

INSTRUCTION MANUAL

SPOTMASTER - MODEL 500C
MODEL 505C

IM No. 597-0050

BROADCAST ELECTRONICS, INC.



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EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Claims for loss or damage will not be honored without proper notification of inspection by the carrier.

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Phone (217) 224-9600 Customer Service

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REPLACEMENT PARTS

Replacement and Warranty Parts may be ordered from the address below. Be sure to include equipment model and serial number and part description and part number.

Broadcast Electronics, Inc.
4100 N. 24th St., P.O. Box 3606
Quincy, Illinois 62305
Tel: (217) 224-9600
Telex: 25-0142
Cable: BROADCAST
Fax: (217) 224-9607

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SPOTMASTER Model 500C (Recorder/Reproducer)
SPOTMASTER Model 505C (Reproducer Only)

SPECIFICATIONS

SIZE: — Compact:	10¼" W, 12¾" L, 6-5/8" H
Rack:	19" W, 14½" D, 7" H
WEIGHT — 500:	Compact: 18 lbs. Rack: 23 lbs.
505:	Compact: 15 lbs. Rack: 21 lbs.
MOTOR:	Hysteresis Synchronous
OUTPUT LEVEL:	+4 dbm adjustable (plus 10 db peak factor)
OUTPUT LOAD IMPEDANCE:	Nominal 600Ω (Transformer Output)
FREQUENCY RESPONSE:	50 — 12000 Hz ±2 db
	50 — 15000 Hz ±3 db
SIGNAL TO NOISE RATIO:	55 db below 3% THD
HARMONIC DISTORTION:	Less than 2%
	(400 Hz - Normal recording level)
WOW AND FLUTTER:	Less than .2 of 1%
STOP TIME:	1/10 second or better
START TIME:	1/25 second or better
* LINE INPUT:	.2 volts (bridging)
* MICROPHONE INPUT:	(150Ω) .5 millivolts
(Compact Only)	
* MONITORING:	Independent record and reproduce systems permit monitoring of either the recording or reproducing amplifier while recording.
CONTROLS:	* Gain, On - Off
	* Record - Momentary Push Button Switch
	* Recording Meter Selector Switch
	(program, control tone, bias)
	Start Switch
	Stop Switch.
	Output Level
POWER REQUIREMENTS:	105 - 125 VAC, 60 Hz, 50 watts
	(50 Hz optional extra)
SPEED:	7½ inches per second
PLAYING TIME:	1 second to 31 minutes

* Refers to Model 500C Record/Play unit only

SECTION 1

INSTALLATION AND OPERATING INSTRUCTIONS

1. GENERAL

SPOTMASTER Models 500C and 505C recording and/or reproducing units are professional grade tape cartridge machines for use in radio stations, TV stations, recording studios and similar operations. Ease of installation, operation and maintenance is a feature of the equipment. The recording amplifier of the 500C is designed to accept audio input levels between -15 and $+20$ dbm. Compact models are equipped with a microphone preamplifier for use with a standard broadcast type dynamic microphone and will accommodate input levels as low as -65 dbm.

The output circuitry of the reproducing amplifier in each model is designed to work into line key inputs of standard broadcast type consoles. The output level is adjustable by means of a variable control located on the rear panel of the equipment.

The equipment is designed to accept standard NAB tape cartridges, types A, B and C, available in tape lengths from 20 seconds to 31 minutes in playing time, thereby making possible the use of as little as 1 second or as much as 31 minutes of program or spot material on a single cartridge. SPOTMASTER cartridge racks are recommended for cartridge storage.

2. INSTALLATION

(A) Either the Model 500C recorder or 505C reproducer may be used as a playback unit and installed in a control room or studio within convenient access of the operator but, if desired, may be installed at a remote location and operated by means of a remote control unit (BE-101 or BE-102). Units may be placed side by side on any available table top, control desk, or on an inclined shelf constructed over the turntables. The output of one or all machines may be connected to a single console line input, but connection of each unit to a separate line input key is recommended where possible. This increases flexibility and provides greater control over individual units. Standard broadcast installation procedures should be followed. Use shielded connecting cables, avoid high hum and magnetic fields, avoid high temperatures, avoid dusty locations, etc. *Do not install directly over a console or other heat generating equipment due to the possible adverse effect of excessive heat on the transistorized amplifiers.*

The playback amplifier output is available from two standard (headphone type) jacks connected in multiple and located on the rear panel of the unit. The mating plug should be a Switchcraft type 40 or equal. The playback amplifier is designed to operate into a 600Ω load but because of the output stage design, the unit may be connected to much higher load impedances without adverse effect on program quality. The secondary of the output transformer may be reconnected for operation into 150 ohm loads, if desired. (See schematic diagram.) To connect the playback amplifier to the console, install a two conductor line between the output jack and a line input of the console.

If machines are connected in multiple, balance the output of the group by means of the variable output level control on the rear panel of each machine. When connecting machines in multiple to a single console input, a 560 ohm isolating resistor should be installed in series with the output of each machine to prevent the loading effect of other machines in the group, if the output controls are to be operated fully open. (See B3, sect. 2D)

NOTE

The playback amplifier output jack is insulated above ground. External ground connections should be made to the case ground terminal.

(B) The Model 500C is designed for use both as a recorder and a reproducer. When used as a recorder, it is only necessary to connect a suitable program source (approximately -10 dbm) to the record amplifier line input jack (Switchcraft type 40 or equal mating plug) and follow the recording procedure outlined in Section 3. On compact models a low impedance dynamic microphone may be connected to the microphone preamplifier (Cannon XL connector), if desired. If the microphone input is used, be certain to remove the phone plug from the line input jack since this disconnects the microphone preamplifier.

3. RECORDING PROCESS (Model 500C & 500C-R)

CAUTION

Before recording, make certain that the cartridge is thoroughly erased by means of a bulk type degausser. Erase both sides of the cartridge, then tip up and erase exposed tape on the open end of cartridge. (NAB Standards, Section 2.55, require that no erase function be provided as a machine capability.)

(A) The model 500C recorder is equipped with record pre-set and record release circuitry which automatically switches back to the playback mode each time the machine is stopped. To switch from playback to the record mode it is only necessary to momentarily depress the RECORD button. This energizes the record/play relay (K2) which in turn activates the recording circuitry. Program material may be fed to the recording amplifier either through the line input jack (located on the rear panel) or by means of a microphone connected to the microphone input. (Microphone preamplifiers are provided as standard equipment on all compact models and as optional equipment on rack mounted models.) The input level to the recording amplifier is adjustable by means of the gain control located on the front panel. Program peaks as read on the VU meter should reach but not exceed zero VU.

Load the proper length cartridge in the machine and move the load lever to the "Play" or "Ready" position. This action rotates the pressure roller into position and energizes the motor. Momentary pressure on the "start" button sets the tape in motion. "Tightness" of cueing will depend upon how quickly program material is started after the start button is depressed. *It is recommended that at least one-fourth second be allowed between the start of tape motion and the beginning of program material.* (See note 3, page 6, NAB Cartridge Standard)

When a recording has been completed, allow the machine to run until it stops automatically. This cues the tape to the beginning of the program and at the same moment switches the equipment back to the playback mode which is indicated by the play lamp. A guard ring is provided to protect the RECORD button from accidental activation.

If, for any reason, it is desired to return the equipment to the playback mode, when in the record mode, it is only necessary to momentarily depress the STOP button.

If multiple spots are to be recorded on a single cartridge it is necessary to stop the machine at the end of each spot and reactivate the record circuitry by momentarily depressing the record button before proceeding with the next recording.

If program material is to be edited or changed it is recommended that this be done on reel to reel equipment and then transferred to the cartridge.

(B) Standard cartridge lengths are 20, 40, 70, 100, 140 seconds, and 3½, 5½, 8½, 10½, 12½, 16 and 31 minutes. Check the length of the recording to be made and allow two seconds minimum dead tape after the recording is finished. For instance, a 70 second cartridge should be used when recording a 60 second spot. Additionally, three 20 second spots may be recorded on a 70 second cartridge but a 70 second cartridge should not be used for two 35 second spots.

When in the record mode a 1000 Hz cueing tone of the proper amplitude and duration is automatically recorded on the tape cueing track at the instant the start button is depressed.

"Off the tape" monitoring facilities while recording are provided. To check recording quality during the recording process, a suitable amplifier-speaker combination or headphones may be connected to the playback amplifier output jack.

(C) When recording, the meter switch on the recorder should be kept in the "P" or program position, which indicates program recording level. A thirty day check of the "T" tone voltage and "B" bias voltage by rotating the switch to these positions is advisable. **DO NOT CHANGE THE METER SWITCH WHILE RECORDING.**

The meter in the "T" position should read approximately "0" VU ± 3 db, and when the start button is depressed should decay to zero in approximately 1/2 second. The meter in the "B" or bias position should read approximately "0" VU. (Both of the above meter indications are approximate as the actual voltages are adjusted for optimum performance of each individual machine during final test operations. For this reason, it is wise to make a note of the meter reading in both the tone and bias positions for comparison purposes on later check dates.)

4. **PLAYBACK PROCESS**

Place a recorded cartridge in position and move the load lever to the "Play" position. (If using a Model 500C recorder as a playback machine, make certain the PLAY indicator lamp is glowing. This indicates that the equipment is in the playback mode.)

Momentary pressure on the "start" button will start tape travel across the heads resulting in reproduction of the recorded material through the playback amplifier. The tape may be stopped at any point for a live insert, if desired, by depressing the "stop" button.

Do not remove the cartridge from the machine, however, until the spot has ended and the start light goes out which indicates that the spot is cued and ready for re-use.

5. **REMOTE CONTROL**

To use the SPOTMASTER Type 101 or 102 remote control unit, insert the remote control plug in the receptacle on the rear panel of the playback unit.

One, two or three machines may then be controlled from a remote point. Machines stop automatically when the tape cartridge is re-cued.

SECTION 2 CIRCUIT DESCRIPTION

1. **POWER SUPPLY**

Two DC power supplies furnish power for the operation of the equipment as follows: One is a 37 VDC triple zener regulated, solid state, bridge rectifier supply which furnishes power to the recording amplifier, the playback amplifier, the bias generator, the cue tone generator/s, the cueing amplifier/s, and the relays. The silicon bridge type rectifier (CR1) and filter components for this supply are located on the relay board.

The second is a 120 VDC supply furnishing power for the tape transport solenoid and the neon signal lamps. The silicon rectifier (CR4) and filter for this unit are located on the relay board.

2. **CONTROL CIRCUITRY**

The manner of operation of the control circuitry will become apparent to the experienced

technician upon examination of the diagrams, but the following notes will be helpful.

(A) AC power is supplied to the motor when the load lever is moved to the play position, thereby actuating a micro switch associated with it.

(B) Power is supplied to the tape transport solenoid through a set of contacts on the "power" relay (K1). This relay is energized by momentary pressure on the START button and remains energized due to the existence of a constant 9 volt hold voltage across the relay coil. If the STOP button is depressed or a 1000 Hz tone appears at the input of the cueing amplifier, the hold voltage is reduced below the relay drop out point and the relay returns to normal, thereby releasing the tape transport solenoid and stopping tape travel.

(C) The automatic delay control circuitry (Q1) delays application of voltage to the cue tone amplifier/s until the primary cue tone, recorded on the tape, has travelled past the cueing head after the START button is depressed. Delay time is approximately 3 seconds.

The silicon transistor (Q1) in the delay control circuit receives bias voltage through a set of back contacts on K1 relay when this relay is in the relaxed position (machine not running). Q1 draws maximum current in this mode with the result that no voltage is supplied for the operation of the cueing amplifier. The relay (K1) is instantly energized when the START button is depressed and remains so until the machine stops. The bias voltage is thereby removed from Q1 when C1 discharges through R1 and R3. The discharge time is approximately 3 seconds. Since Q1 is non-conducting when "bias" is removed, operating voltage is then applied to the cueing amplifier.

Diode CR5 prevents reverse current flow from C1 thereby maintaining the same time constant in both the record and play modes.

(D) The output level control located on the rear panel provides a means of adjusting the output level of the playback amplifier. If operating the equipment into loads *less* than the output impedance of the output transformer, the control should not be advanced more than three-quarters open unless an isolating resistor is installed in series with one of the connecting output leads. The resistor should be equal to the transformer secondary impedance, i.e., 150 Ω or 600 Ω . (See schematic for output transformer connections.)

(E) The momentary push button RECORD switch (S4) energizes relay K2 which applies zener-regulated (CR2 & CR1 on BO-8) voltage to the recording amplifier, bias oscillator and cue tone oscillator. The associated indicator lamps are energized through a separate set of contacts on the same relay. Zener diode CR2 serves to stabilize the holding voltage for relays K1 and K2. Diodes CR6 and CR7 are blocking diodes to prevent interaction between the energizing voltages applied to K1 and K2.

(F) The recording gain control (Model 500C) provides a means for adjusting the audio input to the recording amplifier. The AC power switch is ganged with the recorder gain control.

(G) The meter selector switch, when in the "P" position connects the VU meter so as to indicate program recording level. When in the "T" position it indicates the momentary cue tone recording level (and Cue-Trip tone recording levels), and when in the "B" position it indicates the recording bias level. (See section 1.3C).

(H) Essential circuitry for remotely controlling either the START, STOP, or RECORD PRESET is available at the "remote socket" on the rear panel (see circuit diagram). A momentary connection across socket terminals 2 and 3 starts tape travel. A momentary connection across socket terminals 2 and 7 stops it. A momentary connection across socket terminals 1 and 3 switches the equipment to the record mode.

3. CUE TONE AMPLIFIER (Primary)*

The cue tone amplifier is a modular, 4- stage transistorized amplifier (Q5, Q6, Q7, and Q8)

driven by the cue reproduce head and receives power from the zener regulated power supply (see Section 2.2, Control Circuitry). The amplifier is of modular plug-in construction and mounts on the relay board.

The sensitivity of the amplifier may be adjusted, if necessary, by means of variable resistor R28. Factory adjustment is for .3 mv sensitivity at 1000 Hz with the input terminated into 600Ω. No field adjustment should be necessary under normal operating conditions.

The manner of operation of the tone amplifier and the automatic stop circuitry is as follows: The output transistor (Q8) of the cueing amplifier is in parallel with the run relay coil (K1). When the cue reproduce head senses the presence of a 1000 Hz cueing tone, previously recorded on the tape, the signal is amplified and causes maximum current to flow in the output transistor (Q8). Since both the transistor and the relay (K1) receive power through a common resistor (R7), the voltage applied across K1 relay coil is reduced below the hold-in voltage and the relay drops out, thereby instantly stopping the tape.

4. PLAYBACK AMPLIFIER

The playback portion of the equipment consists of a modular, 4-stage transistorized (Q1, Q2, Q3, and Q4) program amplifier driven by the program reproduce head which is connected directly to the input. Power is supplied from a zener-regulated source. It is designed for high quality reproduction and utilizes audio frequency equalization conforming to standards of the National Association of Broadcasters. Equalization is accomplished by means of selective feed back circuitry (R16, R16A, C10 and C10A). C10A is selected as a trimmer for C10. The amplifier response curve when combined with the response curve of the reproduce head provides the necessary NAB reproduce curve response. **IT IS IMPORTANT, THEREFORE, THAT ONLY SPOTMASTER-APPROVED REPRODUCE HEADS BE USED FOR REPLACEMENT.** If necessary, the amplifier high frequency response may be adjusted by means of variable resistor R16A which is effective within the band from 5 kHz to 15 kHz to the extent of approximately 5 decibels at 15 kHz.

The amplifier is a plug-in modular device and is mounted on the relay board.

5. RECORDING UNIT

(A) The recording amplifier is a four-stage (Q11, Q12, Q13, and Q14) plug-in unit utilizing NAB equalization. Equalization is accomplished by means of high frequency network C72 and R75, low frequency network C75 and R79, and high frequency bypass condenser C77 and variable resistor R84. Any necessary adjustment to the amplifier record curve can usually be made by adjusting variable resistor R84. Reducing the value of this resistor increases the high frequency record current and vice versa.

The amplifier is designed for line level audio input voltages and the input level is adjustable by means of a variable control (P2) located on the front panel. The output of the amplifier is connected to the program record head through a plug-in head lead at the head bracket. The output level is factory adjusted by means of variable resistor R85 to produce the proper record current for the NAB Standard Reference Level (8 db below 3% THD) when the recording VU meter indicates 0 VU at 400 Hz. C78 and L2 from a parallel tuned network serving as a bias trap.

Power is supplied by the regulated power supply through relay K2 when in the record mode.

(B) The bias generator utilizes two silicon transistors (Q1 and Q2) and a bias transformer (T1) arranged as a push-pull oscillator on a plug-in etched circuit board. Bias is adjustable and is properly adjusted at the factory but if readjustment should become necessary in the field, variable resistor R1 will provide an approximate 5 db change in bias current. The bias voltage should indicate approximately "0" VU on the VU meter with the meter selector switch in the "B" position. $\frac{1}{2}$ A 27 volt zener diode CR1 regulates the voltage supplied to the bias generator. Variable resistor R1 adjusts bias current to the program record head and R13 adjusts current to the cue record head. Variable resistor R2 is provided to adjust the

* Circuit descriptions of optional secondary and tertiary cueing equipment will be found in the Series C Cue-Trip Supplement issued when the equipment is ordered.

indication of the VU meter to zero VU when the meter selector switch is in the "B" position.

(C) The primary cue tone recorded on the tape is supplied by a 1000 Hz oscillator and amplifier combination utilizing two transistors (Q17 and Q18), and associated components arranged on a plug-in board. Power is supplied to the two transistors from a regulated 27V source. The Q17 oscillator stage begins oscillation when the record button is depressed. When the start button is depressed, voltage across the timing network (C81 and R89) is interrupted and begins to decay, but Q17 continues to oscillate for approximately one half second due to the time constant of the network. When the voltage across the network equals that at the collector of Q17, D7 begins to conduct and stops oscillation. A one half second tone is thereby recorded on the cue track of the tape. The tone duration may be changed, if desired, by changing the value of R89 in the timing network. The tone level, which is in conformance with NAB Standards (Section 2.15) is determined by the adjustment of variable resistor R99 and may be visually monitored by turning the meter switch to the "T" position. ^{2/} (Also see section 1.3C).

Recording bias is supplied to the cue record head through R13 on the bias generator board. ^{3/}

Depressing the start switch thus starts tape motion as well as automatically applying the correct duration and amplitude of primary cue tone to the tape cue track. (See Cue-Trip supplement for description of optional secondary and tertiary control tones if used.)

SECTION 3

INSTALLATION AND MAINTENANCE NOTES, (Series C)

(1) Avoid installing equipment in overheated areas. Provide good ventilation. SPOTMASTER amplifiers are heat compensated to 140° F, but many transistors are temperamental at higher temperatures. Therefore, do not install equipment over a console or other heat generating devices.

(2) SPOTMASTERS are designed for long, trouble-free operation, but good maintenance procedures should be followed. Keep component parts clean and in good adjustment. For best results, *clean heads, pressure roller and capstan drive shaft each day* with BE Type 903 cleaning fluid or isopropyl alcohol.

^{1/} (A) A Simpson Model 260 (50 VAC position) or Precision Model 120 (60 VAC position) VOM will indicate a bias voltage of approximately 20 volts across the program record head when in the record mode. It should be recognized that this does not represent a *true* indication of the high frequency bias voltage. The 20 volt reading is relative but the method provides a practical means of checking or adjusting bias in the field when more adequate instrumentation is not available. Bias at the tone head when measured in the same manner should be approximately 5 volts.

(B) Recording bias voltage has a definite effect on high frequency response and to a lesser degree on recording level. An increase in bias level will result in reduction of high frequency recording level. Conversely, a reduction in recording bias will result in an increase in high frequency recording level.

Precise adjustment of bias record current is made by observing the output of the playback amplifier while recording a 400 Hz tone and adjusting R1 for maximum 400 Hz signal. It will be noted that as the bias current is increased, the 400 Hz output level will reach a peak over a broad curve and then gradually fall off as the bias current is further increased. Correct adjustment is at peak output of the 400 Hz signal.

^{2/} The program playback amplifier may be conveniently used to measure the level of the recorded cue tone from the tape by plugging the program amplifier head lead into the cue reproduce head and comparing the cue tone level from the cue track with a 1000 Hz signal recorded on the program track. The two levels should be the same, ± 3 db. (See Annex C, Table 2 of NAB Standards)

^{3/} See Footnote 1.

(3) As in much electronic equipment, the minimum noise output may be affected by the polarity of the AC power plug. Correct polarization will help to reduce residual noise to a minimum.

(4) A good connection to ground is essential, especially when operating at high magnetic fields.

(5) Any change in the characteristics of transistors will usually be evidenced by low gain and/or increased distortion. If it is ever necessary to change a transistor, be certain to follow recommended practices as to soldering. Transistors and diodes are heat sensitive and can be damaged during installation by the application of too much heat during the soldering process.

(6) Optimum high frequency response is quite often more dependent upon the tape and cartridge than upon the machine. Warped cartridges, improperly fitting pressure pads, worn tape or cartridges not complying with NAB Standards are major contributors to high frequency loss. Cartridges and tape should be examined frequently for the above and other faults.

(7) Enclosed plug-in type relays are used in the equipment and are easily removed for repair or replacement.

(8) REMOVAL OF AMPLIFIERS

Both the cueing amplifier and the playback amplifier are plug-in modules and are easily removed for servicing, if necessary.

The recording amplifier, the bias generator and the 1000 Hz cue generator are plug-in modules held in place by a single screw from the bottom of the case to each module.

(9) LUBRICATION

Sintered bronze bearings are used in the motor, the capstan and the flywheel, and under ideal conditions further lubrication should not be necessary. Depending upon environment and conditions of use, however, it may be desirable to disassemble, clean and relubricate the bearings in these parts on an annual basis.

Occasional lubrication at points in the assembly may be necessary where sliding parts come together. "Lubriplate" or similar lubricant is recommended.

(10) HEAD ADJUSTMENT

The alignment of a new head or realignment of the existing head/s requires two adjustments tracking and azimuth. On combination record/reproduce equipment, the reproduce head must be adjusted first followed by the adjustment of the record head. Materials and tools required are:

- (1) A .050" hex key
- (2) A SPOTMASTER 10 kHz alignment cartridge
- (3) A tracking cartridge

(This cartridge may be fabricated from a standard type A 70 second cartridge with the cover and pressure pads removed so that the tape travel path across the head may be easily observed. The wire guide usually found in such cartridges should be taped in place at each end to prevent its accidental movement during operation.)

- (4) A means of measuring the output level of the program amplifier.
- (5) A 10 kHz signal source

REPRODUCE HEAD ADJUSTMENT PROCEDURE

- (1) Refer to Fig. 1 for location of the tracking and azimuth adjusting screws.
- (2) A coarse adjustment of head tracking should be made by measurement. With the .050" hex key, rotate the tracking screw for a spacing of 5/16" between the deck

surface and the lower edge of the head pole pieces (see Fig. 1).

- (3) The fine adjustment makes use of the tracking cartridge described in item (3) under "Materials Required". Place the cartridge on the deck and set the tape in motion. Hold cartridge firmly against deck surface with finger pressure. Observe the tape travel path across the head. Adjust the tracking screw so that the top and bottom pole pieces are equidistant from the top and bottom edges of the tape. The ideal tracking adjustment is shown in Fig. 1.

The lower edge of the tape guides, located on the head bracket, should be flush against the deck surface.

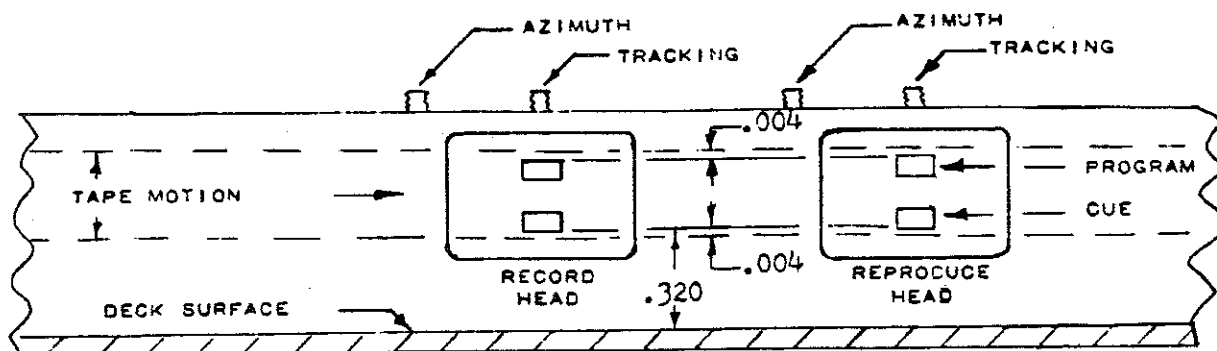


Figure 1

- (4) Remove tracking cartridge and place azimuth alignment cartridge on the deck. Set tape in motion and while observing the output level of the playback amplifier adjust the azimuth screw for maximum output at the tape alignment frequency.
- (5) Repeat steps (3) and (4) for final adjustment.

RECORD HEAD ADJUSTMENT PROCEDURE

- (1) After the reproduce head has been adjusted, proceed with alignment of the record head. See Fig. 1 for location of tracking and azimuth adjusting screws.
- (2) Follow tracking adjustment instructions (2) and (3) under REPRODUCE HEAD ADJUSTMENT PROCEDURE.
- (3) Remove tracking cartridge and place unrecorded cartridge on deck, turn RECORD/PLAY switch to RECORD, feed a 15 kc signal into the line input of the record amplifier, adjust recording gain to a meter reading of -10 VU, start the tape in motion and adjust the azimuth adjustment screw for maximum output from the playback amplifier.
- (4) Repeat procedure for final adjustment.
- (5) See note 1B, page 8 for record bias adjustment.

HEAD PENETRATION

The head bracket, on which the head is mounted, is adjustable, forward or backward, to provide for proper penetration of the head into the cartridge and to permit compensation for various types of pressure pads in common use. The bracket is factory-adjusted for use with Fidelipac cartridges equipped with teflon-coated foam pads, but may be changed for use with other type pads, if necessary. Generally, the factory adjustment is adequate for most cartridges in common use at this time. (See NAB Cartridge Tape Recording and Reproducing Standards, Chart B, Fig. 2.)

SECTION 4

MECHANICAL ADJUSTMENTS

All of the adjustments described below are made before your SPOTMASTER equipment leaves the factory, but the following notes are furnished in the event field readjustment should become necessary.

1. LOAD LEVER STOP ADJUSTMENT

An adjustable load lever stop is provided under the lever cover plate to limit the travel of the load lever when in the "Ready" or "Play" position. Its purpose is to prevent engagement of the pressure roller and the capstan when a cartridge is in position ready for playback but before the "Start" button is depressed. If necessary, the adjustment should be made by energizing the solenoid (push "Start" button) then move the stop firmly against the load lever and tighten the mounting screw. When the Stop button is pressed and the solenoid is de-energized the pressure roller should clear the capstan approximately 1/16 inch and the swing arm should clear the solenoid approximately 3/16 inch. (A similar stop is provided on rack mounted Series 500A, 500B and 500C models and is located on the back side of the panel beneath the lever. The adjustment procedure is as described above.)

2. PRESSURE ROLLER ADJUSTMENT

If necessary, the adjustment of pinch roller pressure is easily made from the rear of the tape deck by inserting a screw driver through a small hole found near the rear center of the tape deck. Turning clockwise increases pinch roller pressure. Too tight an adjustment may cause slow tape speed and perhaps tape creepage through the cartridge when the machine is idling. Too tight an adjustment may also keep the capstan solenoid from seating properly, resulting in solenoid "drop-out" a few seconds after the "Start" button is depressed. Too loose an adjustment will cause tape slippage. Correct adjustment is generally achieved when pressure roller adjustment is advanced three-quarters to one full turn beyond the point where the pressure roller "just touches" the capstan. When properly adjusted approximately 1½ to 2 lbs. pull will be exerted on a short length of non-lubricated 1 mil mylar tape attached to a tension scale. (See Section 1.30 of NAB Cartridge Tape Standards.)

CAUTION

1. Clean pinch roller and capstan thoroughly before making adjustment.
2. Tighten solenoid swing arm retaining screw (under side of deck) before adjusting pinch roller.

NOTE

Refer to illustrated adjustment procedure on following page.

3. HEAD BRACKET ADJUSTMENT

The head bracket is adjustable by loosening the two retaining screws under the cover. The

PRESSURE ROLLER ADJUSTMENT

Due to normal wear of the roller diameter, the pressure of the roller may decrease after a period of time. Excessive wear and roller misalignment will result in erratic tape motion, causing flutter or wow.

Pressure Adjustment Procedure

To adjust for proper pressure of the roller against the capstan . . .

1. Remove the "Play/Release" control cover and the control arm knob.
2. Move the control arm to the "PLAY" position.
3. Hold the swing arm platen firmly into place against the rubber cushion of the solenoid (using thumb and forefinger).
4. Release pressure of the roller by turning (counterclockwise) with Pressure Adjustment Screw on the rear edge of the chassis . . . Gradually bring the roller into engagement with the capstan (using the light gap between as a gauge) until the light gap just disappears.
5. Turn the Adjustment Screw one (1) full clockwise turn.

Do not overadjust for faulty cartridge operation. This is not a speed adjustment.

Parallel Adjustment Procedure

At the factory, the pressure roller is adjusted parallel to the capstan with a special gage device. Normally this adjustment need never be changed. If it is known for certain that readjustment is necessary, use the following procedure.

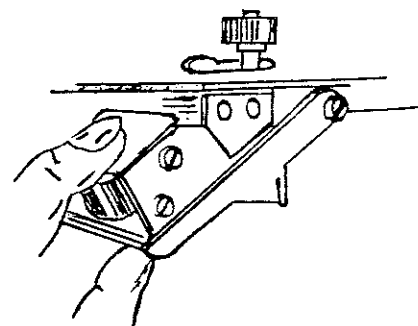
First, follow Steps 1, 2, and 3 of the Pressure Adjustment Procedure.

4. Instead of completely closing the light gap as in the preceding Step 4, leave a narrow gap for reference.
5. Loosen the two screws which hold the solenoid to the solenoid bracket. (The clearance provided in the screw holes will allow radial movement of the solenoid.)
6. Move the solenoid and the swing arm, as a single unit, just enough to position the roller shaft parallel to the capstan.
7. Tighten the solenoid anchor screws.
8. Using the Pressure Adjustment Screw, still holding the swing arm engaged with the cushion, move the pressure roller into engagement with the capstan until the light gap just disappears.
9. Continue to turn the screw one (1) full clockwise turn.

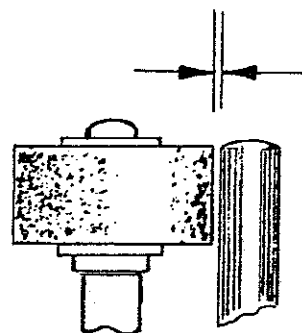
NECESSARY FINAL CHECK – After all adjustments have been completed and before replacing control cover . . . move the control arm to the "PLAY" position.

The pressure roller should be completely clear of the capstan. A gap of approximately 1/32 inch should be evident between the lower edge of the pressure roller and the capstan.

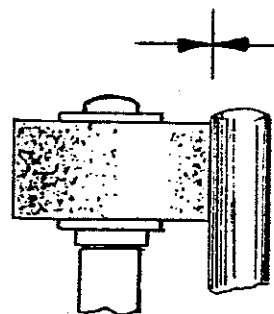
To adjust the clearance, loosen the single screw which anchors the phenolic bearing strip to the panel . . . and move the phenolic strip toward the capstan to increase the clearance, or away to decrease.



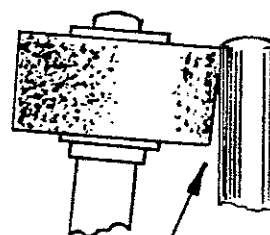
HOLD PLATEN AGAINST CUSHION



NARROW LIGHT GAP



LIGHT GAP COMPLETELY CLOSED



ROLLER SHAFT NOT PARALLEL

head bracket may then be moved forward or backward as desired. The best adjustment is obtained when the head penetration into the cartridge is approximately $9/32$ " when measuring from the leading edge of the cartridge to the *face* of the head. Correct adjustment is important in order to prevent excessive head wear, loss of high frequencies and variations in frequency response during reproduction.

4. STRIKING ANGLE OF PINCH ROLLER

The striking angle of the pinch roller, as related to the capstan, is determined by the position of the solenoid. The correct adjustment of the solenoid is made at the factory but if for any reason it is necessary to change it, the solenoid may be moved slightly up or down as required by loosening the two mounting screws on the side. Correct adjustment is obtained when, with the swing arm held firmly against the face of the solenoid, the pressure roller strikes the capstan squarely. If the solenoid is readjusted, it may then be necessary to readjust the roller pressure as well as the load lever stop, as described in Items No. 1 and No. 2 above. After the solenoid mounting screws have been re-tightened, make certain that the *swing arm face plate meets the face of the solenoid squarely* so as to provide the necessary holding power.

5. FLY WHEEL THRUST BEARING

The thrust bearing at the bottom of the fly wheel should be adjusted to provide for minimum friction to the fly wheel. The adjusting screw is located at bottom center of the fly wheel shaft. Allow approximately $1/64$ " end play. Adjustment of the horizontal alignment of the bottom thrust bearing is possible by loosening the two nuts holding the thrust bearing mounting plate in place and moving the plate from side to side as required. When the two adjustments have been properly made, the fly wheel should spin freely.

SECTION 5 OPERATING NOTES

- (1) Be certain that each operator is properly instructed in the operation of the equipment. Seeming equipment failure is sometimes due to operating errors.
- (2) Before recording, be certain each cartridge is *bulk* erased. In conformance with NAB Standards, SPOTMASTER playback and recording units are not equipped with erase heads. Erase the cartridge top and bottom, and then tip up on the tape end. *Check cartridge pressure pads for proper seating against the heads.* Check for free movement of the cartridge rotor release spring.
- (3) Be careful that correct levels are maintained during the recording process. If all recordings are made at the same recording level, comparatively few adjustments are necessary in the playback process. *Never* allow recording peaks to exceed "0" VU.
- (4) When inserting a cartridge in the unit, always move the load lever firmly against the stop.
- (5) On playback, always let the cartridge run after the announcement ends until it automatically stops. It will then be cued and ready for re-use.
- (6) Store cartridges at normal room temperature for best results.

(7) Clean heads, capstan drive shaft and rubber pressure roller daily with BE Type 903 Cleaning Fluid. This is extremely important. Lubricated tape is used in all cartridges and some of the lubricant is naturally deposited on these parts during the playing process.

(8) It is comparatively easy to check whether or not you have recorded a stop tone on the tape. Connect the playback head lead to the tone head and start the tape. The tone, if properly recorded, will then be heard through the playback amplifier and should produce a signal equivalent to program level ± 3 db.

(9) When recording a short spot, for example, one 20 seconds in length, three identical spots may be recorded on a 70 second cartridge. This reduces cue-up time to a minimum. Similarly, six 10 second station breaks can be placed on a 70 second cartridge.

(10) **IMPORTANT:** If the "Start" button is accidentally depressed *before* placing a cartridge in position, and the load lever is moved to the "Play" position, the machine will not start when the "Start" button is depressed the second time. This condition can be immediately corrected by depressing the "Stop" button. The machine then can be started by depressing the "Start" button.

(11) A good practice to follow when recording *new* or *rewound* cartridges is to first run the tape until the splice travels two or three inches past the head assembly. The tape should be stopped at this point. Recording can then proceed in the usual manner.

If this is done, the possibility of recording over the splice will be eliminated. Recording over the splice quite often produces a slight "bump" or drop out during the playback process.

(12) Occasionally, tape will become misaligned across the face of the cartridge due to handling, and when recorded the stop cue track may not be properly positioned on the tape. To avoid this, it is good practice, prior to making a recording, to place the cartridge in position and with the Record/Play switch in the "Play" position run the tape for a few seconds to allow it to align itself in the correct tape travel path across the heads. The Record/Play switch may then be placed in the "Record" position and the normal recording process followed. If this is done, you can then be certain that the recorded stop cue will track properly.

(13) Easy identification of cartridges is possible by the application of SPOTMASTER Tape-Tags.

SECTION 6 PARTS LISTS

SPOTMASTER, Series 500C

Parts listed below are common to both the
Model 500C Recorder/Reproducer and the 500C Reproducer

Schematic Ref. No.	Description	Stock No.
CHASSIS/PANEL		
*R65	Resistor 4.7K ohm	
*R87	" 10K "	
*R88	" 3.3K "	
P1	Pot 2.5K ohm	
*P2	Pot/Switch 100K ohm	190-1063
F1	Fuse, 3AG½	
C50	Capacitor .33 @ 400v (Rack Model Only)	
*C65	Capacitor 10 @ 16v	
*S1	Power Switch (Ganged w/P2 on 500C)	344-1561
S2	Start Switch	343-0011
S3	Stop Switch	343-0010
*S4	Record Pre-set Switch	343-0101
*S5	Meter Switch	344-0215
*	VU Meter	319-0033
*	Record/Play Light	324-0101
T1	Power Transformer (117vac/50-60Hz)	(B34-118) 376-0118
T1	Power Transformer (220-240vac/50Hz)	(B34-119) 376-0119
T2	Output Transformer (500/600 ohm)	370-0026
	A1H Indicator Lamp	343-0011
TAPE DECK		
C50	Capacitor .33 @ 400v	
C51	(See page 19, Ref. 82)	
K4	Solenoid (Complete mechanical parts list appears on page 19)	289-0140
DM2RB	Record Head, 2-track	252-0003
DM1B	Reproduce Head, 2-track	252-0001
M51	Micro switch	346-3300

* Not used in 505C

** Operational only on Cue Trip I option

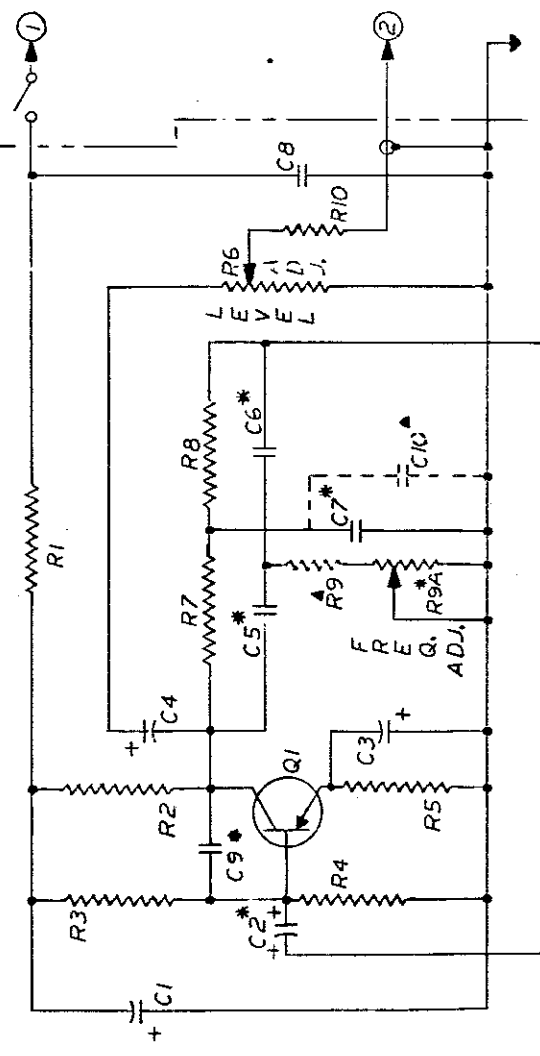
All resistors ½ watt and capacitors in microfarads unless
otherwise noted

ISSUE	REVISIONS	DESCRIPTION	DATE	APPROVED
2	ECN 227		5/1/73	
1	ECN 263		5/1/73	

PARTS LIST				
100-1043	R1	1K OHMS	1AW.	
100-4743	R2	4.7	"	
100-2263	R3	220	"	
100-2253	R4	22	"	
100-1043	R5	1	"	
176-1064	R6	100	" POT. 110W.	
100-3353	R7	33	"	1AW.
100-3353	R8	33	"	
106-5633	R9	560	"	
100-2253	R10	22	"	
176-2047	R31	2.0	" POT. 110W.	
015-5064	C1	5MFD.	6+VDC.	
C64-1063	C2	1	35 TANT (15CH)	
C11-2044	C2	0.02	500 PFC (8KHZ)	
014-3274	C3	32	40	
064-1063	C4	1	35V TANT	
030-1053	C5	0.1	100VES (150HZ)	
002-1034	C5	0.001	100C (18KH)	
030-1053	C6	0.1	50 (15CHZ)	
002-1034	C6	0.001	100C (18KHZ)	
000-4754	C7	0.47	10 (15CHZ)	
002-2034	C7	0.002	100C (18KHZ)	
001-2044	C8	0.02	500	
002-1024	C9	100 PFD.	100C (150HZ)	
002-2034	C10	0.002 MFD.	" (8KHZ)	
210-3644	Q1	2N3644	TRANSISTOR	
440-0805			STANDOFF (2)	
413-0315			TURRET TERMINAL (3)	

LIST OF MATERIAL	
DRAWN BY	ODM
CHECKED BY	ODM
PROJECT	82870
DATE	8-31-70
APPROVED BY	
WEST ASSEMBLY	
400 & 500	
SERIES	
TITLE	
CUE-TRIP TONE GENER.	
DWG NO.	912-0050
PART NO.	912-0050A
SHEET	1 OF 1

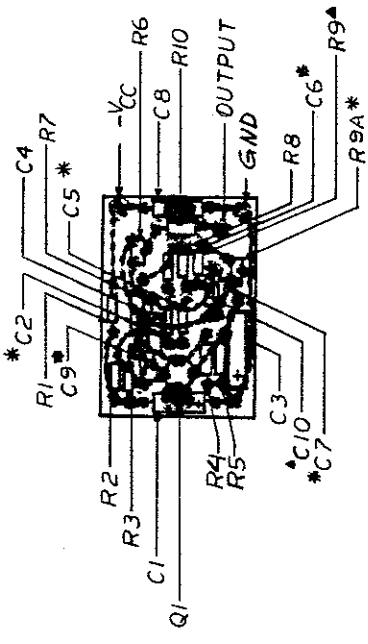
SHOWN AS 150 HZ. OSC.



CO-5F

NOTES:

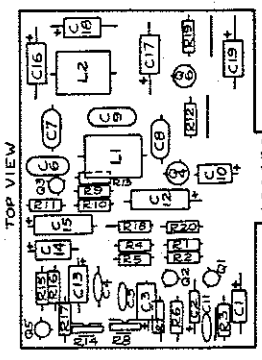
- ① TO TERMINAL 27 OF RLY. BD1-37VDC.1.
- ② TO TERMINAL 5 OF HEAD DRV. SOCKET.
- * COMPONENT VALUES VARY WITH DESIRED FREQUENCY.
- ▲ COMPONENT NOT INCLUDED WITH 150HZ. VERSION. (JUMPER USED INSTEAD OF R9)
- * COMPONENT NOT IN 8KHZ. VERSION
- PART # 912-0050 - 150HZ
- PART # 912-0050A - 8KHZ



PARTS LIST		REVISIONS		DATE	
PART NUMBER	SYM	DESCRIPTION	DESCRIPTION	DATE	APPROVED
110-1053	R1	10K OHMS, 1/2W, 10% RESISTOR	C8	0.1 MFD, 100V, MYLAR CAPACITOR	6/9/73
110-2253	R2	220K "	C9	.15 " " "	
110-1063	R3	100K "	C10	1.0 " 63V, ELEC	
110-1053	R4	10K "	C11	.001 " 500V, DISC	
110-1063	R5	100K "	C12	.32 " 40V, ELEC	
110-1063	R6	100K "	C13	1.0 " 63V, "	
110-2253	R7	22K "	C14	*.01 " 500V DISC	
172-1064	R8	100K " 1/10W POTENTIOMETER	C15	1.0 " 63V ELEC	
110-3343	R9	3.3K " 1/2W, 10% RESISTOR	C16	32 " 40V " "	
110-6853	R10	68K "	C17	5.0 " 64V, DISC	
110-1063	R11	100K "	C18	*.001 " 500V, ELEC	
110-1053	R12	10K "	C19	5.0 " 64V, DISC	
110-1043	R13	1K "	C20	*.001 " 500V, DISC	
172-1064	R14	100K " 1/10W POTENTIOMETER	C21	5.0 " 64V, ELEC	
110-1543	R15	1.5K " 1/2W, 10% RESISTOR	C22	*.002 " 500V, DISC	
110-3343	R16	*3.3K " " "	C23	5.0 " 64V, ELEC	
110-6853	R17	68K " " "	Q1	2N4248 TRANSISTOR	
110-1063	R18	100K " " "	Q2	2N4248 "	
110-4733	R19	10K " " "	Q3	2N4248 "	
110-4733	R20	470 " " "	Q4	2N3644 "	
			Q5	2N4248 "	
013-1074	C1	10 MFD, 16V, ELEC CAPACITOR	Q6	2N3644 "	
015-1064A	C2	1 " 63V, " "	L1	100MHY INDUCTOR	
001-1044	C3	1 " " " " " "	L2	100MHY " "	
002-2034	C4	.01 " 500V, DISC			
030-1553	C5	.002 " 1000V, " "			
030-1053	C6	.15 " 100V, MYLAR			
	C7	0.1 " " " " " "			

PARTS LIST

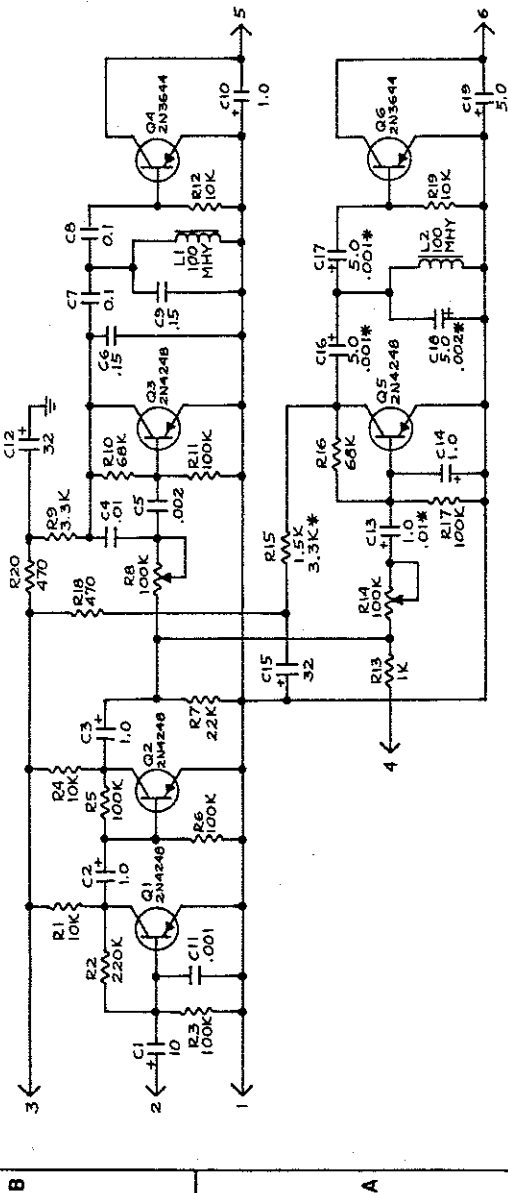
ZONE ISSUE: A REDRAWN - ECU 227 DATE APPROVED: 6/9/73



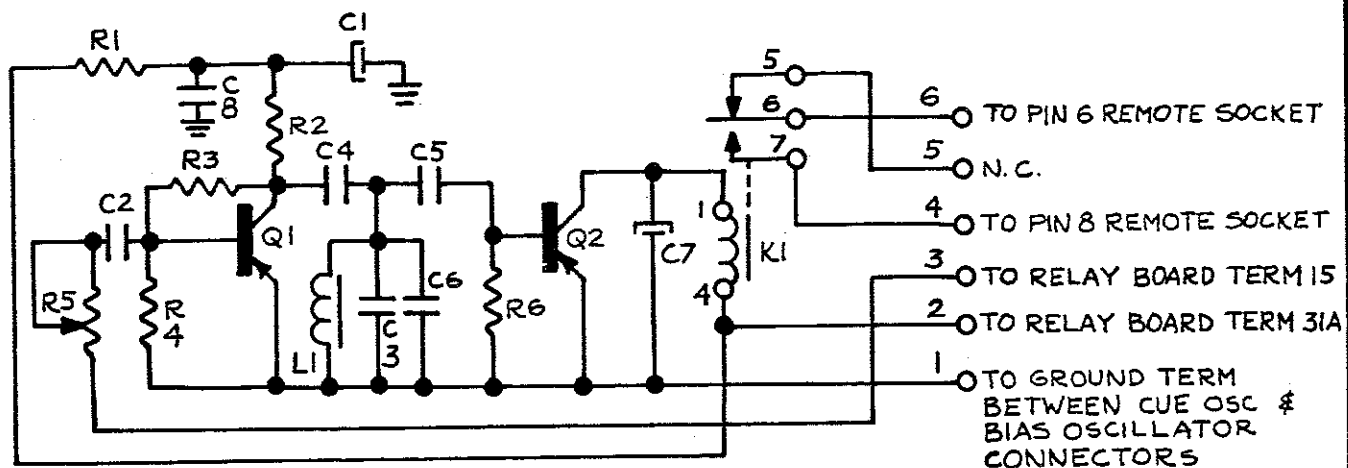
RELAY DRIVER OUT (AUX CUE TONE)
 RELAY DRIVER OUT (1KHZ STOP TONE)
 RELAY AMP OUT
 GROUND

- NOTES:
- 1KHZ/150HZ - PART # 910-0041
 - 1KHZ/8KHZ - PART # 910-0041A
 - * - COMPONENT VALUES USED ON 1KHZ/8KHZ BOARD ONLY.
 - LAST COMPONENTS USED: R20, C19, Q6 & L2.

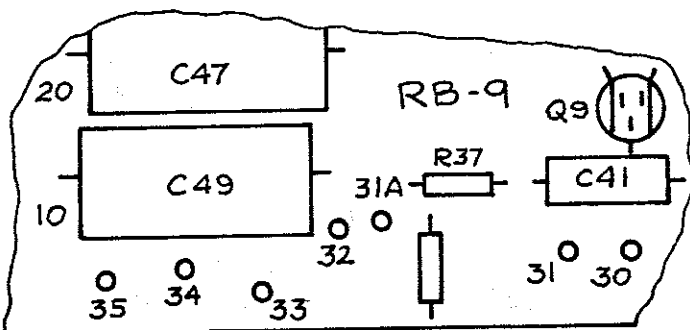
TAM - 4



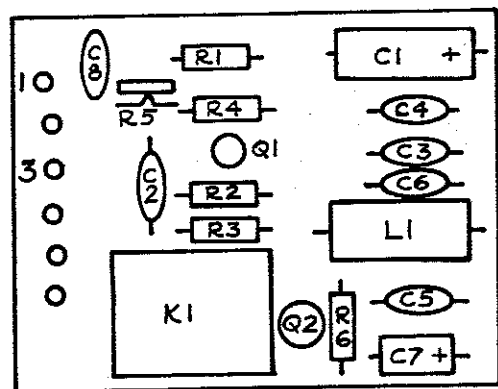
DESIGNED: 6/9/73	DATE: 6/9/73	BROADCAST ELECTRONICS INC.	
CHECKED:	DATE:	A FILMWAYS COMPANY -	
DESIGNED BY:	DATE:	TITLE 1KHZ/150HZ - 1KHZ/8KHZ	
APPROVED:	DATE:	DUAL CUE TONE SENSOR	
REVISION:	DATE:	C DWG NO 910-0041 REV	
TREATMENT OR FINISH:	DATE:	910-0041 A	
		PART NO. 910-0041 & 910-0041A	



CF-3 CIRCUIT DIAGRAM
8KHz CUE TRIP II SENSOR



SECTION OF POWER SUPPLY/RELAY BOARD
SHOWING LOCATION OF TERMINAL 31A.



CF-3D PARTS LAYOUT

PARTS LIST

SYM	DESCRIPTION	PART NO.
R1	470 OHM, 1/2W, 10% RESISTOR	110-4733
R2	3.3K " " "	110-3343
R3	220K " " "	110-2263
R4	100K " " "	110-1063
R5	100K, 1/10W, TRIMMER	176-1064
R6	4.7K, 1/2W, 10% RESISTOR	110-4743
C1	32MFD, 40V ELEC. CAP.	014-3274
C2	.02MFD, 500V DISC. CAP.	001-2044
C3	.002MFD " " "	002-2034
C4	.001MFD " " "	002-1034
C5	.001MFD " " "	002-1034
C6	500pf " " "	001-5024
C7	5MFD, 64V, ELEC. CAP.	015-5064
C8	.002MFD, 500V, DISC. CAP.	002-2034
L1	100MHY CHOKE	364-1662
Q1	2N4248 TRANSISTOR	210-4248
Q2	2N3644 " "	210-3644
—	RELAY SOCKET	417-1230
—	CF-3C P C BOARD	510-0032
K1	T154X-562 RELAY	271-0154

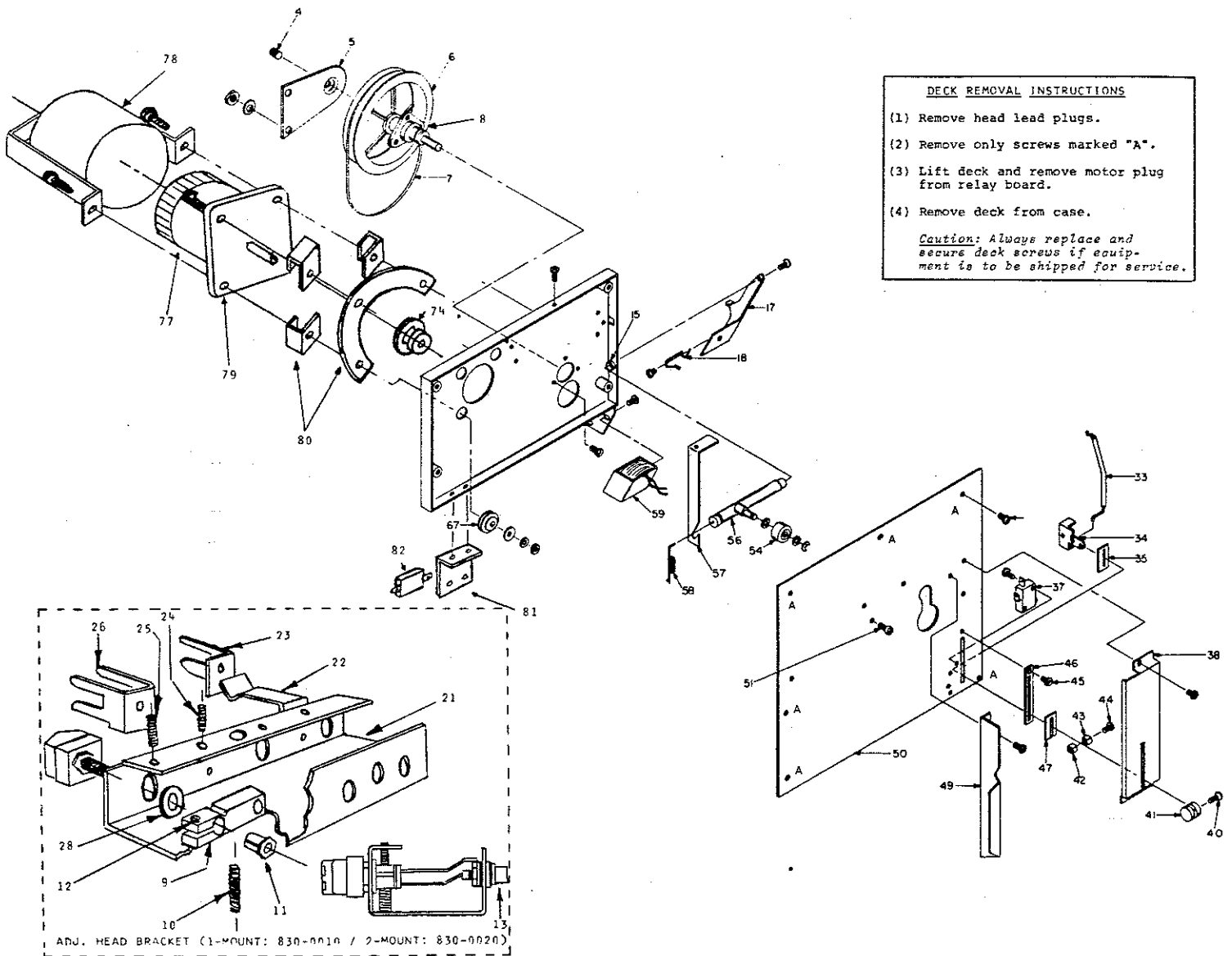
BROADCAST ELECTRONICS INC.
— A FILMWAYS COMPANY —

TITLE (MANUAL SUPPLEMENT DWG)
500C SERIES QII SENSOR

SIZE	DWG NO.	REV
A	A-910-0032 A	B

FORMERLY 708178 REV B-ECN 875

SPOTMASTER COMPACT MECHANICAL VIEW AND PARTS LIST



REF No.	DESCRIPTION	STOCK No.
4	NYLON THRUST BEARING ONLY	420-1337
4,6,5	FLYWHEEL THRUST BEARING ASSEMBLY	443-4481
6	CAPSTAN 7 FLYWHEEL ASSEMBLY	444-0335
7	MOTOR BELT	405-0438
8	UPPER CAPSTAN BEARING ONLY	444-0334
9,10,11)	HEAD MOUNT KIT #129	449-0129
12,24,25)		
9	ADJUSTMENT LEVER	
13	PHONO JACK	417-0135
15	NYLON ROLLER SHAFT BUSHING	406-0778
17	SWING ARM	459-0108
18	SOLENOID RELEASE SPRING	436-0135
21	HEAD BRACKET	470-4460
22	CARTRIDGE CLIP	459-0002
23	TAPE GUIDE LEFT	452-2101
26	TAPE GUIDE DOUBLE	452-0103
33	CONTROL LINKAGE ARM	429-0664
34,42,43,44,46,47,35)	CONTROL ARM ASSEMBLY	459-0109
35		
35	BEARING BLOCK PLATE, LOWER	459-4059
37	MICRO SWITCH	34A-3340
38	LOAD LEVER COVER	459-2055
41,40	LOAD LEVER KNOB ASSEMBLY	481-0615

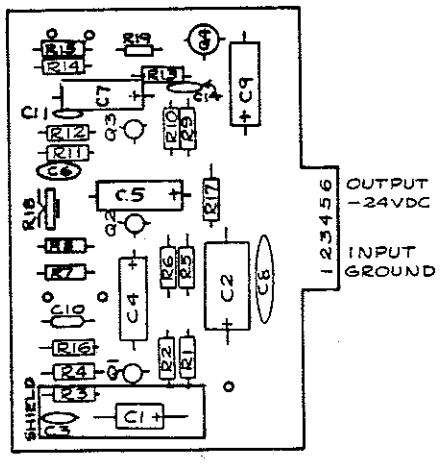
REF No.	DESCRIPTION	STOCK No.
46	LOAD LEVER GUIDE PLATE	459-0136
47	BEARING BLOCK PLATE, UPPER	459-4060
49	CARTRIDGE GUIDE	459-0105
50	TAPE DECK PLATE, LAMINATED STAINLESS	400-0105
51	CARTRIDGE STOP SCREW	420-0112
54	PRESSURE ROLLER	404-0001
56	ROLLER SHAFT ASSEMBLY	446-0107
57	ROLLER SHAFT SUPPORT BRACKET	453-0110
58	ROLLER POSITION SPRING	432-0616
59	SOLENOID	289-0140
67	MOTOR SHOCK MOUNT	389-9034
74	MOTOR PULLEY, 60HZ, 7.5IPS	389-0100
74	MOTOR PULLEY, 50HZ, 7.5IPS	389-0200
77	HURST SYNCHRONOUS MOTOR, 115VAC/60HZ	384-1112
77	PAPST SYNCHRONOUS MOTOR, 115VAC/60HZ	384-1052
77	PAPST SYNCHRONOUS MOTOR, 125-220VAC/50HZ	384-1053
77	PAPST SYNCHRONOUS MOTOR, 240VAC/50HZ	384-1054
78	MOTOR SHIELD (USED ONLY WITH 384-1112)	389-9000
79	MOTOR MOUNTING PLATE (USED ONLY WITH 384-1112)	453-0001
80,67	MOTOR MOUNTING KIT (USED WITH ALL MOTORS)	389-9156
81	CAPACITOR MOUNTING BRACKET (FOR 029-0274)	453-0002
82	MOTOR START CAPACITOR 2MFD(FOR 384-1112)	029-0274
82	MOTOR START CAPACITOR 6MFD(FOR 384-1052)	029-6054
82	MOTOR START CAPACITOR 8MFD(FOR 384-1053&125V)	029-8064
82	MOTOR START CAPACITOR 2.5MFD(FOR 384-1053&220V)	029-2564
82	MOTOR START CAPACITOR 2MFD(FOR 384-1054)	029-2064

*These parts do not appear in rack-mounted units which use a modified compact deck employing the other parts listed above as well as special parts unique to rack units.

REV A - REDRAWN 6/11/73
 B - ECN 268 7/13/73
 C - ECN 369 2/14/74
 D - ECN 819 6-2-76
 E - ECN 843 7-26-76

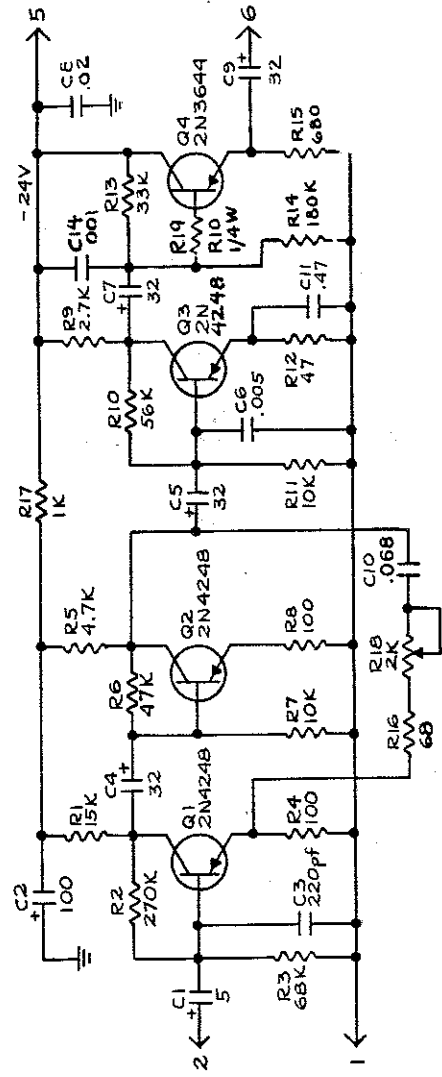
PARTS LIST

PART NO.	SYM	DESCRIPTION	PART NO.	SYM	DESCRIPTION
110-1553	R1	15K RESISTOR	014-3274	C5	32 MFD, 40V, ELEC CAPACITOR
110-2763	R2	270K "	001-5034	C6	.005 " 500V, DISC "
110-6853	R3	68K "	014-3274	C7	32 " 40V, ELEC "
110-1033	R4	100 "	001-2044	C8	.02 " 500V, DISC "
110-4743	R5	4.7K "	014-3274	C9	32 " 40V, ELEC "
110-4753	R6	47K "	005-6843	C10	.068 " 100V, CERAMIC "
110-1053	R7	10K "	000-4754	C11	.47 " 3V DISC "
110-1033	R8	100 "	002-1034	C14	.001 " " "
110-2743	R9	2.7K "	210-4248	Q1	2N4248 TRANSISTOR
110-5653	R10	56K "	210-4248	Q2	2N4248 "
110-1053	R11	10K "	210-4248	Q3	2N4248 "
110-4723	R12	47 "	210-3644	Q4	2N3644 "
110-3353	R13	33K "	459-0008		SHIELD
110-1863	R14	180K "	511-0040		P.C. BOARD (PAM-4C)
110-6833	R15	680 "			
110-6823	R16	68 "			
110-1043	R17	1K "			
176-2044	R18	2K " 0.1W TRIMMER			
100-1023	R19	10 " 1/4W RESISTOR			
015-5064	C1	5 MFD, 64V, ELEC CAPACITOR			
014-1084	C2	100 " 40V, "			
001-2224	C3	220pf, 500V, DISC			
014-3274	C4	32 MFD, 40V, ELEC			



NOTES:

1. LAST COMPONENTS USED: R19, C14 & Q4.
2. COMPONENT NOS. NOT USED: C12 & C13

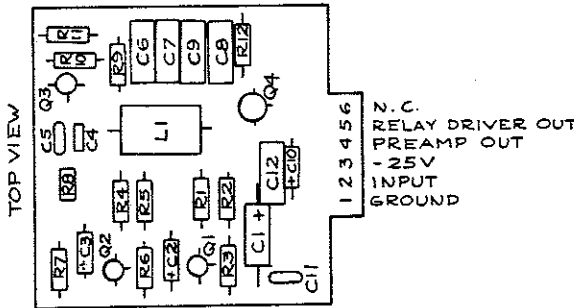


PAM - 4

DRAWN 4/11/73	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
CHECKED 1/28/74	PROGRAM AMPLIFIER BD
APPROVED M/14 7/1/74	REV E
PART NO. B-911-0040	REV
911-0040	

REVISED 7/1/74

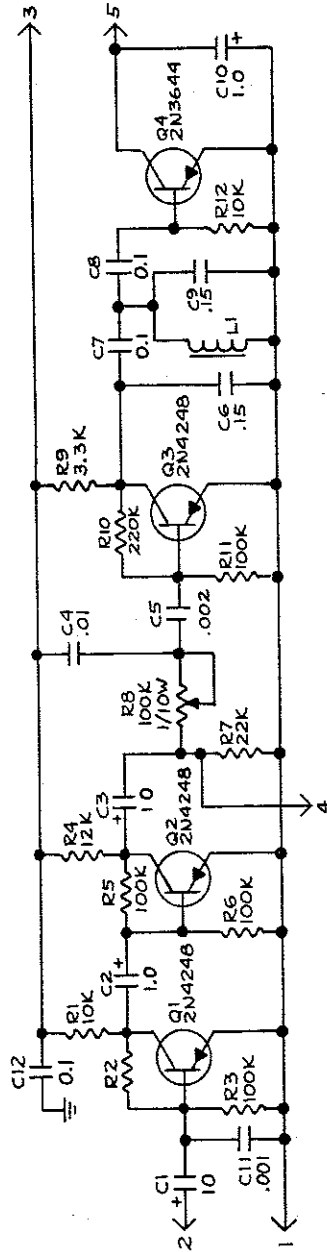
SYM	2N4248	FPN4248
Q1 Q2		
Q3		
Q4	2N3644	FPN3644



PARTS LIST

PART NO.	SYM	DESCRIPTION	PART NO.	SYM	DESCRIPTION
110-1053	R1	10K OHM, 1/2W, 10% RESISTOR	002-2034	C5	.002 MFD, 500V DISC CAPACITOR
110-2263	R2	220K "	030-1553	C6	.15 " 100V MYLAR "
110-1063	R3	100K "	030-1053	C7	0.1 " " " "
110-1253	R4	12K "	030-1053	C8	0.1 " " " "
110-1063	R5	100K "	030-1553	C9	.15 " " " "
110-1063	R6	100K "	015-1064A	C10	1.0 " 63V ELEC "
110-2253	R7	22K "	002-1034	C11	.001 " 500V DISC "
176-1064	R8	100K " 1/10W TRIMMER	030-1053	C12	0.1 " 100V MYLAR "
110-3343	R9	3.3K " 1/2W, 10% RESISTOR			
110-2263	R10	220K "	210-4248	Q1	2N4248 TRANSISTOR
110-1063	R11	100K "	210-4248	Q2	2N4248 "
110-1053	R12	10K "	210-4248	Q3	2N4248 "
			210-3644	Q4	2N3644 "
013-1074	C1	10 MFD, 16V ELEC CAPACITOR			
015-1064A	C2	1.0 " 63V "	364-1662	L1	100 MHY FERRITE CHOKE
015-1064A	C3	1.0 " " "			
031-1043	C4	.01 " 200V MYLAR "	510-0014		P.C. BOARD (TAM-1K6C)

NOTES:
 1. RESISTORS IN OHMS, 1/2W, 10%; CAPACITORS IN MICROFARADS.



TAM-1K6C

DRAWN 7/16/73	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
CHECKED 1/13/73	1KHz SENSOR
APPROVED 1/5/73	B-910-0014
	PART NO. 910-0014
	REV B

REV A REDRAWN, ECM 227 5/16/73
 REV B PER ECN # 743 4/5/76

ISSUE	DESCRIPTION	DATE	APPROVED
A	ECN-125 (REDRAWN)	7/17/73	
B	ECN-164	11/21/73	
C	ECN-657		

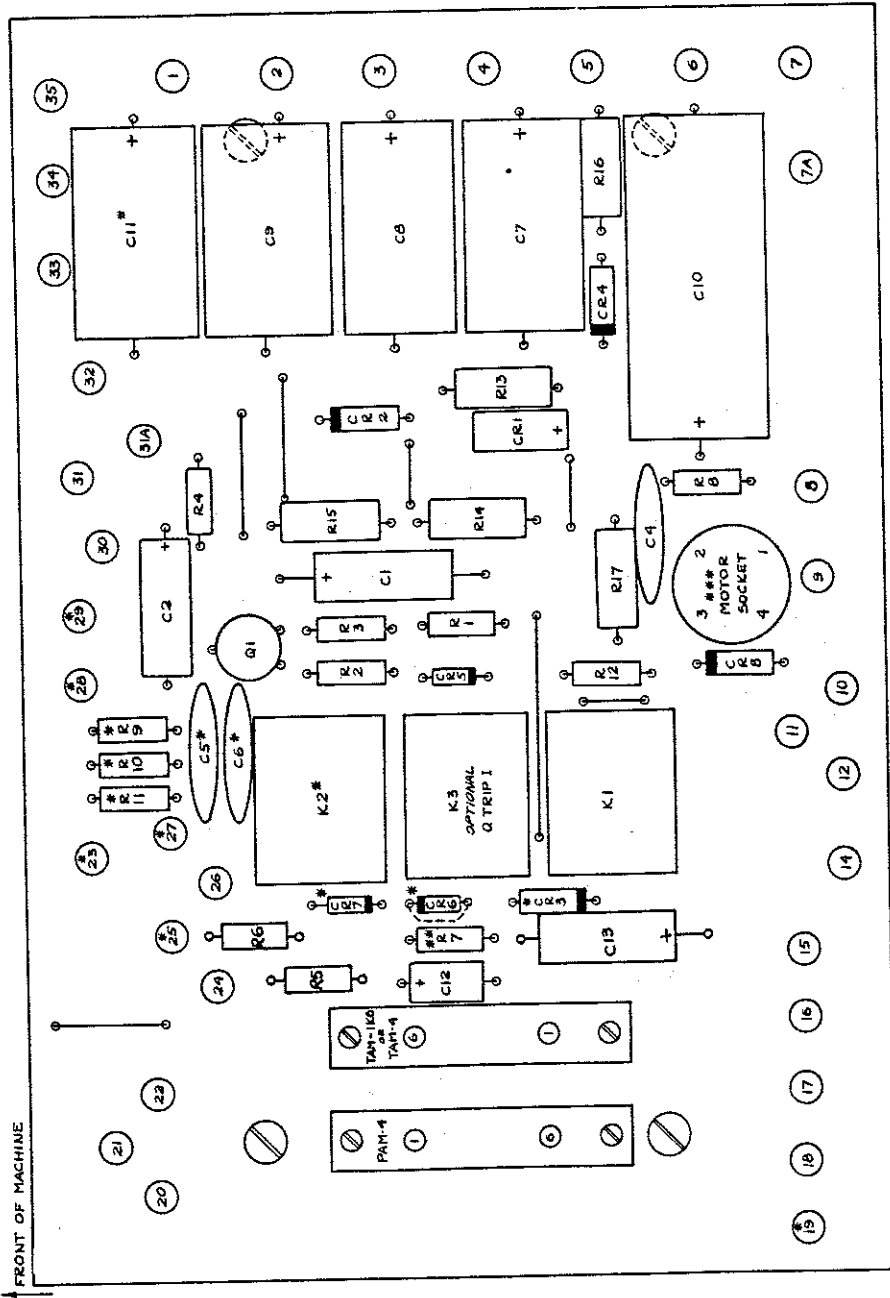
PARTS LIST

PART NUMBER	SYN	DESCRIPTION
110-1053	R1	10K OHMS, 1/2W, 10% RESISTOR
110-1053	R2	10K
110-3343	R3	3.3K
110-1543	R4	1.5K
110-4733	R5	470
110-4733	R6	470
110-4743	R7	47K
110-2253	R8	22K
110-3353	R9	3.3K
110-1043	R10	1K
110-3353	R11	3.3K
110-3353	R12	3.3K
122-3312	R13	3.3K 2W, W/V
130-1833	R14	150
132-1033	R15	100
132-1033	R16	100
132-2333	R17	220
014-1084	C1	100MED, 40V ELEC CAPACITOR
014-3274	C2	32MFD
001-2044	C4	.02MED, 500V DISC
001-2044	C5	.02MED, 500V
001-2044	C6	.02MED, 500V
014-5084	C7	500MED, 50V ELEC
014-5084	C8	500MED, 50V
014-5084	C9	500MED, 50V
015-5074A	C10	30MFD, 250V
015-5084	C11	5MFD, 50V
015-5084	C12	5MFD, 64V
014-3274	C13	32MFD, 40V
239-0037	CR1	9A10SE RECTIFIER
200-0027	CR2	1Z37A ZENER DIODE
200-0009	CR3	1Z5.1A
203-2071	CR4	IN2071 DIODE
203-4005	CR5	IN4005
203-4005	CR6	IN4005
203-4005	CR7	IN4005
203-2071	CR8	IN2071
210-3644	Q1	2N3644 TRANSISTOR
271-0154	K1	RELAY
271-0154	K2	RELAY
271-0154	K3	RELAY
601-0022		W2A JUMPER WIRE
417-0333		TRANSISTOR SOCKET
417-1230		RELAY SOCKET (R/P/3) PB (2)
417-0643		6-PIN CONNECTOR (2)
440-0807		STAND OFF SWAGE (4)
413-0315		TURRET TERMINAL (36)
417-0478		4-PIN MOTOR SOCKET
514-0900		P.C. BOARD (88-9)

RB-9

BROADCAST ELECTRONICS INC.
-A FILMWAYS COMPANY-

DESIGNED BY	7/16/73
CHECKED BY	BS 7/17/73
TITLE	POWER SUPPLY & RELAY BOARD
REV	REV
FORMERLY	60C22A 11/17/73 NY



TOP VIEW
SCALE: 2/1

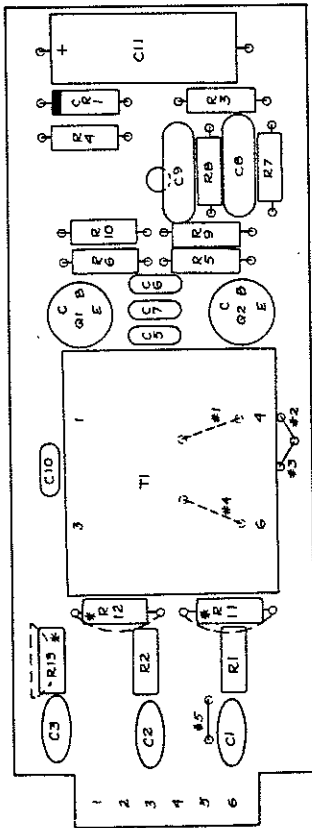
- NOTES:
1. RECORD/PLAYBACK (R/P) UNITS - 914-0090
PLAYBACK ONLY (PB) UNITS - 914-0090A
 2. * COMPONENTS USED ON R/P UNITS (914-0090) ONLY.
(CR6 IS REPLACED BY A JUMPER ON PB UNITS)
 3. ** ON PB UNITS R7 IS 10K OHMS, 1/2W, PART NUMBER 110-1053.
 4. *** UNITS WITH 220VAC POWER ARE EQUIPPED WITH 5-PIN MOTOR SOCKET, PART NUMBER 417-0579.
 5. Q1 - 150Hz AUXILIARY TONE.
 6. LAST COMPONENTS USED: R17, C18, CR8, Q1 & K3.
 7. COMPONENT NUMBER NOT USED: C3.

FUNCTIONS

PIN	DESCRIPTION	PIN	DESCRIPTION
20	PROGRAM AMPLIFIER INPUT	26	BIAS OSCILLATOR - 37VDC
21	PROGRAM AND CUE HEAD SHIELD	28	RECORD LAMP - HI
22	CUE AMPLIFIER INPUT	29	RECORD LAMP - COMMON
23	PLAY LAMP - HI	30	RUN LAMP - HI
24	START CONTROL	31	RUN LAMP - COMMON
25	RECORD SET CONTROL	31A	- 27VDC
26	DIRECT MOTOR CONN (PIN 2 OF MOTOR PLUG)	32	GROUND
27	117VAC (220VAC) INPUT	33	STOP CONTROL
28	220VAC MOTOR CONN (PIN 5 OF MOTOR PLUG)	34	READY LAMP - LOW
29	K1 NORMALLY OPEN CONTACT	35	READY LAMP - HI
30	K1 NORMALLY CLOSED CONTACT		
31	K1 NORMALLY OPEN CONTACT		
32	GROUND		
33	STOP CONTROL		
34	READY LAMP - LOW		
35	READY LAMP - HI		
17	PROGRAM OUTPUT		
18	PROGRAM OUTPUT SHIELD		
19	PROGRAM RECORD AMPLIFIER - 24V		

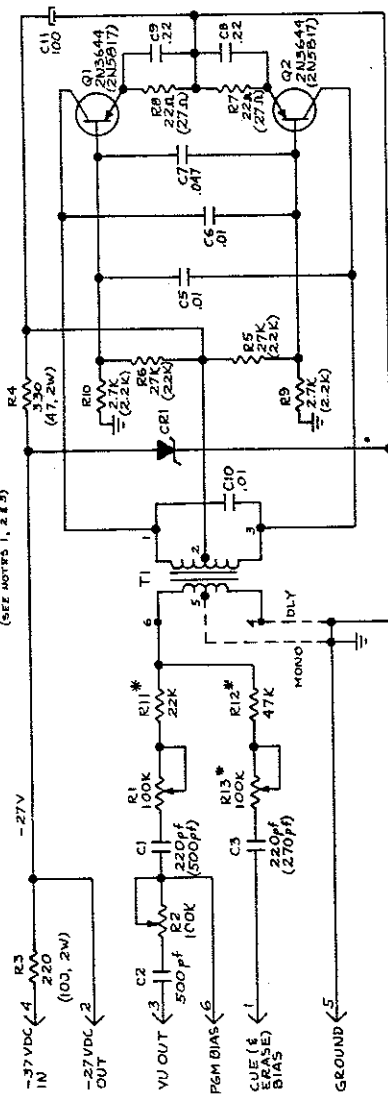
REV ECN 321 11/73
 E . 10 71 11-7/76

REVISIONS		DATE	APPROVED
A	ECN 123	7/672	
B	ECN 139	4/673	
C		4/17/73	
D	ECN 247		

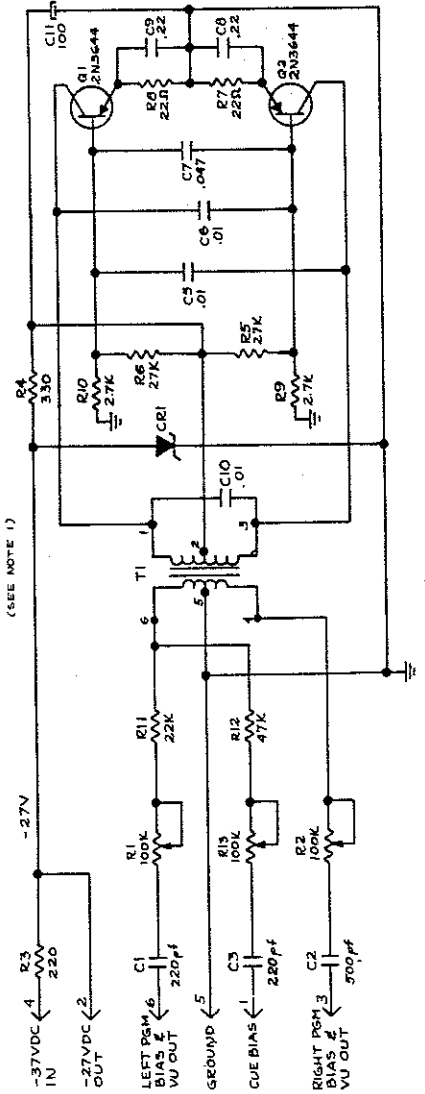


TOP VIEW
 SCALE: 2/1

MONO & DELAY
 (SEE NOTES 1, 2 & 3)



STEREO
 (SEE NOTE 1)



PARTS LIST

PART NUMBER (MONO & STEREO)	PART NUMBER (DELAY)	SYM	DESCRIPTION
R1	100K	R1	100K OHMS, .1W POTENTIOMETER
R2	100K	R2	100K
R3	220	R3	1/2W, 10% RESISTOR
R4	330	R4	2W, W/W
R5	47	R5	1/2W, 10%
R6	27K	R6	2W, W/W
R7	27K	R7	1/2W, 10%
R8	22K	R8	"
R9	22K	R9	"
R10	22K	R10	"
R11	22K	R11	"
R12	47K	R12	"
R13	100K	R13	1W POTENTIOMETER
C1	500pf	C1	500PF, 500V CAPACITOR
C2	500pf	C2	500PF
C3	220pf	C3	220PF
C4	270pf	C4	270PF
C5	.01HFD, 200V	C5	.01HFD, 200V
C6	.01HFD	C6	.01HFD
C7	.047HFD, 100V	C7	.047HFD, 100V
C8	.22HFD	C8	.22HFD
C9	.22HFD	C9	.22HFD
C10	.01HFD	C10	.01HFD
C11	100HFD, 40V	C11	100HFD, 40V
Q1	2N3644	Q1	2N3644 ZENER DIODE
Q2	2N5817	Q2	2N5817 TRANSISTOR
T1	T10T2 BIAS	T1	T10T2 BIAS TRANSFORMER
			STAND OFF
			PRINTED CIRCUIT BOARD 180-81503

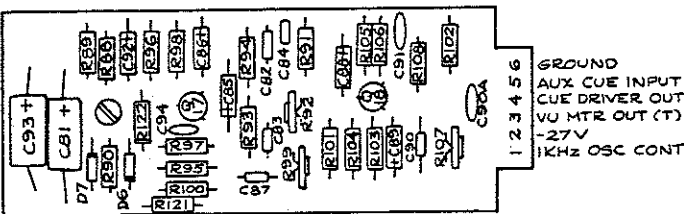
NOTES:

- 912-0070 - MONO - USE JUMPERS #3, #4 & #5
 912-0070A - DELAY - USE JUMPERS #2, #4 & #5
 912-0070B - STEREO - USE JUMPERS #1, #3 & #4
- * COMPONENTS NOT USED IN DELAY UNITS (912-0070A).
- RESISTORS IN OHMS, 1/2W UNLESS OTHERWISE NOTED.
 POTENTIOMETERS ARE .1W.
- CAPACITORS IN MICROFARADS UNLESS OTHERWISE NOTED.
- RESISTOR AND CAPACITOR VALUES IN PARENTHESES ARE FOR DELAY UNITS (912-0070A) ONLY.
- LAST COMPONENTS USED: R13, C1, C11, Q1, Q2 & T1.
- COMPONENT NUMBER NOT USED: C4.

DESIGNED BY	BROADCAST ELECTRONICS INC.
DRAWN BY	WAS 7/1/73
CHECKED BY	WAS 7/1/73
PROJ. NUMBER	912-0070A
DATE	7/672
APPROVED BY	WAS 7/1/73
COMPONENT NUMBER	C-912-0070
REV	F

BO-8 MSD-1

TOP VIEW



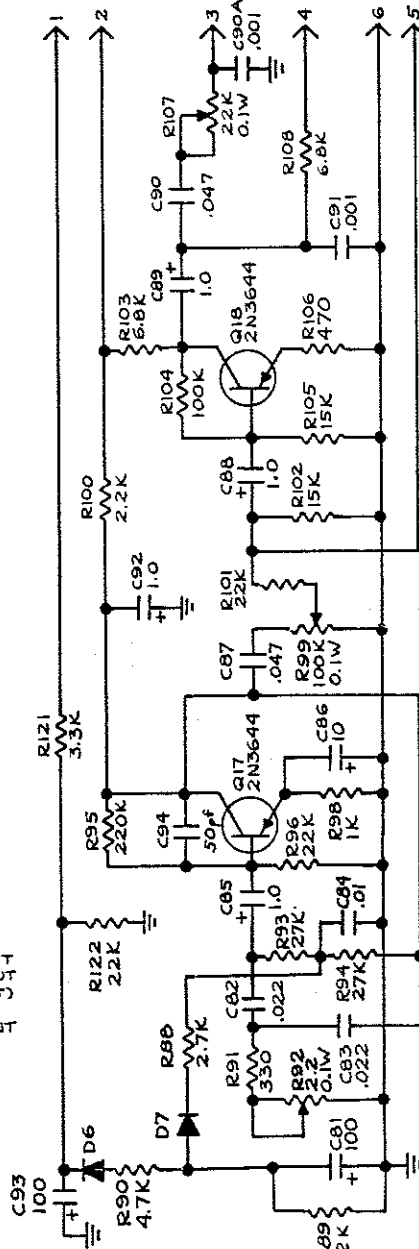
PARTS LIST

PART NO.	SYM	DESCRIPTION	PART NO.	SYM	DESCRIPTION
110-2743	R89	2.7K OHMS, 1/2W, 10% RESISTOR	014-1084	C81	100 MFD, 40V, ELECTROLYTIC CAP.
110-1253	R89	12K "	030-2043	C82	.02 " 100V, DIPPED MYLAR "
110-4743	R90	4.7K "	030-2043	C83	.02 " " " "
110-3333	R91	330 "	030-1043	C84	.01 " 100V " "
176-2044	R92	2.0K " 0.1W TRIMMER	015-1064A	C85	1.0 " 63V, ELECTROLYTIC "
110-2753	R93	27K " 1/2W, 10% RESISTOR	013-1074	C86	10 " 16V " "
110-2753	R94	27K "	030-4743	C87	.047 " 100V, DIPPED MYLAR "
110-2263	R95	220K "	015-1064A	C88	1.0 " " " "
110-2253	R96	22K "	015-1064A	C89	1.0 " " " "
110-4743	R97	4.7K "	030-4743	C90	.047 " 100V, DIPPED MYLAR "
110-1043	R98	1K "	002-1034	C90A	.001 " 500V, DISC "
176-1064	R99	100K " 0.1W TRIMMER	002-1034	C91	.001 " " " "
110-2243	R100	2.2K " 1/2W, 10% RESISTOR	015-1064A	C92	1.0 " 63V, ELECTROLYTIC "
110-2253	R101	2.2K "	014-1084	C93	100 " 40V, " "
110-1553	R102	15K "	001-5014	C94	50 pf 500V, DISC "
110-6843	R103	6.8K "	210-3644	Q17	2N3644 TRANSISTOR
110-1063	R104	100K "	210-3644	Q18	2N3644 " "
110-1553	R105	15K "	203-4005	D6	IN4005 DIODE
110-4733	R106	470 "	203-4005	D7	IN4005 " "
176-2054	R107	22K " 0.1W TRIMMER	440-0807	---	STANDOFF SWAGED (1)
110-6843	R108	6.8K " 1/2W, 10% RESISTOR	512-0071	---	P. C. BOARD (CO7-1K)
110-3343	R121	3.3K "			
110-2253	R122	22K "			

NOTES

- COMPONENT NUMBERS NOT USED:
R1 THRU R87, R109 THRU R120, C1 THRU C80, Q1 THRU Q16 & D1 THRU D5.
- LAST COMPONENTS USED:
R122, C94, Q18 & D7.

CO7-1K



DRAWN	7MSD 7/15/73	BROADCAST ELECTRONICS INC.
CHECKED	MIA 4/15/73	- A FILMWAYS COMPANY -
APPROVED	MIA 7/9/74	1KHZ OSCILLATOR
		DWG NO. B-912-0071
		PART NO. 912-0071

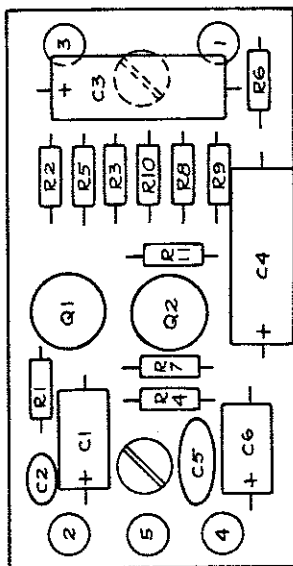
65... 7/1/74

PARTS LIST

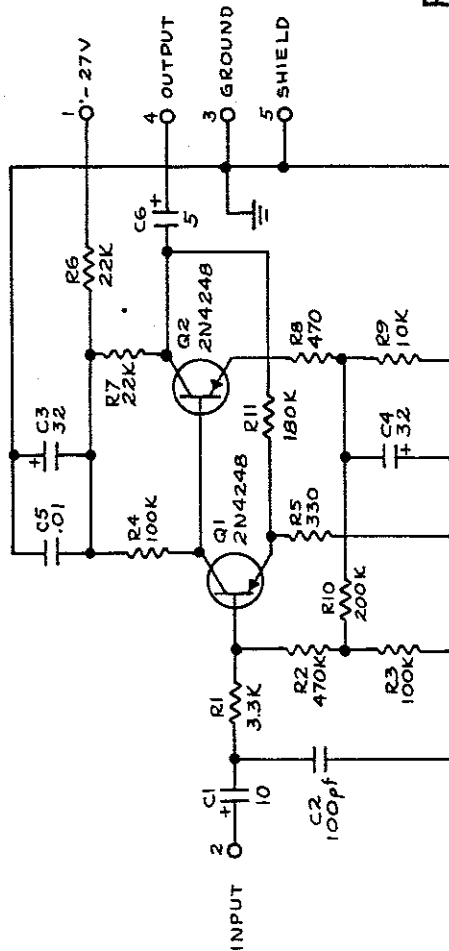
PART NUMBER	SYM	DESCRIPTION
100-3343	R1	3.3K OHM, 1/4W, 10% RESISTOR
100-4763	R2	470K " " " "
100-1063	R3	100K " " " "
100-1063	R4	100K " " " "
100-3333	R5	330 " " " "
100-2253	R6	22K " " " "
100-2253	R7	22K " " " "
100-4733	R8	470 " " " "
100-1053	R9	10K " " " "
100-2062	R10	200K " " " "
100-1863	R11	180K " " " "
013-1074	C1	10 MFD, 16V ELECTROLYTIC CAPACITOR
002-1024	C2	100pf DISC CAPACITOR
014-3274	C3	32MFD, 40V, ELECTROLYTIC CAPACITOR
014-3274	C4	32MFD, 40V " "
001-1044	C5	.01MFD DISC CAPACITOR
015-5064	C6	5 MFD, 64V, ELECTROLYTIC CAPACITOR
210-424B	Q1	2N424B TRANSISTOR
210-424B	Q2	" "
409-0121	—	TRANSISTOR PADS (2)
413-1597	—	MEDIUM TURRET TERMINALS (5)
440-0805	—	1/4 x 3/8 6-32 THREADED STANDOFF (2)
511-3010	—	P.C. BOARD (PA-301)

BROADCAST ELECTRONICS INC
 -A FILMWAYS COMPANY-
 MICROPHONE PREAMPLIFIER BOARD
 PART NO. **B-911-3010**
 10/5/62 MSS REVISION 7/1/64

NOTES:
 1. LAST COMPONENTS USED:
 R11, C6 & Q2.



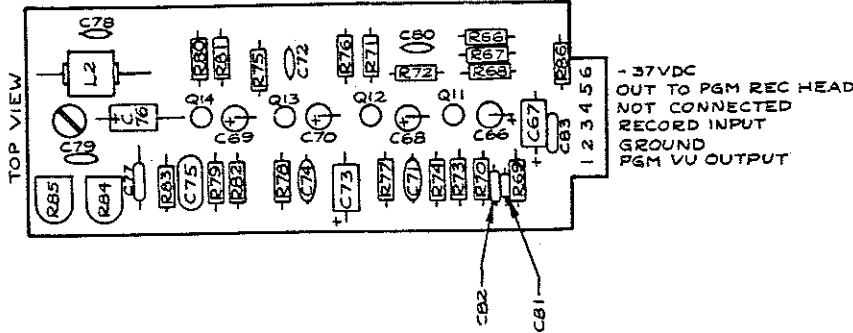
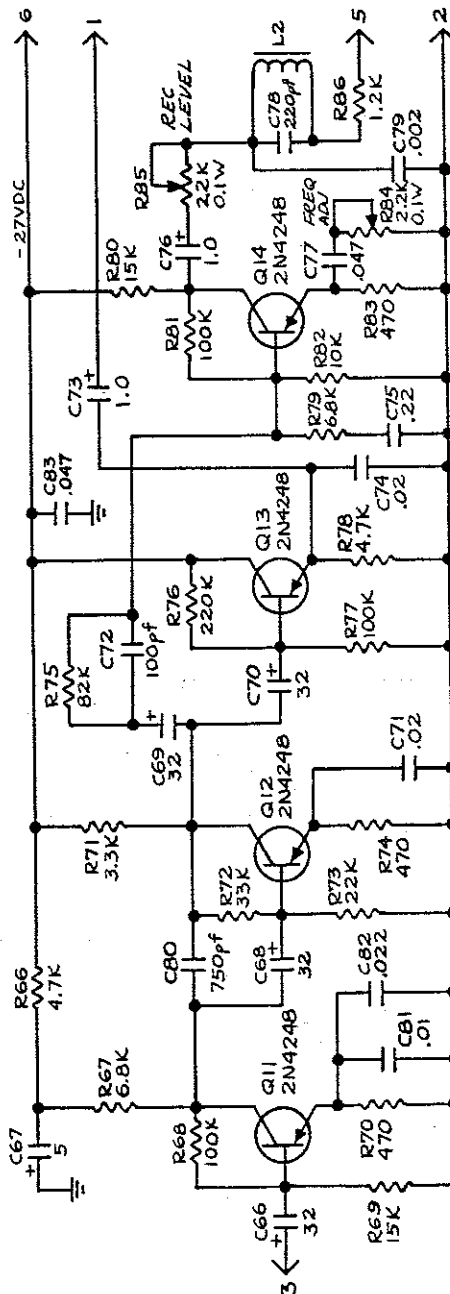
SYM	2N424B	FPN424B
Q1 & Q2	○	○



PA-301

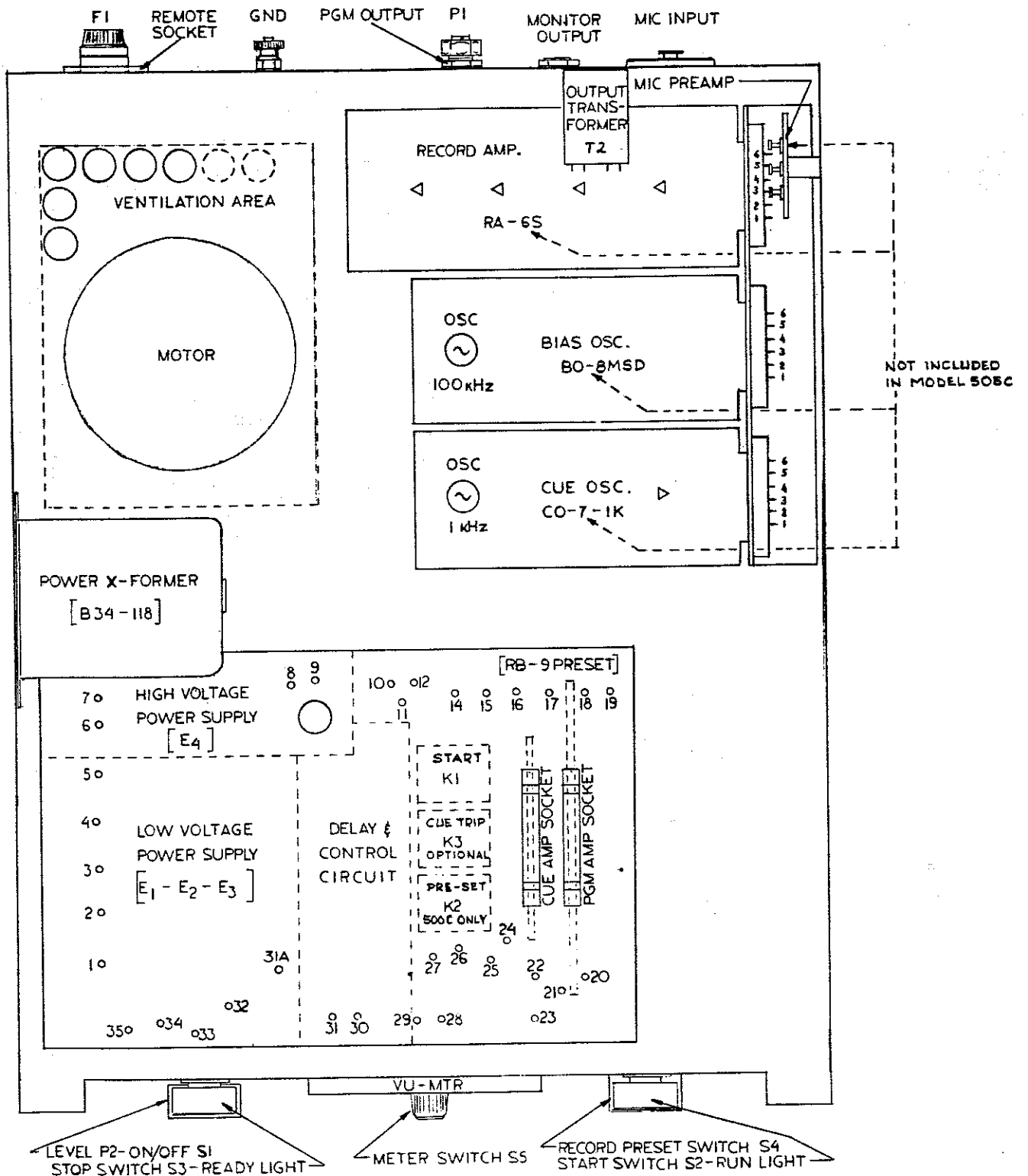
PARTS LIST

PART NO.	SYM	DESCRIPTION	PART NO.	SYM	DESCRIPTION
110-4743	R66	4.7K OHMS, 1/2W, 10% RESISTOR	001-2044	C71	.02 MFD, 500V, DISC CAPACITOR
110-6843	R67	6.8K "	002-1024	C72	100pf "
110-1063	R68	100K "	015-1064A	C73	1.0 MFD, 35V, ELEC "
110-1553	R69	15K "	001-2044	C74	.02 MFD, 500V, DISC "
110-4733	R70	470 "	030-2253	C75	.22 " 100V, MYLAR "
110-3343	R71	3.3K "	015-1064A	C76	1.0 " 63V, ELEC "
110-3353	R72	3.3K "	001-2224	C77	220pf, 500V, DISC "
110-2253	R73	22K "	002-2034	C79	.02 MFD, 1000V "
110-4733	R74	470 "	001-7524	C80	750pf, 500V, "
110-8253	R75	82K "	031-1043	C81	.01 MFD, 100V, MYLAR "
110-2263	R76	220K "	031-2243	C82	.02 " 200V "
110-1063	R77	10K "	030-4743	C83	.047 " 100V "
110-4743	R78	47K "	210-4248	Q11	2N4248 TRANSISTOR
110-6843	R79	6.8K "	210-4248	Q12	2N4248 "
110-1553	R80	15K "	210-4248	Q13	2N4248 "
110-1063	R81	10K "	210-4248	Q14	2N4248 "
110-1053	R82	10K "	364-0103	L2	CHOKE
110-4733	R83	470 "	440-0807		STANDOFF, SWAGE (I)
175-2044	R84	2.0K "	510-0060		P. C. BOARD (RA-8)
175-2054	R85	20K "			
110-1243	R86	1.2K "			
014-3274	C66	32 MFD, 40V, ELEC CAPACITOR			
015-5064	C67	5 OR 4.7 MFD, 35V "			
014-3274	C68	32 " 40V, "			
014-3274	C69	32 " 40V, "			
014-3274	C70	32 " 40V, "			



RA-8T

BROADCAST ELECTRONICS INC - A FILMWAYS COMPANY -	
RECORD AMP BOARD	REV B
PART NO. B-910-0060	910-0060
DRAWN 7/13/76	CHECKED
APPROVED MIA	7/1/74



COMPONENT LAYOUT
 SPOTMASTER COMPACT MODELS
 500C & 505C

BROADCAST ELECTRONICS
 SILVER SPRING, MARYLAND
 C-900-0500 & C-900-0505

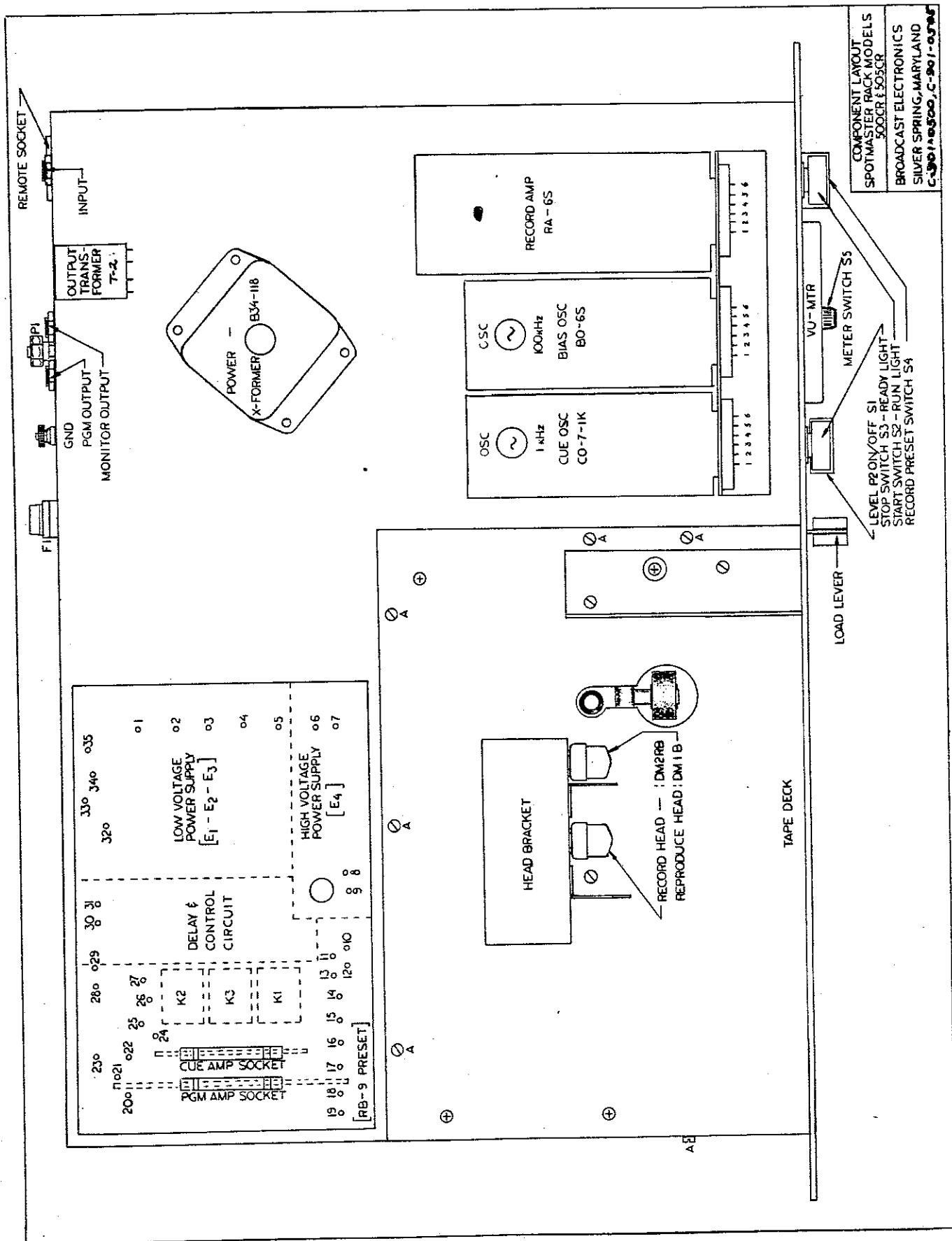


TABLE OF TYPICAL VOLTAGES
SPOTMASTER MODELS 500C & 505C

		Emitter	Base	Collector
PROGRAM AMPLIFIER				
Q1	2N4248	- .1	- .65	- 5.5
Q2	2N4248	- .32	- .94	- 6.5
Q3	2N4248	- .40	- 1.0	- 7.2
Q4	2N3644	-16.5	-17.0	-24.0
CUE TONE AMPLIFIER 1000Hz				
Q5	2N4248	0	- .62	- 5.0
Q6	2N4248	0	- .66	- 2.7
Q7	2N4248	0	- .64	- 1.5
Q8	2N3644	0	- .06	- 9.0
DELAY CIRCUIT-RUN MODE				
Q1	2N3644	0	0	-32.0
DELAY CIRCUIT-STOP MODE				
Q1	2N3644	0	- .75	- .04
RECORD AMPLIFIER (500C)				
Q11	2N4248	- .6	- 1.2	-10
Q12	2N4248	- 2.2	- 2.9	- 9.0
Q13	2N4248	- 2.4	- 6.0	-27.0
Q14	2N4248	- .04	- 1.0	-12.5
CUE TONE OSCILLATOR & CUE HEAD DRIVER (500C)				
Q17	2N3644	- 1.5	- 1.3	-17.0
Q18	2N3644	- 1.0	- 1.5	-14.0
BIAS OSCILLATOR (500C)				
Q1	2N3644	- .34	+ .6	-20.0
Q2	2N3644	- .35	+ .59	-20.0

POWER SUPPLY

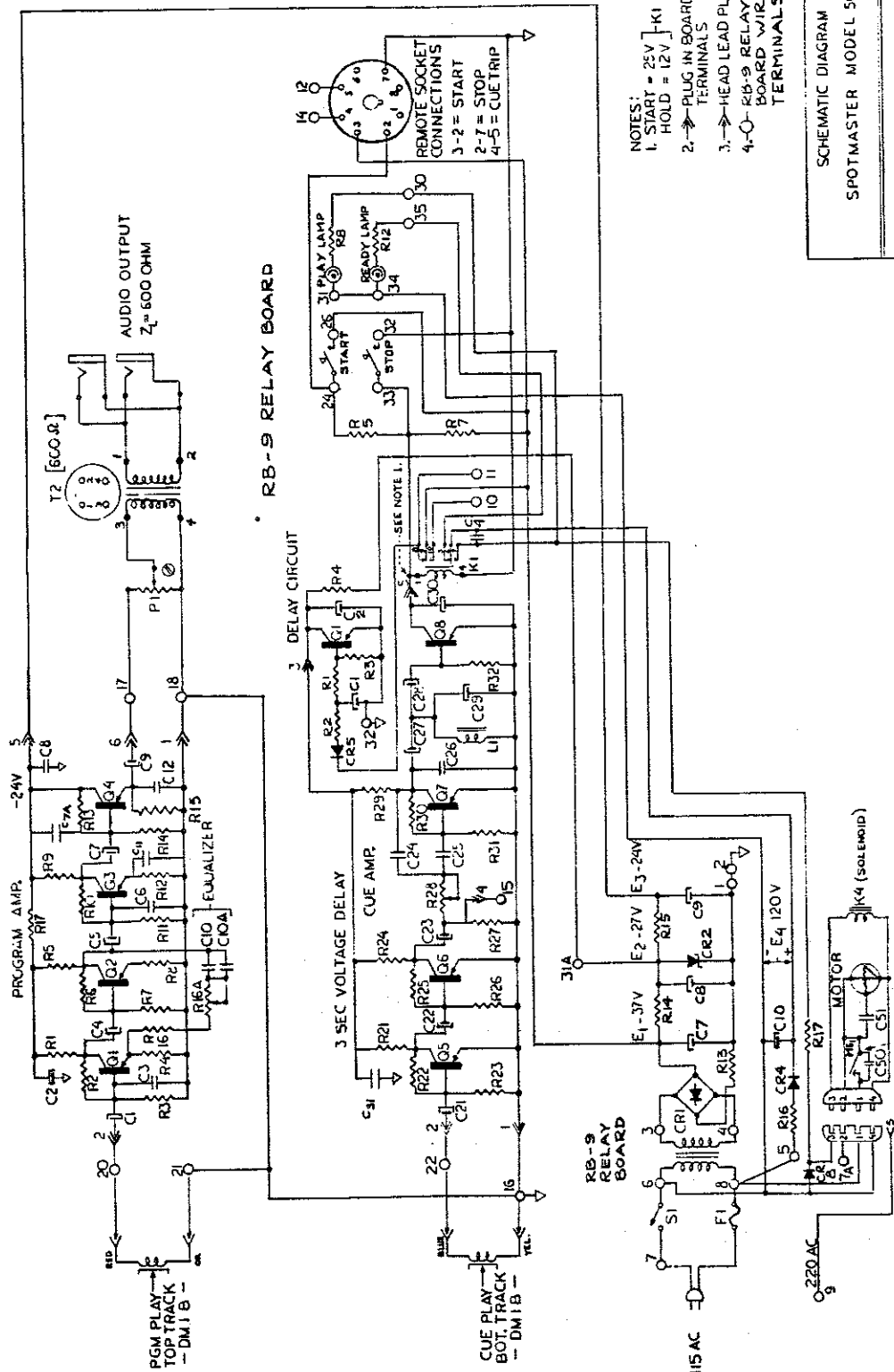
E_1	E_2	E_3	$*E_4$	$E_{ac} (T_1 \text{ secondary})$
-37 vdc	-27 vdc	-24 vdc	+120 vdc	32 vac

* Measure E_4 across C10, solenoid energized

All DC voltages negative with respect to chassis ground unless otherwise noted

Measurements made using 20,000 Ω per volt with SPOTMASTER equipment in RUN mode unless otherwise noted.

AC input to transformer (T_1 primary) = 115 vac



- NOTES:
- 1. START = 25V [K1 HOLD = 12V]
 - 2. → PLUG IN BOARD TERMINALS
 - 3. → HEAD LEAD PLUG
 - 4. ○ RB-9 RELAY BOARD WIRING TERMINALS

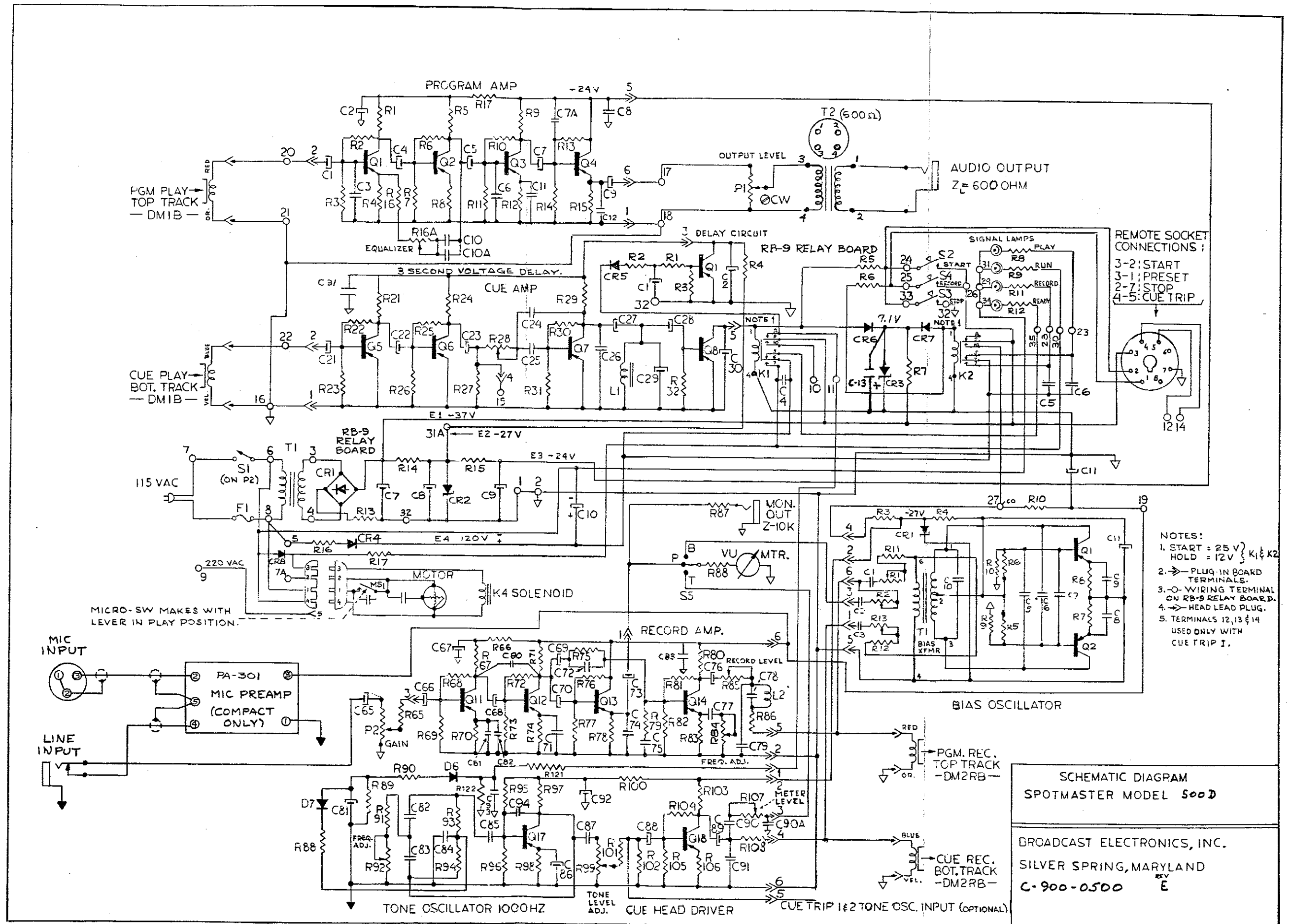
SCHEMATIC DIAGRAM

SPOTMASTER MODEL 505C

BROADCAST ELECTRONICS, INC.
SILVER SPRING, MARYLAND
C-900-0505

RELAY BOARD GRID TERMINALS 1, 2, 16, 19, 21, 32.
NO. CONNECTION TERMINALS 19, 23, 25, 21, 28, 29.
TERMINALS 12, 13, 14 USED ONLY WITH OPTIONAL CUE TRIP 1.

MICRO-SW. MAKES WITH LEVEL IN PLATE POSITION



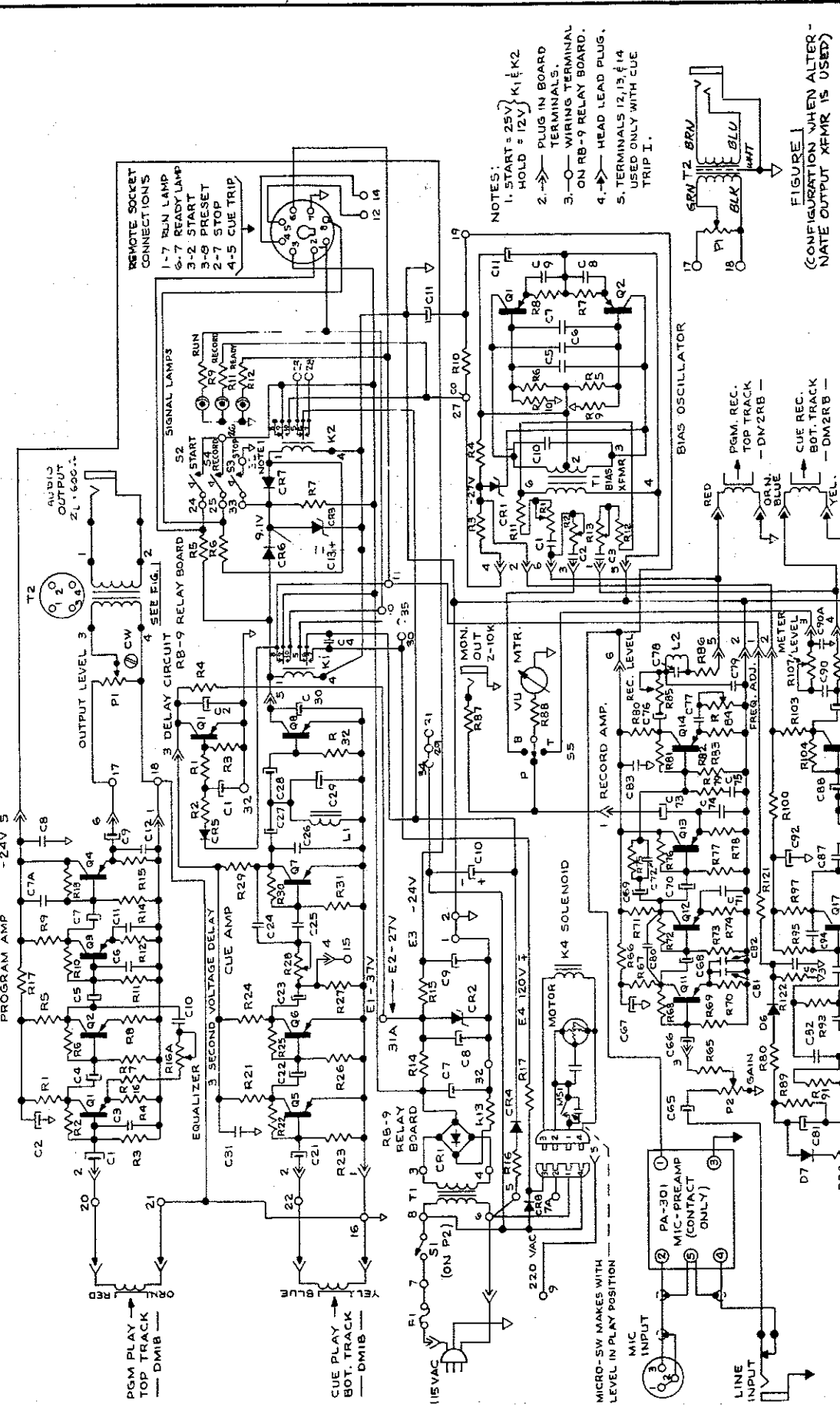
REMOTE SOCKET CONNECTIONS:
 3-2: START
 3-1: PRESET
 2-7: STOP
 4-5: CUE TRIP

- NOTES:
1. START = 25 V } K1 & K2
 HOLD = 12 V
 2. → PLUG-IN BOARD TERMINALS.
 3. ○ WIRING TERMINAL ON RB-9 RELAY BOARD.
 4. → HEAD LEAD PLUG.
 5. TERMINALS 12, 13 & 14 USED ONLY WITH CUE TRIP J.

SCHMATIC DIAGRAM
 SPOTMASTER MODEL 500D

BROADCAST ELECTRONICS, INC.
 SILVER SPRING, MARYLAND
 C-900-0500
 REV E

REV	DESCRIPTION	DATE	APPROVED
C	REDRAWN FOR MANUAL	10/29/76	
D	ECN 899	10/29/76	



- NOTES:
- 1- START = 25V HOLD = 12V K1 & K2
 - 2- PLUG IN BOARD TERMINALS.
 - 3- WIRING TERMINAL ON RB-9 RELAY BOARD.
 - 4- HEAD LEAD BOARD.
 - 5- TERMINALS 12, 13 & 14 USED ONLY WITH CUE TRIP I.

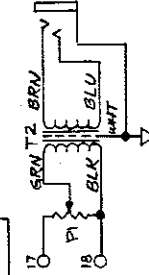


FIGURE 1
(CONFIGURATION WHEN ALTERNATE OUTPUT XFMR IS USED)

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

LIST OF MATERIAL	
DESIGN NO.	DATE
BROADCAST ELECTRONICS INC.	10/29/76
-A FILMWAYS COMPANY-	
TITLE	PROJECT
SPOTMASTER MODEL 500D	70
REV	APPROVED BY
D	
SCALE	TREATMENT OR FINISH
5000	
SHEET 1	OF 1

FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL ONLY. ALL RIGHTS RESERVED.

REV	DESCRIPTION	DATE	APPROVED
A	REDRAWN FOR MANUAL	11-25-76	[Signature]
B	ECN 899	11-30-76	[Signature]
C	ECN 913	1-10-77	[Signature]

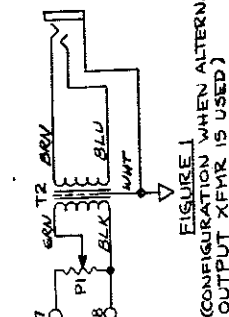
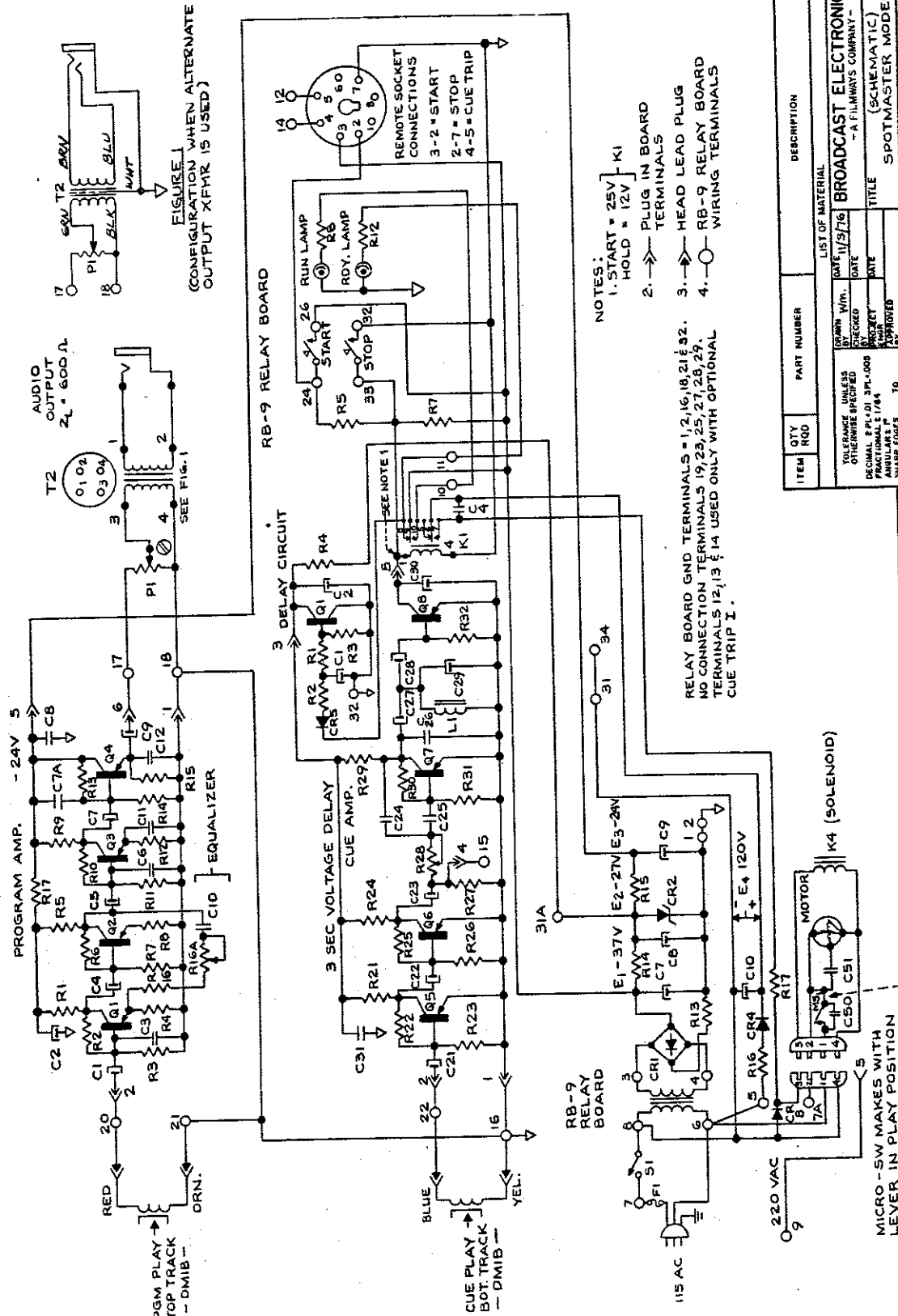


FIGURE 1
(CONFIGURATION WHEN ALTERNATE
OUTPUT XFMR IS USED)

- NOTES:
1. START = 25V
HOLD = 12V } K1
 2. → PLUG IN BOARD
TERMINALS
 3. → HEAD LEAD PLUG
 4. ○ RB-9 RELAY BOARD
WIRING TERMINALS

RELAY BOARD GND TERMINALS = 1,2,16,18,21,32.
NO CONNECTION TERMINALS 19,23,25,27,28,29.
TERMINALS 12,13 & 14 USED ONLY WITH OPTIONAL
CUE TRIP I.

MICRO-SW MAKES WITH
LEVER IN PLAY POSITION

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BROADCAST ELECTRONICS, INC.
MEMPHIS, TENNESSEE
ALL RIGHTS RESERVED

ITEM	QTY	ROD	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL					
TOLERANCE UNLESS OTHERWISE SPECIFIED		DATE 11/9/76	BROADCAST ELECTRONICS INC.		
DECIMAL FRACTIONS	BY	DATE	"A FILMWAYS COMPANY"		
ANGULARS	BY	DATE	TITLE (SCHEMATIC)		
SHARP EDGES TO BE INDICATED	BY	DATE	SPOTMASTER MODEL 505D		
MATERIAL	TREATMENT OR FINISH	SCALE	DWG NO 940-0508		
			REV C		
			SHEET 1 OF 1		

PRODUCT WARRANTY

LIMITED ONE YEAR

While this warranty gives you specific legal rights, which terminate one (1) year (6 months on turntable motors) from the date of shipment, you may also have other rights which vary from state to state.

Broadcast Electronics, Inc. ("BE"), 4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305, hereby warrants cartridge machines, consoles, transmitters and other new Equipment manufactured by BE against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year (6 months for turntable motors) from the date of shipment. Other manufacturers' Equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BE's sole responsibility with respect to any Equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BE's factory or authorized repair depot within the period aforesaid.

In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement. However, the warranty period will be extended for the length of time that the original user is without the services of the Equipment due to its being serviced pursuant to this warranty. The terms of the foregoing warranty shall be null and void if the Equipment has been altered or repaired without specific written authorization of BE, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in BE's product literature or instruction manual which accompany the Equipment purchased. BE shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of BE.

BE shall not be liable to the original user for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, 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. All express and implied warranties shall terminate at the conclusion of the period set forth herein.

Except as set forth herein, and except as to title, there are no warranties, or any affirmations of fact or promises by BE, with reference to the Equipment, or to merchantability, fitness for a particular application, signal coverage, infringement, or otherwise, which extend beyond the description of the Equipment in BE's product literature or instruction manual which accompany the Equipment. Any card which is enclosed with the Equipment will be used by BE for survey purposes only.

BROADCAST ELECTRONICS, INC.
4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305

