

'94 TWIN AMP

p/n 02-4809-000(120V)

SERVICE MANUAL



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Fender Musical Instruments Corp.
7975 North Hayden Road Scottsdale, AZ 85258

'94 TWIN AMP

(This is the model name for warranty claims)

SERVICE MANUAL

JUNE 1995 REV A
TYPE PR266

IMPORTANT NOTICE:

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For warranty repair service, only Fender specified part numbers are to be used. It is recommended they also be used for post-warranty maintenance and repair.

Parts marked with an asterisk (*) indicate the required use of that specific part. This is necessary for RELIABILITY and SAFETY requirements. **DO NOT USE A SUBSTITUTE!**

A coded naming convention is used in the description of certain parts. The codes and what they mean are as follows:

CAPACITOR CODES

CAP AE = Aluminum Electrolytic
CAP CA = Ceramic Axial
CAP CD = Ceramic Disk
CAP MPF = Metalized Polyester Film
CAP MY = Mylar
CAP PFF = Polyester Film/Foil

RESISTOR CODES

RES CC = Carbon Comp
RES CF = Carbon Film
RES FP = Flame Proof
RES MF = Metal Film
RES WW = Wire Wound

HARDWARE CODES

BLX = Black Oxide
CR = Chrome Plated
HWH = Hex Washer Head
M = Machine Screw
NI = Nickel Plated
OHP = Oval Head Phillips
PB = Particle Board
PHP = Pan Head Phillips
PHPS = Pan Head Phillips Sems
SMA = Sheet Metal "A" Point
SMB = Sheet Metal "B" Point
SS = Stainless Steel
TF = Thread Forming
ZI = Zinc Plated

'94 TWIN AMP

SPECIFICATIONS

Product Release No.:	PR 266 <i>(This is not a model number)</i>
Part Number:	120V Version : 21-4809 230V Version : 21-4889
Power Requirements:	120V Version: 120 volts AC, 60 HZ, 360 watts. 230V Version: 230 volts AC, 50 HZ, 360 watts.
Input Impedance:	Input 1: 1M Ω Input 2: 136k Ω
Effects Loop:	Pre Reverb. Nominal Level: +2, -5.5, -13 dbv Output Impedance: 4.2k Ω maximum Input Impedance: 130k Ω minimum
Effects Mix Control:	Continuously variable between the signal at the EFFECTS SEND and EFFECTS RETURN jacks.
Reverb:	Post effects loop.
Preamp Out:	Post reverb, +1.3 dbv nominal level. Recommended load: 22 k Ω minimum.
Power amp in:	+1.3 dbv sensitivity, 1130k Ω input impedance.
Balanced Line Output:	Derived from the output transformer, fully balanced. +3 dbv nominal level into 600 Ω or greater. Pin 1 floating, pin 2 (+), pin 3 (-)
Amplifier Load Impedance:	Switch selectable for 4, 8, or 16 Ω .
Power Output:	OUTPUT HIGH setting: 100 watts RMS, 5% THD. OUTPUT LOW setting: 25 watts RMS, 5% THD.
Speaker Complement:	Two Fender P.N 026488 Special Design 12" 8 ohm speakers wired in series.
Dimensions:	Height: 20 3/4" (52.7 cm) Width: 26 3/8" (67 cm) Depth: 11 1/2" (29.2 cm) Weight: 77 lbs. (35 kg)

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'94 TWIN AMP

THEORY OF OPERATION

INPUTS

J1 and j2 are high and low sensitivity inputs that feed the first preamp stage (V1A). V1A provides a gain of about 38 for channel 1, and about 49 for channel 2. The gain difference is due to different loading of the plate of V1A. The signal then couples to relay K1B, which routes it to the channel one or channel two circuitry.

CHANNEL ONE

The '94 Twin Amp is a direct descendent of classic tube amps like the Twin Reverb and the 410 Bassman. Channel one is the traditional Fender design which offers the vintage sound as well as contemporary sounds with the use of switch-selectable Gain and Master Volume controls. It's like two channels in one. The first stage of Channel One contains the Treble (R17), Bass (R18) and Mid (R19) tone controls. The signal from the Treble control feeds through Relay K2B, which routes the signal to either the Clean or Vintage Overdrive section of channel one.

CLEAN

The signal from pin 11 of Relay K2B feeds through the Clean Volume control (R11) to V1B. R12 and C4 provide the Bright boost feature via a pull switch on the Clean Volume control. V1B provides a gain of about 45. The Clean channel circuitry terminates at pin 6 of Relay K2A. K2A selects between the output of the Clean or Vintage Drive circuit.

VINTAGE DRIVE

The signal from Pin 9 of Relay K2B feeds through the Gain control (R8) to the first stage (V2A) of the Vintage Drive circuitry. V2A provides a gain of about 20, then drives the second gain stage (V2B). V2B provides a gain of about 48; then couples the signal to the vintage drive Volume control (R23), which also contains the select switch for the Clean/Drive feature. When in the Channel 2 mode, Relay K1A connects the wiper of the Gain control (R8) to ground, muting the input to the Vintage Drive stage. The Vintage Drive circuit terminates at pin 8 of Relay K2A.

CHANNEL TWO

Channel Two is like owning a second, modern hot-rodded amp with more soaring gain than previously found in a Fender tube amp. The signal from pin 9 of Relay K1B feeds through the Channel Two Gain control (R25) to the first (V3A) and then second (V3B) stage of the overdrive circuitry. From V3B, the signal is fed to through the Treble (R35), Bass (R36), and Mid (R37) tone controls. Finally the signal travels through the channel two Volume control (R39), which also contains the Channel Select switch. Channel two terminates at pin 9 of Relay K4B. K4B selects between channels one and two.

EFFECTS LOOP

The selected (Ch-1 or Ch-2) signal from Relay K4B is fed to a Split-Load Phase Inverter (V4A). The output from Pin 1 of V4A follows two paths to Relay K3A. One path travels through one half of the Mix control. The second path connects directly to K3A. The signal from Pin 3 of V4A drives the Effects Send Jack (J3), and is normalled to the Effects Return jack (J4). The Effects Level switch provides three signal levels for matching a wide variety of external signal processing devices. The switch also maintains unity gain between the Send and Return jacks. The signal from the Effects Return jack feeds V4B, then travels through the other half of the Mix control (R44B), and to Relay K3B. The dry and wet signals sum together through R54 and R55. Relay K3 is controlled by the Effects Select switch in the Both position, K3 will be in the Normally Closed position. Any signal available at the Effects Return jack will pass, whether in Ch-1 or Ch-2. The Mix control will be active. With the Effects Select switch in the Ch-1 position, the Effects Return will be active while the amp is in the Ch-1 mode. When the amp is switched to the Ch-2 mode, the control voltage from U2B will energize relay K3, K3A will toggle, bypassing one half of the Mix control (R44A), and K3B will break the connection from the Effects Return. Therefore the Effects Return will be active only for the channel that is selected by the Effects Select switch.

REVERB

The signals from Relays K3A & K3B sum through R54&R55, then split to feed the Reverb Drive circuit and the summing amp for the Wet and Dry signal. V5 (12AT7) and T1 make up the standard Reverb Drive circuit. The

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THEORY OF OPERATION(CONT)

Reverb return circuit uses JFET Q1. Without a footswitch connected to the footswitch jack, diode CR17 enables the reverb to function. V6A amplifies the reverb return signal. Note that V6A should provide a minimum gain of 49. The output from V6A drives the Reverb control (R62), then sums with the dry signal through R63.

V6B feeds the Cathode Follower V7B, which drives the Preamp Out jack. The signal is normalled to the Power Amp in jack and then feeds V7A. V7A contains the Presence control, accepts feed back from the output and feeds the Phase Inverter V8.

OUTPUT SECTION

The output tubes (V9, V10, V11, V12, 5881/6L6WGC) are arranged in a push-pull configuration that will produce 100watts into a 4, 8, or 16 Ω load. The Impedance Selector (S10) will switch between the respective taps of the output transformer secondary. CR1&CR4 are flyback protection diodes that prevent the output transformer from an over voltage condition. This can occur when the output transformer experiences an open load. A separate secondary winding drives an XLR jack (J13), which provides a balanced line out with a floating ground pin (pin1). This can be used to drive a slave amp and additional speaker cabinets. It can also be used as a send to a mixing console. However to get a useful sound, the signal should be pre-equalized before the console input. A low-pass filter set a 5 to 6 kHz with a minimum 18 db per octave slope works well.

BIAS

The Bias is set by measuring the voltage drop across the Flame Proof 1 Ω resistors R89 & R90. If the voltage drop reads 80mV, then the current through the resistors will be 80mA ($E/R=1$) = (80mV divided by 1 Ω = 80mA). CR2 & 3 are protection diodes for R89 & R90. If an output tube shorts, the fault current will shunt through the diodes instead of R89 & R90.

BIAS ADJUSTMENT

The Bias Adjust and Balance Adjust controls, along with the Bias and Balance test points are located on the rear panel for easy access. Allow the amplifier to warm up for at least 2-3 minutes with the Output switch set to High, and the Standby switch in the On position. With a digital voltmeter set to its most sensitive DC voltage scale; connect the test probes to the test points (J11 & J12) labeled "Bias". Adjust the Output Bias Adjust control (R94) to read .08 VDC (80mVDC). This will Bias V9 & V10. Now connect the test probes across the "Balance" test points (J10 & J11). The meter is now referenced to the 80mVDC instead of ground. Adjust the Output Balance Adjust control to obtain 0VDC. This precisely matches V11 & V12 to V9 & V10. For optimum sonic performances, set Bias to 80mVDC, then set Balance.

For optimum sonic performance with increased tube life, set Bias to 60mVDC, then set Balance.

For optimum tube life, set Bias to 40mVDC, then set Balance.

Note: If a bias measurement of 40mVDC cannot be obtained, it may be time to replace the output tubes.

CHANNEL/REVERB SWITCHING

A 27.5VAC signal is tapped off from the Brown secondary of the power transformer. This signal is presented to the Footswitch jack. By rectifying the positive or negative half of the waveform, a DC control voltage is created. This voltage is used to control several opamp comparator circuits.

TROUBLESHOOTING TIP

Most channel switching problems will probably be related to intermittent or sticky relays. However troubleshooting the switching circuitry is easy. All test point voltages are on the schematic. First verify the reference voltage at the comparator. The reference voltage is applied to the non-inverting input of the opamp. Then measure the output of the comparator. If it doesn't toggle properly, check the control voltage. If the control voltage is not correct, hang a scope probe on the footswitch jack. Look at the AC waveform, activate the channel select switches, and look for the rectified waveform. The Reverb is switched by rectifying the negative side of the waveform. The Gain Select and Channel Select are switched by rectifying the positive side of the waveform at two different voltage levels. Diode CR16 and Zener CR18 set the two voltage levels.

POWER LEVEL SWITCHING

Via the output switch (S9) the output power of the amplifier can be switched between 25 and 100 watts. S9A selects between the center tap and full winding of the high voltage secondary of the power transformer. This causes the B+ and Z supplies to

'94 TWIN AMP

THEORY OF OPERATION(CONT)

switch from +454Vdc to +230Vdc. This voltage change only affects the four output tubes. The high voltage supplies for the preamp tubes are tapped off prior to the output switch (S9). When switching the high voltages at the power tubes, the negative Bias voltage must also be switched. The Bias supply is derived through a voltage doubler from the Brown secondary of the power transformer. S9B determines the path of the Bias current. The low power path is through R97 (100K), and the high power path is through R98 (18K) and R97 (100K) in parallel. R96 (82K) sets up the voltage divider that feeds the Bias and Balance controls (-52Vdc High, -21 Vdc Low).

Note: It is recommended that the amplifier be in the Stand-by mode before switching the High/Low Output switch.

LOW POWER OPTION

The '94 Twin Amp can be run with only two output tubes instead of four. This is done by removing the inner two 5881/616wgc tubes. The Impedance Selector switch must be set to one-half the total speaker load. The rule is ---half the tubes---half the impedance. Therefore when using the internal two speakers (16 Ω load), the Impedance Selector switch must be set to 8 Ω. This will produce 60 watts RMS in the Output High setting, and 15 watts RMS in the Output Low setting.

PARTS LIST

NOTE: SHADED ITEMS ARE FOR REFERENCE ONLY

PRINTED CIRCUIT BOARD ASSEMBLY

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
1	048973	CABLE RIBBON 9 CKT 15 3/4 IN	P3A
1	048972	CABLE RIBBON 9 CKT 9 3/4 IN	P2A
1	038691	CAP AE AX 4.7 UF 50V	C35
7	009512	CAP AE AX 22 UF 25V 20%	C1,5,11,24,28,53,61
4	024819	CAP AE AX 22UF 500V	C22,42,43,44
4	036954	CAP AE RDL 22UF 63V 20%	C36,37,59,62
4	024820	CAP AE AX 47UF 350V	C40,41,51,52
1	028471	CAP AE RDL 47UF 50V 20%	C60
2	031040	CAP AE RDL 100UF 100V 20%	C45,50
2	013638	CAP AE AX 220UF 285V	C38,39
2	028482	CAP AE RDL 220UF 50V 20%	C46, 49
2	039362	CAP AE RDL 1000UF 35V LOPROFIL	C47,48
1	025982	CAP CD 68PF 1000V 10%	C4
2	020917	CAPCD 250 PF 1000V 10%	C6, 17
1	025777	CAP CD 470PF 1000V 10%	C25
2	011435	CAP CD 680PF 1000V 10%	C13,27
1	017620	CAP CD 1500PF 1000V 10%	C31
1	039265	CAP CA 2200PF 100V	C30
2	026202	CAP PFF .0022UF 600V	C10,14
3	025962	CAP PFF .0047UF 400V	C12,29,65
2	027275	CAP MPF .068 UF 100V	C57,58
7	024833	CAP MPF RDL .022UF 400V 10%	C3,8,9,16,18,26,63
2	024835	CAP MPF RDL .022UF 630V 10%	C32,33
2	024853	CAP MPF RDL .1UF 250V 10%	C23,34
5	024854	CAP MPF RDL .1UF 400V 10%	C2,7,15,19,21
2	027281	CAP MPF .22UF 63V	C55,56
1	027286	CAP MPF .47UF 63V	C54
1	024876	CAP MPF RDL .68UF 250V 10%	C20
1	049028	CONTROL POT 1M 2B W/DPDT	R39 (CHANNEL 2 VOLUME)
1	047781	CONTROL SNAPIN 1K 15C	R82 (PRESENCE)
2	041510	CONTROL SNAPIN 25K B	R19, 37 (CHANNELS 1&2 MID)
1	037600	CONTROL SNAPIN 100K B	R62 (REVERB)
4	037597	CONTROL SNAPIN 250K 30A	R17,18,35,36 (CHANNELS 1&2 TREBLE,BASS)
1	047780	CONTROL SNAPIN 250 K 30A	R23 (CHANNEL 1 DRIVE VOLUME)

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PRINTED CIRCUIT BOARD ASSEMBLY (CONT)

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
1	041511	CONTROL SNAPIN 250K B DUAL	R44 (MIX)
1	041512	CONTROL SNAPIN 1M 30A	R11 (CHANNEL 1 CLEAN VOLUME)
2	037596	CONTROL SNAPIN 1 MEG J TAPER	R8,25 (CHANNELS 1,2 GAIN)
2	026133	CONTROL TRIM 25K LIN	R92,94 (BIAS/BALANCE ADJUST)
11	026730	DIODE 1N4006 800V	CR2,3,5-11, 14, 15
14	006260	DIODE 1N4448 SIGNAL	CR16,17,19,20,22-30,32
2	031729	DIODE ZEN 1N5231B .5W 5.1V 5%	CR18, 31
1	028990	RES CF 1/4W 5% 51K	R50
2	024995	RES CF 1/4W 5% 68K	R1,2
1	024996	RES CF 1/4W 5% 82K	R96
8	024997	RES CF 1/4W 5% 100K	R16,24,34,59,70,71,97,153
7	028955	RES CF 1/4W 5% 130K	R51,54,55,93,95,142,147
1	025058	RES CF 1/4W 5% 180K	R49
7	025059	RES CF 1/4W 5% 220K	R22,26,29,32,58,64,141
1	028016	RES CF 1/4W 5% 300K	R125
4	025065	RES CF 1/4W 5% 470K	R63,76,77,129
14	025069	RES CF 1/4W 5% 1M	R3,6,7,40,56,118,121,123,127,128,135,138,156,157
1	025077	RES CF 1/4W 5% 3.3m	R65
2	025084	RES CF 1/4W 5% 10M	R12,38
2	041741	RES MOX FP 1/2W 5% 47Ω	R108,109
1	025941	RES CF 1/2W 5% 560Ω	R57
1	026549	RES CF 1/2W 5% 1.5K	R134
1	026493	RES CF 1/2W 5% 2.7K	R120
1	031065	RES CF 1/2W 5% 91K	R146
9	025116	RES CF 1/2W 5% 100K	R5,10,15,21,27,30,61,67,140
6	025117	RES CF 1/2W 5% 220K	R99-102,110,111
2	033095	RES MOX FP 1W 5% 1Ω	R89,90
1	037354	RES FILM 1W 5% 4.7K	R80
1	041739	RES MOX FP 1W 5% 6.8K	R104
1	027349	RES FILM 1W 5% 10K	R42
1	041738	RES CF 1W 5% 15K	R43
1	027350	RES FILM 1W 5% 22K	R79
1	027352	RES FILM 1W 5% 91K	R73
1	027353	RES FILM 1W 5% 100K	R72
1	041277	RES CF 2W 5% 820Ω	R112
1	041740	RES MOX FP 2W 5% 4.7K	R103
1	041737	RES CF 2W 5% 33K	R53
2	036924	RES WW BT 5W 10% 1K	R91,154
2	029047	RES WW BT 7W 10% 270Ω	R106,107
1	041742	RES WW VT 7W 10% 10K	R105
3	038652	SWITCH SLIDE 4P3T	S4-6
9	026001	TERMINAL EYELET W/ LUG	1
1	028503	THERMISTOR 10 Ω 5A C60-11	TH1
1	041261	VOLT REF LM4040DCZ-10V TO-92	U1
1	014689	XSTR N-CH JFET J111 TO-92	Q1

CHASSIS ASSEMBLY

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
4	016473	SCRW M 8-32X1/2 PHP ZI	(OUTPUT TRANSFORMER MOUNT)
1	028684	SCRW SMB 6X3/8 PH PHS BLK	(@J6, REVERB RCA JACKS)
2	026521	SCRW SMB RX3/8 RH PHS BLK	(@ J13, BALANCED LINE OUT)
15	028937	SCRW TF 6-32X5/8 PHPZI TAPTYT	(PCB TO CHASSIS MOUNT)
15	025936	STANDOFF NYLON PCB SNAPIN 3/8"	(PCB TO CHASSIS MOUNT)
1	026472	SWITCH SLIDE DPTT	S10 (IMPEDANCE SELECT)
2	036570	SWITCH TOGGLE DPST W/ NUTS	S7,8 (POWER, STANDBY)
1	049976	SWITCH TOGGLE DPST W/ LEADS	S9 (OUTPUT HIGH,LOW)
3	023531	TUBE 12AT7	VR4,5,8
5	013341	TUBE 7025/12AX7A SOVIET MADE	V1,2,3,6,7
8	023598	TUBE SHIELD	(@V1,2,3,4,5,6,7,8)

**'94 TWIN AMP
CHASSIS ASSEMBLY (CONT)**

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
4	023580	TUBE SOCKET 8 PIN	XV9,10,11,12
8	023606	TUBE SOCKET 9 PIN	XV1,2,3,4,5,6,7,8
4	039214	TUBE VACUUM 5881/6L6WGC	V9,10,11,12
2	9904300100	WASHER LCK INTL 3/5X.681X.032	(@J14,16)
2	026564	WSHR FLAT .284X1/2ZI	(@R92,94 BIAS/BALANCE POTS)
3	027520	WSHR FLAT .380X.630 FIBER	(@J14,15,16)
8	022319	WSHR FLAT 1/4X9/16 NI	(POWER TRANSFORMER MOUNT)
3	031153	WSHR FLAT 3/8X.614 NI	(@J14,15,16 SPKR OUTPUT JACKS)
1	026401	WSHR SHLDR FIBER 3/8X5/8	(@J15)
1	047776	XFMR 94 TWIN 120V	T3 (120V DOMESTIC ONLY)
1	049052	XFMR PWR 94 TWIN EXPORT	T3 (100V,115V,230V.240V)
1	026478	XFMR OUTPUT 100W 4,8,16 Ω	T2
1	037099	XFMR REVERB VIBROVERB	T1

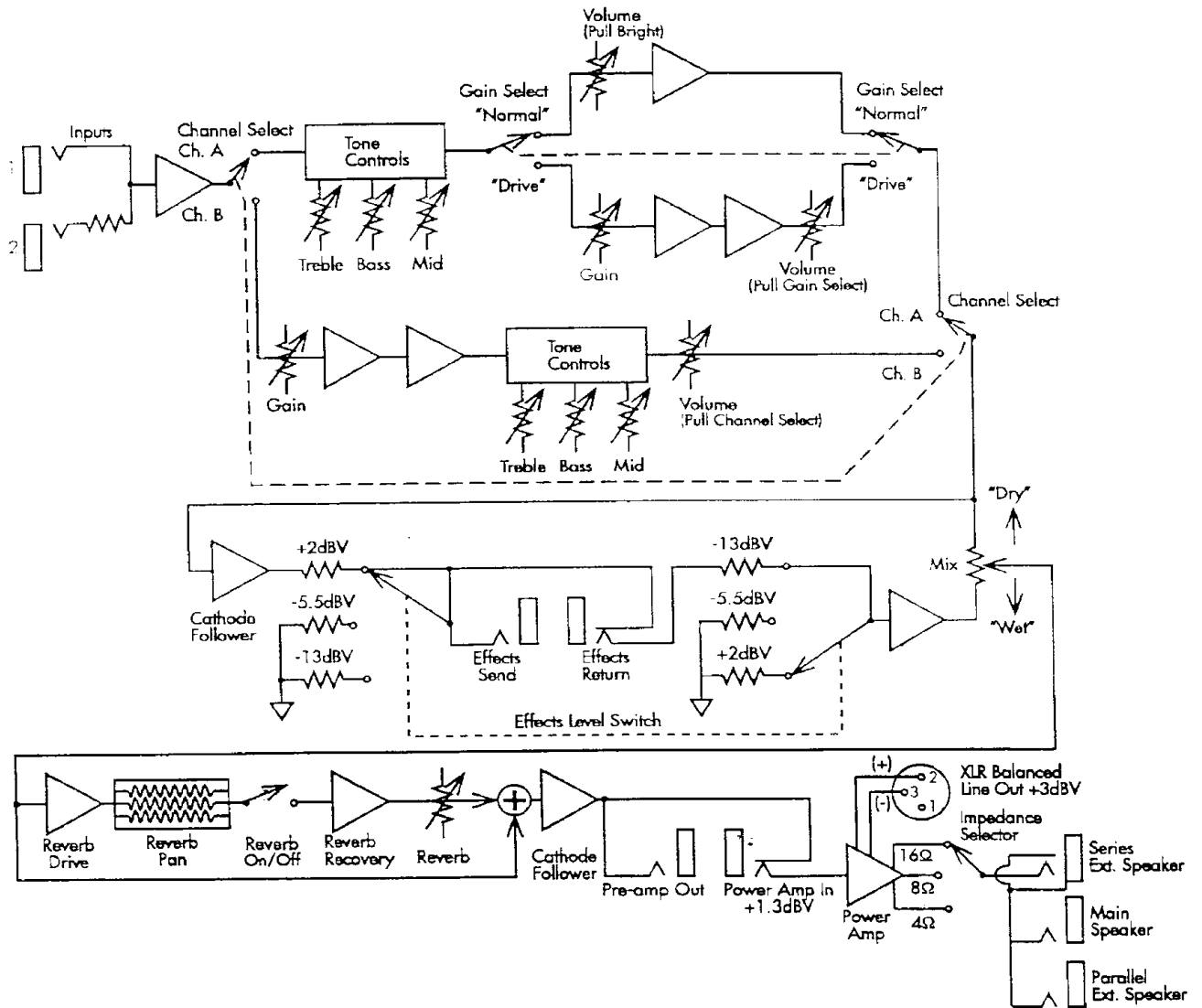
FOOTSWITCH ASSEMBLY

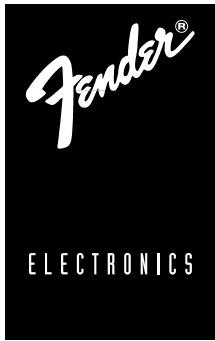
QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
1	028895	CABLE ASSY FTSW RT ANG 12'	(FOOTSWITCH CABLE)
2	006260	DIODE 1N4448/1N914B SIGNAL	CR1,3
2	031017	DIODE ZEN 1N5223B 2.7 V 5%	CR2,4
1	047800	FTSW ASSY 3BTN GAIN/CH/REV	(COMPLETE FOOTSWITCH)
1	037036	JACK PHONE PCB MONO CA PREMIUM	J1
3	031871	LED BI-COLOR 5MMX5MM	LD1,2,3
1	031647	NUT HEX 12MMX1MM NI	(@J1)
1	024952	RES CF 1/4W 5% 100Ω	R1
8	028889	SCRW SMB 6X1/4 PHP	(END CAP MOUNT)
3	041527	SPACER RND NYL .680X.250X.147	(LD1,2,3)
3	028714	SWITCH PUSH SPDT	S1,2,3
3	031899	WSHR NYL .485X.775X.150TK	(@S1,2,3)

MISCELLANEOUS

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
1	047775	MANUAL OWNERS '94 TWIN AMP	
1	047768	SCHEM REDU W/ SRV '94 TWIN AMP	

'94 TWIN AMP BLOCK DIAGRAM





'94 TWIN AMP

SERVICE MANUAL ADDENDUM

This addendum contains important modification and revision information including parts and revision "C" schematics. Please attach to the existing service manual for the '94 Twin Amp.



CONTENTS:

- Notices
- Description of changes
- Parts list
- Schematics/diagrams

'94 TWIN AMP
ADDENDUM
(This is the model name for warranty claims)

**SERVICE MANUAL
ADDENDUM**

MAY 1996

TYPE PR 266

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NI = Nickel Plated
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'94 TWIN AMP
ADDENDUM

DESCRIPTION OF CHANGES

All of the following modifications are present on revision "E" printed circuit boards. Some of the other modifications appear on earlier revision PCBs.

The PCB revision level is located on the solder side of the centermost PCB, near the orange wire and filter capacitor C40.

Reason For Changes:

Compliance with Safety Regulatory Agencies:

Added "Crowbar" protection circuit (CR33 – 38) to the screen (Z) supply capacitors (C40, 41). The crowbar circuit is present on Revision D & E printed circuit boards.

Do not attempt the above modification to earlier revision PCBs.

Added RF emissions suppression capacitor (C64, P/N 025995) across the high voltage transformer secondary, prior to the full-wave bridge rectifier circuit.

Performance modifications:

Added CR32 and changed R124 and R134 to ensure that Relays K1, K2, and K3 drop out when de-energized. (See zone 7B on Rev C schematic).

Refer to Tech Note TN95-4

Upgraded the HIGH/LOW OUTPUT power switch.

Refer to Tech Note TN96-3

Changed the Reverb muting circuit to eliminate noise in the reverb recovery circuit caused by poor power line conditions. Change R59 from 100k to 1.8k, add Q2 (JFET) and R155 (1.8k). (See zone 4C on rev C schematic).

Refer to Tech Note TN96-5

Attached is a Revision C schematic/service diagram.

'94 TWIN AMP
ADDENDUM
PARTS LIST REVISIONS

PRINTED CIRCUIT BOARD ASSEMBLY

QTY	PART #	DESCRIPTION	REFERENCE DESIGNATION
5	024819	CAP AE AX 22uF 500V	C22,42,43,44,51
2	024820	CAP AE AX 47uF 350V	C40,41
1	025995	CAP CD 8200PF 1000V 20%	C64
15	026730	DIODE 1N4006 800V	CR2,3,5-11,14,15,34-37
14	006260	DIODE 1N4448 SIGNAL	CR16,17,19,20,22-30,32
2	041811	DIODE ZEN 1N5368B 47V 5W 5%	CR33,38
3	047234	RES CF 1/6W 5% 1.8k	R59,117,155
4	024962	RES CF 1/4W 5% 560Ω	R41,52,124,137
1	026549	RES CF 1/2W 5% 1.5k	R134
3	025117	RES CF 1/2W 5% 220k	R99,100,101
1	047768	SCHEM REDU W/SERV '94 TWIN AMP	(REVISION "C")
1	049976	SWITCH TOGGLE DPST DC W/NUT	S9 (REFER TO TECH NOTE TN96-3)
2	014689	XSTR N-CH JFET J111 TO-92	Q1,2



TECH NOTES

Fender Musical Instruments Corp.
7975 North Hayden Road Scottsdale, Arizona 85258

TECH NOTE # TN95 - 4

ISSUE DATE: July, 1995
ISSUED BY: C. Colaço
PAGE: 1 of 2

PRODUCT(S) AFFECTED:

'94 TWIN AMP

(All Serial numbers prior to LO-635399)

SYMPTOMS:

When switching from channel two (Red), to channel one Drive (Yellow), there appears to be a loss in gain in the channel one Drive mode.

And/or the channel one Drive (Yellow) and channel two (Red) are active at the same time. The channel indicator LED's (Yellow & Red) are not affected.

CONDITION:

Excessive voltage (3.5 - 4 Vdc) across the relay coils (K1 & K4) when in the de-energized state. The modification will limit the voltage to an acceptable 2 Vdc.

REQUIRED ACTION:

1. On the centermost PCB, near IC U2, locate R119 and R124. Lift the PCB and change R124 from 680 ohms to 560 ohms 1/4W (P/N 024962).
2. Install a 1N4448 small signal diode (P/N 006260) across R119. Orient the diode so the Cathode (band) connects to the junction of R119 and C60. Re-install the PCB.
3. Change R134 from 1K to 1.5K 1/2 watt (P/N 026549).
This can be done without removing the preamp board. R134 is located on the preamp board, directly behind the yellow Led LD2 (see Service Diagram). R134 connects to the anode of LD2. De-solder R134 and allow it to drop out of the PCB onto the chassis. Install the 1.5K 1/2W resistor from the solder side of the PCB.
Don't forget to remove the old resistor from inside the chassis!

WARRANTY CLAIM INSTRUCTIONS:

The above modification should be performed on any '94 Twin Amp requiring service in or out of warranty. For proper labor reimbursement, please indicate the Tech Note Number TN95-4 in the Authorization Code Box (Box # 12) on the Warranty Reimbursement Form. Labor reimbursement = 1 Hour.



TECH NOTES

Fender Musical Instruments Corp.
7975 North Hayden Road Scottsdale, Arizona 85258

TECH NOTE # TN96 - 3

ISSUE DATE: March, 1996

ISSUED BY: C. Colaço

PAGE: 1 of 2

PRODUCT(S) AFFECTED:

'94 TWIN AMP

(All Serial numbers prior to LO-673648 should require this modification)

SYMPTOMS:

Overheating of power tubes when in the LOW OUTPUT power mode.
Unit appears to be locked into the HIGH OUTPUT power mode.

CONDITION:

Arcing between switch contacts in the high voltage leg of the HIGH/LOW OUTPUT power switch (S9). The arcing occurs only when the HIGH/LOW OUTPUT switch is operated while the amplifier is in the fully on mode (NOT IN STANDBY). This may cause burning, pitting, and eventual welding together of the switch contacts. Therefore when the amplifier is switched to the LOW power mode, the high voltages at the output tubes remain high, but the Bias voltage drops. The result is a severely under Biased output stage that quickly overheats.

REQUIRED ACTION:

A new style switch has been specified for this application.

Determine if the old style switch is installed in the unit. The old style switch is identical to the Power and Standby switches. If the old style is present, order **P/N 049976 SWITCH TOGGLE DPST DC W/NUT**. The new style switch will have a pair of White & Black leads as opposed to Faston lugs. The leads must be soldered directly to the power supply PCB. This is to comply with safety regulatory agencies (U.L.,C.S.A.).

DO NOT SPLICE THE SWITCH LEADS WITH THE EXISTING JUMPER WIRES.

To gain access to the solder side of the PCB, disconnect the Black wires from CP1 & CP2. Disconnect the wires at the Stand-by switch. This will allow the PCB to be tilted up from the rear.

Remove the old style HIGH/LOW OUTPUT switch & wires. Note the location where the Blue and Brown wires solder to the PCB.

Early revision (A-D) PCB's are silk-screened "TO OUTPUT SWITCH", "BLU" & "BN". Solder the pair of White switch leads to the two points labeled "BLU". Solder the pair of Black switch leads to the two points labeled "BN". Revision "E" PCB's are silk-screened "TO OUTPUT SWITCH", "WHT" & "BLK". White leads to "WHT", Black leads to "BLK". Re-install the PCB. Verify proper switching of the B+ and negative Bias voltages.

WARRANTY CLAIM INSTRUCTIONS:

The above modification should be performed on any '94 Twin Amp requiring service in or out of warranty. For proper labor reimbursement, please indicate the Tech Note Number TN96-3 in the Authorization Code Box (Box # 12) on the Warranty Reimbursement Form. Labor reimbursement = 1 Hour.



TECH NOTES

Fender Musical Instruments Corp.
7975 North Hayden Road Scottsdale, Arizona 85258

TECH NOTE # TN96 - 5

ISSUE DATE: June, 1996

ISSUED BY: C. Colaço

PAGE: 1 of 2

PRODUCT(S) AFFECTED:

'94 TWIN AMP

All units which contain an A, B, C, or D revision PCB. See REQUIRED ACTION.

SYMPTOMS:

Noisy Reverb. At a low setting (2-4) on the reverb control, the reverb appears to sound noisy. The following modification will reduce, but not eliminate the noise.

CONDITION:

The input to the reverb recovery tube (V6A) is susceptible to picking up noise. The reverb noise is most noticeable when the A.C. line voltage is noisy. The noise will transfer to the 6.3 volt Heater secondary of the power transformer, where it can be induced into the reverb recovery circuit. Changing the node at V6 pin 2, from high impedance to low impedance will reduce the circuit's susceptibility to picking up noise.

REQUIRED ACTION:

Determine which revision PCB is in the unit. A, B, C, & D revision PCBs do not contain the modification. An E revision PCB will contain the factory installed mod. The PCB part number and revision level is printed on the underside of the center most PCB near the Orange wire and filter capacitor C40. Another way to identify an E revision PCB is to locate R117 (1.8K), at the far left side of the center most PCB near IC U2. On an E revision PCB, R117 will be a small 1/6 Watt resistor (about half the size of a 1/4 watt resistor). Earlier revisions used a 1/4 watt resistor.

The following modification can be performed on the solder side of the preamp PCB without removing it from the chassis. Refer to the service diagram (revision A or B) to locate Q1 (J111) and R59 (100K). They are located behind relay K3, which is positioned between the Volume (R39) and Mix (R44) controls. **(SEE FIGURE 1)**

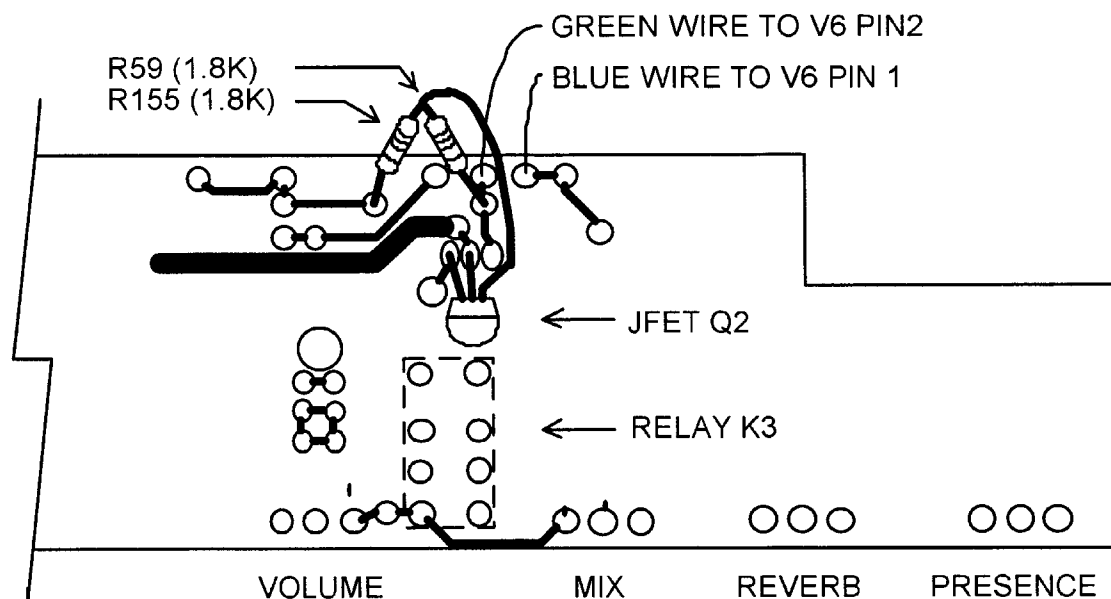
Replace R59 (100K) with two (2) 1.8K, 1/6 watt (P/N 047234001) or 1/4 watt (P/N 024970001) resistors in series. Allow access to the connection between the two resistors as another component will connect there.

Install a 2nd JFET (Q2) P/N 014689, in parallel with Q1. Face the flat side of the JFET towards the rear of the chassis and solder pins 2 & 3 directly to the solder pads of JFET Q1. Pin 1 of Q2 must connect between the two 1.8K resistors. This may require a short piece of light gauge wire. Use shrink tubing if necessary. Reference schematic 047767 / 047768 rev C, zone 4C.

Using the footswitch, verify the reverb on/off function.

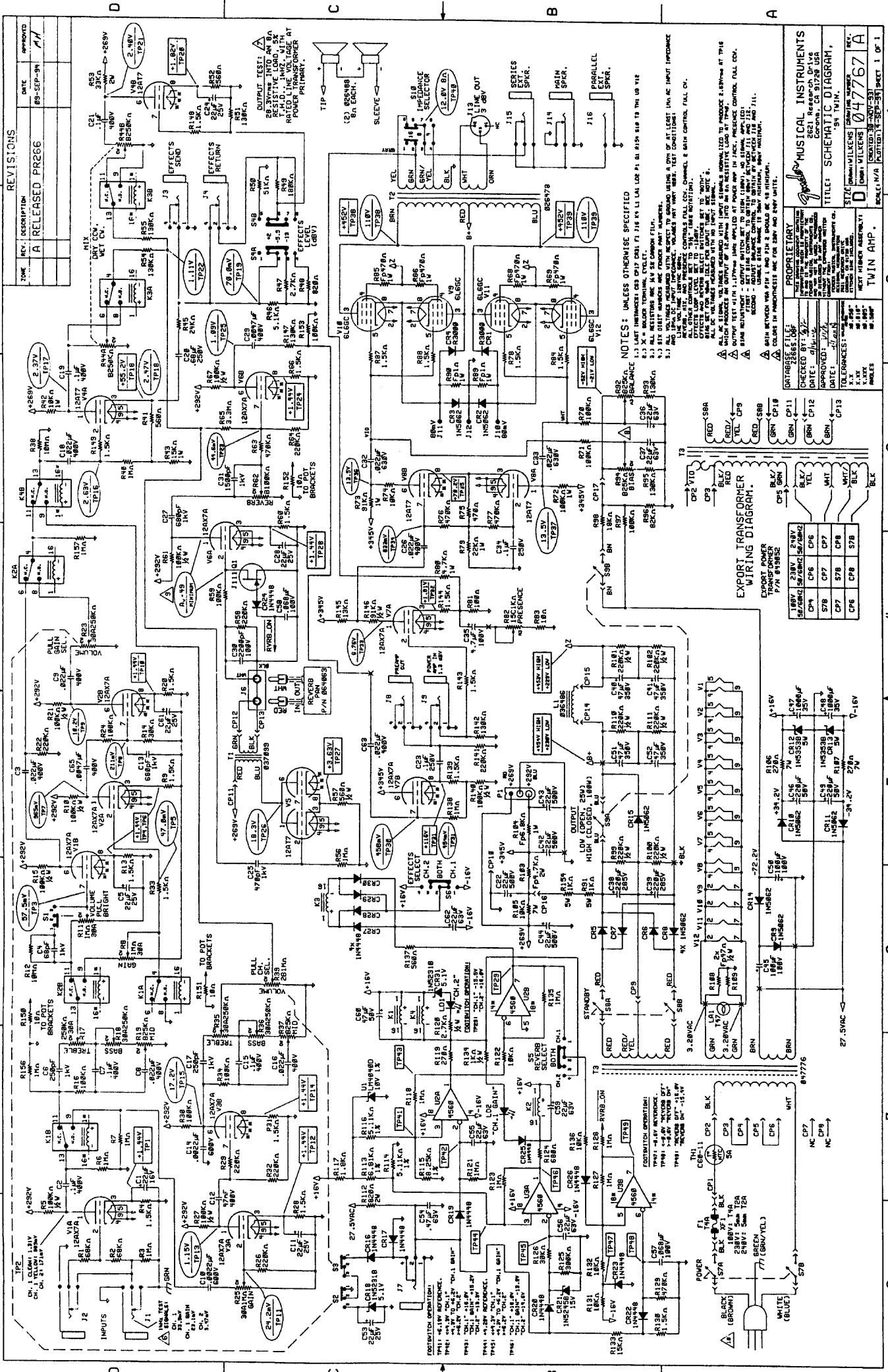
Figure 1 does not show all of the solder pads and traces on the PCB. What is shown will clarify placement of the modification.

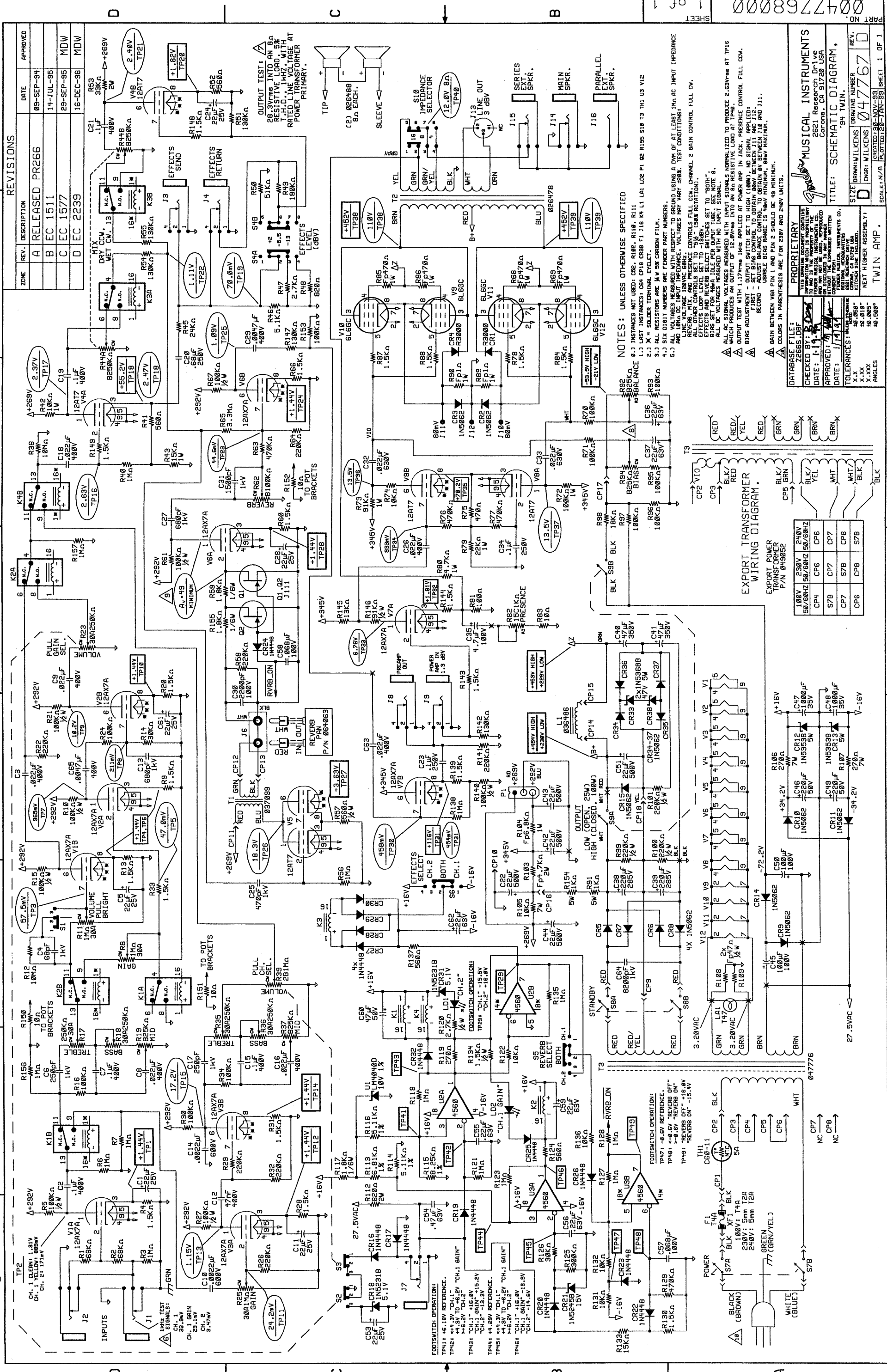
FIGURE 1



WARRANTY CLAIM INSTRUCTIONS:

The above modification should be performed on any '94 Twin Amp requiring service in or out of warranty. For proper labor reimbursement, please indicate the Tech Note Number TN96-5 in the Authorization Code Box (Box # 12) on the Warranty Reimbursement Form. Labor reimbursement = 3/4 Hour.





REVISIONS

ZONE	REV.	DESCRIPTION	DATE	APPROVED
A	RELEASED	PR266	09-SEP-94	
B	EC 1511		14-JUL-95	MDW
C	EC 1577		29-SEP-95	MDW
D	EC 2239		16-DEC-98	MDW

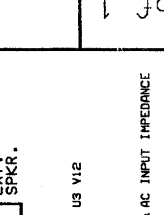
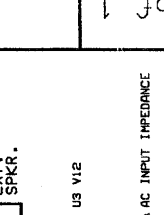
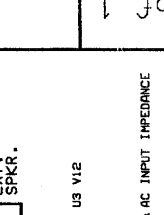
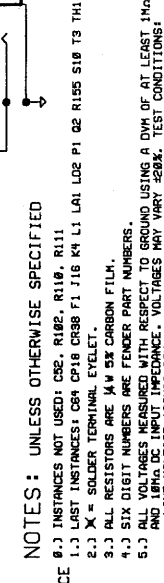
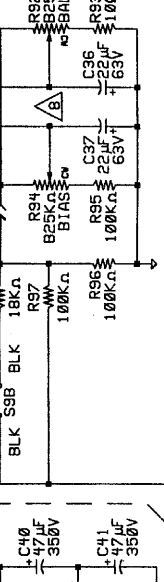
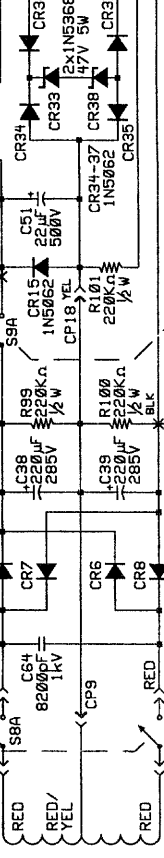
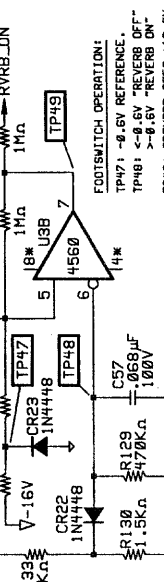
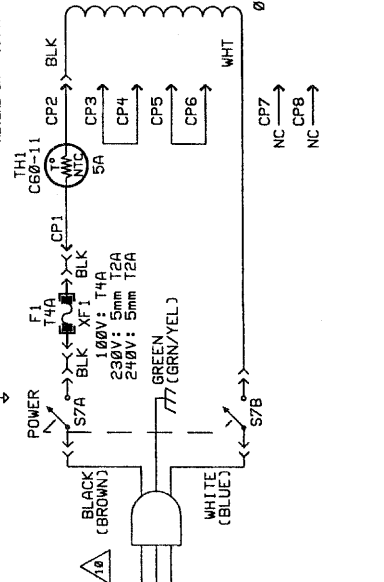
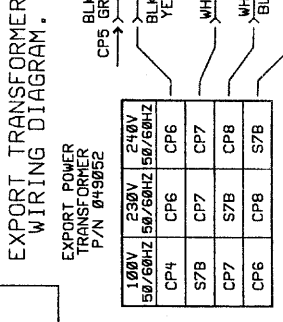
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 Corona, CA 92708
 PHONE: (714) 992-1111
 FAX: (714) 992-1111
 WWW: WWW.SPECTRUMMUSIC.COM

CHECKED BY: [Signature]
 DATE: 1-19-94
 APPROVED: [Signature]
 DATE: 1/19/94

TOLERANCES: X.XX
 X.XXX
 X.XXX
 ANGLES: 30, 45, 90, 120, 150, 180

SIZE: DRAWN: WILKENS
 ENGR: WILKENS
 TITLE: SCHEMATIC DIAGRAM,
 '94 TWIN.
 REV. 047767
 D
 SCALE: N/A
 PLOTTED: 20-JAN-99
 SHEET 1 OF 1

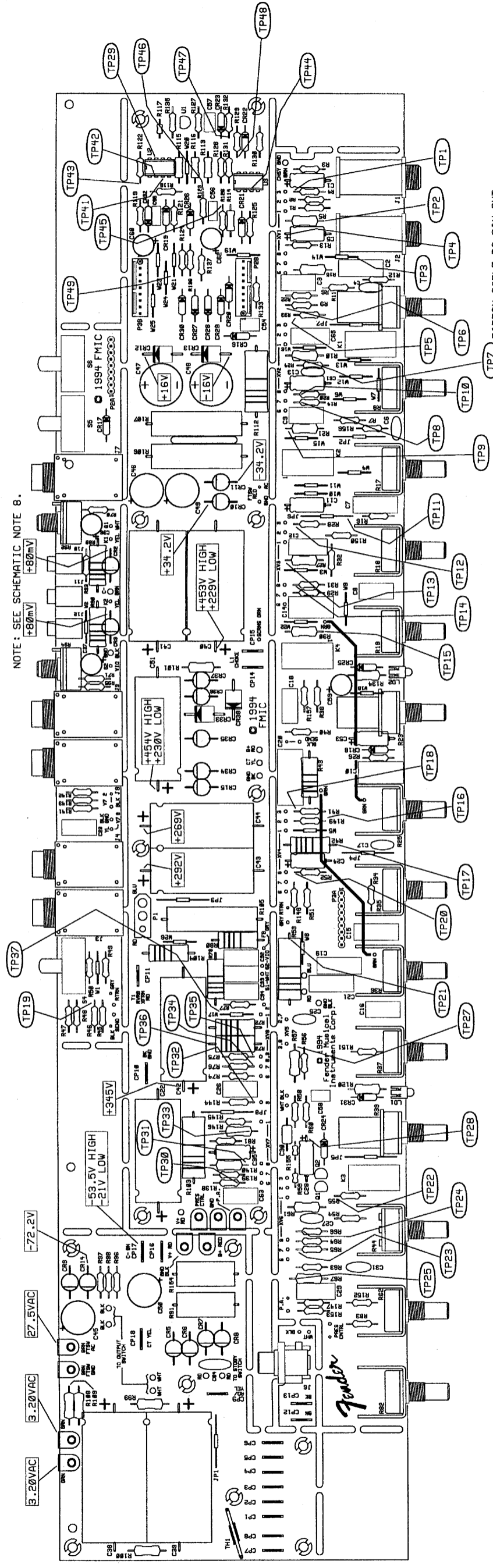
NOTES: UNLESS OTHERWISE SPECIFIED
 0.3 INSTANCES NOT USED: CR2, R102, R110, R111
 1.3 LAST INSTANCES: CR9, CR16, CR38, F1, I16, K4, L4, L02, P1, Q2, R185, S10, T3 THRU US V12
 2.3 X = SOLDER TERMINAL EYELET
 3.3 ALL RESISTORS ARE 1/4 W CARBON FILM.
 4.3 SIX DIGIT NUMBERS ARE FEMER PART NUMBERS.
 5.3 PART NUMBERS IN PARENTHESES ARE FOR 230V AND 240V UNITS.
 LINE VOLTAGE LEVAGE RANGE: VOLTAGES MAY VARY 25%. TEST CONDITIONS:
 REVERB, MIX, AND PRESENCE CONTROLS FULL CCW, CHANNEL 2 GAIN CONTROL FULL CW.
 ALL OTHER CONTROLS SET TO "50% (50% ROTATION)."
 EFFECTS AND REVERB SELECT TO "BOTH".
 BIAS SET FOR 400mA IDLE PER OUTPUT TUBE. SEE NOTE 6.
 ALL AC SIGNAL VOLTAGES MEASURED WITH INPUT SIGNALS NORMALIZED TO PRODUCE 2.65V RMS AT TP16 WHICH PRODUCES AN OUTPUT OF 12.0V RMS INTO AN 8Ω RESISTIVE LOAD AT TP49.
 PRESENCE CONTROL FULL CCW.
 OUTPUT TEST WITH 1.17V RMS 1kHz APPLIED AT POWER AMP IN JACK, PRESENCE CONTROL FULL CW.
 BIAS ADJUSTMENT - OUTPUT SWITCH SET TO HIGH (100V), NO SIGNAL APPLIED!
 FIRST - ADJUST BIAS RANGE CONTROL TO OBTAIN BIAS RANGE BETWEEN 1.0V AND 1.11V.
 SECOND - ADJUST BIAS RANGE IS 100V MINIMUM, 800V MAXIMUM.
 GAIN BIAS IN PARENTHESES ARE FOR 230V AND 240V UNITS.



REVISIONS			
ZONE	REV. DESCRIPTION	DATE	APPROVED
B	EC 1511	14-JUL-95	
C	EC 1577	29-SEP-95	
D	EC 2239	16-DEC-98	

FILM/DWG: SERVICE DIAGRAM
 DATABASE: Z266P.DBF DATE: 20-JAN-99
 LAYERS PLOTTED: 1 2 3 4 10 18

NOTE: SEE SCHEMATIC NOTE 8.



RIBBON CABLE P2 PIN-OUT.

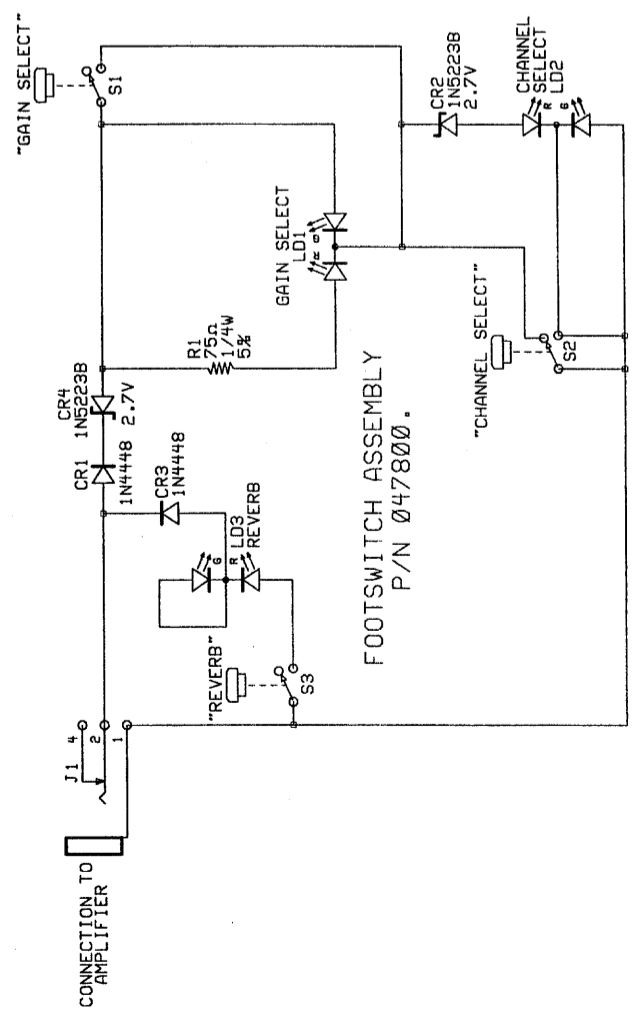
PIN NO.	CONNECTS NODE COMMON TO:
1	R112, C54, CR19 A, CR20 A, R133
2	J7 SHUNT, CR16 A, CR17 K
3	R119, R120, R134, S5 PIN 4, K1 K4 PIN 16, C60 -
4	S5 PIN 2, R136
5	U2B PIN 7, R135, R137, S5 PIN 1
6	+16V SUPPLY TO S6 PIN 4
7	CR28 A, CR29 K, S6 PIN 2
8	-16V SUPPLY TO S6 PIN 1
9	FOOTSWITCH CIRCUITRY GROUND

RIBBON CABLE P3 PIN-OUT.

PIN NO.	CONNECTS NODE COMMON TO:
1	+16V SUPPLY, C59 +, K1 K2 K4 PIN1
2	R124, CR25 A, K2 PIN 16, C59 -
3	FTSW GND, C53 -, CR18 A, S2 PIN 2
4	R128, C58, Q1 GATE
5	R119, R120, R134, S5 PIN 4, K1 K4 PIN 16, C60 -
6	CR27 K, CR28 K, K3 PIN 1
7	+16V SUPPLY, CR31 A
8	CR29 A, CR30 A, K3 PIN 16
9	R124, CR25 A, K2 PIN 16, C59 -

- (TP26) AT XV5 PINS 1&6 (BLUE WIRE).
- (TP38) AT XV10 PIN 3 (BROWN WIRE).
- (TP39) AT XV12 PIN 3 (BLUE WIRE).
- (TP40) AT MAIN SPEAKER JACK TIP (GREEN WIRE).

NOTES:
 1.) PCB SHOWN AS FABRICATED BEFORE BREAKAWAYS ARE PLACED IN CHASSIS.
 2.) WIRES NOT SHOWN FOR CLARITY.



FOOTSWITCH ASSEMBLY
 P/N 047800.

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MUSICAL INSTRUMENTS
 2621 Research Drive
 Corona, CA 91726 USA

TITLE: SERVICE DIAGRAM,
 TWIN AMP.

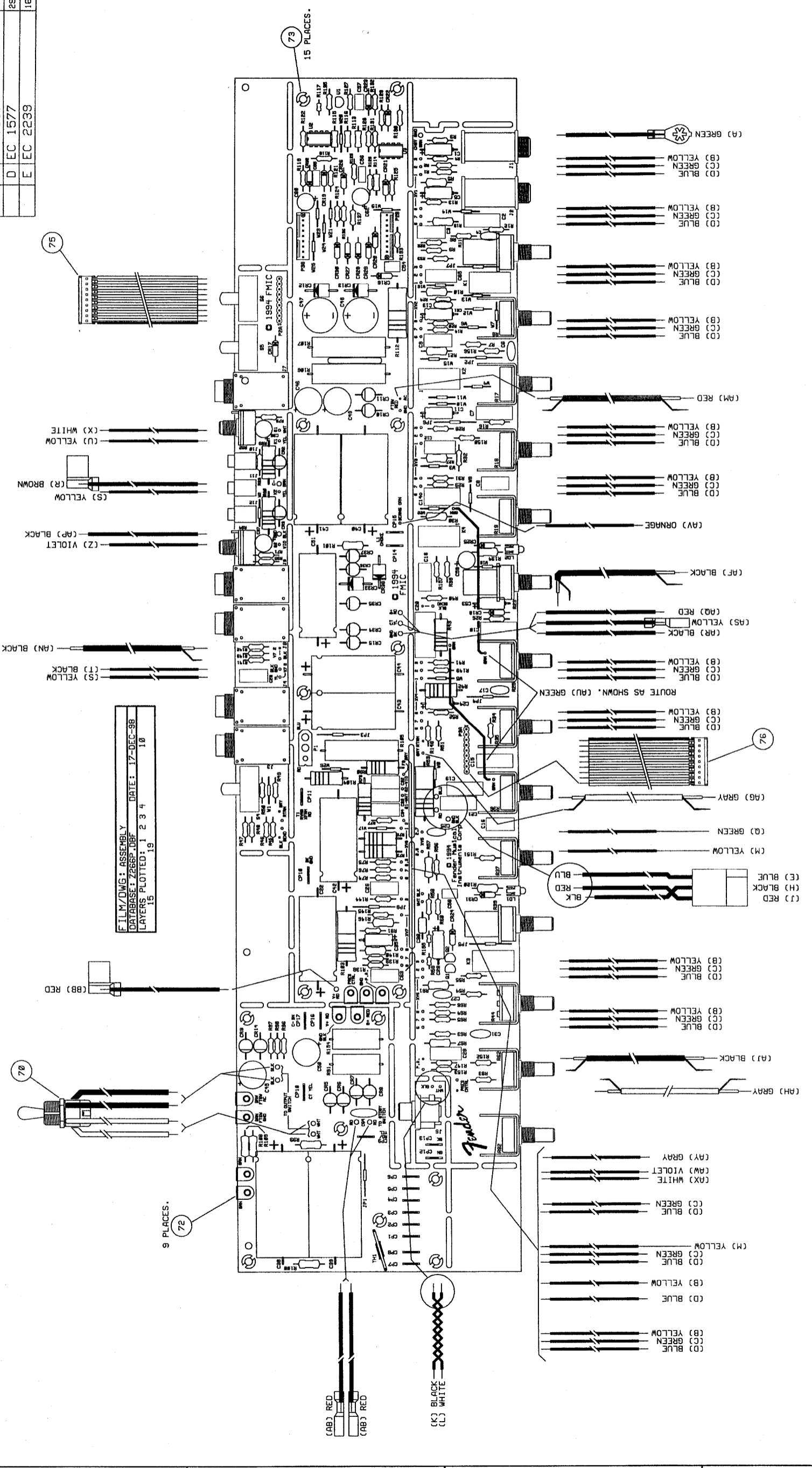
SIZE: DRAWN: WILKENS
 ENGR: WILKENS
 DRAWING NUMBER: 047769
 REV. D

DATE: 13-SEP-94
 CREATED: 13-SEP-94
 NEXT HIGHER ASSEMBLY:
 TWIN AMP.

SCALE: NONE PLOTTED: 20-JAN-99 SHEET 1 OF 1

ZONE	REV. #	DESCRIPTION	DATE	APPROVED
	A	RELEASED PR266	09-SEP-94	
	B	EC 1349	03-DEC-94	
	C	EC 1511	14-JUL-95	
	D	EC 1577	29-SEP-95	MDW
	E	EC 2239	16-DEC-98	MDW

REV. #	DESCRIPTION	DATE	APPROVED
1	RELEASED PR266	09-SEP-94	
2	EC 1349	03-DEC-94	
3	EC 1511	14-JUL-95	
4	EC 1577	29-SEP-95	MDW
5	EC 2239	16-DEC-98	MDW



FILM/DWG: ASSEMBLY
 DATABASE: Z266P.DBF DATE: 17-DEC-98
 LAYERS PLOTTED: 1 2 3 4 10
 19

- (A) GREEN
- (B) YELLOW
- (C) BLUE
- (C) GREEN
- (D) BLUE
- (E) YELLOW
- (F) BLACK
- (G) GRAY
- (H) RED
- (I) BLACK
- (J) BLUE
- (K) BLACK
- (L) WHITE
- (M) YELLOW
- (N) BLUE
- (O) GREEN
- (P) YELLOW
- (Q) BLUE
- (R) BLACK
- (S) YELLOW
- (T) BLACK
- (U) YELLOW
- (V) VIOLET
- (W) BLACK
- (X) WHITE
- (Y) YELLOW
- (Z) BROWN

- NOTES:
- LETTER AT WIRE DESIGNATES ITEM LETTER ON PCB WIRE SET P/N 049080.
 - WIRES SHOWN WITH X-POSITION IN LINE WITH RESPECTIVE HOLES UNLESS SHOWN OTHERWISE.
 - ADHERE C22, C38, C39, C40, C41, C42, C43, C51, C59, C60, C62, C44, R105, R106, R107 TO PCB WITH RTV SILICON RUBBER COMPOUND.
 - INSTANCES NOT USED: C52 R102 R110 R111

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 2621 Research Drive
 Corona, CA 91720 USA

TITLE: ASSEMBLY DIAGRAM, TWIN AMP, '94 TWIN.

SIZE: DRAWN: WILKENS | DRAWING NUMBER: 047771
 ENGR: WILKENS | REV: E

DATE: 17-DEC-98 | CREATED: 17-DEC-98 | SHEET 1 OF 4

SCALE: 1:1 | PLOTTED: 17-DEC-98

TOLERANCES: X.X
 X.XX
 X.XXX
 ANGLES: 45, 90, 135, 225, 315

1

2

3

4

5

6

7

8

A

B

C

D

D

C

B

A