



# TECHNICAL SERVICE INFORMATION

2425 South Main Street Bloomington, Illinois 61701 Telephone: 309-828-1381

TSI-061272-01-KM  
June 12, 1972

TO: CHIEF ENGINEER

SUBJECT: REPLACEMENT OF ORIGINAL TYPE PROGRAM AMPLIFIER WITH  
NEWLY DESIGNED AMPLIFIER UTILIZING SQUELCH CIRCUITRY

REASON: INTERNATIONAL TAPETRONICS CORPORATION has improved the original program amplifier card by incorporating into its circuitry an electronic attenuator. The new design has been engineered primarily for the purpose of virtually eliminating transients caused from starting the machine.

An MFC6040 Integrated Circuit, designed primarily as an electronic attenuator, is used in the new amplifier circuit. The addition of the I.C. between the existing second and third stages of the program amplifier ahead of the level pot makes possible audio attenuation down to -70 dB minimum, from a "0" reference level.

In ITC's application, the device is controlled through the use of relay contacts which supply a ground to the MFC6040 through diode CR101 (also CR102 on stereo) and resistor R145 (also R146 on stereo) during a "play" mode of operation only. When the machine is "started", the momentary "rise" or "turn on" time of the I.C. which is controlled by capacitor C122 (also C126 on stereo) eliminates the possibility of a transient from passing through the last two stages of the program amplifier.

NOTE

International Tapetronics recommends the use of the new amplifier design for replacement of original type amplifier cards. If you find, by visual inspection, the presence of an MFC6040 Integrated Circuit on your program amplifier circuit board, your present system is utilizing the squelch circuitry. If you find that your machine(s) uses the original type amplifier card and you wish to make a transition to the new amplifier, make a request (phone or written) for the new amplifier(s) at a cost of \$29.85 for monophonic application, and \$51.90 for stereophonic. The following kits should be requested:

1. MONOPHONIC PROGRAM AMPLIFIER WITH SQUELCH, kit part number 878-0017-000.
2. STEREOHONIC PROGRAM AMPLIFIER WITH SQUELCH, kit part number 878-0017-010.

These renewal kits contain parts and instructions for a simple conversion for adaptation of the new circuitry.

PROGRAM REPRODUCE AMPLIFIER CARD (Models with audio squelch)

MONO 831-0027-003  
STEREO 831-0027-013

www.SteamPoweredRadio.Com

Symbol Part Number Description

CAPACITORS

C105	696-0114-000	5 mfd, 25V
C119	681-0032-000	680 pf, 200V
C120	696-0055-000	400 mf, 10V
C121	696-0114-000	5 mf, 25V
C122	696-0122-000	50 mf, 25V

CAPACITORS (Stereo Only)

C114	696-0114-000	5 mfd, 25V
C123	681-0032-000	680 pf, 200V
C124	696-0055-000	400 mf, 10V
C125	696-0114-000	5 mfd, 25V
C126	696-0122-000	50 mf, 25V

TRANSISTORS

Q101	590-0013-000	2N5089
Q102	590-0013-000	2N5089
Q103	590-0001-000	2N3053

TRANSISTORS (Stereo Only)

Q105	590-0013-000	2N5089
Q106	509-0013-000	2N5089
Q107	590-0001-000	2N3053

RESISTORS

R102	626-0319-000	220k Ohms, ½ watt, 5%
R107	626-0251-000	330 Ohms, ½ watt, 5%
R109	626-0255-000	470 Ohms, ½ watt, 5%
R139	626-0271-000	2.2k Ohms, ½ watt, 5%
R140	626-0279-000	4.7k Ohms, ½ watt, 5%
R141	626-0287-000	10k Ohms, ½ watt, 5%
R145	626-0271-000	2.2k Ohms, ½ watt, 5%

RESISTORS (Stereo Only)

R121	626-0319-000	220k Ohms, ½ watt, 5%
R126	626-0251-000	330 Ohms, ½ watt, 5%
R128	626-0255-000	470 Ohms, ½ watt, 5%
R142	626-0271-000	2.2k Ohms, ½ watt, 5%
R143	626-0279-000	4.7k Ohms, ½ watt, 5%
R144	626-0287-000	10k Ohms, ½ watt, 5%
R146	626-0271-000	2.2k Ohms, ½ watt, 5%

INTEGRATED CIRCUIT

IC101	606-0003-000	MFC 6040
-------	--------------	----------

INTEGRATED CIRCUIT (Stereo Only)

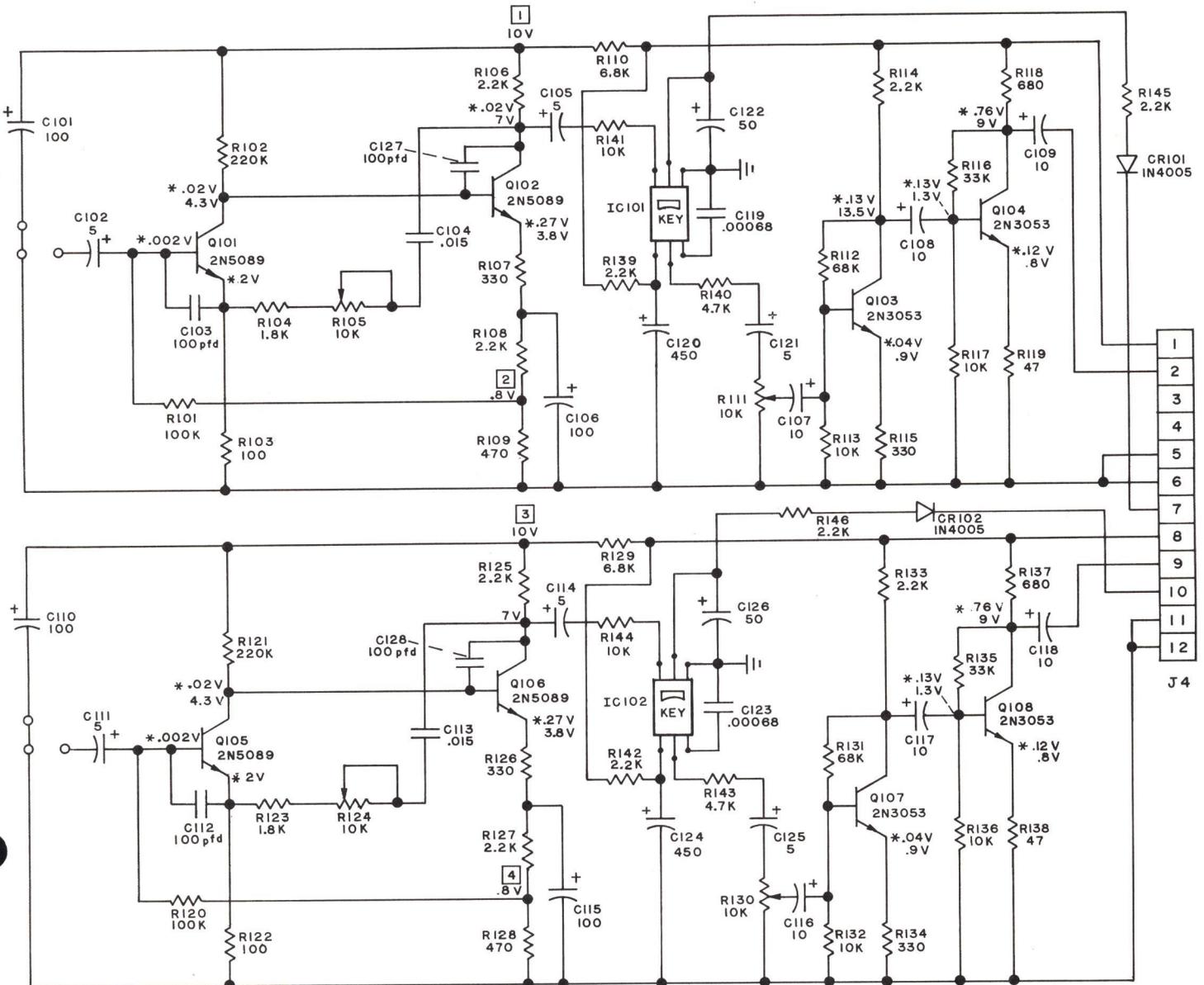
IC102	606-0003-000	MFC 6040
-------	--------------	----------

DIODE

CR101	575-0007-000	1N4005
-------	--------------	--------

DIODE (Stereo Only)

CR102	575-0007-000	1N4005
-------	--------------	--------





# TECHNICAL SERVICE INFORMATION

2425 South Main Street Bloomington, Illinois 61701 Telephone: 309-828-1381

TSI - 072072-02-KM  
July 20, 1972

TO: CHIEF ENGINEER

SUBJECT: Recorded transient on R/P series and WRA/3D series recording units. Replacement of original type re-recording amplifier with redesigned discrete component recording amplifier.

REASON: Occasionally International Tapetronics Corporation has received Customer Service calls concerning a "thump" or "pop" that is recorded on the tape at the end of the recording process. After testing and evaluation of the potential problem, several helpful improvements can be suggested.

1. Remove and tie off (insulate) the wire on Pin 14 of recorder interconnect socket J6 located on the re-producer.
2. Add a wire to pin 14 of J6 and connect the other end to pin 6 of relay K-1.
3. Remove resistor R707 from the recording control card in the recorder and replace with a 1,000 ohm, 1 watt resistor. (Leads may have to be tucked under slightly in order to mount in existing holes.)
4. Remove capacitor C704 from the control card in the recorder and replace with a .47 mfd. capacitor (.1 mfd. on high-speed cue machines).

The "pop" or "thump" phenomena is created by the recording head coupling capacitor discharging across the head at an uneven rate as the bias oscillator and recording amplifier are turned off at the end of the recording process. The shift(s) of voltage during turn-off is recorded on the tape and sometimes reads back as an audible "pop" or "thump".

In order to prevent the "thump" or "pop" from recording, the rate of change of voltage of the bias oscillator and recording amplifier must be controlled as they are turned off. Because of inherent characteristics of Integrated Circuits (such as that used in ITC original type recording amplifiers), the rate of change of voltage cannot be

totally controlled. The slope of the recording amplifier voltage at turnoff may be a snap with a slight stutter in it as compared to the smooth turn-off slope of the bias oscillator. The criss-crossing of these two slopes causes the "thump" that is sometimes heard.

International Tapetronics Corporation has developed a new recording amplifier which utilizes all discrete components. We feel that this circuit is a more reliable design than the original type used in our equipment. By using discrete components, we have been able to control the voltage shifts to a point at which the "thumps" have been virtually eliminated.

With a few simple modifications, the new recording amplifier card can replace original type recording amplifiers. These modifications are included in a set of instructions which are sent with new recording amplifier printed circuit cards.

NOTE

→ A visual inspection of your equipment can be made to determine the type of recording amplifier used. Original type recording amplifiers are ITC part number 831-0005 and utilize an RCA CA3052 Integrated Circuit. Part number for the new program recording amplifier is 831-0042. These part numbers are located on the foil side of the circuit card.

In most cases the suggested wiring and component changes will reduce the "thump" to an acceptable level in situations where it has been found audible. If, however, the "thump" is still at too high of a level, the new recording amplifier, coupled with the wiring and component changes will virtually eliminate the transient.

For a period of one month, ITC will make the new recording amplifier available for replacement on a cost basis. A request, phone or written, should be made for:

PROGRAM RECORD AMPLIFIER, MONO KIT - 878-0018-000      \$18.21

PROGRAM RECORD AMPLIFIER, STEREO KIT - 878-0018-010      \$26.09

(Please specify type of Recorder - Mono, Stereo, Single Cue Speed or High-Speed Cue.)

*Complete in our  
machines*



2425 SOUTH MAIN STREET  
BLOOMINGTON, ILLINOIS 61701  
309-828-1381

September 16, 1974

Chief Engineer:

We have recently undertaken a program in the engineering department at International Tapetronics Corporation to update and improve circuitry on all cartridge recorder and reproducer equipment. Enclosed with this letter are Technical Service Bulletins which directly relate to the improvements resulting from this program.

You will notice on TSI Bulletin 74-3 that a number of component values have been marked in red. I strongly recommend that the values of resistors R140, R141, R143, and R144 (R143 and R144 are on stereo cards only) be changed to those shown. The new values will allow greater dynamic range and prevent premature clipping of musical or voice peaks. Distortion will also be improved even at normal operating levels.

If you have received ITC cartridge equipment within the last four weeks, it is very important that the noted values be changed as per the schematic. An engineering error was made and some incorrect values were inserted which can cause high distortion at peak operating levels. A visual inspection and comparison of the program reproduce amplifier PC card is the only way to know whether these values must be changed. The PC card number (831-0027) can be found on the etched (foil) side of the board.

We do feel the enclosed information is valuable and that by making the recommended changes, improved performance can result. If you have any questions or need additional information concerning these Service Bulletins, please feel free to write or call ITC. I will be happy to be of service to you.

Cordially,

A handwritten signature in blue ink that reads 'Kerry L. Meyer'.

Kerry L. Meyer  
Customer Service

KLM/gk

enc.



*Complete in our  
Machines*

**TECHNICAL  
SERVICE  
INFORMATION**

2425 South Main Street    Bloomington, Illinois 61701    Telephone: 309-828-1381

TSI BULLETIN 74-2

TO:            CHIEF ENGINEER

SUBJECT: NEW DIGITAL CUE DETECTOR PC CARD FOR ITC CARTRIDGE EQUIPMENT WITH HIGH SPEED CUE OPTION (SP-0005, SP-0006, WP-0005, WP-0006, RP-0005, AND RP-0006).

REASON: The policy at INTERNATIONAL TAPETRONICS CORPORATION is to update circuitry as much as is practical especially when the latest technology can offer a significant improvement in circuit design and performance. Recently a new device has been made available which provides an ideal solution to high speed cue equipped cartridge equipment.

High speed cue machines have a unique requirement in that the 1 kHz detector must have the ability to sense any frequency between 925 Hz and 4300 Hz (1 kHz,  $\pm$  75 Hz, increases as much as four times in the high speed cue mode) and yet reject any frequency outside this band along with any associated harmonics. This a very difficult requirement as 150 Hz cue tones may be as high in frequency as 720 Hz in the high speed cue mode (150 Hz,  $\pm$  30 Hz, times 4) and the level of these tones and their harmonics is nearly prohibitive. These cue tones, however, must be rejected to prevent false cueing.

The device used in the ITC improved circuit uses a multi-purpose frequency sensitive switch which offers ideal characteristics for use in the high speed cue circuit. This integrated circuit (of the MOS/MSI type) actually amounts to a digital filter. It can detect any frequency within a predetermined band. This predetermined band is very stable and can be maintained within a wide operating voltage and temperature range. The thresholds of the band are extremely sharp and can produce an effective "Q" factor which may exceed 1000. The device is not amplitude sensitive and it is immune to noise and harmonics.

This new circuit, along with its associated interface, has been incorporated into a directly replaceable plug-in PC card. Eleven of these cards have been field-tested by ITC customers and have proven themselves to be extremely reliable. We feel this new PC card to be the ideal solution to a situation which has historically had some drawbacks.

ITC is offering this new PC card to customers with high speed cue equipped machines at a special reduced price until November 15, 1974. This card directly replaces (no modifications required) PC card #831-0016-023 and PC card #831-0043-003.

A request by phone or mail may be made for: PC Card, Digital High Speed Cue Detector, Part #831-0085-003, Special Price—\$71.07.



*Complete in our  
machines*

**TECHNICAL  
SERVICE  
INFORMATION**

2425 South Main Street Bloomington, Illinois 61701 Telephone: 309-828-1381

TSI BULLETIN 74-3

TO: CHIEF ENGINEER

SUBJECT: COMPONENT CHANGES IN THE PROGRAM REPRODUCE AMPLIFIER WITH SQUELCH CIRCUITRY. USED ON SP, WP, 3D, AND RP SERIES. PC CARD PART NUMBERS—831-0027-003 — MONOPHONIC AND 831-0027-013 — STEREOPHONIC.

REASON: INTERNATIONAL TAPETRONICS CORPORATION has recently undertaken a program to evaluate present circuitry in all ITC cartridge equipment with the goal of improvement and design update where possible.

Three specific areas which relate to overall performance were considered when analyzing the program reproduce amplifier: 1) reliability; 2) response; and, 3) thermal stability.

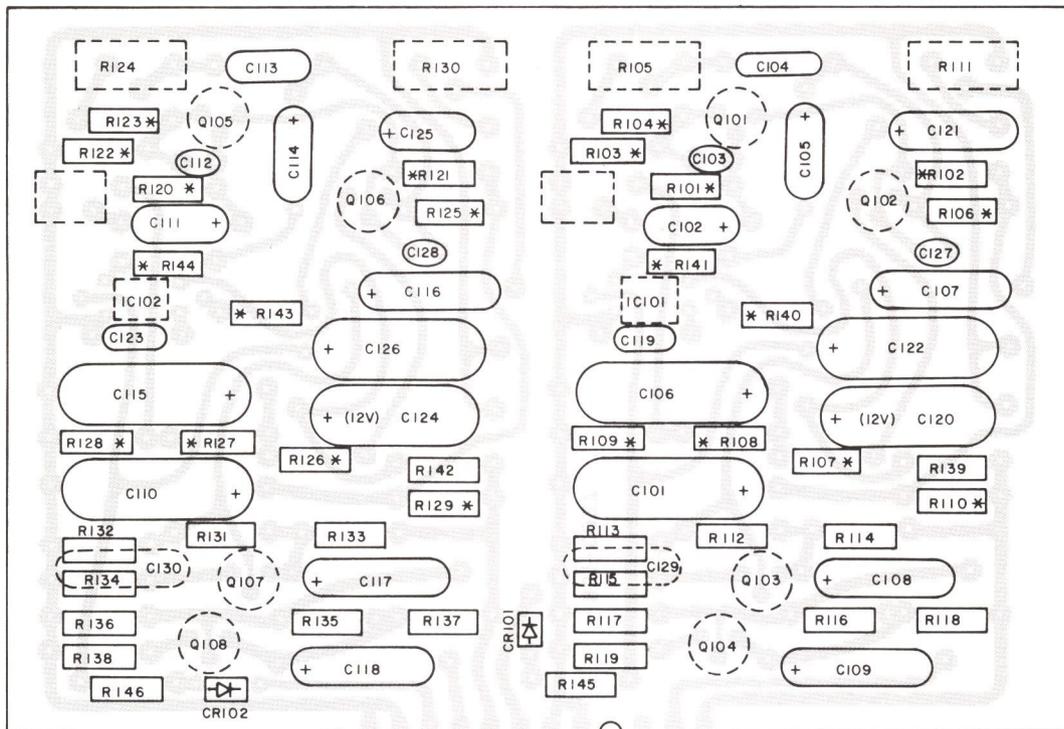
1. The reliability factor is related to control of the squelch circuitry (IC101 and IC102). The following circuit changes have been made.
  - a. R139 (also R142 on stereo cards) has been changed from 2.2k ohms to 1000 ohms — ½ watt. This improvement allows the IC chip to operate in a more reliable supply voltage region.
  - b. R145 (also R146 on stereo cards) has been changed from 2.2k ohms to 1.5k ohms — ½ watt. This improves the "turn-on" reliability of the squelch amplifier and prevents inconsistent output level.
2. The response of the amplifier has been improved between the frequencies of 8 kHz to 15 kHz. Add a .022 mfd. capacitor in parallel with resistor R115 (also R134 on stereo cards).

3. The thermal stability and signal-to-noise ratio has been improved by rebiasing in the preamplifier and output stages and by using low noise carbon film resistors in critical areas. Capacitor values and transistor types have also been changed.

<u>Component</u>	<u>Old Value</u>	<u>New Value</u>
R102	220k ohms	100k ohms carbon film
R104	1.8k ohms	3.3k ohms carbon film
R106	2.2k ohms	10k ohms carbon film
R107	330 ohms	1k <span style="background-color: black; color: black;">████</span> ohms carbon film
R108	2.2k ohms	6.8k ohms carbon film
R109	470 ohms	1.5k ohms carbon film
R110	6.8k ohms	22k ohms (mono) 18k ohms (stereo)
*R121	220k ohms	100k ohms carbon film
*R123	1.8k ohms	3.3k ohms carbon film
*R125	2.2k ohms	10k ohms carbon film
*R126	330 ohms	1k <span style="background-color: black; color: black;">████</span> ohms carbon film
*R127	2.2k ohms	6.8k ohms carbon film
*R128	470 ohms	1.5k ohms carbon film
*R129	6.8k ohms	18k ohms carbon film
R116	33k ohms	22k ohms
R117	10k ohms	4.7k ohms
R140	4.7k ohms	2200 <span style="background-color: black; color: black;">████</span> ohms
R141	10k ohms	47k <span style="background-color: black; color: black;">████</span> ohms
*R135	33k ohms	22k ohms
*R136	10k ohms	4.7k ohms
*R143	4.7k ohms	2200 <span style="background-color: black; color: black;">████</span> ohms
*R144	10k ohms	47k <span style="background-color: black; color: black;">████</span> ohms
C104	.015 mfd.	.01 mfd. 200 v
*C113	.015 mfd.	.01 mfd. 200 v
Q103	2N3053 NPN	2N5816 NPN
Q104	2N3053 NPN	2N5816 NPN
*Q107	2N3053 NPN	2N5816 NPN
*Q108	2N3053 NPN	2N5816 NPN

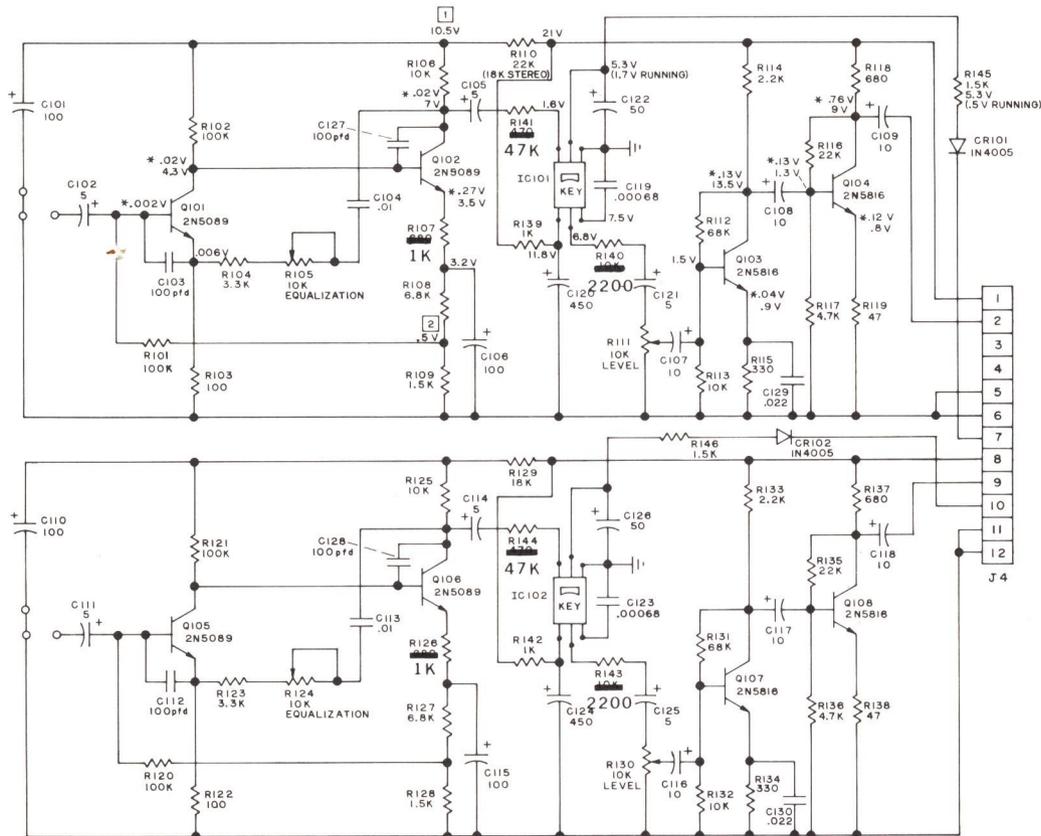
\* Indicates additional components on stereo cards.

NOTE: All resistors are 1/2 watt. 5% tolerance.



\* LOW NOISE RESISTOR

PROGRAM REPRODUCE AMPLIFIER  
831-0027-013 STEREOPHONIC



Schematic—Program Reproduce Amplifier

# ADDENDUM

## PROGRAM REPRODUCE AMPLIFIER FOR SP, WP, RP, RPD, & 3D MACHINES

831-0094-003 (Mono)  
831-0094-013 (Stereo)

### General Description

The Program Reproduce Amplifier shown in the Technical Manual has been replaced with a new amplifier circuit bearing ITC part number 831-0094-003 (mono) or 831-0094-013 (stereo). The new amplifier offers improved sonic performance, passive squelching and increased reliability.

All interconnect wiring to the 831-0094 printed circuit board (via J4) remains as represented in the Technical Manual. However, one jumper wire has been added from the Program Reproduce Amplifier edge connector, J4, Pin 3 to the Detector card edge connector, J5, Pin 5. This jumper supplies 24 volts to the squelch devices (LDR 101 and LDR 102) on the Program Reproduce Amplifier P.C. card.

### Circuit Description

The 831-0094-003 (mono) and 831-0094-013 (stereo) Program Reproduce Amplifiers are provided to amplify and contour the signal supplied by the reproduce tape head.

On stereo units the Left Channel and Right Channel are identical. Therefore, the description on the following page references components in the Left Channel Only.



INTERNATIONAL TAPETRONICS CORPORATION

2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

TELEPHONE: 309-828-1381

## Circuit Description (continued)

The input signal is coupled from the reproduce tape head to the first stage via coupling capacitor C102. Transistors Q101 and Q102 serve as a pre-amplifier which is stabilized to prevent performance variations. DC Feedback is supplied to the base of Q101 from the emitter of Q102 via R101, R107, and R108. AC feedback from the collector of Q102 to the emitter of Q101 (C105, R105, and R104) determines the frequency response of the amplifier. Variable "equalization" is provided by potentiometer R105. C103 and C104 are included for high frequency (RF) rejection.

The output of the pre-amplifier is AC coupled (C107) to the Light Dependent Resistor, LDR 101, which functions as a squelching device. LDR 101 and R113 form a signal voltage divider circuit. The resistance of LDR 101 is controlled by the internal lamp element's brilliance. In this application, the lamp is either fully "on" or "off" as determined by relay K1. With the deck in the run mode, a ground path is supplied to LDR 101 via contacts 6 and 10 of relay K1. Hence, the resistance element of LDR 101 exhibits minimum resistance and the potential across R113 is at its maximum value.

Signal from R113 is again AC coupled (C108) to the base of Q103, a common emitter amplifier stage, with the biasing resistor, R114, connected between the collector and base for DC and temperature stability. The collector output of Q103 is AC coupled (C109) to the base of driver transistor Q104. Q104 supplies drive current for complimentary amplifiers Q105 and Q106. Transistors Q104, Q105, and Q106 are direct coupled with local feedback provided by R119. The output stage (Q105 and Q106) is AC coupled (C111) to Pin 2 of J4.

PARTS LIST

831-0094-003 (Mono)  
831-0094-013 (Stereo)

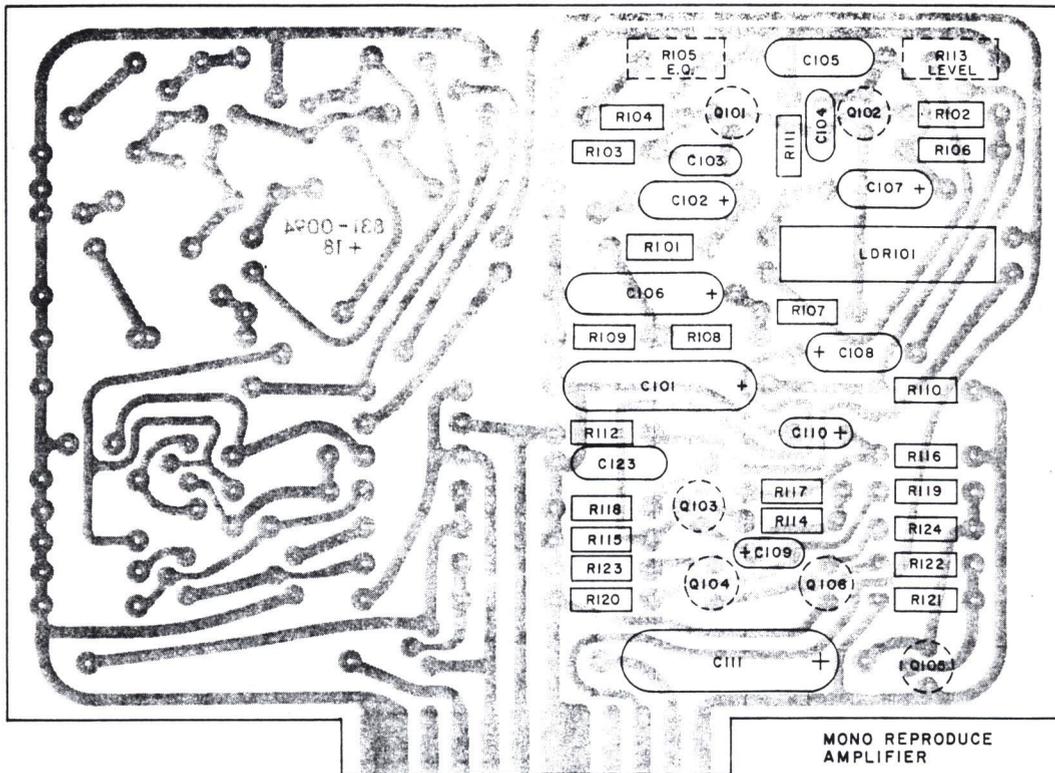
<u>Component</u> (LC-RC)	<u>ITC Part Number</u>	<u>Description</u>
R101, R129	630-0311-000	Resistor, 100K ohm 1/2 watt 5%
R102, R125	630-0303-000	Resistor, 47K ohm 1/2 watt 5%
R103, R126	630-0247-000	Resistor, 220 ohm 1/2 watt 5%
R104, R127	630-0269-000	Resistor, 1.8K ohm 1/2 watt 5%
R105, R128	636-0002-000	Potentiometer, 10K ohm 1/4 watt
R113, R137	"	"
R106, R130	630-0271-000	Resistor, 2.2K ohm 1/2 watt 5%
R117, R141	"	"
R121, R145	"	"
R107, R131	630-0251-000	Resistor, 330 ohm 1/2 watt 5%
R118, R142	"	"
R108, R132	630-0267-000	Resistor, 1.5K ohm 1/2 watt 5%
R109, R133	630-0255-000	Resistor, 470 ohm 1/2 watt 5%
R110, R134	630-0285-000	Resistor, 8.2K ohm 1/2 watt 5%
R111, R135	630-0295-000	Resistor, 22K ohm 1/2 watt 5%
R120, R144	"	"
R112, R136	630-0258-000	Resistor, 620 ohm 1/2 watt 5%
R114, R138	630-0307-000	Resistor, 68K ohm 1/2 watt 5%
R115, R139	630-0287-000	Resistor, 10K ohm 1/2 watt 5%
R116, R140	"	"
R119, R143	630-0315-000	Resistor, 150K ohm 1/2 watt 5%
R122, R146	630-0252-000	Resistor, 360 ohm 1/2 watt 5%
R123, R147	630-0231-000	Resistor, 47 ohm 1/2 watt 5%
R124, R148	630-0223-000	Resistor, 22 ohm 1/2 watt 5%
C101, C112	696-0124-000	Capacitor, Electrolytic 100MFD, 25V
C102, C113	696-0114-000	Capacitor, Electrolytic 5MFD, 25V
C107, C118	"	"
C108, C119	"	"
C103, C114	677-0001-000	Capacitor, Silver Mica 100PFD 300V
C104, C115	"	"
C105, C116	681-0048-000	Capacitor, Paper .015 MFD 200V
C106, C117	696-0078-000	Capacitor, Electrolytic 100 MFD 12V
C109, C120	694-0003-000	Capacitor, Tantalum 4.7 MFD 35V
C110, C121	694-0007-000	Capacitor, Tantalum 47 MFD 20V
C111, C122	696-0201-000	Capacitor, Electrolytic 220 MFD 25V
C123, C124	681-0050-000	Capacitor, Paper .022 MFD 200V

PARTS LIST (cont.)

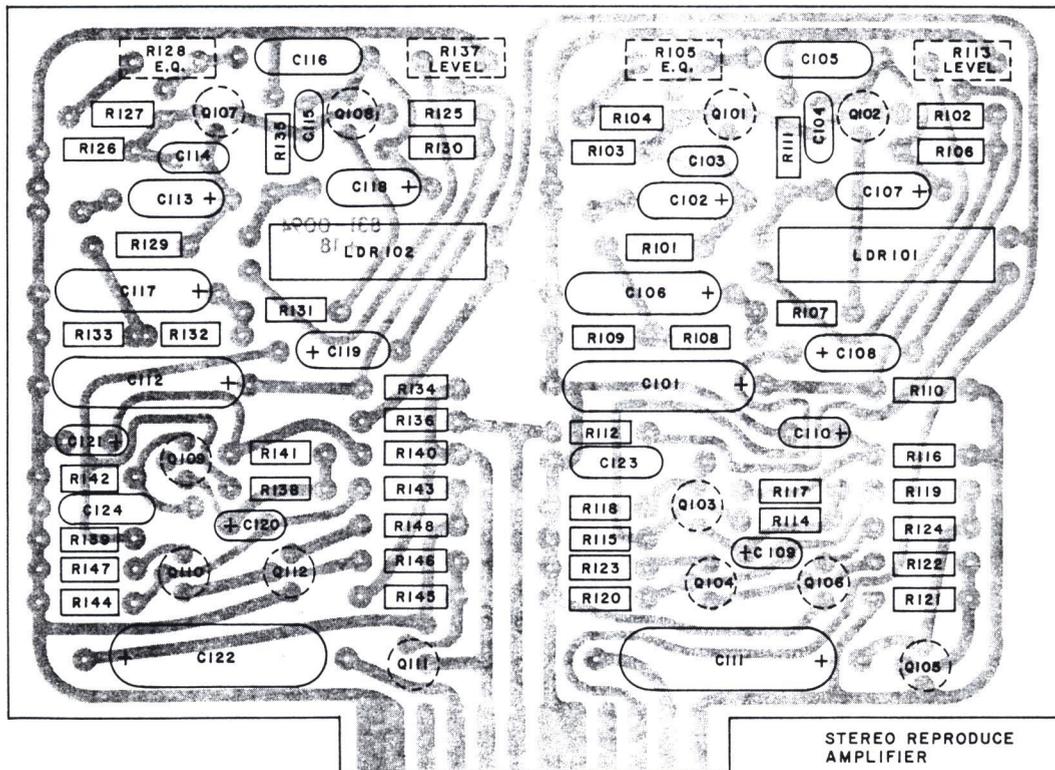
<u>Component</u>	<u>ITC Part Number</u>	<u>Description</u>
Q101, Q107	590-0013-000	Transistor, 2N5089
Q102, Q108	"	"
Q103, Q109	590-0017-000	Transistor, 2N5816
Q104, Q110	"	"
Q105, Q111	"	"
Q106, Q112	590-0018-000	Transistor, 2N5817
LDR101	650-0003-000	LDR, Sigma, 301-T1-12B1
LDR102	"	"

Miscellaneous Parts

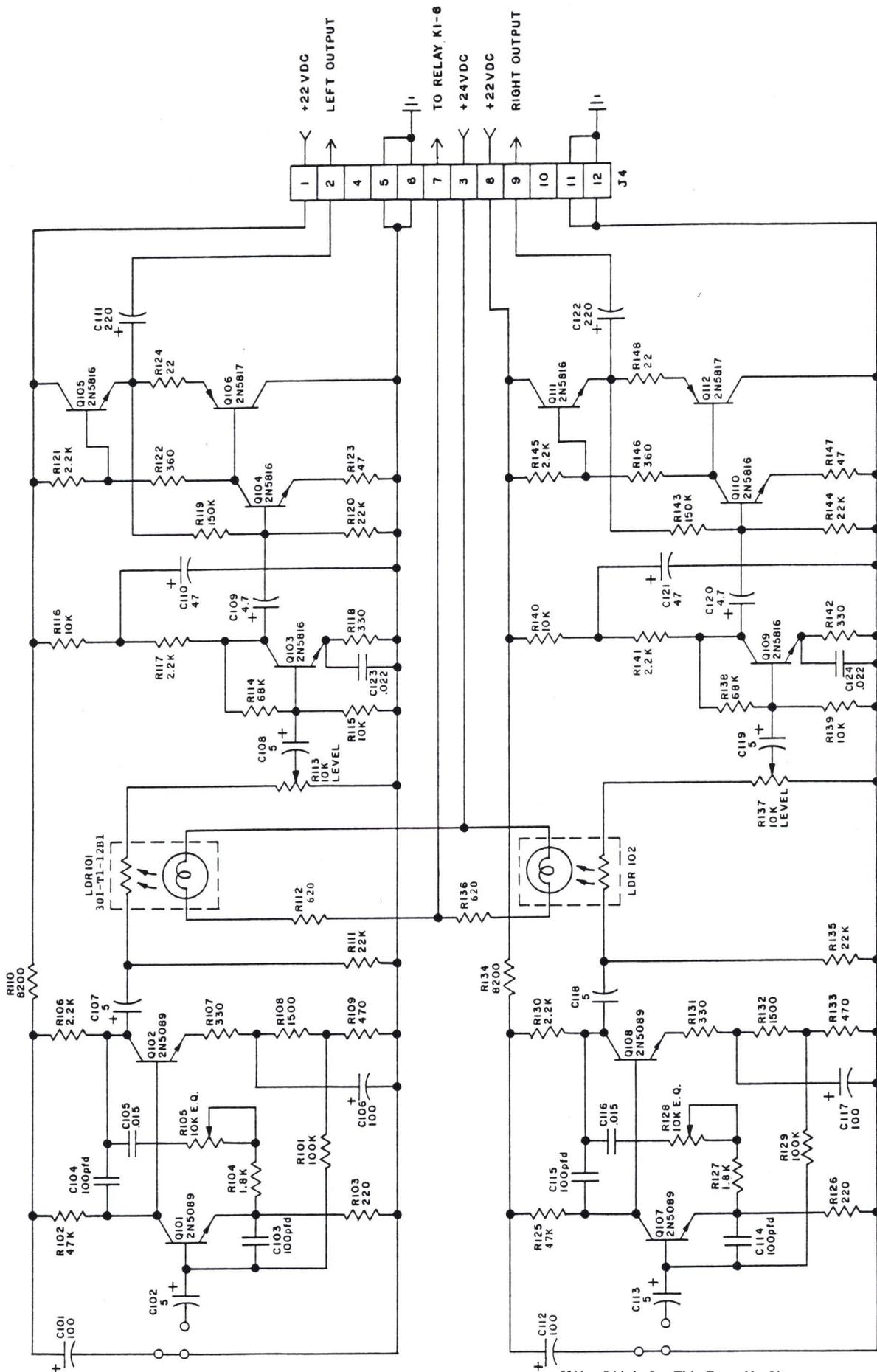
(3/6)	282-0002-000	Pin, Terminal, P.C.
(1)	325-0094-003	P.C. Card, Mono
(1)	325-0094-013	P.C. Card, Stereo
(12)	613-0001-000	Socket, Transistor



MONO REPRODUCE  
AMPLIFIER  
831-0094-003



STEREO REPRODUCE  
AMPLIFIER  
831-0094-013



TITLE		SCHEMATIC - SP, WP, 3D
		+18dBm REPRODUCE AMP.
INTERNATIONAL TAPETRONICS CORPORATION		893-0064-003
McCOMBSON, I.L.L. 6/10/61	DRAWING NUMBER	REV.

If You Didn't Get This From My Site,  
Then It Was Stolen From...  
[www.SteamPoweredRadio.Com](http://www.SteamPoweredRadio.Com)



878-0017-000 MONO KIT

878-0017-010 STEREO KIT

### PROGRAM AMPLIFIER WITH SQUELCH

The parts supplied in this kit are for the addition of the new program amplifier with squelch (831-0027-003, mono or 831-0027-013, stereo) to machines not originally equipped with this amplifier. A schematic of the new circuit is attached to this sheet.

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
1	575-0007-000	Diode 1N4005
1		Hook-up wire, 24"
1		Teflon insulation, 4"
(1)	831-0027-003	Program Amplifier (Monophonic only)
(1)	831-0027-013	Program Amplifier (Stereophonic only)

### INSTRUCTIONS

1. Connect the 1N4005 diode to pins 13 and 14 of Relay K1 with the cathode end (striped) on pin 14. Use the enclosed teflon insulation to cover the bare leads of the diode.
2. Connect a jumper wire to pins 7 and 10 of the program amplifier socket J4, and then to pin 6 of Relay K1.
3. Replace the original type program amplifier with the new.



MONO 831-0027-003  
STEREO 831-0027-013

www.SteamPoweredRadio.Com

Symbol Part Number Description

**CAPACITORS**

C105	696-0114-000	5 mfd, 25V
C119	681-0032-000	680 pf, 200V
C120	696-0055-000	400 mf, 10V
C121	696-0114-000	5 mf, 25V
C122	696-0122-000	50 mf, 25V

**CAPACITORS (Stereo Only)**

C114	696-0114-000	5 mfd, 25V
C123	681-0032-000	680 pf, 200V
C124	696-0055-000	400 mf, 10V
C125	696-0114-000	5 mfd, 25V
C126	696-0122-000	50 mf, 25V

**TRANSISTORS**

Q101	590-0013-000	2N5089
Q102	590-0013-000	2N5089
Q103	590-0001-000	2N3053

**TRANSISTORS (Stereo Only)**

Q105	590-0013-000	2N5089
Q106	509-0013-000	2N5089
Q107	590-0001-000	2N3053

**RESISTORS**

R102	626-0319-000	220k Ohms, ½ watt, 5%
R107	626-0251-000	330 Ohms, ½ watt, 5%
R109	626-0255-000	470 Ohms, ½ watt, 5%
R139	626-0271-000	2.2k Ohms, ½ watt, 5%
R140	626-0279-000	4.7k Ohms, ½ watt, 5%
R141	626-0287-000	10k Ohms, ½ watt, 5%
R145	626-0271-000	2.2k Ohms, ½ watt, 5%

**RESISTORS (Stereo Only)**

R121	626-0319-000	220k Ohms, ½ watt, 5%
R126	626-0251-000	330 Ohms, ½ watt, 5%
R128	626-0255-000	470 Ohms, ½ watt, 5%
R142	626-0271-000	2.2k Ohms, ½ watt, 5%
R143	626-0279-000	4.7k Ohms, ½ watt, 5%
R144	626-0287-000	10k Ohms, ½ watt, 5%
R146	626-0271-000	2.2k Ohms, ½ watt, 5%

**INTEGRATED CIRCUIT**

IC101	606-0003-000	MFC 6040
-------	--------------	----------

**INTEGRATED CIRCUIT (Stereo Only)**

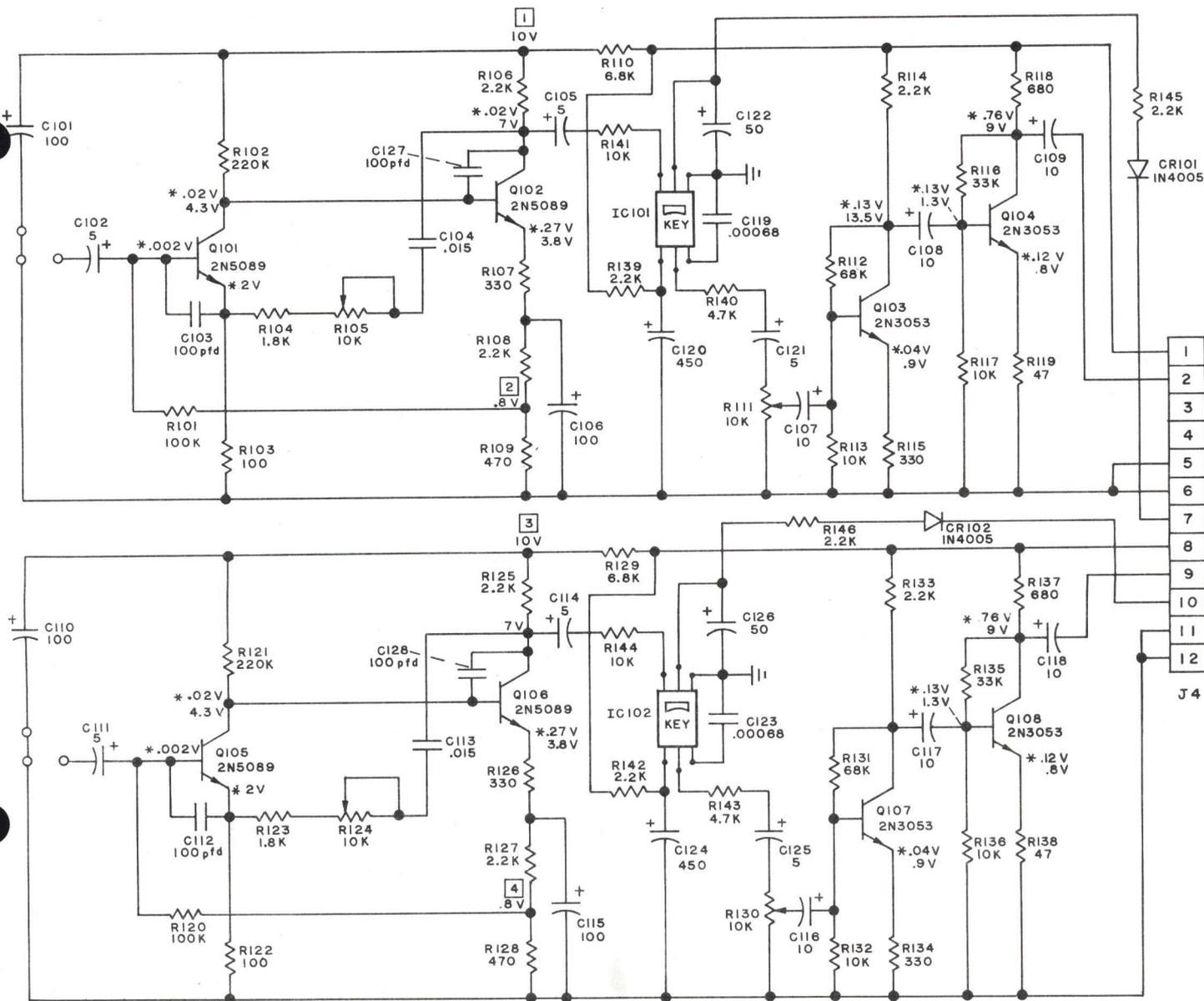
IC102	606-0003-000	MFC 6040
-------	--------------	----------

**DIODE**

CR101	575-0007-000	1N4005
-------	--------------	--------

**DIODE (Stereo Only)**

CR102	575-0007-000	1N4005
-------	--------------	--------



878-0018-000 MONO KIT  
878-0018-010 STEREO KIT  
PROGRAM RECORDING AMPLIFIER

The parts supplied in this kit are for the replacement of original type recording amplifiers (831-0005-003, MONO, and 831-0005-013, STEREO) with the new discrete components program recording amplifier.

PARTS LIST

<u>QUANTITY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	626-0463-000	1,000 ohm resistor - 1 watt
(1)	681-0058-000	.1 mfd. 200V, Capacitor, Paper
1	685-0001-000	.47 mfd. 250V, Capacitor, Met. Poly.
(1)	831-0042-003	Program Record Amplifier - Mono
(1)	831-0042-013	Program Record Amplifier - Stereo

INSTRUCTIONS

1. Remove the .022 mfd. capacitor(s) C301 (and C302 if stereo) located on the underside of the recorder chassis on the program recording amplifier card edge socket J302. These capacitors are now located on the new recording amplifier card and need to be removed from the chassis for proper operation.
2. Replace resistor R707 on the control card with the enclosed 1,000 ohm, 1 watt resistor. The leads will need to be slightly folded under in order to mount in the existing holes.

NOTE: On newer machines, this resistor may have been changed at the factory. If so, disregard this step.

3. Replace capacitor C704 on the control card with the enclosed .47 mfd. capacitor (.1 mfd. on high speed cue machines). This capacitor may have been changed at the factory on some models and, if so, this step should also be disregarded.
4. Remove the original recording amplifier and replace with the new circuit card.
5. Refer to SECTION IV - ELECTRICAL ADJUSTMENTS, in the Recording Amplifier Instruction Manual for the following adjustments:
  - a. PROGRAM BIAS TRAP ADJUSTMENT
  - b. PROGRAM PLAY METER ADJUSTMENT
  - c. PROGRAM RECORD EQUALIZATION
  - d. PROGRAM RECORD METER ADJUSTMENT
  - e. PROGRAM BIAS METER ADJUSTMENT
  - f. CUE BIAS METER ADJUSTMENT
  - g. CUE TONE (PLAY) METER ADJUSTMENT

Refer to the attached sheet for parts location and schematic diagram of the circuit.

## PARTS LIST - PROGRAM RECORDING AMPLIFIER CARD

831-0042-003 (MONO)

831-0042-013 (STEREO)

<u>SYMBOL</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
CAPACITORS		
C401	694-0003-000	4.7 mfd, 35V, Tantalum
C402	677-0001-000	100 pfd, 300V, Silver Mica
C403	694-0005-000	1 mfd, 35V, Tantalum
C404	696-0122-000	50 mfd, 25V, Electrolytic
C405	681-0040-000	.0033 mfd, 200V, Paper
C406	694-0004-000	.47 mfd, 35V, Tantalum
C407	694-0005-000	1 mfd, 35V, Tantalum
C408	681-0046-000	.01 mfd, 200V, Paper
C409	677-0003-000	300 pfd, 300V, Silver Mica
C410	696-0165-000	500 mfd, 25V, Electrolytic
C411	694-0003-000	4.7 mfd, 35V, Tantalum (Stereo Only)
C412	677-0001-000	100 pfd, 300V, Silver Mica (Stereo Only)
C413	694-0005-000	1 mfd, 35V, Tantalum (Stereo Only)
C414	696-0122-000	50 mfd, 25V, Electrolytic (Stereo Only)
C415	681-0040-000	.0033 mfd, 200V, Paper (Stereo Only)
C416	694-0004-000	.47 mfd, 35V, Tantalum (Stereo Only)
C417	694-0005-000	1 mfd, 35V, Tantalum (Stereo Only)
C418	681-0046-000	.01 mfd, 200V, Paper (Stereo Only)
C419	677-0003-000	300 pfd, 300V, Silver Mica (Stereo Only)
C420	694-0005-000	1 mfd, 35V, Tantalum
C421	681-0030-000	470 pfd, 200V, Paper
C422	696-0078-000	100 mfd, 12V, Electrolytic
C423	681-0034-000	.001 mfd, 200V, Paper
C424	694-0003-000	4.7 mfd, 35V, Tantalum
C425	681-0050-000	.022 mfd, 200V, Paper
C426	694-0005-000	1 mfd, 35V, Tantalum (Stereo Only)
C427	681-0030-000	470 pfd, 200V, Paper (Stereo Only)
C428	696-0078-000	100 mfd, 12V, Electrolytic (Stereo Only)
C429	681-0034-000	.001 mfd, 200V, Paper (Stereo Only)
C430	694-0003-000	4.7 mfd, 35V, Tantalum (Stereo Only)
C431	681-0050-000	.022 mfd, 200V, Paper (Stereo Only)
C432	696-0122-000	50 mfd, 25V, Electrolytic

## DIODES

CR401	575-0001-000	1N295
CR402	575-0001-000	1N295
CR403	575-0001-000	1N295
CR404	575-0001-000	1N295
CR405	575-0001-000	1N295 (Stereo Only)
CR406	575-0001-000	1N295 (Stereo Only)
CR407	575-0001-000	1N295 (Stereo Only)
CR408	575-0001-000	1N295 (Stereo Only)

## TRANSISTORS

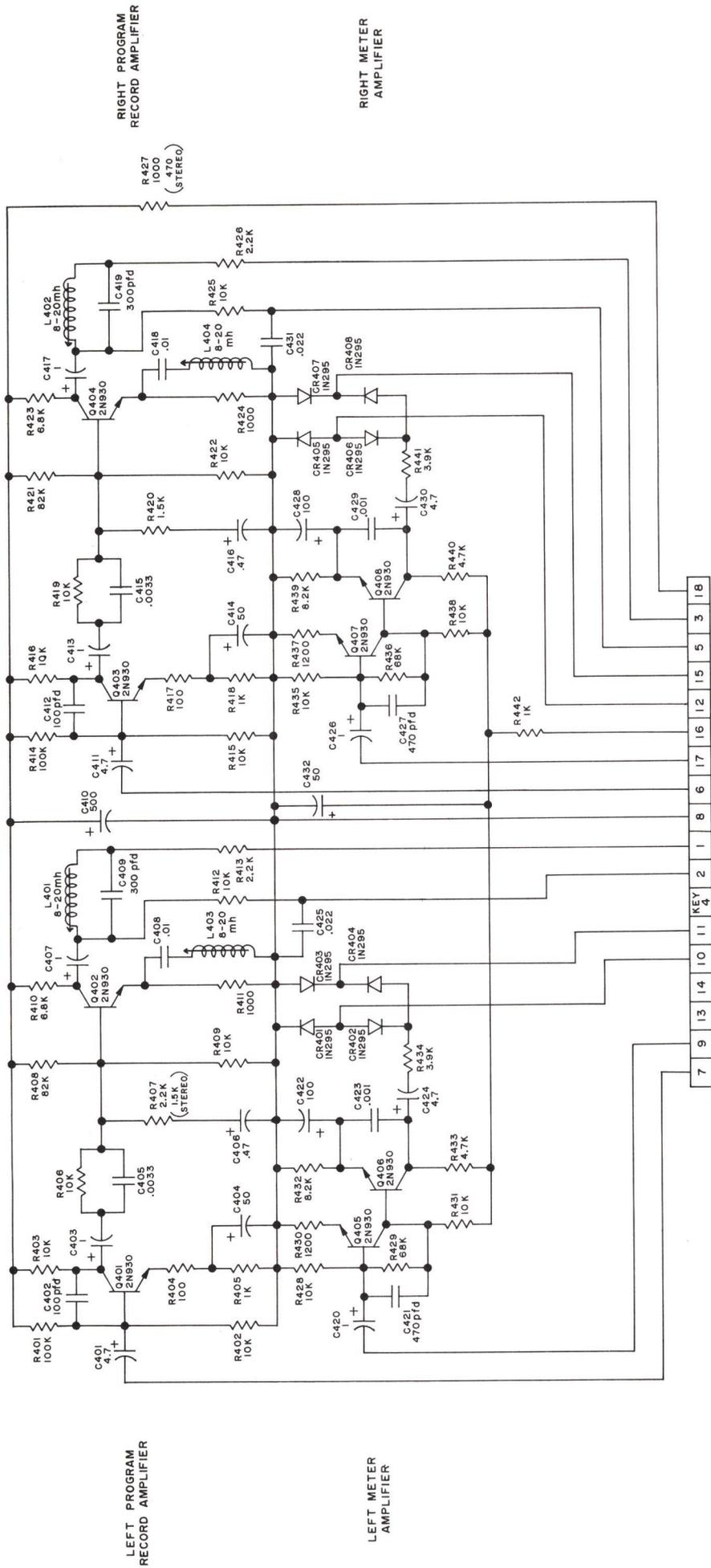
Q401	590-0011-000	2N930	NPN
Q402	590-0011-000	2N930	NPN
Q403	590-0011-000	2N930	NPN (Stereo Only)
Q404	590-0011-000	2N930	NPN (Stereo Only)
Q405	590-0011-000	2N930	NPN
Q406	590-0011-000	2N930	NPN
Q407	590-0011-000	2N930	NPN (Stereo Only)
Q408	590-0011-000	2N930	NPN (Stereo Only)

## INDUCTORS

L401	513-0004-000	Variable, 8-20 MH
L402	513-0004-000	Variable, 8-20 MH (Stereo Only)
L403	513-0004-000	Variable, 8-20 MH
L404	513-0004-000	Variable, 8-20 MH (Stereo Only)

## RESISTORS (½ watt - 5% tolerance)

R401	626-0311-000	100k Ohm
R402	626-0278-000	10k Ohm
R403	626-0287-000	10k Ohm
R404	626-0239-000	100 Ohm
R405	626-0263-000	1k Ohm
R406	626-0287-000	10k Ohm
R407	626-0271-000	2.2k Ohm (Mono Only)
	626-0267-000	1.5k Ohm (Stereo Only)
R408	626-0309-000	82k Ohm
R409	626-0287-000	10k Ohm
R410	626-0283-000	6.8k Ohm
R411	626-0263-000	1k Ohm
R412	626-0287-000	10k Ohm
R413	626-0271-000	2.2k Ohm
R414	626-0311-000	100k Ohm (Stereo Only)
R415	626-0287-000	10k Ohm (Stereo Only)
R416	626-0287-000	10k Ohm (Stereo Only)
R417	626-0239-000	100 ohm (Stereo Only)
R418	626-0263-000	1k Ohm (Stereo Only)
R419	626-0287-000	10k Ohm (Stereo Only)
R420	626-0267-000	1.5k Ohm (Stereo Only)
R421	626-0309-000	82k Ohm (Stereo Only)
R422	626-0287-000	10k Ohm (Stereo Only)
R423	626-0283-000	6.8k Ohm (Stereo Only)
R424	626-0263-000	1k Ohm (Stereo Only)
R425	626-0287-000	10k Ohm (Stereo Only)
R426	626-0271-000	2.2k Ohm (Stereo Only)
R427	626-0263-000	1k Ohm (Mono Only)
	626-0255-000	470 Ohm (Stereo Only)
R428	626-0287-000	10k Ohm
R429	626-0307-000	68k Ohm
R430	626-0265-000	1200 Ohm
R431	626-0287-000	10k Ohm
R432	626-0285-000	8.2k Ohm
R433	626-0279-000	4.7k Ohm
R434	626-0277-000	3.9k Ohm
R435	626-0287-000	10k Ohm (Stereo Only)
R436	626-0307-000	68k Ohm (Stereo Only)
R437	626-0265-000	1200 Ohm (Stereo Only)

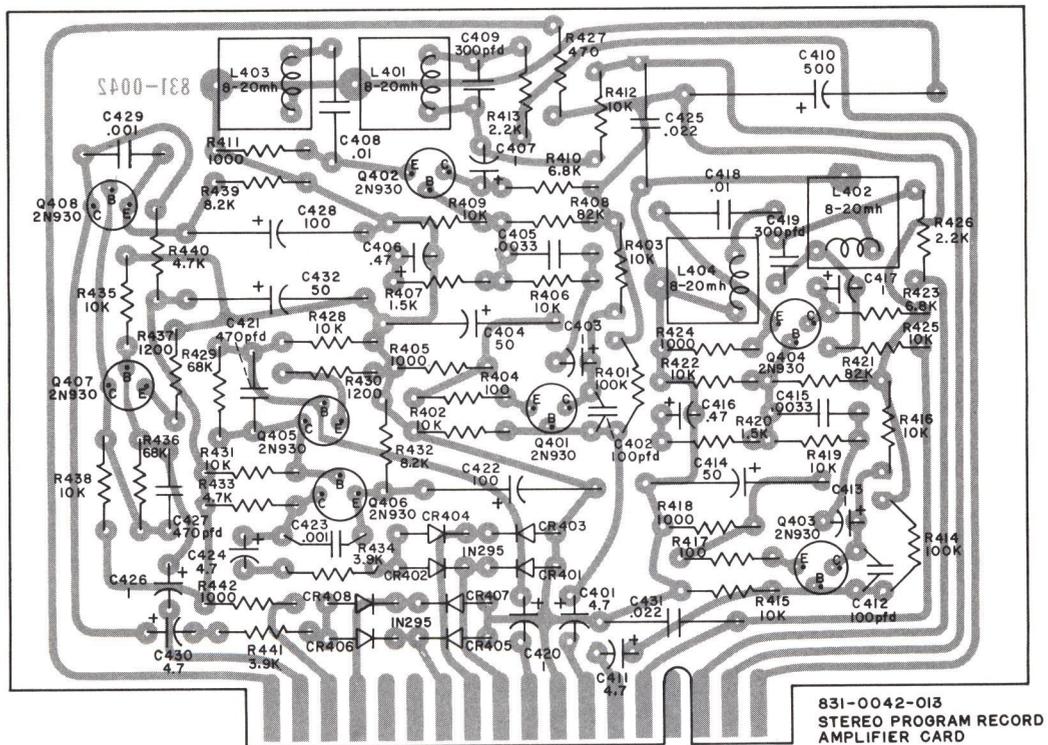
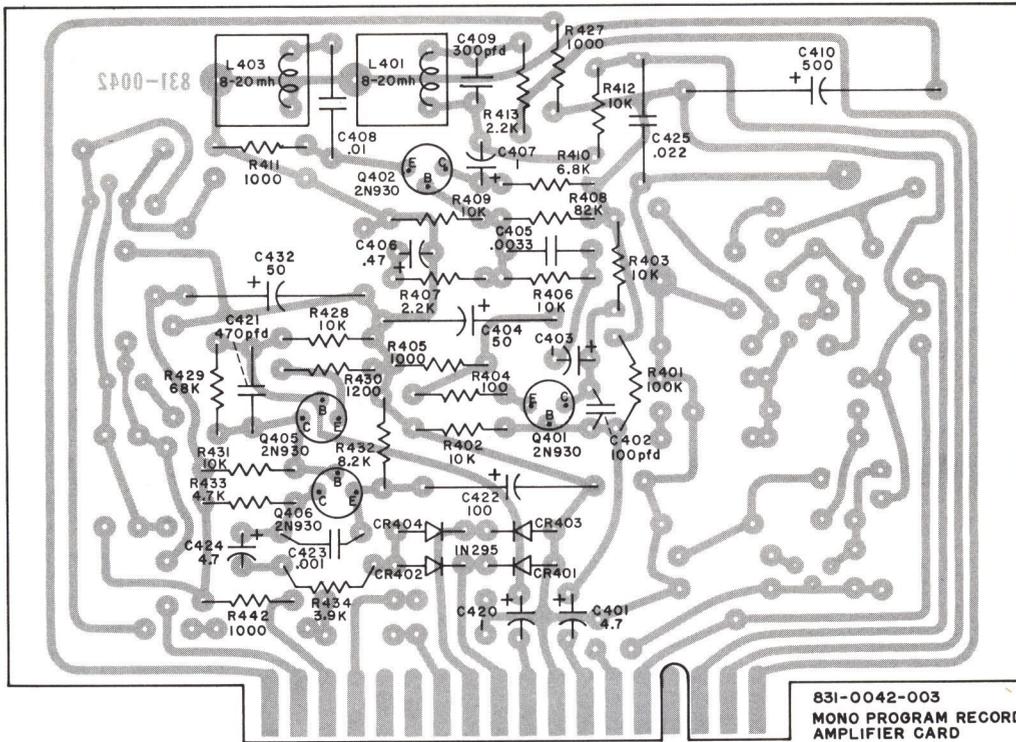


If You Didn't Get This From My Site,  
Then it Was Stolen From...

[www.SteamPoweredRadio.Com](http://www.SteamPoweredRadio.Com)



- R438 626-0287-000
- R439 626-0285-000
- R440 626-0279-000
- R441 626-0277-000
- R442 626-0263-000
- 10k Ohm (Stereo Only)
- 8.2k Ohm (Stereo Only)
- 4.7k Ohm (Stereo Only)
- 3.9k Ohm (Stereo Only)
- 1k Ohm



# ADDENDUM



## ADDENDUM FOR SP, WP, RP, RPD, & 3D

Several changes have been incorporated in ITC cartridge machines to provide enhanced performance and more reliable operation.

### OUTLINE OF IMPROVEMENTS

#### Reproduce Head

A new reproduce head, designed by ITC provides a flatter frequency response, especially in the lower frequencies. Playback frequency response is specified flat + 2 dB from 50 to 15 kHz, but typically is much better than this. The new head, due to its unique construction can last up to 10 times longer than conventional lamination heads. The record head remains a Nortronics Duracore with extended life expectancy.

Ordering information for the new head is as follows:

ITC Part Number	Description
504-0033-000	Head, 2 Track Mono, Reproduce
504-0034-000	Head, 3 Track Stereo, Reproduce

#### Head Mounting Assembly

The head mounting assembly is removable as a unit, maintaining proper alignment. Each adjustment is independent of the other adjustments, and each is lockable. The new head module incorporates a longer azimuth pivot for much finer adjustment. Figure (1) shows an exploded view of the head mounting assembly.

 **INTERNATIONAL TAPETRONICS CORPORATION**  
2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701  
TELEPHONE: 309-828-1381

## Pressure Roller

ITC is now using a pressure roller made from 525K, an advanced rubber compound which exhibits twice the pulling power of ordinary rubber and is not affected by temperature, humidity and all commonly used cleaning substances. The pressure roller also offers five times the life of conventional rollers and increased hardness stability (durometer.) This pressure roller is presently being used in all ITC cartridge machines, and is being shipped as a standard replacement part.

## Cartridge Hold-Down System

The final area of improvement to your ITC unit is a new cartridge hold-down system which provides very precise and repeatable cartridge insertion. This is accomplished by exerting downward pressure on the load-bearing side rails of the cartridge and by applying pressure on the left side of the cartridge to consistently seat it against the right cartridge guide.

## MECHANICAL AND ELECTRICAL ADJUSTMENTS

Some of the following procedures require the use of a tape height gauge. This gauge can be obtained from ITC (part number 830-0022-011). See figure 4 for an illustration of this gauge.

## Cartridge Hold-Down System

Optimum performance from tape cartridges can only occur if the cartridge is positioned accurately and consistently in precisely the same location each time it is inserted into the machine. A means of alignment can be achieved by using a specifically marked cartridge as illustrated in Figure 2. Use a point or scribe and mark the cartridge as shown.

Refer now to Figure 3 in which a cartridge is shown in its properly aligned position. If the alignment cartridge does not position as illustrated, remove the left hand cartridge guide completely and loosen (do not remove) the mounting screws on the right hand cartridge guide. Position the cartridge to the right or left until the scribed lines are located directly over the heads as shown. Be certain that the front edge of the cartridge seats firmly and squarely against the tape guide screws. With the cartridge held securely in this location, position the right hand cartridge guide firmly against the right hand side of the cartridge and then tighten down both cartridge guide mounting screws.

Remove the cartridge and re-insert into the machine forcing it to slide squarely against the right hand guide. Check the alignment again, if it is not exactly positioned, repeat the alignment procedure. It is very important that this alignment is being made as perfectly as possible and that it be consistent in all other cartridge machines. Failure to achieve consistent alignment from machine to machine will create inconsistent tape travel path and thus phase error on stereo machines and azimuth errors on mono.

Mount the left hand cartridge guide as illustrated in Figure 3. A gap of approximately 1/16 inch (1.5 mm) between the edge of the cartridge and the guide is recommended. This will insure correct "seating" of the cartridge each time it is inserted into the machine (an important key to consistent tape travel and alignment).

### Tape Guides

Three independent tape guides are used to provide maximum tape guidance outside of the cartridge. The left tape guide has been specially formed to provide clearance for the cartridge corner post area.

1. Check the positioning of each tape guide by advancing the tape height gauge into the tape guide as shown in Figure 4. The gauge should advance fully into the tape guide without friction, while resting flat on the deck - not tilted as shown by the dashed line (or its opposite) in Figure 4. The tape height gauge must be demagnetized so that it will not affect the heads.
2. If adjustment is required, loosen the two mounting screws.
3. Keeping the tape height gauge flat on the deck, position the tape guide as shown in Figure 4.
  - a. Position the tape guides as close to the head as possible without contacting the head mounting blocks or any parts mounted on these blocks.
  - b. Keep the tape guides vertical. Normally the bottom edge of the tape guide's mounting surface will rest very near the surface of the deck plate.
4. Tighten the tape guide mounting screws and recheck the adjustment.
5. Check and adjust the other tape guides as required. The slot in the tape guide is .249 inch wide (actual tape width is .246, + .002 - .000 inch). The width of this slot can also be properly gauged with the tape height gauge. The arm on the gauge should advance fully into the slot without friction, but there should be no room for noticeable movement of the tool in the slot.

Correctly made adjustments obtained with the tape height gauge will be accurate to less than .001 of an inch.

### Head Height and Zenith

The magnetic tape head nearest the capstan shaft is the reproduce head. The head farthest from the capstan is the record head, except on reproduce only machines. A dummy head is mounted in this position on reproduce only machines in order to maintain constant tension on the tape and thus minimize wow and flutter and improve tape guidance.

The adjustment procedure outlined below should be followed in positioning both the reproduce and record heads. Only height and zenith adjustments are required for a "dummy" head. See Figure 5 for the location of the adjustment screws.

1. Loosen the head adjusting screw lock nut by turning counterclockwise approximately four complete turns.
2. Coarse Height: Adjust the Front Height Set Screw until the top of the upper head track (pole Piece) is 9/16 of an inch above the deck surface.
3. Coarse Zenith: Adjust the Rear Height Set Screw until the face of the head is perpendicular with the surface of the deck. Position the Tape Height Gauge (or any gauge known to be square) on the deck surface and move it against the face of the head as shown in Figure 6. The gauge must be demagnetized before making adjustments. Be careful to avoid scratching the face of the head. When the head is perpendicular, the face of the head and the "square" will be flush.
4. Fine Height and Zenith: This adjustment is made using the tape height gauge.
  - a. Position the gauge in front of the face of the heads as the tape would be positioned if it were being played (Figure 4).
  - b. Alternately adjust the Rear and Front Height Set screws to position the top of the upper head track (pole piece) so that it is even with the upper edge of the gauge, and to position the bottom of the lower head track (pole piece) so that it is even with the lower edge of the gauge. The set screws should be adjusted by equal amounts in the same direction.
  - c. Recheck the zenith of the head instructed in step 3. If adjustment is necessary, height must also be rechecked and adjusted until both height and zenith are perfect.
  - d. Carefully tighten the Front and Rear Height Lock Nuts. Recheck the height and zenith adjustments. If a change has resulted, repeat the Fine Height and Zenith adjustments.

## Mono Azimuth Adjustments

Before attempting these adjustments, insure that the mechanical adjustments of the tape guides and the adjustment of height and zenith of both the Record and Reproduce heads (or Reproduce and "dummy" in Reproduce only machines) are correct.

### 1. Reproduce Head Azimuth Adjustment:

- a. Connect a 600 ohm load to the reproduce amplifier output terminals. Connect a high impedance voltmeter across this load.
- b. Insert a 15 kHz Standard Azimuth Alignment Tape and start the machine.
- c. Adjust the reproduce head azimuth set screw (refer to Figure 5 for location) to produce maximum output level.
- d. Carefully tighten the lock nut observing the voltmeter to insure that no change in output level occurs.

### 2. Record Head Azimuth Adjustment: It is reminded that changes in azimuth to the Master Record head can result in azimuth errors in all the Reproduce machines within a system unless the resultant azimuth is carefully checked against each of these Reproducers. Any change in azimuth of the record head should be attempted ONLY AFTER all mechanical adjustments are carefully checked and the Master Reproduce head is aligned to the 15 kHz Standard Azimuth Alignment Tape as above.

- a. Select an erased 3 1/2 minute cartridge which is known to have consistently good operating characteristics. It is suggested that this cartridge be set aside and used only for recording head adjustments. It thus will become the standard for your operation.
- b. Connect a 600 ohm load to the Reproducer output terminals. Connect a high impedance voltmeter across this load.
- c. Connect an audio oscillator to the recorder input and set it for -10 dBm at 15 kHz.
- d. Start the recorder and adjust the azimuth set screw on the record head to produce maximum output level (See Figure 5).
- e. Carefully tighten the lock nut observing the voltmeter to insure that no change in output level occurs.

## Stereo Azimuth Adjustment

Two track stereo recording-reproducing performance is subject to several contributing mechanical inaccuracies which can cause phase shift in simultaneously monitored reproducer outputs. In stereo systems these phase shifts are generally not perceptible in the final reproduction; however, in cases where monophonic "dubbing" or channel summing is desired, phase shifts can result in serious amplitude variations or drop-outs especially at the higher frequencies. Most common causes of these problems are:

1. Lateral displacement of the pole pieces with respect to each other within the head case.
2. Improper azimuth of the heads with respect to each other (record head to reproduce head on any reproducer in a system).
3. Improper tape guidance (skew) either within the cartridge or through the tape guide system.

International Tapetronics has attempted to provide the best features possible to assist in the proper guidance of tape outside of the cartridge. Three adjustable tape guides, heavy-duty micro-adjustable patented head module, and the use of "dummy" heads in Reproduce only machines, lend to consistent guidance of the tape through the head assembly.

The following tests and adjustments do not preclude the many possible techniques for measuring phase shift, but provide the basis for satisfactory results using a minimum of equipment and skill.

### 1. Master Reproduce Head Azimuth:

- a. Connect 600 ohm loads to both left and right channel outputs. Connect a high impedance voltmeter to the left channel output. Insert a FULL TRACK 1 kHz reference "0" level tape and start the machine. Set the left output gain control for 0 dBm output. Now connect the voltmeter to the right channel output and adjust the right output gain control for 0 dBm output.
- b. Insert a 15 kHz FULL TRACK azimuth alignment tape and carefully adjust the reproduce head azimuth screw for a maximum reading on the voltmeter. Observe the mechanical position of the azimuth screw.
- c. Move the voltmeter to the left channel output. Now move the azimuth screw a small amount in either direction and observe the voltmeter reading as an increasing or decreasing output. Continue moving the screw in the direction that produces increasing output until a maximum reading is obtained.

- d. Observe direction and amount that the screw was turned to obtain maximum reading on the left output with respect to the previous setting for maximum on the other channel. Set the azimuth screw to the midpoint between these settings to obtain AVERAGE azimuth for the two channels.
- e. Connect the horizontal input of a scope so equipped to the right channel output. Insert a FULL TRACK FREQUENCY ALIGNMENT TAPE and start the machine. Adjust the horizontal gain, if provided on the scope to a suitable amplitude. Remove the horizontal input.
- f. Connect the vertical input to the same right channel output and adjust the vertical gain to provide a deflection equal to that of the horizontal above.
- g. Now connect the horizontal input to the left channel output. Run the tape to the 1 kHz section. A pattern such as Figure 7 should now appear. If not, reverse the two leads of the horizontal input. This pattern represents the "0" or near "0" phase shift pattern of the system.
- h. Allow the tape to run to the 4 kHz section and observe if phase shift has occurred. (Refer to Figures 8 through 10.) If phase shift has occurred, adjust the play head azimuth screw to correct this phase shift in the exact reverse rotation to which it has occurred. (This means that if the pattern was increasing clockwise from 0 shift as frequency increased, the azimuth screw should be turned in such a way to cause the scope display to rotate CCW back to the "0" position.)
- i. Now allow the tape to continue through the various frequencies observing the scope display to insure that no 180° reversals occur. At 15 kHz final adjustment of the azimuth screw can be made to provide best average phase shift. It is normal for shift "jitters" of several degrees to occur at the highest frequencies, so setting should be based on best results. It is desirable to run the tape several times, observing that phase reversals do not occur at any frequency. Tighten the azimuth lock nut while observing that no phase changes occur.

## 2. Master Record Head Azimuth:

NOTE: Performance of this procedure assumes that the reproduce alignment procedure has been performed, and that all test equipment is still connected to the unit under test.

- a. Select a 3 1/2 minute cartridge that is known to have consistently good operating characteristics.
- b. Connect an audio oscillator to the recorder input and set it for 1 kHz at -10 dBm.
- c. Start the recorder and adjust the recording head azimuth screw for maximum amplitude of the display on the scope. (The scope gains may be adjusted in equal amounts to increase amplitude of the display if necessary.)

- d. Sweep the oscillator from 1 kHz up to 15 kHz. If a phase shift begins to occur, adjust the azimuth screw to retain the "0" phase shift pattern. When 15 kHz is reached and the azimuth is set, tighten the lock nut while observing that the phase does not change.
3. Other Reproduce Head Azimuth: It is important to realize that all reproducers within a system must be azimuth - aligned to the master recorder. To implement this, it is necessary to prepare a test cartridge recorded on the master recorder each time any adjustment to this recorder is performed. This cartridge is in turn used to align EACH reproducer in the system.

#### Head Replacement

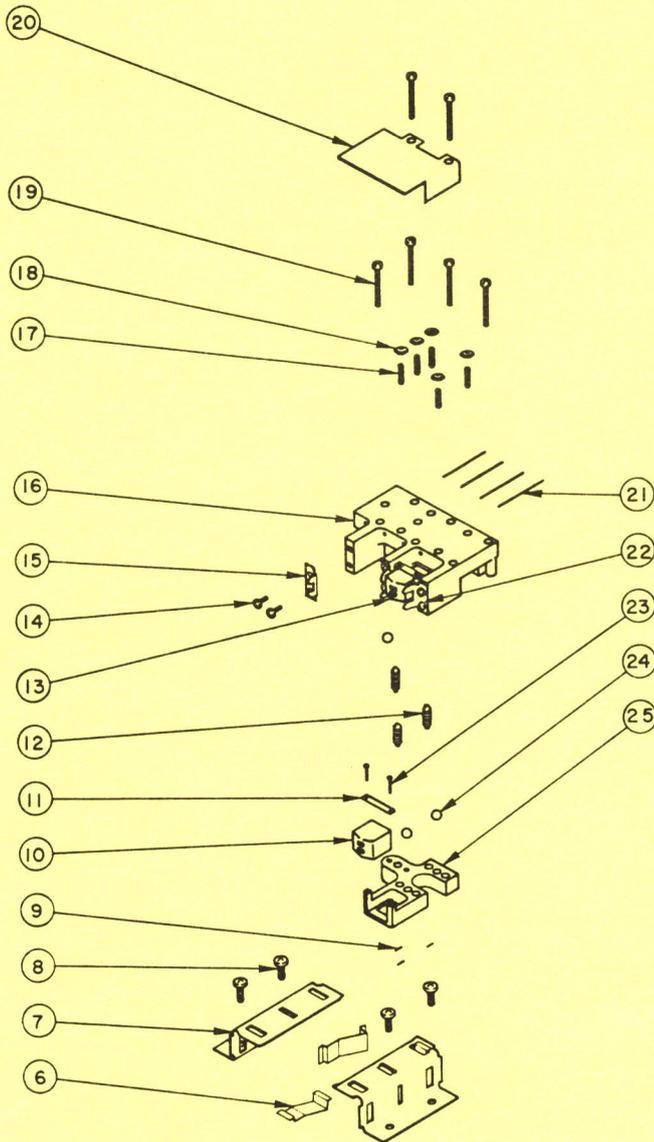
ITC equipment utilizes no-mount type heads to provide quick and easy installation.

1. Loosen the two screws in the head mounting strap. Remove the old head and insert a new one.  
NOTE: The color of the head lead arrangement
3. Align the rear edge of the head case so that it seats squarely against the back of the "step" cast into the head mounting block. See Figure 11.
4. Tighten the screws in the head mounting strap.
5. Reconnect the head cables.

CAUTION: Use care when reconnecting the head cables as the head pins can be broken off if excessive side pressure is exerted against them.

6. Follow the procedures outlined in this SECTION regarding height, zenith and azimuth/phase alignment.

Figure 1



- |    |              |                                      |
|----|--------------|--------------------------------------|
| 6  | 301-0045-001 | Spring, Cartridge Retaining          |
| 7  | 272-0020-002 | Guide, Cartridge                     |
| 8  | 350-0604-000 | Screw, Phillips Panhead 6-32 x 1/4   |
| 9  | 282-0001-001 | Pin, Roll 1/16 x 5/16                |
| 10 | 504-0036-000 | Head, Recording - Mono               |
|    | 504-0037-000 | Head, Recording - Stereo             |
| 11 | 303-0001-001 | Strap, Head Mounting                 |
| 12 | 301-0036-000 | Spring, Extension 7/16 x 3/16 O.D.   |
| 13 | 504-0033-000 | Head, Reproduce - Mono               |
|    | 504-0034-000 | Head Reproduce - Stereo              |
| 14 | 350-0403-000 | Screw, Phillips Panhead 4-40 x 3/16  |
| 15 | 272-0003-001 | Guide, Tape L.H.                     |
| 16 | 253-0057-003 | Block, Head Assembly                 |
| 17 | 355-0608-000 | Screw, Socket Set 6-32 x 3/8         |
| 18 | 370-0602-000 | Nut, Hex 6-32 x 1/4                  |
| 19 | 350-0616-000 | Screw, Phillips Panhead 6-32 x 1-1/8 |
| 20 | 297-0010-001 | Shield, Head Upper                   |
| 21 | 282-0034-001 | Pin, Head Assembly 1.312 x .093      |
| 22 | 272-0002-002 | Guide, Tape R.H. and Center          |
| 23 | 350-0308-000 | Screw, Phillips 3-48 x 5/8           |
| 24 | 322-0002-000 | Ball, Steel 5/16 Diameter            |
| 25 | 253-0056-002 | Block, Head Mounting                 |

Figure 2

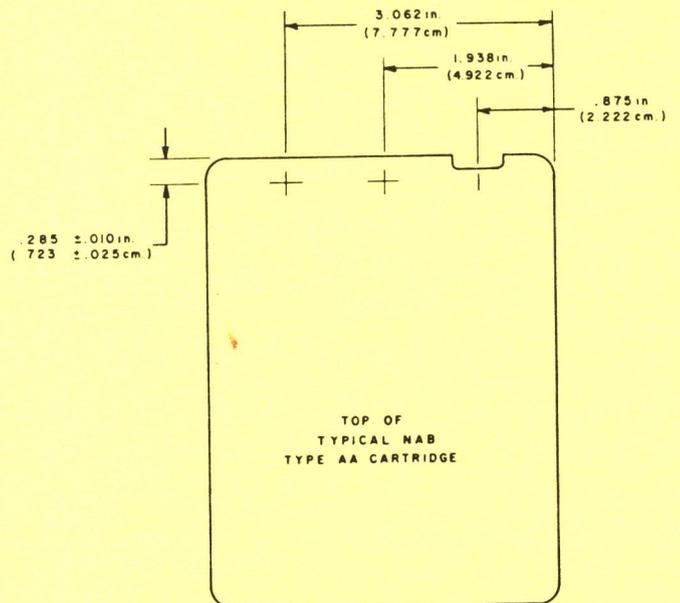


Figure 3

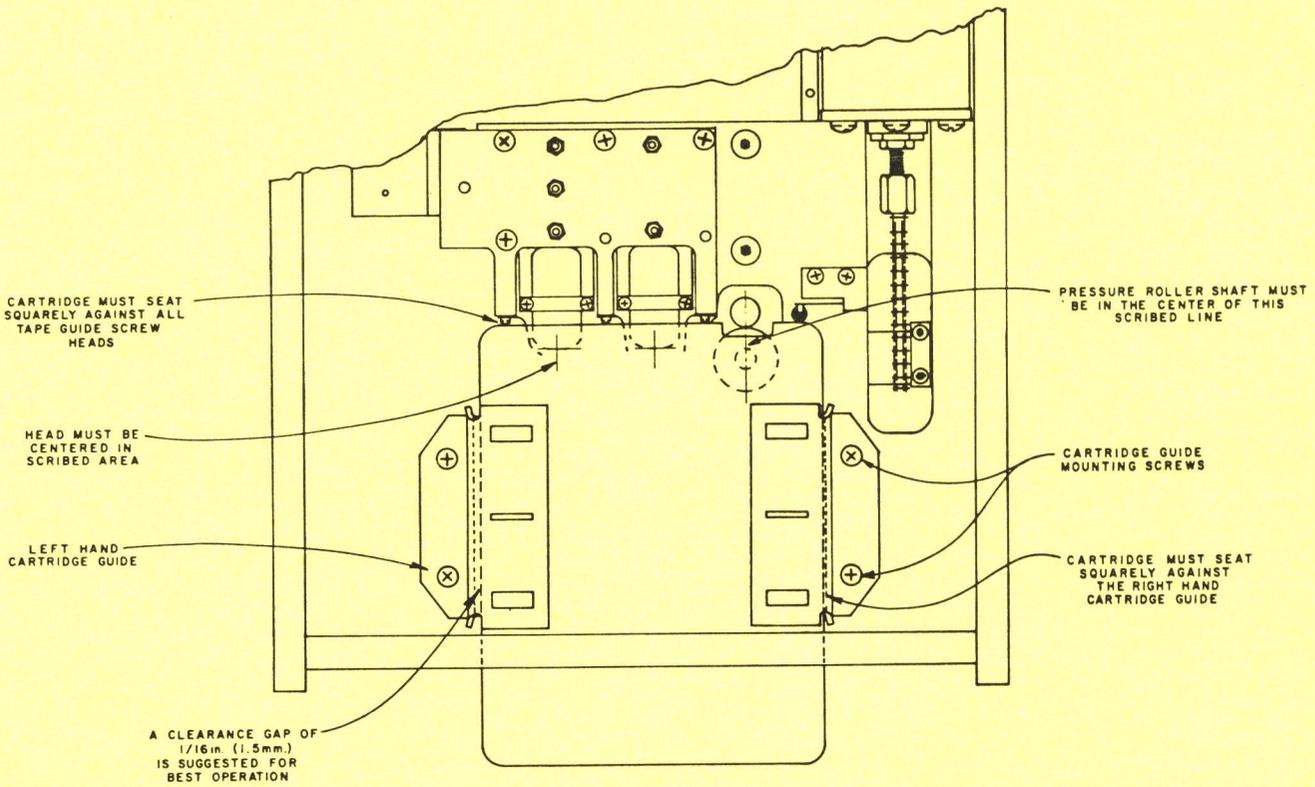


Figure 4

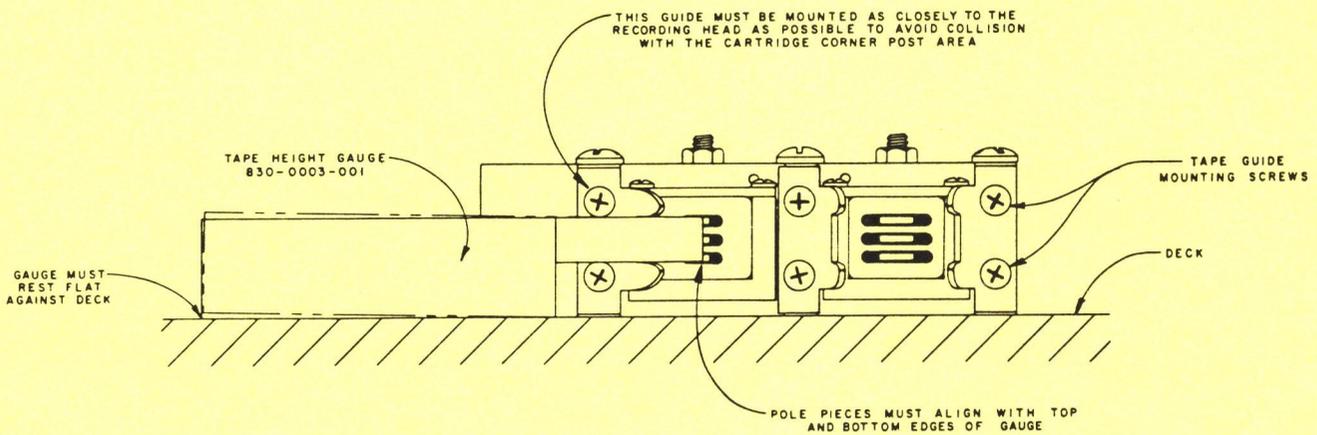


Figure 5

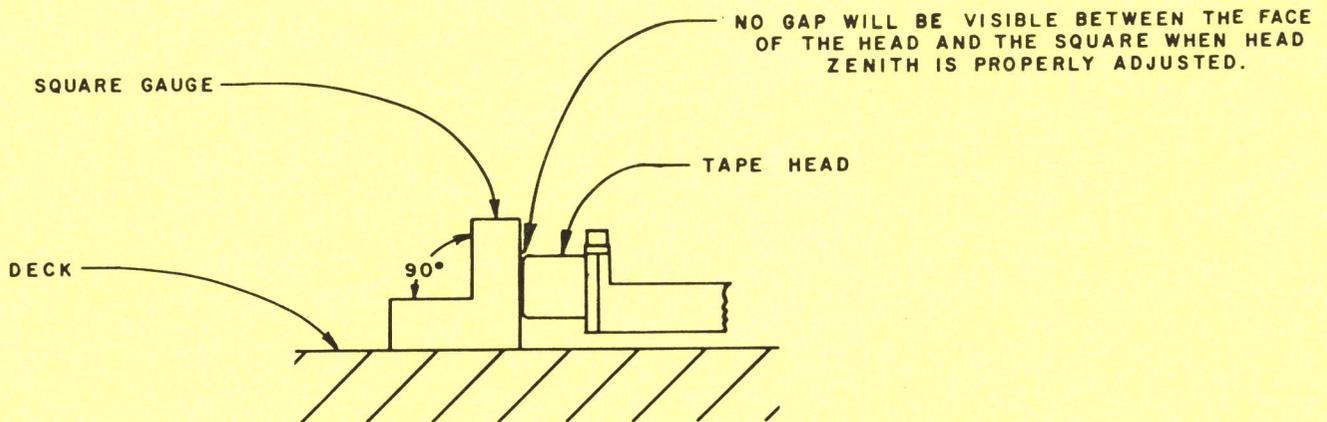
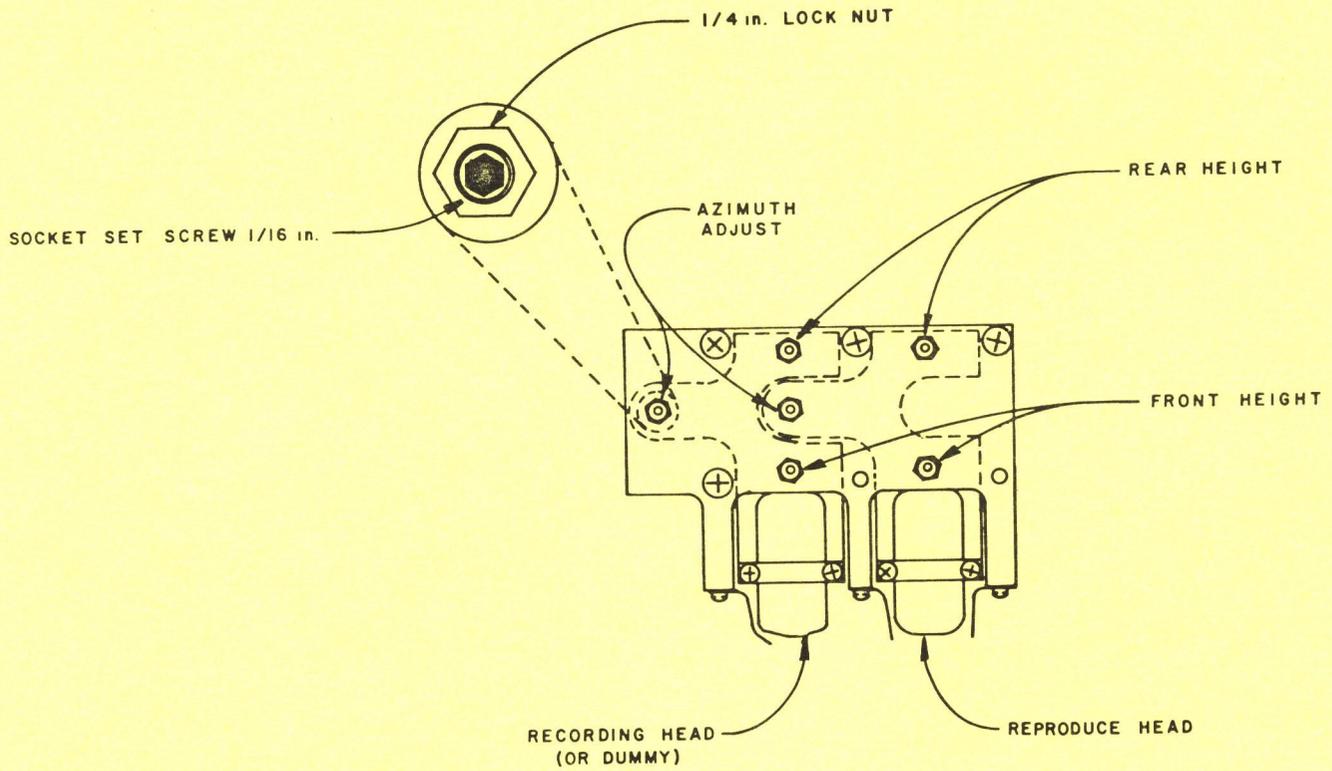


Figure 6

0° PHASE SHIFT

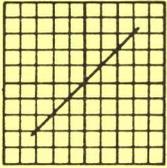


Figure 7

45° PHASE SHIFT

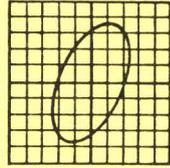


Figure 8

90° or 270° PHASE SHIFT

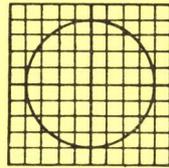


Figure 9

180° PHASE SHIFT

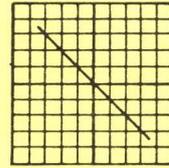


Figure 10

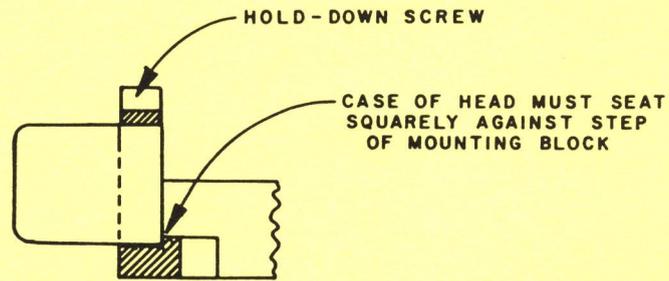


Figure 11

TO: CHIEF ENGINEER

SUBJECT: ITC CARTRIDGE MACHINE GAUGES

REASON: GAUGE UPDATE

ITC has made numerous changes recently regarding gauge usage on it's many models of tape machines. Because of improvements in pressure roller design, we find it advantageous to clarify the use of the appropriate gauges when performing preventative maintenance on your ITC gear.

Due to a change in pressure roller composition in ITC cartridge machines, a minor change has been made in the mechanical adjustments necessary to provide optimum performance regarding the Wow and Flutter specifications. All ITC cartridge machines manufactured after (February 1, 1979) utilize the new pressure roller compound "525-K". This compound is greatly improved over the older rubber rollers you are familiar with in that it is much less hygroscopic - that is, it is not affected by changes in temperature and humidity, which caused the old style rubber rollers to change in size and durometer (compression factor) with changes in weather. It is also immune to most cleaning agents. The result is much more consistant performance, relating to tape skew and phase performance. Mechanically, the new "525-K" rollers will fit your existing ITC cartridge tape equipment. They look exactly like the older rubber rollers, but upon close examination, you will find the new "525-K" rollers to be slightly larger in the overall outside diameter than the old rubber rollers. Because of this, ITC has made minute changes in the setup gauges used in the mechanical adjustment of ITC cartridge tape gear. The procedure used in adjustment of your equipment remains the same as in your technical manuals. The only change is the gauge itself, which is available from ITC. Please refer to the gauge chart at the rear of this bulletin to determine your specific need.

022780/DM

**INTERNATIONAL TAPETRONICS CORPORATION**

2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

TELEPHONE: 309-828-1381

ITC is presently shipping cartridge machine pressure rollers made with the new "525-K" compound to customers who purchase pressure rollers as replacement parts. When changing from the old rubber pressure rollers to the new "525-K" compound pressure rollers, mechanical adjustments should be made to your cartridge tape machines to maintain optimum performance. We suggest you develop a method of segregating your "old" supply of pressure rollers from any "new" rollers you may have as spare parts in order to keep the two different pressure roller "compounds" apart when replacement time comes. The "old" rollers are .01" smaller in outside diameter than the 525-K compound pressure rollers.

Gauge number 830-0029 has replaced 830-0006. This is the pressure roller pressure gauge used in ITC Series SP, WP, RP, RPD, 3D, and PD-II cartridge tape machines. The distinguishing difference between the gauges is physical shape: the new gauge has a single step at the end, where the old gauge had two steps. Refer to the pictorial gauge chart at the end of this bulletin for distinguishing differences. Use gauge number 830-0029 when making mechanical adjustments where the new "525-K" compound pressure rollers are in use. Gauge number 830-0006 should be used only when making mechanical adjustments where the old "rubber" pressure roller is in use.

Gauge number 830-0028 has replaced gauge number 830-0007 as the capstan shaft locator gauge. This gauge is used in SP, RPD, WP, RP, 3D, and PD-II cartridge tape machines. The distinguishing difference between the two gauges can be discovered in a simple comparison of physical size. The 830-0028 gauge is approximately 1.6 cm tall, while the 830-0007 gauge is approximately 1.8 cm tall. The 830-0028 gauge is also slightly larger in diameter, and can be "felt" if the two gauges are held end to end. The actual difference in diameter can be measured with a micrometer. Use gauge number 830-0028 in place of gauge number 830-0007 when the new "525-K" compound pressure rollers are in use.

Gauge number 830-0022 replaces gauge number 830-0003. This gauge is for adjusting head height in the SP, WP, RP, 3D, PD-II and Series 99 cartridge tape machines. It is similar to the old number 830-0003 gauge, except that we have cut an extra "notch" at the rear of the gauge to facilitate its fitting into the more compactly designed tape decks such as the 3D. These two gauges may be used interchangeably where space is not a limiting factor. Please refer to Fig. 1 for physical differences.

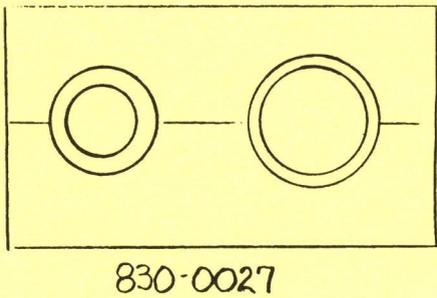
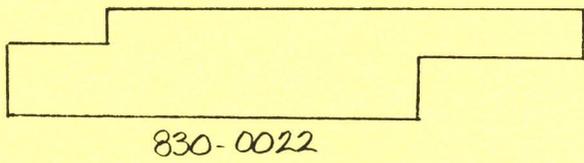
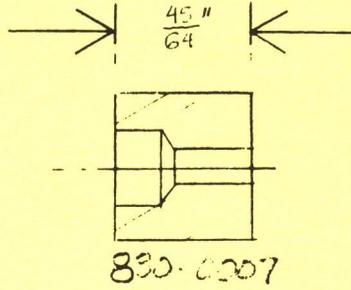
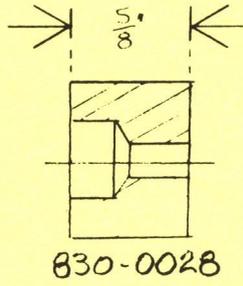
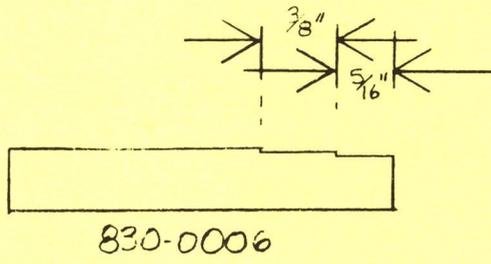
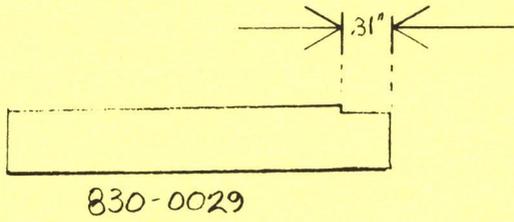
Gauge number 830-0027 is new, and is used as the capstan shaft locator gauge on ITC Series 99 cartridge tape machines. Please refer to your Series 99 Technical Manual for instructions on its use.

The new ITC gauge numbers are listed below, in chart form. These new gauge numbers are for your convenience in ordering the appropriate gauges necessary for your particular needs. If you have any questions regarding gauge usage, or wish to order them, call ITC Technical Service at (309) 828-1381, or write to:

International Tapetronics Corporation  
 2425 S. Main Street  
 P.O. Box 241  
 Bloomington, Illinois 61701

CARTRIDGE MACHINE GAUGES - USER INFORMATION

Description and ITC Part Number	SP-WP-RP-RPD	3-D	PD-II	Series 99	Description and ITC Part Number
Capstan Shaft Locator 830-0027				X	Capstan Shaft Locator 830-0027
Capstan Shaft Locator 830-0028	X	X	X		Capstan Shaft Locator 830-0028
Pressure Roller Pressure 830-0029	X	X	X		Pressure Roller Pressure 830-0029
Head Height 830-0022	X	X	X	X	Head Height 830-0022



TO: All ITC Customers  
(Please forward to Engineering Department)

RE: Returned Equipment and Components Policy

Dear Chief Engineer:

ITC's objective is to offer the best possible service to our customers. This objective carries through to any equipment that is returned for service--whether it's under warranty or being charged to the customer. Occasionally, however, we've found that our ability to provide this high caliber of service is hampered by our receipt of assemblies and machines without the customer's prior contact with ITC. Special procedures have been developed to allow expedient repair of customer returned items. However, our system only works when we have been notified by the customer that an item will be returned.

Here's how you can help:

1. If a problem is encountered with an ITC machine, call our Technical Service Department collect, at 309-828-1381. Most often, the problem can be diagnosed over the telephone and the necessary replacement part(s) can be shipped. . .often the same day. In most cases, this is the fastest and least expensive method of making the repair for both the customer and ITC.
2. If the problem can't be remedied via telephone conversations, ITC will gladly repair the defective item and return it to you. All we require is notification from you that the item will be returned.

082978LC

810-0008-000

**INTERNATIONAL TAPETRONICS CORPORATION**

2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

TELEPHONE: 309-828-1381

3. When returning an item or machine for repair, please take a moment to:
  - A. Write a note and describe the problem as fully as possible.
  - B. Be sure to include on the list your name, call letters or company name, and phone number.
4. Package the item securely! Often we receive items that have sustained shipping damage. Occasionally, the damage is sufficiently extensive as to prohibit repair. ITC is not liable for shipping damage. Also, we strongly recommend that complete machines be returned in their original packing material. If you don't have the proper shipping materials, ITC can supply them. It takes longer but it is better to be safe than sorry. Remember--you are responsible for shipping damage.
5. Return the machine with prepaid shipping via your choice of transportation. If necessary, ITC will offer suggestions on methods of shipment.
6. It is an excellent idea to insure the parcel. Declared value can be obtained from the appropriate ITC price list.

It is our sincere hope that you will assist us in this matter. When an item is returned without our prior knowledge, every customer suffers.

Thank you for your cooperation.



**PROGRAM REPRODUCE AMPLIFIER  
FOR  
SP, WP, RP, RPD, & 3D MACHINES**

**831-0094-003 (Mono)  
831-0094-013 (Stereo)**

General Description

The Program Reproduce Amplifier shown in the Technical Manual has been replaced with a new amplifier circuit bearing ITC part number 831-0094-003 (mono) or 831-0094-013 (stereo). The new amplifier offers improved sonic performance, passive squelching and increased reliability.

All interconnect wiring to the 831-0094 printed circuit board (via J4) remains as represented in the Technical Manual. However, one jumper wire has been added from the Program Reproduce Amplifier edge connector, J4, Pin 3 to the Detector card edge connector, J5, Pin 5. This jumper supplies 24 volts to the squelch devices (LDR 101 and LDR 102) on the Program Reproduce Amplifier P.C. card.

Circuit Description

The 831-0094-003 (mono) and 831-0094-013 (stereo) Program Reproduce Amplifiers are provided to amplify and contour the signal supplied by the reproduce tape head.

On stereo units the Left Channel and Right Channel are identical. Therefore, the description on the following page references components in the Left Channel Only.

## Circuit Description (continued)

The input signal is coupled from the reproduce tape head to the first stage via coupling capacitor C102. Transistors Q101 and Q102 serve as a pre-amplifier which is stabilized to prevent performance variations. DC Feedback is supplied to the base of Q101 from the emitter of Q102 via R101, R107, and R108. AC feedback from the collector of Q102 to the emitter of Q101 (C105, R105, and R104) determines the frequency response of the amplifier. Variable "equalization" is provided by potentiometer R105. C103 and C104 are included for high frequency (RF) rejection.

The output of the pre-amplifier is AC coupled (C107) to the Light Dependent Resistor, LDR 101, which functions as a squelching device. LDR 101 and R113 form a signal voltage divider circuit. The resistance of LDR 101 is controlled by the internal lamp element's brilliance. In this application, the lamp is either fully "on" or "off" as determined by relay K1. With the deck in the run mode, a ground path is supplied to LDR 101 via contacts 6 and 10 of relay K1. Hence, the resistance element of LDR 101 exhibits minimum resistance and the potential across R113 is at its maximum value.

Signal from R113 is again AC coupled (C108) to the base of Q103, a common emitter amplifier stage, with the biasing resistor, R114, connected between the collector and base for DC and temperature stability. The collector output of Q103 is AC coupled (C109) to the base of driver transistor Q104. Q104 supplies drive current for complimentary amplifiers Q105 and Q106. Transistors Q104, Q105, and Q106 are direct coupled with local feedback provided by R119. The output stage (Q105 and Q106) is AC coupled (C111) to Pin 2 of J4.

PARTS LIST

831-0094-003 (Mono)  
831-0094-013 (Stereo)

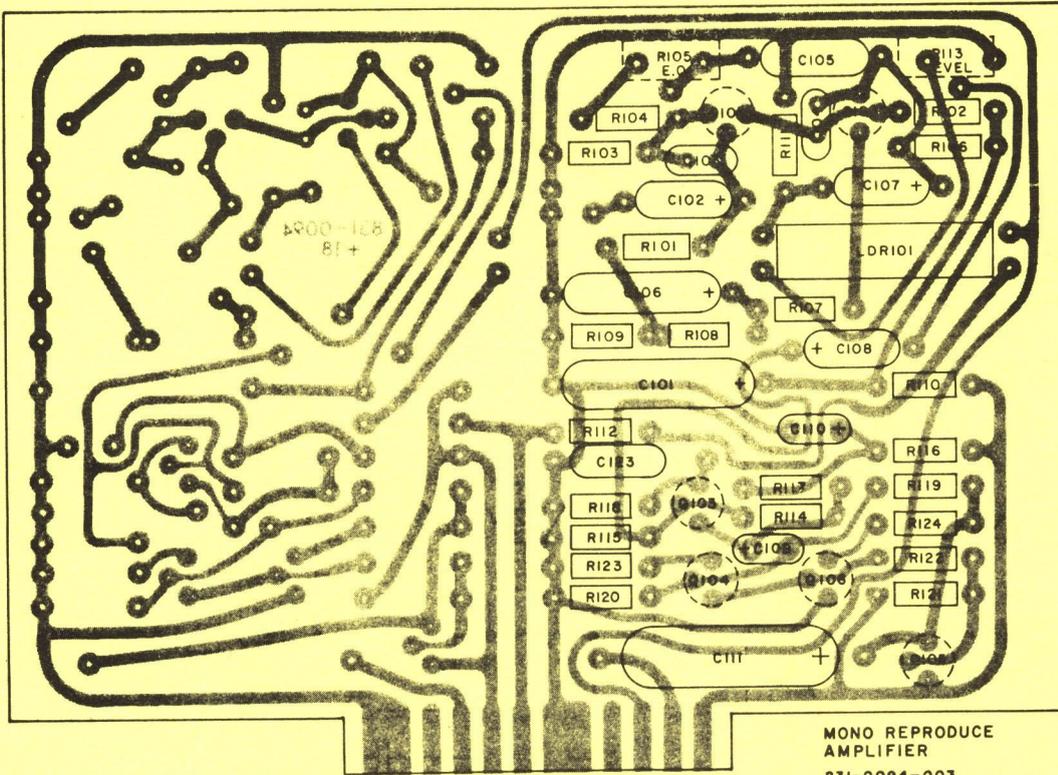
<u>Component</u> (LC-RC)	<u>ITC Part Number</u>	<u>Description</u>
R101, R129	630-0311-000	Resistor, 100K ohm 1/2 watt 5%
R102, R125	630-0303-000	Resistor, 47K ohm 1/2 watt 5%
R103, R126	630-0247-000	Resistor, 220 ohm 1/2 watt 5%
R104, R127	630-0269-000	Resistor, 1.8K ohm 1/2 watt 5%
R105, R128	636-0002-000	Potentiometer, 10K ohm 1/4 watt
R113, R137	"	"
R106, R130	630-0271-000	Resistor, 2.2K ohm 1/2 watt 5%
R117, R141	"	"
R121, R145	"	"
R107, R131	630-0251-000	Resistor, 330 ohm 1/2 watt 5%
R118, R142	"	"
R108, R132	630-0267-000	Resistor, 1.5K ohm 1/2 watt 5%
R109, R133	630-0255-000	Resistor, 470 ohm 1/2 watt 5%
R110, R134	630-0285-000	Resistor, 8.2K ohm 1/2 watt 5%
R111, R135	630-0295-000	Resistor, 22K ohm 1/2 watt 5%
R120, R144	"	"
R112, R136	630-0258-000	Resistor, 620 ohm 1/2 watt 5%
R114, R138	630-0307-000	Resistor, 68K ohm 1/2 watt 5%
R115, R139	630-0287-000	Resistor, 10K ohm 1/2 watt 5%
R116, R140	"	"
R119, R143	630-0315-000	Resistor, 150K ohm 1/2 watt 5%
R122, R146	630-0252-000	Resistor, 360 ohm 1/2 watt 5%
R123, R147	630-0231-000	Resistor, 47 ohm 1/2 watt 5%
R124, R148	630-0223-000	Resistor, 22 ohm 1/2 watt 5%
C101, C112	696-0124-000	Capacitor, Electrolytic 100MFD, 25V
C102, C113	696-0114-000	Capacitor, Electrolytic 5MFD, 25V
C107, C118	"	"
C108, C119	"	"
C103, C114	677-0001-000	Capacitor, Silver Mica 100PFD 300V
C104, C115	"	"
C105, C116	681-0048-000	Capacitor, Paper .015 MFD 200V
C106, C117	696-0078-000	Capacitor, Electrolytic 100 MFD 12V
C109, C120	694-0003-000	Capacitor, Tantalum 4.7 MFD 35V
C110, C121	694-0007-000	Capacitor, Tantalum 47 MFD 20V
C111, C122	696-0201-000	Capacitor, Electrolytic 220 MFD 25V
C123, C124	681-0050-000	Capacitor, Paper .022 MFD 200V

PARTS LIST (cont.)

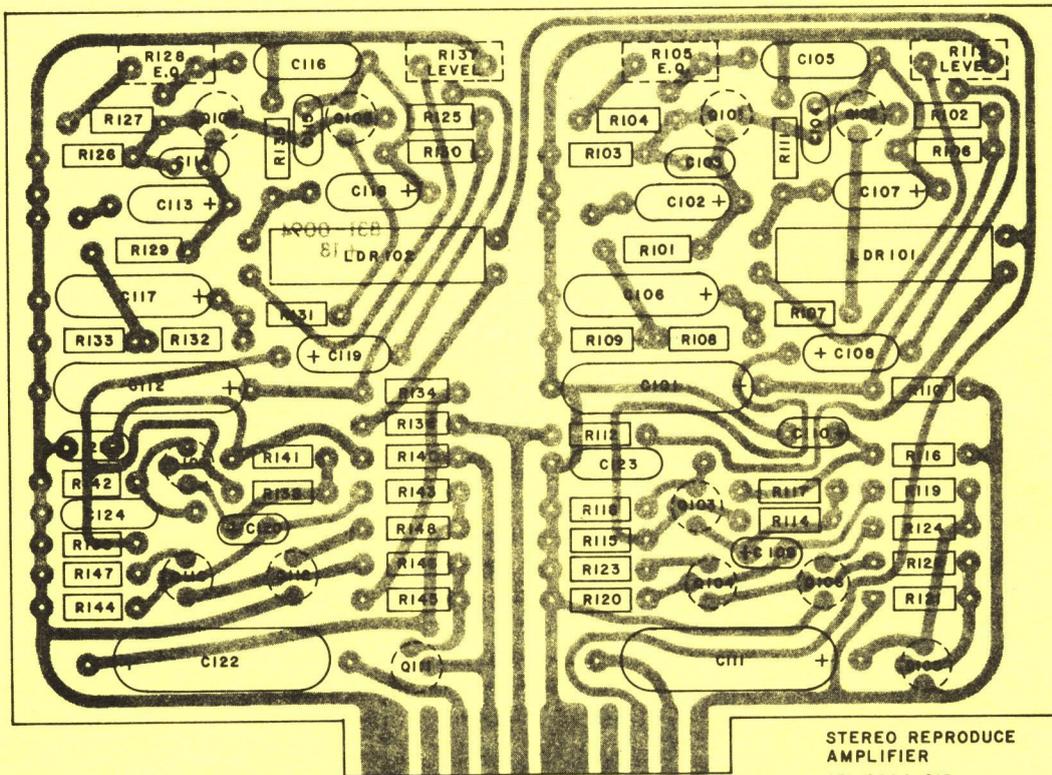
<u>Component</u>	<u>ITC Part Number</u>	<u>Description</u>
Q101, Q107	590-0013-000	Transistor, 2N5089
Q102, Q108	"	"
Q103, Q109	590-0017-000	Transistor, 2N5816
Q104, Q110	"	"
Q105, Q111	"	"
Q106, Q112	590-0018-000	Transistor, 2N5817
LDR101	650-0003-000	LDR, Sigma, 301-T1-12B1
LDR102	"	"

Miscellaneous Parts

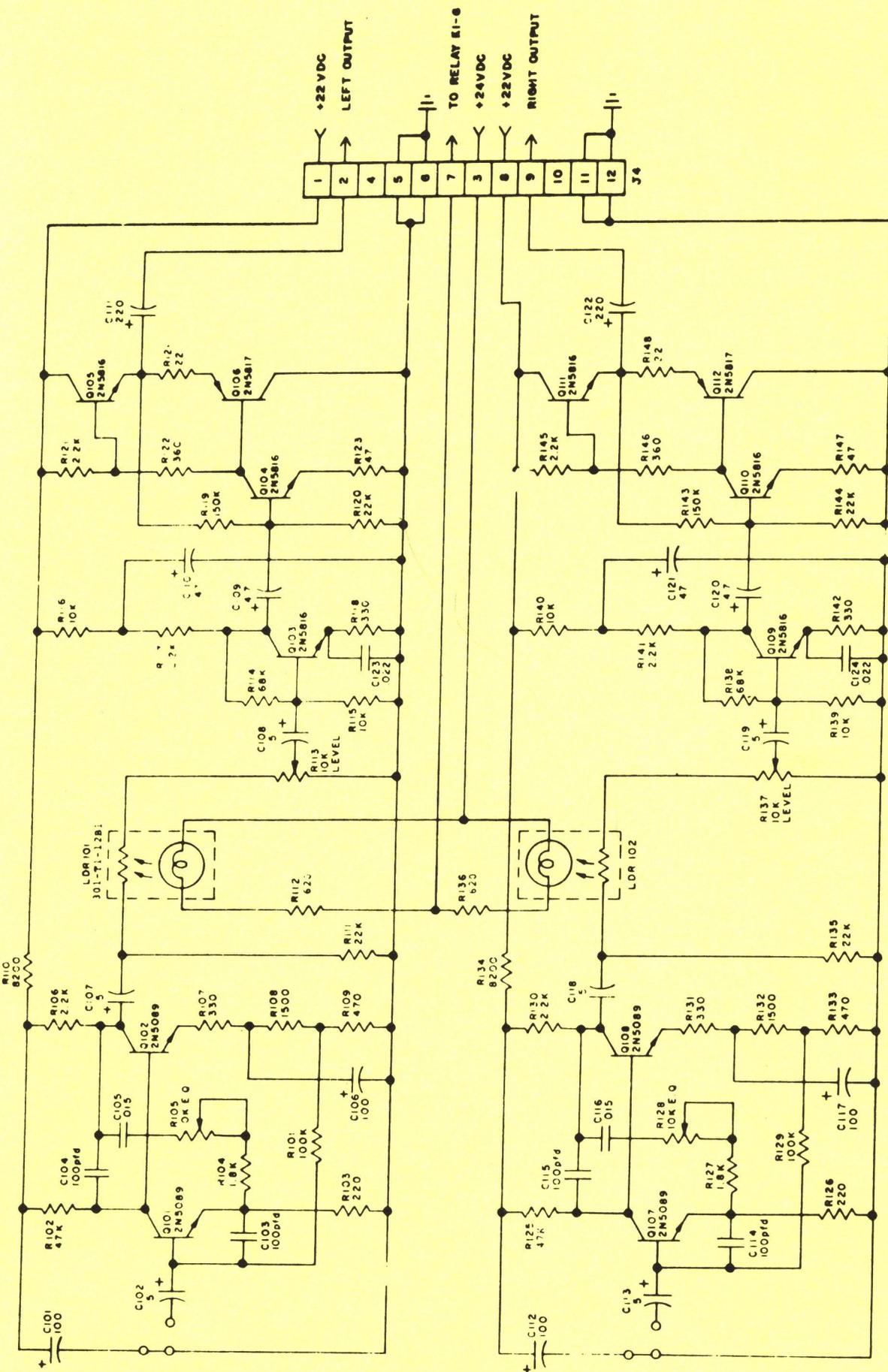
(3/6)	282-0002-000	Pin, Terminal, P.C.
(1)	325-0094-003	P.C. Card, Mono
(1)	325-0094-013	P.C. Card, Stereo
(12)	613-0001-000	Socket, Transistor



MONO REPRODUCE  
AMPLIFIER  
831-0094-003



STEREO REPRODUCE  
AMPLIFIER  
831-0094-013



<b>TITLE</b> SCHEMATIC - SP, WP, 3D +18dBm REPRODUCE AMP	
<b>INTERNATIONAL</b> <b>TAPETRONICS</b> <b>CORPORATION</b>	<b>893-0064-003</b> <small>DRAWING NUMBER</small>

If You Didn't Get This From My Site,  
 Then It Was Stolen From...  
[www.SteamPoweredRadio.Com](http://www.SteamPoweredRadio.Com)