

SERVICE MANUAL

PRICE \$1.00

TX-420
SERIAL NUMBERS
BEGINNING 10001

The Fisher® TX-420



Stereo To Four-Channel Converter

WORLD LEADER IN HIGH QUALITY STEREO

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CAUTION:

This precision high-fidelity instrument should be serviced only by qualified personnel, trained in the repair of transistor equipment and printed circuitry.

Many of these items are included only as a reminder — they are normal procedures for experienced technicians. Shortcuts may be taken, but these often cause additional damage to transistors, circuit components, or printed circuit boards.

SOLDERING: A well-tinned, hot, clean soldering iron tip will make soldering easier, without causing damage to the printed circuit board or the components mounted on it. Regular use of a sponge cleaner will maintain a clean soldering surface. The heat available at the tip, (not the wattage of the iron) is important. Some 50-watt irons reach temperatures of 1,000° F, while others will hardly melt solder. Small-diameter tips should be used for single solder connections, pyramid and chisel tips for large areas.

Always disconnect the AC power cord from the line when soldering. Turning the power switch OFF is not sufficient. Power-line leakage paths, through the heating elements of the iron, may destroy transistors.

PARTS REMOVAL: If a part is not being returned for in-warranty factory replacement, it may be cut in half (with diagonal cutting pliers) to make removal easier. Multiple terminal parts, such as IF transformers, or electrolytic capacitors, should be removed using special de-soldering tips made especially for this purpose. Removing solder from terminals, reduces the possibility of breaking the printed circuit board when the part is removed.

ACCIDENTAL SHORTS: A clean working area, free of metal particles, screws, etc., is an important preventive in avoiding servicing problems. Screws, removed from the chassis during servicing, should be stored in a box until needed. While a set is operating, it takes only an instant for a base-to-collector short to destroy a transistor (and others direct-coupled to it). In the time it takes for a dropped screw, washer, or screwdriver, to contact a pair of terminals (or terminal and chassis), a transistor can be ruined.

SOLID-STATE DEVICES: Integrated Circuits contain the equivalent of many circuit parts, including transistors, diodes, resistors, and capacitors. The preferred troubleshooting procedure requires isolating the trouble to one stage using AC signal tracing methods. Once the suspected stage is located the DC voltages at the input and output leads are measured to give an accurate indication of the operating conditions of the IC. DO NOT use an ohmmeter, to check continuity with the IC mounted on the printed circuit board. Forward biasing the internal junctions within the IC may burn out the transistors. Do not replace a defective IC until all external resistors, capacitors, and transformers are checked first, to prevent the replacement IC from failing immediately due to a defect in the connecting components. Solder and unsolder each lead separately using a pliers or other heat sink on the lead to

prevent damage from excessive heat. Check that the leads are connected to the correct locations on the printed circuit board before turning the set on.

Whenever possible, a transistor tester should be used to determine the condition of a transistor or diode. Ohmmeter checks do not provide conclusive data, and many even destroy the junction(s) within the device.

Never attempt to repair a transistor power amplifier module until the power supply filter-capacitors are fully discharged.

If an output or driver transistor becomes defective (opens or shorts), always check ALL direct-coupled transistors and diodes in that channel. In addition, check the bias pot., and other parts in the bias network, before installing replacement transistors. All output and driver transistors in one channel may be destroyed if the bias network is defective. After parts replacement, check bias for specified idling current.

In some applications, replacement of transistors must be made from the same beta group as the original type. The beta group is indicated by a colored marking on the transistor. Include this information when ordering replacements.

When mounting a replacement power transistor, be sure the bottom of the flange, mica insulator, and the surface of the heat sink, are free of foreign matter. Dust and grit will prevent flat contact, reducing heat transfer to the heat sink. Metallic particles can puncture the insulator, cause a short, and destroy the transistor.

Silicone grease must be used between the transistor and the mica insulator and between the mica and the heat sink for best heat transfer. Use Dow-Corning DC-3, or an equivalent compound made for power transistor heat conduction.

Use care when making connections to speakers and output terminals. To reduce the possibility of shorts, lugs should be used on the exposed ends, or stranded wire should be tinned to prevent frayed wire ends. Current in the speakers and output circuitry is quite high — poor contacts, or small wire, can cause significant power losses. For wire lengths greater than 30 feet, 16 AWG, or heavier, should be used.

VOLTAGE MEASUREMENTS: All voltages are measured with the line voltage adjusted to 120 volts. All measured voltages are $\pm 20\%$. DC voltages are measured to chassis with a VTVM, with no signal input unless otherwise noted. AC signal voltages are measured under the conditions specified on the schematic.

ALIGNMENT PROCEDURES: DO NOT attempt realignment unless the required test equipment is available, and the alignment procedure is thoroughly understood.

The following equipment is required to completely test and adjust the Converter:

- Line Voltage Autotransformer or Voltage Regulator
- DC Vacuum Tube Voltohmmeter
- Accurately Calibrated AC Vacuum Tube Voltmeter
- Oscilloscope (Flat to 100 kHz Minimum)
- Low-Distortion Audio (Sine Wave) Generator
- Harmonic Distortion Analyzer
- 2 —Load Resistors, 8-Ohms, 100 Watt (Minimum Rating)
- Test Cartridges — 2 and 4 Channel
- Soldering iron with Small Tip, Fully Insulated from AC Line
- Suction Desoldering Tool

REMOVING DRESS PANEL AND DOOR

- (1) Remove screws securing chassis in cabinet and remove chassis.
- (2) Gently pull VOLUME, BALANCE, BASS, and TREBLE knobs from their shafts. Remove the plastic bushings from the shafts.
- (3) Remove the four screws securing dress panel to chassis (two from top and two from bottom of chassis).
- (4) Remove CARTRIDGE lamp assembly from the rear of dress panel and door assembly.
- (5) Reverse the procedure for reassembly.

REPLACING CARTRIDGE LAMPS

- (1) Remove dress panel and door assembly for access to the CARTRIDGE lamps.
- (2) Remove CARTRIDGE lamp assembly from the rear of dress panel and door assembly.
- (3) To replace the CARTRIDGE lamp assembly, label and disconnect lamp wires from pins on the power supply board.
- (4) To replace an individual lamp, carefully remove the

lamp through the front of lamp housing (push lamp wires through the housing from the rear) and solder in a new lamp.
(5) Reverse the procedure for reassembly.

REMOVING PC BOARDS

To remove boards, disconnect leads and remove screws securing the board to its mounts, or remove the board from its support mounting clip. Label all wires for reference. Points to note are as follows: The power amplifier module heat sinks are secured to the rear skirt of the chassis with four screws. These must be removed to remove the module. The control amplifier board is secured to the chassis front panel with three screws and is removed through the top of the chassis.

PUSHBUTTON SWITCH ASSEMBLIES

Remove the dress panel and door for access to switch assemblies for removal. The switch assemblies are secured with two screws to the chassis front skirt.

PLEASE READ CAREFULLY: The parts lists on this and following pages do not include shipping charges. Please include the serial number of the Fisher equipment for which the part(s) are intended. Send your order to:

PARTS DEPARTMENT, FISHER RADIO, 11-40 45th Road, Long Island City, N. Y. 11101.

MAIN CHASSIS

Symbol	Description	Part No.	Sug. Ret.	Symbol	Description	Part No.	Sug. Ret.
--	Bushing, Control Shaft	EA51374-1	.35	--	Lamp, 28V, 40 mA	LM21436-3	.60
--	Cabinet	KK4078-130	25.70	--	Line Cord	W50023-1	1.25
--	Cartridge Player Deck	TP21357	111.85	--	PCB Preamplifier/Power Supply	PB2281-1	33.40
--	Dress Panel and Door Assembly	AS4078-126	18.70	--	PCB 2+2 Channel Decoder	PB2289-2	16.55
--	Speed Nut	H21A715-9	.35	--	PCB Control Amplifier	PB2095-7	32.45
--	Insert, Upper	AD23039	2.45	--	PM Power Amplifier Module	PM2119-1	62.30
--	Insert, Lower	AD23040	1.40	--	PCB Pre-Driver/Driver	PB2225-5	49.25
--	Nameplate '420'	NP22641-3	.90	--	*Switch, Fused Voltage Selector	SR51304-1	1.90
--	Escutcheon	EA51361	3.40	--	Transformer, Power	TD4078-115	14.50
--	Door, Tape Cartridge	AD51349	2.45	--	*Transformer, Power	TE4078-215	30.25
--	Retainer Clip (door)	HH21750-2	.35	C284	Ceramic, 3900 pF, 10%, 500V	C51B189-17	.40
--	Rod, Door Hinge	AN51350	.55	F1	Fuse, Slo-Blo, 1.25A, 125V	FL51313-1	.65
--	Spring, Torsion (door)	AN51351	.30	*F1	Fuse, Slo-Blo, 1.25A, 250V	F51B247-16	.60
--	Lens, Red	EA21425-1	.30	*F1	Fuse, Slo-Blo, 710mA, 250V	F51B247-12	.60
--	Push Nut (lens retainer)	HN21781-1	.25	R294, 295	Composition, 27K, 5%, 1/4W	RC07BF273J	.45
--	Fuse Holder	EA51366	1.60	S3, 4, 5	Switch, Input Source Selector (3-switch assembly)	SP50200-54	3.20
--	Jack Strip, Input-Output (6 jacks)	JK20611-3	1.65	S6, 7	Switch, 2+2 Decoder, Classical-Popular (2-switch assembly)	SP50200-55	3.20
--	Jack, Phones	JK20627-5	1.10	S8, 9	Switch, Repeat-Consec, Change (2-switch assembly)	SP50200-51	2.65
--	Knob:						
	Bass, Treble, Volume,	EK20036	.50				
	Balance						
--	Pushbutton	EK20021-3	.50				
--	Lamp Assembly, Cartridge (6 lamps)	AS21431-1	12.00				

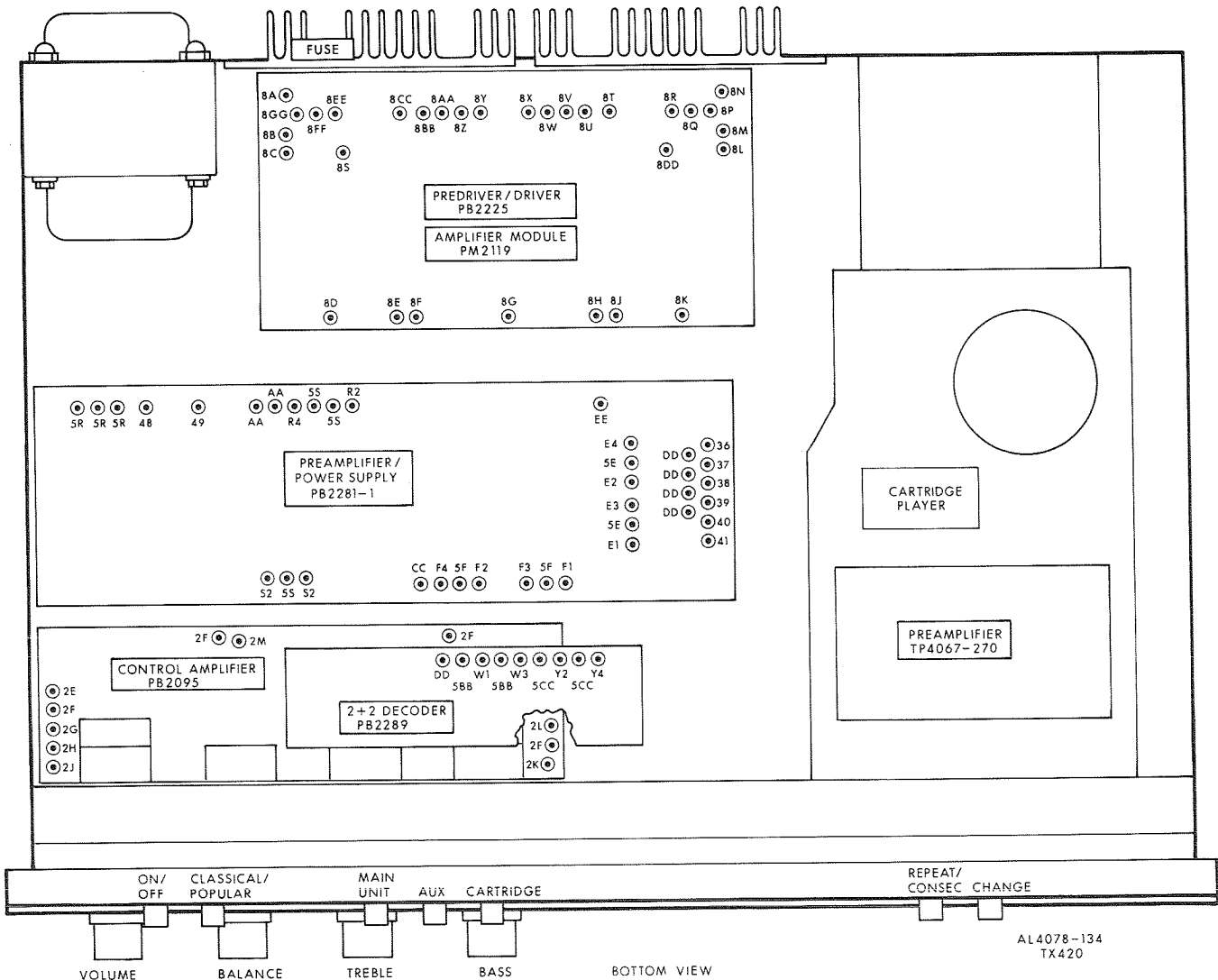
BECAUSE ITS PRODUCTS ARE SUBJECT TO CONTINUOUS IMPROVEMENT, FISHER RADIO RESERVES THE RIGHT TO MODIFY ANY DESIGN OR SPECIFICATION WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION.

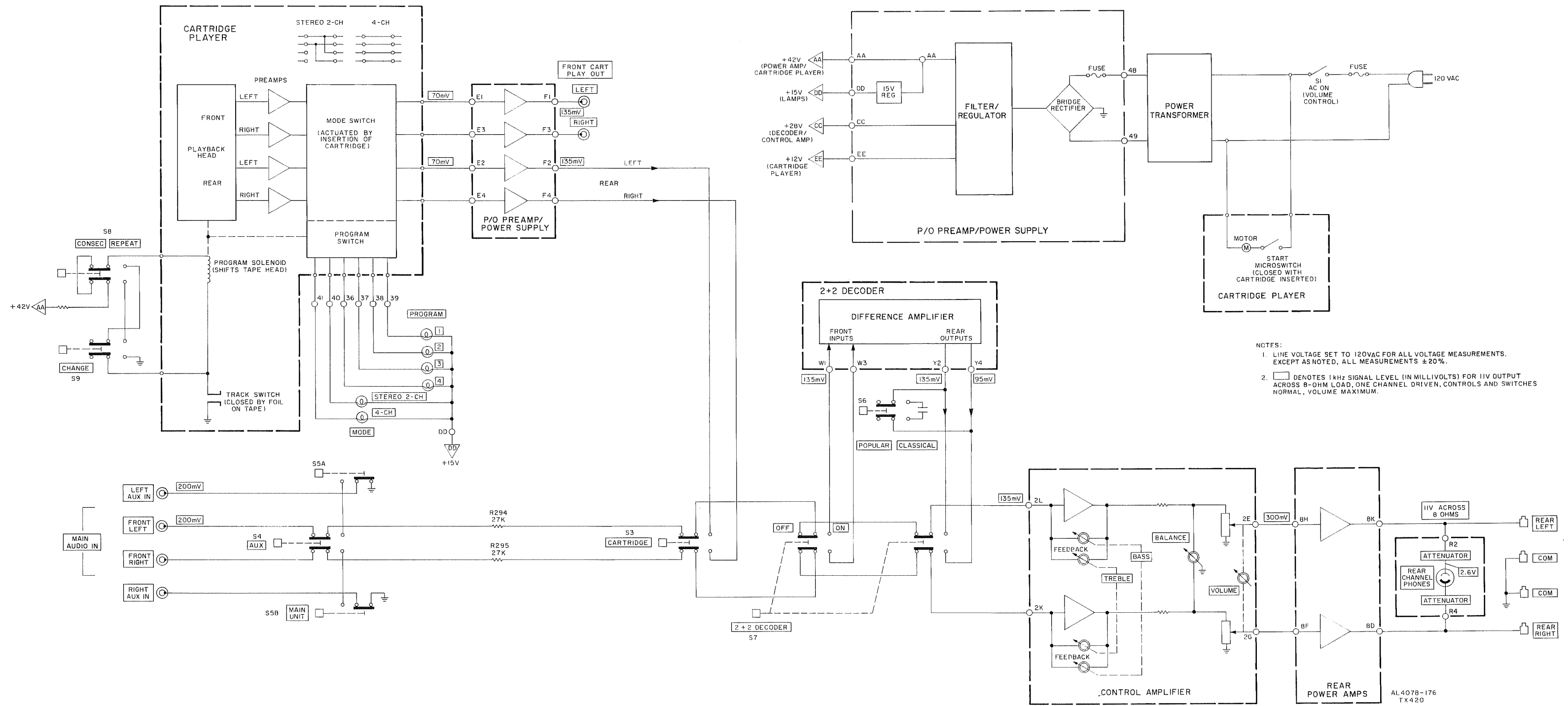
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

CAUTION:

- (A) Test one channel at a time.
- (B) Limit tests to 10 minutes.
- (C) Use a load with a minimum power rating of 100 watts.

- (1) Unplug AC power cord. Depress AUX pushbutton and release all others. Set VOLUME control to minimum and set BASS, TREBLE, and BALANCE to their center positions.
- (2) Connect a low-distortion sine-wave generator to the LEFT AUX IN jack. Set the generator frequency to 1 kHz, and the output level to minimum.
- (3) Connect an 8-ohm load resistor between REAR LEFT and COMMON speaker terminals. Connect a harmonic distortion analyzer across the load.
- (4) Connect AC power cord and set VOLUME at maximum.
- (5) Increase generator output for 12 watts RMS (9.7V across 8-ohm load). HD meter should indicate 1% or less.
- (6) Repeat preceding steps for REAR RIGHT channel.



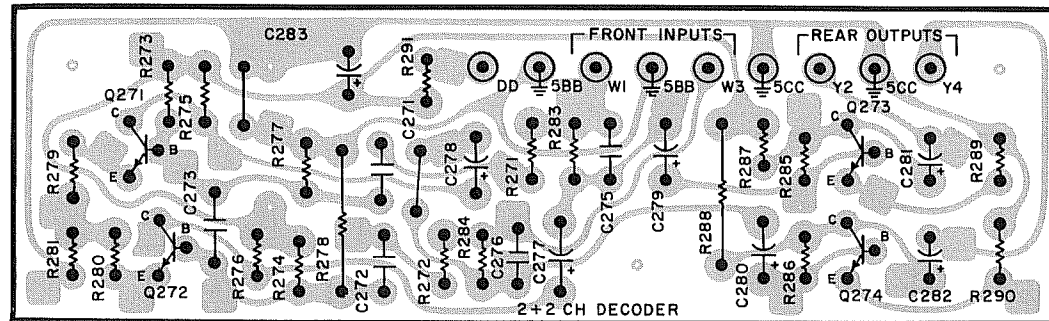


2+2 CH DECODER PB2289-2

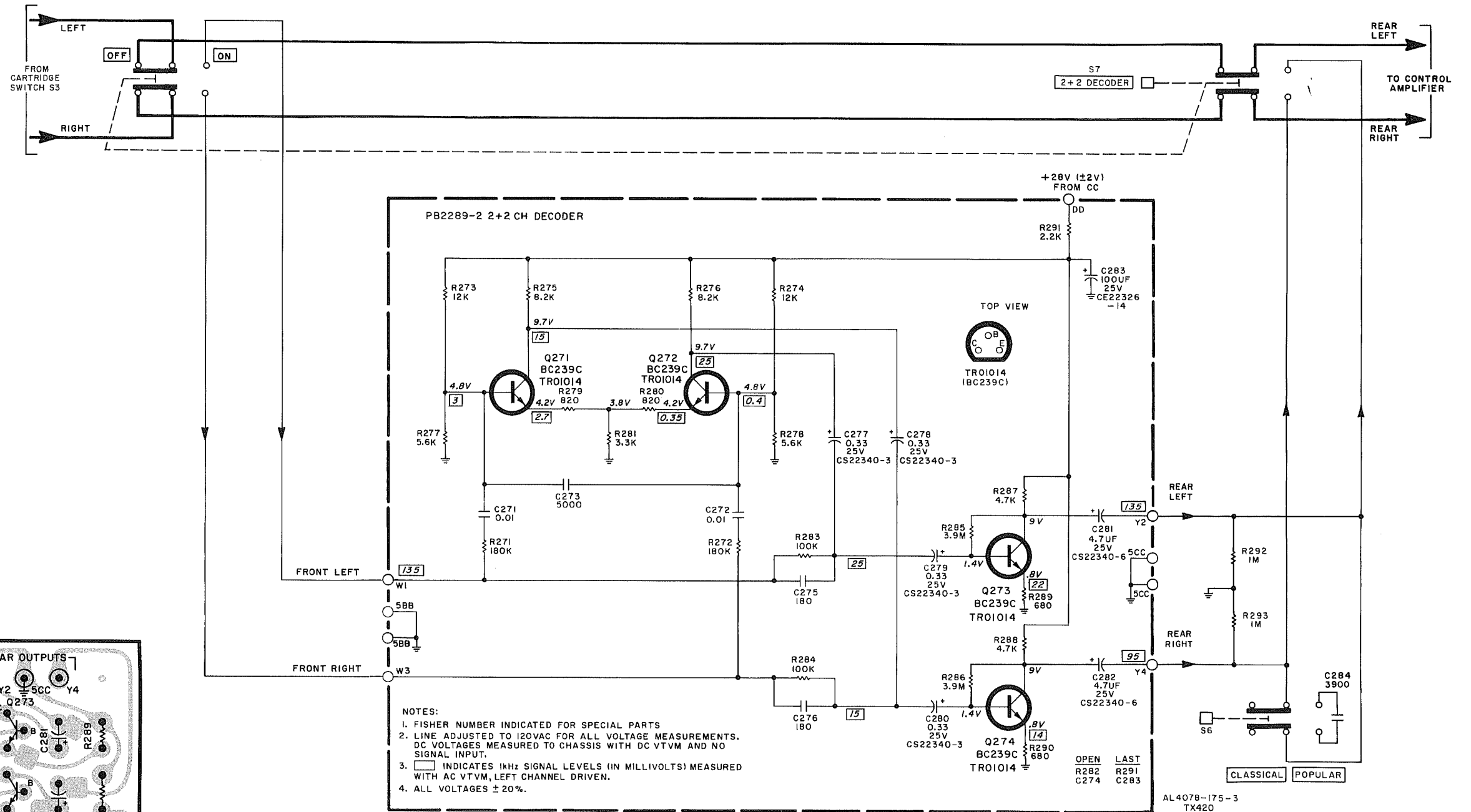
Symbol	Description	Part No.	Sug. Ret.
C271, 272	Mylar, 0.01uF, 5%, 100V	C50B574-1	.45
C273	Ceramic, 5000pF, 20%, 500V	C50B567-2	.30
C275, 276	Ceramic, 180pF, 10%, 500V	C50B651-14	.50
C277, 278	Sintered Alum., 0.33uF, 20% 25V	CS22340-3	.50
C279, 280	Sintered Alum., 0.33uF, 20% 25V	CS22340-6	.70
C283	Electrolytic, 100uF, 25V	CE22326-1A	.40
Q271, 272, 273, 274	Transistor BC239C	TR01014	.50
R271, 272	Composition, 180K, 5%, 1/4W	RC07BF184J	.30
R273, 274	Composition, 12K, 5%, 1/8W	R12DC123J	.30
R275, 276	Composition, 8.2K, 5%, 1/4W	RC07BF822J	.30
R277, 278	Composition, 5.6K, 5%, 1/8W	R12DC562J	.30
R279, 280	Composition, 820, 5%, 1/4W	RC07BF821J	.30
R281	Composition, 3.3K, 5%, 1/4W	RC07BF332J	.30
R283, 284	Composition, 100K, 5%, 1/4W	RC07BF104J	.30
R285, 286	Composition, 3.9M, 5%, 1/4W	RC07BF395J	.30
R287, 288	Composition, 4.7K, 5%, 1/4W	RC07BF472J	.30
R289, 290	Composition, 680, 5%, 1/4W	RC07BF681J	.30
R291	Composition, 2.2K, 5%, 1/4W	RC07BF222J	.30

MISCELLANEOUS

Symbol	Description	Part No.	Sug. Ret.
C284	Ceramic, 3900 pF, 10%, 500V	C51B189-17	.40
R292, 293	Deposited Carbon, 1M, 5%, 1/3W	R33DC105J	.30
S6, 7	Switch, Classical-Popular, 2+2 Decoder (2 switch Assembly)	SP50200-55	3.20



AL2289-III

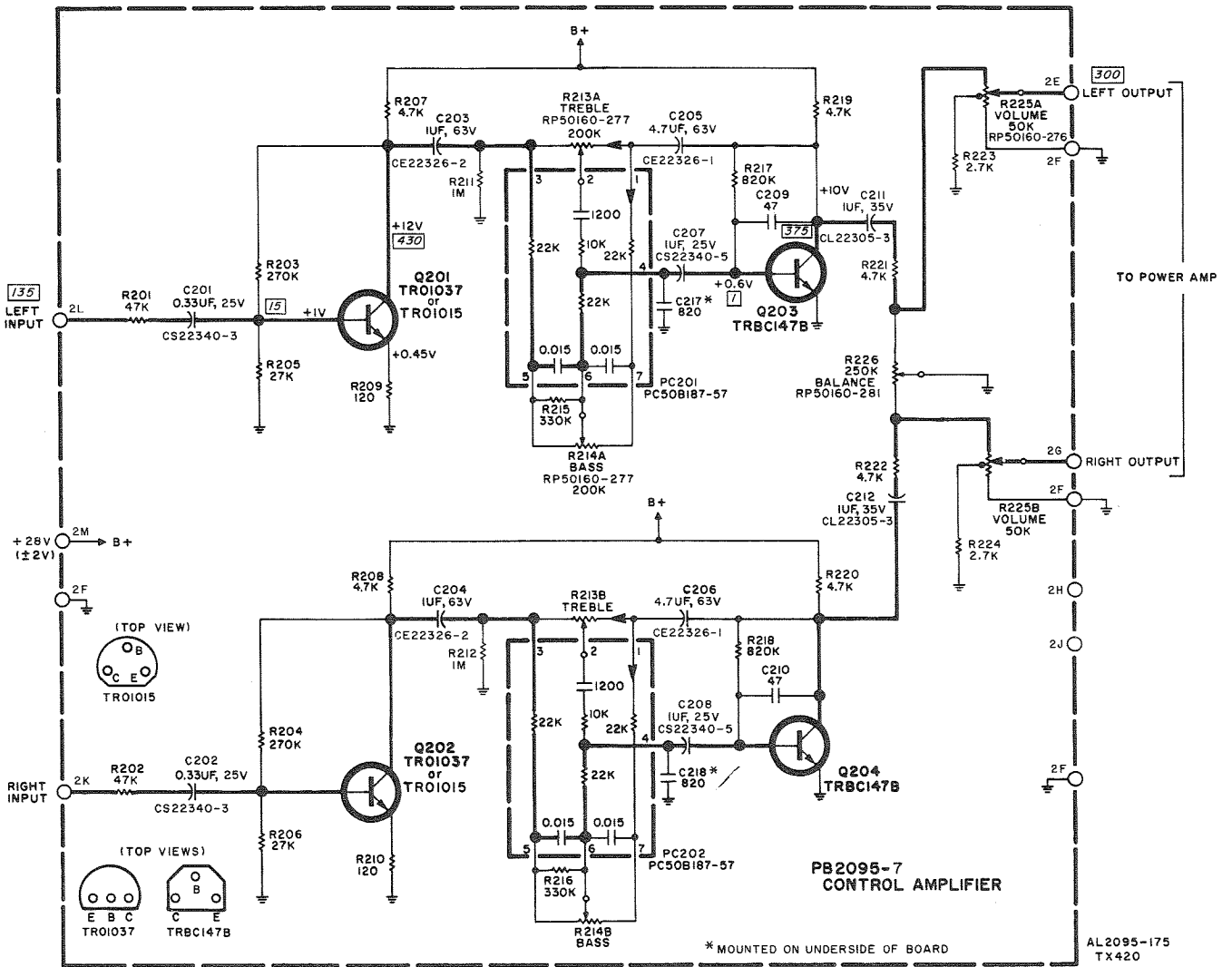


- NOTES:
1. FISHER NUMBER INDICATED FOR SPECIAL PARTS
 2. LINE ADJUSTED TO 120VAC FOR ALL VOLTAGE MEASUREMENTS. DC VOLTAGES MEASURED TO CHASSIS WITH DC VTVM AND NO SIGNAL INPUT.
 3. [Symbol] INDICATES 1kHz SIGNAL LEVELS (IN MILLIVOLTS) MEASURED WITH AC VTVM, LEFT CHANNEL DRIVEN.
 4. ALL VOLTAGES ± 20%.

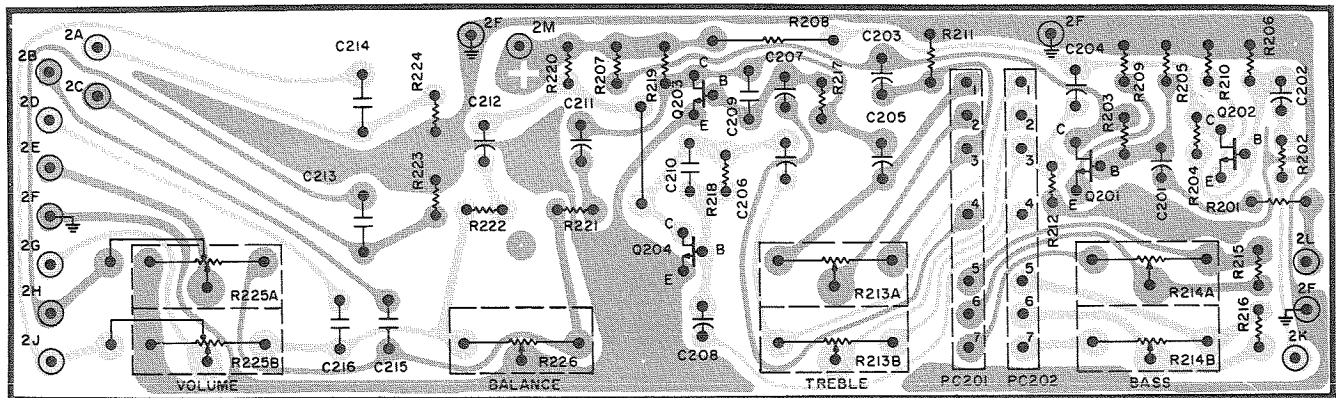
Symbol	Description	Part No.	Sug. Ret.
C201, 202	Sintered Alum., 0.33 uF, 25V	CS22340-3	.45
C203, 204	Electrolytic, 1 uF, 63V	CE22326-2	.35
C205, 206	Electrolytic, 4.7 uF, 63V	CE22326-1	.35
C207, 208	Sintered Alum., 1 uF, 25V	CS22340-5	.45
C209, 210	Ceramic, 47 pF, 10%, 500V, N330	C50B652-19	.30
C211, 212	Tantalum, 1.0 uF, 20%, 35V	CL22305-3	.80
C217, 218	Ceramic, 820 pF, 10%, 500V	C51B189-6	.35
PC201, 202	Encapsulated Tone Control Network	PC50B187-57	1.60
Q201, 202	Transistor, NPN (BC414C)	TR01037 or TR01015	1.00
Q203, 204	Transistor, NPN	TRBC147B	.60
R201, 202	47K	R33DC473J	.30
R203, 204	270K	R33DC274J	.30

Symbol	Description	Part No.	Sug. Ret.
R205, 206	27K	R33DC273J	.30
R207, 208, 219, 220, 221, 222	4.7K	R33DC472J	.30
R209, 210	120	R33DC121J	.30
R211, 212	1M	R33DC105J	.30
R213A, B	Potentiometer, Dual-Bass, 214A, B	RP50160-277	2.10
R215, 216	330K	R33DC334J	.30
R217, 218	820K	R33DC824J	.30
R223, 224	2.7K	R33DC272J	.30
R225A, B	Potentiometer, Dual Volume, 50K (with switch)	RP50160-276	4.00
R226	Potentiometer, Balance, 250K	RP50160-281	1.75

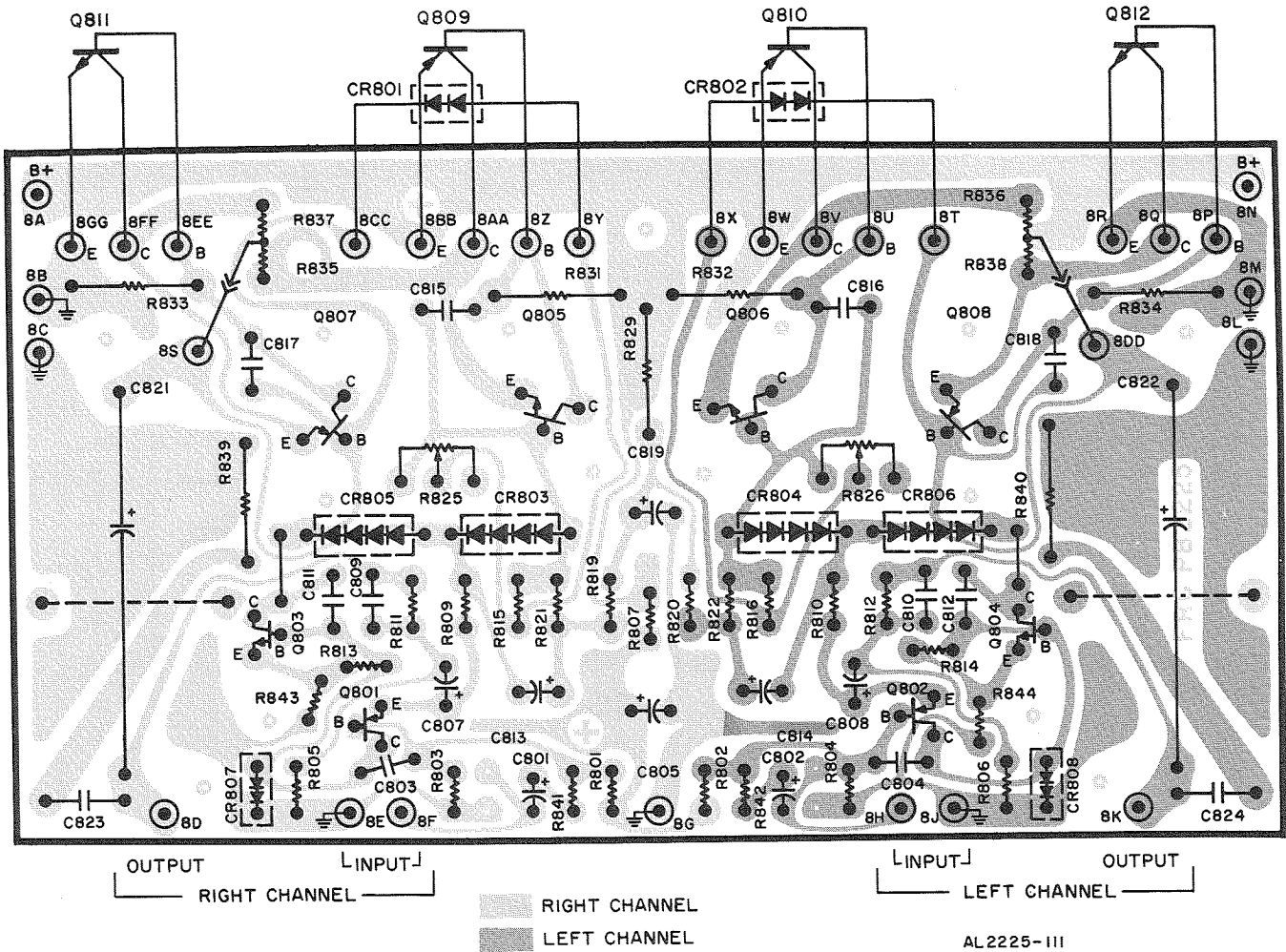
Unless otherwise noted, all resistors are carbon film in ohms, 5%, 1/3 Watt
K = Kilohm, M = Megohm



- NOTES:
1. LINE ADJUSTED FOR 120VAC FOR ALL VOLTAGE MEASUREMENTS. DC VOLTAGES MEASURED WITH DC VTVM TO CHASSIS WITH NO INPUT SIGNAL.
 2. □ DENOTES 1kHz SIGNALS (IN MILIVOLTS) MEASURED WITH AC VTVM ONE CHANNEL DRIVEN.
 3. EXCEPT AS NOTED ALL VOLTAGES ±20%.



- RIGHT CHANNEL
- LEFT CHANNEL



CENTER VOLTAGE TEST

Set VOLUME control to minimum. Warm-up unit about 10 minutes. Set line voltage to 120 VAC.

Connect common lead of DC VTVM to chassis ground. Connect probe to pin 8S (right channel) and 8DD (left channel). Meter should indicate 21V ($\pm 3V$ at each pin.) See illustration.

IDLING CURRENT ADJUSTMENT

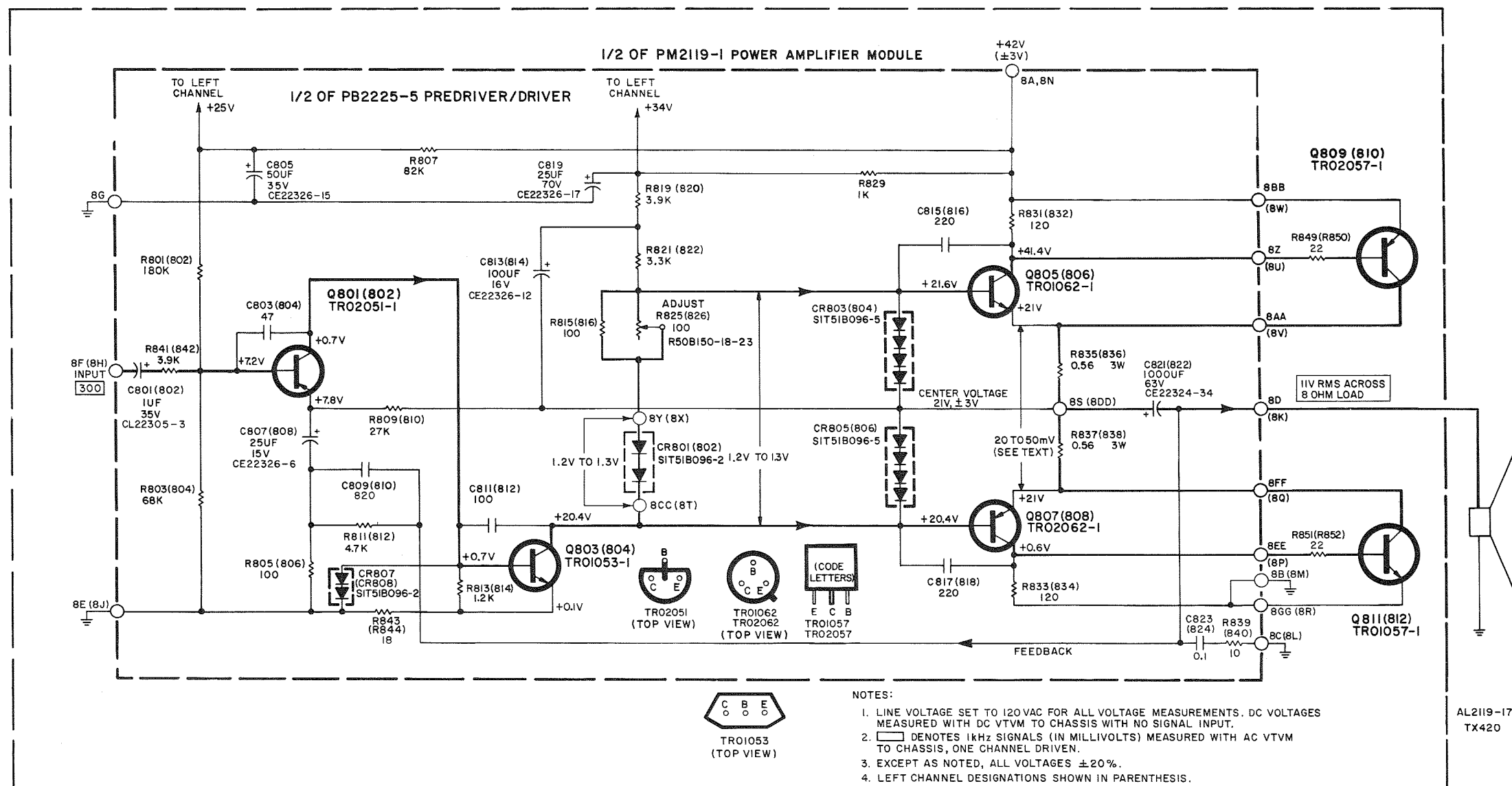
Set VOLUME control to minimum. Warm-up unit about 10 minutes. Set line voltage to 120 VAC.

RIGHT AMPLIFIER

Connect common lead of DC VTVM to pin 8FF (collector of Q811) and probe to pin 8AA (collector of Q809). See illustration. Set IDLING ADJUST R825 for indication of 20 to 50 mV.

LEFT AMPLIFIER

Connect DC VTVM between pins 8Q and 8V and adjust R826 for indication of 20 to 50 mV.



POWER AMPLIFIER MODULE PM2119-1
PREDRIVER/DRIVER PB2225-5

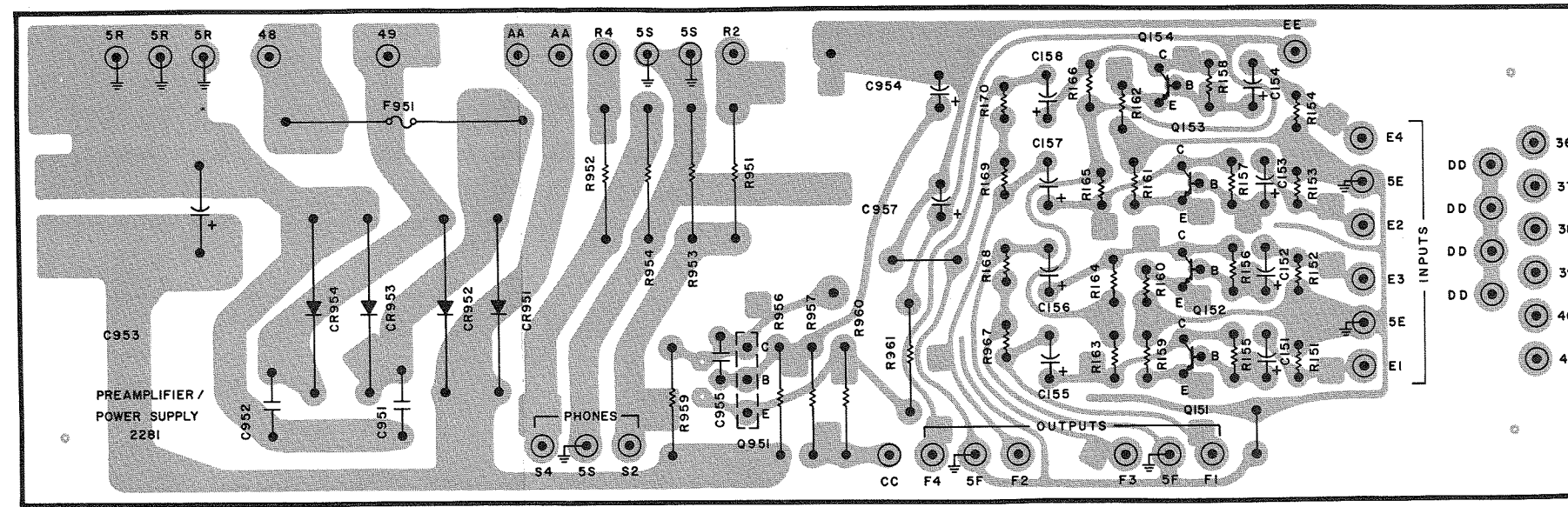
Symbol	Description	Part No.	Sug. Ret.
C801, 802	Tantalum, 1 uF, 35V	CL22305-3	.80
C803, 804	Ceramic, 47 pF, 10%, 500V, N330	C50B652-19	.30
C805	Electrolytic, 50 uF, 35V	CE22326-15	.40
C807, 808	Electrolytic, 25 uF, 35V	CE22326-6	.40
C809, 810	Ceramic, 820 pF, 10%, 500V	C50B651-6	.30
C811, 812	Ceramic, 100 pF, 10%, 500V	C50B651-19	.30
C813, 814	Electrolytic, 100 uF, 16V	CE22326-12	.40
C815, 816, 817, 818	Ceramic, 220 pF, 10%, 500V	C50B651-15	.30
C819	Electrolytic, 25 uF, 70V	CE22326-17	.40
C821, 822	Electrolytic, 1000 uF, 63V	CE22324-34	2.05
C823, 824	Ceramic, 0.1 uF, 35%, 100V	C51163-1	.80
CR801, 802	Silicon Stabistor	SIT51B096-2	.75
CR803, 804	Silicon Stabistor	SIT51B096-5	.95
Q801, 802	Transistor, PNP	TR02051-1	.75
Q803, 804	Transistor, NPN	TR01053-1	1.45

Symbol	Description	Part No.	Sug. Ret.
Q805, 806	Transistor, NPN	TR01062-1	1.90
Q807, 808	Transistor, PNP	TR02062-1	2.00
Q809, 810	Transistor, PNP	TR02057-1	3.00
Q811, 812	Transistor, NPN	TR01057-1	2.75
R801, 802	180K	R33DC184J	.30
R803, 804	68K	R33DC683J	.30
R805, 806, 815, 816	100	R33DC101J	.30
R807	82K	R33DC823J	.30
R809, 810	27K	R33DC273J	.30
R811, 812	4.7K	R33DC472J	.30
R813, 814	1.2K	R33DC122J	.30
R819, 820, 841, 842	3.9K	R33DC392J	.30
R821, 822	3.3K	R33DC332J	.30
R825, 826	Variable, 100	R50B150-18-23	.95
R829	1K	R33DC102J	.30
R831, 832, 833, 834	Composition, 120, 5%, 1/2W	RC20BF121J	.30

Symbol	Description	Part No.	Sug. Ret.
R835, 836, 837, 838	Wirewound, 0.56, 5%, 3W	RP3WR56J	.50
R839, 840	Composition, 10, 10%, 1/2W	RC20BF100K	.30
R843, 844	18	R33DC180J	.30
R849, 850, 851, 852	Composition, 22, 10%, 1/2W	RC20BF220K	.30
--	Clip, Diode (CR801, 802)	A51B128	.50
--	Clip, Heat Sink (Q805, 806, 807, 808)	A51A141	.30
--	Heat Sink, Base (Q805, 806, 807, 808)	A50A975-1	.40
--	Heat Sink, Top (Q805, 806, 807, 808)	A50A975-2	.40
--	Socket, Transistor (Q805, 806, 807, 808)	X20B401-3	.55

Unless otherwise noted, all resistors are carbon film in ohms, 5%, 1/3 Watt
K = Kilohm, M = Megohm

AL2119-175
TX420



AL2281-III

PREAMPLIFIER/POWER SUPPLY PB2281-1

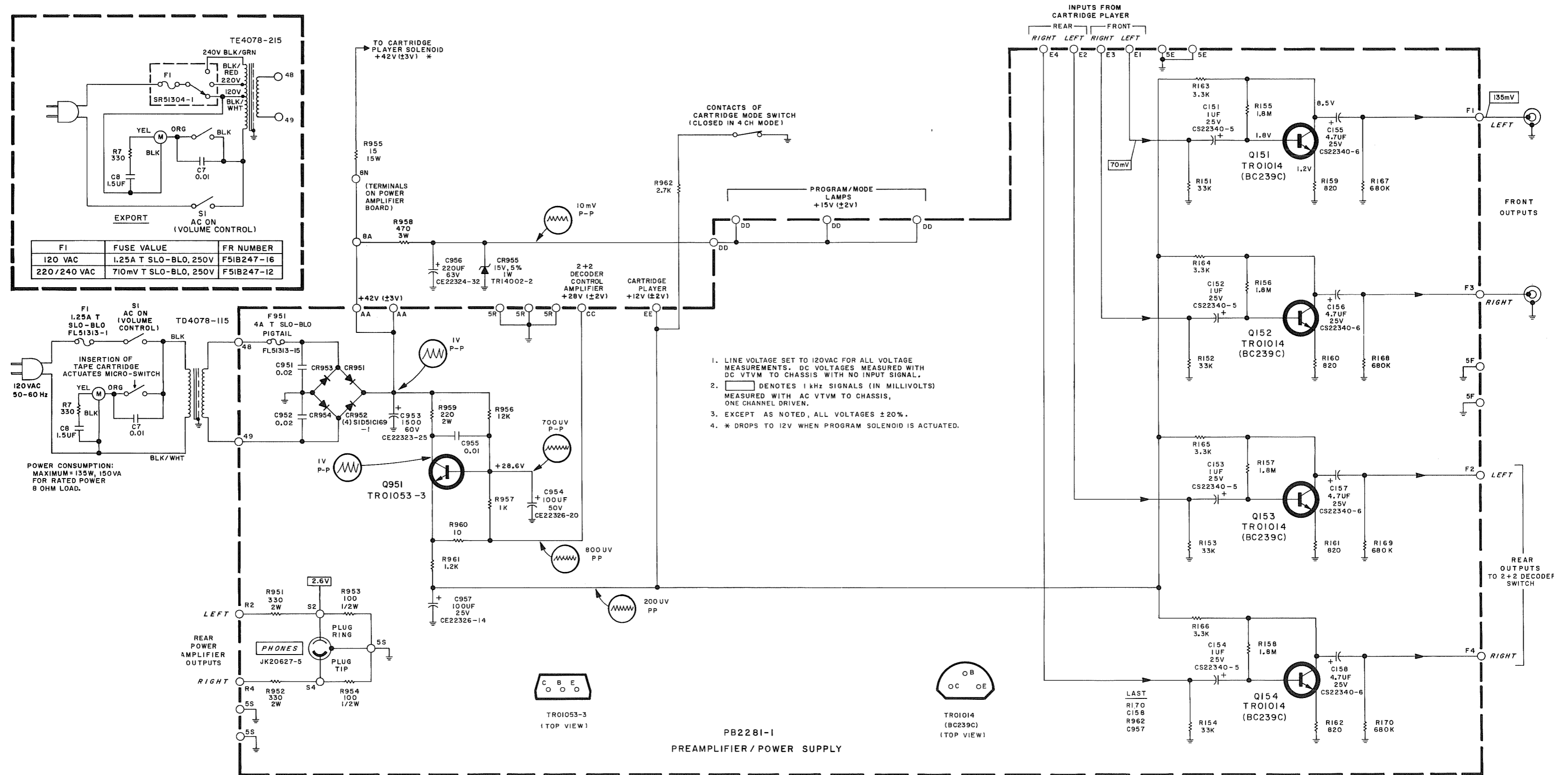
Symbol	Description	Part No.	Sug. Ret.
C151, 152, 153, 154	Sintered Alum., 1 uF, 25V	CS22340-5	.45
C155, 156, 157, 158	Sintered Alum., 4.7 uF, 25V	CS22340-6	.60
C951, 952	Ceramic, 0.02 uF, 20%, 500V	C50B567-3	.35
C953	Electrolytic, 1500 uF, 60V	CE22323-25	3.45
C954	Electrolytic, 100 uF, 50V	CE22326-20	.75
C955	Ceramic, 0.01 uF, +80 - 20%, 100V	C50B570-1	.40
C956	Electrolytic, 220 uF, 63V	CE22324-32	1.25
C957	Electrolytic, 100 uF, 25V	CE22326-14	.40
CR951, 952, 953, 954	Silicon Diode	SID51C169-1	.75
CR955	Zener Regulator, 15V, 5%, 1W	TR14002-2	1.05
F951	Fuse, Slo-Blo, 4A, 125V	FL51313-15	.75
Q151, 152, 153, 154	Transistor, NPN (BC239C)	TR01014	.70
Q951	Transistor, NPN	TR01053-3	1.95
R151, 152, 153, 154	33K	R33DC333J	.30
R155, 156, 157, 158	1.8M	R33DC185J	.30
R159, 160, 161, 162	820	R33DC821J	.30
R163, 164, 165, 166	3.3K	R33DC332J	.30
R167, 168, 169, 170	680K	R33DC684J	.30
R951, 952	Wirewound, 330, 5%, 2W	RW200W331J	.45
R953, 954	Composition, 100, 5%, 1/2W	RC20BF101J	.30
R955	Wirewound, 15, 5%, 15W	RW15W150J	.65
R956	12K	R33DC123J	.30
R957	1K	R33DC102J	.30
R958	Wirewound, 470, 5%, 3W	RW3W471J	.50
R959	Wirewound, 220, 5%, 2W	RW200W221J	.45
R960	10	R33DC100J	.30
R961	Carbon Film, 1.2K, 5%, 1/2W	R50DC122J	.30
R962	Composition, 2.7K, 5%, 1/2W	RC20BF272J	.30

MISCELLANEOUS

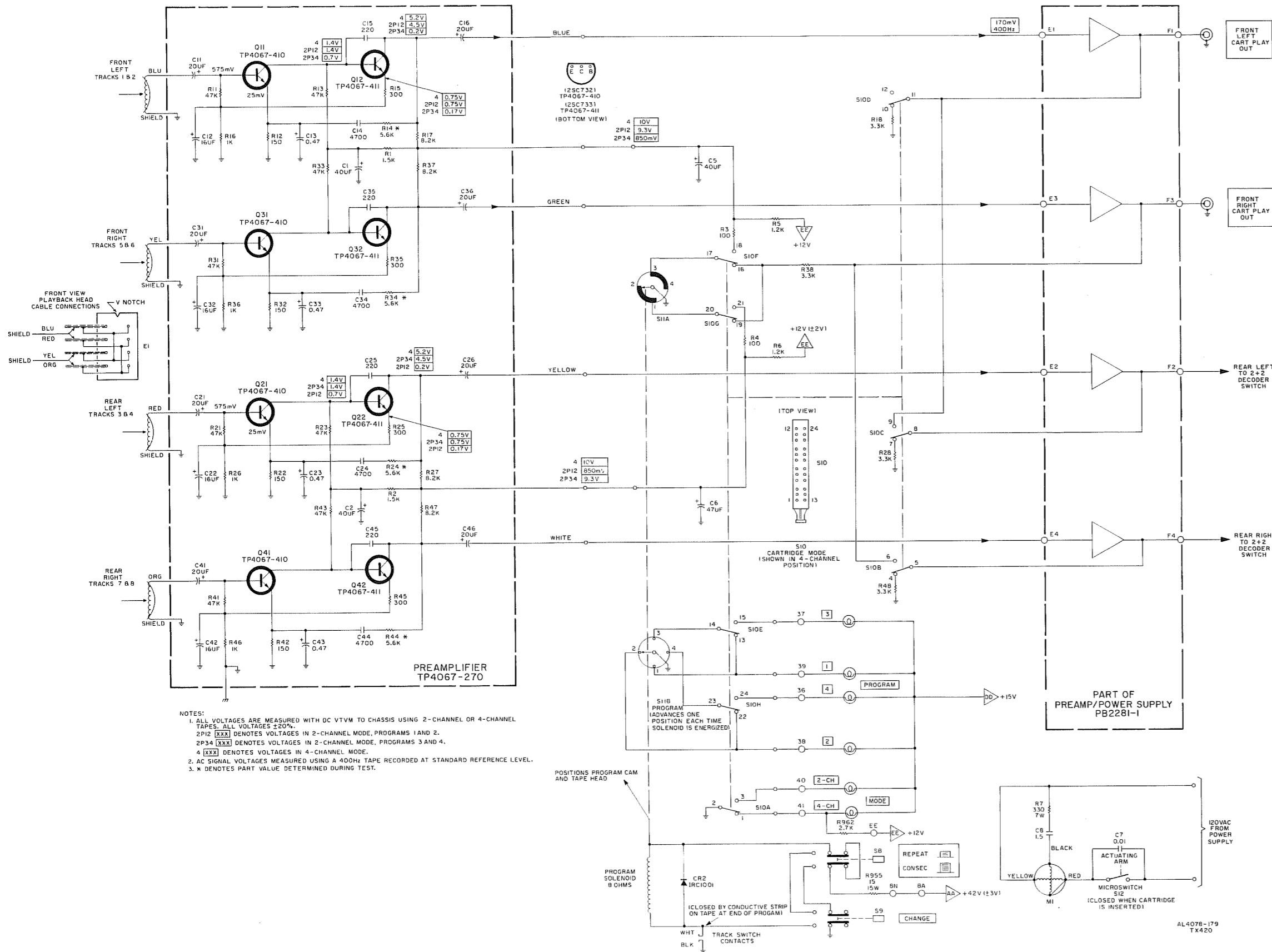
Symbol	Description	Part No.	Sug. Ret.
F1	Fuse, Slo-Blo, 1.25A, 125V	FL51313-1	.65
*F1	Fuse, Slo-Blo, 1.25A, 250V	F51B247-16	.60
*F1	Fuse, Slo-Blo, 710 mA, 250V	F51B247-12	.60
S1	Switch, Power On (Part of Volume Control)	RP50160-276	4.00
	Fuse Holder	EA51366	1.60
	Line Cord	W50023-1	1.25
	*Switch, Voltage Selector	SR51304-1	1.65
	Transformer, Power	TD4078-115	14.50
	*Transformer, Power	TE4078-215	30.25

*Used in export units only

Unless otherwise noted all resistors are carbon film in ohms, 5%, 1/3 Watt
K = Kilohm, M = Megohm



PB2281-1
PREAMPLIFIER/POWER SUPPLY



NOTES:
 1. ALL VOLTAGES ARE MEASURED WITH DC VTVM TO CHASSIS USING 2-CHANNEL OR 4-CHANNEL TAPES. ALL VOLTAGES $\pm 20\%$.
 2P12 [xxx] DENOTES VOLTAGES IN 2-CHANNEL MODE, PROGRAMS 1 AND 2.
 2P34 [xxx] DENOTES VOLTAGES IN 2-CHANNEL MODE, PROGRAMS 3 AND 4.
 4 [xxx] DENOTES VOLTAGES IN 4-CHANNEL MODE.
 2. AC SIGNAL VOLTAGES MEASURED USING A 400Hz TAPE RECORDED AT STANDARD REFERENCE LEVEL.
 3. * DENOTES PART VALUE DETERMINED DURING TEST.

FUNCTIONAL OPERATION

Insertion of a tape cartridge automatically closes microswitch S12, which supplies AC power to the motor. When a 4-channel cartridge is inserted, all four channels of the preamplifier are activated, equalizing and amplifying signals to the output terminals.

In 4-CH operation, the 8-track cartridge contains two programs.

- | | | |
|------------|---------|---------------------|
| Program 1: | Track 1 | Front left channel |
| | Track 5 | Front right channel |
| | Track 3 | Rear left channel |
| | Track 7 | Rear right channel |
| Program 2: | Track 2 | Front left channel |
| | Track 6 | Front right channel |
| | Track 4 | Rear left channel |
| | Track 8 | Rear right channel |

There are two mechanical positions for the tape head, up or down. Pressing CHANGE pushbutton S9 actuates the program solenoid. The solenoid moves a pawl which engages and rotates the program cam. A transfer pin which rides on the cam surface causes the tape head to alternately move up for Program 1 or down for Program 2. The program solenoid is also actuated by a conductive strip placed on the tape at the end of the program.

With REPEAT - CONSEC switch S8 in the CONSEC position, the program in progress continues to play until the conductive strip contacts the track switch, shifting the tape head to play the next program automatically. In the REPEAT position, the B+ to the program solenoid is opened. This prevents actuation of the solenoid and shifting of the tape head when the conductive strip contacts the track switch. Thus the same program is repeated. Pressing CHANGE pushbutton S9 actuates the program solenoid in either CONSEC or REPEAT. In REPEAT, B+ to the solenoid is fed through contacts of the CHANGE switch.

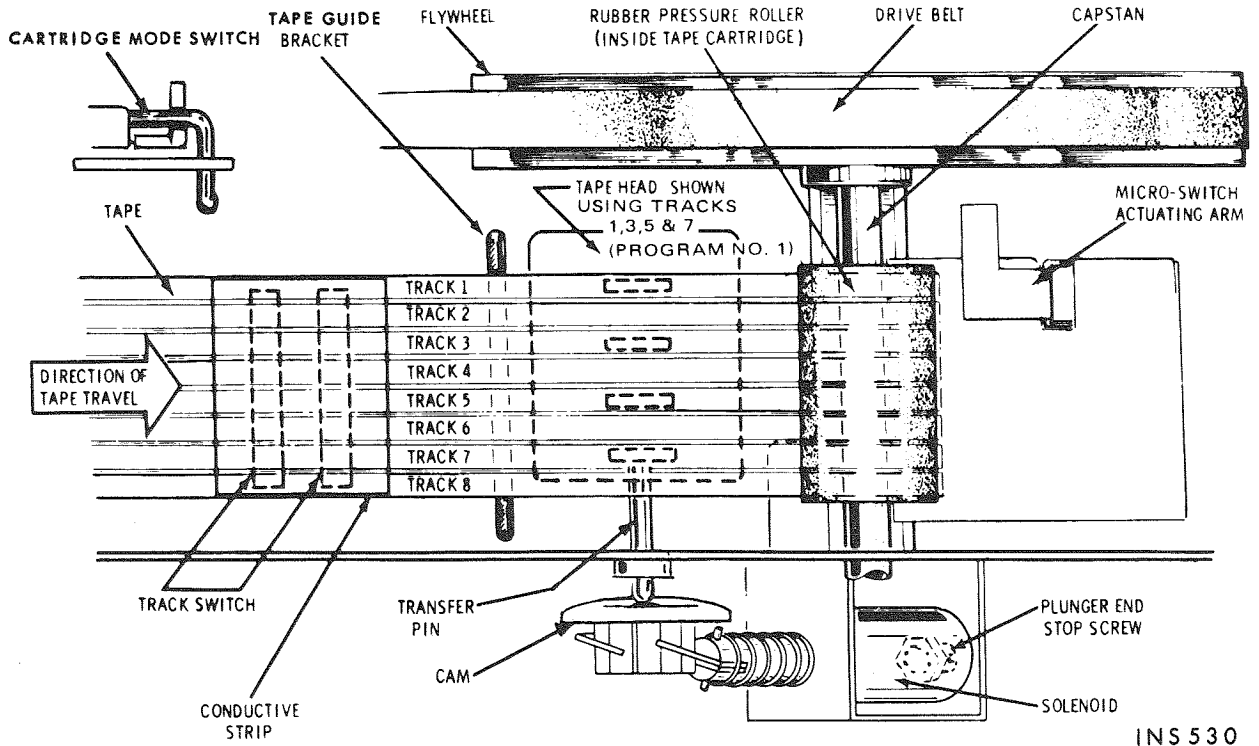
There are four separate programs contained in a 2-channel cartridge.

- | | | |
|------------|---------|---------------|
| Program 1: | Track 1 | Left channel |
| | Track 5 | Right channel |
| Program 2: | Track 2 | Left channel |
| | Track 6 | Right channel |
| Program 3: | Track 3 | Left channel |
| | Track 7 | Right channel |
| Program 4: | Track 4 | Left channel |
| | Track 8 | Right channel |

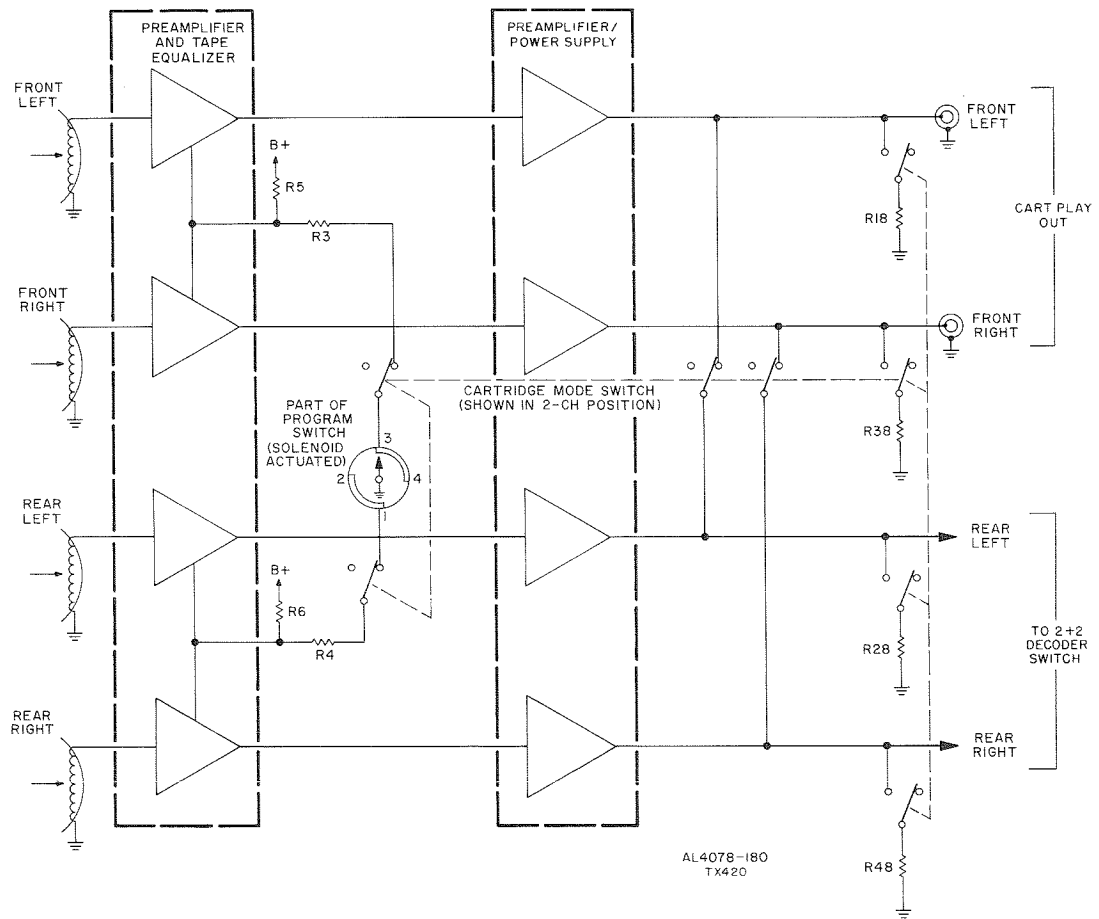
When a 2-channel cartridge is inserted, it engages the actuating arm of cartridge mode microswitch S10, and it is actuated. (A slot in the 4-channel cartridges bypasses the engaging arm of the microswitch.) To prevent playing two independent stereo (2-channel) programs simultaneously (one program on tracks 1 and 5, and the other on tracks 3 and 7), the B+ feeding the front or rear preamplifier channels is turned off, making only one pair of channels active at a time. For programs 1 and 2 the front channels of the preamplifier are active, for programs 3 and 4 the rear channels are active. Program switch S11B does the switching. The program switch is a rotary type operated by the program solenoid in conjunction with the cam. In addition, the left front and left rear channels are paralleled in 2-channel mode and the right front and rear channels are similarly paralleled. Cartridge mode switch S10 makes the parallel connections.

When active channels are paralleled with inactive channels, a normal 6dB drop in the output level results from paralleling source impedances. In 4-channel operation, resistors R18, R28, R38, and R48 are switched in across the pre-amp outputs (F1, F2, F3, F4). The parallel resistors reduce the output level approximately 6dB to maintain equal output levels in the 2- and 4-channel modes.

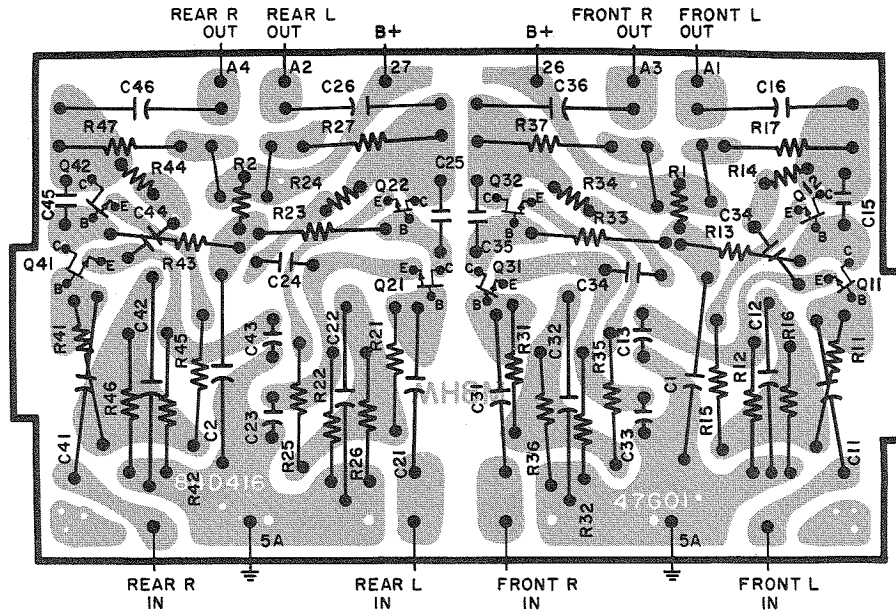
The appropriate CARTRIDGE MODE and PROGRAM lamps are switched on through S10 and S11. With a 4-channel cartridge, switch connections are such that only PROGRAM lamps 1 and 2 can light.



INS 530



AL4078-180
TX420



INS 527

COPPER SIDE

PREAMPLIFIER TP4067-270

MISCELLANEOUS

Symbol	Description	Part No.	Sug. Ret
C1, 2	Electrolytic, 40uF, 16V	TP4067-401	1.45
C11, 16, 21, 26, 31, 36, 41, 46	Electrolytic, 20uF, 16V	TP4067-403	.85
C12, 22, 32, 42	Electrolytic, 16uF, 16V	TP4067-404	1.45
C13, 23, 33, 43	Electrolytic, 0.47uF, 10V	TP4067-405	1.15
C14, 24, 34, 44	Mylar, 4700pF, 10%, 50V	TP4067-406	1.00
C15, 25, 35, 45	Ceramic, 220pF, 10%, 100V	TP4067-407	.85
Q11, 21, 31, 41	Transistor	TP4067-410	3.85
Q12, 22, 32, 42	Transistor	TP4067-411	3.85
R1, 2	Composition, 1500, 10%, 1/4W	RC20BF152K	.30
R11, 13, 21, 23, 31, 33, 41, 43	Composition, 47K, 10%, 1/4W	RC07BF473K	.40
R12, 22, 32, 42	Composition, 150, 5%, 1/4W	RC07BF151J	.40
R14, 24, 34, 44	Composition, 5.6K, 10%, 1/4W	RC07BF562K	.40
R15, 25, 35, 45	Composition, 300, 5%, 1/4W	RC07BF301J	.40
R16, 26, 36, 46	Composition, 1K, 10%, 1/4W	RC07BF102K	.35
R17, 27, 37, 47	Composition, 8.2K, 10%, 1/4W	RC07BF822K	.35

Symbol	Description	Part No.	Sug. Ret.
C5	Electrolytic, 40uF, 35V	TP4067-401	1.45
C6	Electrolytic, 47uF, 35V	CE22324-22	.70
C7	Ceramic, 0.01, 10%, 600V	C2747	.50
C8	Mylar, 1.5uF, 250V	TP4067-408	1.55
CR2	Diode, Silicon, IRC 1001	TP4067-409	1.75
M1	Motor (P/o Motor Assembly)	TP4067-501	30.00
R3, 4	Composition, 100, 5%, 1/3W	R33DC101J	.30
R5, 6	Composition, 1.2K, 5%, 1/3W	R33DC122J	.30
R7	Wirewound, 330, 10%, 7W	TP4067-412	.85
R18, 28, 38, 48	Composition, 3.3K, 5%, 1/4W	RC20BF332J	.35
--	Lamp, 28V, 40mA	LM21436-3	.60
--	Lamp Assembly, Cartridge (6 lamps)	AS521431-2	12.00
--	Solenoid Assembly, Program	TP4067-504	5.45
R955	Wirewound, 15, 10%, 15W	RW15W150J	.65
R962	Composition, 2.7K, 5%, 1/2W	RC20BF272J	.30
S8, 9	Switch, Repeat-Consec, Change	SP50200-51	2.65
S10	Switch, Cartridge Mode	TP4067-133	.80
S11	Switch, Program (P/o Cam Shaft Assembly)	TP4067-505	5.25
S12	Microswitch, AC	TP4067-024	4.05

SUGGESTED TEST CARTRIDGES

RCA No.	Description
323	400Hz, full track, at standard recording level, in a 2-channel cartridge shell.
326	8kHz, full track azimuth alignment, in a 2-channel cartridge shell.
340	Check for proper head indexing and channel orientation.
353	3.15kHz wow and flutter.
523	Same as 323, in a 4-channel cartridge shell.
526	Same as 326, in a 4-channel cartridge shell.
540	Same as 340, in a 4-channel cartridge shell.
554	1kHz, recorded on tracks 2 and 6 at standard recording level, in a 4-channel cartridge shell.
572	Spot frequency test containing 50Hz, 1kHz, and 8kHz tones

Order tapes directly from:
RCA RECORDS
 Special Products Division
 1133 AVENUE OF THE AMERICAS
 NEW YORK, N. Y. 10036

SOLENOID END-STOP ADJUSTMENT

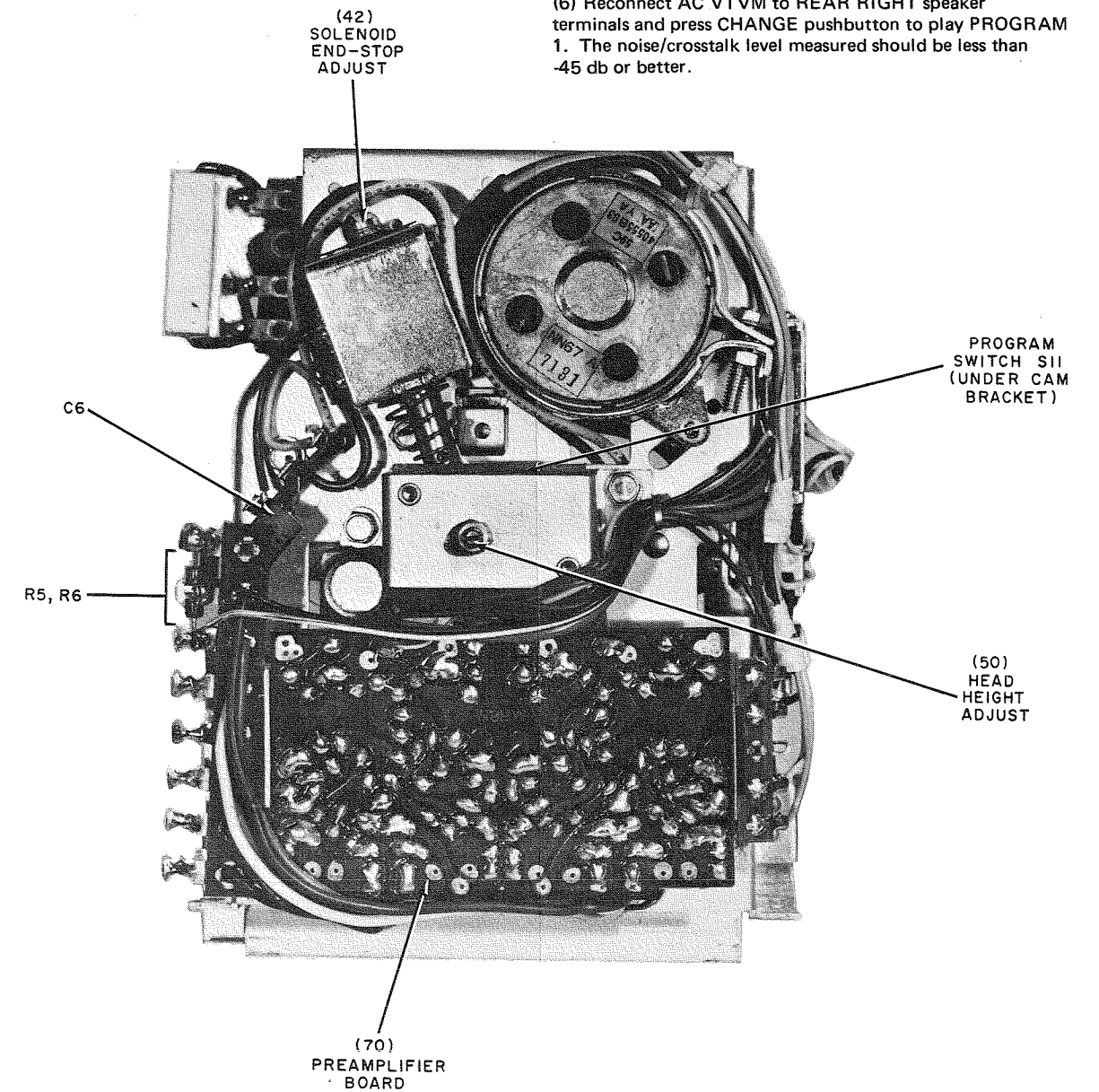
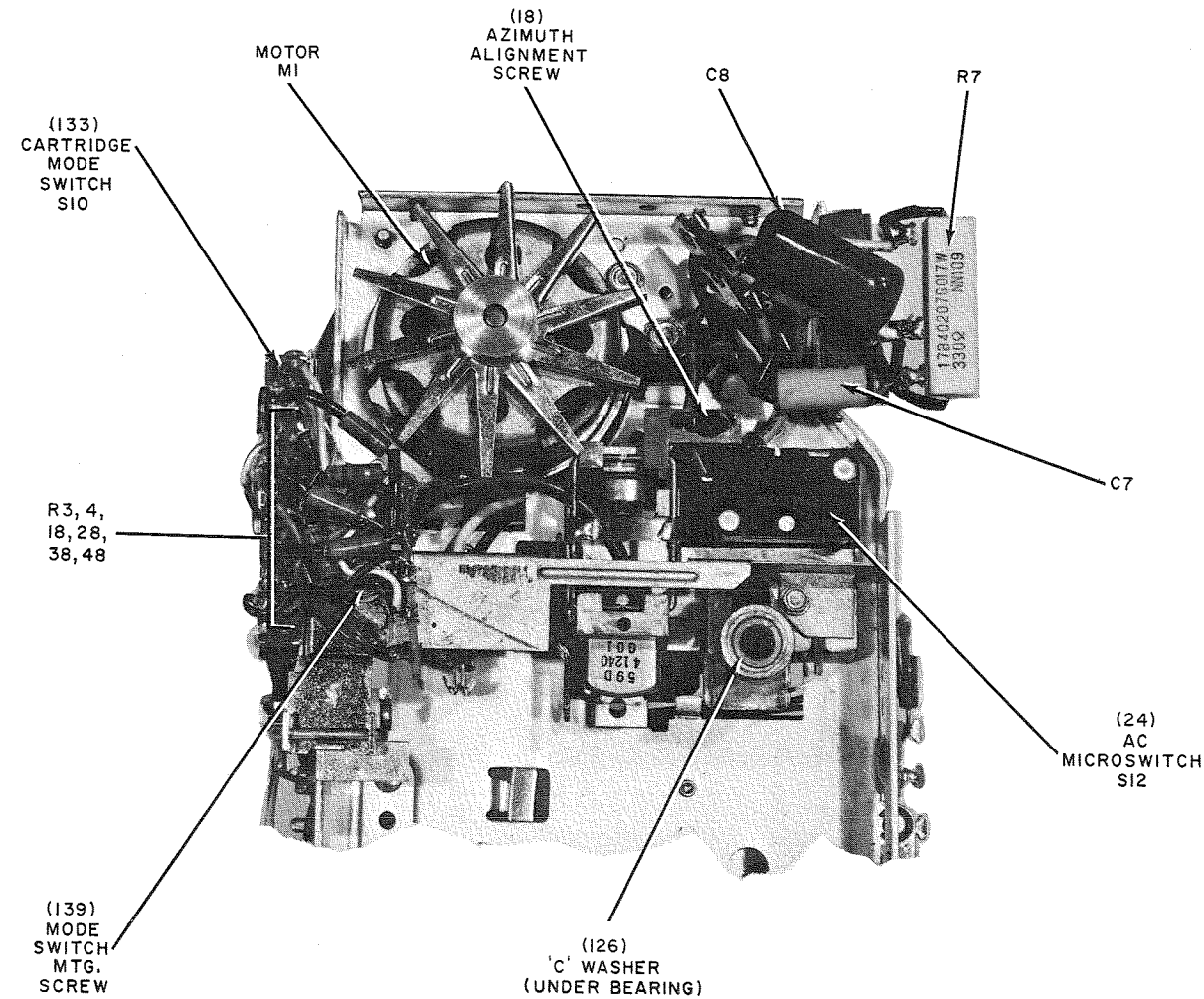
- (1) Insert any 2-CH or 4-CH cartridge. A test cartridge is not required.
- (2) Back-out solenoid end-stop adjustment (42) until the tape head completely stops indexing.
- (3) Turn end-stop adjustment in the opposite direction 1 turn.
- (4) Check operation by indexing head several times. Program lights should advance in the proper sequence.

AZIMUTH ALIGNMENT

- (1) Connect an AC VTVM to the FRONT RIGHT CART PLAY OUT jack. Insert test cartridge 323 or 523.
- (2) Adjust the azimuth alignment screw (18) for maximum output.
- (3) Insert test cartridge 326 or 526 and adjust for maximum output as in step (2).
- (4) Lock adjustment screw in place using glyptol, loctite, Duco, or other suitable cement. Be careful to avoid getting cement on the drive belt.

HEAD HEIGHT ADJUSTMENT

- (1) Set BASS and TREBLE controls to minimum. (This reduces the noise level so that head height may be more accurately adjusted to reduce crosstalk.)
- (2) Connect a jumper from the FRONT LEFT CART PLAY OUT jack to LEFT AUX IN jack. Jumper the FRONT RIGHT OUT to the RIGHT AUX IN jack. (With these jumpers, the INPUT SOURCE is the front outputs from the cartridge player when the AUX pushbutton is depressed.)
- (3) Connect an AC VTVM to the REAR RIGHT speaker terminals and press the AUX INPUT SOURCE SELECTOR. Insert test cartridge 554 and press the CHANGE pushbutton to play PROGRAM 2.
- (4) Loosen locknut (52) located on the bottom of cam bracket (51) and adjust cam shaft (50) for maximum output.
- (5) Connect the AC VTVM to REAR LEFT speaker terminals and check output as outlined above.
- (6) Reconnect AC VTVM to REAR RIGHT speaker terminals and press CHANGE pushbutton to play PROGRAM 1. The noise/crosstalk level measured should be less than -45 db or better.



CARTRIDGE PLAYER DISASSEMBLY

NOTE: Index numbers used in parenthesis refer to exploded view.

REMOVING FLYWHEEL

- (1) Remove cartridge player from chassis.
- (2) Remove drive belt (10).
- (3) Rotate flywheel so that the two ends of 'C' washer (126) are accessible from the front.
- (4) Using two small bladed screwdrivers (or similar tools) push both ends of 'C' washer simultaneously to displace it from shaft.
- (5) Rotate flywheel so that the rounded portion of 'C' washer is at the front. Insert a small, pointed tool (preferably with a right angle bend at the tip) in the cutaway portion of the 'C' washer, between the washer and shaft, and pull washer from shaft.
- (6) Remove flywheel (15) and flywheel spacer (131).

REMOVING HEAD-MOUNT/CAPSTAN HOUSING

- (1) Remove flywheel.
- (2) Remove antistatic bracket (111) by taking out holding screw (1).
- (3) Remove screw (21) near the capstan well which secures shield (22).
- (4) Remove cartridge mode switch (133), and terminal strip by removing terminal strip mounting screw (139). Remove actuating arm (125) from the switch.
- (5) Remove screws (128) and (129) holding the cartridge mode switch mounting bracket (127) to the side of the chassis.
- (6) Unsolder shield (22) mounted in a slot in the mechanism frame. Be careful not to bend the shield when removing it.
- (7) Remove screw (36) holding solenoid terminal strip (136).
- (8) Remove screw (53) holding cam bracket (51).
- (9) Remove screw (35) located between solenoid and cam bracket.
- (10) Remove the two screws holding the AC microswitch (24). Remove the switch insulator (26) and motor actuating arm (25).
- (11) Remove the playback head. Refer to REMOVING PLAYBACK HEAD procedure.
- (12) Lift the capstan housing assembly (C) slightly and slide the head connector between the cross spring.
- (13) Lift the head and capstan housing assembly from the chassis.

CAUTION: The head transfer pin (68) is now free and will fall out if the chassis is turned upside-down. The rounded edge of this pin goes toward the switch, the flat side faces the head.

REMOVING PLAYBACK HEAD

- (1) Remove flywheel.
- (2) Loosen allen-head screw (97) securing playback head.
- (3) Loosen head in mount by applying a slight downward pressure (with index finger), at the upper front edge of the head.
- (4) Slide the head and cable assembly out the front of the head retainer (95). Carefully pull the head out of the head socket connector (93).

NOTE: The colored dot on the top of the socket, and the dot on the top rear (pin side) of the head show correct orientation when the head is replaced.

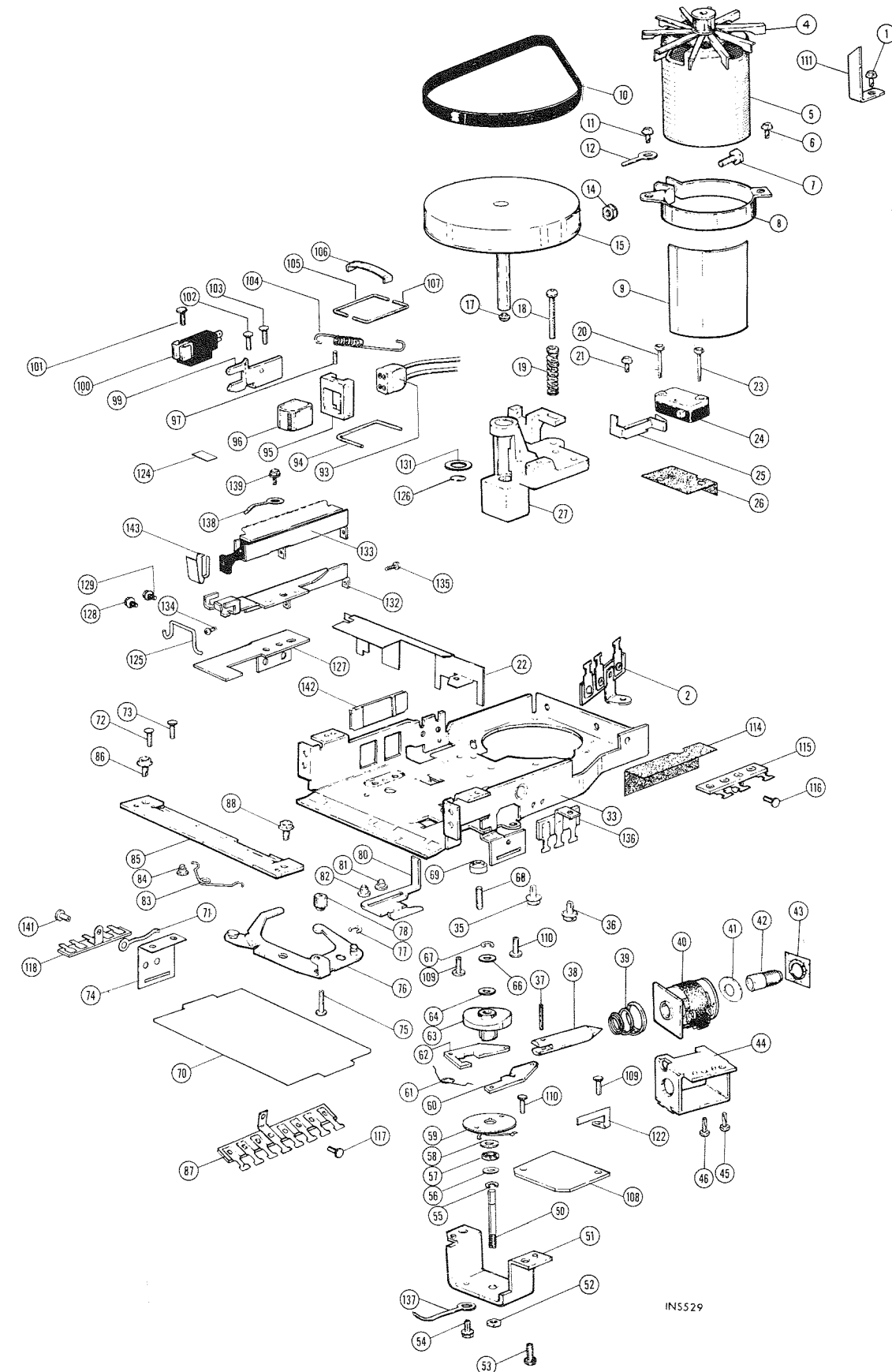
- (5) Remove the metal shim (124) located beneath the head on the front edge of the bracket.

INSTALLATION CAUTION: Before plugging head into socket, place a small-bladed screwdriver (or similar tool) between the cross bracket and the front part of the head bracket to support the rear of the socket. Then, carefully push head into socket.

REMOVING MOTOR

- (1) Lift off drive belt (10).
- (2) Unsolder motor wires from terminal strip (136).
- (3a) If the pulley/fan assembly (4) is set-screw mounted, loosen the screw and remove the assembly.
- (3b) On some units, the motor shaft and pulley/fan assembly are cemented together. The assembly can be removed by inserting a small screwdriver under the fan to pry the pulley/fan assembly from the shaft while heating the motor shaft with a soldering iron (to soften the cement).
- (4) Remove tension adjustment screw (11), noting its original position. Remove screw (6) on opposite mounting bracket.
- (5) Carefully remove motor, motor bracket (8), and shield (9) intact.

INSTALLATION NOTE: As a guide, use a straight-edge across the flywheel and pulley when adjusting the height of the motor, so that the flat end of the pulley and top of flywheel are in the same plane.



IN5529

MECHANICAL PARTS

Item	Description	Part No.	Sug. Ret.	Item	Description	Part No.	Sug. Ret.
1, 6, 11	Screw, Tpg: 6-32x $\frac{1}{4}$	TP4067-201	.10	67	Washer, 'C'	p/oTP4067-505	--
2	*Terminal Strip	--	--	68	Transfer Pin	TP4067-068	.95
4	Pulley/Fan Ass'y: 60Hz	TP4067-004	3.50	69	Transfer Pin Bushing	TP4067-069	.65
-	Pulley/Fan Ass'y: 50Hz	TP21349	3.50	70	Preamplifier Board	TP4067-270	29.75
A	Motor less Pulley/Fan	TP4067-501	30.00	71	*Wraparound Lug	--	--
5	Motor Only	p/oTP4067-501	--	72, 73,			
7	Screw, Tpg: 8-32x $\frac{1}{4}$	p/oTP4067-501	--	116, 141	*Rivet: .122x1/8	--	--
8	Motor Mounting Bracket	p/oTP4067-501	--	74	Spring Bracket	TP4067-074	.55
9	Magnetic Shield	p/oTP4067-501	--	75	*Rivet: .088x15/32	--	--
10	Drive Belt	TP4067-010	1.60	76	Ejector Lever	TP4067-076	1.20
12	*Wraparound Lug	--	--	77	Washer, 'C'	TP4067-077	.35
14	Nut, Hex: 8-32	p/oTP4067-501	--	78	Cartridge Return Roller	TP4067-078	.40
B	Flywheel Ass'y	TP4067-502	2.30	80	Slide Bracket	TP4067-080	.55
15	Flywheel and Shaft	p/oTP4067-502	--	81, 82, 84	*Shoulder Rivet	--	--
17	Capstan Shaft Bearing	p/oTP4067-502	--	83	Ejector Spring	TP4067-083	.55
18	Screw, Mach: 4-40x $\frac{1}{4}$	TP4067-018	.20	85	Hold-Down Bracket	TP4067-085	.65
19	Azimuth Adjust Spring	TP4067-019	.40	86, 88	Screw, Tpg: 8-32x $\frac{1}{4}$	TP4067-086	.40
20, 23	Screw, Tpg: 4-40x5/8	TP4067-020	.10	87	*Terminal Strip	--	--
21	Screw, Tpg: 4-40x $\frac{1}{4}$	TP4067-021	.40	93	Head Socket Connector	TP4067-093	3.00
22	*Shield	--	--	94	L (bottom) Radius Arm	p/oTP4067-503	--
24	AC Microswitch	TP4067-024	4.05	95	Head Retainer	p/oTP4067-503	--
25	Motor Actuating Arm	TP4067-025	.70	96	Tape Head, 4-Channel	TP4067-096	30.00
26	*Switch Insulator	--	--	97	Screw, Tpg: 4-40x3/16	TP4067-097	.40
C	Capstan Housing Ass'y	TP4067-503	7.15	99	Tape Guide Bracket	TP4067-099	1.00
27	Capstan Housing/Block	p/oTP4067-503	--	100	Track Switch	TP4067-100	1.15
33	*Chassis	--	--	101, 102,			
35, 36	Screw, Tpg: 8-32x9/32	TP4067-035	.10	103, 109,			
37	Spiral Pin (Ratchet Plunger)	TP4067-037	.50	110, 117	*Rivet: 122x3/16	--	--
38	Solenoid Plunger	TP4067-038	.85	104	Head Tension Spring	TP4067-104	.85
39	Solenoid Spring	TP4067-039	.40	105	L (top) Radius Arm	p/oTP4067-503	--
D	Solenoid Ass'y	TP4067-504	5.45	106	Spring Clip	p/oTP4067-503	--
40	Solenoid Coil	p/oTP4067-504	--	107	R (top) Radius Arm	p/oTP4067-503	--
41	Spring Washer	p/oTP4067-504	--	108	Program Switch Stator	p/oTP4067-505	--
42	Solenoid Stop	p/oTP4067-504	--	111	Antistatic Bracket	TP4067-211	1.00
43	Spring Nut	p/oTP4067-504	--	114	*Terminal Insulator	--	--
44	Solenoid Bracket	p/oTP4067-504	--	115	*Terminal Strip	--	--
45, 46	Screw, Mach: 6-32x5/32	TP4067-045	.10	118	*Terminal Strip	--	--
E	Cam Shaft Ass'y	TP4067-505	5.15	122	Spring	p/oTP4067-505	--
50	Cam Shaft	p/oTP4067-505	--	124	Head Shim	TP4067-124	.50
51	Cam Bracket	p/oTP4067-505	--	125	Actuating Arm	TP4067-125	.70
52	Nut, Hex: 8-32	p/oTP4067-505	--	126	Washer, 'C'	TP4067-126	.50
53	Screw, Tpg: 8-32x3/8	TP4067-053	.40	127	*Switch Mounting Bracket	--	--
54	Screw, Tpg: 6-20x $\frac{1}{4}$	TP4067-054	.40	128, 129	Screw, Tpg: 8-18x $\frac{1}{4}$	TP4067-128	.10
55	Washer, 'C'	p/oTP4067-505	--	131	Flywheel Spacer	TP4067-131	.35
56, 58, 66	Washer, Flat	p/oTP4067-505	--	132	Switch Bracket	TP4067-132	1.60
57	Thrust Bearing	p/oTP4067-505	--	133	Switch, Cartridge Mode	TP4067-133	.80
59	Program Switch Rotor	p/oTP4067-505	--	134, 135	Screw, Tpg: 6-40x $\frac{1}{4}$	TP4067-134	.10
60	Push Ratchet Pawl	TP4067-060	.50	136	*Terminal Strip	--	--
61	Pawl Tension Spring	TP4067-061	.50	137, 138	*Wraparound Lug	--	--
62	Pull Ratchet Pawl	TP4067-062	.50	139	Screw, Tpg: 6-20x $\frac{1}{4}$	TP4067-054	.10
63	Ratchet Cam	p/oTP4067-505	--	142	Cartridge Guide Spacer	TP4067-142	.40
64	Spring Washer	p/oTP4067-505	--	143	Actuating Arm	TP4067-143	.65

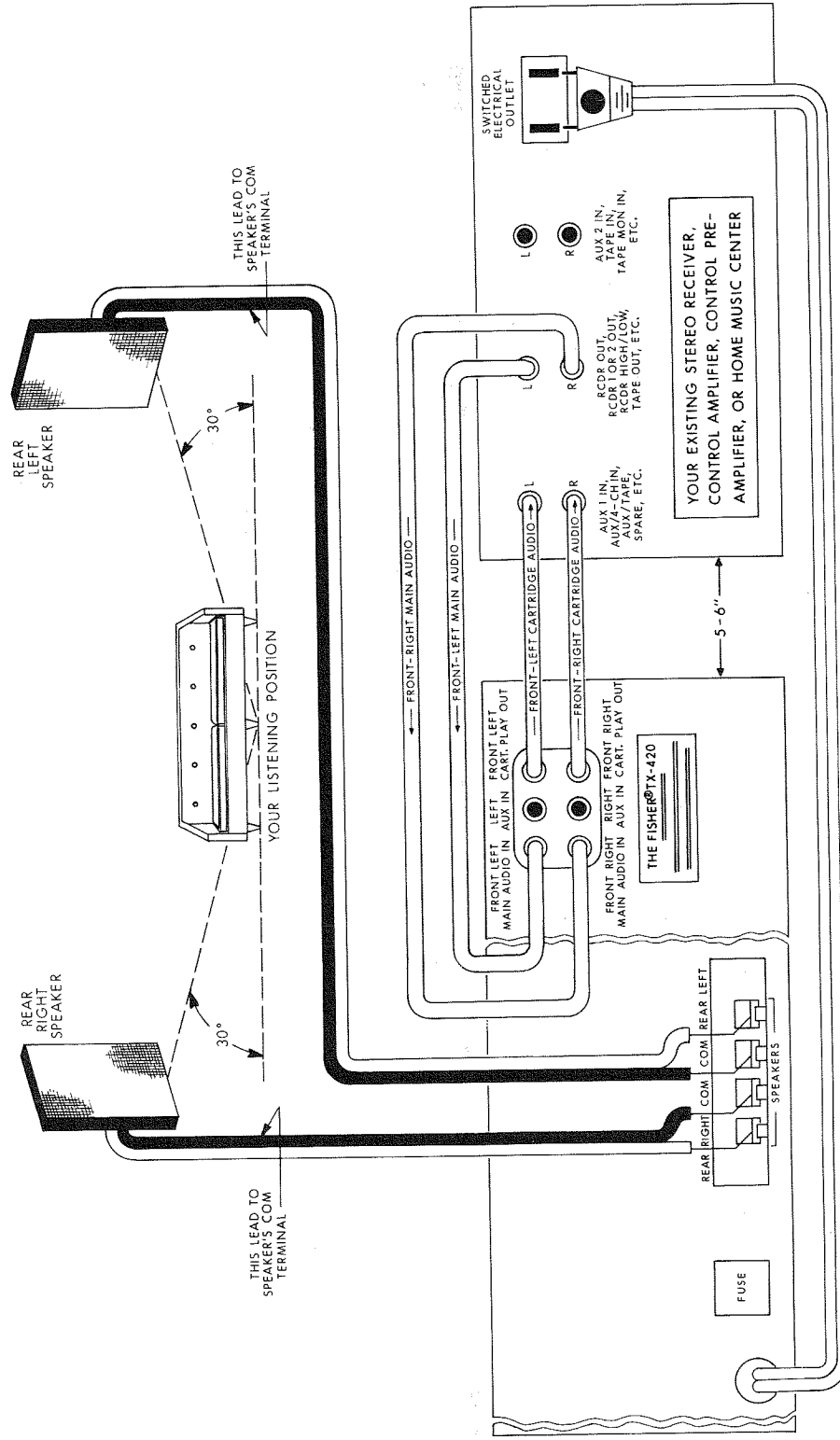
* Replacement part NOT supplied by Fisher Radio

CAUTION: IN ANALYZING THE CAUSE OF COMPLAINT, DO NOT INSERT ADDITIONAL TAPE CARTRIDGES UNTIL THE POSSIBLE CAUSE AND REMEDY HAVE BEEN REFERRED TO IN THIS GUIDE.

SYMPTOM	CAUSE	REMEDY
Tape breaks or winds up around capstan shaft.	1. Defective tape cartridge.	Replace cartridge with known good cartridge.
Squealing or excessive wow.	1. Defective tape cartridge. 2. Defective capstan shaft and/or bearings.	Replace cartridge with known good cartridge. Replace flywheel assembly, and/or capstan housing.
Drive belt slips off flywheel (also slow tape start-up).	1. Defective Drive belt. 2. Motor bracket bent (drive shaft not vertical).	Replace drive belt. Straighten bracket. If belt rides high on pulley, insert screwdriver between motor and flywheel (in circular slot of chassis) and pry motor away from flywheel until shaft is aligned. If belt rides low, insert screwdriver in slot on opposite side of motor and pry toward flywheel until aligned. CAUTION: DO NOT APPLY PRESSURE TO PULLEY.
Tape pulls out of center of cartridge when cartridge is removed from unit.	1. Undersized or burred tape guide slot.	Deburr slot or replace guide bracket.
Poor tape drive (also wow and flutter).	1. Flywheel and/or motor pulley dirty or greasy. 2. Drive belt improperly installed. 3. Drive belt defective (stretched, etc.). 4. Defective capstan shaft, and/or bearings.	Use isopropyl alcohol to clean the outer edge of flywheel, motor pulley, and capstan shaft. Make certain rough surface of belt is on inside. (Rough surface drives flywheel.) On belts with stripes, install belt with stripes on outside. Replace drive belt. Replace flywheel assembly, and/or capstan housing.
Crosstalk:	1. Defective tape cartridge. 2. Tape head out of adjustment. 3. Head mounting hardware binding. 4. Tape guide bracket not positioning tape correctly with respect to head. 5. Defective cam and shaft assembly. 6. Tape head not indexing correctly.	Replace cartridge with known good cartridge. Check head height and azimuth adjustments as outlined on page 15. Check for obstructions or bent mounting rods. Index head to lower position, then lift up head. It should have sufficient tension to spring back without binding. Check distance between bottom edge of tape guide bracket and chassis. If distance is not .095 to .100, replace tape guide bracket. Replace cam and shaft assembly. See "Improper Head Indexing".
Motor does not run when cartridge is inserted.	1. Microswitch not actuated.	Replace switch, or bend actuating arm enough to actuate switch when cartridge is inserted.
Intermittent audio during tape operation.	1. Intermittent tape-capstan, or tape-to-head contact. 2. Intermittent head-connecting cable.	See "Poor Tape Drive". Determine if cable is faulty by wiggling receptacle end of cable, or feed a signal into input of preamplifier. If cable is faulty, replace.
Improper head indexing, intermittent head indexing.	1. Inadequate tension on solenoid plunger return spring. 2. Defective plunger. 3. Solenoid plunger end-stop screw not properly adjusted. 4. Cam tension spring out of hole, or missing. 5. Defective cam and shaft assembly.	Increase spring tension, or replace spring. Replace solenoid plunger. Adjust solenoid end-stop screw as outlined on page 15. Insert spring into its hole, or replace spring. Replace cam and shaft assembly.
Unit does not change Program	1. Solenoid not operating. 2. Tape head not indexing properly.	Check solenoid circuit. Repair or replace defective parts. See "Improper Head Indexing".
Slow speed (also see "Poor Tape Drive").	1. Binding tape cartridge. 2. Defective drive belt. 3. Defective capstan shaft, and/or bearings.	Replace cartridge with known good cartridge. Replace drive belt. Replace flywheel assembly, and/or capstan housing.

SERVICE NOTES

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AL4078-168
TX420



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