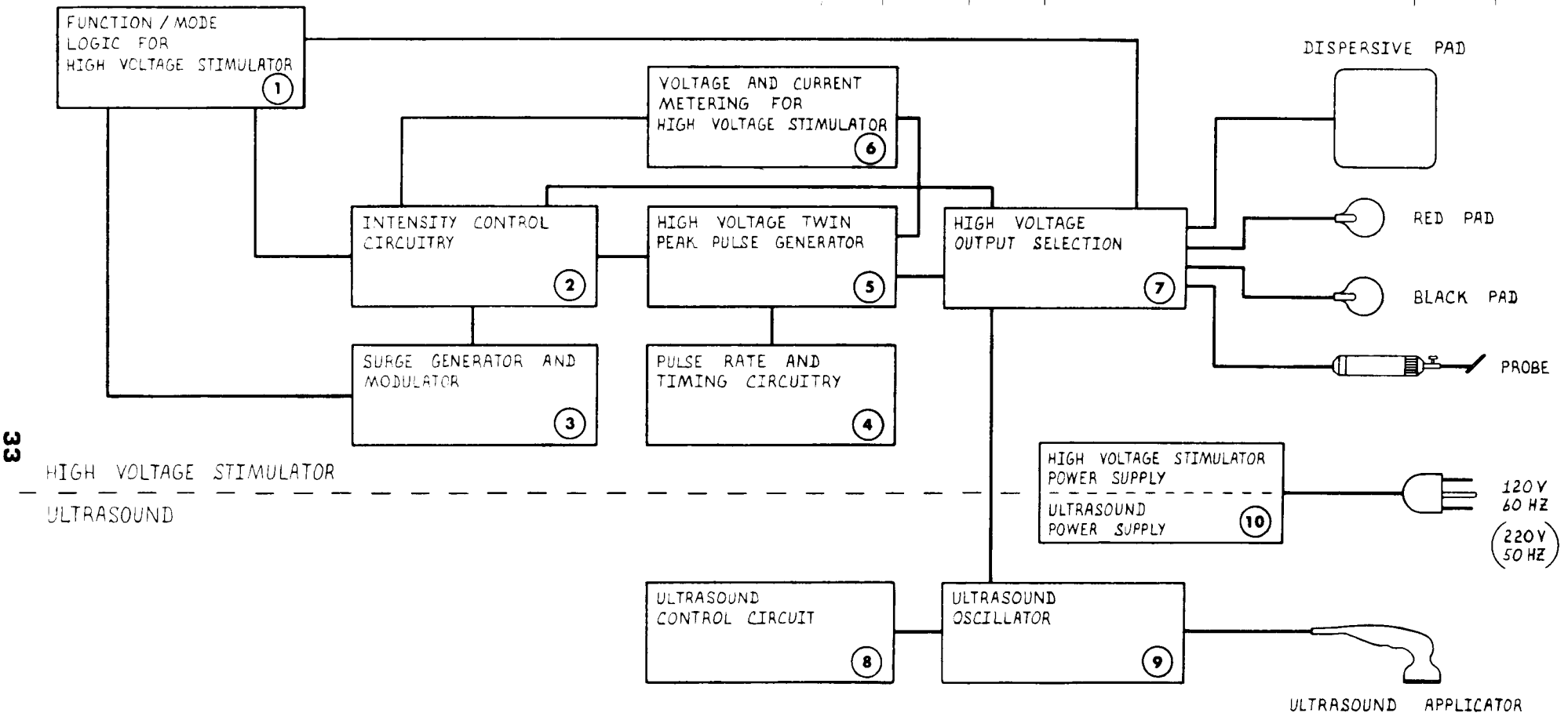
SURGE ON AND OFF INDICATOR
(TEST ADAPTER)



APPLICATOR CURRENT TRANSFORMER ADAPTER FOR CALIBRATING INTELECT 200 & 700



REVISIONS					
REV.	E.N. NO.	DATE	DESCRIPTION	ENGINEER	APPROVAL
—	1102	5-5-83	RELEASE	D. BLEY	J. Duckworth



33

SECTION N

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS DECIMALS ANGLES
XX:
XXX:

MATERIAL

FINISH

DO NOT SCALE DRAWING

APPROVALS		DATE
ENGINEER	J. BLEY	5-11-83
DRAWING	J. SM	3-31-83
CHECK		
APPROVAL	J. Duckworth	5-17-83

CHATTANOOGA CORPORATION

INTELECT 700 BLOCK DIAGRAM

SIZE	DRAWING NO.	
B	B.D. 72823	
SCALE NONE		SHEET 1 OF 1

ORIGIN BLOCK *	CIRCUIT DESIGNATION	DESCRIPTION OR NAME OF SIGNAL	DESTINATION BLOCK *	CIRCUIT DESIGNATION
1	IC 22 PIN 6	$\overline{\text{SURGE}}$	2 3	IC 25 PIN 6 IC 5 PIN 13
1	IC 4 PIN 3	$\overline{\text{SURGE}}$ ENABLE	3	R150 10K
1	IC 17 PIN 4	RESET SURGE	2	IC 19 PIN 6
1	R112 100K	PROBE ENABLE	2 7	IC 25 PIN 13 R58 15K
1	IC 24 PIN 11	BLACK PAD ENABLE	7	R52 15K
1	IC 24 PIN 10	RED PAD ENABLE	7	R55 15K
1	IC 16 PIN 11	INTENSITY SQUELCH	2	R143 8.2K
1	IC 15 PIN 4	BLACK + RED SELECT	2	IC 19 PIN 13
1	IC 17 PIN 11	IFF RED SELECT	2	IC 19 PIN 12
1	IC 17 PIN 10	IFF BLACK SELECT	2	IC 19 PIN 5
1	IC 17 PIN 3	RESET CONTINUOUS/RECIPROCATE	2	IC 25 PIN 5
2	IC 26 PIN 7	INTENSITY VOLTAGE SIGNAL	3 6	R63 10K 1% R69 18K
2	Q16 COLLECTOR	0-15V INTENSITY PROGRAMMING	5	Q17 EMITTER
3	IC 32 PIN 6	SURGE INTENSITY OUT	2	IC 19 PIN 9
4	IC 6 PIN 3	CHARGE PULSE	5	R16 4.7K
4	IC 34 PIN 3	TRIGGER PULSE	5	R9 1K
5	J5 PIN 13	(+) TWIN PULSE	7	P5 PIN 13
5	J5 PIN 15	(-) TWIN PULSE	7	P5 PIN 15
5	T4 (●)	CURRENT SIGNAL	6	C31 0.1

REVISIONS					
REV.	E.N. NO.	DATE	DESCRIPTION	ENGINEER	APPROVAL
F	1102	5-5-83	ADD SURGE TO INT. 700	D. BLEY	
G	1110	6-6-83	CORRECTION TO E.N. #1102	D. BLEY	

ORIGIN BLOCK *	CIRCUIT DESIGNATION	DESCRIPTION OR NAME OF SIGNAL	DESTINATION BLOCK *	CIRCUIT DESIGNATION
7	J7 PIN 1	PROBE INTENSITY SIGNAL	2	R139 10K
8	J3 PIN 1	OVER TEMP. SIGNAL	9	P3 PIN 1
8	J3 PIN 3	DUTY CYCLE	9	P3 PIN 3
8	J3 PIN 6	-12 TO -70V D.C. VARIABLE	9	P3 PIN 6
10	IC 26 PIN 14	+10V REF. (H.V.)	7 2	J7 PIN 2 J4 PIN 17
10	C 34 (-)	STIMULATOR COMMON (▽)	1 - 7	
10	VR1 OUT	ULTRASOUND +12V DC	8 - 9	
10	BR1 (-)	-70V UNREGULATED	8	R14 330Ω
10	BR1 (+)	ULTRASOUND COMMON	7 - 8 - 9	

NOTES:
1. ALL CAPACITORS IN μf UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS IN OHMS, 1/4 W, 5% UNLESS OTHERWISE SPECIFIED
3. ALL DIODES IN4148 UNLESS OTHERWISE SPECIFIED

NTE 519

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE
FRACTIONS DECIMALS ANGLES
± .XX ± .XXX ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

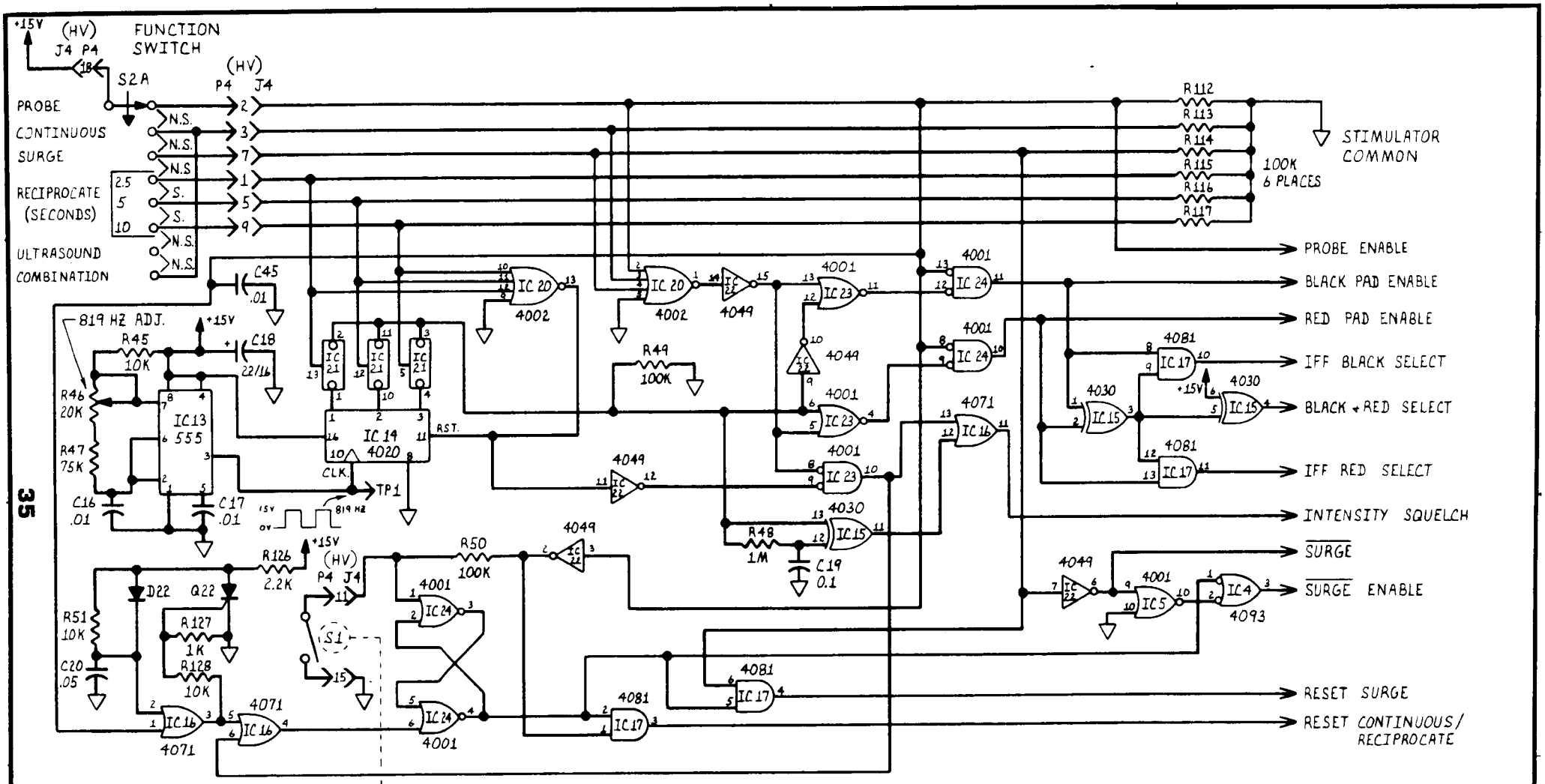
APPROVALS		DATE
ENGINEER	D. BLEY	5-11-83
DRAWING		4-4-83
CHECK		
APPROVAL		5-17-83

CHATTANOOGA CORPORATION

INTELECT 700 SCHEMATIC SIGNAL LIST

SIZE B | DRAWING NO. E.S. 72823

SCALE NONE | SHEET 1 OF 11



35

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

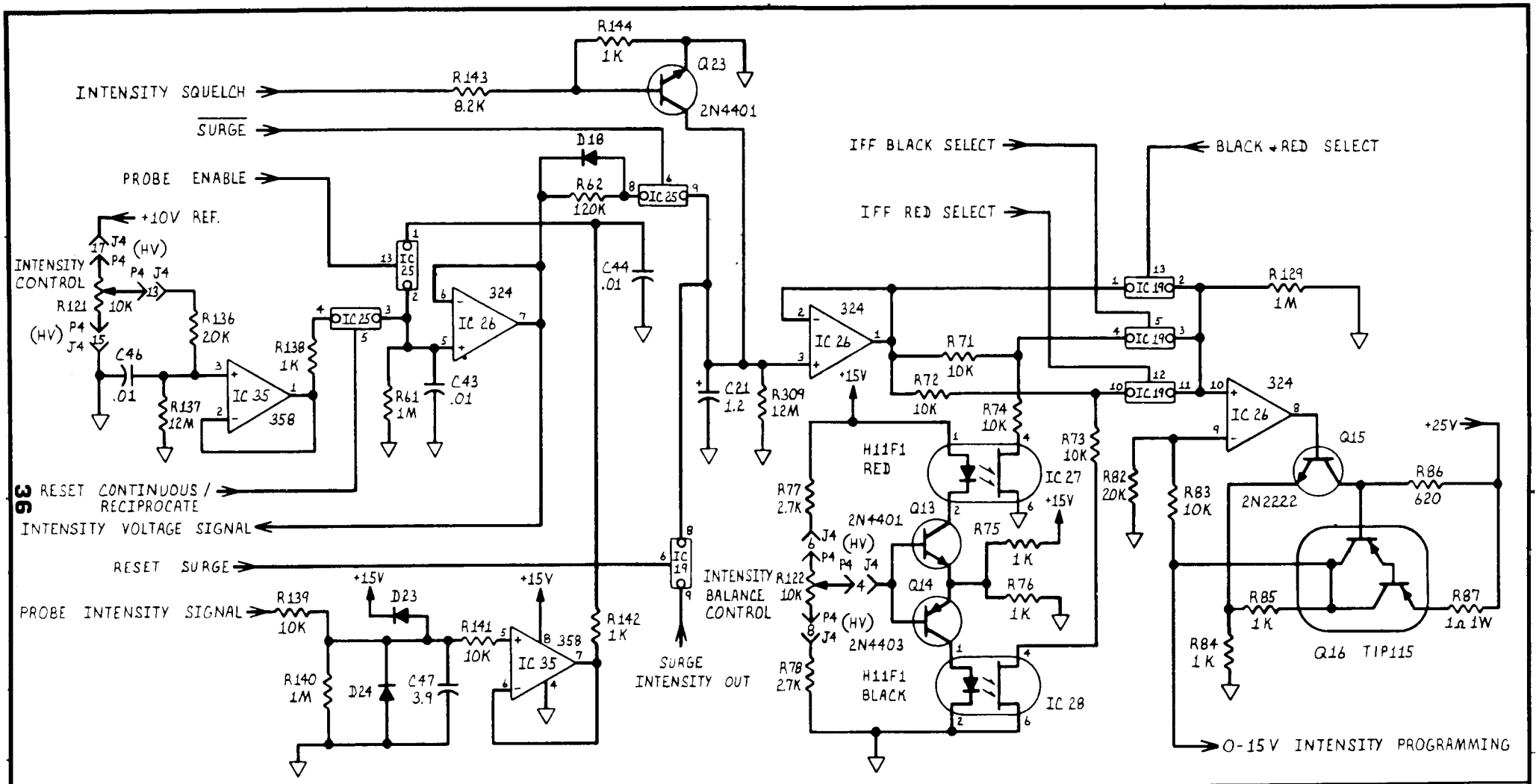
APPROVALS		DATE
ENGINEER	D. BLEY	5-11-83
DRAWING	J&M	3-7-83
CHECK		
APPROVAL	J. Buchanan	5-11-83

CHATTANOOGA CORPORATION

INTELECT 700 SCHEMATIC
STIMULATOR FUNCTION / MODE LOGIC

SIZE	BLOCK	DRAWING NO.
B	1	E.S. 72823

SCALE NONE | REV. G | SHEET 2 OF 11



96

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE
FRACTIONS DECIMALS ANGLES
± XX± ±
XXX±

MATERIAL

FINISH

DO NOT SCALE DRAWING

APPROVALS		DATE
ENGINEER	D. BLEY	5-11-83
DRAWING		3-8-83
CHECK		
APPROV		5-17-83

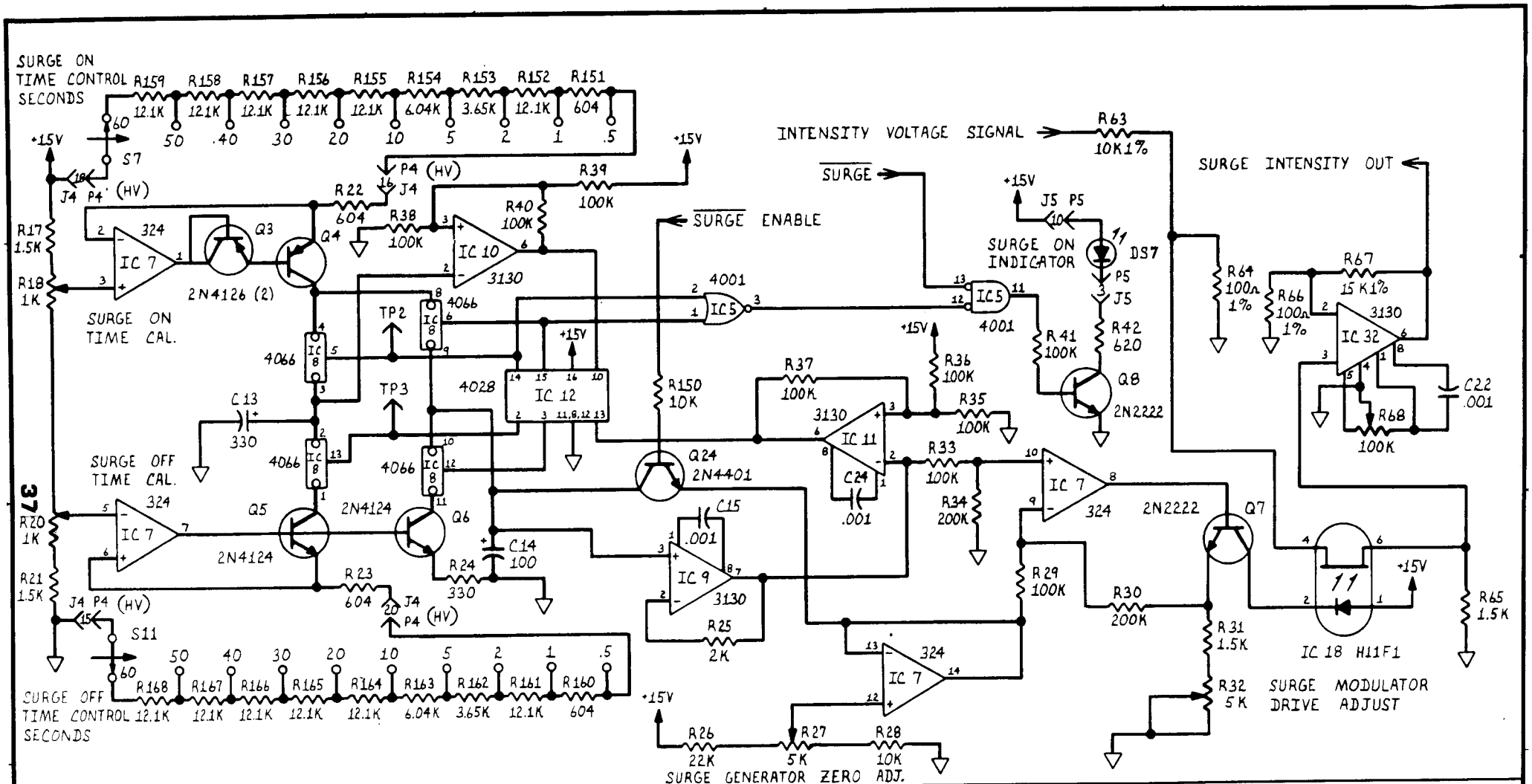
CHATTANOOGA CORPORATION

INTELECT 700 SCHEMATIC

STIMULATOR INTENSITY CONTROL CIRCUITRY

SIZE	BLOCK	DRAWING NO.
B	2	E.S. 72823

SCALE NONE | REV. G | SHEET 3 OF 11



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± .XX± .XXX± ±	APPROVALS	DATE
MATERIAL	ENGINEER D. OLEY	5-11-83
	DRAWING J&M	3-10-83
	CHECK	
FINISH	APPROVAL C. Duckworth	5-17-83
DO NOT SCALE DRAWING		

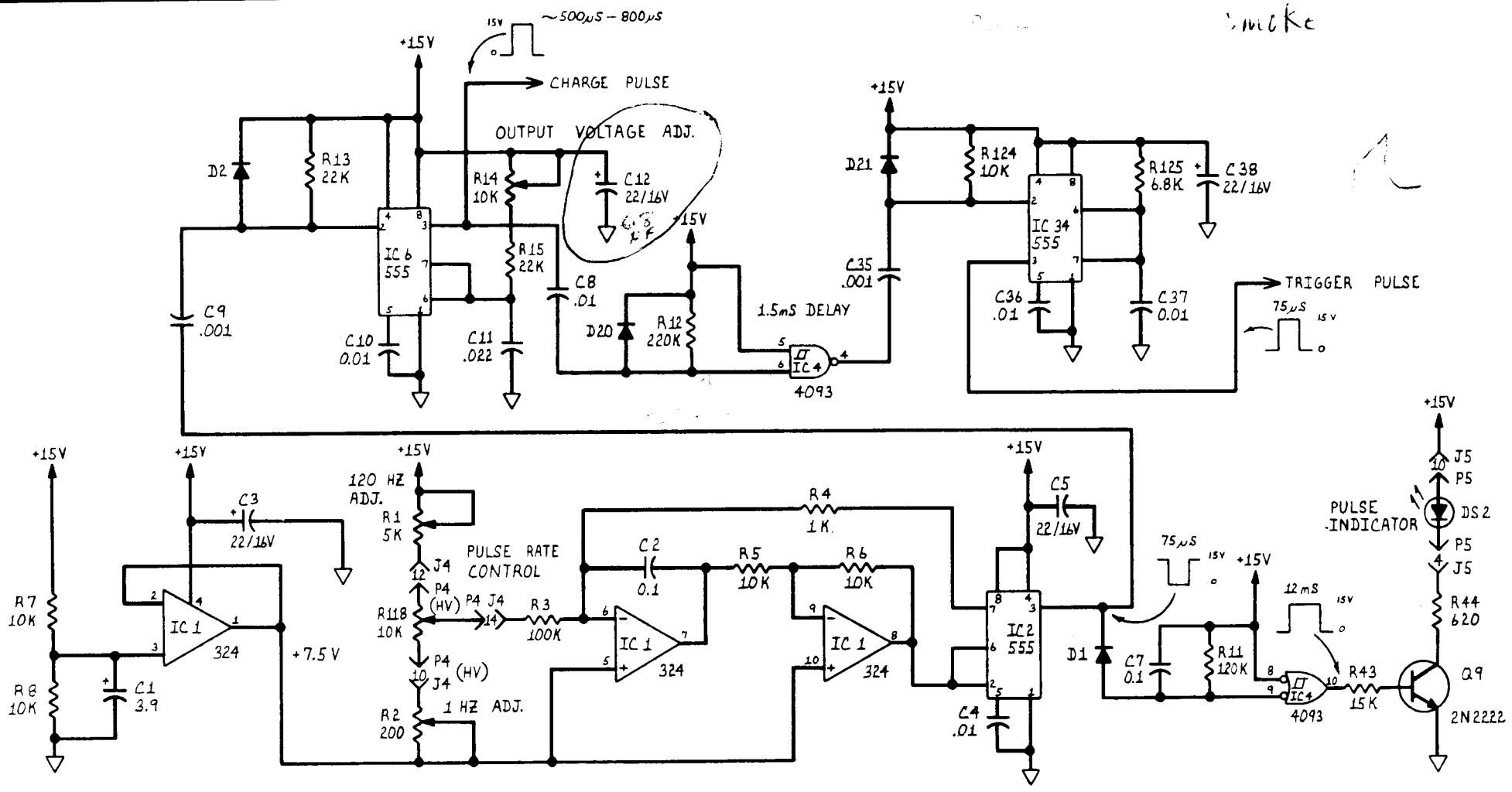
CHATTANOOGA CORPORATION

INTELECT 700 SCHEMATIC

STIMULATOR SURGE GENERATOR + MODULATOR

SIZE	BLOCK	DRAWING NO.
B	3	E.S. 72823

SCALE NONE | REV. G | SHEET 4 OF 11



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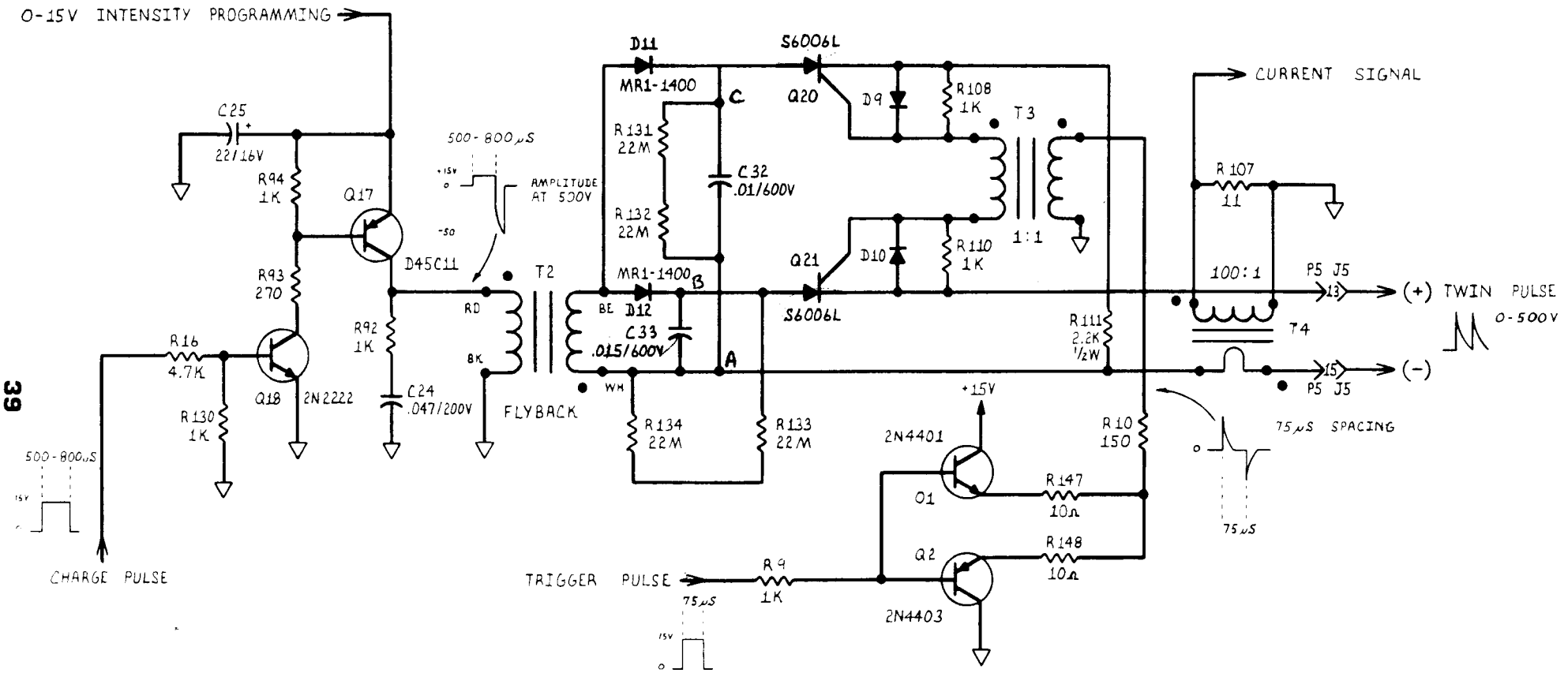
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .XX± ± .XXX±	APPROVALS	DATE	CHATTANOOGA CORPORATION
MATERIAL	ENGINEER D. BLEY	5-11-83	INTELECT 700 SCHEMATIC
	DRAWING J&M	3-10-83	STIMULATOR PULSE RATE + TIMING GENERATOR
FINISH	CHECK		SIZE B BLOCK 4 DRAWING NO. E.S. 72823
DO NOT SCALE DRAWING	APPROVAL E. Duckworth	5/17/83	SCALE NONE REV. G SHEET 5 OF 11

A Scope Grd
B Test Point
C Test Point

500Ω Load Disp to Read (on B/K)
With MAX INT. Check "I" on meter (100μA)

CONNECT Scope ⏚ TO COMMON Point Between
C 32 & C 33 Check wave Form & Voltage



39

If DS NOT is faulty (IE 1 PULSE) CORRECT
N21 Regs check & replace D11 & 12
Q20-21 & C32 & 33

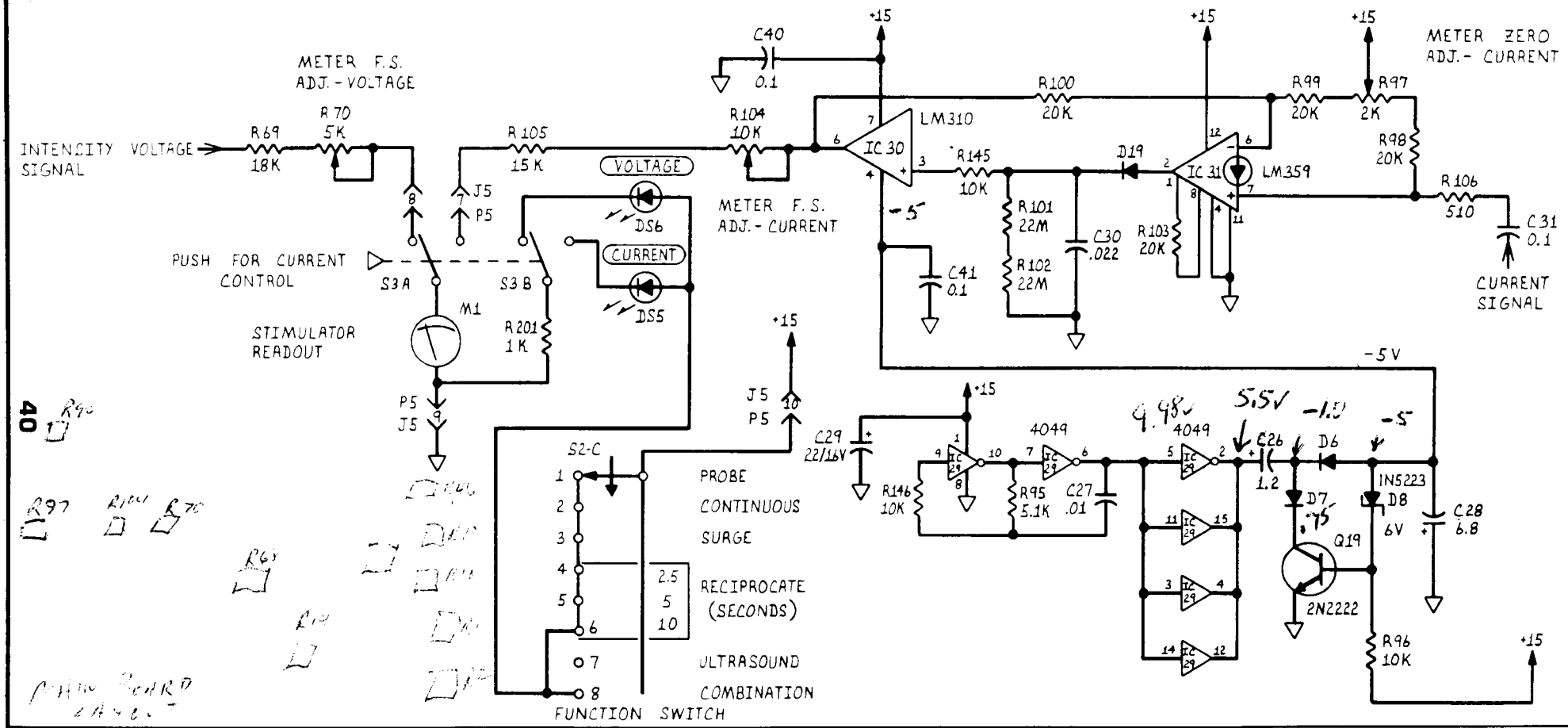
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± XX± ± XXX±	APPROVALS	DATE
MATERIAL	ENGINEER D. BLEY	5-11-83
	DRAWING	5-11-83
FINISH	CHECK	
DO NOT SCALE DRAWING	APPROVAL J Duckworth	5-17-83

CHATTANOOGA CORPORATION

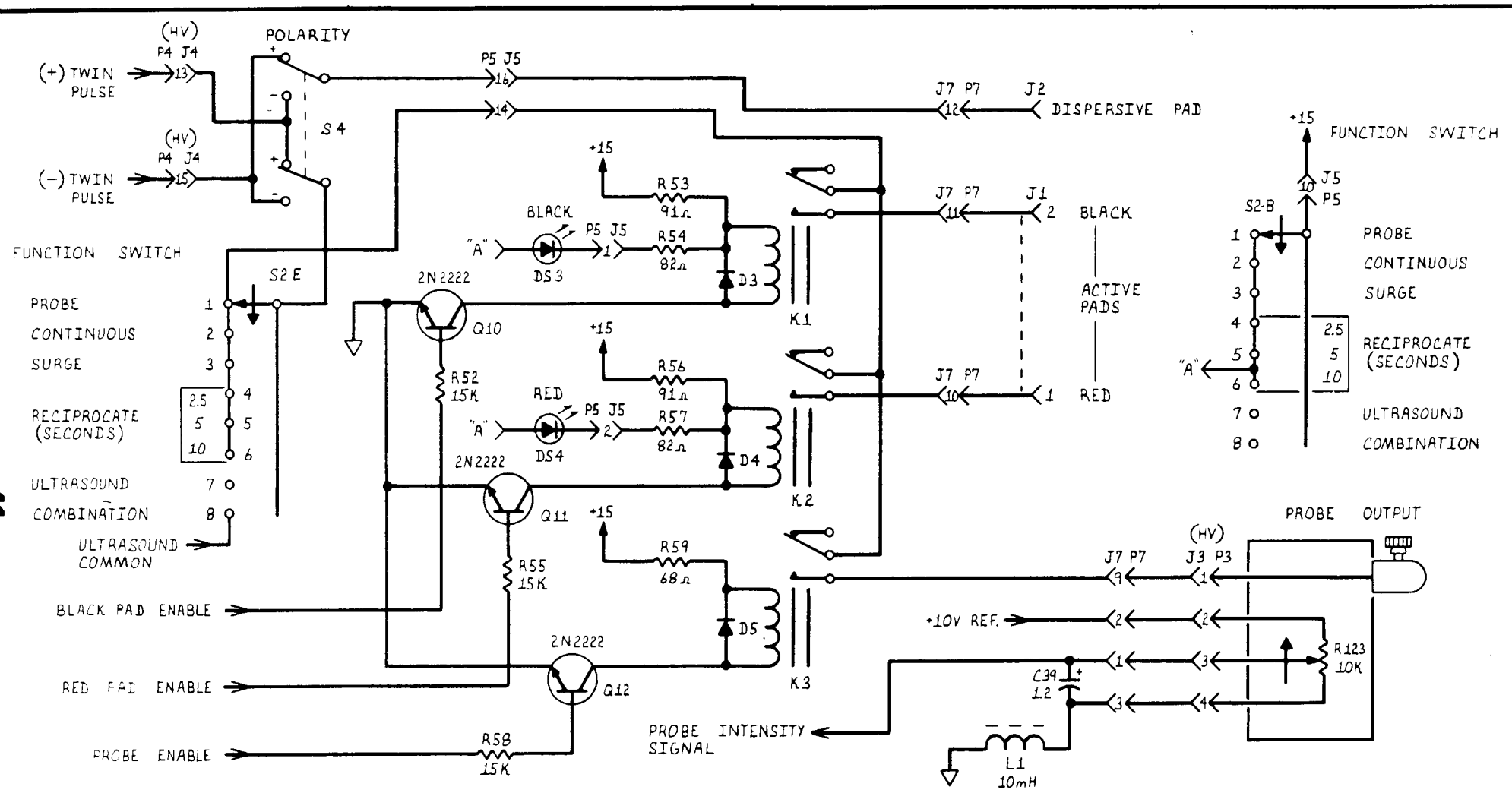
INTELECT 700 SCHEMATIC
STIMULATOR HIGH VOLTAGE GENERATOR

SIZE	BLOCK	DRAWING NO.
B	5	E.S. 72823

SCALE NONE | REV. G | SHEET 6 OF 11



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX± ° XXX±	APPROVALS	DATE	CHATTANOOGA CORPORATION
MATERIAL	ENGINEER D. BLEY	5-11-83	INTELECT 700 SCHEMATIC
FINISH	DRAWING J. LM	3-22-83	STIMULATOR VOLTAGE + CURRENT METER CIRCUIT
DO NOT SCALE DRAWING	CHECK		SIZE B BLOCK 6 DRAWING NO. E.S. 72823
	APPROVAL J. Bickwell	5-17-83	SCALE NONE REV. G SHEET 7 OF 11



41

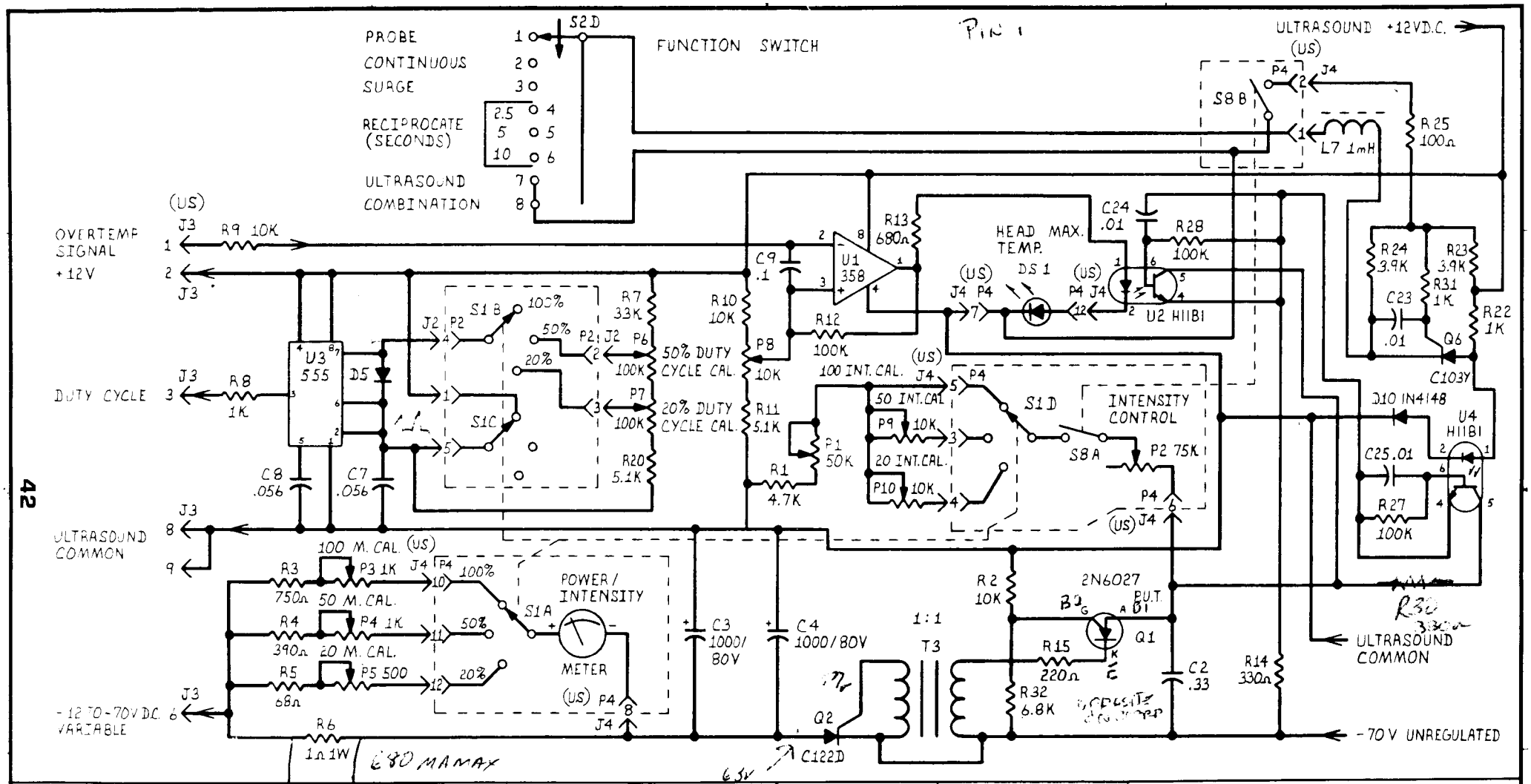
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± .XX ± .XXX	APPROVALS	DATE
MATERIAL	ENGINEER D. BLEY	5-11-83
	DRAWING J & M	3-24-83
	CHECK	
FINISH	APPROVAL J. Duckworth	5-17-83
DO NOT SCALE DRAWING		

CHATTANOOGA CORPORATION

INTELECT 700 SCHEMATIC
HIGH VOLTAGE OUTPUT SELECTION

SIZE	BLOCK	DRAWING NO.
B	7	E.S. 72823

SCALE NONE | REV. G | SHEET 8 OF 11



42

Put shorted 12 R15 Blown.

Jumpers, Hi & Low End
Check Q1 Q2 R15

17.65V MAX SET ACROSS

E80 MAMAX

6.3V

MAX

NOTE: IF Q1 2N6991 UPDATE MUST Be Done

R2 to 10K

R32 ADD 6.8K to B2 other side — 7c

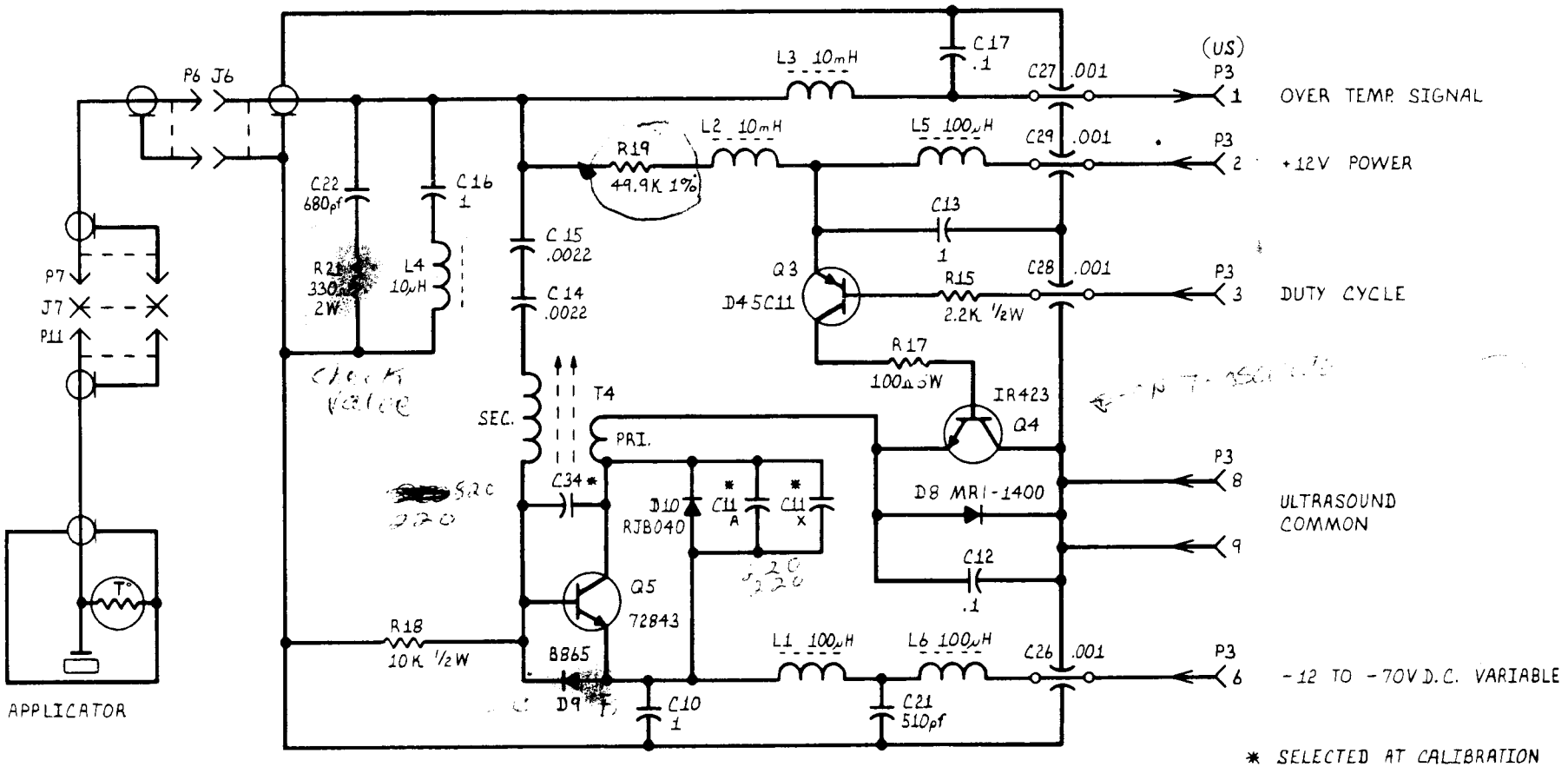
Twist Legs 7.5K

ADD R30 330Ω

905,000 + 1,050,000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX± XXX±	APPROVALS	DATE	CHATTANOOGA CORPORATION
MATERIAL	ENGINEER D. BLEY	5-11-83	INTELECT 700 SCHEMATIC
	DRAWING	4-13-83	ULTRASOUND CONTROL CIRCUIT
FINISH	CHECK		
DO NOT SCALE DRAWING	APPROVAL	5-17-83	SIZE B · BLOCK 8 · DRAWING NO. E.S. 72823 · SCALE NONE · REV. G · SHEET 9 OF 11

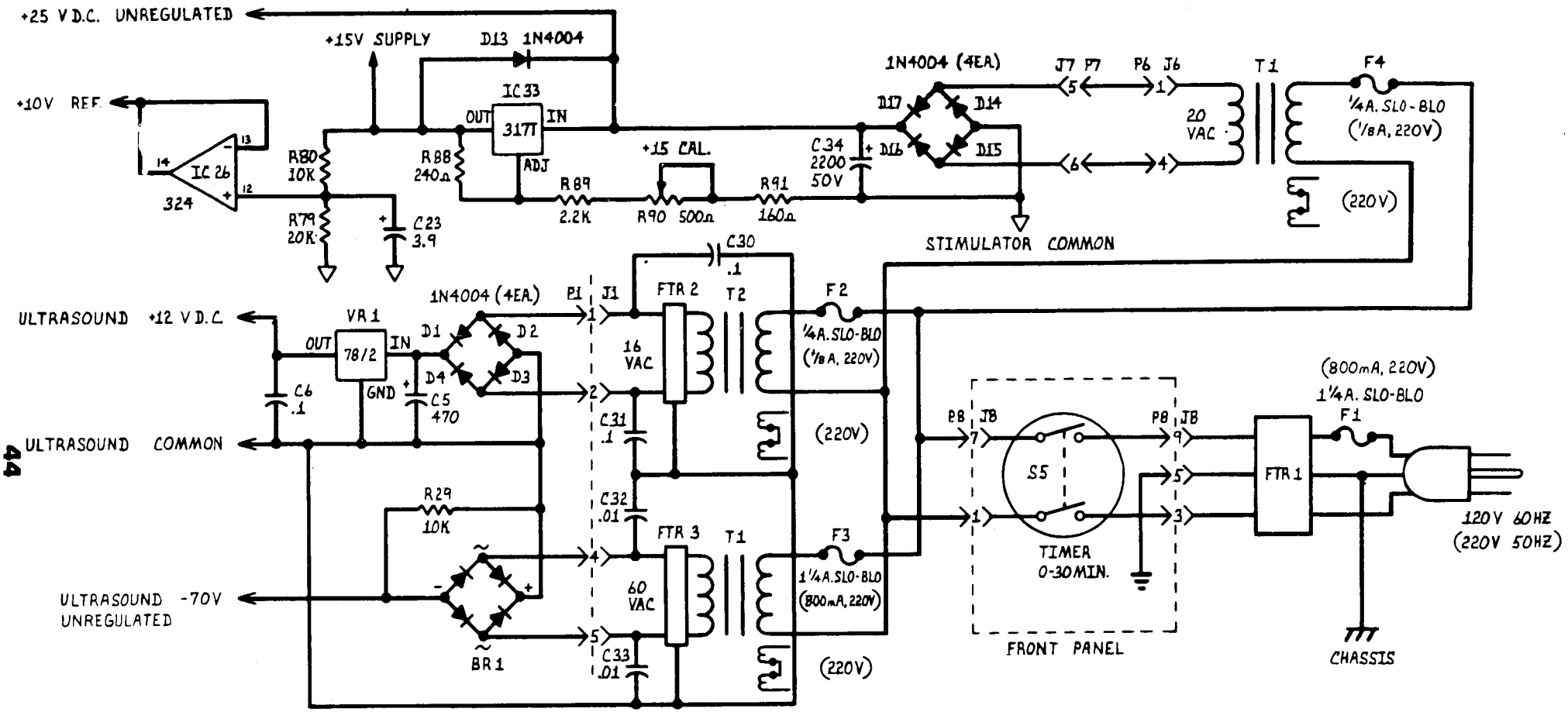
NOTE: IF 330Ω BURNS UP
Check Crystal Contact !! Q5 2N6545



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX± XXX± ±	APPROVALS	DATE	CHATTANOOGA CORPORATION
MATERIAL	ENGINEER D. BLEY	5-11-83	INTELECT 700 SCHEMATIC
FINISH	DRAWING	3-28-83	ULTRASOUND OSCILLATOR
DO NOT SCALE DRAWING	CHECK		SIZE B · BLOCK 9 · DRAWING NO. E.S. 72823
	APPROVAL 5-17-83		SCALE NONE · REV. G · SHEET 10 OF 11

NOTE 13006
CUT FROM ITEM (illegible)

43



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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± .XX± .XXX± ±	APPROVALS	DATE	CHATTANOOGA CORPORATION
	ENGINEER D. BLEY	5-11-83	INTELECT 700 SCHEMATIC
MATERIAL	DRAWING J. S. M	3-30-83	POWER SUPPLIES
	CHECK		
FINISH	APPROVAL G. Duckworth	5-17-83	SIZE B BLOCK 10 DRAWING NO. E.S. 72823
DO NOT SCALE DRAWING			SCALE NONE REV. G SHEET 11 OF 11

rear panel designations

intelect ™ MODEL 700 ULTRASOUND GENERATOR S/N

OSC FREQ. 1.0 MHz. CONTINUOUS AND PULSED @ 100 HZ

DUTY CYCLE	TEMPORAL PEAK/AVG INTENSITY RATIO	
20%	100 PPS	5
50%	100 PPS	2
100%	CONT	1

THIS DEVICE COMPLIES WITH REQUIREMENTS SET FORTH IN 21CFR 1050.10 FCC TYPE APPROVED

CHATTANOOGA CORPORATION CHATTANOOGA, TN. 37405 70654

GROUNDING RELIABILITY CAN ONLY BE ACHIEVED WHEN THIS EQUIPMENT IS CONNECTED TO AN EQUIVALENT RECEPTACLE MARKED "HOSPITAL GRADE"

DANGER - HIGH VOLTAGE - REFER SERVICING ONLY TO QUALIFIED PERSONNEL

FCC ID: BWU8UKU700
UNITED STATES OF AMERICA

CHATTANOOGA CORPORATION CHATTANOOGA, TN. 37405

POWER INPUT 207-253V 50/60 HZ. 1.25 AMP MAX

WARNING - FOR CONTINUED PROTECTION AGAINST FIRE HAZARD REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE

FUSE 1 AMP/250 V. SLO-BLO 70652

CAUTION: CASUALTY (BURN) AND FIRE HAZARD - DO NOT USE NEAR CONDUCTIVE MATERIALS SUCH AS METAL BED POSTS, INNER SPRING MATTRESSES, ETC. - RENEW ELECTRODE CABLES UPON EVIDENCE OF DETERIORATION

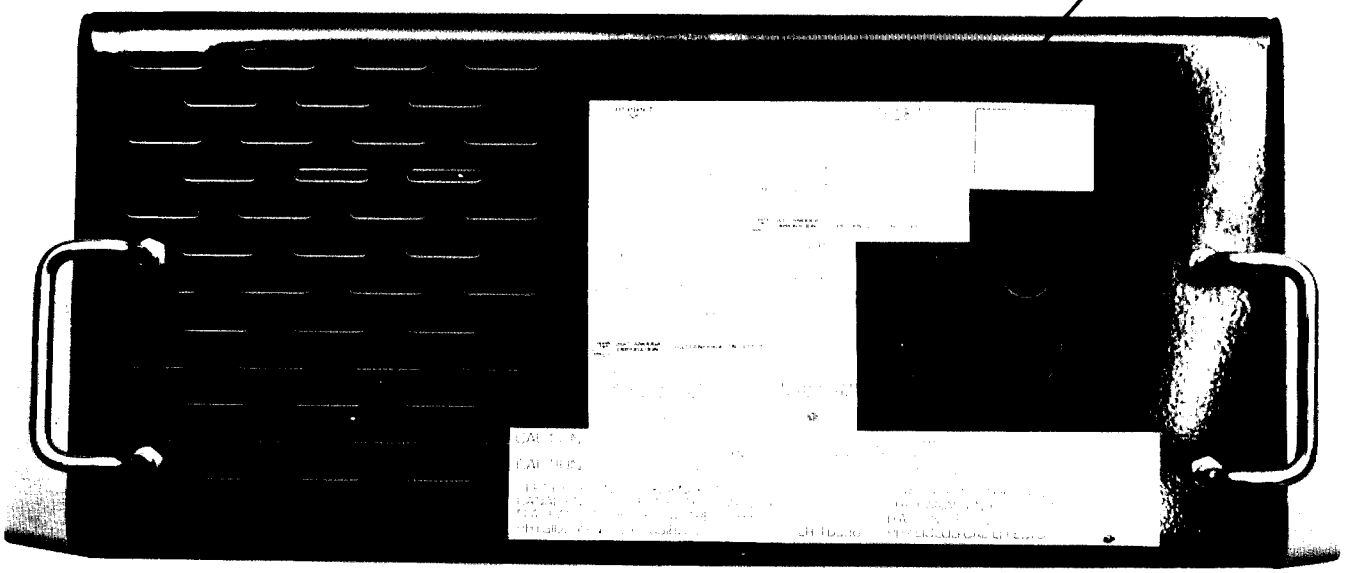
CAUTION: ELECTRIC SHOCK HAZARD - DO NOT REMOVE COVER - REFER SERVICING TO QUALIFIED SERVICE PERSONNEL

CERTIFIE SELON LES EXIGENCES DU CODE CANADIEN DE L'ÉLECTRICITÉ. L'ACNOR N'A PAS ÉTUDIÉ LES AUTRES EFFETS PHYSIOLOGIQUES POSSIBLES.

LR-16036

CERTIFIED TO THE REQUIREMENTS OF THE CANADIAN ELECTRICAL CODE. CSA HAS NOT INVESTIGATED OTHER PHYSIOLOGICAL EFFECTS. 70424

This is the actual serial number of your Intelect 700.™



CHATTANOOGA CORPORATION
Chattanooga, Tennessee 37405