

Intersound
PROFESSIONAL SOUND PRODUCTS

INSTRUMENT PREAMP
P.C.B.

PCB: A-102, B-103

MusicParts.Com Tech Notes:
Original IVP preamp version
by Intersound

POWER DIODES 1N4004
SIGNAL DIODES 1N4148
ZENER DIODES 1N5231B

Rev 2-11-79

IVP INSTRUMENT VOICING PREAMPLIFIER

1.0 GENERAL INFORMATION

The Intersound IVP is an instrument preamplifier. The IVP has two input channels feeding a common equalization section. A unique tube voicing circuit allows creative use of overdrive distortion and may be switched in or out remotely. Effects insert points are provided at two points in the circuit. Line level as well as instrument level outputs allow connection to most amplifiers. A microphone level 150 ohm balanced output is provided for direct connection to a PA system or other console input.

1.1 SPECIFICATIONS

TYPE:	Musical Instrument Preamplifier
INPUTS	2 unbalanced switchable gain
INPUT SENSITIVITY	LOW 800 mV RMS (0 dBv) nominal 200 mV RMS (-10 dBv) minimum 8 V RMS (+20 dBv) maximum
	HIGH 225 mV RMS (-10 dBv) nominal 50 mV RMS (-24 dBv) minimum 2 V RMS (+7 dBv) maximum
INPUT IMPEDANCE	1 megohm
EFFECTS SENDS	2 total
load Z	1 kohm minimum, 51 ohm source impedance
output level	1.5V RMS (+6 dBv) nominal 8V RMS (+20 dBv) maximum
EFFECTS RETURNS	2 total
input Z	50 kohm
input level	1.5 V RMS (+6 dBv) nominal
EQUALIZATION	Shelving type and sweep type peak/dip
shelving type	+15 dB @ 50 Hz and 10 kHz
sweep type	+15 dB @ 30-240 Hz, 100-800 Hz, 450-3.6 kHz, 1.2-9.6 kHz
FREQUENCY RESPONSE	20-20 kHz \pm 1 dB
DISTORTION	< 0.1% (clean voice)
SIGNAL TO NOISE	> 85 dB, EQ flat, nominal operating levels
OVERALL GAIN	18 dB nominal, 36 dB max.
OUTPUTS	3 total, 1 balanced, 2 unbalanced
Balanced output	-10 dBm into 600 ohms (+10 dBm max)
Unbalanced out 1	8 V into 600 ohms (+20 dBm max)
Unbalanced out 2	-10 dBm into 600 ohms (+10 dBm max)

1.2 GENERAL SERVICING INFORMATION

Most TAPCO/INTERSOUND circuitry is built around commonly available IC operational amplifiers. A certain amount of familiarity with operational amplifier theory and operation will facilitate servicing this unit. Throughout this manual, the following convention is used when discussing the various amplifier stages: U1(1). This is interpreted as follows: Chip designation U1, output pin = 1.

The opamp's output pin is particularly significant because all of the unit's stages are referenced to ground. Thus, the normal quiescent voltage at any opamp output is 0 volts DC, give or take a few millivolts. Any opamp output that is not at 0 volts DC is suspect, especially if it is at or near one of the power supply rails. Beware: much of the circuitry is direct coupled. It is important to look backward towards the input to localize the exact cause of trouble.

1.3 REPAIR PARTS

Service parts are available from the TAPCO factory. Contact us by phone or mail.

Our address: TAPCO Inc.
 3810 148th Ave. NE
 Redmond, WA 98052

206 881 9555 (8AM - 4PM pacific time zone)

If you are ordering parts and do not have the six digit part number, please include the model and serial number of the unit, the assembly part number and revision. The assembly part number/revision is a six digit, one letter code beginning with 800 rubber stamped on the parts side of the PCB assembly. In lieu of this information, the two digit, one letter code etched into the foil side of the PCB is helpful. If you are ordering a control or switch, tell us the function name....power, frequency, input level, etc.

In any event, be sure to include the following information:

Your Name
Shipping address (no post office boxes, please)
City, State, Zip
Daytime phone number
Method of shipment (UPS ground if not specified)

If you call for assistance on/with a problem, please have the EXACT model number, serial and assembly part numbers handy.

2.0 DISASSEMBLY INSTRUCTIONS

All circuitry is contained on two printed circuit assemblies. Access the interior of the unit via the sheet metal screws securing the top cover.

2.0.1 MAIN BOARD

- A. Remove top cover screws and top cover.
- B. Remove all pot knobs and control nut underneath.
- C. Remove all front panel jack nuts.
- D. Push the front panel PCB assembly towards the rear and remove.
- E. Reverse this procedure to reassemble.

2.0.2 POWER SUPPLY OUTPUT BOARD

- A. Remove top cover screws and top cover.
- B. Remove screws from corners of PCB.
- C. Remove PCB.

3.0 CIRCUIT DESCRIPTION

3.1 INPUT PREAMPS

Each of the two input channels of the IVP uses a LF356 JFET opamp. This provides a high input impedance (1 Meg) with low noise and distortion. Each opamp (U9 and U10) operates in non-inverting mode at a gain of 14.5 dB (high) or unity (low).

Each input preamp drives an individual channel fader and is then mixed in U7(1), an inverting summing amplifier with a gain of 6.6 dB. The mix amplifier feeds a Baxandall tone control circuit, U7(7), which drives the sweep equalizer circuit.

3.2 SWEEP EQUALIZER

The circuit is similar to many graphic equalizers. U4(1) is the boost-cut amplifier and U6(1), U6(7), U5(1), and U5(7) are simulated inductors. Each simulated inductor has a tuning control (R46, R47, R48, and R49) that varies the value of the simulated inductance. Each inductance is then series resonated with a capacitor (C29, C26, C24, and C20) and connected to each of the equalizer pots. Each pot is connected between the inverting and non-inverting input of U4(1).

When the wiper of a given equalizer pot moves towards the non-inverting input, the input signal is shunted away through the simulated LC circuit. When the wiper moves towards the inverting input, the feedback signal is shunted away. Since the series resonant LC circuit has its minimum impedance at resonance, the net action is that of a dip or peak in the frequency response.

U4(1) also includes a complementary emitter follower in its feedback loop. This provides a low source impedance and additional current drive for the first effects insert loop. The signal at this point is monitored by a full wave peak detector that drives a LED.

3.3 PEAK INDICATOR

U8(7) is a unity gain inverter. Its input and output signal are the push-pull drive for a full wave rectifier (D20 and D25). C34 stores the peak value of the input signal (less the diode drop) to lengthen the on time of the overload LED, once it is triggered. R50 provides the discharge path. The voltage across this capacitor is monitored by U8(1) which operates as a comparator and drives the LED.

3.4 EFFECTS RECEIVE 1

U4(7) is the unity gain effects receive buffer. Its output is split between the tube voice circuit and the clean voice circuit.

3.5 TUBE/CLEAN VOICE

U2(1) and U2(7) are variable gain inverting amplifiers. U2(1) feeds discrete differential amplifier (Q20, Q21) with 1:1 transformer T1 in its output circuit. The circuit has monotonically increasing low order distortion with rising signal level until a soft overload point is reached. With sufficient overdrive, the circuit produces increasing levels of high order harmonics.

3.6 FET SWITCH

The output of the tube voice transformer and the clean voice buffer, U2(7) feed a SPDT FET switch. The FETs are used in a series-shunt configuration, with complementary gate drive. Thus when a given switch is on, the series FET is turned on, and the shunt FET is pinched off. These states reverse in the off mode.

The complementary gate drive voltages are provided by U3(1) and U3(7). Both halves of U3 operate as comparators, with U3(7) logically complementing U3(1). U3(1) is controlled by the external footswitch or by the front panel switch. U3's outputs also drive transistors that drive the front panel LEDs.

U1(1) buffers the output of the FET switch and also has a complementary emitter follower in its feedback loop. This drives the second effects insert loop. U1(1) operates at a 7 dB loss.

3.7 OUTPUT BUFFER

The second effects return feeds the MASTER volume control (R44). This drives the final output amplifier U1(7), operating at a gain of 14.5 dB, which also has a complementary emitter follower in its feedback loop. It drives the high level output, the low level unbalanced output and the balanced microphone level output.

3.8 POWER SUPPLY

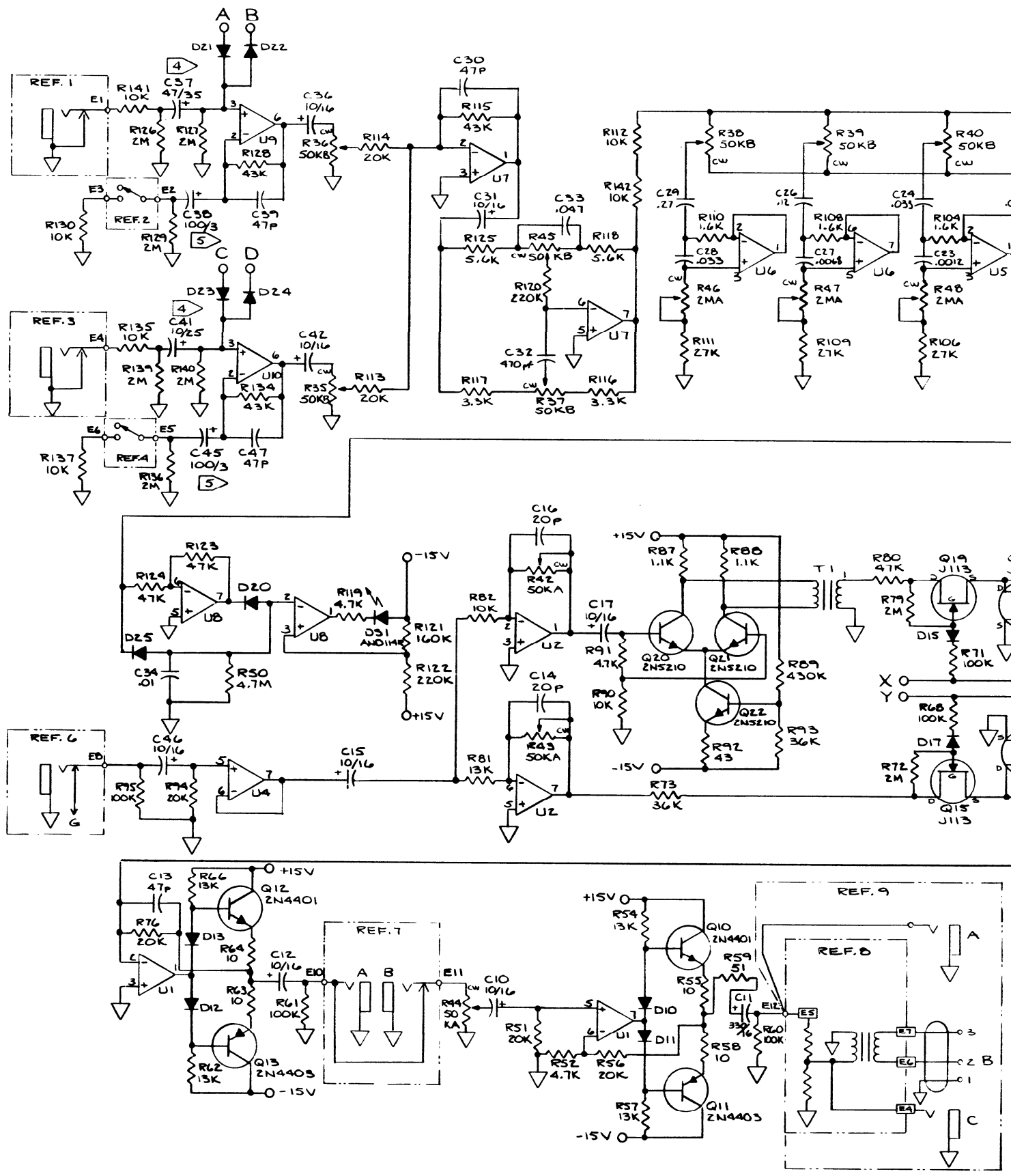
The power supply for the IVP is more or less conventional. Refer to the power supply schematic diagram.

A full wave bridge rectifier supplies raw dc to a dual polarity tracking regulator. Q5 is the pass transistor, with Q3 supplying current limiting when the voltage drop across R15 exceeds its emitter-base threshold. D5, a 5.1V zener diode, is the reference element. Q2 operates as an emitter follower and supplies a 4.5V reference voltage to U1, the error amplifier, as well as operating power for U2. R14 and R13 set the gain of U1 at 3.32. The reference voltage is multiplied by this gain for a net output voltage of 14.95V (15V nominal).

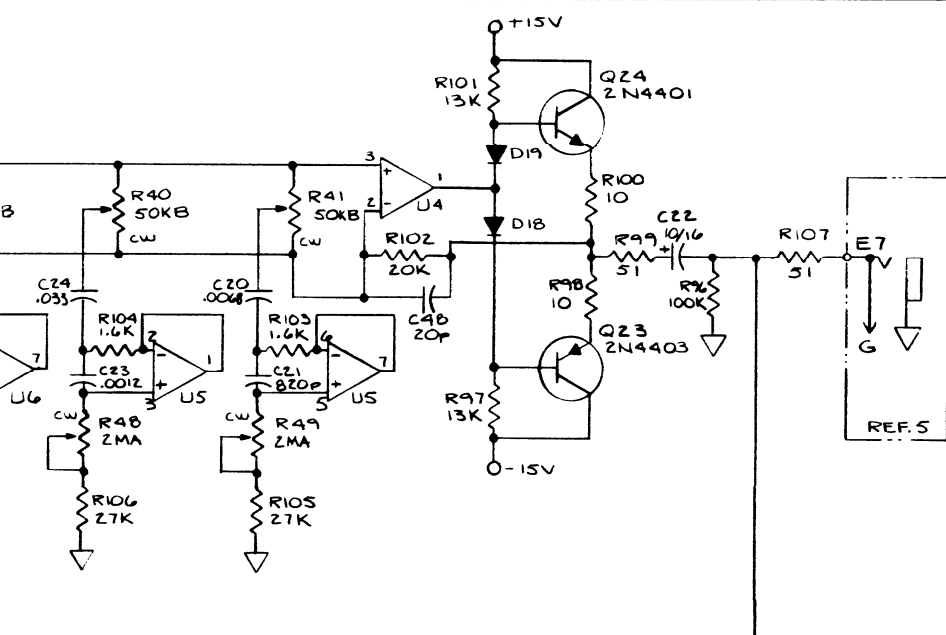
Q4 and Q1 operate in a similar fashion to Q5 and Q3. U2 operates as a unity gain inverter, driving Q4. Its input is the output of the positive 15V regulator. Thus, the output of Q4 is -15V and tracks variations in the output of the positive supply.

IVP MISCELLANEOUS PARTS

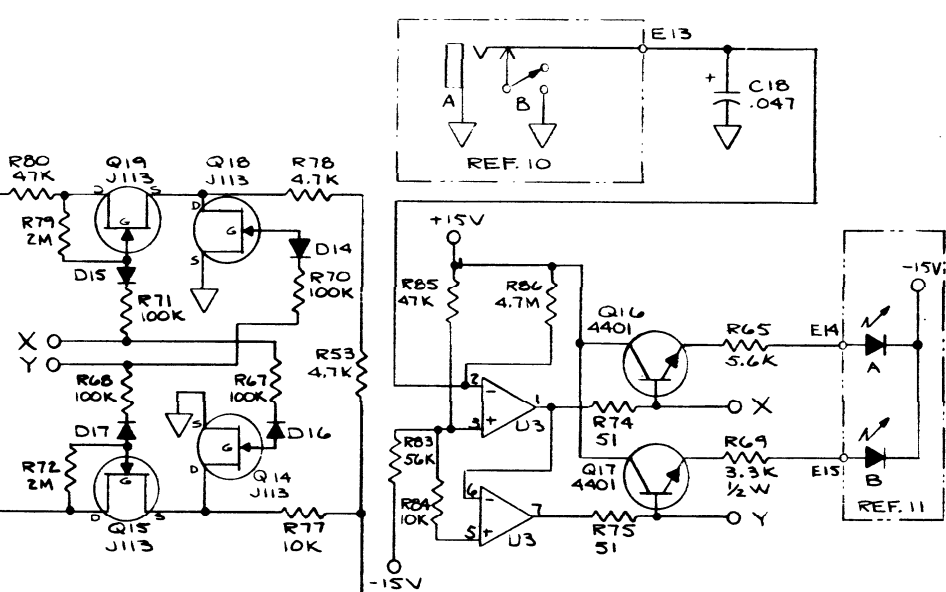
Part number	Description
004701	CAP, UL APPD, .01MF/125VAC
005401-2	POT, PCB V, 50K LIN, QR6581
005414	POT, PCB V, 50K AUDIO, MV 9619
005461	POT, CHASSIS MOUNT, 2M REV AUDIO, QR6583
006041	XISTOR, SIL, NPN, 2N4401
006042	XISTOR, SIL, PNP, 2N4403
006043	XISTOR, SIL, NPN, TIP31
006044	XISTOR, SIL, PNP, TIP32
006045	XIXTOR, JFET, J113
006046	XIXTOR, SIL, NPN, 2N5210
007006	IC, DUAL OPAMP, RC4558DN
007008	IC, SINGLE, OPAMP, LM301AN
007010	IC DUAL OPAMP, TL072/LF353
007012	IC SINGLE OPAMP, LF356N
008049	DIODE, SIGNAL, 1N4447
008050	DIODE, POWER, 1N4004
008060	DIODE, LED, ROUND, RED
008063	DIODE, LED, ROUND GREEN
008066	DIODE, ZENER, 5.1V, 1N5231B
300001	CONN, JACK, PHONE, S/C #11
300002	CONN, JACK, PHONE, SWITCHING, S/C #12A
300010	CONN, JACK, MIC, 3 PIN MALE, D3F
301045	SW, RCKR, SPST, W/W 1600-22EB
301046	SW, PWR, DPDT PUSH ON/OFF, LTGNE-15
302093	XFMR, TUBE VOICE
302094	XFMR, BALANCING, T-1562
302095	XFMR, PWR, HT4013
303010	RUBBER FEET, .81 SQ, 3M SJ5023
303019	SPACER, LED MOUNTING, .700
303040	SPACER, PCB, NYLON, .75 LONG
303073	BEZEL, LED, .25 BLK
303103	FUSEHOLDER, PANEL MT, SHURTER FEU
303106	FUSE CARRIER, USA, 3AG GREY 031.1666
303108	FUSE 1/4A SLO-BLO
400067	KNOB, SKIRTED, W/PTR, .25, W/SETSCRU
400068	KNOB, W/PTR, .25, W/SETSCRU
440152	PANEL, TOP & BOTTOM, IVP
450241	CHASSIS, FRONT IVP, SCREENED
450242	CHASSIS, MAIN, IVP, SCREENED
500107	SCREW, PHPSMS, TYPE AB, BLK OXIDE
500201	SCREW, PHPMS, BLK OXIDE, 8-32X3/8
500291	NUT, 8-32 KEP, CAD
500591	NUT, 3/8-32 HEX UNEF-2B
500680	WASHER, LOCK, 3/8 INTERNAL STAR
500681	WASHER, FLAT, 3/8 BRITE NICKLE
800138	PCB, ASSY, IVP POWER SUPPLY
800139	PCB, ASSY, IVP, MAIN



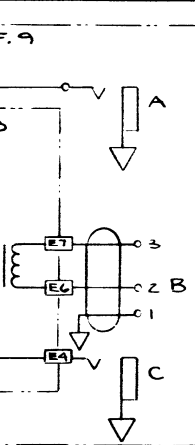
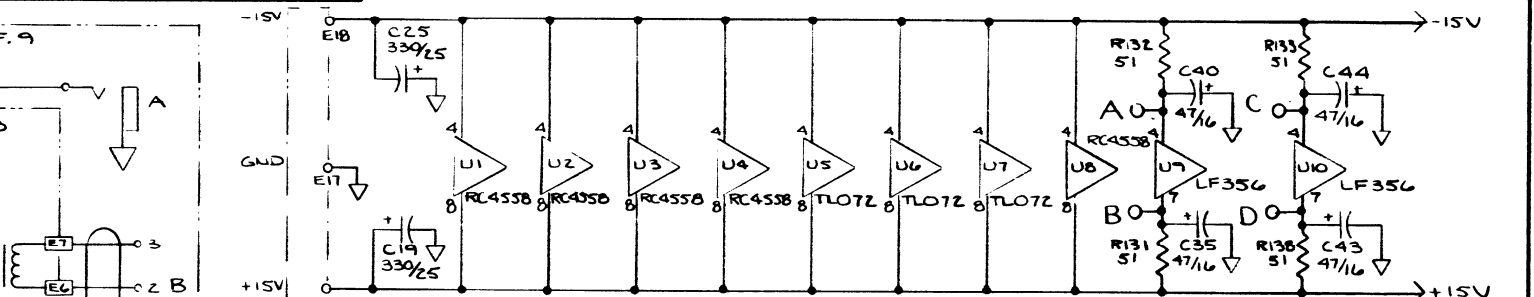
REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPROVED
A	CORRECTED DWG. ERRORS - ELO 8L7	PH	12-28-71	<i>[Signature]</i>
B	CORR DWG ERRORS - ADDED R73, S3, & S4. ADDED C25 & A, CW TO R75. ECN 355	PH	1-26-72	<i>[Signature]</i>



- NOTES:
1. ALL RESISTANCE IN OHMS, 1/4 W, 5% UNLESS OTHERWISE SPECIFIED.
 2. ALL CAPACITANCE IN μ F UNLESS OTHERWISE SPECIFIED.
 3. ALL DIODES IN 4447.
 4. ~~C36~~ & C41 MINIMUM VALUE 2.2 μ F/16V
 5. ~~C38~~ & C45 MINIMUM VALUE 33 μ F/3V.
 6. FIRST USED: R35, Q10, U1, D10, C10, E1
 7. LAST USED: R142, Q24, U10, D25, C48, E18
 8. NOT USED: E9

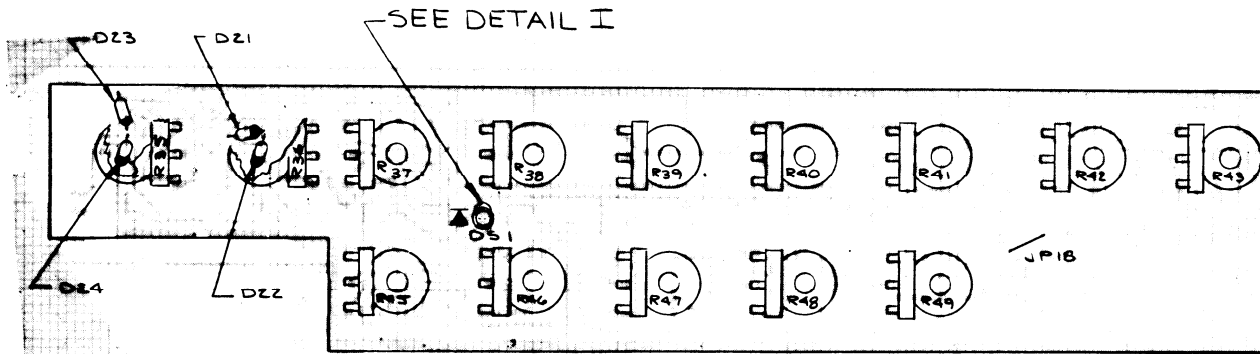
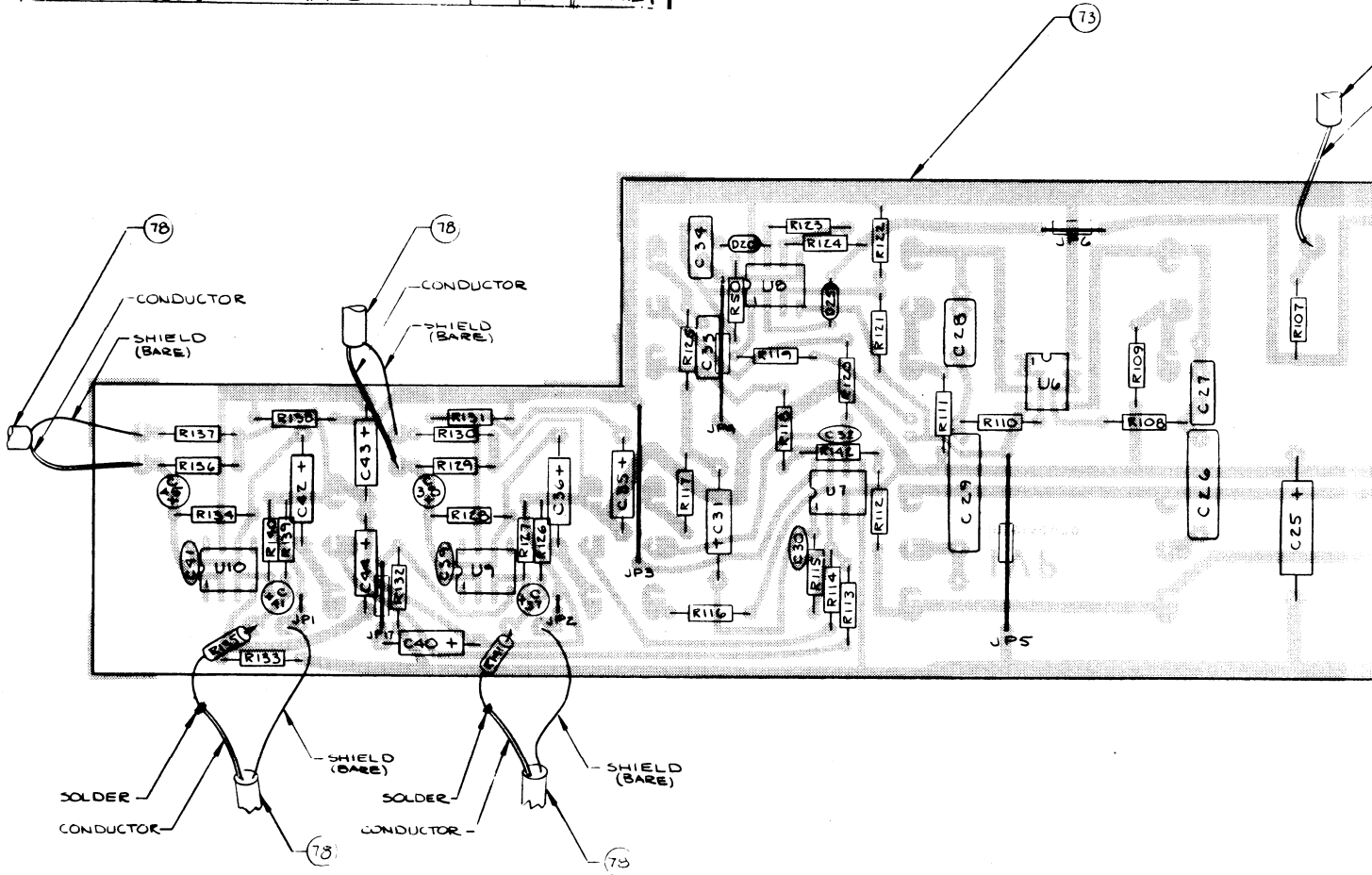


- REFERENCES:
1. MAIN INPUT CHANNEL 2 (FP)
 2. CHANNEL 2 INPUT GAIN (LO-HI) FP
 3. MAIN INPUT CHANNEL 1 (FP)
 4. CHANNEL 1 INPUT GAIN (LO-HI) FP
 5. EFFECTS LOOP 1 (PREVOICE) SEND (RP)
 6. EFFECTS LOOP 1 RECEIVE (RP)
 7. A: EFFECTS LOOP 2 (POSTVOICE) SEND (RP)
B: EFFECTS LOOP 2 RECEIVE (RP)
 8. POWER SUPPLY ASSY
 9. A: MAIN OUTPUT (RP)
B: BALANCED OUTPUT (RP)
C: OUTPUT @ 10 dB (RP)
 10. A: FOOTSWITCH (RP)
B: TUBE, CLEAN VOICE SELECTOR (FP)
 11. A: POWER SUPPLY ASSY (CLEAN LED)
B: POWER SUPPLY ASSY (TUBE LED)



UNLESS OTHERWISE SPECIFIED DIM AND TOL ARE IN INCHES AND SHALL BE INTERPRETED PER ANSI (Y 14.5-1986.) TOLERANCES ARE 1 DEC: .1 3 DEC: .005 2 DEC: .02 4 DEC: .0005 ANGLES: 0.30° REMOVE BURRS, BRK SHARP EDGES MACH SURFACES	DRAWN	HARTLEY	3/16/71	 TECHNICAL AUDIO PRODUCTS CORPORATION SCHEMATIC DIAG IVP F/P								
	CHECKED	<i>[Signature]</i>	3/19/81									
	APPD		1/1									
	RELEASE STATUS											
MATL	PREL	<i>[Signature]</i>	6/9/81	<table border="1"> <tr> <td>SIZE</td> <td>PROD</td> <td>DWG. NO.</td> <td>REV.</td> </tr> <tr> <td></td> <td>REL</td> <td>25213</td> <td>B</td> </tr> </table>	SIZE	PROD	DWG. NO.	REV.		REL	25213	B
SIZE	PROD	DWG. NO.	REV.									
	REL	25213	B									
FINISH:	FINAL	<i>[Signature]</i>	6/7/81									
HT. TREAT			1/1									
DO NOT SCALE DWG.				SCALE: NONE UNIT WT: SHEET 1 OF 1								

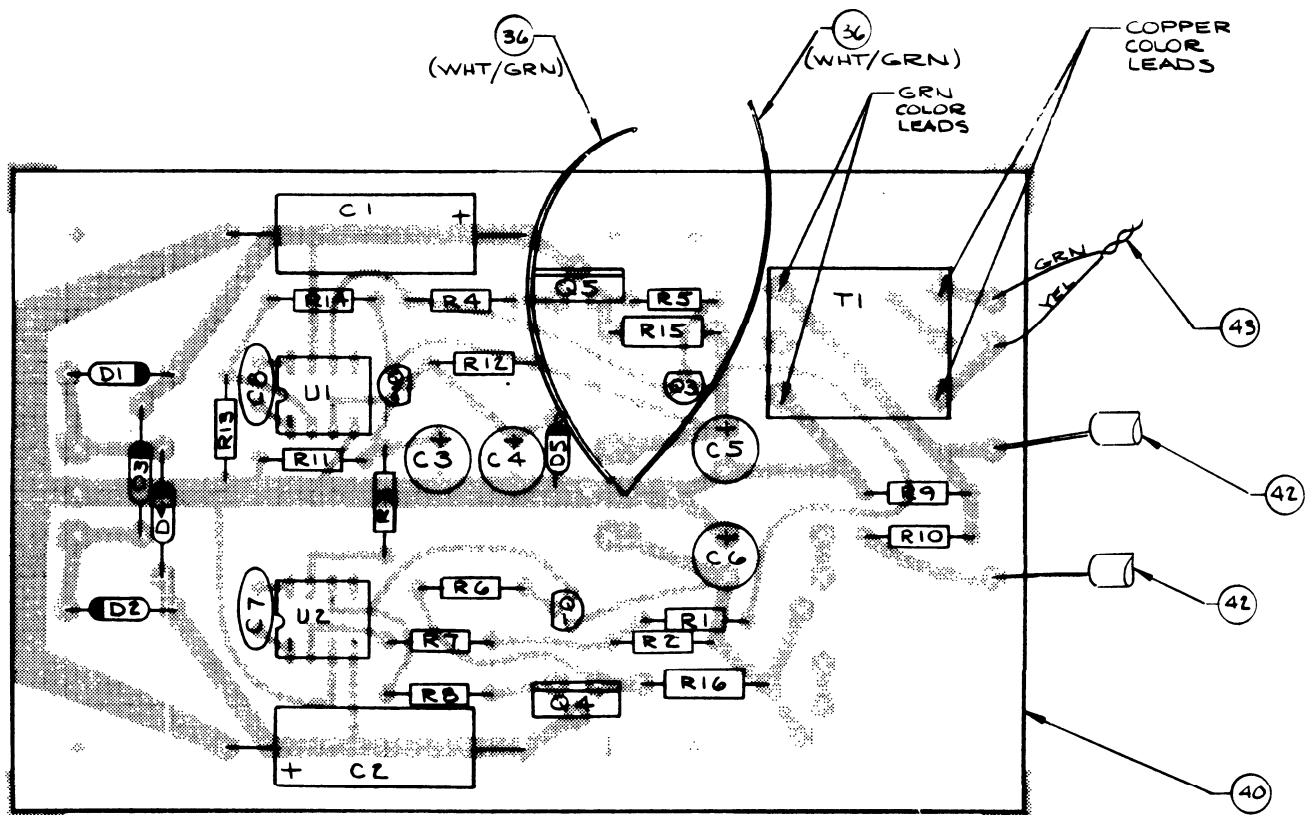
REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPROVED
-	INCORP ECN 271: PN ITEM 47 WAS 005952-2, PN ITEM 48 WAS 005954-2	PH	1-16-81	<i>[Signature]</i>
A	INCORP ECO 749: FINAL REVISIONS BEFORE REL TO PRODFLOW 761	PH	5-1-81	<i>[Signature]</i>
-	CORRECTED SCHEMATIC DWG NO. REF ECN # 704	VB	6-25	<i>[Signature]</i>
B	INCORP ECO 798: P/L CHANGE	PH	9-29-81	<i>[Signature]</i>
C	INCORP ECO 807: P/L CHG	PH	11-2-81	<i>[Signature]</i>
-	CHGD REV OF SCHEMATIC	PH	2-16-81	PHARLEY



CIRCUIT SIDE

FRONT PANEL

2	452503-9	——	JUMPER ZERO OHM	.3LS	JP13,14	96	A
2	452503-8	——		1.1LS	JP5,7	95	A
1	452503-7	——		1.0LS	JP12	94	A
1	452503-6	——		.9LS	JP4	93	A
2	452503-4	——		.7LS	JP9,10	92	A
1	452503-3	——		.5LS	JP15	91	A
3	452503-2	——		.4LS	JP6,8,17	90	A
1	452503	——	JUMPER ZERO OHM	.6LS	JP11	89	A
1	005909	——	RES CF .25W 5%	(.4LS) 20K	R56	88	A
4	005905	——		(.4LS) 13K	R54,57,62,66	87	A
2	005902	——		10K	R135,141	86	A
1	005893	——		(.4LS) 4.7K	R52	85	A
1	005846-3	——		(.6LS) 51Ω	R99	84	A
3	005846	——	RES CF .25W 5%	(.4LS) 51Ω	R59,74,75	83	A
						82	
1	804219	25204	WIRE TWST TRIO WHT/GRN/YEL	8.0		81	
						80	
						79	
4	454036	25197	CABLE SHD 2 COND	5.0		78	
5	454035	25198	CABLE SHD 2 COND	15.0		77	
						76	
5	452400	——	WIRE 22 AWG SOLID TINNED BUS		12 14	75	
						74	C
						73	
1	451098	91	PCB IVP FRONT PANEL BD			72	
						71	
1	303019	——	SPACER			70	A
1	302093	25191	XFMR TUBE VOICE			69	
						68	B
						67	
						66	
1	193080	——	WIRE 22 AWG WHT/ORG	8.0		65	
1	190080	——	WIRE 22 AWG WHT/BLK	8.0		64	
1	166160	——	WIRE 22 AWG BLU .25 STRPEABND	16.0		63	
2	008049-4	——	DIODE	.5LS	D18,19	62	A
6	008049-5	——	DIODE	.3LS	13	61	A
1	008060	——	DIODE LED ROUND RED		DS1	60	
4	008049	——	DIODE SIG	1N4497	11 14	59	A
4	008049-3	——	DIODE SIG	(.4LS) 1N4497	D10,11,12,13	58	A
2	007012	——	IC SINGLE OP-AMP (8-PIN) LF356N		U9,10	57	
5	007006	——	IC DUAL OP-AMP (8-PIN) 4559		U1,2,3,4,8	56	
3	007010	——	IC DUAL OP-AMP (8-PIN) TL072		U5,6,7	55	
3	006046	——	XISTOR SILICON	2N5210	Q20,21,22	54	
4	006045	——	J-FET	J113	Q18,19,15,14	53	
3	006042	——	XISTOR SILICON PNP	2N4403	Q11,13,23	52	
5	006041	——	XISTOR SILICON NPN	2N4401	Q10,12,16,17,24	51	
						50	
						49	
2	005967-2	——	RES CF .25W 5%	.5LS 4.7M	R50,86	48	
8	005958-2	——		2M	10	47	
1	005941-2	——		430K	R89	46	
2	005934-2	——		220K	R122,120	45	C
1	005931-2	——		160K	R121	44	
8	005926-2	——	RES CF .25W 5%	.5LS 100K	9	43	
800139	PART NO	DWG NO.	DESCRIPTION		REF. DESIG	ITEM NO	REV
PARTS LIST							



REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPROVED
-	INCORP ECN 271: PN ITEM 13 WAS 005804-2	PH	1-16-81	<i>[Signature]</i>
A	INCORP ELO 759	PH	5-1-81	<i>[Signature]</i>
B	INCORP ECO 805	PH	10-27-81	<i>[Signature]</i>
-	INCORP ECN 329: CHG DISCRIP. ITEM 38	PH	11-13-81	<i>[Signature]</i>
C	INCORP ECO 816: ITEM 42 WAS P. 454034	PH	11-30-81	<i>[Signature]</i>

NOTES:

- 1. FOR SCHEMATIC DIAGRAM SEE DWG. 25214

DRAWN	HARTLEY	1/13/81	TAPCO TECHNICAL AUDIO PRODUCTS CORPORATION			
CHECKED		/ /				
APP'D		/ /				
RELEASE STATUS			PCB ASSY POWER SUPPLY IVP			
PREL.	<i>[Signature]</i>	6/9/81				
FINAL	<i>[Signature]</i>	6/9/81				
	/ /	/ /				
			SIZE	PROD REL	DWG. NO.	REV.
					25183	C
DO NOT SCALE DWG.			SCALE: 2:1	UNIT WT:		SHEET 1 OF 1

POWER SUPPLY IVP

1	804218	25203	WIRE TWST PR 22AWG YEL/GRN 5.0		43	
2	454036	25198	CABLE SHD 2 COND 5.0		42	C
					41	
1	451097	90	PCB (B-105) IVP PWR SUPPLY		40	
					39	
1	302094	25192	XFMR BALANCING T-1562 TI		38	-
					37	
2	195075	---	WIRE 22 AWG WHT/GRN 7.5		36	A
					35	A
					34	
					33	
1	008066-2	---	DIODE ZENER 5.1V .315 IN5231B DS		32	
4	008050	---	DIODE POWER IN4002 DI,2,3,4		31	
					30	
2	007008	---	IC SINGLE OP-AMP (8-PIN) LM301 U1,2		29	
					28	
1	006043	---	XISTOR SILICON NPN TIP31 Q5		27	
1	006044	---	PNP TIP32 Q4		26	
2	006041	---	NPN 2N4401 Q2,3		25	
1	006042	---	XISTOR SILICON PNP 2N4403 Q1		24	
1	005012	---	RES. .5W, 5% CF 4.7Ω R16		23	B
1	005012-2	---	RES. .5W, 5% CF (.5LS) 4.7Ω R15		22	B
					21	
1	005905-2	---	RES. 25 W, 5% CF .5LS 13K R14		20	
1	005895-2	---	.5LS 5.6K R13		19	
1	005889-2	---	.5LS 3.3K R12		18	
1	005887-2	---	.5LS 2.7K R11		17	
1	005878-2	---	.5LS 1.1K R10		16	
1	005870-2	---	.5LS 510Ω R9		15	
4	005869-2	---	.5LS 470Ω R4,6,7,8		14	B
1	005815-2	---	.5LS 2.7Ω R3		13	
1	005869	---	RES. 25W 5% CF .4LS 470Ω R5		12	B
2	005601-2	---	RES. 25 W, 1% MF .5LS 20K R1,2		11	
					10	
					9	
1	004025	---	CAP. CER. 10% 47/50 C8		8	B
1	004037	---	CAP. CER. 10% 100/50 C7		7	B
					6	
2	001351	---	CAP. ELEC. AL RAD 100/16 C5,6		5	
2	001771	---	CAP. ELEC. AL RAD 220/35 C3,4		4	
2	001415	---	CAP. ELEC. AL AX 339/35 C1,2		3	
					2	
					1	
	800138	25183	PCB ASSY, PWR SUPPLY		1	
800138	PART NO.	DWG. NO.	DESCRIPTION	REF DESIG	ITEM NO	REV
	PARTS LIST					