INSTRUCTION MANUAL

MODEL PBR-30A

REMOTE CONTROL SYSTEM

MOSELEY ASSOCIATES, INC.

SANTA BARBARA RESEARCH PARK

GOLETA, CALIFORNIA 93017

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Santa Barbara Research Park
111 Castilian Drive
Goleta, California 93017

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TABLE OF CONTENTS

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I. INTRODUCTION

The Model PBR-30A Remote Control System was designed specifically to remotely control television, FM, and standard broadcast transmitters. A total of 30 metering channels and 30 Raise/On and 30 Lower/Off control functions are provided by the system which requires only a single full-duplex telephone connection or similar full-time, two-way, communications-grade radio link. Control signals are sent to the transmitter in the form of audio tones. One of these is used to control the position of the stepping switch, and two are used to activate the Raise/On and Lower/Off circuitry. The stepping switch distributes the Raise and Lower outputs to a set of terminals on the rear of the Transmitter Unit and simultaneously selects a metering sample. The metering signals are returned from the transmitter to the studio in either the audible or subaudible spectrum.

Access to internal components is excellent. The mechanical design concept enables component testing, adjustment, and replacement to be accomplished with ease. The full-width, swing-away door on the Studio Unit provides full access from the front. The Transmitter Unit has both front and rear swing-down doors. All circuit modules are plug-in, and all transistors are socketed. All large capacitors except the computer-grade power supply filters are tantalum. The system functions well under wide temperature variations and other environmental extremes.

The PBR-30A is available in two basic versions: the PBR-30AW intended for wire-line service, and the PBR-30AR intended for radio (wireless) service. The PBR-30AR consists basically of the PBR-30AW with added plug-in subcarrier boards for simple interfacing with STL and radio receiving equipment. The PBR-30A is factory wired for either of the two basic operating modes.

II. SPECIFICATIONS

Number of Metering Channels	30
Number of Control Channels	30 Raise/On and 30 Lower/Off
Metering System Input	Approximately 1 VDC for full-scale studio meter deflection. Nominal 20K resistive floating input insulated for 350 VDC.
Calibration Controls	Multiturn potentiometers
Calibration Voltage Source	Internal Zener diode
Metering Stability	With weekly checks, better than 1%
Studio-to-transmitter Interconnection Requirements PBR-30AW	Ordinary telephone circuit, full-time two-way or any other voice-grade communications link.
PBR-30AR	Plug-in or external control sub-carrier generators and detectors for STL (radio) service, typical 26 kHz and 110 kHz
Telephone Circuit Impedance	600 Ω
Telephone Circuit Levels	0 dBm (1 milliwatt) maximum
Allowable Circuit Loss	20 dB
Radio Link Impedances	2 kΩ nominal
Radio Link Levels	0.5 volt rms
Subcarrier Frequencies (PBR-30AR)	26 kHz or 110 kHz nominal
Semiconductor Devices	All silicon diodes, integrated circuits and JEDEC-registered transistors
Duty Cycle	Continuous
System Temperature Range	-10°F to 140°F
Power Requirements	20 watts average, 40 watts peak at transmitter; 20 watts at studio
19" Vertical Rack Space	8-3/4" - Transmitter Unit 10-1/2" - Studio Unit
Domestic Shipping Weight	60 lbs.
Available Metering Options	Audible (amplitude modulated 1280 Hz) or subaudible (20-30 Hz) metering return; Plug-in SCA subcarrier generators for FM and TV transmitters.

III. GENERAL DESCRIPTION (WIRE SYSTEM - PBR-30AW)

A. Control

The PBR-30A first will be discussed interconnected as a wire system (PBR-30AW). In this mode of operation the unit is designated as the PBR-30AW, and any two-way communications-grade telephone circuit can be used to interconnect the two units.

Considering the control portion first, a 920 Hz audio tone is sent from the Studio Unit (SU) to the Transmitter Unit (TU) at all times. This tone is keyed off briefly to advance the stepping switch. The number of positions the stepping switch advances is equal to the number of these brief interruptions. If the tone is keyed off for a half-second or longer, the stepping switch will seek its home or Calibrate position. The aforementioned interruptions are generated by the integrated circuitry located in the Studio Unit (SU) and are controlled by the buttons located on the front panel of the unit. The short interruptions are generated by a 10 Hz oscillator while the longer half-second interruptions are generated by a reset circuit. Of interest at this point is that failure of this 920 Hz tone to be generated at the studio or to be received at the transmitter site will cause a fail-safe relay in the Transmitter Unit (TU) to become de-energized. The contacts of this relay can be used to remove the transmitter from the air in accordance with FCC regulations.

The stepping switch selects which voltage sample in the transmitter is to be returned to the studio for metering purposes. It also selects which terminals on the rear of the PBR-30A TU are to be energized for control purposes. Each position of the stepper switch selects a metering sample, a Raise output, and a Lower output. These Raise and Lower outputs are not actually energized until either the Raise or Lower relay in the Transmitter Unit is energized. These relays are energized one at a time when either the RAISE or LOWER button at the studio is depressed. Depressing one of these buttons adds a second tone (670 Hz for Lower, 790 Hz for Raise) to the 920 Hz tone already going to the transmitter. Each button controls one oscillator, and since only one button at a time may be depressed, only one tone at a time may be added on to the normally present control tone going to the transmitter. No more than two tones are sent to the transmitter site at the same time. It should be noted that Raise and Lower signals may not be sent when the stepper switch is being advanced. The control tone actuating the stepper switch and fail-safe relay is keyed electronically, and the Raise and Lower tones are keyed manually.

B. Metering

It was mentioned that one pair of decks on the stepper switch selects a metering sample to be applied to the electronics in the PBR-30A Transmitter Unit (TU). This metering sample, normally in the 1 VDC range, is applied through gold-plated contacts on the stepper switch to a DC amplifier and then to a voltage-controlled oscillator. With no signal applied, this oscillator operates at a frequency of approximately 80 Hz. As the sample voltage increases to 1 volt, the oscillator frequency is shifted upward to 120 Hz. It is then counted down in an integrated circuit to a range of 20 Hz to 30 Hz. The reason for this counting process is twofold; one is to enable the use of reasonably-sized, high stability components in the oscillator, and the second is to eliminate any second-harmonic component in the metering signal. This is of importance in some methods of telemetry. In the wire system, however, the 20 Hz to 30 Hz signal is merely used to modulate a 1280 Hz carrier which is then sent back to the studio. Here it is detected and converted back to the original 20 Hz to 30 Hz tone. Application to a pulse-counting demodulator enables recovery of a current proportional to the original 0 to 1 volt sample. The frequency of the metering oscillator was proportional to the sample voltage; now the meter deflection is proportional to the oscillator frequency. The overall telemetry system is remarkably linear.

C. Radio and Other Options - PBR-30AR

The preceeding discussion concerned the operation of the PBR-30A when the two units are interconnected with an ordinary telephone line. Should radio remote control be used, certain options are available which allow the user to easily bypass the facilities of the telephone company. The first such option to be considered is the use of a subcarrier on a Studio-Transmitter Link (STL) to convey the control tones from the studio site to the transmitter site. This, in itself, offers some relief from wire line unreliability. The subcarrier may be external, or preferably it should consist of a set of plug-in modules available as part of a radio remote control package available from Moseley Associates, Inc. In either case, the subcarrier generator is frequency modulated by the summed control tones and delivers a subcarrier signal to the microwave Studio-Transmitter Link. The STL then conveys the subcarrier, containing control information, to the transmitter site. The subcarrier demodulator in the PBR-30AR TU consists of two boards; one a bandpass filter to extract the control subcarrier from the output of the STL receiver, and a second containing the actual subcarrier demodulator. The output of this demodulator is a replica of the control signal(s) sent from the Studio Unit.

Metering is returned, in the case of the radio systems, via a subcarrier on the FM broadcast or television transmitter. In the case of standard broadcast transmitters, the metering tones are shifted to 20 Hz to 30 Hz and are applied to the transmitter with the Moseley Associates, Inc., Model MIU-1 Metering Insertion Unit. In all of these applications, the metering signal is sinusoidalized (filtered) and used intact. In the case of FM and TV transmitters, the signal is used to modulate an SCA subcarrier. In the case of AM, the signal is used to modulate the main carrier directly at a level of 5% to 6%. In FM and TV, either an internal or an external subcarrier generator may be used. The internal subcarrier generator does not have facilities for the addition of programming, nor does it have facilities for muting. The metering signal is received at the studio with an appropriate receiver, and the subaudible telemetry signal is extracted and directly demodulated to operate the studio metering system.

IV. PRE-INSTALLATION CHECKOUT

Upon removing the units from the shipping cartons, they should be visually inspected for damage incurred during transit. One Studio Unit and one Transmitter Unit, each with an extension printed circuit board, and two instruction manuals are shipped with each system as standard items. The units should be checked out using the telephone line terminals if they are intended for wire line service, or they should be interconnected with short jumper coaxial cables with Type BNC connectors if the control system is for radio link service. With power applied to each unit, all operations should be confirmed. Operating the RECYCLE button on the Studio Unit should cause the stepper to cycle itself first to home and then on to whatever channel has been selected by the push-button assembly. Pressing the CALIBRATE bar will also cause the stepper to proceed directly to the home position. Pressing a given numbered button will cause the stepper to advance to that position. Pressing the RAISE or LOWER buttons on the Studio Unit will cause the corresponding relays in the Transmitter Unit to operate. Turning off the power on the Studio Unit or otherwise disabling the system should cause the transmitter fail-safe relay to de-energize after about 20 seconds.

When the stepping switch is at the home or Calibrate position, its gold-plated metering decks will select an internally regulated reference calibrating voltage. This is normally used to cause half-scale deflection on the first (left-hand) meter. Observe the two-point calibrating procedure. Pressing the LOWER button will remove the calibrating voltage, causing the meter to go to zero deflection. Adjust the ZERO control until the meter reads zero. Release the LOWER button. Adjust the CALIBRATE control until the meter reads midscale. Since these two controls tend to interact to some extent, this procedure may have to be repeated. Normally, the CALIBRATE control will need only occasional adjustment, perhaps weekly, and the only daily adjustment which may be required will be the ZERO adjustment.

Shorting to ground any of the ALARM terminals on the rear of the Transmitter Unit should cause the metering signal to be momentarily keyed off, and this in turn will cause the ALARM lamp on the Studio Unit to come on. Pressing the ALARM RESET button on the Studio Unit should then extinguish this lamp. It should be noted that the ALARM lamp may turn on when the power is first applied to the unit.

Pressing the LOCAL button on the Transmitter Unit will remove all control from the Studio Unit. All control can then be accomplished at the transmitter. Pressing the STEPPER button briefly will now advance the stepper one step. Doing this repeatedly will advance the stepper as many steps as the button is depressed. Holding the STEPPER button down for about half a second will cause the stepper to home.

It is advisable at this time to have all personnel concerned with the operation of this equipment become familiar with the units while they are operating in this manner.

V. INSTALLATION

The only connections required at the studio end of the system are connections to the power source and either the telephone line or the STL (radio) equipment. The Transmitter Unit requires these same connections plus connections to the control and metering circuits. Notice that the control power outputs are active only when the proper (RAISE or LOWER) relays are energized. The actual output will be a contact closure between the appropriate (RAISE or LOWER) terminals on the rear of the Transmitter Unit corresponding to the position of the stepper switch. See drawing 91A-6362.

To prolong the life of the stepper switch, the current passing through these contacts should be kept as low as possible. Use external repeating relays if the load will exceed 50 watts or 1 ampere, or if it is significantly inductive.

The metering input samples should supply 1 VDC or more. Either side of this sample may be grounded, or neither, should that be desired. The metering input system on the PBR-30A is floating. The telemetry or remote metering samples can be derived from most older transmitters with little trouble, and most modern transmitters have the sampling points built in. With the addition of the proper Moseley Associates, Inc. metering kits, older transmitters can be easily monitored. A typical voltage to be measured via the metering circuit in the PBR-30A System might be power amplifier plate voltage. The usual method of sampling this voltage is to step it down (with a resistive voltage divider) from its normal value in the kilovolt range to a more convenient value of 3 VDC to 5 VDC and then connect it to an appropriate metering terminal of the PBR-30A Transmitter Unit. The point to remember is that the voltage or current to be measured must first be converted to a voltage of 3 VDC to 5 VDC. This signal is then fed into the metering input terminal selected on the rear of the Transmitter Unit of the PBR-30A. In effect, the studio meters of the PBR-30A are connected to the transmitter through a metering system which can operationally be disregarded at this time. Merely select from the studio the signal to be monitored, and the studio meter will give a replica of the transmitter reading.

At the Transmitter Unit, the FAIL-SAFE terminals should be inserted in series with the rear door interlock system or other control circuitry in the transmitter in order that the transmitter will go off the air in the event that the control system fails. When two or more transmitters are controlled by the PBR-30A, external fail-safe repeating relays should be used.

VI. DETAILED CIRCUIT DESCRIPTION

A. Control Circuitry

In the following discussion, occasional reference to the appropriate main frame schematic will be helpful in understanding the PBR-30A operation.

The basic control circuit of the PBR-30A involves the continuous transmission from the studio to the transmitter of a 920 Hz audible tone. The oscillator which generates this tone is located on Board 7 in the Studio Unit, as shown in schematic drawing 91B-6307.

The oscillator utilizes transistor Q-703 in a bridged-T RLC configuration. Components are selected for stable operation at the chosen frequency of 920 Hz, with a secondary winding on the inductor to provide an output for subsequent summing with other tones on another board.

If the base of transistor Q-703 is held at ground potential, the circuit will not oscillate. Note the keying input at Pin 19 of this board (Board 7). This point is normally positive, causing Q-701 to conduct. This places the base of Q-702 near ground, and it does not conduct, thereby allowing oscillation. Should the keying input drop to near ground, Q-701 will not conduct, Q-702 will conduct, and oscillation will stop. This is the method of keying the oscillator. The keying signal enters Board 7 from Board 4.

For maintenance purposes, notice that orange TP-701 and yellow TP-702 are both normally positive. Under this condition the control circuit is oscillating, and green TP-703 shows the oscillator output as delivered to Pin 5 and ultimately to the summing amplifier on Board 9.

The output of the control oscillator appears at Board 7, Pin 5. It is routed by printed circuitry to the input of the summing amplifier, Board 9, Pin 20. (See schematic 91B-6309.) Here it is summed, along with other tones which will be discussed later, for subsequent application to either a telephone line or a subcarrier generator. For the moment a wire-line system (telephone interconnection) will be assumed. The summing or output amplifier uses Q-901 as a voltage amplifier and Q-902 as a power amplifier. The output appears at Pin 14. White TP-901 will confirm satisfactory operation of the summing amplifier. The output of this board is delivered to the telephone line matching transformer and then is connected to the line terminals.

At the transmitter site, the signal from the telephone line is delivered to a 1 kHz low-pass filter and then to an input limiting amplifier, Board 17 (schematic 91B-6317). The circuitry around Q-1701 forms a limiter enabling the incoming control tone to be extracted in the following circuitry in the presence of impulse noise. The input to this limiter is available for oscilloscopic observation at the orange TP-1701, and the output of the limiter is observable at yellow TP-1702. The output of the limiter appears at Board 17, Pin 13.

The remaining circuitry on this board will be discussed later in the manual.

B. Stepper Logic and Drive

Reference is made in the following material to schematics 91B-6320, 91B-6321, and 92A-1024. The limiter output from Board 17 is fed to the Stepper Control A, Board 20, Pin 13.

The amplitude-limited control tone is applied to a 920 Hz tone detector using a circuit similar to that used to generate the tone. This circuit uses Q-2001 in a regenerative configuration, with R-2004 as a regeneration control and C-2001 as a tuning control. Q-2002 provides buffering and power amplification to drive the voltage-doubling rectifier with diodes CR-2001 and CR-2002. The signal is smoothed and applied to a Schmitt level detector using Q-2003 and Q-2004.

Now refer to drawing 92A-1024 which shows this area of the PBR-30A. The tone detector under discussion is shown at the left of the schematic, and all circuitry mentioned is shown in the "920 Hz Tone Detector" block. The output signal from this block is positive (about 3 VDC) when the tone is present, and zero when the tone is absent (during pulsing, homing, or system failure). It is fed to the Schmitt level detector, using Q-2003 and Q-2004. These transistors and associated components deliver a strong positive signal (about 12 VDC) when the tone is above a certain level and a low-level signal (about 1 VDC) when the tone is below the critical level. There is no middle ground; this is a so-called trigger circuit. Its output leaves Board 20 at Pin 10 and is passed on to a pulse-width detector using transistors Q-2005 and Q-2006. This circuit has a positive output (at Board 20, Pin 4) only when a "pulse" (missing tone or keyed-off tone) is present for 0.3 second or more. The output of this pulse-width detector is processed with transistors Q-2101 and Q-2102 on Board 21. The output of Q-2102 is near ground under normal conditions (920 Hz tone present) and about 12 volts positive when the pulse has been determined to be in excess of 0.3 second in width (home or fail-safe).

The output of the first Schmitt trigger, Q-2004, normally is positive but drops to ground when a stepping signal occurs. The output of the second Schmitt trigger, Q-2102, normally is at ground. When both of these signals are at ground and when neither Q-2004 nor Q-2102 delivers a positive signal, then the "NOR" gate using Q-2103 and Q-2104 delivers a positive signal output. This is passed on to CR-2102 and on to the power amplifier, using Q-2106 and Q-2107. The stepper is then actuated. This is the signal flow when the stepping switch is to be stepped one or more discrete steps at a time.

Consider now the action of the circuit when a reset or home signal (keying off of the 920 Hz tone for 0.5 second) is detected. The output of the Schmitt trigger Q-2004 drops to zero immediately, as if a "step" signal were being detected. Since the output of Schmitt trigger Q-2102 is at this instant near ground, both inputs of the NOR circuit, Q-2103 and Q-2104, are near ground, and it delivers a positive output to the stepper power amplifier. The stepper drive coil will be momentarily energized, and it will advance one step.

However, 0.3 second after this takes place, the pulse width detector Q-2006 delivers sufficient signal to energize Schmitt trigger Q-2101 and Q-2102. Q-2102 then applies a positive signal to the NOR circuit and prevents further discrete stepping action from taking place. The NOR circuit can deliver power to the stepper only if both inputs are near ground.

Q-2101 of the pulse width Schmitt circuitry normally delivers a positive output. Upon receipt of the long pulse (home or reset), it drops to near ground. This signal is inverted in Q-2105 so that the output of Q-2105 goes to about 12 volts when a reset signal is detected. This is routed through the homing and pulsing contacts on the stepper to the input of the OR circuit, using CR-2101. The stepper switch drive coil then pulses itself until it reaches the home position. At this time the homing contacts open up, removing drive to the OR circuit.

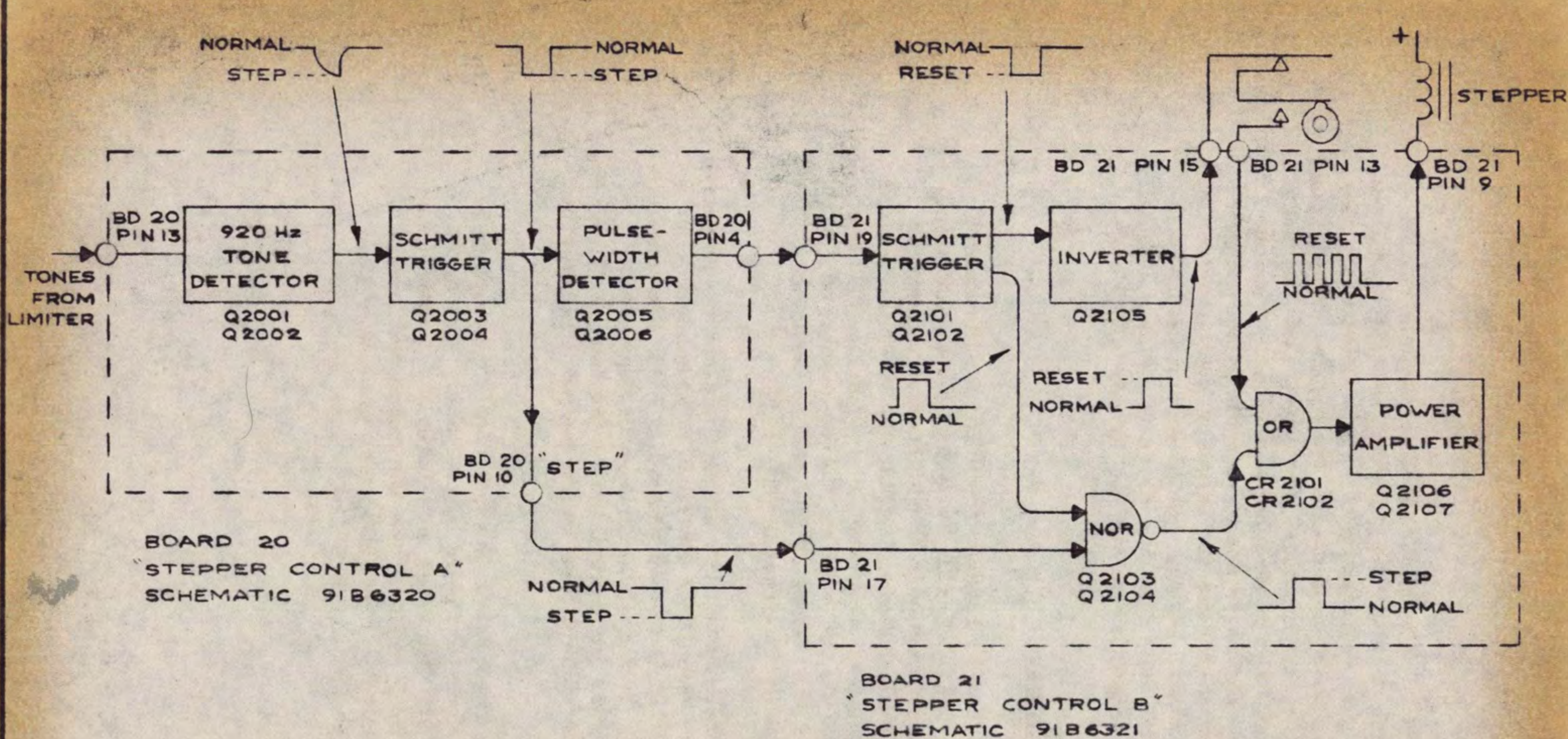
The type of circuit discussed is known in computer terminology as RTL (resistor-transistor logic), and it is reliable and rather elementary in its operation. However, should a failure occur somewhere in this system, it might be possible to apply power to the stepper switch drive coil continuously. To prevent this from happening, Capacitor C-2102 is used to AC couple the drive signals to the power amplifier. In this manner, the drive coil can not be energized continuously and so it is prevented from overheating. Another unique protective feature is the Zener diode and conventional diode-damping network across the stepping switch drive coil. This is shown on the schematic as the set of diodes CR-2104 through CR-2106. Finally, note that the drive transistor is easily capable of supplying the necessary power (in excess of 50 watts) to the drive coil.

C. Raise-Lower Generation

A pair of oscillators, each with circuitry similar to the control oscillator, is included in the PBR-30A System. These additional two oscillators are keyed on manually by depressing either the front panel RAISE or LOWER buttons. When one of these buttons is depressed, its corresponding oscillator is turned on. These two oscillators are located on the pair of boards numbered "BD 8" and are identical save for the values of the tuning capacitors. They are shown schematically in drawing 91B-6308.

To key on one of these oscillators, the emitter circuit is connected to ground. Schematically, Pin 20 of Board 8 is grounded, connecting the emitter circuit of Q-801 to ground. This allows the stage to oscillate. On the tuning inductor, as in the control oscillator, there is a winding for extraction of the tone. This signal is summed with the control tone in the output amplifier on Board 9.

Note again that there are two boards labeled "BD 8" and each is identical except for the values of tuning capacitors. One is to generate the Raise tone, and the other generates the Lower tone. They must be in their proper sockets, or the raise and lower functions will be interchanged. The Raise tone generator uses 0.047 μfarad tuning capacitors, and the Lower tone generator uses 0.068 μfarad capacitors.



RRC-10T PBR-30

REVISIONS	DATE
A REDRAWN FOR CLARITY.	7-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

BLOCK DIAGRAM
STEPPER CIRCUITRY

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	JAG	7-69	SCALE:
CHK			92A1024 A
ENG	JLT	7-69	

D. Raise Detection

Once the Raise, or Lower, and the Control tones are summed and sent to the transmitter site, they are all processed identically. The tones are applied to the limiter circuit, Board 17 in the Transmitter Unit. Refer to schematic 91B-6317. Transistor Q-1701 and associated circuitry accomplish limiting of the tone levels as previously discussed.

Also located on this board is the tone detector of the Raise channel. This detector, using transistors Q-1702 through Q-1705, operates in a manner strikingly similar to that of the control channel. The regenerative detector, buffer, and Schmitt trigger circuits are as discussed for the control channel. But, instead of driving logic circuitry for pulse-width detection and the like, the Schmitt is simply coupled to a relay-driving transistor, and the Raise relay is driven upon the receipt of a Raise tone.

E. Lower Detection

The output of the limiter on Board 17 is also applied to the input of the Lower detector on Board 18 (schematic 91B-6318). This detector is essentially a duplicate of the Raise detector except that the input limiter is eliminated.

F. Fail-safe

With reference to schematic 91B-6320, observe that the Schmitt trigger output from Q-2004 with the normal presence of the Control tone is positive. This voltage is routed to, among other places, the fail-safe circuitry located on Board 19. See schematic 91B-6319. The positive input is applied to Pin 20 of this board through diode CR-1901. Capacitor C-1901 quickly charges substantially to the full value of the input signal. It is then passed through the buffer amplifier Q-1901 to another Schmitt trigger used for level selection. The output of this circuit is positive when the control tone (used now for fail-safe purposes) is present. The positive signal is used to drive transistor Q-1904 and actuate the fail-safe relay.

Failure of the control system will result in a loss of the positive input to the fail-safe board, and capacitor C-1901 will slowly discharge through resistor R-1901. The voltage present across C-1901 is normally about 10 volts. When this has discharged down to about 1.5 volts, the fail-safe relay will be de-energized. This will then cause the transmitter to be removed from the air. The time lag between control system failure and transmitter shut down is about 20 seconds.

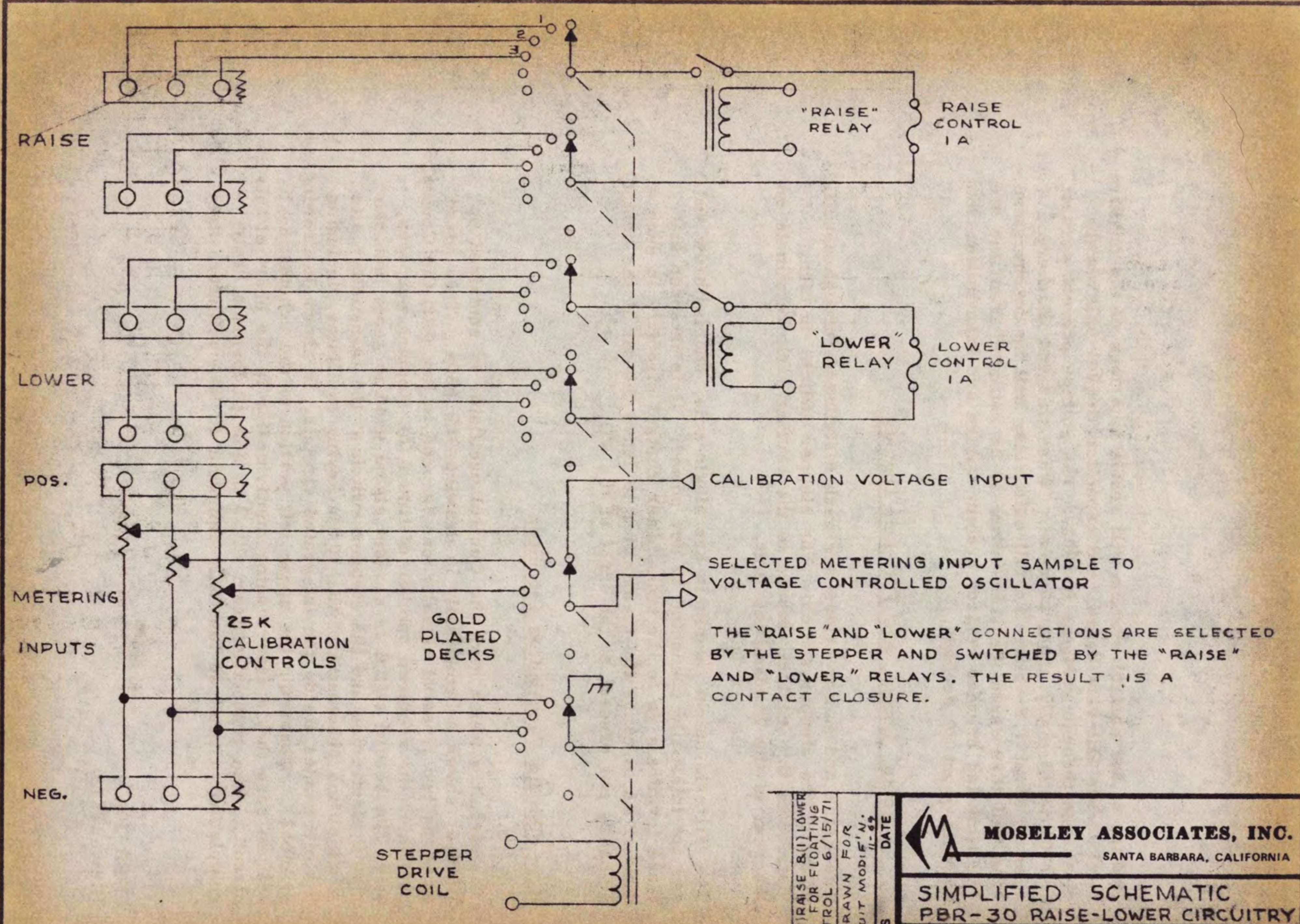
G. Raise, Lower, and Fail-safe Outputs

The Raise and Lower relays are each distributed through specific decks of the stepper switch. The stepper switch, in turn, distributes this contact closure to the barrier strip terminals on the rear of the Transmitter Unit.

The fail-safe output terminals are single-pole, double-throw and are not internally connected to any power. It is intended that these terminals go to the transmitter control circuitry in such a manner as to cause the transmitter to leave the air if the control signal is not present at the input of the TU.

H. Studio Push-button Circuitry

The circuitry which keys the Control oscillator is contained on Boad 4, shown schematically in drawing 91B-6304. This board develops two types of signals; one is used to key (off) the Control oscillator the required number of times for stepping purposes, while the second signal is a reset signal used to reset both the studio electronics and the stepper switch at the transmitter site. A simplified schematic of the 10 Hz keying oscillator, including the electronics inside the integrated circuits, is shown in drawing 91A-6327. Observing the upper left portion of the schematic, it will be seen that a free-running multivibrator is the heart of this circuit. The connection from Pin 3 to Pin 13 forms a "self-completing" circuit so that only complete 10 Hz oscillators are



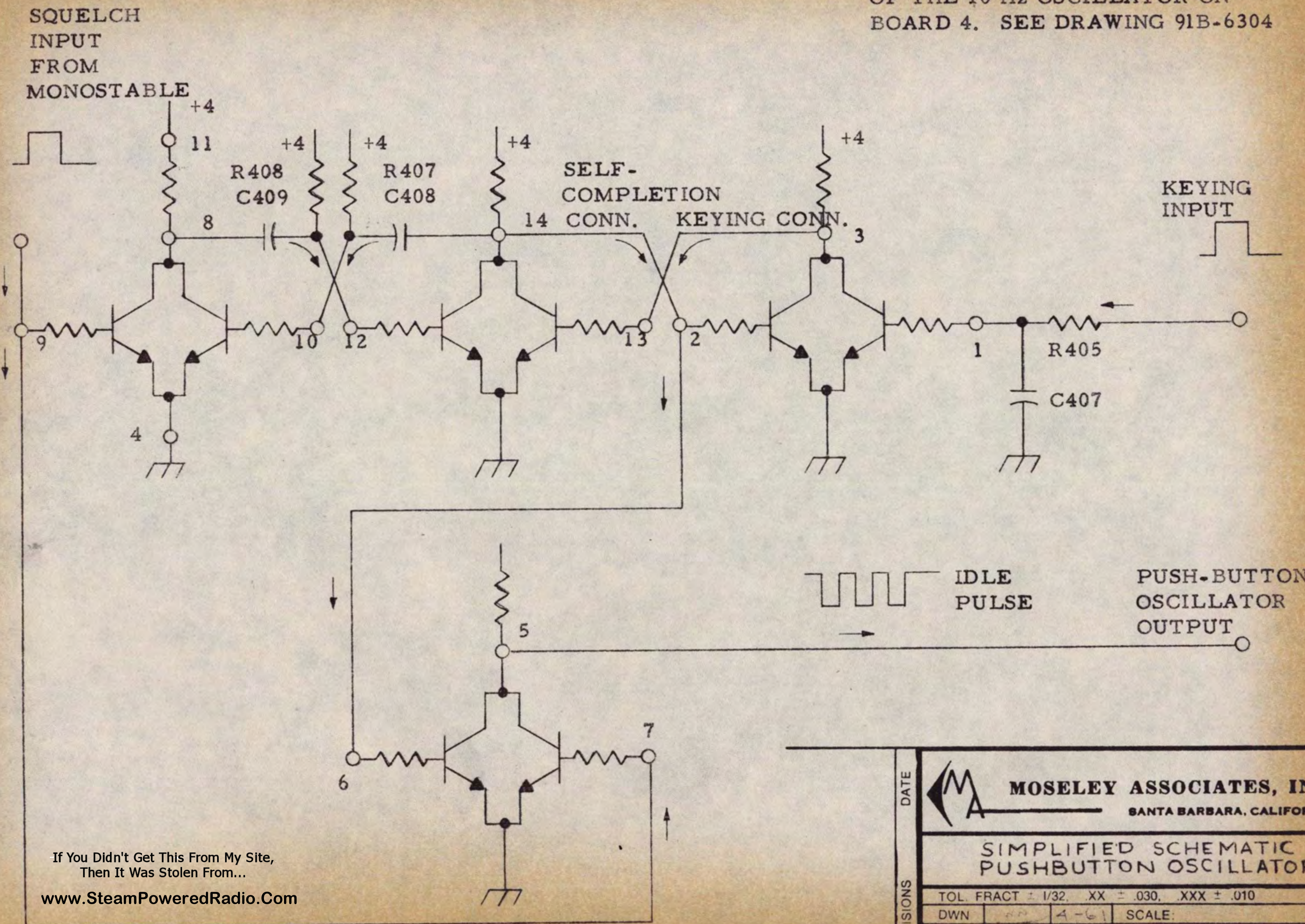
REVISIONS		DATE
B	ADD (1) RAISE & (1) LOWER DECK FOR FLOATING CONTROL	6/15/71
A	REDRAWN FOR CIRCUIT MODIF'N.	11-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SIMPLIFIED SCHEMATIC
PBR-30 RAISE-LOWER CIRCUITRY

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	JAG	11-69	SCALE: NONE
CHK	FXY	11/69	91A6362 B
ENG	JCT	11-69	

THIS DRAWING WILL ASSIST IN UNDERSTANDING THE OPERATION OF THE 10 Hz OSCILLATOR ON BOARD 4. SEE DRAWING 91B-6304



DATE	MOSELEY ASSOCIATES, INC. SANTA BARBARA, CALIFORNIA		
	SIMPLIFIED SCHEMATIC PUSHBUTTON OSCILLATOR		
REVISIONS	TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
	DWN	4-61	SCALE:
	CHK		91A6327
	ENG JCP	11-67	

developed. The input to Pin 6 and the resultant output from Pin 5 provide an isolated (buffered) output whose signal polarities are proper for operating the keyer on the 920 Hz Control generator board.

The input to Pin 9 at the left side of the schematic is a "muting" input. When this point is driven with a positive signal, the oscillator cannot function.

The input to Pin 1 at the right side of the schematic is a "keying" input. When this point is positive, the oscillator is allowed to function. The keying input signal is derived from a set of integrated circuits on another series of boards, and is positive if the button pushed does not agree with what the electronics has stored as the current stepper position. As soon as the electronics portion is in agreement with which button has been depressed, the keying signal is switched off, and the 10 Hz oscillations cease.

It was mentioned that Pin 9 of this integrated circuit was a "muting" input. When this point is driven positive, the oscillator cannot function. Further, the output buffer is also keyed into conduction. The positive pulse which accomplishes this is derived from a monostable multivibrator. This circuit when triggered any of three ways will generate a single pulse whose amplitude is sufficient to operate the "muting" circuits and whose time length is sufficient to allow all the studio electronics as well as the transmitter stepper switch to go to home position.

The monostable multivibrator can be triggered by pushing the RECYCLE button on the front panel, by pushing the CALIBRATE button, or by allowing the integrated circuitry on other boards to signal the end of the counting process.

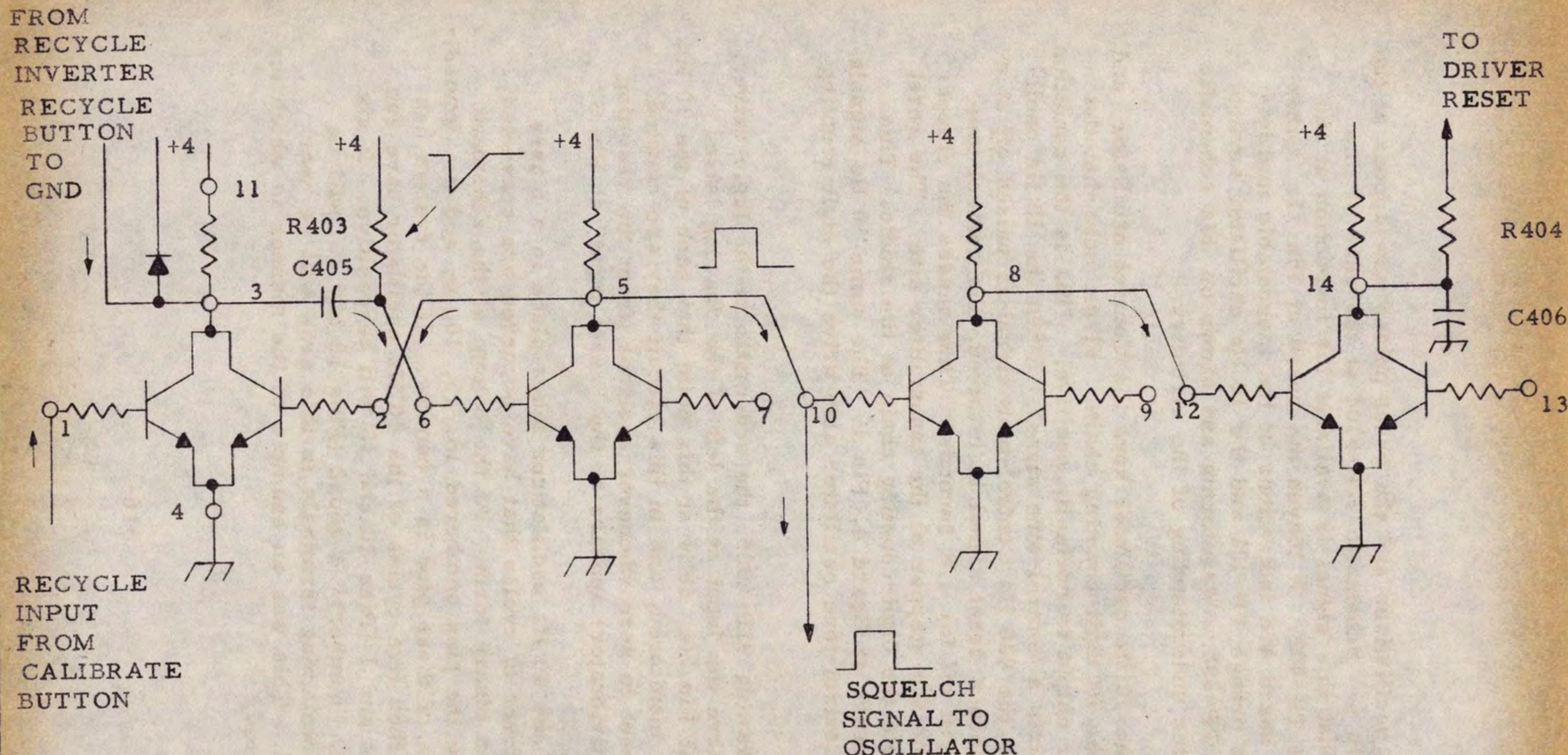
Examine drawing 91A-6328 which shows that the monostable multivibrator is triggered by pulling the collector at Pin 3 down to near ground. This is accomplished by applying power into Pin 1, by grounding Pin 3, or by grounding Pin 3 through a diode. This latter technique is the method by which the inbuilt electronic counter accomplishes the resetting of the system. Once this action has been started, the output pulse is applied to the remaining sections of this IC for buffering.

Both the 10 Hz oscillations and the reset pulses now appear at the oscillator IC Pin 5. Schematic 91B-6304 at the rear of this manual shows that this signal is available for inspection at the green test point TP-403. It leaves the board at Pin 11. Other signals on this board are indications of the monostable multivibrator output at orange TP-401 and the 10 Hz oscillator keying input at yellow TP-402. Waveforms are shown on this schematic to enable a better understanding of the circuitry.

The output of the 10 Hz oscillator keys the Control oscillator, and it also drives the IC digit-counting chain. First, note that the 10 Hz oscillator output is normally positive. This is the condition required to sustain a control-tone signal. When the 10 Hz oscillator is pulsing, the 920 Hz Control-tone signal is pulsed off at a 10 Hz rate. When a reset signal is involved, the control-tone oscillator is keyed off for 1.8 seconds. This causes the stepper circuitry to home the stepper at the transmitter site. The reset signal also resets the digit-counting chain at the studio. This reset signal appears at Board 4, Pin 1. The same 10 Hz signals that drive the Control-tone oscillator also drive the digit-counting chain.

Refer now to drawing 91B-6305, the schematic of the logic driver, Board 5. Observe the input at the left of the drawing labled "toggle input" at Pin 20. It is at this point that each of the 10 Hz oscillations are monitored, and in this circuit they are counted. The count is reset to zero whenever a signal (from the resetting monostable multivibrator) appears at the "reset input" at Pin 3.

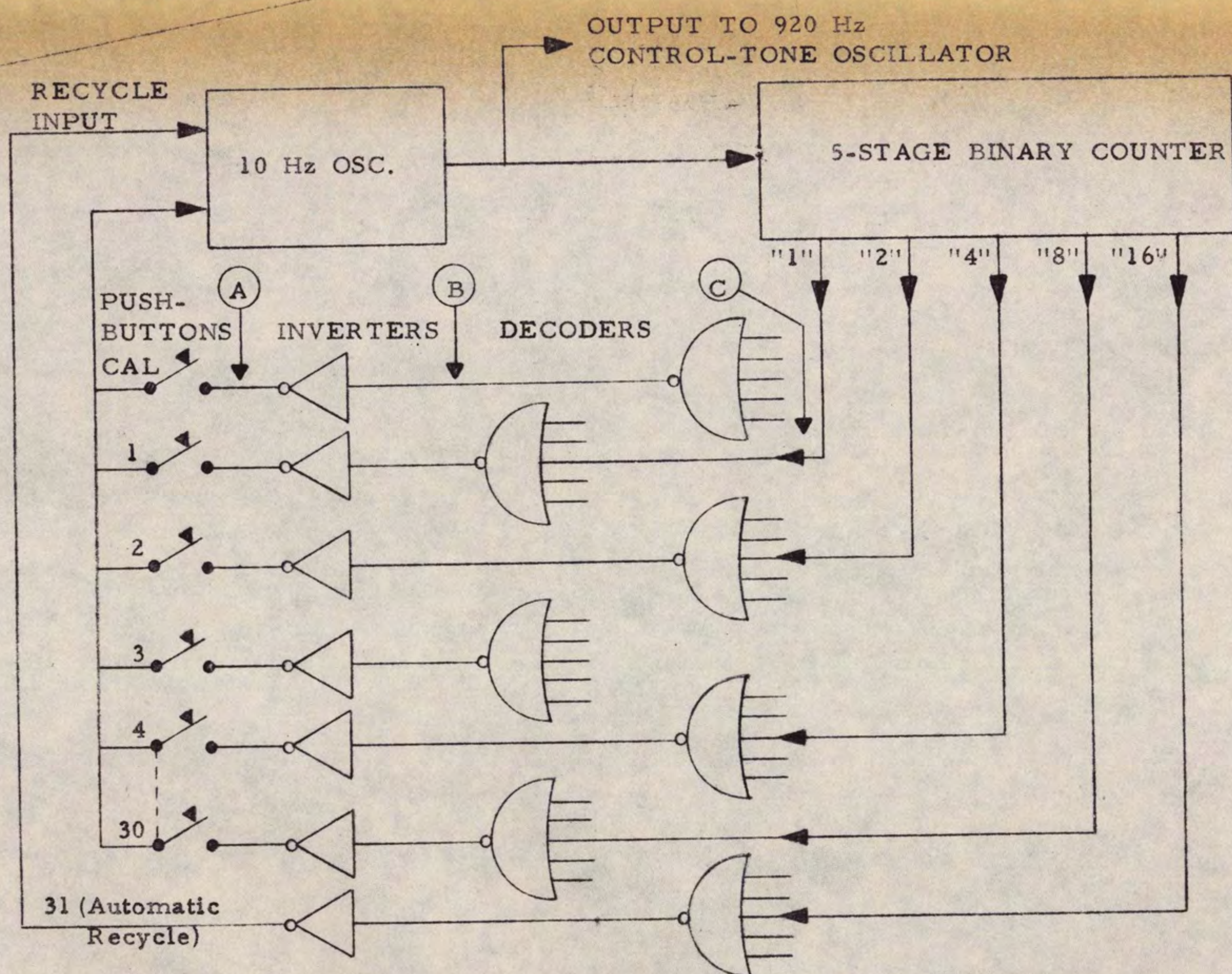
The counting of the 10 Hz oscillations takes place in a binary manner; the number of cycles that have occurred are converted immediately to a binary form. At the bottom of the schematic (91B-6305), note the pins numbered 18, 13, 10, 6, and 2. Immediately below each of these pins is a number. If the system has been reset and then five cycles of the 10 Hz oscillator have run, the "numbers" 4 and 1 (Pins 10 and 18) will be positive. If six cycles have run, "numbers" 4 and 2 (Pins 10 and 13) will be positive. The remaining terminals in this area will be near ground potential. This was an example of the manner in which the pulses are counted.



THIS DRAWING SHOWS THE DETAILS OF CIRCUITRY AROUND IC-401, SCHEMATIC 91B-6304, BOARD 4.
NUMBERS NEAR CIRCLES ARE INTEGRATED CIRCUIT PIN NUMBERS.

MOSELEY ASSOCIATES, INC. SANTA BARBARA, CALIFORNIA			
SIMPLIFIED SCHEMATIC RESET CIRCUIT			
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN		4-69	SCALE:
CHK			91A6328
ENG	JCT	11-69	

DATE
REVISIONS



Note: DECODERS ALL HAVE 5 INPUTS; FOR THIS REASON THE COMPLETE WIRING IS NOT SHOWN. SIMILARLY, ALL 31 PUSHBUTTONS ARE NOT SHOWN.

DATE	MOSELEY ASSOCIATES, INC. SANTA BARBARA, CALIFORNIA		
	SIMPLIFIED SCHEMATIC PUSHBUTTON LOGIC		
REVISIONS	TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
	DWN	4-69	SCALE:
	CHK JLP	4-69	91A6329
	ENG JLP	4-69	

These voltages or signals (at the bottom of drawing 91B-6305) are routed to a set of eight identical boards, each containing four decoding circuits. A total of 32 decoders is thus set up. One detects a count of zero (home or calibrate), another detects a count of 1, and so on up to 31. The 31st decoder is used to indicate that the system has gone past the 30th position, and electrically it applies a signal to the reset circuit. These decoders are shown schematically in drawing 91B-3606. All eight boards are shown as Board 6, and they may be interchanged.

Pushing the manual RECYCLE button on the front of the Studio Unit will reset all of the integrated circuit electronics, and the process will reset the stepper switch at the transmitter site. The 10 Hz oscillator will then oscillate, producing a series of pulses equal in number to the button number which has been pushed. For example, if Button 5 is depressed and the RECYCLE button is then pushed, the system will reset and then count out five pulses at a 10 Hz rate.

Refer now to the simplified block diagram of the decoding system shown in drawing 91A-6329. If a given push button is depressed, it connects the "key-on" input on the 10 Hz oscillator to the output of a corresponding inverter. The output of this inverter will be positive; its input is near ground. The inverter input will rise to a positive value only when all five input lines to the corresponding decoder are at ground potential. This is the case only when sufficient pulses have been counted into the 5-stage binary counter to satisfy the decoder. Its inputs will one by one drop to ground, and when all five inputs are at ground, its output will be positive. This will bring the output of the inverter down to ground, removing excitation to the key-on input on the 10 Hz oscillator.

Should the binary chain for any reason count to Position 31, the last decoder detects this immediately and automatically resets the system. Counting will then restart on its own accord.

Meanwhile, the 920 Hz Control tone oscillator is following this activity and keying (off) the Control tone as necessary to allow the stepping switch to be continuously synchronized with the studio electronics.

I. Metering Generation

The metering or telemetry system in the PBR-30A is unusually flexible in its operation. The metering samples from the transmitting equipment are applied to their individual calibration controls and then routed to contacts on the stepper switch.

One of these metering systems at a time is selected by the stepper switch for application to the metering system electronics. This is located in the Transmitter Unit Board 22. See drawing 91B-6322 for the schematic.

The input from the stepping switch is routed to Pin 18 of this board and applied to Pin 3 of the integrated circuit DC amplifier. This amplifier has components around it for phase compensation.

The DC amplifier is non-inverting and heavily gain-stabilized with negative feedback. A positive input from 0 through 0.7 VDC yields an output from this stage of 0 through 7 VDC.

The output of this DC amplifier is applied to the voltage-controlled oscillator. This is a multivibrator whose frequency is directly proportional to the voltage applied to it from the DC amplifier. The output waveform is a good approximation of a square wave.

In applications where the final metering waveform must be a good sine wave (sinusoid), it is important that all harmonic content be reduced far below the fundamental. Filtering of the metering signal can be simplified if it contains no second harmonic. This condition is met by dividing the metering signal (twice) from its original range of 80 Hz - 120 Hz down to 20 Hz - 30 Hz. An ideal square wave, it must be remembered, contains no even harmonics. This division process also results in the voltage-controlled oscillator using smaller components with better temperature coefficients than if the metering signal (20 Hz - 30 Hz) were generated "on frequency." Dividing the original metering signal down with bistable circuits also assures a constant output amplitude.

The metering signal leaves Board 22 on Pin 5, and it is applied to the metering processor. At this point an option is available; the basic 20 Hz - 30 Hz metering square-wave signal is either filtered and turned into a sine wave, or else it is used to key (amplitude modulate) a 1280 Hz tone. The first option is used when the metering signal is to be applied to an AM transmitter or to an FM SCA subcarrier with programming. The 1280 Hz option is used when the metering is returned from the transmitter to the studio via a communictions-grade link such as a telephone line or other voice-quality system.

The output of the metering oscillator is a square wave of about 1 volt peak-to-peak amplitude in the range of 20 Hz to 30 Hz. Discussing first the subaudible processing, reference is made to schematic 91B-6530, Board 23.

The input to this board appears at Pin 20 and is immediately applied to a low-pass filter which removes harmonics to a level of 60 dB below 100% modulation. Following the low-pass filter is a voltage amplifier and a power amplifier. This latter has the ability to drive a subcarrier generator or an AM transmitter. Remember that in the case of AM broadcast, the metering processor output frequency is in the range of 20 Hz to 30 Hz.

J. Metering Detection

The metering signal is recovered at the studio from an AM receiver or modulation monitor using the MRU-1 Metering Recovery Unit. In the case of FM, a specially modified telemetry receiver is used. In either case, the metering signal is recovered and applied to the subaudible metering processor (Board 11) at the studio. The schematic for this circuit is shown in drawing 91B-6528. The signal is applied immediately to a low-pass filter. The purpose of this filter is to reject program material which may be present with the metering signals. Only the 20 Hz to 30 Hz signal will be passed by the filter.

In the case of the audible metering return (modulated 1280 Hz), the square-wave metering oscillator output is applied to Pin 20 of Board 24, the Audible Metering Processor at the transmitter. See schematic 91B-6324. The metering oscillator output stage acts as a keyer for the 1280 Hz tone oscillator. The output from this oscillator is applied immediately to a line-driving amplifier. The output connections are arranged in a manner such that the BNC connector for metering output is also brought into play. Metering signals appear at both the telephone line and at the Metering Output BNC connector.

At the studio, the input from the wire line (via the Type 2-1300 High-pass Filter) or from the BNC connector is applied to the audible metering processor, Board 12. Refer to schematic 91B-6312. Here the metering signal is limited and applied to the 1280 Hz tone detector. This detector recovers the 20 Hz to 30 Hz modulation impressed on the tone at the transmitter site. Simple filtering and amplification follow this detection process.

The metering signal, whether it has been conveyed to the studio via audible (modulated 1280 Hz signal) or subaudible (20 Hz to 30 Hz) tones, is applied now to the actual metering demodulator, board 13. The schematic for this unit is shown in drawing 91B-6529.

The processed input signal is applied to Pin 19 of this board and is used to actuate a Schmitt trigger circuit. This is a circuit to produce a waveform of uniform amplitude with rapid rise and fall times. It is used to operate the monostable integrated circuit IC-1302 which produces pulses of uniform width and amplitude at a rate equal to the metering signal frequency. The output of the monostable is applied to power amplifier Q-1302 and then to the low-pass filter using IC-1303. The output of this IC drives the meter movement via multiplier resistor R-1319, damping resistor R-1322, and acceleration capacitor C-1307.

The presence of metering signals at the output of the monostable multivibrator is detected by diode CR-1303 operating in conjunction with capacitor C-1308 and resistor R-1326. The resultant voltage across C-1308 is used to drive the DC amplifier using transistors

Q-1303 and Q-1304. The signal at the collector of Q-1304 provides an output to the alarm detector (Pin 6) to the squelch system using transistor Q-1305 and to the "READ" lamp driver using transistors Q-1306 and Q-1307.

K. Alarm Encoder

Unique with the Moseley Associates, Inc., PBR-30A System is an alarm system based on momentary key-off of the metering signal.

Basically, receipt of an alarm condition at the Transmitter Unit causes a brief interruption of the metering signal. This is accomplished electronically by the Alarm Encoder, Board 25. Refer to schematic 91B-6325.

If any of the input terminals (Pins 10, 12, 14, 16, or 18) are connected to ground, then that terminal which has been held at -2 volts will suddenly go to ground potential. This positive-going signal is coupled through a capacitor (C-2501 through C-2505) to an input of IC-2501. This is a 5-input gate. If any of its inputs go positive, its output (Pin 7) will go to ground. This negative-going excursion is used to key a monostable multivibrator using IC-2502. The pulse width of the signal so generated is about 0.5 second in length. It is used to provide drive to transistor Q-2501. When this transistor is conducting, it effectively shorts to ground the output of the metering oscillator board.

In summary, when any alarm input is connected to ground, the metering is removed from the system for a period of 0.5 second. This brief metering key-off is detected at the studio by the metering demodulator and alarm detector.

L. Metering Read

On the metering demodulator, Board 13 in the SCU, is a metering presence circuit, using the components around transistor Q-1303 and Q-1304. In the presence of metering, capacitor C-1308 is discharged via diode CR-1303 to near ground potential. This removes the drive to the base of transistor Q-1303 and its collector will then reside at a positive voltage. This causes transistor Q-1304 to conduct and its collector will be near ground potential. As a result, the positive voltage to Pin 6 (to operate the alarm system) is removed, squelch transistor Q-1305 is cut off and amplifier Q-1306 is cut off. The positive voltage at the collector of Q-1306 then provides drive to lamp driver Q-1307. As a result, the front-panel "READ" lamp will be on.

Should metering fail, the alarm detector will receive a positive voltage via Pin 6, the squelch transistor will clamp the meter at zero deflection and the "READ" lamp will be extinguished.

M. Alarm Detection Circuitry

With reference to the schematic of the Alarm Detector, Board 14, schematic 91B-6314, this positive-with-alarm signal enters the alarm detector circuit at Pin 19. This point is normally at near ground potential and rises to about +3 volts with metering cessation. Integrated circuit IC-1401 generates a 0.8 second pulse upon cessation of metering. At the end of this pulse, another pulse is generated, using IC-1402, which is about 1 second in width. Should the metering return during the time of this second pulse ("window"), another pulse is generated which sets the set-reset bistable using IC-1403. This in turn will energize transistor Q-1401 which illuminates the front-panel alarm lamp. The lamp is turned off by manually resetting the bistable using the front-panel ALARM RESET button. Note that in order to activate the alarm detector in its entirety, the metering signal must be keyed off for a period of time greater than 0.8 second but less than 1.8 seconds. Very brief or very long metering system failures will not actuate the alarm circuitry.

N. Subcarrier Equipment

The discussion of the PBR-30A has been primarily limited to operation on a telephone line. At this point, the additional circuitry to enable wireless (radio) operation will be covered. This system is designated the PBR-30AR.

Considering first the signals at the studio site, the control tones are summed in the Output Amplifier and applied to the Subcarrier Generator. These control tones can be observed at the orange test point, TP-1001, on the Subcarrier Generator, Board 10. Potentiometer R-1001 sets the amount of control-tone signal applied to the voltage-controlled oscillator. The center frequency of the frequency-modulated control subcarrier oscillator is set with the frequency control, R-1004. The oscillator is of the multivibrator type, using Q-1001 and Q-1002. The signal is a square wave and is applied to the filter-driving buffer amplifier Q-1003. A low-pass filter removes unwanted harmonics of the carrier signal and leaves a sine wave. This is amplified in voltage amplifier Q-1004 and is applied to the output power amplifier Q-1005. The output level control R-1028 sets the degree of injection into the microwave equipment.

The subcarrier generator produces a signal with a center frequency of 26 kHz (or other frequencies for special applications) which is deviated approximately plus and minus 5% of the carrier frequency. It is fed into the multiplex input of the STL equipment. In the case of the Moseley Associates, Inc. Model PCL-202/PCL-303 aural STL equipment, the control subcarrier is set for an injection level of about 10%.

At the transmitter site, where the Transmitter Unit and the STL receiver are located, the subcarrier signal is extracted and demodulated. The extraction is accomplished with a bandpass filter located on Board 15. This filter consists of five tuned circuits with sufficient bandwidth to pass the modulation sidebands of the control subcarrier and adequate skirt selectivity to reject unwanted subcarriers or other signals.

The output of the subcarrier filter is passed on to the subcarrier demodulator. This is shown schematically in drawing 91B-6316 and is labeled Board 16. The recovered control subcarrier is applied to Pin 16 of this board and is observable at the orange test point TP-1601. It is then applied to the first transistor in the integrated circuit array IC-1601. This transistor then drives the voltage amplifier using the second transistor in this array. The output of this amplifier is symmetrically clipped by the back-to-back silicon diodes CR-1601 and CR-1602. Symmetrical limiting gives this demodulator good spurious signal rejection (capture ratio). Subsequent amplification in the third section and buffering in the fourth allows a high-level signal to be applied to the Schmitt trigger. This uses the first two sections in the second transistor array, IC-1602. The output of the Schmitt trigger is a sharp-edged square wave which is applied to the pulse-counting demodulator. This demodulator uses the third section of the array actively and the fourth section as a base-emitter protection diode. The output of the demodulator appears at Pin 11 of IC-1602, and the waveform at this point consists of a series of pulses of equal pulse width and amplitude. The pulse rate, however, is the same as the input subcarrier frequency. The average voltage is proportional to the center frequency of the subcarrier.

This signal is applied to a filter-driving buffer using the first section of the third array, IC-1603. This buffer drives a filter using inductors L-1601 and L-1602 as well as capacitors C-1607 through C-1609 to remove the subcarrier frequency.

The voltage at the junction of C-1609 and C-1610 consists of two components; a DC voltage proportional to the subcarrier center frequency, and an AC voltage proportional to the subcarrier modulation. C-1610 passes the AC (modulation) component on to the amplifier stages consisting of the last two sections in array IC-1603. The output of the last stage is a replica of the control tones impressed on the subcarrier generator at the studio or control site. This demodulated output is routed via the Type 2-1301 low-pass filter to the various tone detectors. From this point onward, operation of the PBR-30AR is identical to wire-line operation.

O. Metering Return, Wireless Operation

In radio remote control operation, the metering signals are normally returned to the studio in the subaudible spectrum. Should an AM transmitter be involved in this process, the metering subcarrier generator in the Transmitter Unit is replaced with a jumper board. (The schematic for this complex item is shown in drawing 91B-6326.) In this manner, the subaudible signals are available directly at the "Metering Out" BNC connector on the rear of the TU. It is intended in AM operation that this signal be applied to the transmitter with external equipment to modulate the carrier in the order of 5%.

In FM and TV operation, two possibilities exist. If only metering signals are to be returned to the studio on a subcarrier, then an internal subcarrier generator can be used in lieu of an external multiplex (SCA) generator. For FM this generator is normally supplied tuned to 67 kHz. For TV the subcarrier generator should be set to 39 kHz. In either case, the subcarrier generator is deviated about 5% with the subaudible metering signal, and the injection into the FM or TV aural transmitter is set to about 10%.

If, especially in the case of FM, an external subcarrier generator is employed, then the complex jumper board, BD 26, is installed, and the metering output is taken at the subaudible rate from the BNC connector. It is then routed to the Telemetering Input on the rear of the Subcarrier Generator, such as the Moseley Associates, Inc., Model SCG-4T. The subaudible metering signals will then modulate the resultant SCA signal about 15 dB to 20 dB below program level and will be inaudible on a standard multiplex receiver.

In the patented Moseley Associates, Inc., Type III* Radio Remote Control System, the subaudible metering signals are taken from the BNC connector and are applied to the Multiplex Processing Amplifier Model MPA-1. The metering signals then phase-modulate the subcarrier passing through the MPA-1. They are subsequently detected at the studio in a phase-comparison system.

P. Metering Detection, Wireless Operation

In AM radio remote control, the subaudible metering signals modulating the AM transmitter at about 5% are detected on a

*U.S. Patent 3,317,838

modulation monitor, tuned to the station's carrier. They are then applied to the Metering Input on the Studio Unit. It is suggested that the Model MRU-1 Metering Recovery Unit be used as interface between the modulation monitor and Studio Unit.

In TV radio remote control, the TV aural signal is detected on a receiver tuned to the TV aural carrier. The subcarrier at 39 kHz is extracted and demodulated from this composite signal. The resultant demodulated aural subcarrier modulation is applied to the Metering Input on the Studio Unit.

Similarly, in FM radio remote control, the demodulated 67 kHz subcarrier is applied to the Metering Input BNC connector.

In the Moseley Associates, Inc. Type III System, the metering signals are extracted from the SCA receiver undemodulated (intact at 67 kHz) and are routed directly to the Model SPC-1 Subcarrier Phase Comparator. The output of the SPC-1 is then fed to the Metering Input on the Studio Unit.

VII. POWER SUPPLIES

The power supplies in the PBR-30A are elementary in their operation, and because very rugged components have been used, they should be of little concern. The rectifiers are plug-in types as are the emitter-follower regulators. The filter capacitors are not plug-in because socketed capacitors develop several ohms of contact resistance over several years' usage. In low-voltage applications this is most undesirable. Should one of the plug-in rectifiers need replacement, bear in mind that the diodes used can be replaced with any other silicon diode having a voltage rating in excess of 200 volts PIV and a current rating in excess of 1 ampere. Generally, diodes of this nature are available locally and purchasing them in this manner may expedite repair.

To operate low-powered external equipment, such as the Model TSK-2 Temperature Sensing Kit, regulated plus and minus 10 volts have been brought out to terminals located on the rear of the T.U. Indiscriminate usage of this power for miscellaneous non-remote control purposes is not advised. These terminals are NOT for battery operation of the equipment. They are intended to supply power to accessory kits supplied by Moseley Associates, Inc.

VIII. FIELD ADJUSTMENT, STUDIO UNIT

The following paragraphs outline recommended procedures to be followed should internal adjustments be required on the PBR-30A System.

The control tone oscillator, Board 7, is set on its frequency of 920 Hz by removing transistor Q-702 and adjusting the trimmer capacitor C-705. Set the frequency to 920 Hz using a counter connected to green test point TP-703. Reinsert transistor Q-702 to restore the unit to normal service.

The Raise and Lower oscillators, Board 8, with 0.047 μfarad and 0.068 μfarad tuning capacitors, respectively, are set in a manner similar to the control tone oscillator. First, remove the control tone oscillator board. Then short the orange test point on the Raise oscillator board to ground. Observe the yellow test point TP-802 with a counter. Set tuning capacitor C-805 so that a 790 Hz tone is counted.

To set the Lower oscillator, be sure the control tone oscillator is removed. Short the orange test point on the Lower oscillator board to ground. Observe the yellow test point TP-802 with a counter. Set tuning capacitor C-805 so that a 670 Hz tone is counted.

The subcarrier generator, should this board be used, is set by first putting it on the correct frequency. Observe the white test point, TP-1008, with a counter. Remove the control tone oscillator, Board 7. Adjust the middle potentiometer, R-1004, so that the correct frequency is generated. This will normally be 26 kHz but in special systems may be 110 kHz or 135 kHz. Then adjust the subcarrier output level control (top control) for 1.5 volts peak-to-peak as observed at the white test point TP-1008. Reinstall the control tone oscillator board. Adjust the modulation control (bottom control) until an oscilloscopic observation gives 5% deviation. This pattern is shown on schematic drawing 91B-6310.

To adjust the audible metering processor at the studio, remove the Output Amplifier Board 9, any connection to the telephone line, and any connection to the metering input connector. Observe the blue test point TP-1204. Adjust the regeneration control, R-1211, until this test point indicates a DC voltage. This indicates that the tone detector is oscillating. Set it to its assigned frequency of 1280 Hz by connecting the frequency counter to the green TP-1203. Adjust tuning capacitor C-1205 until the counter reads 1280 Hz. Disconnect the counter, and back off the regeneration control R-1211 until the DC signal at the blue test point TP-1204 drops. This indicates the detector has dropped out of oscillation. Continue in this same direction for two more turns.

IX. FIELD ADJUSTMENT, TRANSMITTER UNIT

The control subcarrier filter in the TU must be sweep-aligned. If the subcarrier generator at the studio has been set on frequency, this sweep process is simply a matter of tuning the inductors for maximum output signal coincident with minimum ripple. It has been shown that this filter will neither drift nor vary to a significant extent with temperature variations, and so field adjusting this filter is not advised.

The three tone detectors may eventually require checking. Bearing in mind that these devices are intended to receive signals generated at the studio, a modification of earlier metering tone-detector tuning may be used. Turn off power at the studio to insure that no signals are sent to the transmitter site. Adjust the regeneration control R-1711 on the Raise Detector, Board 18, with R-1804.

The regeneration control on the Stepper Control board is best adjusted by turning it clockwise several turns and then slowly backing off until the stepper homes. Continue for four more turns.

The above paragraphs have enabled correct adjustment of the regeneration controls. Should adjustment of the tuning controls ever be deemed necessary, simply transmit from the studio to the transmitter site the tone in question and adjust the tuning control for maximum recovered DC out of the corresponding rectifier. For the Raise Detector, adjust its tuning control for maximum DC as observed at the green test point TP-1703. This will require that the Raise push button at the studio be depressed. In the case of the Lower Detector, its tuning capacitor is adjusted for maximum DC as measured at the yellow test point, TP-1802. In the case of the Control Detector, its capacitor is tuned for maximum at the yellow test point TP-2002.

In all cases a voltage near +1.8 VDC at each rectifier output is to be expected when the proper tone is present. Setting the tuning control in each case midway between the points where the amplitude falls off due to mistuning will be satisfactory. For a more precise tuning adjustment, remove the transistor following the rectifier. This will unload the rectifier circuit and allow a precise tuning adjustment. Because the tuning circuits are composed of temperature-stabilized inductors and stable (metalized polycarbonate) capacitors, tuning should seldom, if ever, be required.

The metering oscillator board has a total of three adjustments. One, R-2204, is used to set the integrated-circuit DC amplifier to its proper operating point. A second, R-2220, is used to set the frequency of the oscillator (after the countdown process) to a frequency of 20 Hz without input signal. The third, R-2216, is used to set the oscillator to a frequency of 25 Hz when the calibration voltage is being read.

With no input signal applied, adjust R-2204 (middle) for zero VDC as measured with an ordinary voltmeter connected between the yellow and black test points on the metering oscillator board. Then set R-2220 (top) for a frequency of 22 Hz as measured at the violet test point. Then apply the calibration voltage by advancing the stepper to the home position. Adjust R-2216 (bottom) for a frequency of 25 Hz. This completes the metering oscillator adjustment procedure.

Should the metering be returned to the studio via an audible metering processor, this oscillator must be set to its assigned frequency of 1280 Hz. Remove the metering oscillator board to allow sustained oscillations of the 1280 Hz oscillator. Connect a frequency counter to the yellow TP-2402. Adjust the tuning control C-2402 for a frequency of 1280 Hz. Restore the system to normal.

Remember that the end result to be expected in any tone oscillator/tone detector combination is that the detector satisfactorily receive its mating generator. Other techniques may very well prove quite satisfactory if the individual station has other trustworty specialized equipment.

The above adjustments are not meant to be accomplished routinely, but rather only if considered absolutely necessary. Routine maintenance of this equipment should consist only of keeping it free from dust or other potentially corrosive deposits. Along this line, do not use other than recommended products on the stepper switch. Specifically, use only Automatic Electric Rotary Switch Lubrication, Kit Number PD-9100-1. This is available from Automatic Electric Company, Northlake, Illinois. See drawing SKA-6142.

X. STUDIO CONTROL UNIT PUSH-BUTTON SEQUENCE CHANGE

Unless otherwise specified, the push-button sequence of the PBR-30A Remote Control System is as follows. When the CALIBRATE bar is depressed, the calibration signal is routed to the left-hand meter which has the arrow marks for calibration. When button #1 is pushed, the meter signal is directed to the right-hand meter. This is generally used for filament control, with filament voltage being read on the logging scale. Button #2 and #3 route the meter information to the left-hand and center meters, respectively, for power amplifier voltage and current readings. All of the remaining buttons direct the telemetry information to the right-hand meter. When a Frequency and Modulation Meter Panel, Type 1077-2, is provided, buttons #29 and #30 are used unless otherwise specified.

The sequence of the push-button assembly can be modified to suit individual applications by removing the cover over the push-button assembly in the Studio Unit and altering the jumpers on this assembly in accordance with drawing 93B-1004 enclosed at the rear of this manual. Note that this print shows the provisions which are included in the unit for the addition of five external meters.

PUSH-BUTTON OSCILLATOR	SUBCARRIER FILTER (Radio only)
LOGIC DRIVER	SUBCARRIER DEMODULATOR (Radio only)
PUSH-BUTTON LOGIC	RAISE DETECTOR
PUSH-BUTTON LOGIC	LOWER DETECTOR
PUSH-BUTTON LOGIC	STEPPER CONTROL A
PUSH-BUTTON LOGIC	STEPPER CONTROL B
PUSH-BUTTON LOGIC	FAIL-SAFE
PUSH-BUTTON LOGIC	SUBCARRIER GENERATOR (Radio, if and only if external subcarrier not used; install JUMPER if external subcarrier used.)
PUSH-BUTTON LOGIC	METERING PROCESSOR (Audible, except radio is normally subaudible)
PUSH-BUTTON LOGIC	METERING OSCILLATOR
CONTROL OSCILLATOR (.033 µfd capacitors)	ALARM ENCODER
RAISE OSCILLATOR (.047 µfd capacitors)	
LOWER OSCILLATOR (.068 µfd capacitors)	
~~OUTPUT AMPLIFIER~~	
SUBCARRIER GENERATOR (Radio only)	
METERING PROCESSOR (Audible, except radio is normally subaudible)	
ALARM DETECTOR	
METERING DEMODULATOR	

TRANSMITTER SITE

These boards are all marked TCU.

Components are on left side of board.

STUDIO SITE

These boards are all marked SCU.

Components are on right side of board.

REVISIONS	DATE
A STUDIO SITE WAS REVERSED. 1ST 10 UNITS	5/69

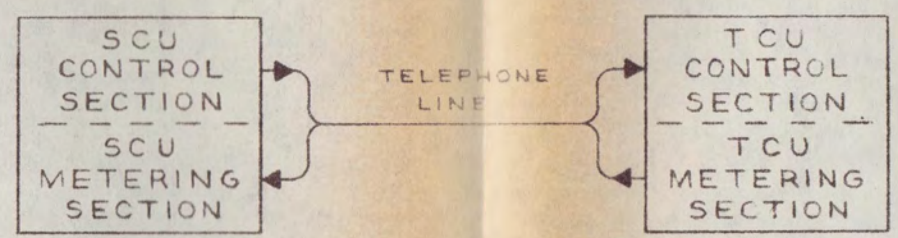
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

PC BOARD LOCATION
Model PBR-30

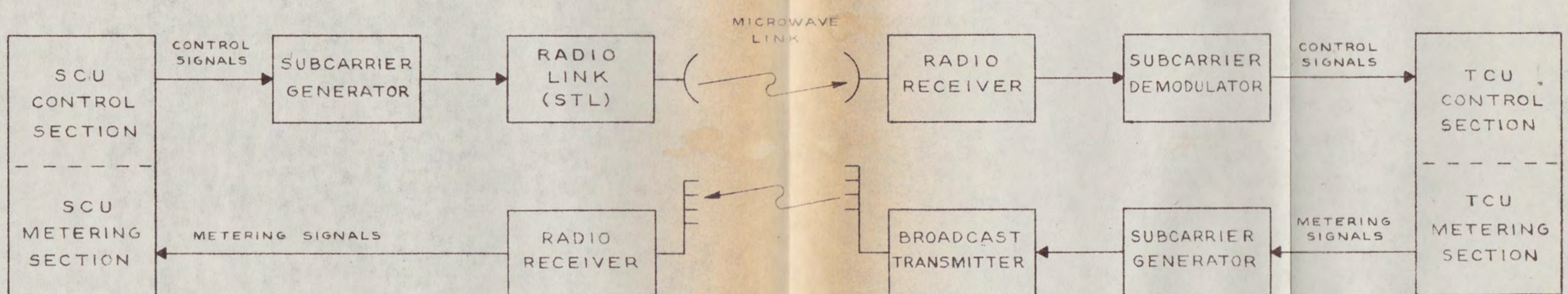
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN			SCALE:
CHK			20B2140
ENG	JCP	5-69	A

A) SIMPLIFIED BLOCK DIAGRAM, ELEMENTARY REMOTE CONTROL SYSTEM



B) WIRE REMOTE CONTROL SYSTEM



C) RADIO REMOTE CONTROL SYSTEM

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

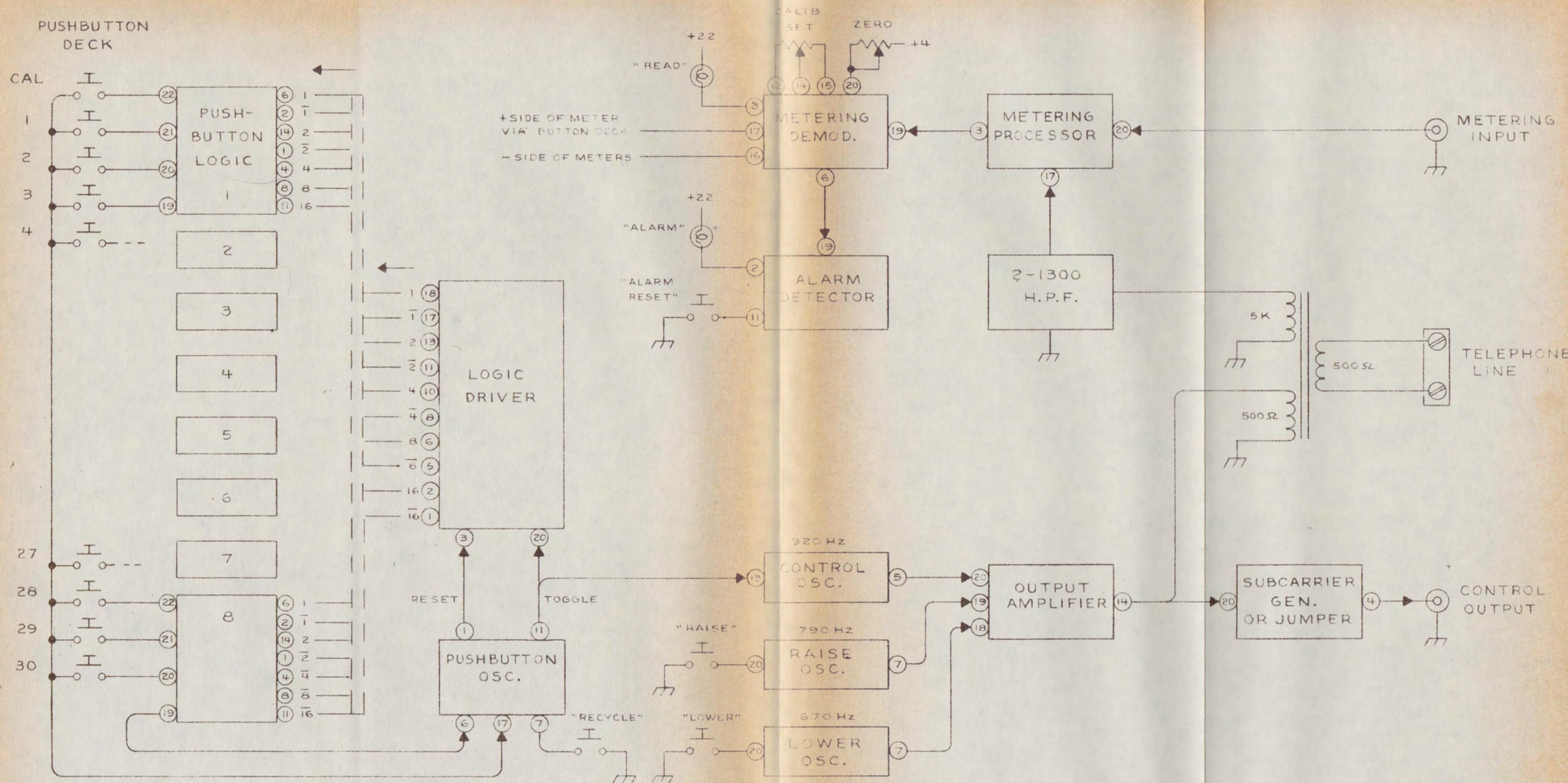
BLOCK DIAGRAM
REMOTE CONTROL SYSTEMS

DATE		
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
DWN	FXY	4/69
CHK		
ENG	JCT	4-69

SCALE:

92B1021

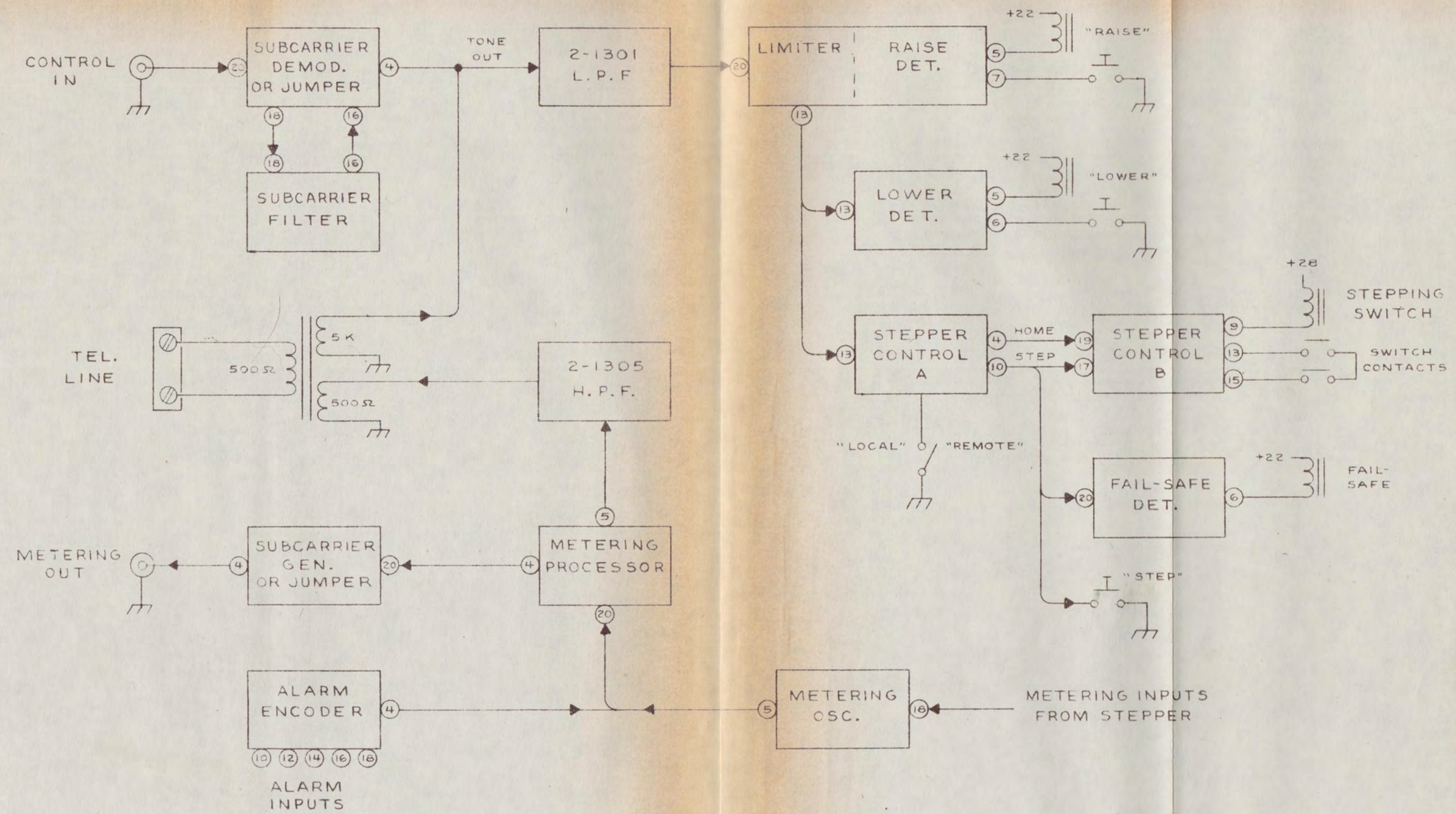
REVISIONS



MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

BLOCK DIAGRAM
STUDIO UNIT PBR-30

DATE			
TOL FRACT ± 1/32 .XX ± .030 .XXX ± .010			
DWN	F X Y	4/69	SCALE:
CHK			92 B 1018
ENG			
REVISIONS			



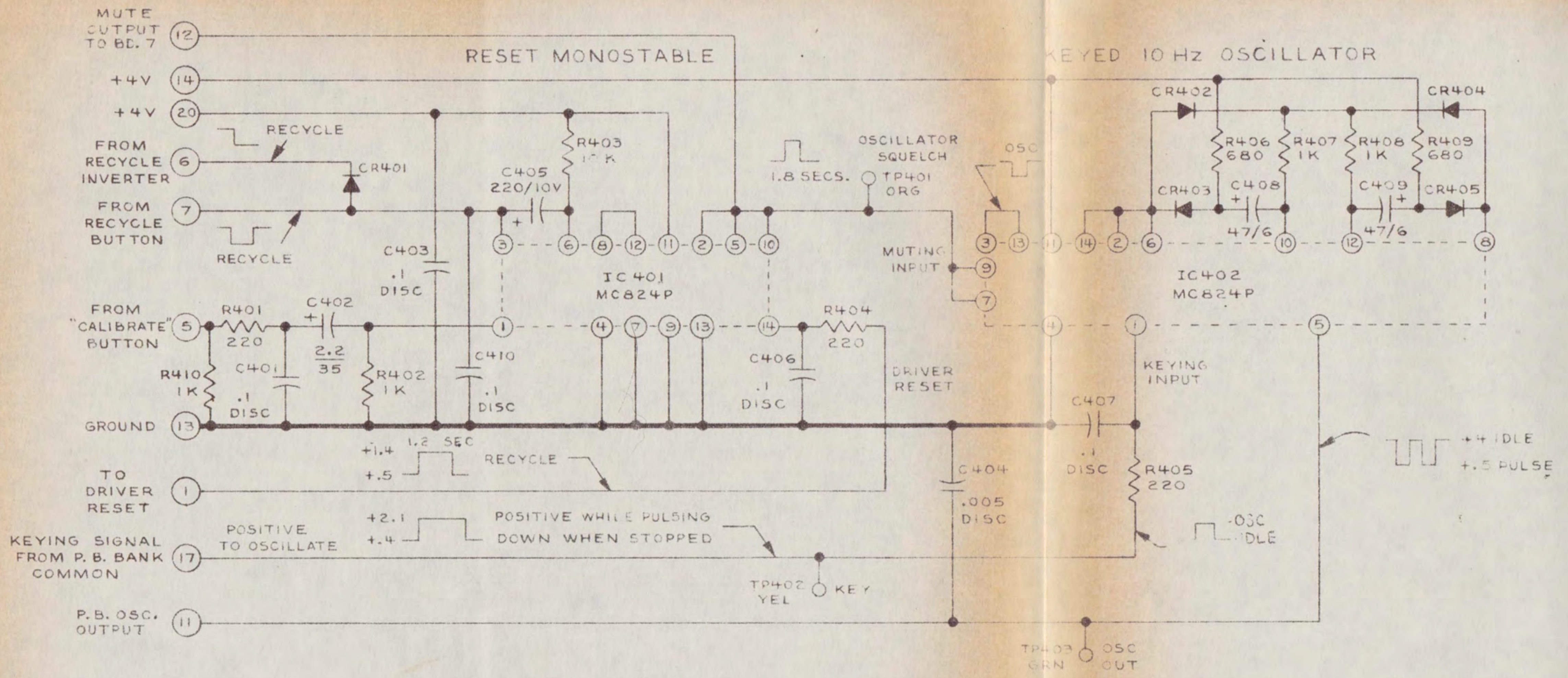
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

BLOCK DIAGRAM
TRANSMITTER UNIT PBR-30

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	4/69	SCALE:
CHK			
ENG			92 B 1019

REVISIONS
DATE

IC402 R410 C410 CR405 TP403



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
   CAPACITOR VALUES ARE IN MICROFARADS.
   DIODES ARE IN4154 OR EQUIVALENT.
2. P.C BOARD 51A5169
3. COMPONENT LAYOUT 20A2109

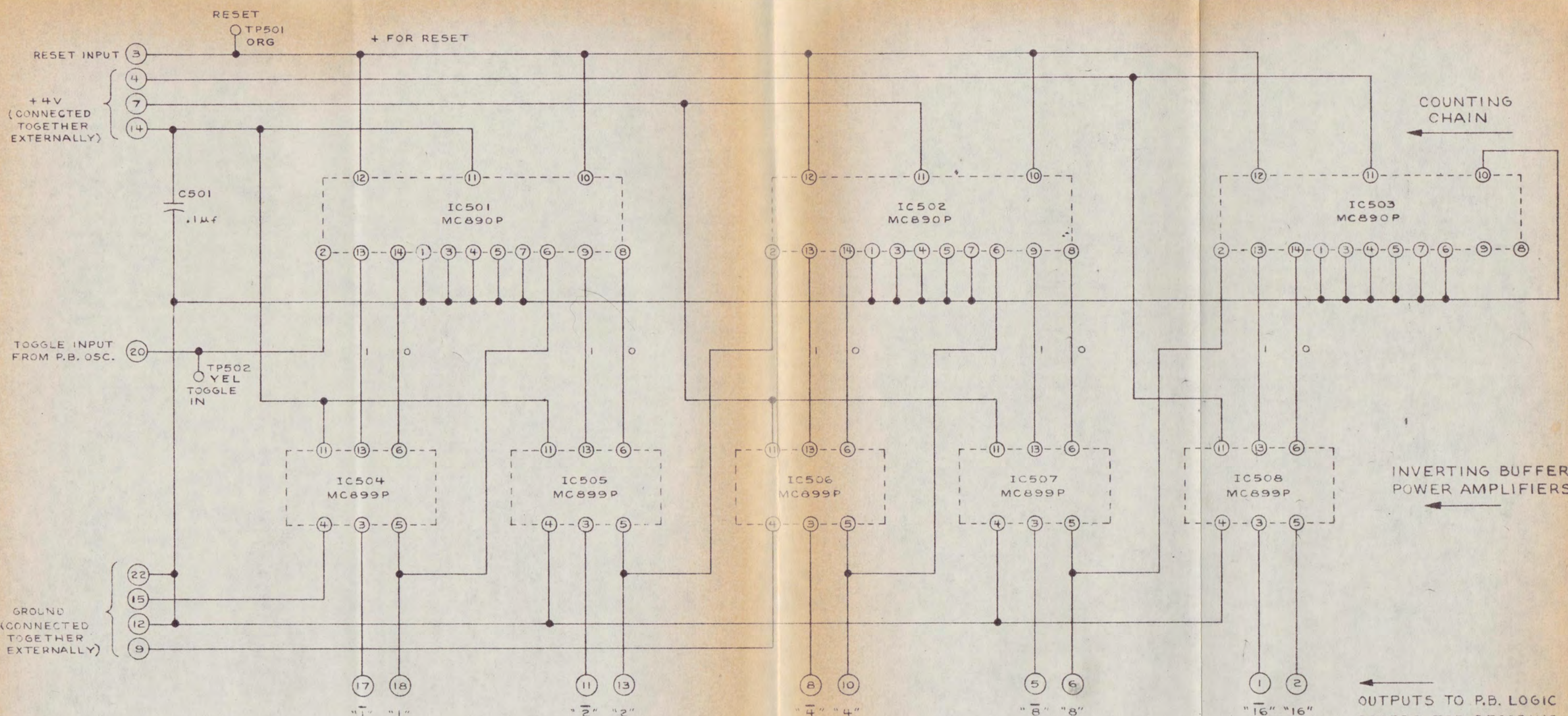
PBR-30

REVISIONS	DATE
A	ADD VOLTAGES TO OUTPUT WAVEFORM 10/1/70
B	ECO 424. 2-1-71 R403 WAS 680
C	ADD MUTE OUTPUT ECO 448 6/30/71 R403 WAS 8.2K

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 4
SCU PUSHBUTTON OSC

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	2/69	SCALE: NONE
CHK			
ENG	JCP	5-69	91 B 6304 C



AFTER RESET SIGNALS ARE AS SHOWN FOR PINS 1, 2, 5, 6, 8, 10, 11, 13, 17 & 18; "NOTS" ARE POSITIVE.

NOTES:

1. P.C. BOARD 51A5170
2. COMPONENT LAYOUT 20A2110
3. MC890P PINS 9 & 13 GO TO GROUND POTENTIAL WHEN 10 OR 12 GO POSITIVE.
4. MC899P INVERTS: 3 IS HIGH WHEN 13 IS LOW.

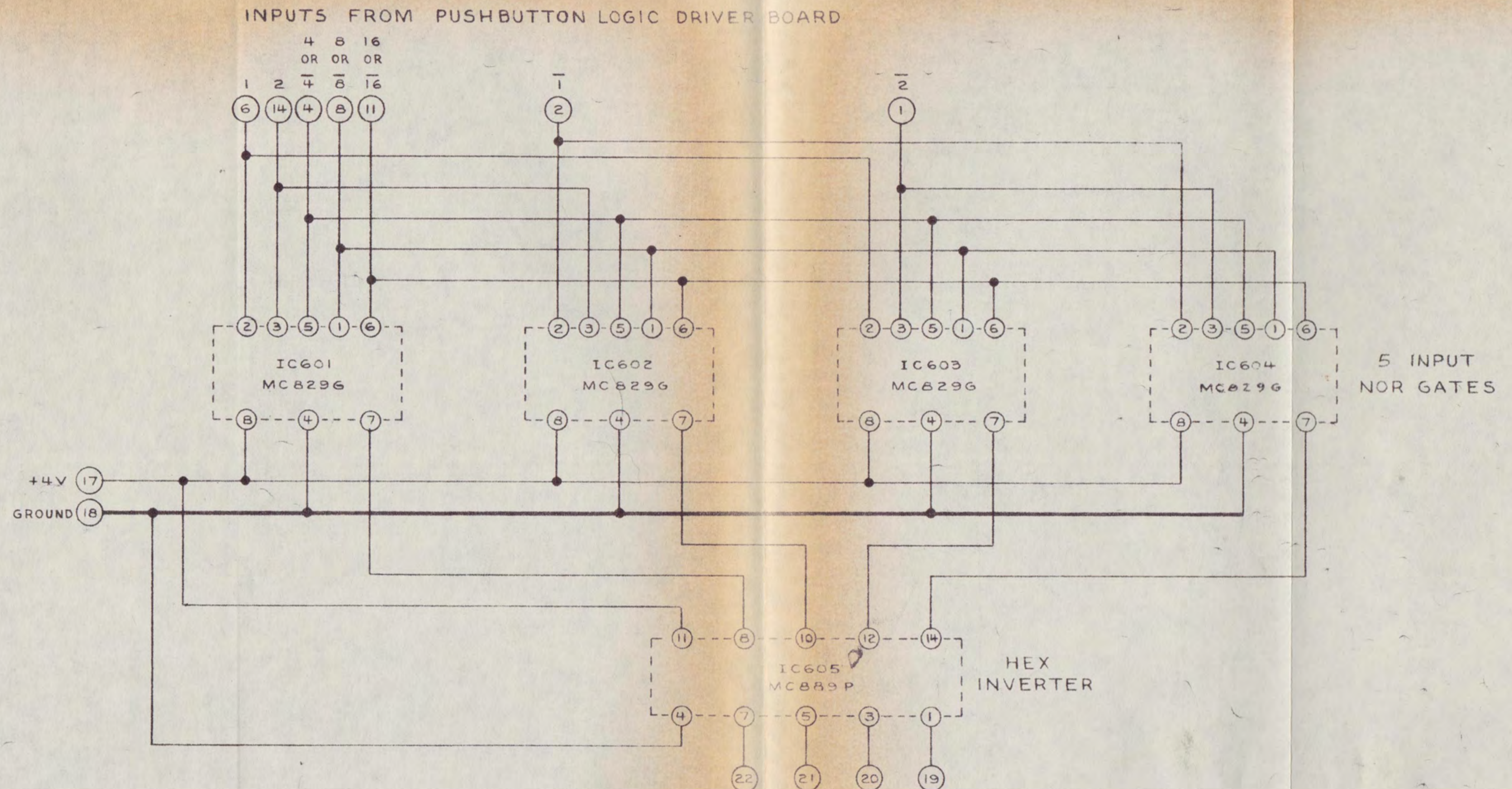
PBR-30

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 5
SCU LOGIC DRIVER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	2/69	SCALE: NONE
CHK			
ENG	JCP	5-69	91 B 6305

DATE
REVISIONS



NOTES:

1 P.C. BOARD 51A5171

2 COMPONENT LAYOUT 20A2111

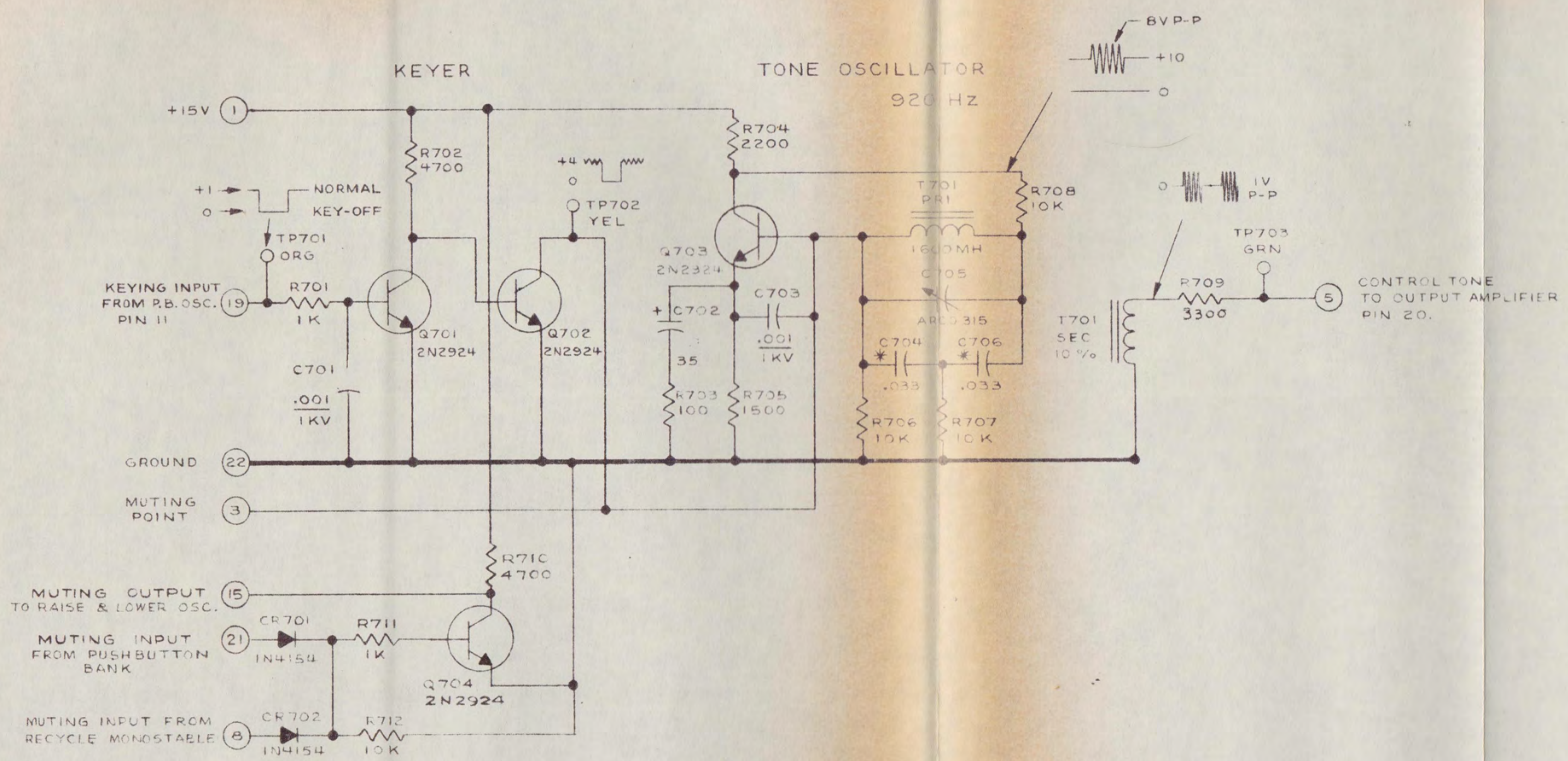
PBR-30

MOSELEY ASSOCIATES, INC. SANTA BARBARA, CALIFORNIA	
SCHEMATIC – BOARD 6 SCU PUSHBUTTON LOGIC	
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010	
DWN FXY 2/69	SCALE:
CHK	91 B 6306
ENG JCT 5-69	

DATE

REVISIONS

Q704 R711 C706 T701 TP703



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD 51A5197.
3. COMPONENT LAYOUT 20A2117
4. ✱ C704 + C706 ARE METALIZED POLYCARBONATE ± 3%.

PBR-30

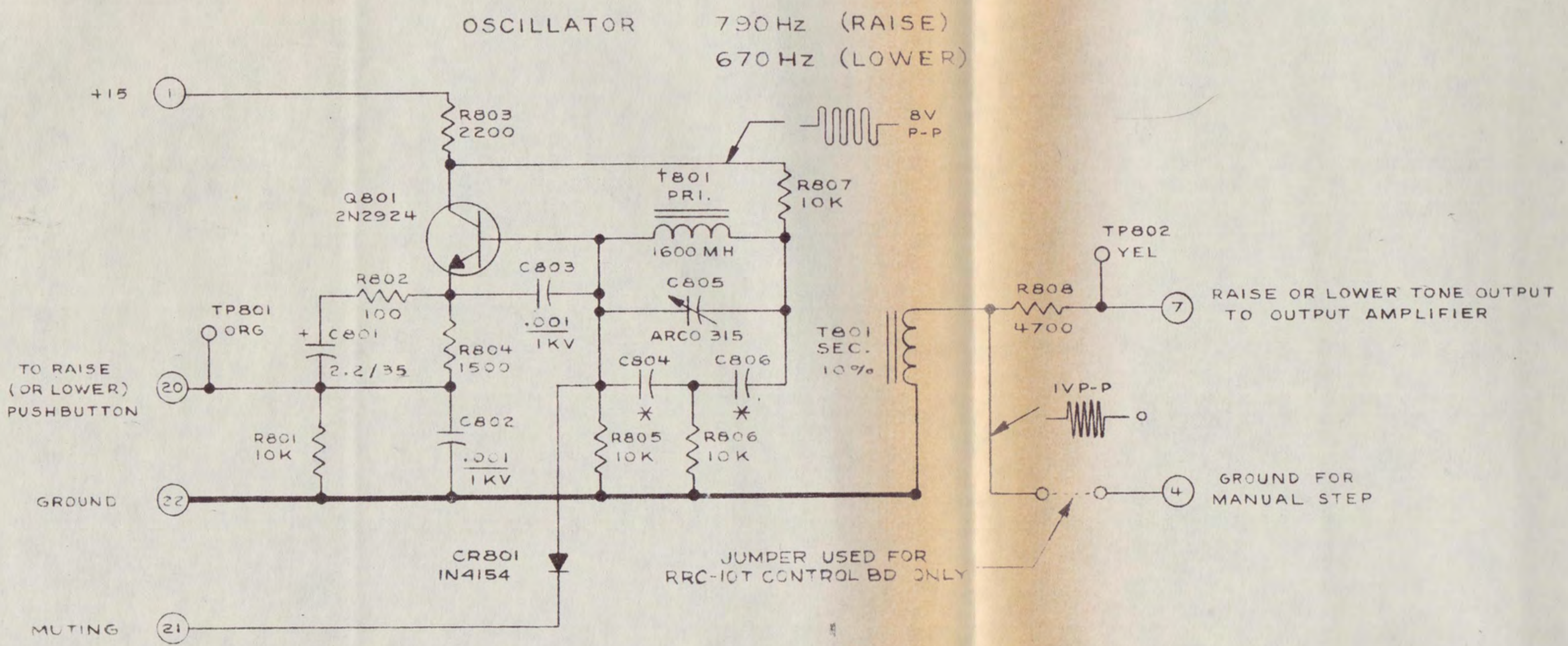
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 7
SCU CONTROL OSC

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010

DWN FXY 2/69
CHK JCT 6-69
ENG JCT 6-69
SCALE:
91 B 6307 D

Q801 R808 C806 T801 TP802 CR801



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 * TUNING CAPACITORS C804 & C806 ARE
METALIZED POLYCARBONATE ± 3%.
.068µF FOR "LOWER" (670 Hz)
.047µF FOR "RAISE" (790 Hz)
.033µF FOR "CONTROL" (920 Hz) RRC-10T ONLY

3 P.C. BOARD 51A5198

4 COMPONENT LAYOUT 20A2118

RRC-10T PBR-30

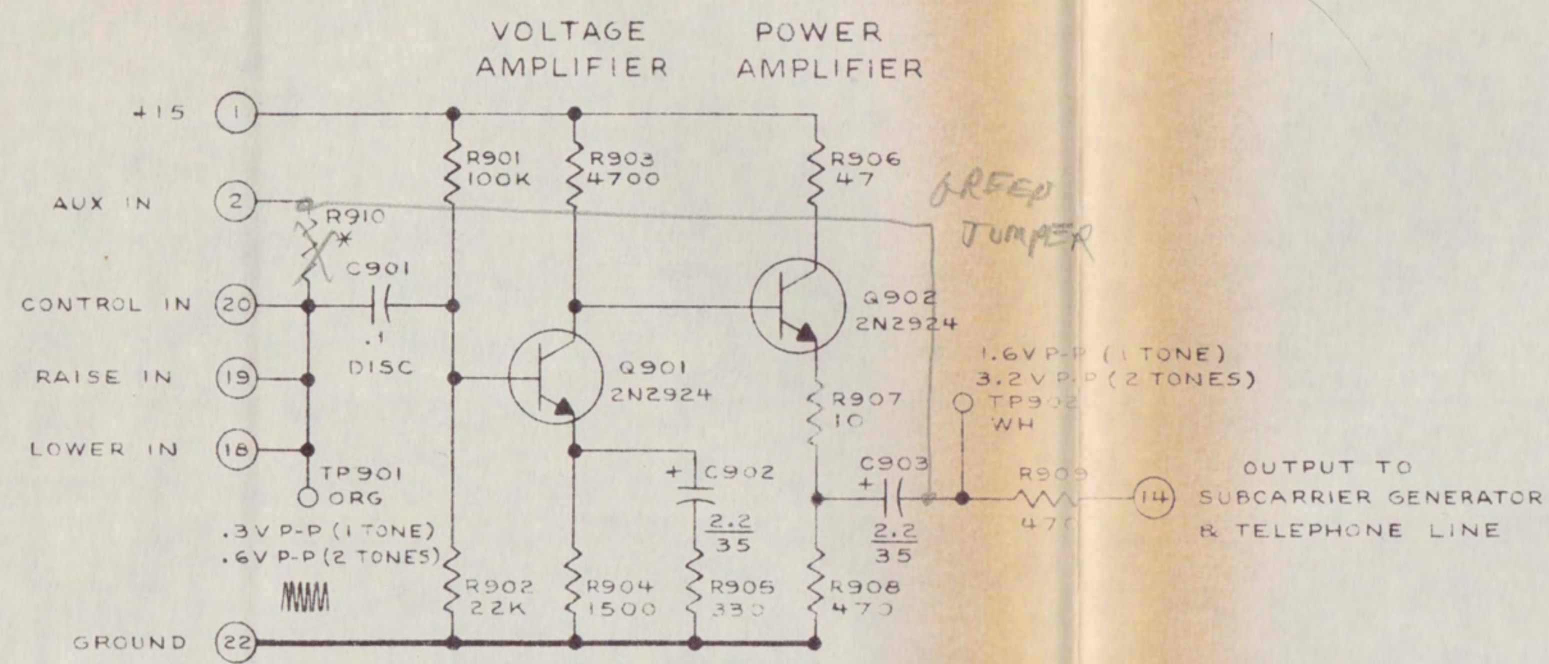
REVISIONS	DATE
D PIN 21 WAS PIN 15	3/70
C ADD CR804 AND PIN 15.	10-69
B ADD RRC-10T JUMPER	9-69
A NOTE 2. ADD .033 FOR RRC-10T	9/69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC – BOARD 8
SCU TONE OSC'S

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	F X Y	2/69	SCALE:
CHK	JCT	6-69	91B6308 D
ENG	JCT	6-69	



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD 51A5200
3. COMPONENT LAYOUT 20A2120
4. * DENOTES SELECTED VALUE.

RRC-10T, PBR-30

REVISIONS	DATE
A ADD PIN 2 AND R910	10-69

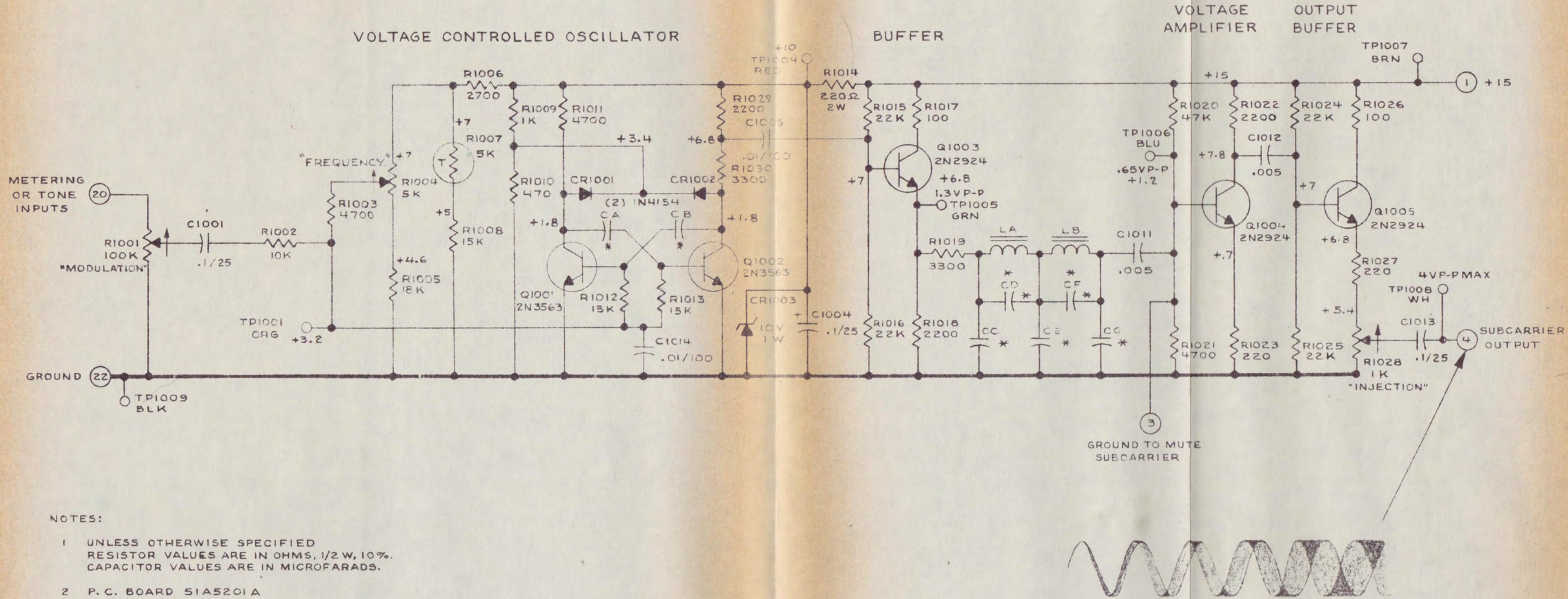
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 9
SCU OUTPUT AMPLIFIER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
DWN	FXY	2/69
CHK		
ENG	JLP	5-69

SCALE:
91B6309 A

Q1005 R1030 C1014 CR1003 L1002 TP1009



NOTES:

1 UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.

2 P. C. BOARD 51A5201 A

3 COMPONENT LAYOUT 20A2121

4 CA THRU CG, LA AND LB VALUES SHOWN ON DRAWING 94A4501

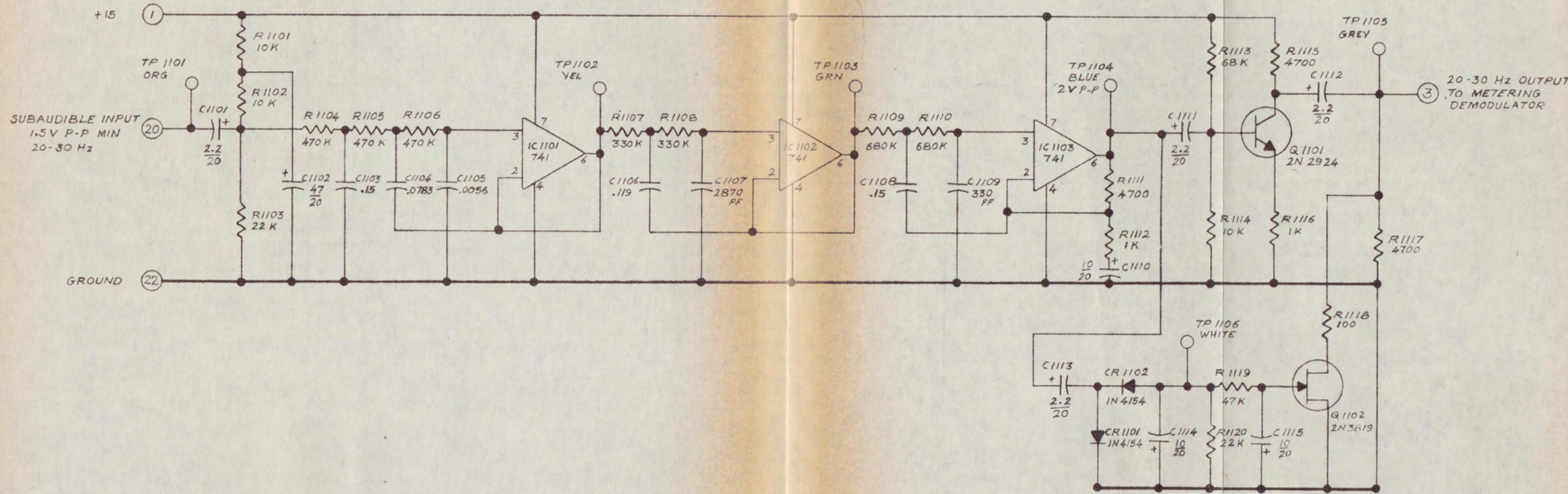
RRC-10T PBR-30

REVISIONS	DATE
D ADD OUTPUT WAVEFORM.	11/13/72
C REVISE * NOTATION PER ECO 332.	3-70
B CIRCUIT MODIF. PER ECO 309.	1-70
A OMIT 26 KHz VALUES. CHANGE NOTE 4	7-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 10A
SUBCARRIER GENERATOR

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	3/69	SCALE:
CHK			91B6310 D
ENG	JCP	5-69	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%
CAPACITOR VALUES ARE IN MICROFARADS

2 P. C. BOARD 51A 5366

3 COMPONENT LAYOUT 20A 2302

PBR-30

REVISIONS	
MGMT. APPR.	
DATE	

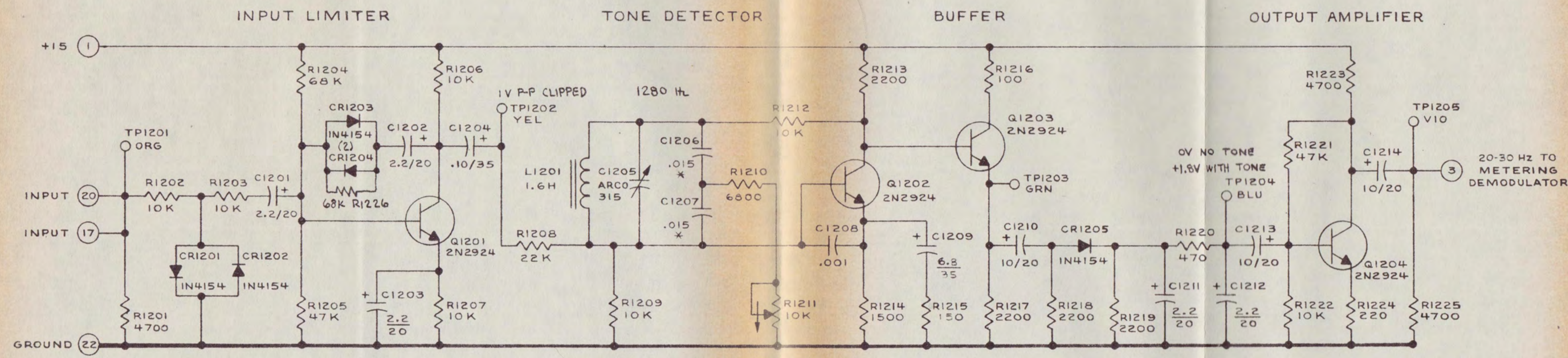
MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

SCHEMATIC BOARD - 11
SCU SUBAUDIBLE METERING PROC.

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	[illegible]	12-6-71	SCALE:
CHK	FXY	12/15/71	91 B 6528
ENG	JCP	15 [illegible] 71	

Q1204 R1226 C1214 CR1205 L1201 TP1205



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. * C1206 & C1207 ARE METALIZED POLYCARBONATE, ± 3%.
3. P.C. BOARD 51A5202.
4. COMPONENT LAYOUT 20A2122.

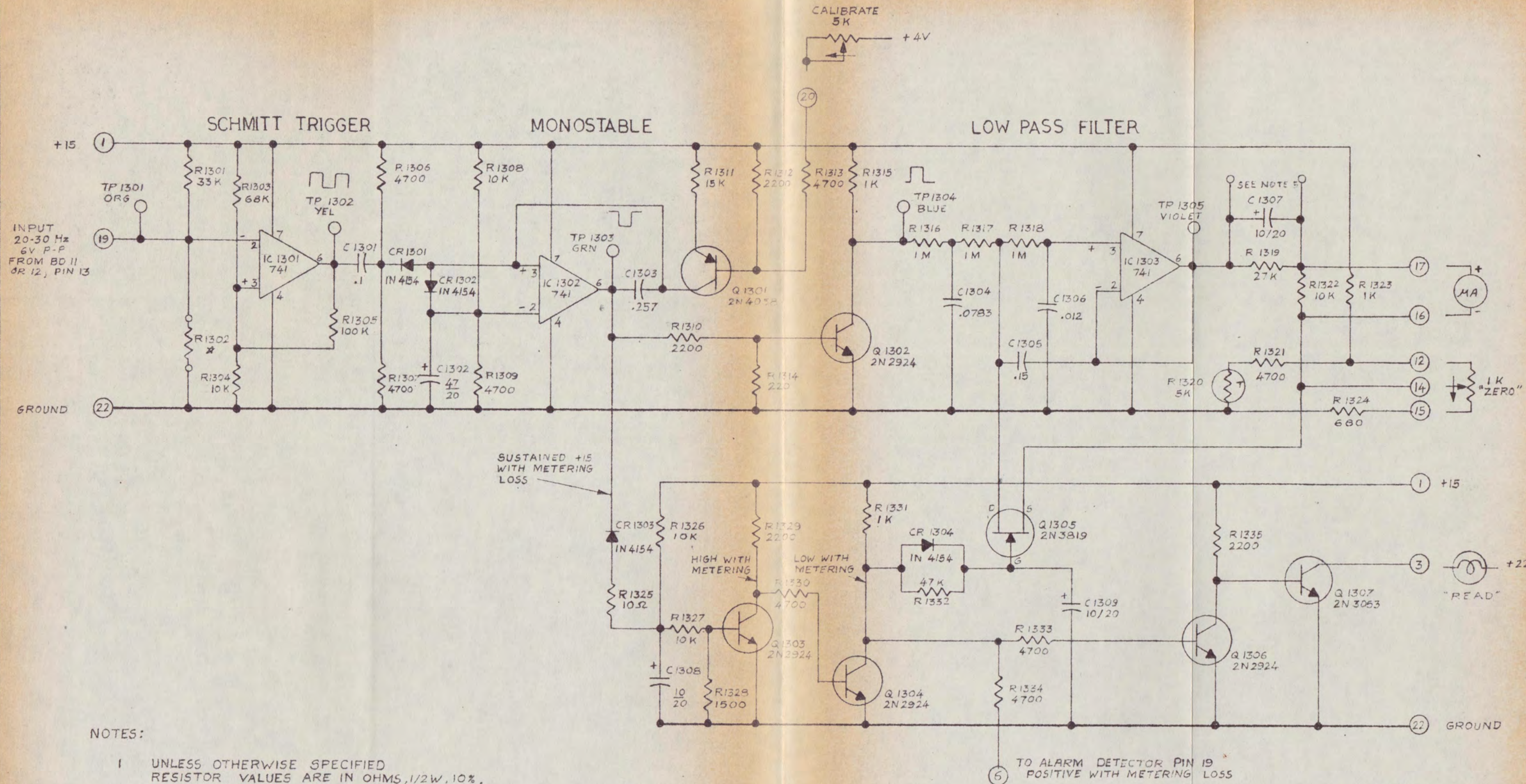
PBR-30

REVISIONS		DATE
B	OUTPUT WAS 22-36 Hz	12/8/71
A	C1209 WAS 2.2 µf, R1215 WAS 220 Ω, ECO 384.	9-70

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 12
SCU AUDIBLE METERING PROC

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	3/69	SCALE:
CHK			91 B 6312 — B
ENG	JCP	5-69	



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD 51A 5370
3. COMPONENT LAYOUT 20A 2298
4. * DENOTES SELECTED VALUE.
5. OPTIONAL COMPONENT.

PBR 30

REV	REVISIONS	DATE
C	NOTE 5 ADDED ECO 566	9/29/72
B	R1303 WAS SELECTED ECO 549.	7/27/72
A	R1326 WAS 6800, R1328 WAS 1K, R1324 WAS 1500. ECO 542	6/22/72

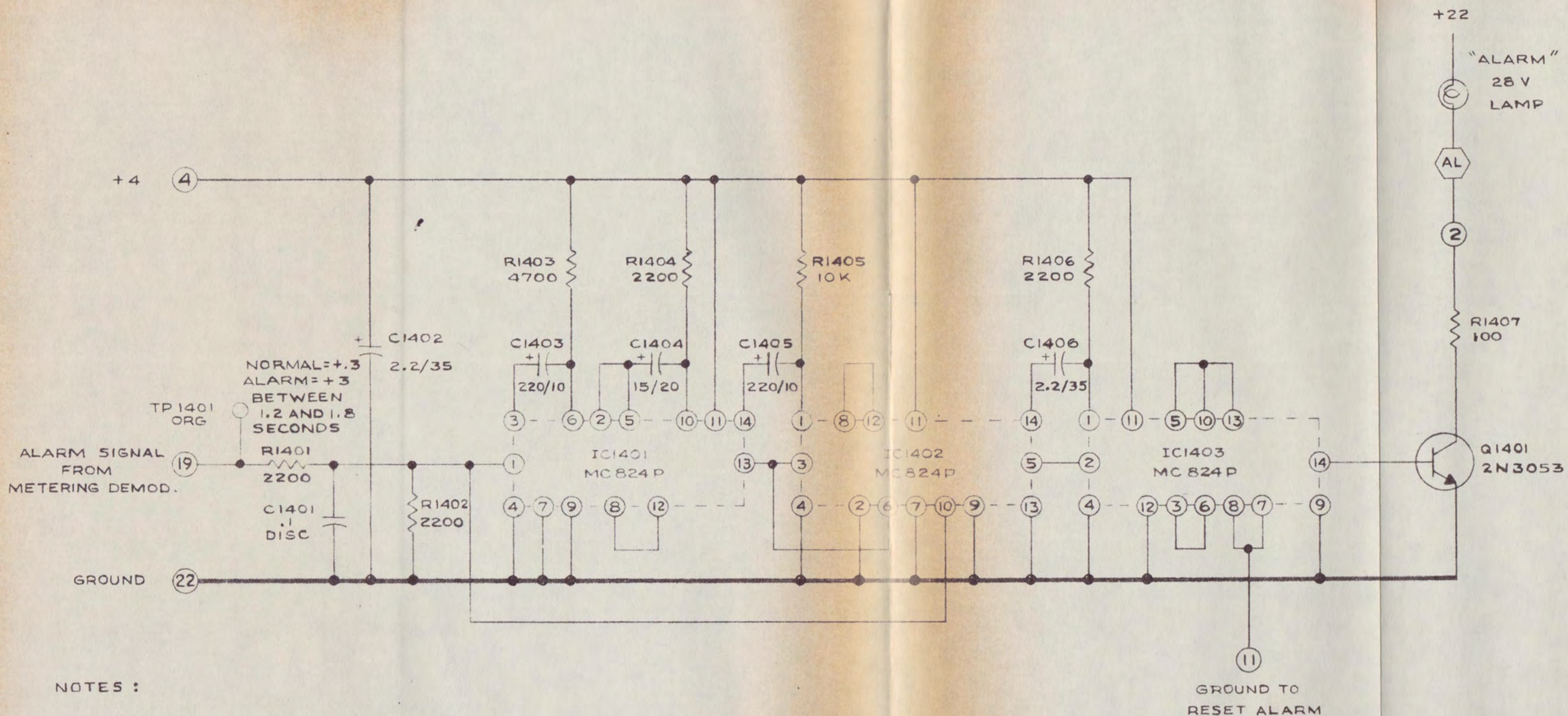
MGMT. APPR.

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

SCHEMATIC BOARD 13
SCU METERING DEMODULATOR

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN		12-8-71	SCALE:
CHK	FXY	12/15/71	91 B 6529 C
ENG		16 DEC 71	



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
   CAPACITOR " " " MICROFARADS
2. ⬡ DENOTES TERMINAL ON MOTHER BD.
3. C1402 AND R1403 DETERMINE WINDOW DELAY
4. C1404 AND R1405 " " WIDTH
5. P.C. BOARD 51A5204A
6. COMPONENT LAYOUT 20A2124

PBR-30

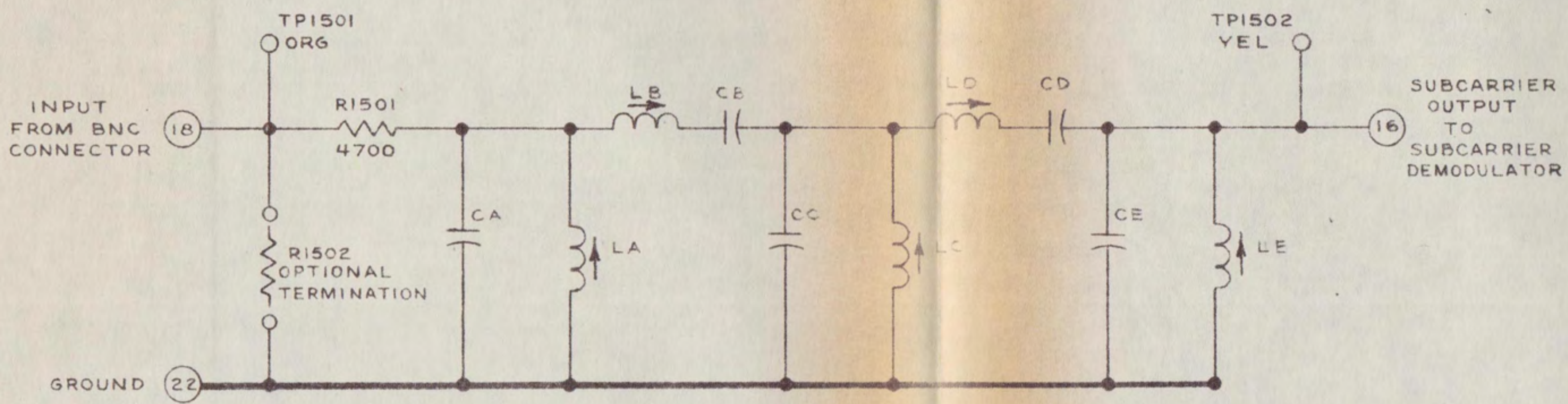
REVISIONS	DATE	
A	REDRAWN FOR CIRCUIT MODIFICATION.	10-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 14
SCU ALARM DET

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010		
DWN JAG	10-69	SCALE: NONE
CHK FXY	10/69	91B6314 — A
ENG JCT	11-69	

R1502 CE LE TP1502



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
   CAPACITOR VALUES ARE IN MICROFARADS.
2. COMPONENT VALUES SHOWN ON DWG. 94A4503.
3. P.C. BOARD 51A5214.
4. COMPONENT LAYOUT 20A2134.

PBR-30

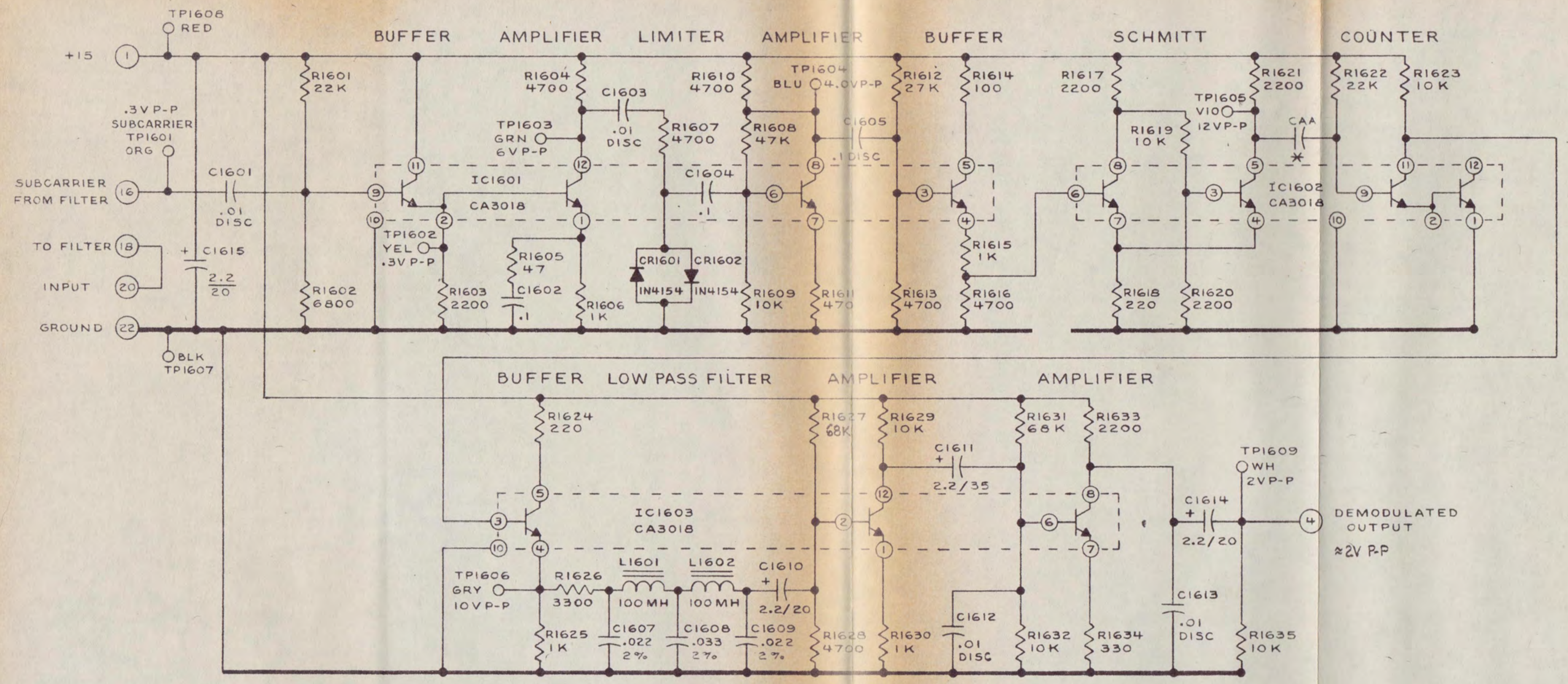
A	REVISE NOTE 2 PER ECO 330.	3-70
REVISIONS		DATE

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 15
SUBCARRIER FILTER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	3/69	SCALE:
CHK			91B6315 A
ENG	JCT	5-69	

IC1603 R1635 C1615 CR1602 L1602 TP1609



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. ✱ VALUE OF CAA IS GIVEN ON 94A4502
3. P.C. BOARD 51A5212.
4. COMPONENT LAYOUT 20A2132.

PBR-30

REVISIONS	DATE
A REVISE NOTE 2 PER ECO 331.	3-70

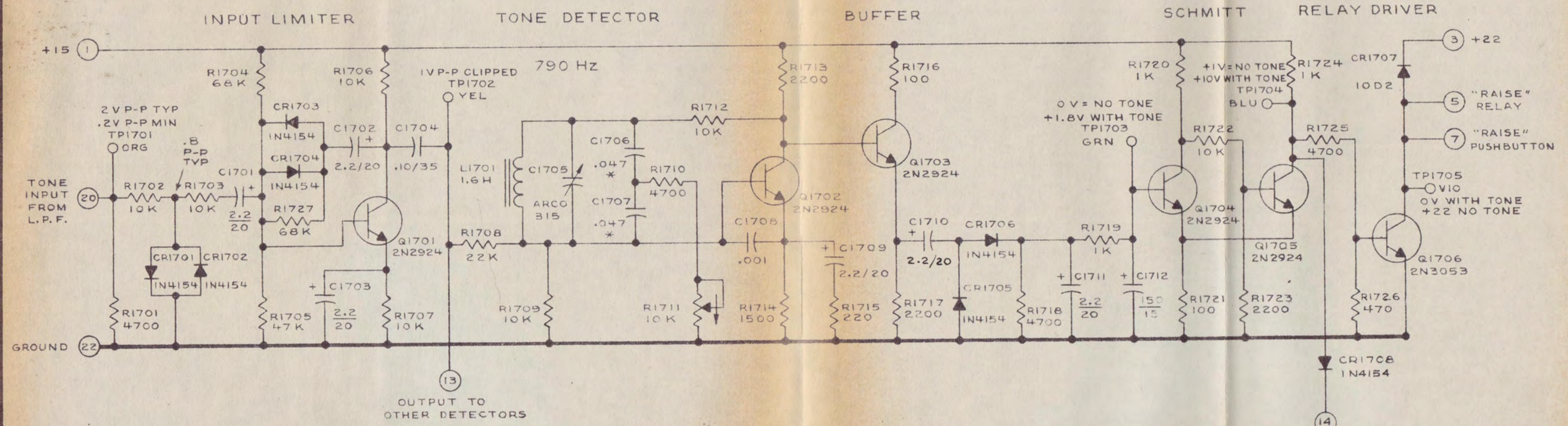
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 16
SUBCARRIER DEMOD

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	FXY	3/69	SCALE:
CHK			
ENG	JCT	5-69	91 B 6316 A

Q1706 R1727 C1712 CR1708 L1701 TP1705



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. * C1706 & C1607 ARE METALIZED POLYCARBONATE ±3%
3. P.C. BOARD 51A5211
4. COMPONENT LAYOUT 20A2131

RRC-10T PBR-30

REVISIONS		DATE
C	C1712 WAS 2.2/20. ECO 450	6/30/71
B	ADD CR1708 AND PIN 14.	10-69
A	C1710 WAS 10/20. ECO 270.	7-69

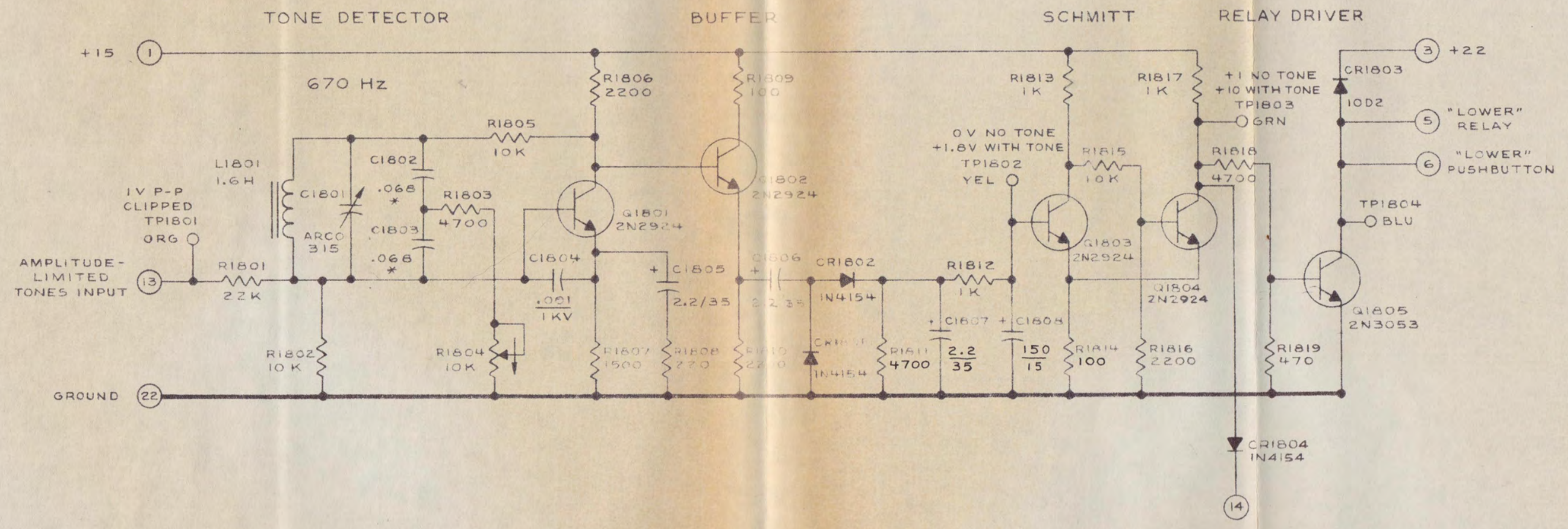
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 17
TCU RAISE DET

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	FXY	3/69	SCALE:
CHK			91 B 6317 C
ENG	JCT	5-69	

Q1805 R1819 C1808 CR1804 L1801 TP1804



NOTES:

1. UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2. *C1802 & C1803 ARE METALIZED POLYCARBONATE ±3%.

3. P.C. BOARD 51A5210

4. COMPONENT LAYOUT 20A2130

RRC-10T PBR-30

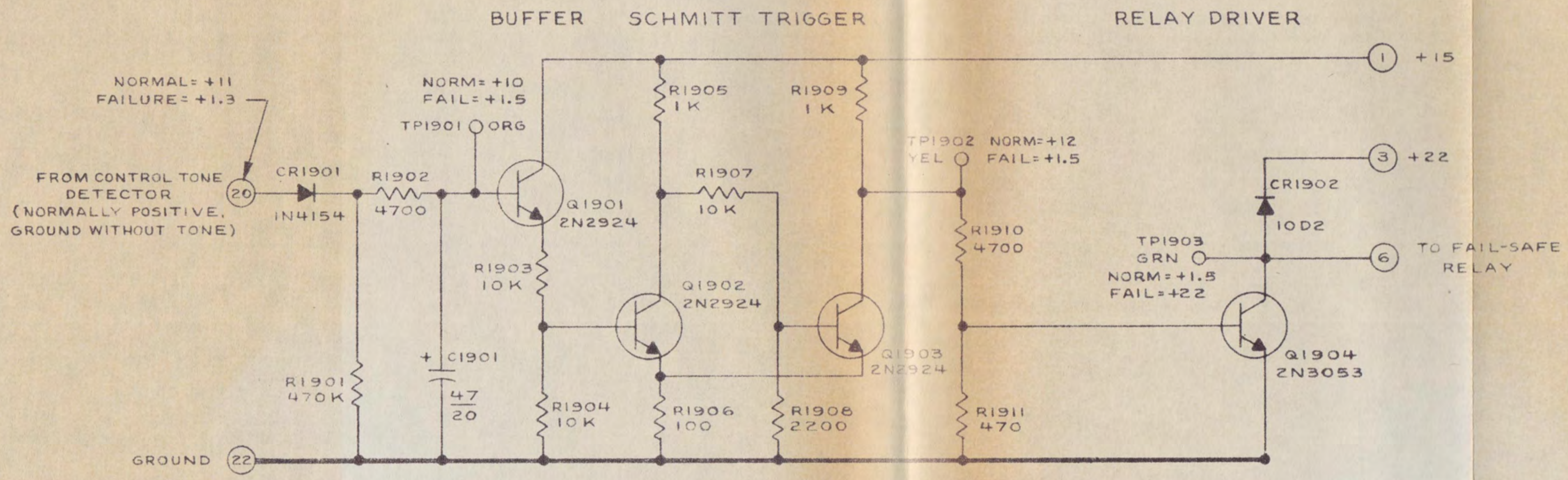
REVISIONS		DATE
C	C1808 WAS 2.2µF ECO 450	6/30/71
B	ADD CR1804 AND PIN 14.	10-69
A	C1806 WAS 15/20 ECO 270	7-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 18
TCU LOWER DET

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	3/69	SCALE:
CHK			
ENG	JCP	5-69	91B6318 C

Q1904 R1911 CR1902 TP1903 C1901



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
   CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARD 51A5209.
3. COMPONENT LAYOUT 20A2129.

PBR-30

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

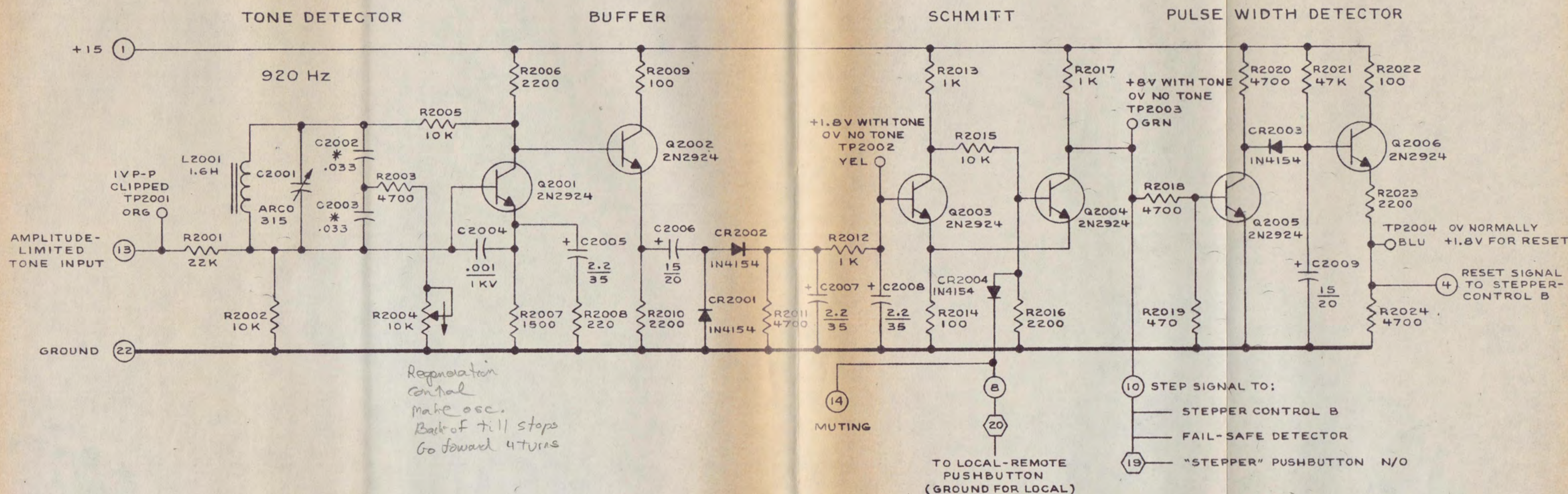
SCHEMATIC - BOARD 19
TCU FAILSAFE

DATE		
REVISIONS		

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	FXY	3/69	SCALE:
CHK			91B 6319
ENG	JCP	5-69	

Q2006 R2024 C2009 L2001 CR2004 TP2004



NOTES:

1 UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10% CAPACITOR VALUES ARE IN MICROFARADS.

2 ⬡ DENOTES TERMINAL ON MOTHER BOARD.

3 P.C. BOARD 51A5218.

4 COMPONENT LAYOUT 20A2138.

5 * C2002 AND C2003 ARE METALIZED POLYCARBONATE ± 3%

RRC-10T PBR-30

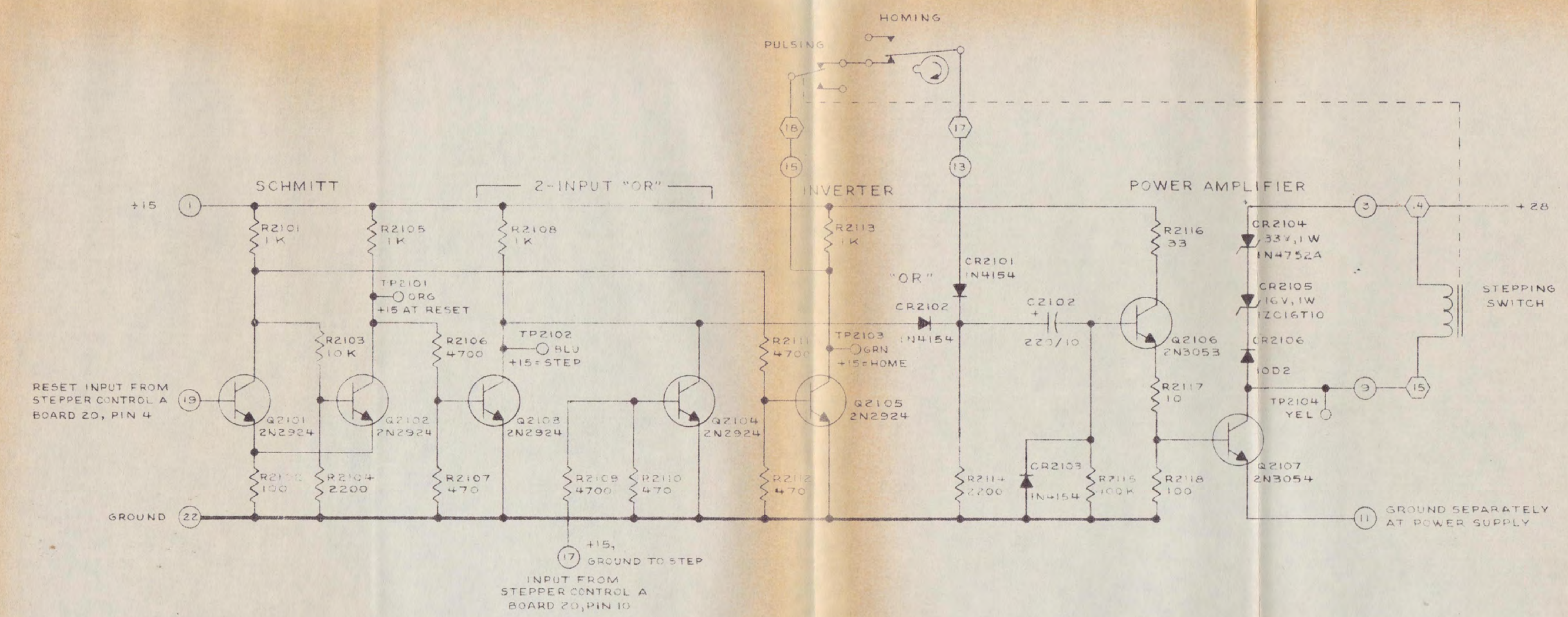
REVISIONS		DATE
B	ADD NOTE 5. ECO 326.	3-70
A	ADD CR2004 AND PIN 14.	10-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC-BOARD 20
TCU STEPPER CONTROL A

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	3/69	SCALE:
CHK			91 B 6320 B
ENG	JCP	5-69	

Q2107 R2113 C2102 CR2106 TP2104



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. ⬡ DENOTES TERMINAL ON MOTHER BOARD.
3. P. C. BOARD 51A5216.
4. COMPONENT LAYOUT 20A2136.

PBR-30

REVISIONS	DATE
A — DELETE C2101, CR2104 WAS 1ZC1 ...T10. ECO 451	6/30/71

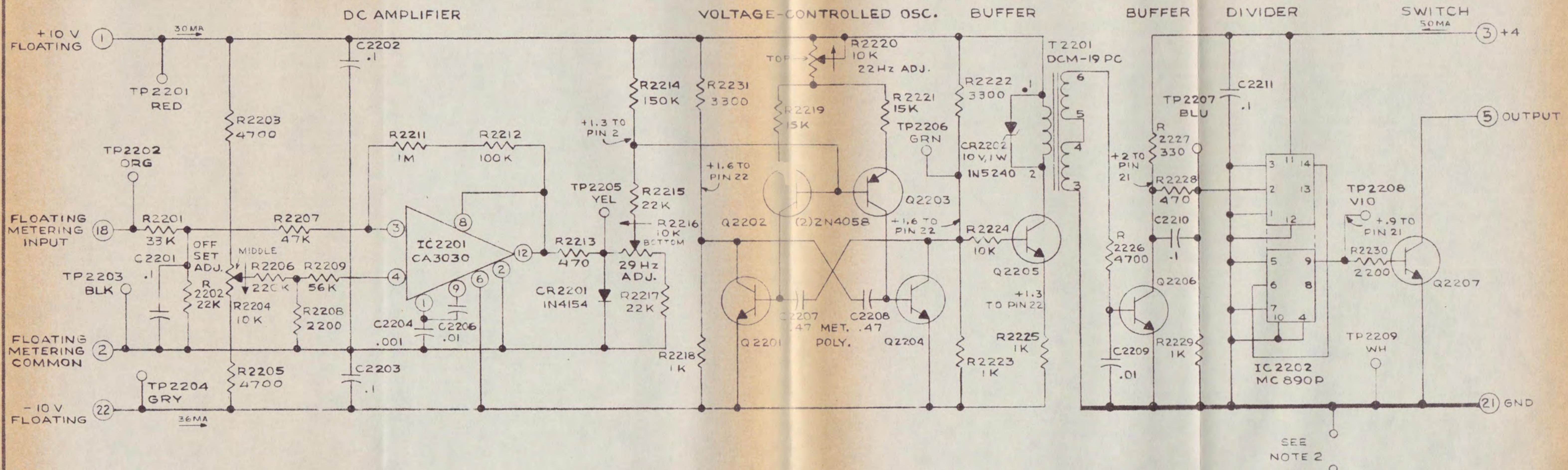
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC–BOARD 21
TCU STEPPER CONTROL B

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
DWN	FXY	3/69
CHK		
ENG	JCT	5-69

SCALE:
91 B 6321 A

R2231 Q2207 C2211



ADJUSTMENT PROCEDURE

1) With no input (orange test point connected to black test point), adjust the middle potentiometer for zero volts DC as measured between the black and the yellow test points.

2) At that time, adjust the top potentiometer (R-2220) for an output frequency of 22 Hz as measured at the violet test point. For standard AM broadcast transmitters, adjust for a frequency of 20 Hz.

3) Remove the connection between the orange and black test points. Home the stepping switch to the Calibrate position and adjust the bottom potentiometer (R-2216) for an output frequency of 29 Hz as measured at the violet test point. For standard AM broadcast transmitters, adjust for a frequency of 25 Hz.

NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%
   CAPACITOR " " " MICROFARADS
   TRANSISTORS ARE 2N2924
2. CONNECT ON RRC-10T ONLY OR OLDER EQUIPMENT.
3. P.C. BOARD 51A5213 A
4. COMPONENT LAYOUT 20A2133

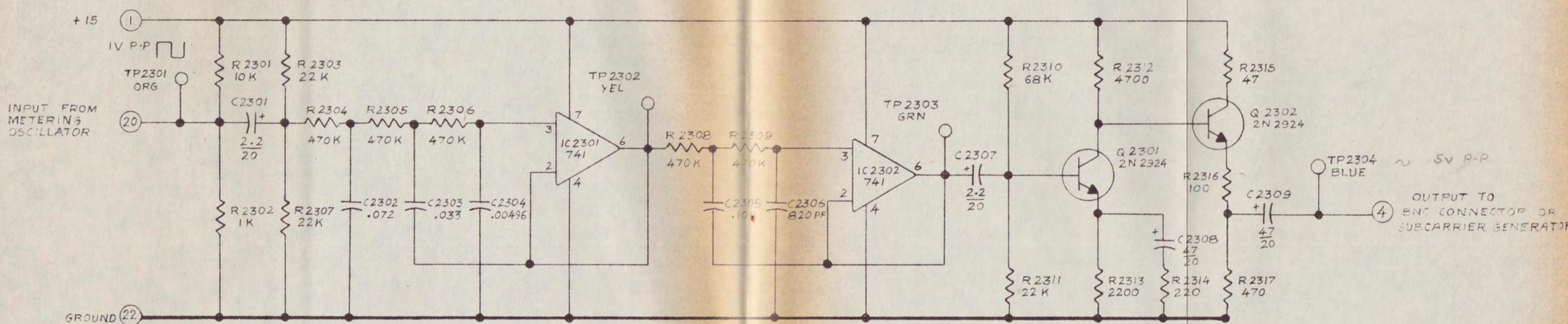
RRC-10T, PBR-30

REVISIONS	DATE
F	REMOVE R2210 & C2205 ECO 498 12/30/71
E	R2220 & R2216 WIREWOUND, R2218 & R2223 WERE 4700. ECO 302, 12-69
D	ECO 299. COMP VALUE CHANGES. APP. TOP, MIDDLE & BOTTOM TO POTS. ADD ADJ. PROCEDURE. 11-69
C	REVISED & REDRAWN 10-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC – BOARD 22
TCU METERING OSC.

TOL	FRACT ± 1/32	XX ± .030	XXX ± .010
DWN	JAG	10-69	SCALE
CHK	FXY	10/69	
ENG	JCT	11-69	91B6322 F



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2W, 10%
CAPACITOR VALUES ARE IN MICROFARADS

2 P.C. BOARD 51 A 5367

3 COMPONENT LAYOUT 20A 2301

PBR-30

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

SCHEMATIC - BOARD-23
TCU SUBAUDIBLE METERING PROC

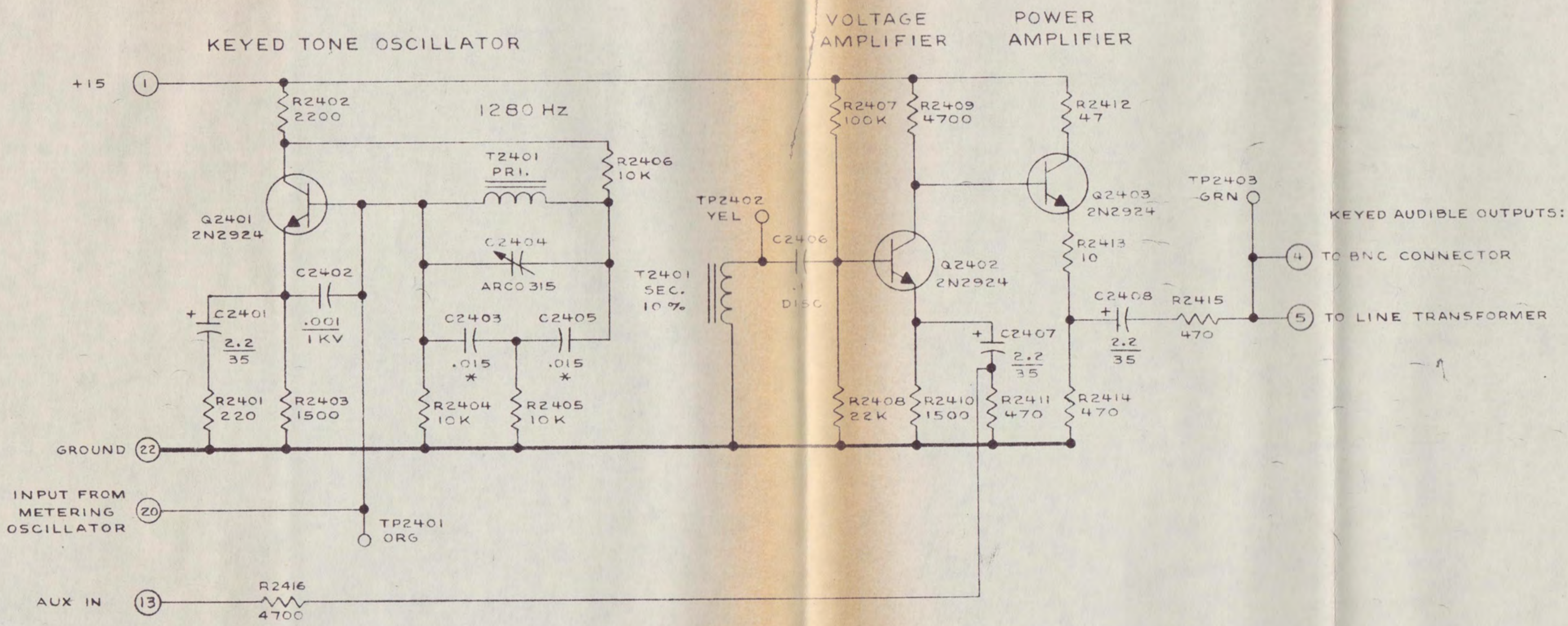
DATE	REVISIONS	MGMT. APPR.		

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	R.F.	12-7-71	SCALE:
CHK	FXY	12/15/71	91 B 6530
ENG	JCA	16 DEC 71	

5/71 DIETERICH-POST CLEARPRINT 1020-8

Q2403 R2416 C2408 T2401 TP2403



NOTES:

1 UNLESS OTHERWISE SPECIFIED,
RESISTOR VALUES ARE IN OHMS, 1/2, 10%
CAPACITOR VALUES ARE IN MICROFARADS.

2 * C2403 & C2405 ARE METALIZED POLYCARBONATE, ± 3%.

3 P.C. BOARD 51A5215

4 COMPONENT LAYOUT 20A2135

RRC-10T, PBR-30

REVISIONS	DATE
A ADD PIN 13 AND R2416	10-69

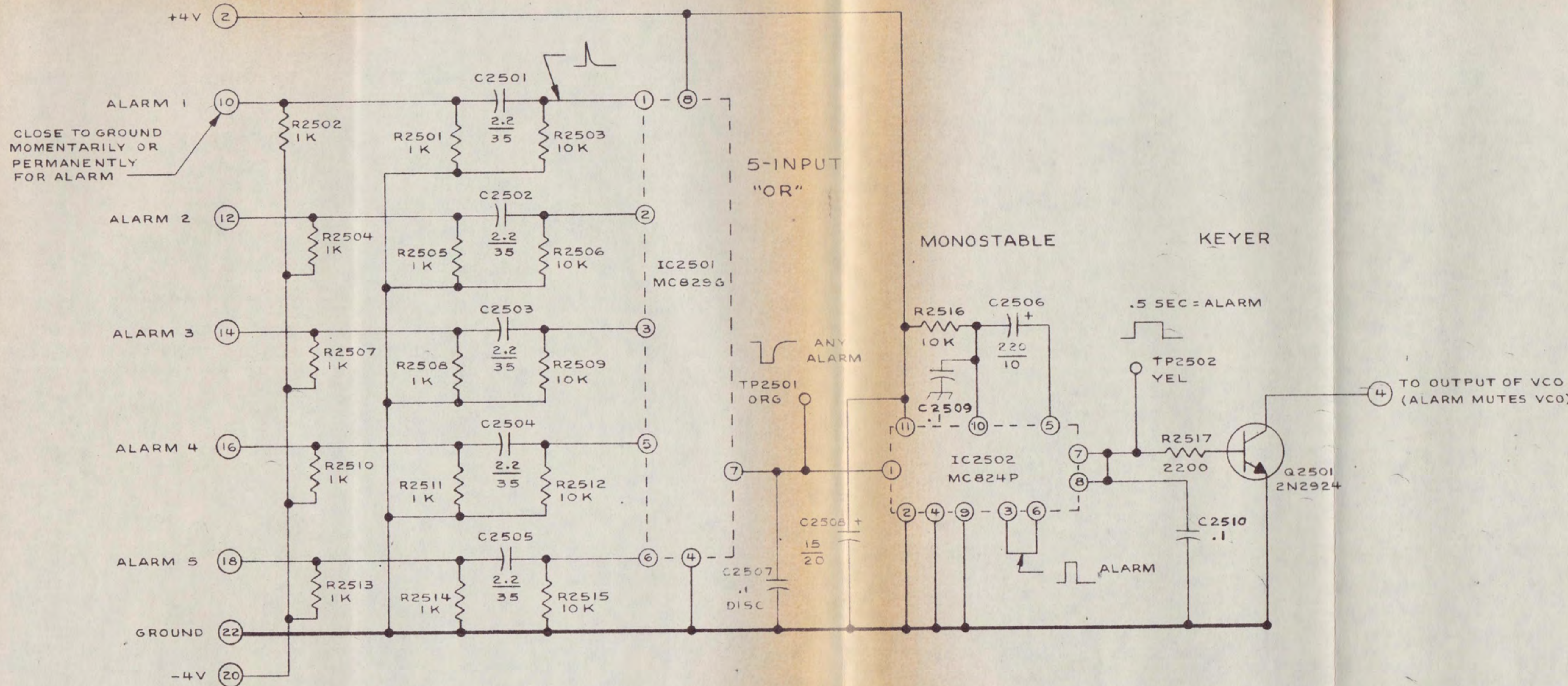
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 24
TCU AUDIBLE METERING PROC.

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	FXY	3/69	SCALE:
CHK			
ENG	JCY	5-69	91 B 6324 A

IC2502 Q2501 R2517 C2510 TP2502



NOTES:

1 UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, 1/2W, 10% CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BOARD 51A5217.

3 COMPONENT LAYOUT 20A2137.

PBR-30

REVISIONS		DATE
B	C2506 WAS 47/20 ECO 359	7/70
A	ADD C2509 & 2510	10-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 25
TCU ALARM ENCODER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	FXY	3/69	SCALE:
CHK			91 B 6325 B
ENG	JCT	5-69	

NOTES

1 THIS BOARD SUBSTITUES FOR A SUBCARRIER GENERATOR OR DEMODULATOR WHEN BNC CONNECTORS ARE USED IN A NON-SUBCARRIER APPLICATION.

2 P.C. BOARD 51A5206.

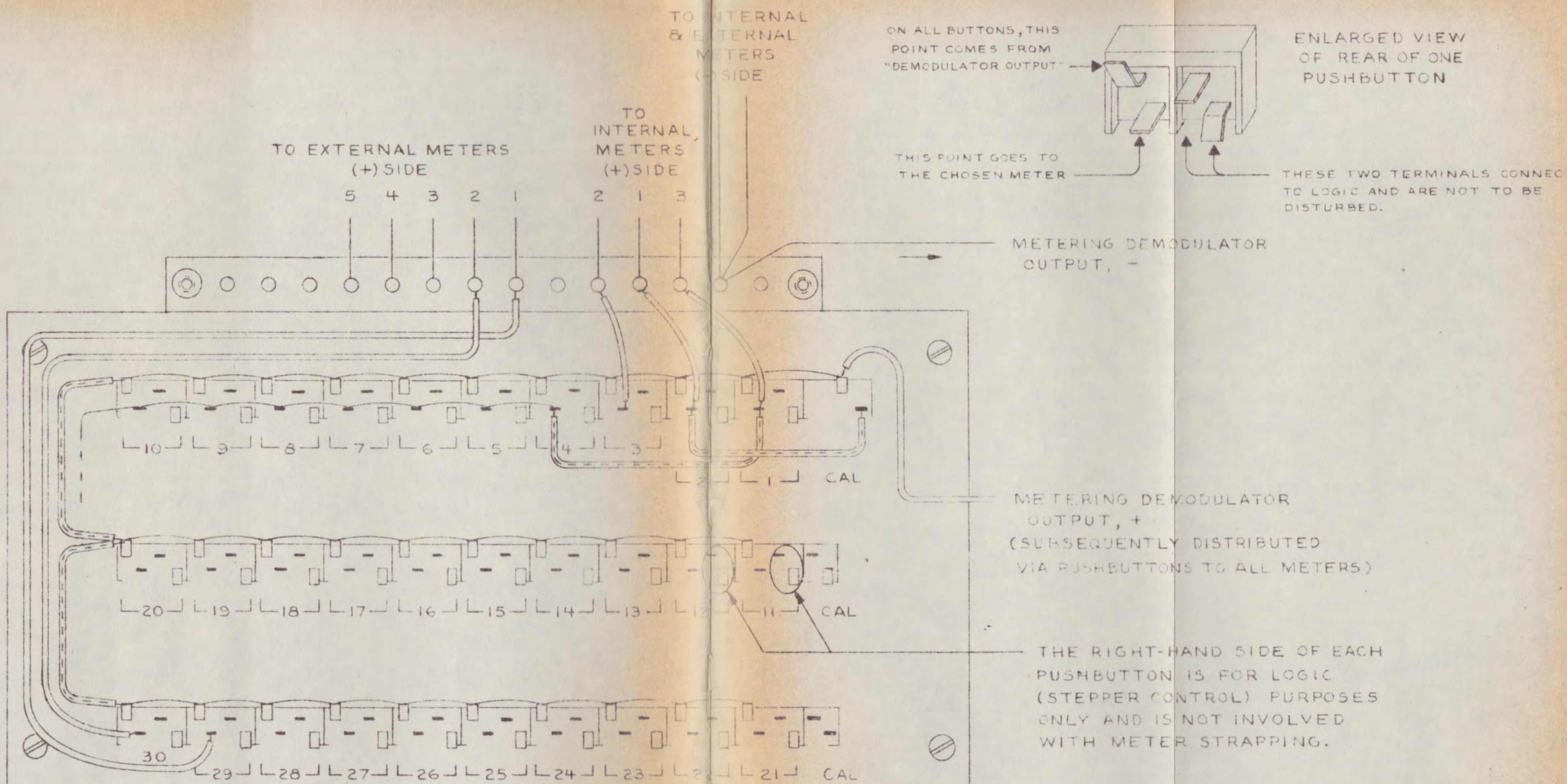
PBR-30

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC - BOARD 26

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	3/69	SCALE:
CHK			91 B 6326
ENG	JCP	5-69	

REVISIONS
DATE



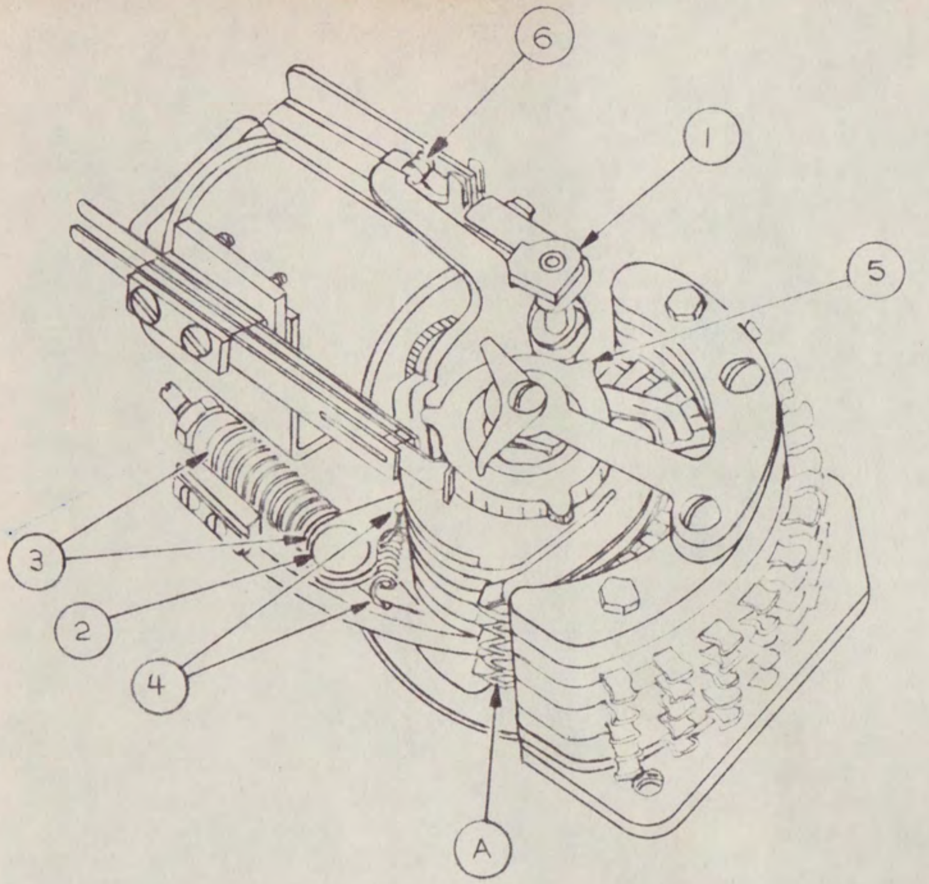
IN THIS PARTIAL DRAWING, "CALIBRATE" AND BUTTON 2 GO TO METER 1. 1 AND 4 THRU 28 GO TO METER 3. BUTTON 3 GOES TO METER 2. BUTTON 29 GOES TO EXTERNAL METER 1. BUTTON 30 GOES TO EXTERNAL METER 2.

REVISIONS		DATE
C	ADD JUMPER-CAL TO P.B. 1	12/18/70
B	REVISE CALIB. BUTTON SWITCHES FOR MAXI SWITCH CONFIGURATION.	2-70
A	DELETE WIRES 6 & 7	7-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SWITCH FUNCTION GUIDE
PBR-30 PUSHBUTTON SWITCH

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	4/69	SCALE: FULL
CHK			93 B 1004 C
ENG			



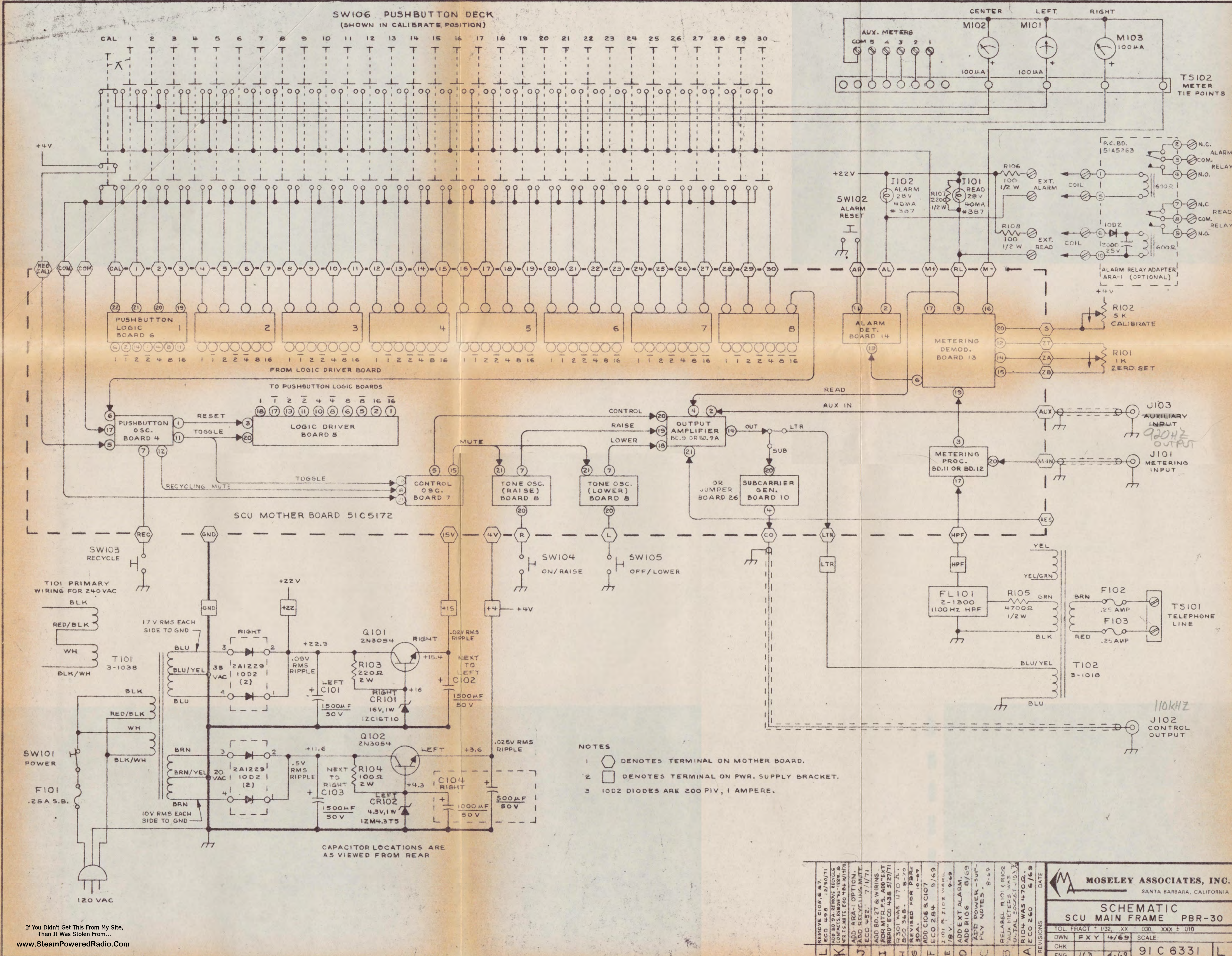
1. Apply one dip of blended lubricating oil to each of the numbered locations.

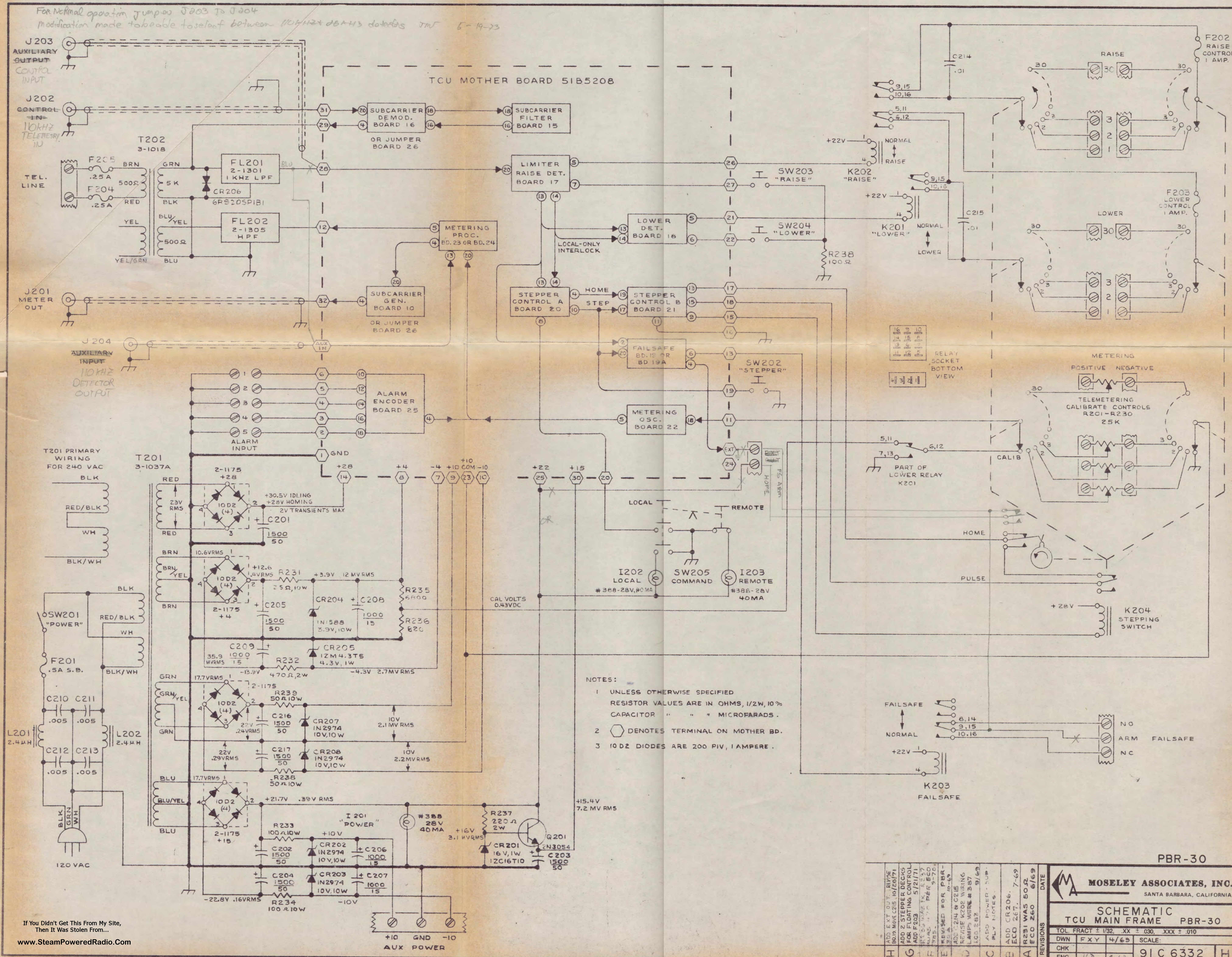
2. Apply one dip of watch oil to each set of wiper tips as shown at location "A".

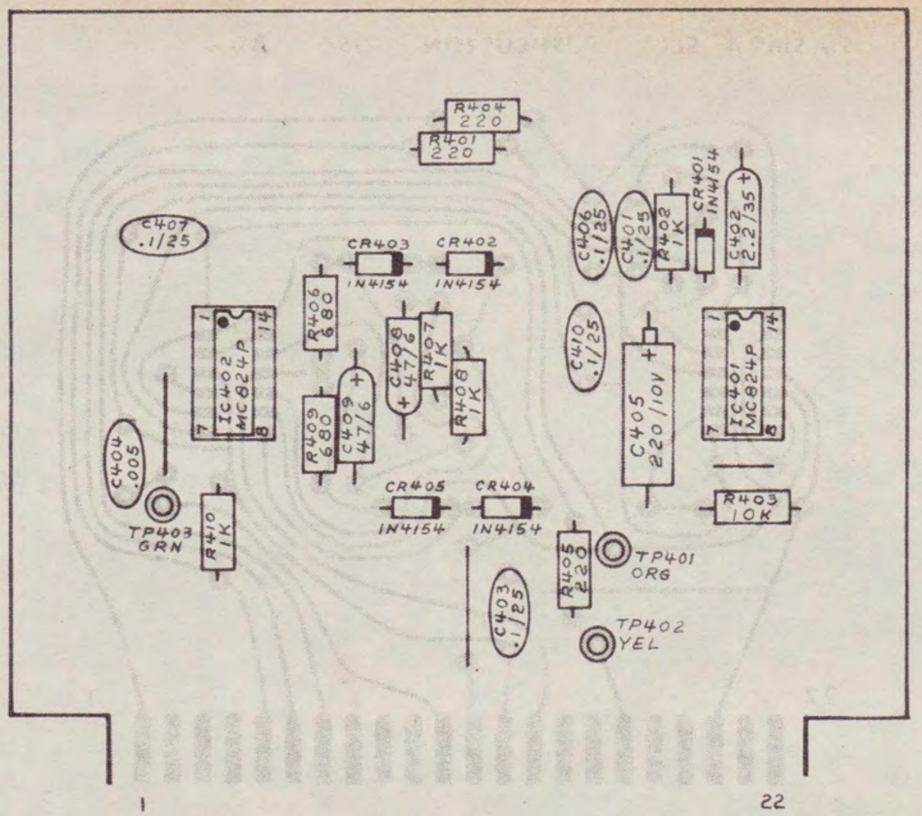
3. Apply two dips of graphite oil lubricant to the ratchet teeth (not shown) while operating the stepping switch.

Standard lubrication kit available from Automatic Electric, Northlake, Illinois. Order PD-9100-1.

MOSELEY ASSOCIATES, INC. SANTA BARBARA, CALIFORNIA	
LUBRICATION INSTRUCTIONS FOR STEPPING SWITCH	
DWN FXY 4-66	SKA 6142
CHK	


SW106 PUSHBUTTON DECK
(SHOWN IN CALIBRATE POSITION)
CAL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
AUX. METERS
COM 5 4 3 2 1
CENTER M102
LEFT M101
RIGHT M103 100µA
100µA
TS102 METER TIE POINTS
+4V
+22V
I102 ALARM 28V 40MA #387
I101 READ 28V 40MA #387
R107 220Ω 1/2 W
SW102 ALARM RESET
R106 100 1/2 W
EXT. ALARM
R108 100 1/2 W
EXT. READ
P.C. BD. 51A5363
N.C.
COM.
N.O.
ALARM RELAY
READ RELAY
COIL
600Ω
1002
1200Ω 25V
ALARM RELAY ADAPTER ARA-1 (OPTIONAL)
PUSHBUTTON LOGIC BOARD 6
FROM LOGIC DRIVER BOARD
ALARM DET. BOARD 14
METERING DEMOD. BOARD 13
R102 5K CALIBRATE
R101 1K ZERO SET
TO PUSHBUTTON LOGIC BOARDS
PUSHBUTTON OSC. BOARD 4
RESET
TOGGLE
LOGIC DRIVER BOARD 5
READ
AUX IN
CONTROL
RAISE
LOWER
MUTE
OUTPUT AMPLIFIER BD.9 OR BD.9A
OUT
LTR
SUB
J103 AUXILIARY INPUT
920HZ OUTPUT
METERING PROC. BD.11 OR BD.12
J101 METERING INPUT
RECYCLING MUTE
CONTROL OSC. BOARD 7
TONE OSC. (RAISE) BOARD 8
TONE OSC. (LOWER) BOARD 8
OR JUMPER BOARD 26
SUBCARRIER GEN. BOARD 10
SCU MOTHER BOARD 51C5172
SW103 RECYCLE
SW104 ON/RAISE
SW105 OFF/LOWER
T101 PRIMARY WIRING FOR 240VAC
BLK
RED/BLK
WH
BLK/WH
T101 3-1038
17 V RMS EACH SIDE TO GND
BLU
BLU/YEL
35 VAC
2A1229 1002 (2)
RIGHT
+22.9
.09V RMS RIPPLE
LEFT C101
1500µF 50V
Q101 2N3054
R103 220Ω 2W
RIGHT CR101 16V,1W 1ZC16T10
+15.4
+16
.02V RMS RIPPLE
NEXT TO LEFT C102
1500µF 50V
Q102 2N3054
BRN
BRN/YEL
20 VAC
+11.6
.5V RMS RIPPLE
NEXT TO RIGHT C103
1500µF 50V
R104 100Ω 2W
LEFT CR102 4.3V,1W 1ZM4.3T5
+4.3
+3.6
.025V RMS RIPPLE
C104 RIGHT
1000µF 50V
500µF 50V
10V RMS EACH SIDE TO GND
SW101 POWER
F101 .25A S.B.
120 VAC
CAPACITOR LOCATIONS ARE AS VIEWED FROM REAR
FL101 2-1300 1100 HZ HPF
R105 4700Ω 1/2W
YEL
YEL/GRN
GRN
F102 .25 AMP
F103 .25 AMP
TS101 TELEPHONE LINE
RED
BLU/YEL
T102 3-1018
110KHZ
J102 CONTROL OUTPUT
NOTES
1 DENOTES TERMINAL ON MOTHER BOARD.
2 DENOTES TERMINAL ON PWR. SUPPLY BRACKET.
3 1002 DIODES ARE 200 PIV, 1 AMPERE.
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA
SCHEMATIC
SCU MAIN FRAME PBR-30
DWN FXY 4/69
ENG JCT 4-69
91C6331 L
REVISIONS DATE


For normal operation jumper J203 to J204
Modification made to be able to select between 110 KHz & 26+43 detectors JMV 6-19-73
J203
AUXILIARY OUTPUT
CONTROL INPUT
J202
CONTROL IN
110 KHZ TELEMETRY IN
T202
3-1018
TEL. LINE
F205
.25A
F204
.25A
FL201
2-1301
1 KHz LPF
CR206
6RS205P1B1
FL202
2-1305
HPF
J201
METER OUT
J204
AUXILIARY INPUT
110 KHZ DETECTOR OUTPUT
TCU MOTHER BOARD 51B5208
SUBCARRIER DEMOD. BOARD 16
OR JUMPER BOARD 26
SUBCARRIER FILTER BOARD 15
LIMITER RAISE DET. BOARD 17
METERING PROC. BD. 23 OR BD. 24
LOWER DET. BOARD 18
LOCAL-ONLY INTERLOCK
SUBCARRIER GEN. BOARD 10
STEPPER CONTROL A BOARD 20
HOME
STEP
STEPPER CONTROL B BOARD 21
FAILSAFE BD. 19 OR BD 19A
ALARM ENCODER BOARD 25
ALARM INPUT
METERING OSC. BOARD 22
SW203 "RAISE"
SW204 "LOWER"
SW202 "STEPPER"
R238 100Ω
K202 "RAISE"
K201 "LOWER"
NORMAL
RAISE
LOWER
C214 .01
C215 .01
F202 RAISE CONTROL 1 AMP.
F203 LOWER CONTROL 1 AMP.
RELAY SOCKET BOTTOM VIEW
METERING
POSITIVE NEGATIVE
TELEMETERING CALIBRATE CONTROLS R201-R230 25K
CALIB
PART OF LOWER RELAY K201
LOCAL
REMOTE
I202 LOCAL #388-28V, 40MA
SW205 COMMAND
I203 REMOTE #388-28V 40MA
PULSE
K204 STEPPING SWITCH
CAL VOLTS 0.43VDC
T201 PRIMARY WIRING FOR 240 VAC
T201 3-1037A
SW201 "POWER"
F201 .5A S.B.
C210 .005
C211 .005
C212 .005
C213 .005
L201 2.4μH
L202 2.4μH
120 VAC
2-1175 +28
+30.5V IDLING
+28V HOMING
2V TRANSIENTS MAX
C201 1500 50
2-1175 +4
R231 25Ω,10W
+3.9V 12MVRMS
CR204 1N1588 3.9V,10W
C208 1000 15
C205 1500 50
R235 5600
R236 820
C209 1000 15
R232 470Ω,2W
CR205 1ZM4.3T5 4.3V,1W
-4.3V 2.7MVRMS
2-1175
R239 50Ω10W
C216 1500 50
CR207 1N2974 10V,10W
10V 2.1MV RMS
C217 1500 50
CR208 1N2974 10V,10W
10V 2.2MVRMS
R238 50Ω10W
2-1175 +15
+21.7V .39V RMS
I201 "POWER"
#388 28V 40MA
R237 220Ω 2W
Q201 2N3054
CR201 16V,1W 1ZC16T10
C203 1500 50
+15.4V 7.2 MV RMS
R233 100Ω10W
C202 1500 50
CR202 1N2974 10V,10W
C206 1000 15
C204 1500 50
CR203 1N2974 10V,10W
C207 1000 15
R234 100Ω10W
-22.8V .16VRMS
-10V
+10 GND -10
AUX POWER
NOTES:
1 UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS, 1/2W, 10% CAPACITOR " " " MICROFARADS.
2 DENOTES TERMINAL ON MOTHER BD.
3 10D2 DIODES ARE 200 PIV, 1 AMPERE.
FAILSAFE
NORMAL
K203 FAILSAFE
NO
ARM
NC
PBR-30
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA
SCHEMATIC
TCU MAIN FRAME PBR-30
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010
DWN FXY 4/69
SCALE:
CHK
ENG 4-69
91 C 6332 H
REVISIONS
DATE
A R231 WAS 50Ω ECO 260 6/69
B ADD CR206. ECO 267 7-69
C ADD POWER SUPPLY NOTES.
D ADD C214 & C215 REVISE K202 WIRING LAMPS WERE #387 ECO 283 9/69
E REVISED FOR PBR-30A 10-69
G ADD 2 STEPPER DECKS FOR FLOATING CONTROL ADD F203 5/21/71
H ADD EXT OUT, REVISE AUX OUT 10/20/71



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%
CAPACITOR VALUES ARE IN MICROFARADS.

2. P.C. BD. 51A5169.

3 SCHEMATIC 91B6304.

PBR-30

REVISIONS		DATE
B	ADD JUMPER TO PIN 12 R403 WAS 8200 ECO 4-5452	6/30/71

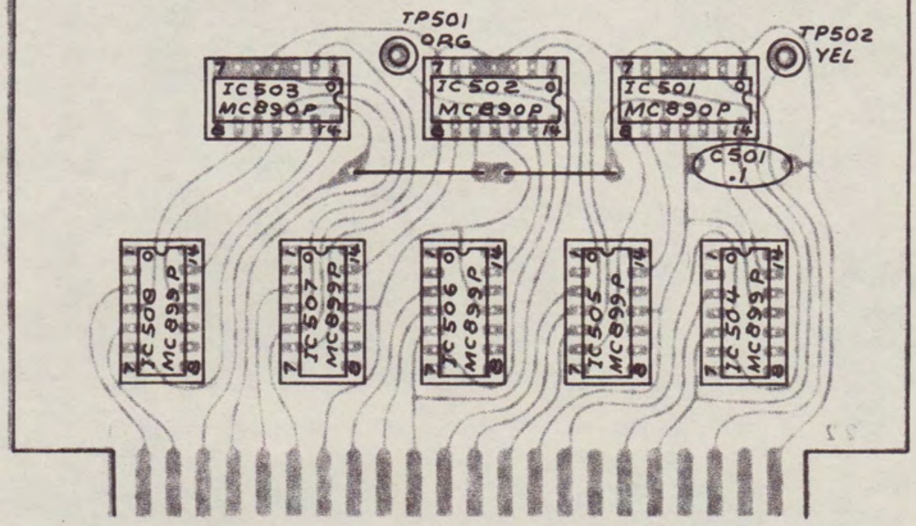
MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD-4
SCU PUSHBUTTON OSC.

TOL. FRACT ± 1/32	XX ± .030, XXX ± .010	
DWN	F X Y	1/25/71
CHK		
ENG	JCT	1 JUL 71

SCALE: FULL

20A2109 B



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

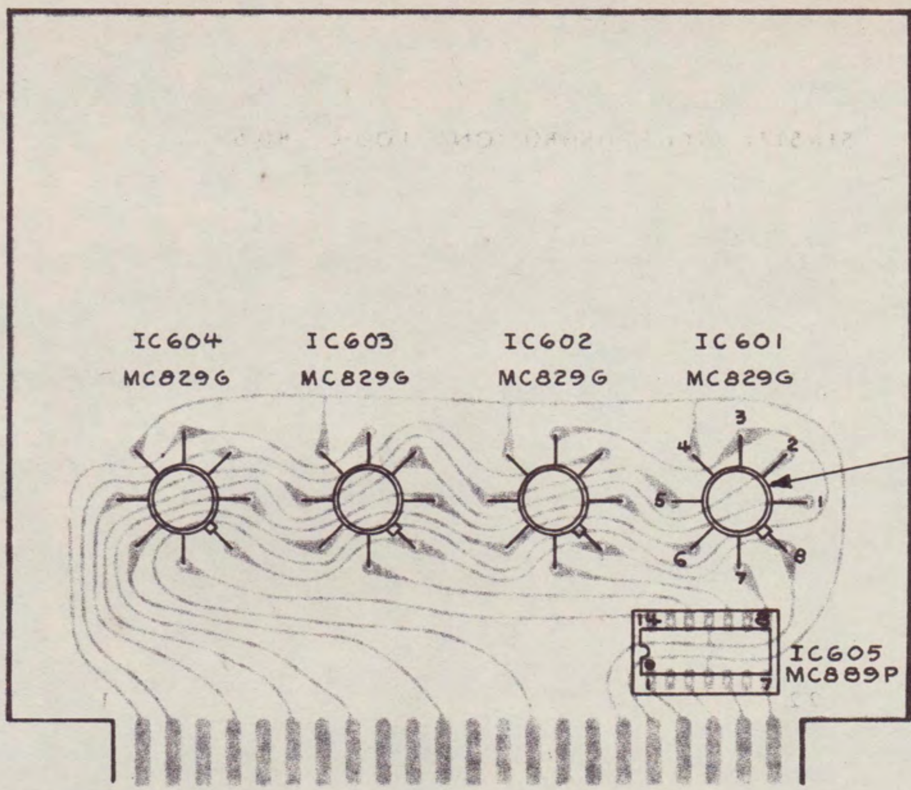
2 P.C. BD. 51A5170
3 SCHEMATIC 91B6305

PBR-30

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 5
SCU LOGIC DRIVER

DATE / REVISIONS			
TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK	JCT	5-69	20 A 2110
ENG	JCT	5-69	



(A) HEIGHT OF MC829G (4) MUST NOT EXCEED HEIGHT OF MC889P, APPROX. 3/8".

NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BOARD 51 A 5171.

3 SCHEMATIC 91 B 6306

PBR-30

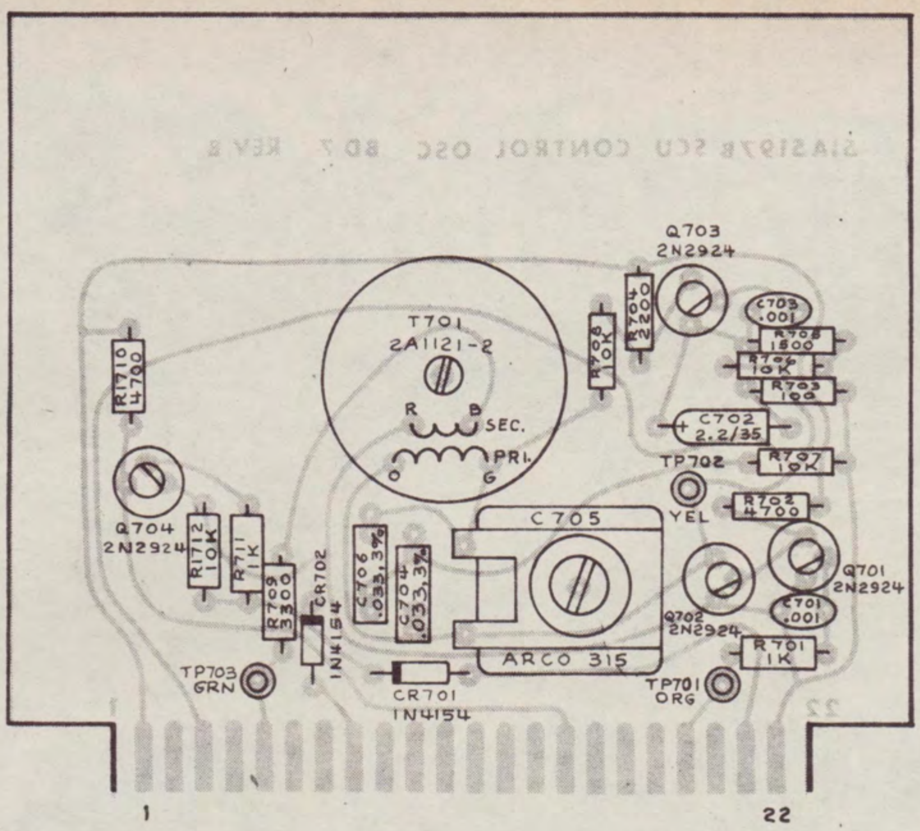
REVISIONS	DATE
A NOTE (A) ADDED	

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 6
SCU PUSHBUTTON LOGIC

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010

DWN	F X Y	5/69	SCALE: FULL
CHK	JCT	5-69	20 A 2111
ENG	JCT	5-69	A



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BOARD 51A5197A

3 SCHEMATIC 91B6307

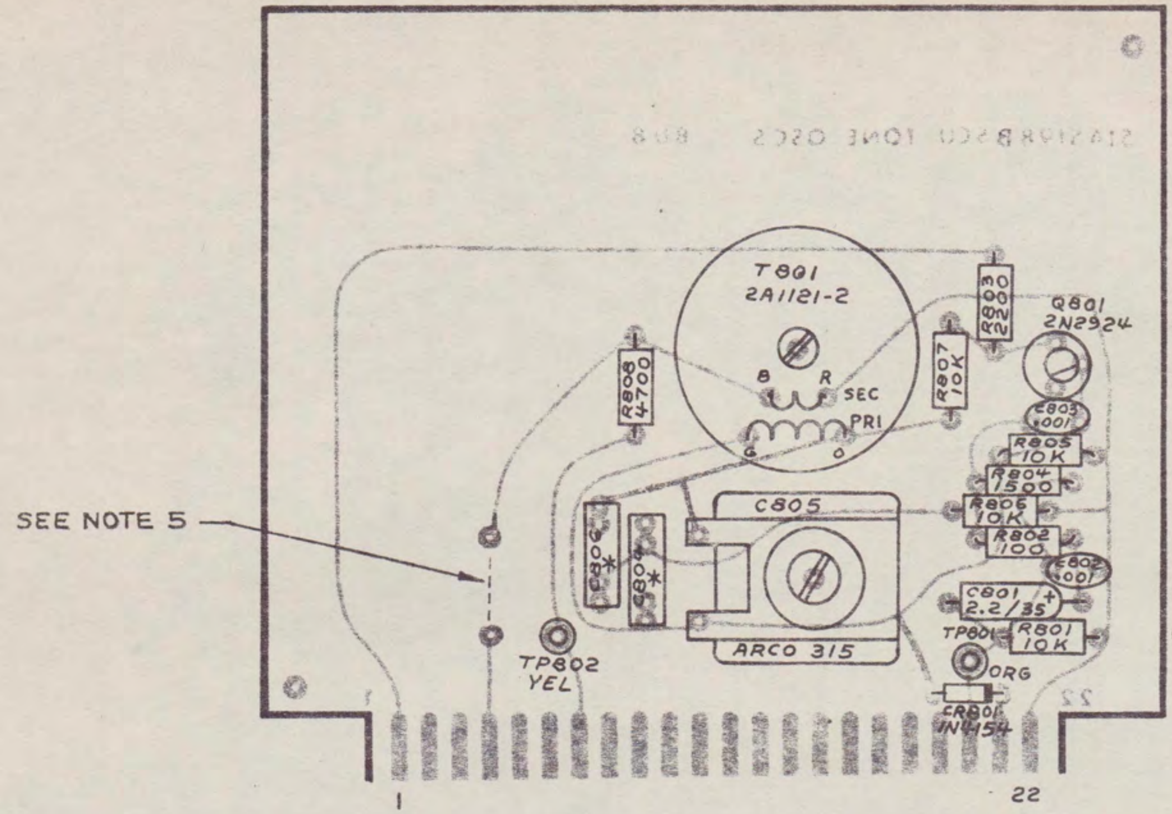
PBR-30

REVISIONS		DATE
C	R709 WAS 2200. ECO 496	12/29/71
B	ADD CR701, 702 & R712. R709 WAS 4700. ECO 449 & 452	6/30/71

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD-7
SCU CONTROL OSC.

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010			
DWN	F X Y	1/25/71	SCALE: FULL
CHK			20A2117 C
ENG	JLT	1 JUL 71	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 * C804 & C806 ARE METALIZED POLYCARBONATE ±3%
.068 µf FOR "LOWER" (670 Hz)
.047 µf FOR "RAISE" (790 Hz)
.033 µf FOR "CONTROL" (920 Hz) RRC-10T ONLY

3 P.C. BD. 51A5198.

4 SCHEMATIC 91B6308.

5 ADD JUMPER FOR RRC-10T CONTROL BD ONLY.

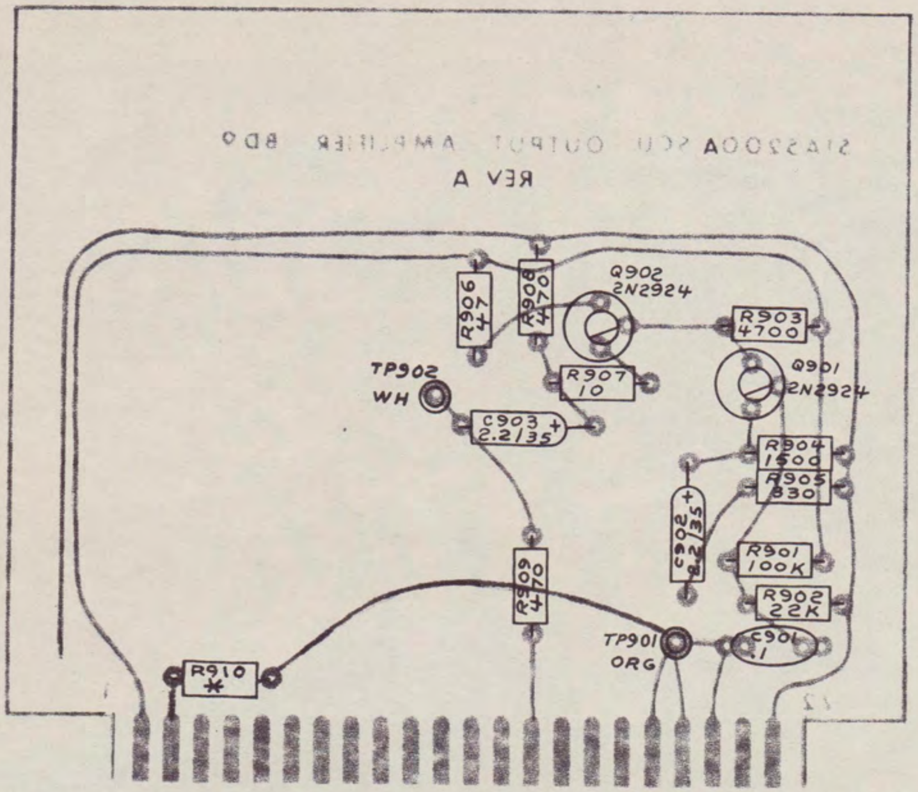
RRC-10T PBR-30

REVISIONS		DATE
D	CR801 WAS TO PIN 15 NEW ARTWORK	3/70
C	ADD CR801 AND IT'S CIRCUITRY.	11-69
B	ADD RRC-10T JUMPER, NOTE 5.	9-69
A	NOTE 2 ADD .033 FOR RRC-10T	9/69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 8
SCU TONE OSC'S

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK			20 A 2118 — D
ENG		5-69	



NOTES

1 P.C. BD 51A5200
2 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.
3 SCHEMATIC 91B6309
4 * SELECTED VALUE.

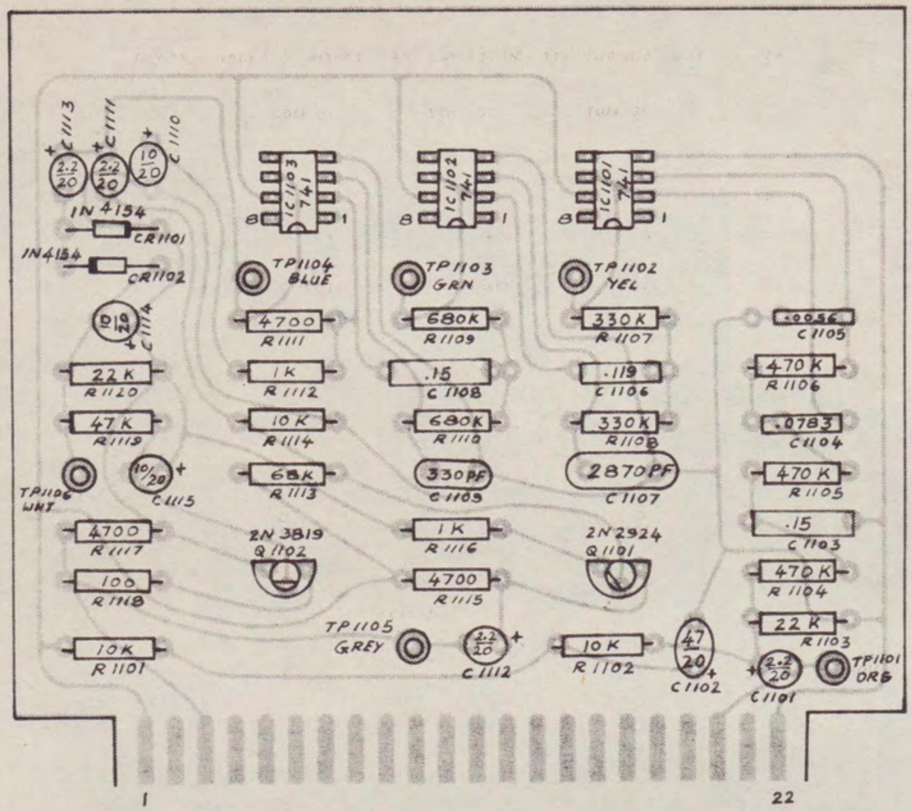
RRC-10T PBR-30

REVISIONS	DATE
A ADD R910. CIRCUITRY ADDED	10-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 9
SCU OUTPUT AMPLIFIER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	FXY	5/69	SCALE: FULL
CHK			20 A 2120
ENG	JCT	11-69	A



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2W, 10%
   CAPACITOR VALUES ARE IN MICROFARADS
2. P.C. BOARD 51A 5366
3. SCHEMATIC 91 B 6528

PBR-30

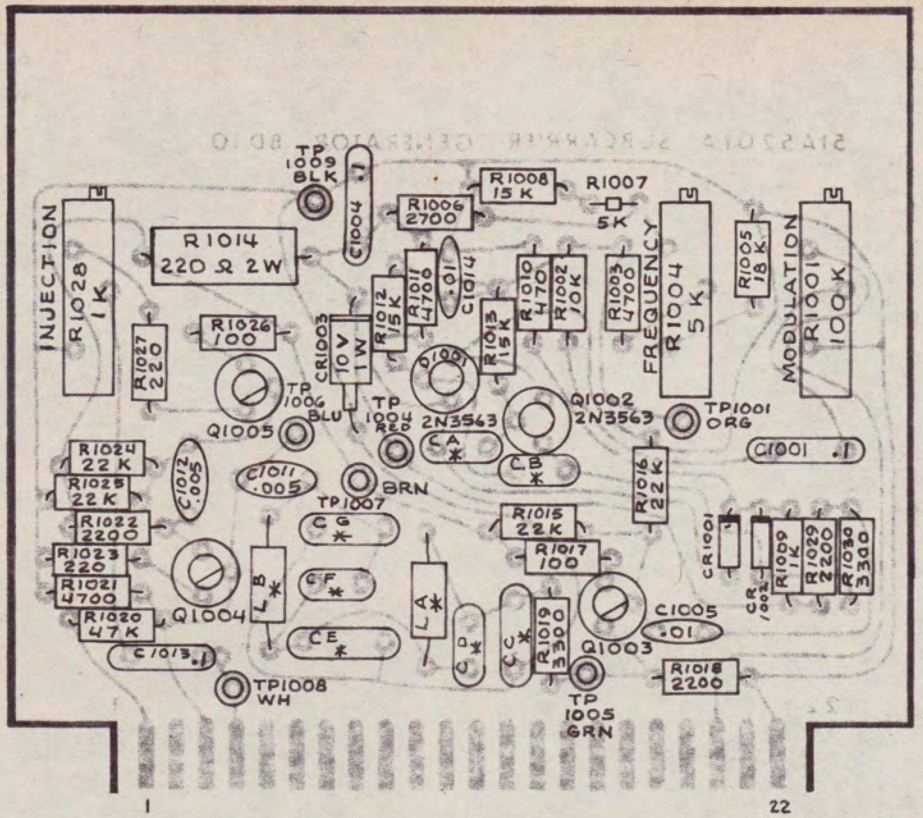
REVISIONS	DATE	MGMT. APPR.

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

COMPONENT LAYOUT BOARD-II
SCU SUBAUDIBLE METERING PROCESS

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	[illegible]	12-10-71	SCALE:	FULL
CHK	F X Y	12/15/71	20 A 2302	
ENG	JCT	15 DEC 71		



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.
TRANSISTORS ARE 2N2924
DIODES ARE IN4154

2 * SEE CHART ON DWG. 94A4501

3 P.C. BOARD 51A5201A

4 SCHEMATIC 91B6310

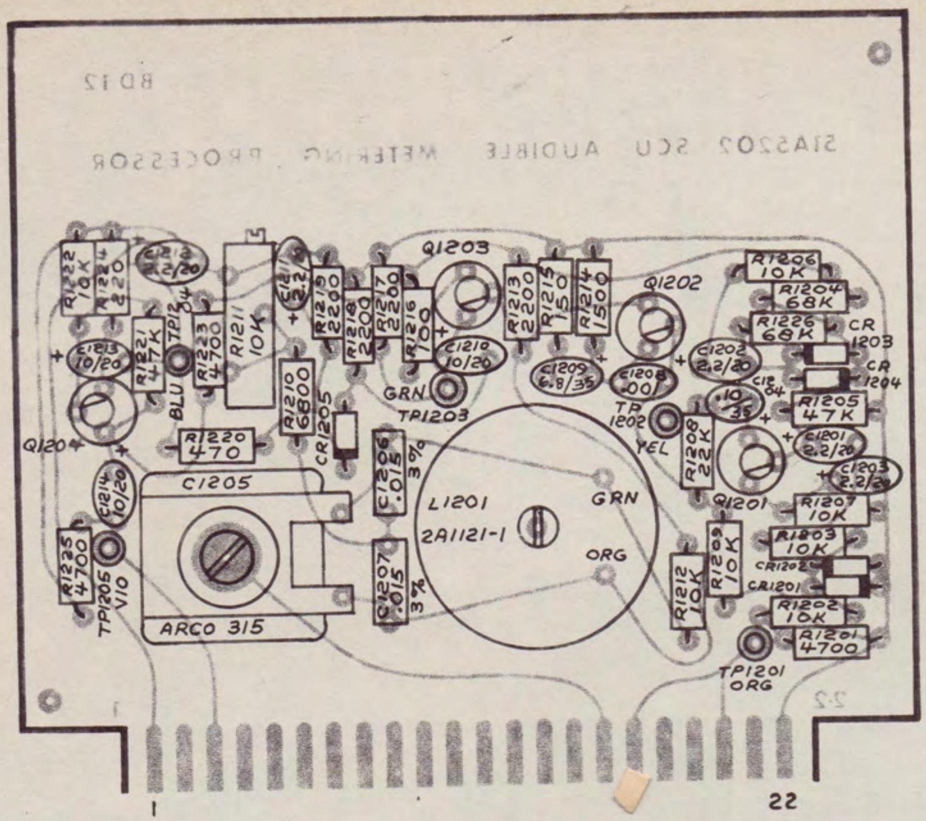
RRC-10T PBR-30

REVISIONS		DATE
D	REVISE * NOTATION PER ECO 332.	3-70
C	REDRAWN. CIRCUIT MODIFIED PER ECO 309.	2-70

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 10A
SUBCARRIER GENERATOR

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	JAG	2-70	SCALE: FULL
CHK	FXY	2/70	20A2121 D
ENG			



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2W, 10%.
   CAPACITOR VALUES ARE IN MICROFARADS.
   TRANSISTORS ARE 2N2924.
   DIODES ARE 1N4154.
2. P.C. BD. 51A5202.
3. SCHEMATIC 91B6312.

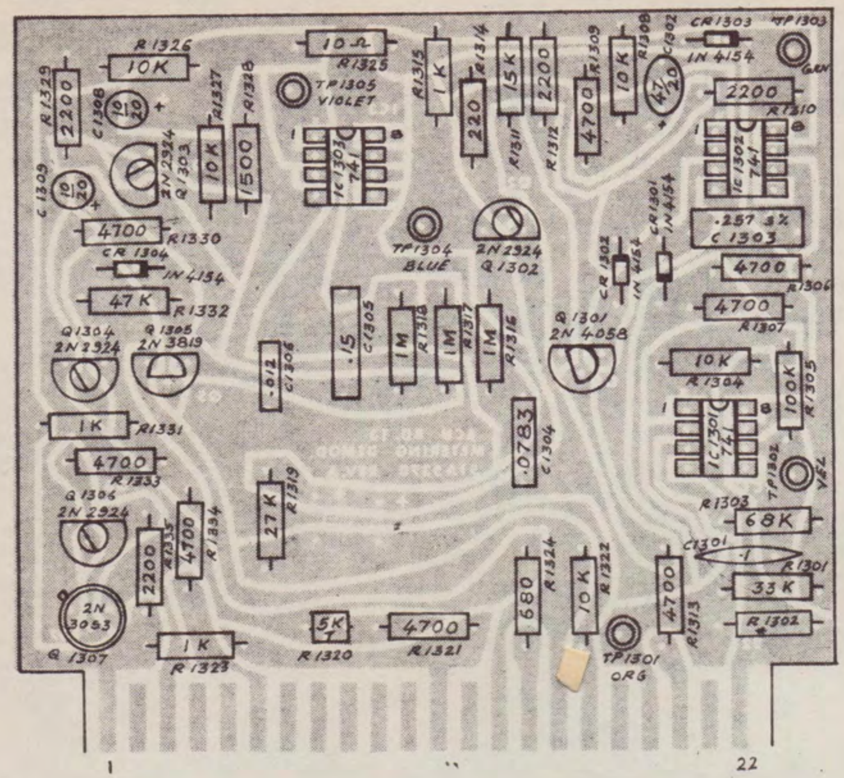
RRC-10T PBR-30

REVISIONS		DATE
A	C1209 WAS 2.2 μF, R1215 WAS 220 Ω. ECO 884.	9-70

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 12
SCU AUDIBLE METERING PROC.

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK			20A2122 A
ENG			



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%
   CAPACITOR VALUES ARE IN MICROFARADS
2. P. C. BOARD 51A 5370
3. SCHEMATIC 91 B 6529
4. * DENOTES SELECTED VALUE

PBR-30

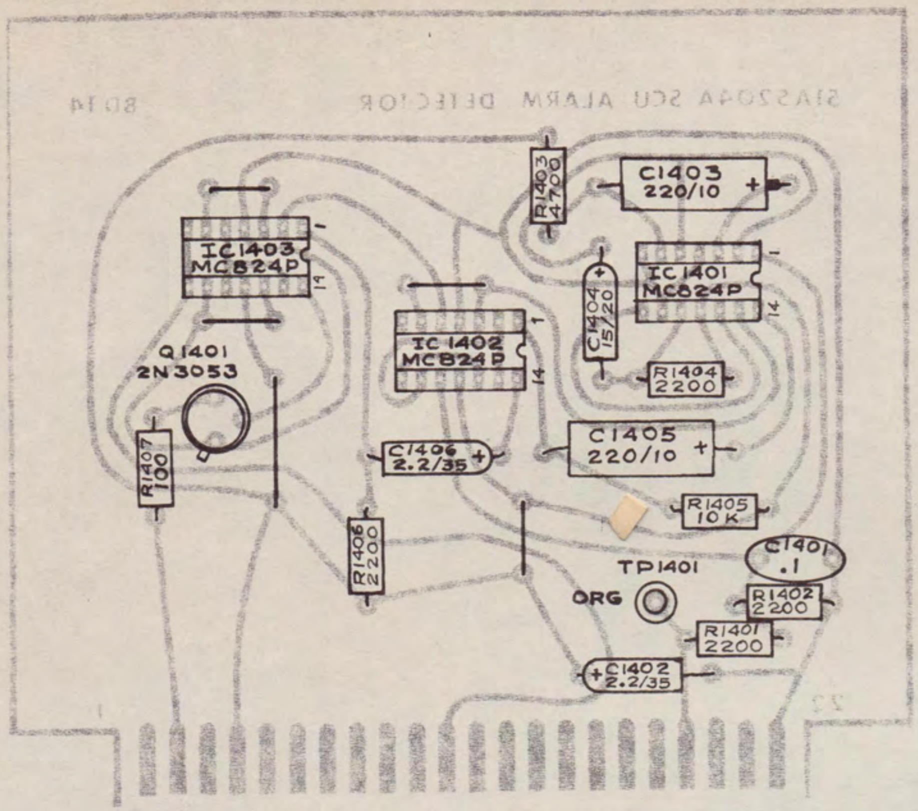
	REVISIONS	DATE
C	TAKE OFF C1307, ECO 566	9/29/72
B	R1303 WAS SELECTED. ECO 549.	7/27/72
A	R1326 WAS 6800. R1328 WAS 1K. R1324 WAS 1500. ECO 542	6/22/72
MGMT. APPR.		

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

COMPONENT LAYOUT BOARD 13
SCU METERING DEMODULATOR

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	[signature]	12-14-71	SCALE: FULL	
CHK	FXY	12/15/71	20 A 2298	C
ENG	[signature]	15 DEC 71		



NOTES :

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W 10%
CAPACITOR " " " MICROFARADS

2 P.C. BD. 51A5204A

3 SCHEMATIC 91B6314

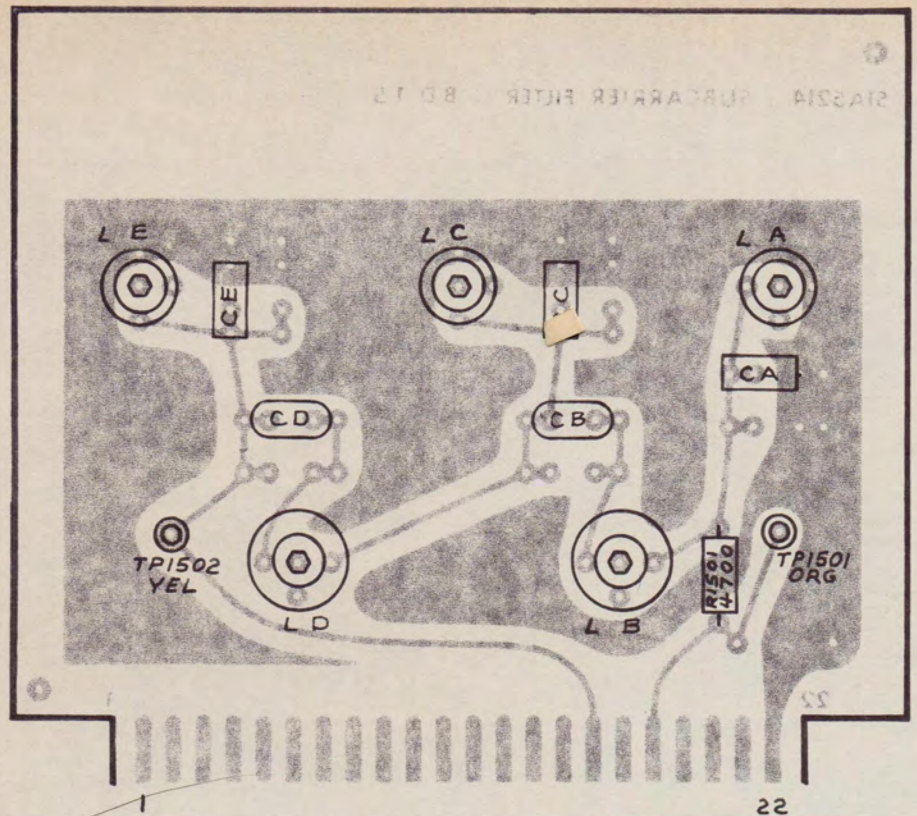
PBR-30

REVISIONS	DATE
A REDRAWN FOR CIRCUIT MODIF.	9-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 14
SCU ALARM DETECTOR

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	JAG	9-69	SCALE: FULL
CHK	FXY	9/69	20 A 2124 — A
ENG	JCT	9-69	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 COMPONENT VALUES SHOWN ON
DWG. 94A4503.

3 P.C. BD. 51A5214.

4 SCHEMATIC 91B6315.

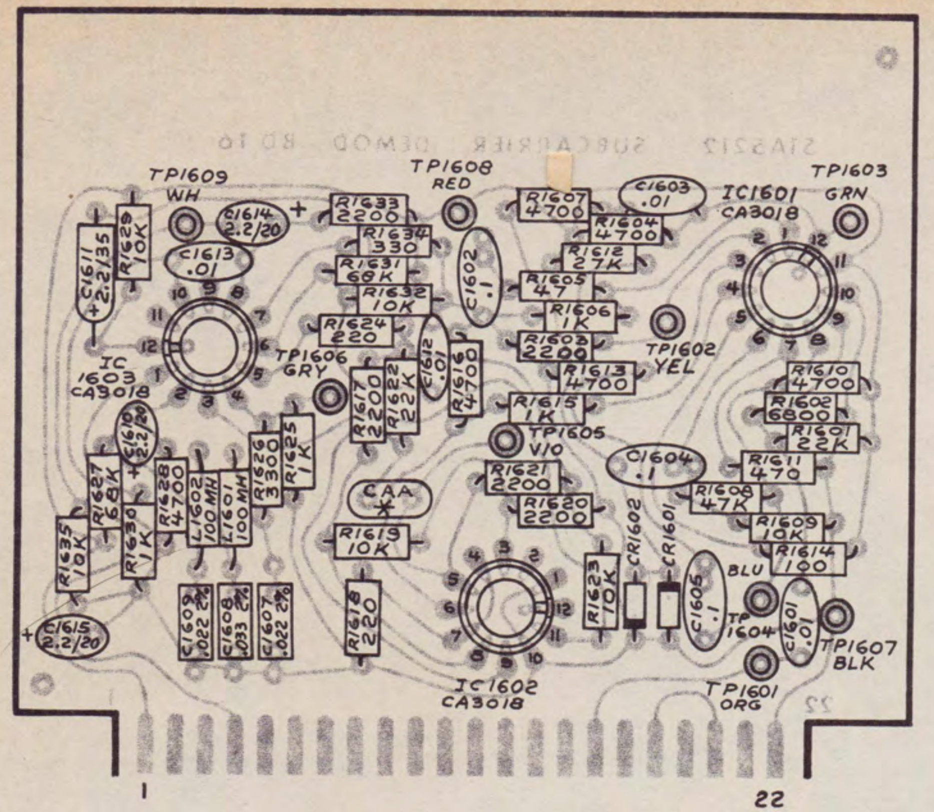
RRC-10 T PBR-30

REVISIONS		DATE
B	REVISE NOTE 2 PER ECO 330.	3-70
A	ADD CHART.	9-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 15
SUBCARRIER FILTER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK	JCM	5-69	20 A 2134
ENG	JCM	5-69	B



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.
DIODES ARE IN4154.

2 * VALUE OF CAA GIVEN ON DWG. 94A4502.

3 P.C. BD 51A5212.

4 SCHEMATIC 91B6316

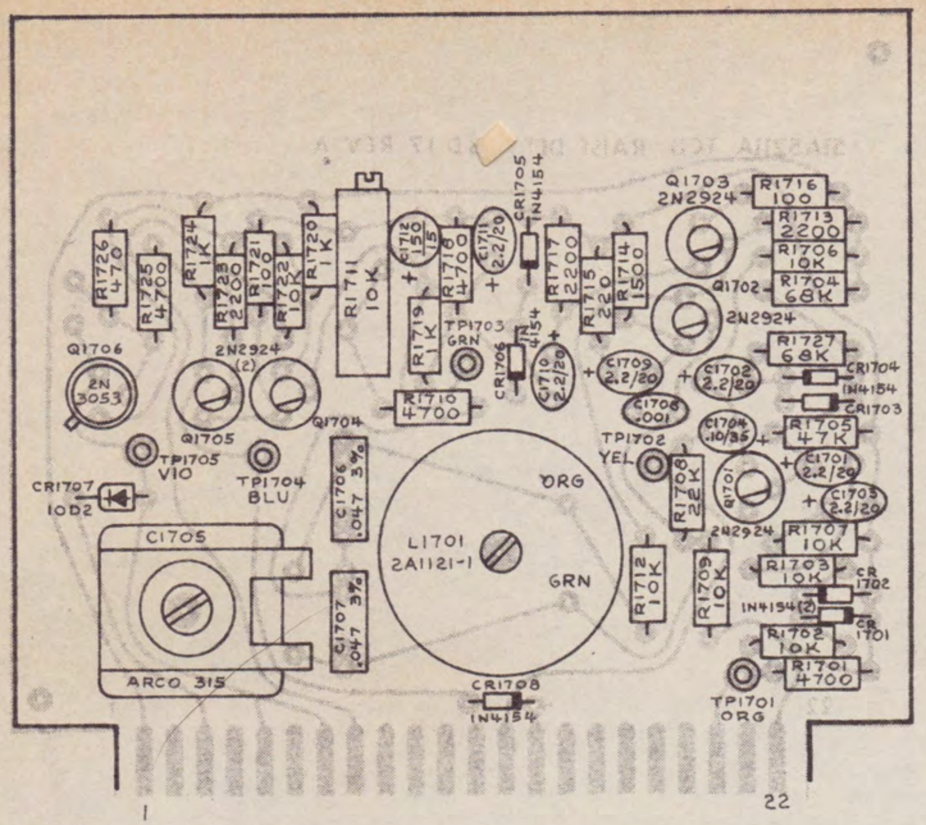
RRC-10T PBR-30

REVISIONS		DATE
B	NOTE 2 REVISED PER ECO 331	3-70
A	ADD C1606 VALUES	7/69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 16
SUBCARRIER DEMOD

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK	JCF	5-69	20A2132 B
ENG		5-69	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BD. 51A5211.

3 SCHEMATIC 91B6317.

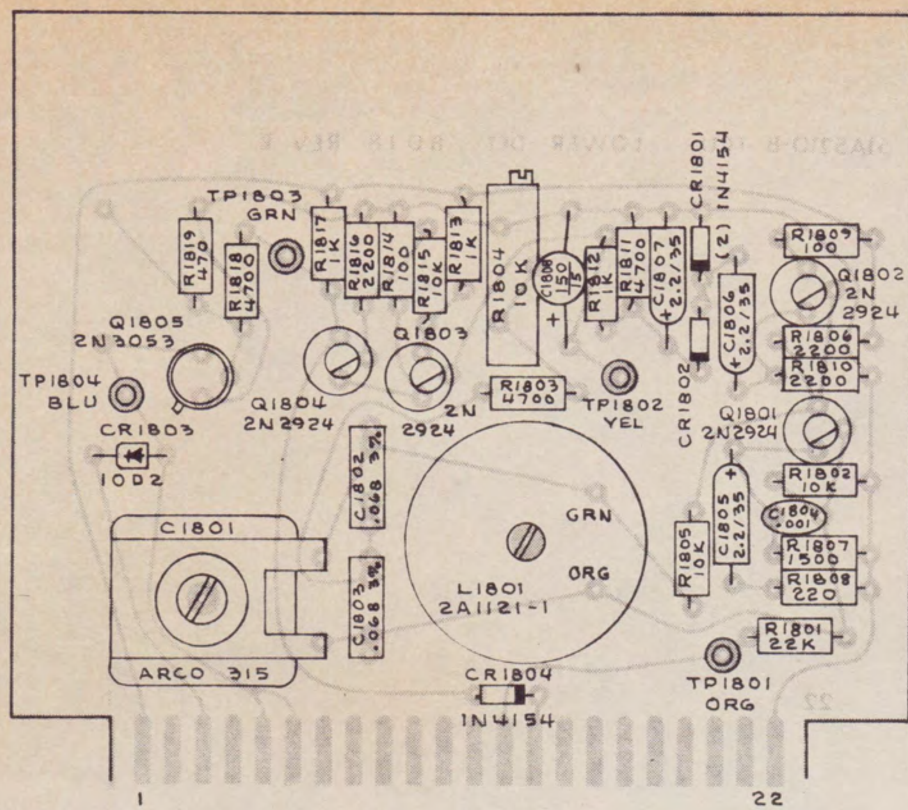
RRC-10T PBR-30

REVISIONS		DATE
C	C1712 WAS 2.2µF ECO 450	6/30/71

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 17
TCU RAISE DET.

TOL	FRACT ± 1/32, .XX ± .030, .XXX ± .010		
DWN	F X Y	2/1/71	SCALE: FULL
CHK			20 A 2131 — C
ENG	JLP	1 JUL 71	



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
   CAPACITOR VALUES ARE IN MICROFARADS.
2. P. C. BD. 51A5210
3. SCHEMATIC 91B6318

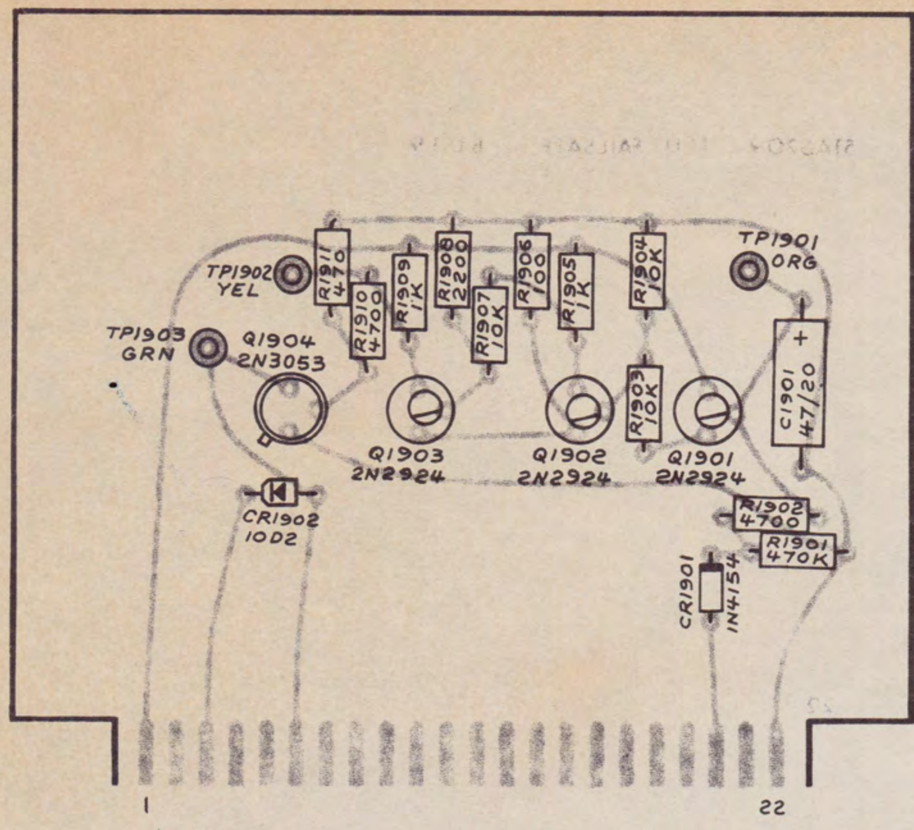
RRC-10T PBR-30

REVISIONS		DATE
C	C1808 WAS 2.2 μF. ECO 450	6/30/71

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 18
TCU LOWER DET

TOL FRACT ± 1/32, XX ± .030, XXX ± .010				
DWN	JAG	2-1-71	SCALE: FULL	
CHK			20A2130	C
ENG	JCT	1 JUL 71		



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BD. 51A5209.

3 SCHEMATIC 91B6319.

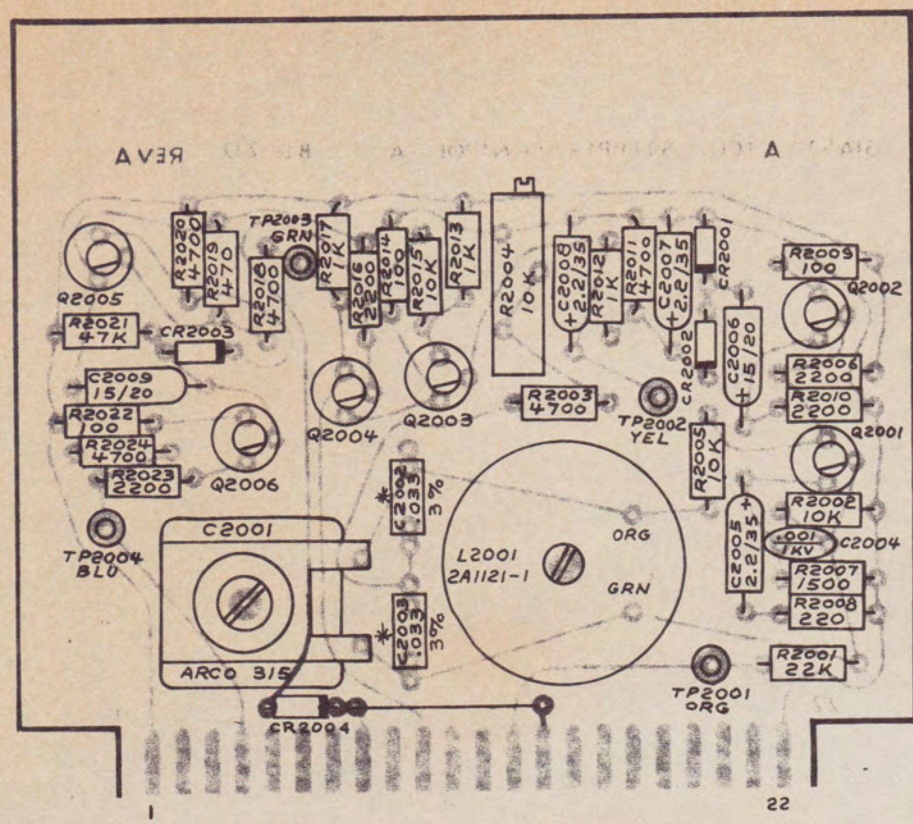
PBR-30

DATE	REVISIONS

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 19
TCU FAILSAFE

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK			20 A 2129
ENG			



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.
TRANSISTORS ARE 2N2924.
DIODES ARE IN4154.

2 P.C. BOARD 51A5218.

3 SCHEMATIC 91B6320.

4 ✱ C2002 & C2003 ARE METALIZED POLYCARBONATE.

RRC-10T PBR-30

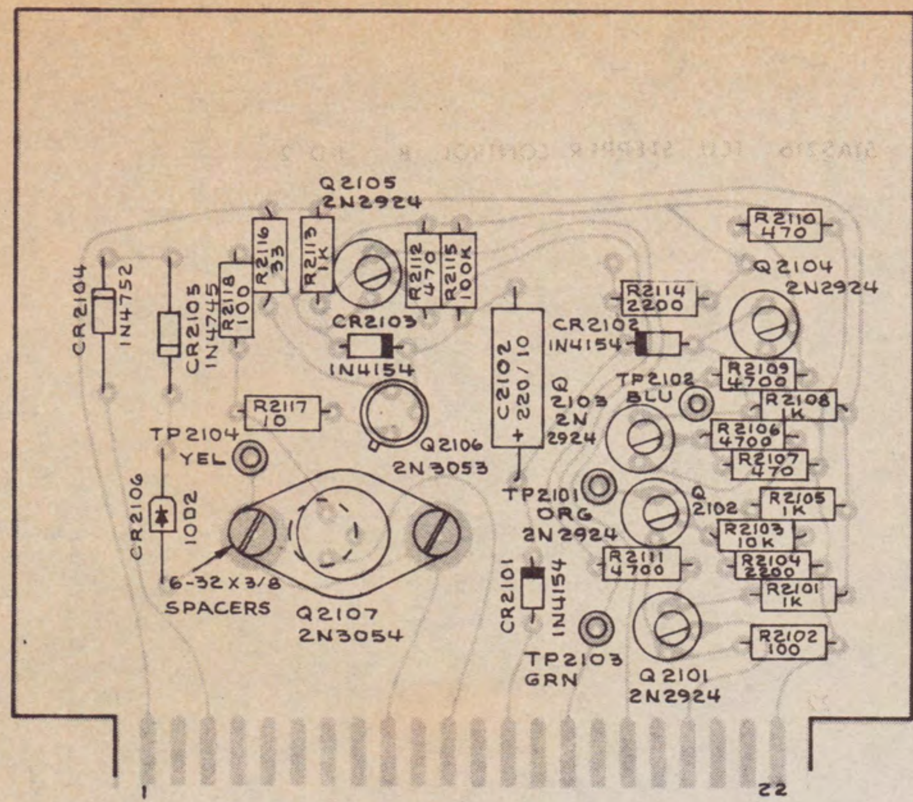
REVISIONS		DATE
A	CIRCUITRY MODIFIED. ADD CR2004.	10-69
B	ADD NOTE 4. ECO 326.	3-70

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 20
TCU STEPPER CONTROL A

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010		
DWN	F X Y	5/69	SCALE: FULL
CHK			20 A 2138
ENG	JCT	11-69	

B



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P. C. BOARD 51A5216
3 SCHEMATIC 91B6321

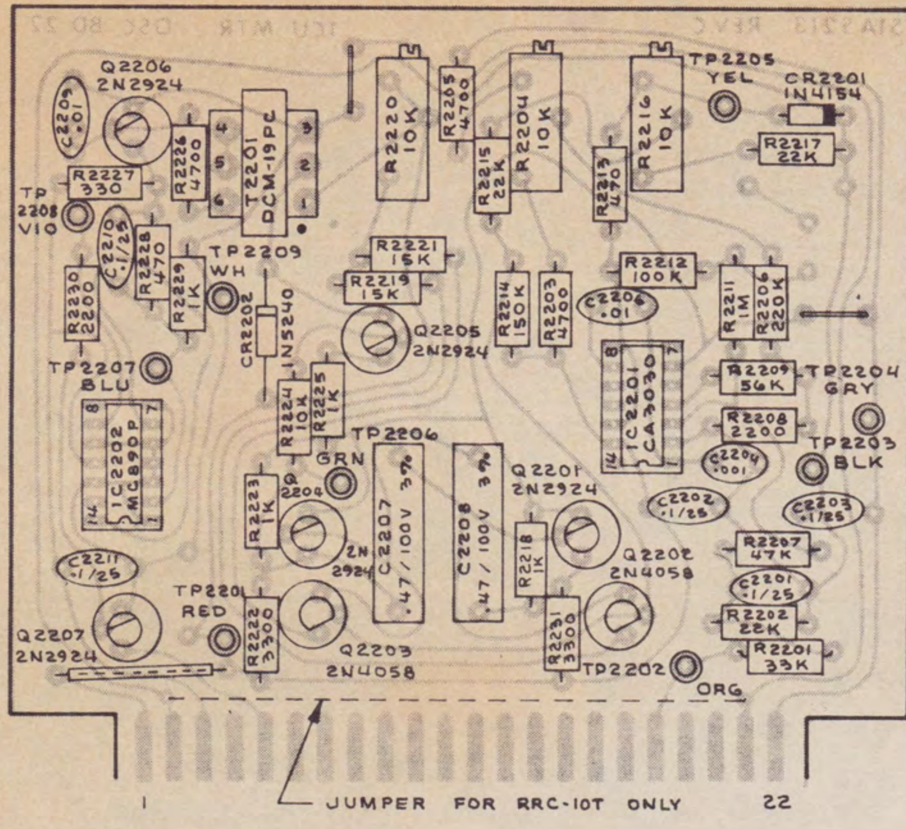
RRC-10T PBR-30

REVISIONS	DATE
C — DELETE C2101, CR2104 WAS 1N4740, ECO 451	6/30/71

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 21
TCU STEPPER CONTROL B

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010			
DWN	JAG	2-2-71	SCALE: FULL
CHK			20A2136 C
ENG	JLT	1 Jul 71	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BOARD 51A5213

3 SCHEMATIC 91B6322

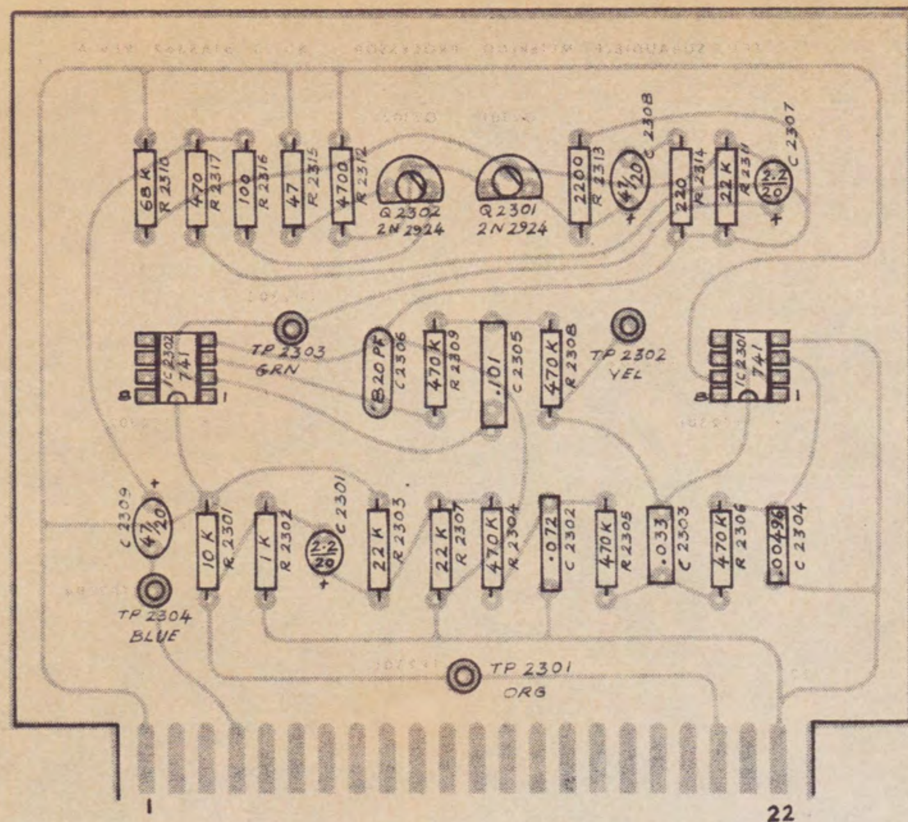
RRC-10T PBR-30

REVISIONS	DATE
G REMOVE R2210 & C2205. RE-DRAWN. E CO 498. 12/30/71	

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 22
TCU METERING OSC

TOL. FRACT ± 1/32	XX ± .030,	XXX ± .010	
DWN	JAG	2-2-71	SCALE: FULL
CHK			20A2133 G
ENG			



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2W, 10%
CAPACITOR VALUES ARE IN MICROFARADS.

2 P. C. BOARD 51A 5367

3 SCHEMATIC 91 B 6530

PBR - 30

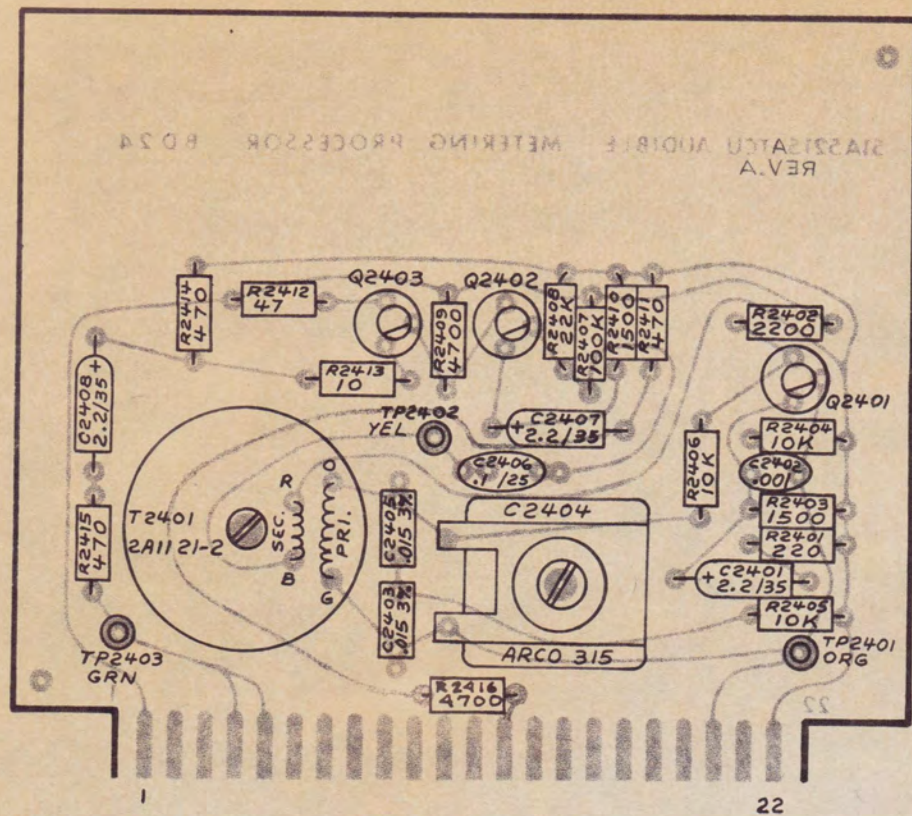
REVISIONS	DATE	MGMT. APPR.

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

COMPONENT LAYOUT BOARD-23
TCU SUBAUDIBLE METERING PROCESS

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	[illegible]	12-13-71	SCALE: FULL
CHK	FXY	12/15/71	20 A 2301
ENG	JCP	13DEC71	



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.
TRANSISTORS ARE 2N2924.

2 P.C. BD. 51A5215.

3 SCHEMATIC 91B6324.

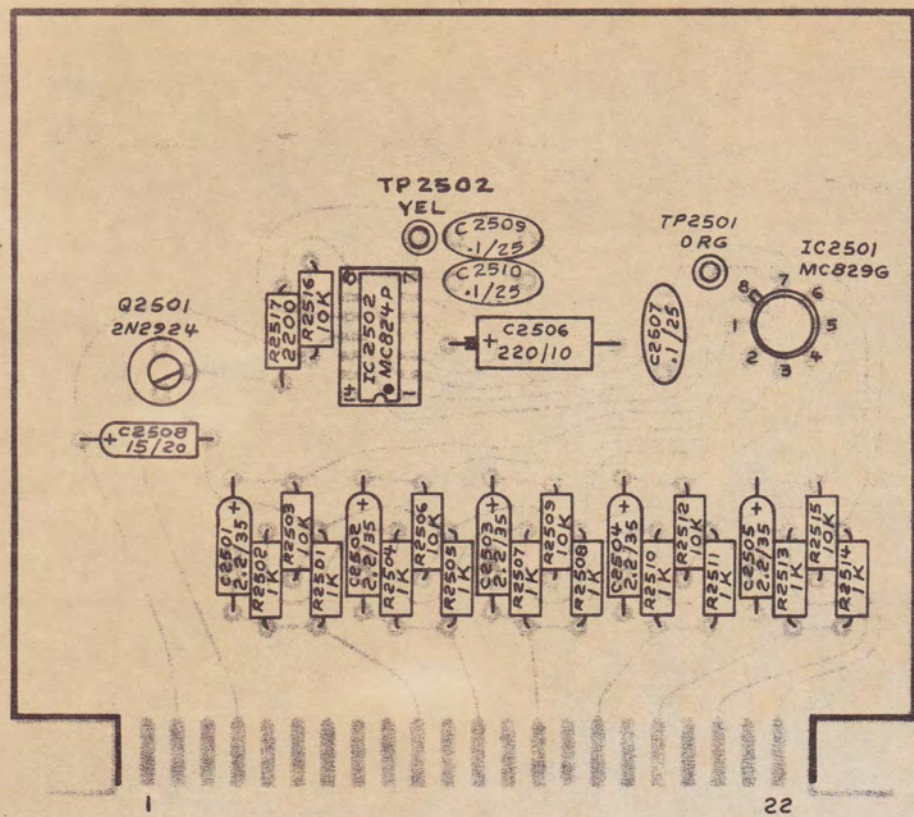
RRC-10T PBR-30

REVISIONS	DATE
A ADD R2416 & ITS CIRCUITRY.	11-69

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 24
TCU AUDIBLE METERING PROC.

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK			20A2135 A
ENG			



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2 W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 P.C. BD. 51A5217.

3 SCHEMATIC 91B6325.

PBR-30

REVISIONS		DATE
A	ADD C2509 & 2510	10-69
B	C2506 WAS 47/20 ECO 359	7/70

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

COMPONENT LAYOUT-BOARD 25
TCU ALARM ENCODER

TOL. FRACT ± 1/32, .XX ± .030, .XXX ± .010			
DWN	F X Y	5/69	SCALE: FULL
CHK			20 A 2137 B
ENG	JLT	11-69	