OPERATING & MAINTENANCE INSTRUCTION MANUAL

MODEL 370

RECORDER ELECTRONICS

INOVONICS
INCORPORATED

USER'S RECORD

Model 370 - Serial No. _____

Date Purchased _____

Warranty Card Sent _____

Purchased From _____

INSTRUCTION MANUAL

MODEL 370

REPLACEMENT RECORDER ELECTRONICS

December, 1981

INOVONICS
INCORPORATED

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(408) 458-0552

TABLE OF CONTENTS

I. GENERAL INFORMATION

The Inovonics 370 is a basic, two-speed replacement record/reproduce electronics package for updating older professional studio tape recorders. It is directly pin-compatible with earlier Ampex machines (300, 350, 351, AG300, AG350 and AG440), and adaptable to many others.

Features of the 370 include:

- Accommodates a wide variety of original-equipment and replacement heads of either high or low impedance.
- Wide equalization adjustment range and increased erase, bias and signal headrooms for use with both normal and high-coercivity tapes.
- Entire electronics assembly unplugs from front of unit for ease in servicing; all component parts are readily-available, "off-the-shelf" types.

The 370 requires only the proper interconnect cable to interface with nearly any combination of transport and heads. Two units may be interconnected for stereo operation. If no specification is made at time or order, the 370 is supplied with cabling for Ampex 350-series, full-track machines.

II. SPECIFICATIONS

Performance of any magnetic recording system is limited in great part by the electrical and magnetic efficiency of the heads and the formulation of the magnetic oxide. Recording electronics actually constitute the "easy part" of the system.

As the 370 is intended for routine replacement use, typical full-track, general-replacement heads were used to derive the specifications. Part numbers and pertinent information are listed in the following table.

HEAD	1kHz Inductance	DC Resistance	Gap Length
REPRODUCE Nortronics 9102	650mH	275-Ohms	200µ"
RECORD Nortronics 9103	10mH	10-Ohms	500µ"
ERASE Nortronics 9125	1.2mH	4-Ohms	N/A

Tape employed in the tests was Ampex 406; Operating Level, 250nW/m; NAB equalization.

Overall Frequency Response (in Hz):

15ips	±2dB, 25 - 25k
7-1/2ips	±2dB, 20 - 15k
3-3/4ips	±2dB, 20 - 8k

Signal-to-Noise Ratio (in dB, referred to a "peak" record level 6dB above 250nW/m; 20Hz - 20kHz)

	OVERALL		STANDBY	
	u'wtd.	wtd.	u'wtd.	wtd.
15ips	66	74	75	83
7-1/2ips	67	74	75	83
3-3/4ips	63	70	70	77

Equalization: 15 - 7-1/2ips or 7-1/2 - 3-3/4ips, NAB: may be user-changed to IEC characteristic.

Erasure: >75dB erasure of 500Hz signal recorded 12dB above Op Level; erase/bias frequency, 125kHz.

Head Impedance Range:

Erase: 0.2 to 2.0mH

Record: 3 to 15mH

Erase: 3mH to 1H

Line Input: "Electronically-balanced," bridging; accepts nominal line levels between -10 and +10dBm.

Line Output: Balanced, transformer-isolated. May be adjusted for nominal line levels between +4 and +10dBm. Clipping level, +24dBm into 600-Ohm load.

Power Requirement: 105 - 130VAC (230V avaliable), 50/60Hz; 0.3A (plus transport).

Size and Shipping Weight: 3-1/2" X 19" X 7"; 12 lbs.

III. INSTALLATION

Unpacking and Inspection

Upon receipt, promptly inspect the equipment for shipping damage. Should any be observed, notify the carrier; if not, proceed as outlined below. It is suggested that the original shipping carton and materials be retained for future reshipment if it should become necessary. In the event of return for repair under terms of the Warranty, damage sustained as a result of improper repacking may invalidate the Warranty.

It is essential that the Warranty Registration card found at the front of this manual be completed and returned. This assures coverage of the equipment under terms of the Warranty, and the user will automatically receive specific servicing or modification information when issued.

Mounting

The 370 is packaged to mount in a standard 19-inch equipment rack or recorder overbridge with EIA mounting provision. Each channel requires 3-1/2 inches of vertical rack space and about 8 inches of cabinet depth to accommodate back-panel connectors.

Connection

The signal, head and transport inter-cabling is pin-compatible with the equipment specified for use with the 370 at time of order. If no specification is made, Ampex 350-series interconnect is assumed and such cabling is provided.

When two units are used in stereo installations, a "daisy-chain style of interconnect cable is supplied which provides erase/bias oscillator "slaving" and common transport logic interface. Normally, input power will be first fed to the bottom-most unit and the cable "daisy-chained" up to the second channel. In such an installation, the lower unit serves as erase/bias oscillator "master," feeding both channels. All electronics are identical, however; it is the cable that dictates the master/slave relationship.

Line In / Out Considerations

As delivered, the 370 is calibrated to operate at a +4dBm line level corresponding to "zero-VU." Operation at other line levels can be accommodated; see section V, pages 10 through 11 for level setting procedure, and page 11 for adjustment of panel meter calibration.

Input impedance of the 370 is 200k-Ohms, balanced, or 100k-Ohms, unbalanced. Should the equipment which feeds the 370 require a terminating load, a resistor may be connected in parallel with the 370 input. In unbalanced, single-ended installations, either side of the input may be tied to ground, although pin 3 of the input connector is generally considered "hot."

The low source impedance of the 370 Line Output results in only about a 0.5dB shift in level from an unloaded to a 600-Ohm-loaded condition. Although a 600-Ohm termination is not necessary, the 370 should nevertheless be connected to its intended load prior to final calibration.

Erase Head Tuning

Four sets of terminals on the circuit board select the tuning capacitance to bring the erase head to resonance at the erase frequency of 125kHz. These terminals are located near the connecting fingers and are labeled E, F, G and H.

If the inductance of the erase head is known, the terminals may be strapped according to the following table:

HEAD INDUCTANCE (mH)	E	F	G	H
0.2	X	X	X	X
0.3	X	X		
0.5		X	X	
0.75	X			X
1.0		X		X
1.25	X			
1.5		X		
1.75			X	
2.0			X	

If inductance of the erase head is not known, the 370 can be put into the RECORD mode and various combinations of the E, F, G and H jumpers tried for maximum voltage across the erase head as monitored with an oscilloscope and low-capacitance probe.

Once optimum tuning is established, the jumpers may be permanently soldered in place.

One note of warning concerning the foregoing:

The 370 erase amplifier has sufficient drive for full erasure of highest coercivity tapes with heads of normal efficiency. Some of the common, "universal replacement" heads can have their modest magnetic structures driven into saturation by the 370. This can overheat and possibly destroy the head, as well as cause noise in the recording process. There is, nevertheless, a self-protection factor which, when taken into account, guarantees that the head will not be overdriven and damaged.

As a head core starts to go into saturation, inductance and "Q" change abruptly. In order to overdrive the head and saturate the core, a tuning capacitance would be required which is different from the value used to resonate the head at low drive levels. Thus if a tuning capacitance is selected for low-level resonance, drive will self-limit when the head inductance starts to change.

If confronted with this possibility, it is best to measure accurately the head inductance with a bridge or consult the manufacturer for the information, and use the table on page 6, rather than experimentally tune for maximum drive.

NAB-to-IEC Record Modification

As shipped, the low-frequency record characteristic of the 370 is fixed at the NAB, 3180μs-turnover figure. Should it be desired to change this to the IEC, "flat" characteristic, R51 on the circuit board must be changed from 390k to 620k-Ohms. The selected LF record curve holds true for both speeds.

Reproduce Head Matching

The 370 accommodates reproduce heads of either a nominal high impedance, typically 200mH to 1H, or low impedance with values between 3 and 10mH. The reproduce amplifier input characteristic is selected by a set of four terminals near the right-rear of the circuit board. These are labeled A, B, C and D.

Without jumpers the 370 accepts high output, high impedance heads as encountered in Ampex 300- and 350-series, full-track machines. Some heads in the Hi-Z category may require addi-

tional amplifier gain. These heads may be two-track, or have even a narrower track format, or merely have fewer windings. Need for more gain will quickly be determined during the Reproduce Calibration procedure (page 10) when it is found that the REPRO GAIN control cannot be turned up quite far enough. The additional gain required by heads of lower output, but still of nominal high impedance, is obtained by installing a jumper between terminals A and B.

Low impedance reproduce heads require a jumper between terminals A, B and C. Again, should it be found that some additional gain is required, the jumper should be extended to include A, B, C and D.

IV. OPERATION AND FUNCTIONAL DESCRIPTION

Panel Controls

The INPUT and REPRO GAIN controls adjust the levels of the input signal and the playback gain, respectively. Since these are the only gain controls, each has a wide range corresponding to the combined ranges of a panel control and a "hidden" calibration adjustment. Should it be desired to "set-and-forget" levels, the control knobs can be removed to lessen the risk of inadvertant misadjustment. Of course the unit won't look quite so pretty, though.

The MONITOR button selects between the input signal and playback from the tape, as to which appears at the Line Output and is indicated by the front panel meter.

The SPEED button manually selects the preset record and reproduce equalization in accordance with transport speed. No provision is made for automatic EQ switching, and both channels of a 370 stereo pair must be individually switched.

When the READY button is in, the 370 will enter the RECORD mode when the transport is in PLAY and either the front-panel or a transport RECORD button is pressed. When the button is in the SAFE position, the 370 will not enter the RECORD mode even when a companion channel is put into READY and RECORD. If, however, one channel of a stereo machine is already recording, the other channel wil enter the RECORD mode when the READY button is depressed.

The POWER switch controls primary AC power to the 370, and to the tape transport if powered by the electronics.

V. CALIBRATION

Equipment Required

Proper alignment of the 370 will require the following test gear:

Head Demagneitizer
Appropriate Reproduce Alignment Tapes
Audio Oscillator
AC Electronic Voltmeter

Reproduce Calibration

1. Establish the nominal impedance of the reproduce head and jumper the appropriate terminals per instructions on page 7.

2. Switch to INPUT MONITOR and clean and demagnetize all heads, moving very slowly while the demagnetizer is near the heads and withdrawing it about a yard from the head assembly before turning it off.

3. Switch to TAPE MONITOR and thread an alignment tape appropriate for the equalization to which the 370 is switched.

4. Play the Operating Level tone on the alignment tape and adjust the REPRO LEVEL control for the nominal line level (usually +4 or +8dBm) as measured by the AC voltmeter connected to the 370 Line Output. If the adjustment is not within the range of the REPRO LEVEL control, refer to page 7 for restrapping instructions.

5. While reproducing the highest frequency on the test tape, adjust the reproduce head azimuth for maximum output.

6. With high impedance reproduce heads, if the resonance of the head is near the top of the passband (as is usually the case for best signal-to-noise performance), a peak in the response will be noted at the highest frequencies. R1 on the circuit board, a fixed resistor across the reproduce head, determines the "Q" of this fundamental resonance for flattest playback response. As shipped, R1 is 220k, a typical value for most hi-Z heads. To optimize this damping resistor

for best performance, decrease the value of R1 to bring down the top end, or increase R1 to bring the top up. This procedure is best done at the highest speed that will be used, and is relevant to high impedance heads only. When low-Z heads are used, the 220k resistor should be left alone.

7. With the appropriate HS (high speed) or LS (low speed) HF equalization pot, playback response can be set for flattest response from reference frequency to highest frequency.

8. If the alignment tape has the same track width as the reproduce head track, set the appropriate LF equalization pot for smoothest response from reference frequency to the lowest frequency. If this is not the case, as with full-track test tapes and two-track machines, wait until step 4 of Record Calibration, page 12.

9. Repeat steps 3, 4, 7 and (if applicable) 8 for the other speed. It is advisable to make the final repro head azimuth adjustment at the lowest speed to be used.

Input Level and Meter Calibration

1. Feed a 1kHz signal from the audio oscillator to the 370 Line Input at nominal line level.

2. Switch to INPUT MONITOR and adjust the INPUT GAIN control for a nominal line level output as measured by the AC voltmeter connected to the 370 Line Output.

3. At this point, adjust the "VU" meter calibration pot, R36 on the circuit board, for a "0 VU" indication. The top cover must be removed from the 370 to reach R36, but once set to a particular Line Output level, the meter should never again require calibration.

Erase / Bias Adjustment

Erase head tuning is covered under Section III, INSTALLATION, page 6.

Historically, bias is adjusted for maximum recording sensitivity at a 15-mil-wavelength (1kHz at 15ips). Some tapes with higher coercivity oxides may require a biasing method which differs slightly from the historic. Follow the manufacturers' recommendation for best per-

formance; the 15-mil-wavelength "peak" method is the one used in the following Record Calibration procedure.

Record Calibration

1. Thread the machine with fresh tape of the type to be used in routine operation.

2. Select HIGH SPEED and INPUT MONITOR. Apply a 1kHz signal to the 370 input which will yield a "0 VU" panel meter indication.

3. Put the tape transport and the 370 into RECORD at the appropriate speed and switch to TAPE MONITOR. Adjust the BIAS pot for a "peak" in the recorded signal, and the FLUX pot for a TAPE MONITOR meter indication of "0 VU."

4. Sweep the oscillator frequency downward from the 1kHz reference. If the reproduce amplifier low frequency equalization was not adjusted in Reproduce Calibration step 8, page 11, the HS-LF pot may be adjusted for flattest response at this time.

5. Sweep the oscillator frequency upward to about 10kHz and adjust record head azimuth for maximum reproduced output.

6. The HS-REQ pot may be adjusted for flattest overall response from the reference frequency to the highest frequency.

7. Repeat steps 4 and 6 for LOW SPEED, adjusting the appropriate LS trim pots for flattest overall response. In the case of 7-1/2 or 3-3/4ips operation, the front-panel INPUT GAIN control should be turned down by 10dB or so, and the REPRO GAIN control turned up by a corresponding amount to make response adjustments at a reduced flux level. This will guard against tape saturation at high frequencies.

VI. CIRCUIT DESCRIPTIONS

Reproduce and Line Output Amplifiers

Q1 is a low-noise, matched pair of conventional NPN junction transistors. It is connected in an unequalized, feedback-pair configuration, and is the low level reproduce head preamplifier. Gain of this preamp is established by resistors R7, 8, 9 and 10, which may be jumpered for four gain settings; two for nominal hi-Z heads and two for lo-Z heads.

Output of the Q1 REPRO preamp is routed through the front-panel REPRO LEVEL control to an equalizing amplifier comprised of IC1A and associated circuitry. With C6 in the primary feedback path, IC1A is an integrating amplifier. HF pots R17 and 18 put a "shelf" in the integrating characteristic for control over high frequency equalization. LF pots R15 and 16 shunt C6 to shelve integration at low frequencies per selected equalization.

All equalization switching in the 370 is performed by two quad, CMOS analog switch gates. These gates, referenced on the schematic as A1 and 2, are operated between ±6V logic supply rails in order to pass ground-referenced AC waveforms at levels up to about +10dBmV. Gates "open" with -6V applied to the control lead and "close" to pass the audio signal when +6V is applied. Terminology in this case is switch-contact-oriented.

Either the output of the equalizing amplifier or Line Input signals may be switched to the output line-drive amplifier, IC1B. A second-order, low-pass filter (R24 and 25 with C8 and 9) attenuates erase/bias leakage, etc. The filter is flat to about 25kHz. A2/1-2 is controlled by the "power-on-reset" circuit of Q5 and shunts MONITOR signals to ground for about 5 seconds after the 370 is first turned on. IC1B is buffered by a discrete, complementary emitter-follower pair to deliver the required current to the output load.

IC2, a buffer amplifier and "precision" full-wave rectifier, drives the front-panel "VU" meter. The meter has a DC movement which is optimally damped for program monitoring by R39. Gain of the meter driver is adjusted by R36 to yield a "zero" indication for either a +4, +8 or other Line Output level.

Record Amplifier

The 370 Line Input is fed directly to the active-balanced, differential input stage, IC3A; the INPUT GAIN control, R44, adjusts for the nominal line level. IC3B, a low-pass filter, is flat to about 25kHz and attenuates out-of-band garbage in the input signal.

IC4B, with input capacitor C22, is an input-differentiating amplifier with an integrating feedback path through C23. The net effect would be flat frequency response were it not for REQ pots R52 and 53. These shelve the integrating characteristic to impart a high-end pre-emphasis with variable turnover frequency. A mid-high-frequency "dip" is provided by R50, C20 and C21 to better match typical record equalization requirements. R51 bypasses C22 at low frequencies to give the low-frequency boost required by the NAB recording characterisitc.

IC4A is the constant-current, record head driver stage. The recording level FLUX trim pot, R59, is in the positive feedback loop of IC4A. Record "relay," FET Q4, is "ramped-on" to give a quiet entry into RECORD. A bias trap (L1 and 2 with C25, and L3/C26) isolates bias, coupled from the erase head by BIAS pot R76 and C42, from IC4A.

Record Logic and Erase / Bias Circuitry

Q11 is the RECORD "switch." When the 370 is READY, Q11 may be turned on by having the PLAY and RECORD lines from the transport momentarily shorted. This also turns on Q12 which holds Q11 on until the transport is stopped, or S3 is switched to SAFE.

Transport logic is isolated from ground-referenced 370 logic by opto-isolator OC1. When the 370 is in RECORD, OC1 turns on Q13 to light the red meter lamps and give a RECORD command to erase/bias circuitry. With this command, Miller Integrator erase amplifier power controller, Q9 and 10 with R70 and C33 providing integration, begins ramping up. The ramp takes about 100ms to reach the positive supply rail, and erase drive increases in direct proportion.

The erase/bias pilot oscillator consists of inverters IC8B and C and a "ceramic resonator," P1. IC8A and F buffer the pilot signal.

The 500kHz erase/bias pilot signal from either the subject unit's oscillator or from another 370 used as "master" in a

stereo pair, is digitally divided by IC7 to produce a symmetrical square wave at 125kHz. The square wave is amplified by Q6 to switch Q7 on and off at the erase frequency. Q8 is "bootstrapped" to Q7, and the two transistors form a "Class-S" power switching amplifier. The output of this amplifier is a symmetrical square wave with a peak-to-peak amplitude equal to the total supply voltage, about 35V p-p, when the erase DC ramp reaches full value. L4, the erase head and appropriate C38-41 tuning capacitance form a high-"Q,""quasi-half-T-section." This transforms the low impedance square wave drive to a high voltage, low distrotion sine wave erase/bias source.

The "power-on-reset" circuit of Q5 holds erase and bias off during turn-on settling.

Power Supply

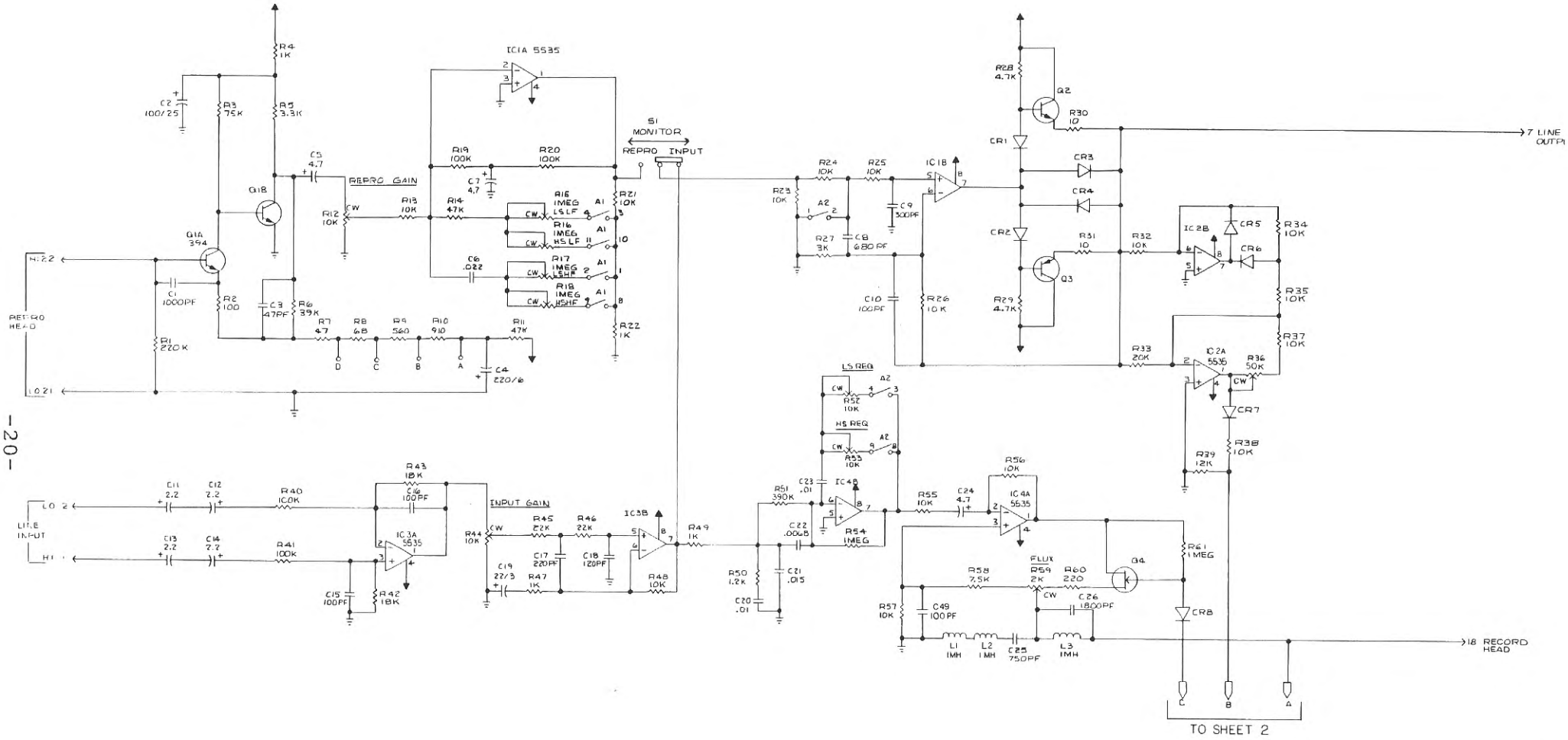
The 370 power supply utilizes variable positive and negative "3-terminal" voltage regulators. These are self-protecting against output or thermal overloads. The output voltage is fixed by the voltage-divider between the output and common terminals. The outputs are ±18V for amplifier, bias and high-level logic. A ±6V logic supply is dropped from the ±18V by zener diodes CR20 and 21.

VII. APPENDIX

SCHEMATIC REFERENCE	INOVONICS PART NO.	COMPONENT DESCRIPTION	MANUFACTURER AND MFR'S PART NO.
PLUG-IN CIRCUIT ASSEMBLY - Assembly 161400, Schematic 161700			
A1,2	1335	CMOS Analog Switch Gate	RCA CD4066 BE
C1	0822	Capacitor, Mica 1000pF	Arco DM19-102J
C2	0920	" Electrolytic 100µF, 25V	Elna type RL - 100/25
C3	0806	" Mica 47pF	Arco DM15-470J
C4	1069	" Electrolytic 220µF, 6.3V	Elna type RL - 220/6.3
C5,7,24,29,43	1054	" Tantalum 4.7µF, 25V	NEC NDD475M25C
C6	0863	" Mylar .022µF, 100V	Sprague 225P 22391
C34	1067	" Tantalum 1.0µF, 35V	NEC NDA105M35C
C8	0820	" Mica 680pF	Arco DM19-681J
C9,42	0827	" " 300pF	" DM15-301J
C10,15,16,28,30,31,49	0810	" " 100pF	" DM15-101J
C11-14,32,36,44,47,48	1053	" Tantalum 2.2µF, 25V	NEC NDB225M25C
C17	0814	" Mica 220pF	Arco DM15-221J
C18	0811	" " 120pF	" DM15-121J
C19	1068	" Tantalum 22µF, 3V	NEC NDC226M03C
C20,23	0862	" Mylar .01µF, 100V	Sprague 225P 10491
C21	0873	" " .015µF, 100V	" 225P 15491
C22	0860	" " .0068µF, 100V	" 225P 68391
C25	0828	" Mica 750pF	Arco DM19-751J
C26	0825	" " 1800pF	" DM19-182J
C33,35,37	0867	" Mylar .1µF, 100V	Sprague 225P10591
C38	0829	" Mica 3000pF	Arco DM19-302J
C39	0834	" " 2700pF	" DM19-272J
C40	0833	" " 2400pF	" DM19-242J
C41	0831	" " 510pF	" DM19-511J
C45,46	0910	" Electrolytic 470µF, 50V	Elna type TE - 470/50

SCHEMATIC REFERENCE	INOVONICS PART NO.	COMPONENT DESCRIPTION	MANUFACTURER AND MFR'S PART NO.
CR1-13,15	1100	Diode, silicon signal	GI 1N4151
CR14,20,21	1105	" zener	Motorola 1N5242
CR16-19,22	1125	" rectifier	" 1N4005
IC1-4	1314	Integrated Circuit	Signetics NE5535N
IC5	1373	" "	National LM317
IC6	1374	" "	" LM337
IC7	1322	" "	RCA CD4013AE
IC8	1336	" "	" CD4069BE
J1	1717	Connector, 6-pin Male	Molex 09-60-1061
L1-3	1403	Inductor, 1mH	Delevan 2500-28
L4	1415	" "	Caddell-Burns 6470-14
OC1	1307	Optical Coupler	Fairchild FCD 820
P1	1410	Ceramic Resonator, 500kHz	RMC CR30-FA / 500K
Q1	1237	Transistor, Dual NPN	National LM394
Q2,6	1204	" NPN	" 2N3567
Q3,5,9	1205	" PNP	" 2N3645
Q4	1230	" FET	Siliconix J111
Q7,8,10	1236	" NPN	Motorola MJE180
Q11	1225	" PNP	" MJE350
Q12	1226	" NPN	" MPSA42
Q13,14	1232	" " Darlington	" MPSA14
		NOTE: Unless otherwise specified, all fixed resistors are carbon film type, value and wattage per schematic. Variable resistors are multi-turn (Spectrol 43P, Beckman 89PR, etc.), value per schematic.	

SCHEMATIC REFERENCE	INOVONICS PART NO.	COMPONENT DESCRIPTION	MANUFACTURER AND MFR'S PART NO.
R12,44	0622	Resistor, variable 10K	Allen Bradley 73M1N040S103A
-	2505	Knob for above	Raytheon 70-2WD-2G
R36	0562	Resistor, variable 50k	Beckman Helitrim 91AR 50K
S1-3	1841	Switch, pushbutton, DPDT-alternate actn.	Schadow FG-EE-FG/WHT
S4	1842	" " DPDT-momentary	" FG-RED-2U-0A
CHASSIS COMPONENTS - Schematic 161800			
C1,2	0872	Capacitor, mylar .01µF, 600V	Sprague 6PS-S10
F1	2706	Fuse, 3AG-3A	Buss or Littlefuse
J1	1644	Connector, 6-pin "Jones" Female	Cinch S306-AB
J2	1640	" 10-pin " Male	Cinch P310-AB
J3,4	1717	" 6-pin Male	Molex 09-60-1061
J5	1609	" 3-pin "XLR" Male	Switchcraft D3M
J6	1610	" " " Female	" D3F
J7	1601	" 1-pin "MS" Male	Amphenol 3102A10S-2P
J8	1602	" 2-pin " "	" 3102A10S-4P
J9	1603	" 3-pin " "	" 3102A10S-3P
J10	1715	" 22-pin P.C.	Edac 356-o22-250-01
M1	2808	Meter, "Simulated VU" (DC movement) (Meter lamps are type 387)	Dixson 301-K / 200uA w/ "VU"scale
R1	0064	Resistor, 1/4W, 5% carbon film 1.5K	
S1	1830	Switch, SPDT "Rocker"	Arrow-Hart 1604-21E
T1	159700	Transformer, Power	Inovonics O.E.M. part
T2	109000	" Output	" " "



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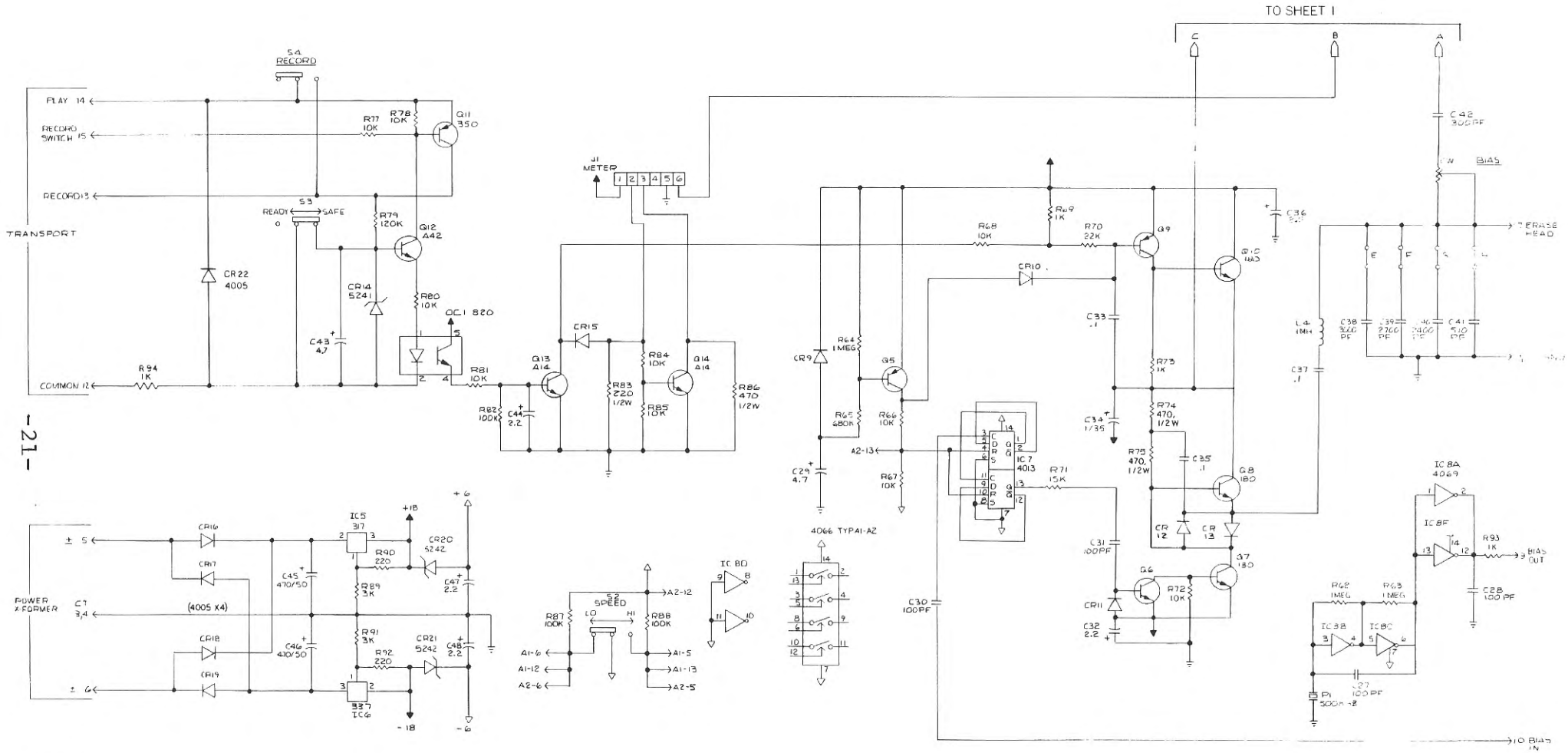
TOLERANCES .XPL ± .01 .XPL ± .005 ANGLES ± 1°	MATERIAL / FINISH	PAGE 1 OF 2	DWG NO 161700	ISSUE D



-21-

NOTES:

UNLESS OTHERWISE SPECIFIED . . . .

1. RESISTORS ARE 1/4W, 5%; VALUE IN OHMS.
2. CAPACITORS ARE 20V OR BETTER; VALUE IN µF.
3. NPN TRANSISTORS ARE P/N 1204 (2N3567 EQUIV).
4. PNP " " P/N 1205 (2N3645 ").
5. FET " " P/N 1211 (MPF 111 ").
6. DIODES ARE P/N 1100 (1N4151 EQUIV).

370	DRAWN	PAK	7-20-81	INOVONICS
	CHECKED	JBW	7-24-81	
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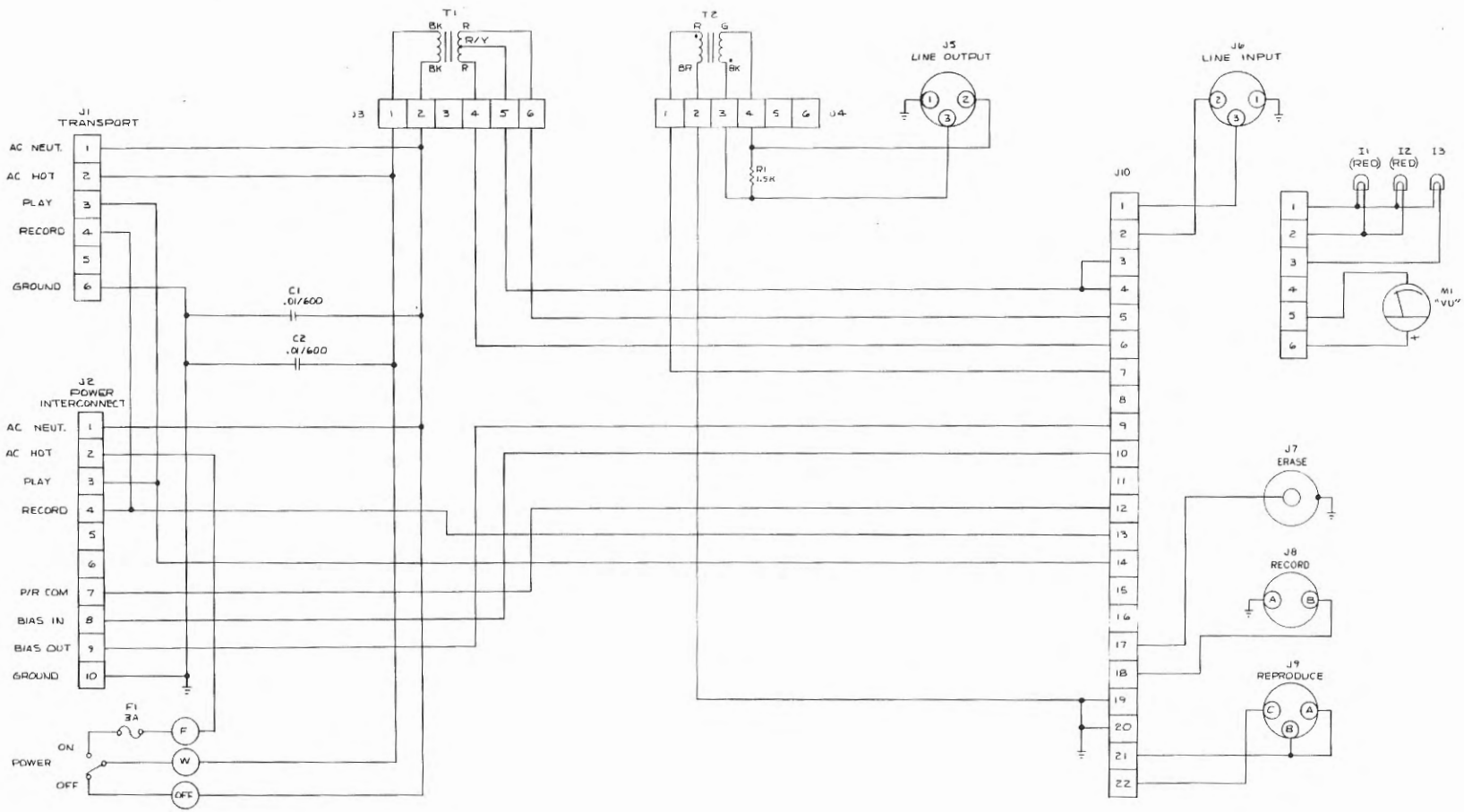
TOLERANCES	MATERIAL / FINISH			PAGE 2 of 2 · DWG NO 161700 · REV D



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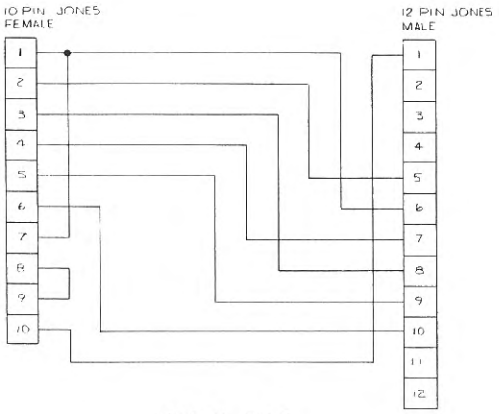
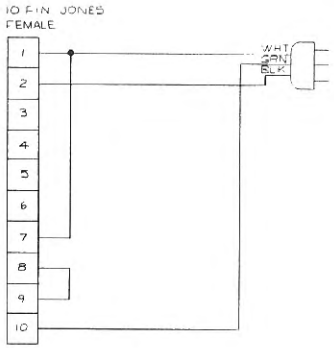
				PAGE 1 of 1 · DWG NO 161800 · ISSUE A



AMPEX 300



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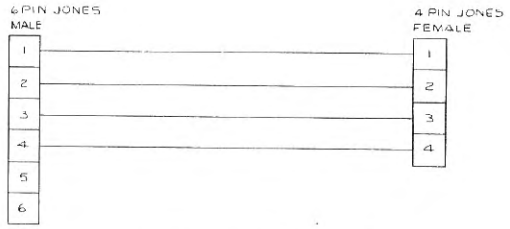
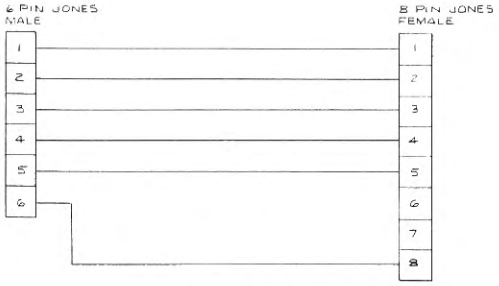
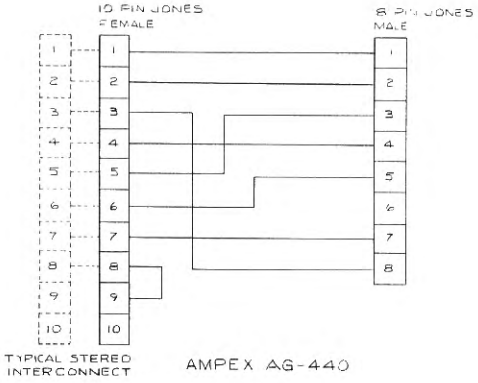


AMPEX 350 ADAPTER

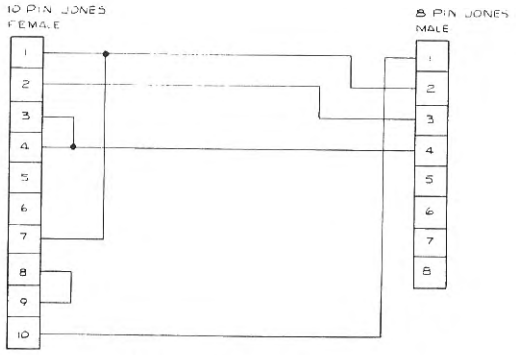


AMPEX AG-350 ADAPTER



TYPICAL STEREO
INTERCONNECT

AMPEX AG-440



AMPEX FR-1100

370 380	DRAWN	FAK	4-20-81	INOVONICS
	CHECKED	JBW	4-23-81	503 B Vanden Way Campbell CA 95008 Phone 374-8300
	APPROVED			TITLE: INTERCONNECT CABLES
TOLERANCES	MATERIAL - FINISH			PAGE 1 OF 1 · DWG NO 161200 · ISSUE A

INOVONICS WARRANTY

Inovonics, Inc. products are warranted to be free from defects in material and workmanship. Any discrepancies noted within 90 days of the date of purchase will be repaired free of charge. Additionally, parts for repairs required between 90 days and one year from the date of purchase will be supplied free of charge, with installation billed at normal rates. It will be the responsibility of the purchaser to return equipment for warranty service to the dealer from whom it was originally purchased unless prior arrangement is made with the dealer to inspect or repair at the user's location.

This warranty is subject to the following conditions:

1. Warranty card supplied with the equipment must be completed and returned to the factory within 10 days of purchase.

2. Warranty is void if unauthorized attempts at repair or modification have been made, or if serial identification has been defaced, removed, or altered.

3. Warranty does not apply to damage caused by misuse, abuse, or accident.

4. Warranty valid only to original purchaser.

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