NORTHERN RADIO COMPANY

Incorporated

143-149 WEST 22nd ST., NEW YORK, N. Y. 10011

Phone: (Area Code 212) 929-9117

pace-setters

in quality

communication

equipment

In Canada: Northern Radio Mfg. Co., Ltd., 1950 Bank St., Ottawa, Ontario.

GUARANTEE

All items of equipment and material used in this unit are guaranteed against material defects, workmanship or manufacture, for a period of one year from date of the installation, except that the items of equipment and material are not guaranteed for a term longer than two years from the date of shipment.

Under the terms of this guarantee, all items which fall within the periods defined will be replaced F.O.B. point of installation without cost to the purchaser. The company will pay transportation charges of any defective part which it desires to have returned to its plant. If, upon examination of the defective item the company can show that failure was not due to any defective workmanship, material or manufacture, the company will bill the purchaser for the cost of replacement, including transportation charges.

NORTHERN RADIO COMPANY, Incorporated
NEW YORK, NEW YORK

September 24th, 1970

ADDENDUM NO. 8

LOW LEVEL POLAR OUTPUT OPTION

This Addendum covers a method of providing a Low L vel Polar (± 6 volt ± 1 volt DC) Output option, per MIL-STD-188( ), for the Frequency Shift Converter, Type 174 Models 3 and 3A.

When Low Level Polar Output is required, the Convert r is equipped with a PRINTER DRIVER (POLAR HIGH LEVEL) Subassembly SA 174210, which has been modified to produce a low level polar signal meeting the requirements of MIL-STD-188( ).

Technically, the modification consists of the addition of a series current limiting resistor in the output circuit with the final output shunted by a bridge rectifier - zener diode combination which limits the output voltage to ± 6 volts ± 1 volt for loads not exceeding 10 mA, and limits short circuit current to approximately 15 mA. A shunting capacitor is also provided to "shape" the output wave amd minimize high frequency output components.

Electrical Parts List for Subassembly Modification (NRC 2077)

Symbol	Description	Mfr.	Part No.
C1	0.68 mfd +80, -20% 50 volt ceramic capacitor	SPR	7C023684D 8500E
CR1	Rectifier Assembly, Bridge, 50 V rms minimum, 0.100 mA minimum	MOT	MDA-920A-2
CR2	4.7 volts ± 5% zener diode, 400 mw	ANY	1N750A
R1	4.7K ohms ± 10% 2 watt composition resistor	ANY	RC42GF472K

The following steps outline the procedure to be followed in installing this modification:

a) Remove the lead from Pin 7 of Connector P601 and connect it to Point A of the Modification Subassembly.

b) Remove the lead from Pin 14 of Connector P601 and connect it to Point B of the Modification Subassembly.

c) Connect a lead from Point D of the Modification Subassembly to Pin 7 of Connector P601.

d) Connect a lead from Point C of the Modification Subassembly to Pin 14 of Connector P601.

e) Remove the two screws mounting PC board NRC 2016 (EB301) that are nearest the Connector P601.

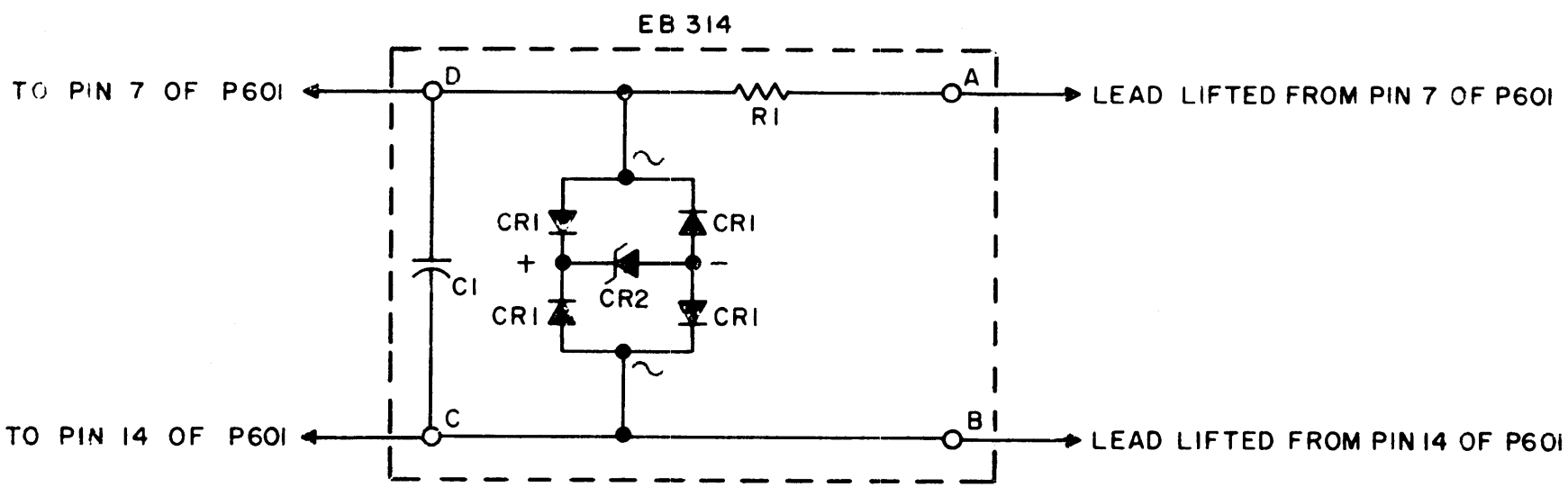
f) Mount the Modification Subassembly with two screws, 3/8 inch long. Place 3/32 inch spacers between the two boards.

The following drawings form part of this addendum:

Schematic (NRC 2077)	A-9-1052
Component Layout (NRC 2077)	A-9-1053

DWG. No.	REV.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	D A. L	9/22/70
MATERIAL:	CHECKER	9 23 70
	ENGINEER	
FINISH:	APPROVAL	

NAME:

SCHEMATIC
LOW LEVEL OUTPUT
MODIFICATION TO SA174210
PRINTER DRIVER
NRC 2077

SCALE: NONE | SH 1 OF 1

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

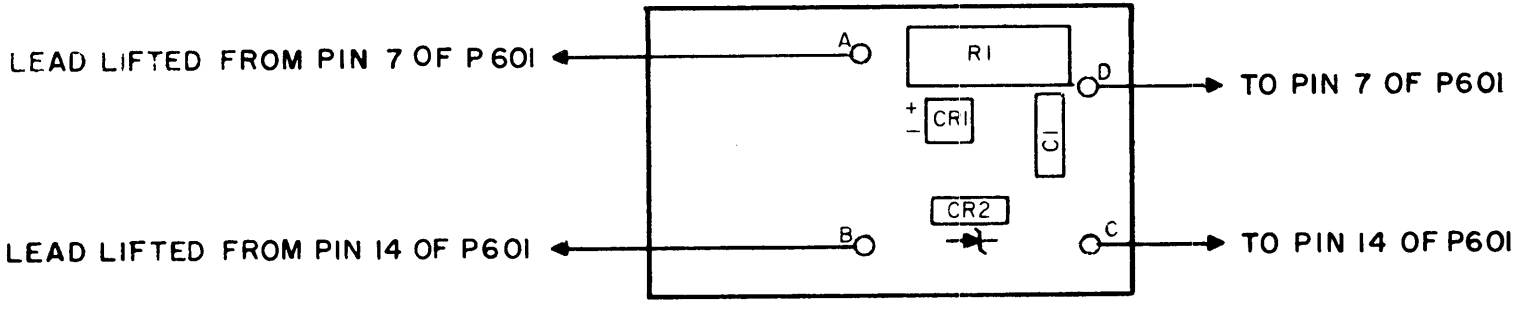
DWG. No. 9-1052

DWG. SIZE A

DWG. No.	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

CIRCUIT BOARD SUB-ASSEMBLY NRC 2077
(CONSISTS OF ETCHED BOARD WITH COMPONENTS)
EB 314 (ETCHED BOARD ONLY)



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN D. A. L	DATE 9/22/70	NAME: LAYOUT, COMPONENTS SUB-ASSEMBLY NRC 2077 LOW LEVEL OUTPUT MODIFICATION TO SAI74210 PRINTER DRIVER NRC 2077	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
MATERIAL:	CHECKER	9-23-70		DWG. N. 9-1053
FINISH:	ENGINEER		SCALE: NONE	SH. 1 OF 1
	APPROVAL			DWG. SIZE A

July 1, 1970

ADDENDUM NO. 7

This addendum covers the Tunable Discriminator SA174203A-S, usable in Northern Radio Frequency Shift Diversity Converter, Type 174 Model 3.

This Discriminator is tuned for a fixed "Mark" frequency of 1000 hertz and an adjustable "Space" frequency as shown below:

Switch Position	"Space" Frequency	For Total Shift of
1	1300 Hz	300 Hz ± 50 Hz
2	1400 Hz	400 Hz ± 50 Hz
3	1500 Hz	500 Hz ± 50 Hz
4	1600 Hz	600 Hz ± 50 Hz
5	1700 Hz	700 Hz ± 50 Hz
6	1850 Hz	850 Hz ± 75 Hz
7	2000 Hz	1000 Hz ± 75 Hz

An Electrical Parts List for the Discriminator SA174203A-S forms a part of this Addendum.

Schematic Diagram, NRC Dwg. No. C-SA174-2-0103A-S is also included.

ELECTRICAL PARTS LIST FOR DISCRIMINATOR, SA174203A-S:

Sym-bol	Function	Description	Mfr.	Part N.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	2550 cps bandpass filter	NRC	1326
FL302	Discriminator tank circuit	Tuned circuit	NRC	2039
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1Kohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Spac tank driv control resistor	1K ohm ± 20% 1/4 watt rectangular pot ntiomet r	ALB	RH102M

Electrical Parts List for Discriminator, SA174203A-S: (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305, Q306 bias control resister	10K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

SUB- ASSEMBLY NRC1338A (EB164A)

P301

1 130
2 140
3 150
4 160
5 170
6 180
7 190
8 200
9 210
10 220
11 230
12 240

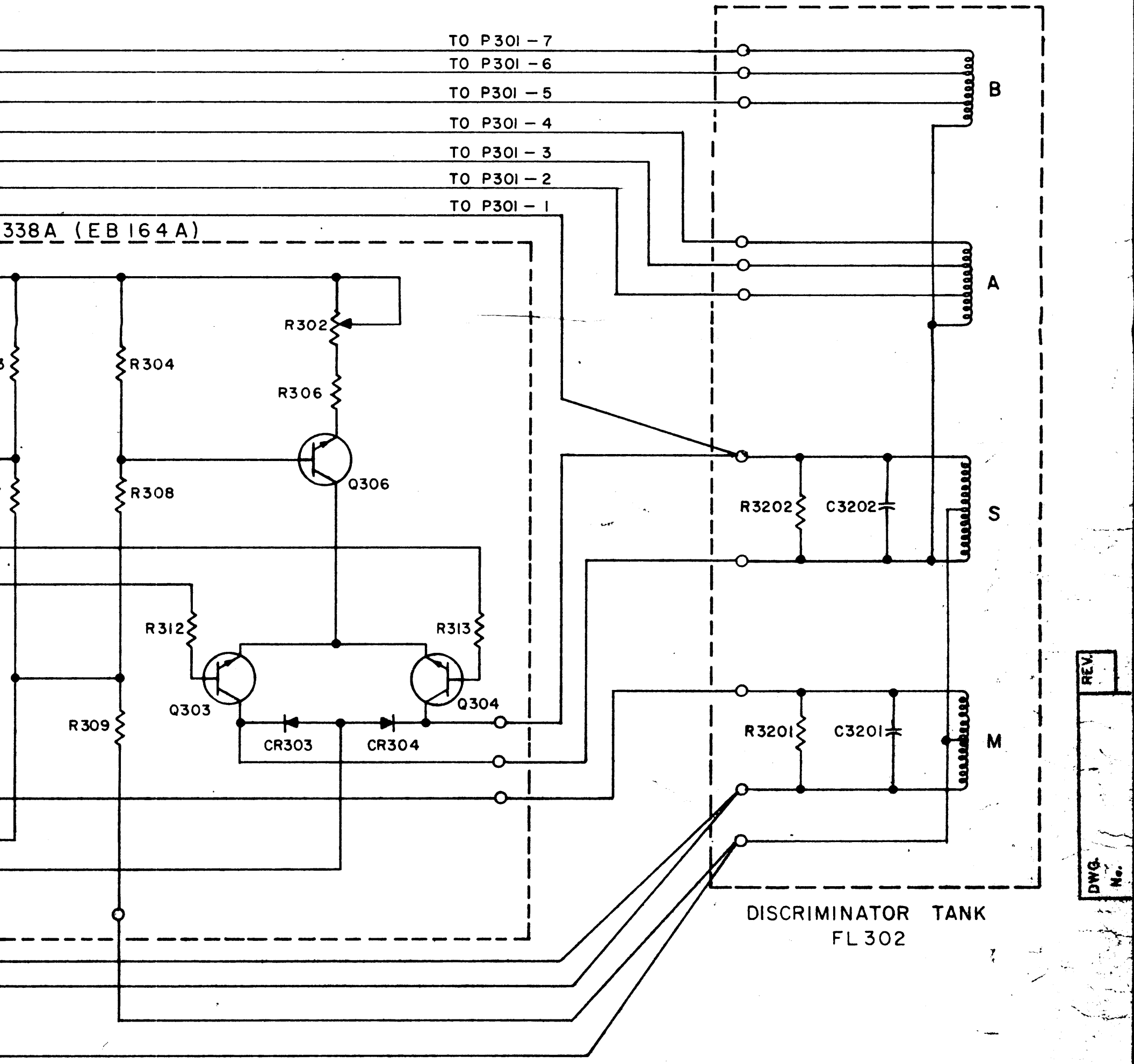
R301
R303
R304
R305
Q305
R307
R308
R310
R311
R312
Q301
Q302
Q30
R309
CR301
CR302

BAND PASS FILTER
FL 301

1
2
3
4

UNLESS OTHERWI
DIMENSIONS AR
TOLERANCES ON
FRACTIONS DECIM
± 1/64 ± .00
MATERIAL:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	D.A.L.	6-29-70	SCHEMATIC TUNABLE DISCRIMINATOR
MATERIAL:	CHECKER	6-30-70	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST N.Y.C.
	ENGINEER		

May 1, 1970

ADDENDUM NO. 6

This addendum covers the High Level, Polar, Printer Driver SA174210. This Driver may be used in place of the Printer Driver, SA174206A when polar output is desired.

The plug-in High Level, Polar, Printer Driver includes a power transformer, rectifiers and filter for a self-contained polar battery.

DC isolation between the output of the DC Amplifier (SA174205A) and the Polar Printer Driver is obtained through the us of a keyed oscillator operating at approximately 50 KHz. Transistor Q603 serves as the oscillator and transistors Q601 and Q602 control the oscillator, keying it "ON" for a "MARK" signal and "OFF" for a "SPACE" signal.

In normal keying, a "MARK" signal is represented by a positive voltage at Pin 11 of Connector P601. Transistor Q601 is reversed biased and is cut off. Transistor Q602 is forward biased by th negative supply voltage on Pin 12 of Connector P601 and saturates permitting transistor Q603 to oscillate. Transformer T602 serves as an inductor for the oscillator circuit and as a decoupling transformer. The AC voltage appearing across the secondary of T602 is rectified by diode CR606 and filtered by capacitor C605. This voltage biases transistor Q605 to saturation. When this condition exists Q607 is forward biased and Q604 is reverse biased. With Q607 forward biased, there is a low impedance path for the minus 60V Loop Battery to Pin 7, of P601. With Q604 "cut-off", the positive Loop Battery loop is an open circuit.

For a "SPACE" condition in normal keying, a negative voltage is present at Pin 11 of P601. This condition forward biases Q601 cutting off Q602 and oscillator Q603. With no AC signal across the secondary of T602, transistor Q605 is "cut-off". Under these conditions Q604 is forward biased from the positive Battery Loop. Transistor Q607 is also "cut-off" and the current limiting resistor R612 is inserted in the negative Battery Loop. Q604 and Q606 are connect d in the conventional Darlington configuration, so that, when Q604 is forward biased, Q606 presents a low impedance to the plus 60V Loop Battery.

Resistors R610 and R611 serve to limit the current flow through Q606 and Q607 and to protect the transistors against voltag surges which occur during the MARK-SPACE transitions as a result of the inductive reactance of a normal teleprinter load.

An Electrical Parts List for the High Level, Polar, Print r Driver forms a part of this addendum.

Symbol	Function	Description	Mfr.	Part No.
C601	Filter capacitor	250 mfd 150 volt electrolytic capacitor	SPR	39D257F150HP4
C602	Filter capacitor	250 mfd 150 volt electrolytic capacitor	SPR	39D257F150HP4
C603	Input filter capacitor	0.01 mfd 50 volt ceramic disc capacitor	SPR	TG-S10
C604	Q603 base coupling capacitor	680 pfd ± 10% 500 volt ceramic capacitor	CEN	ID 681
C605	Rectifier filter capacitor	0.1 mfd ± 10% 200 volt mylar capacitor	FDE	MFC-104K
CR601	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR602	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR603	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR604	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR605	Input clamping diode	225 volts 400 mA silicon diode	ANY	1N645
CR606	Oscillator output rectifier diode	General purpose germanium diode	SYL	1N34AS
CR607	Q606 collector bias diode	225 volts 400 mA silicon diode	ANY	1N645
CR608	Voltage balance diode	225 volts 400 mA silicon diode	ANY	1N645
P601	Main connector plug	14 pin male connector	AMP	57-10140
Q601	1st oscillator control transistor	Germanium transistor, 250 mA PNP	MOT	2N652A

Symbol	Function	Description	Mfr.	Part No
Q602	2nd oscillator control transistor	Germanium transistor, 250 mA PNP	MOT	2N652A
Q603	Oscillator transistor	Germanium transistor, 250 mA PNP	MOT	2N652A
Q604	Positive switching drive transistor	Silicon transistor, 250 volt NPN	NRC	1340
Q605	Switching control transistor	Silicon transistor, 250 volt NPN	NRC	1340
Q606	Positive switching transistor	Silicon transistor, 250 volt NPN	NRC	1340
Q607	Negative switching transistor	Silicon transistor, 250 volt NPN	NRC	1340
R601	Bleeder resistor	220K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF224K
R602	Input coupling resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R603	Q602 base bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R604	Q602 base shunt resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R605	Q603 base series resistor	33K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF333K
R606	Q605 base series resistor	680 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF681K
R607	Q605 base shunt resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R608	Q604 base series resistor	47K ohms ± 10% 1 watt composition resistor	ANY	RC32GF473K
R609	Q606 base shunt resistor	15K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF153K
R610	Current limiter resistor	220 ohms ± 5% 6.5 watt wirewound resistor	ANY	RW67V221

Symbol	Function	Description	Mfr.	Part No.
R611	Current limiter resistor	220 ohms ± 5% 6.5 watt wirewound resistor	ANY	RW67V221
R612	Current balance resistor	47K ohms ± 10% 1 watt composition resistor	ANY	RC32GF473K
R613	Q607 base shunt resistor	15K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF153K
T601	Power transformer	Power transformer Pri: 117/234 volts Sec: 92 volts CT, 100 mA	NRC	1328
T602	Oscillator transformer	Wnd #1: 50 turns CT Wnd #2: 25 turns	NRC	1908

The following drawings are also included:

Schematic Diagram	C-SA174-2-0110
Wiring Diagram	B-SA174-2-0210
Component Layout (Power Supply)	A-SA174-2-0310
Component Layout (Driver)	A-SA174-2-0410

SUB-ASSEMBLY NRC 2015
EB 300

NRC 1328
T601

A.C. IN. 1
A.C. IN. 2
3
A.C. IN. 4
5
6
7

P601
1 8
2 9
3 10
4 11
5 12
6 13
7 14
A.C. IN.
A.C. IN.

CR603
CR601
CR602
CR604
C601
C602
R601

SUB-ASSEMBLY NRC 2016
EB 301

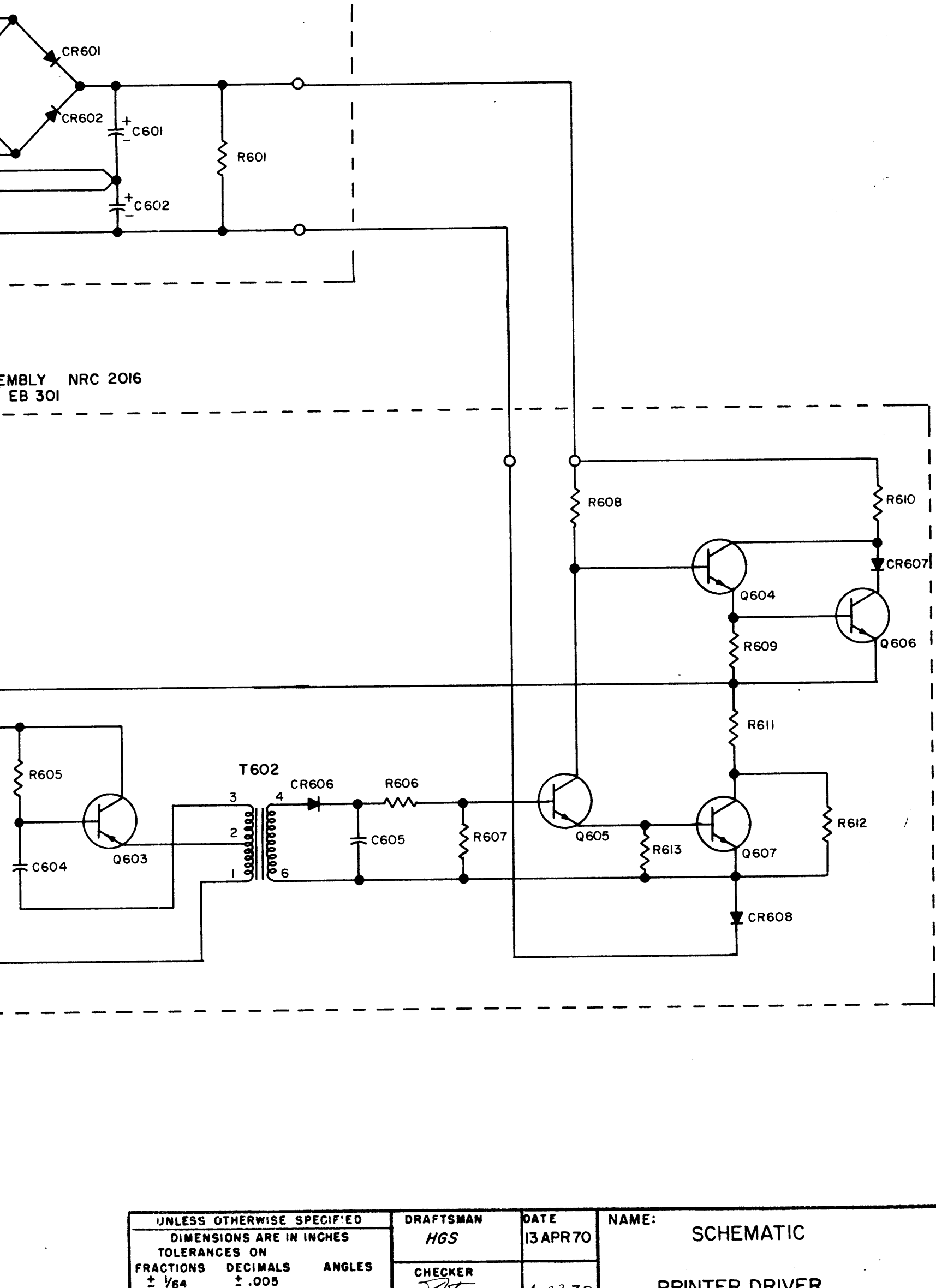
R602
Q601
CR605
C603
R603
Q602
R604
R605
C604
Q603
T602
CR6
3 4
2
1 6

UNLESS OTHERWISE SPE
DIMENSIONS ARE IN IN
TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005
MATERIAL:
FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROV.

B-ASSEMBLY NRC 2015
EB 300

EMBLY NRC 2016
EB 301



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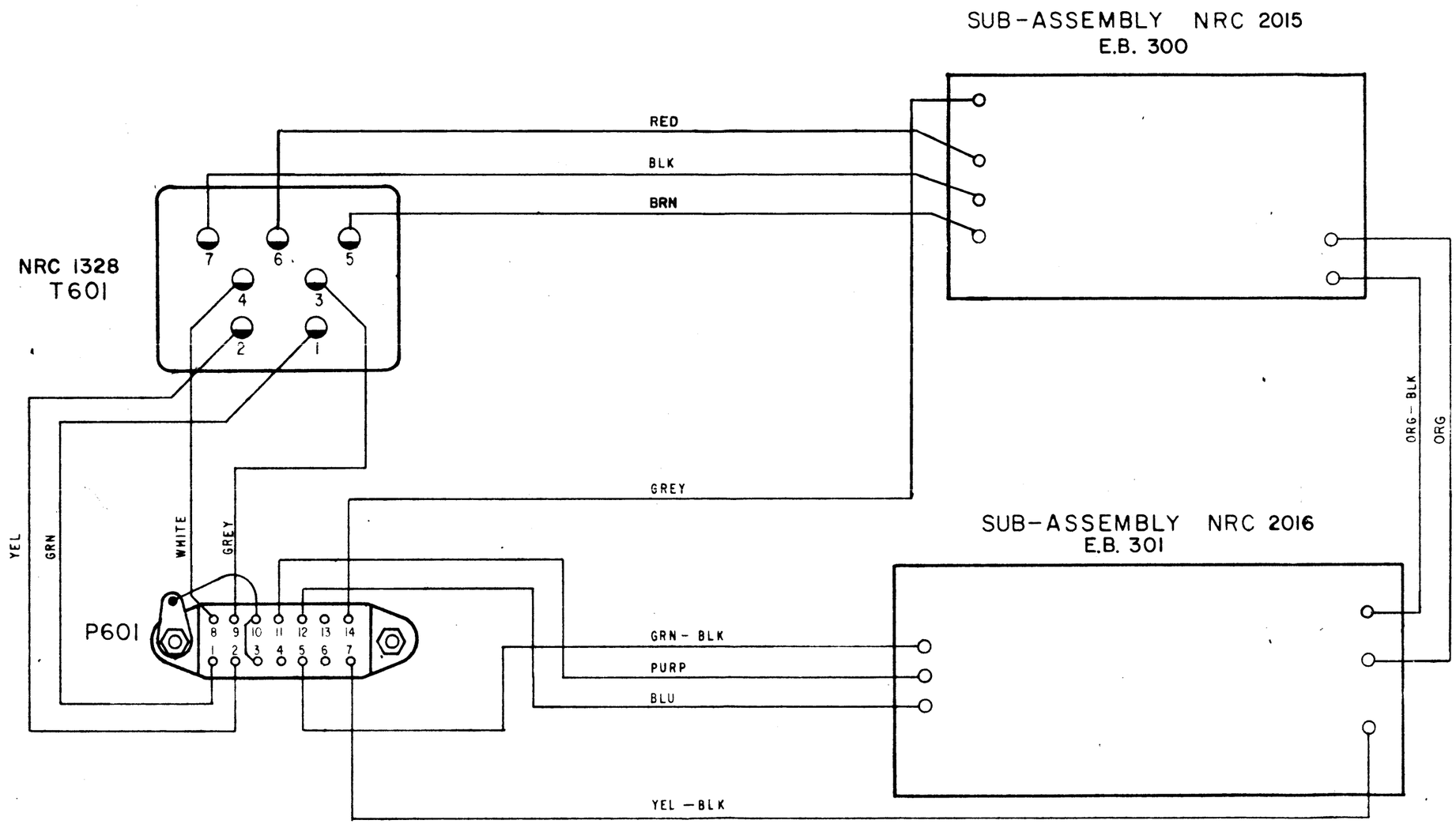
DWG. N.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN HGS	DATE 13 APR 70	NAME: SCHEMATIC PRINTER DRIVER (POLAR HIGH LEVEL) SA 174210
MATERIAL:	CHECKER RF	4-23-70	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
FINISH:	ENGINEER		DWG. N. SA 174-2-0110
	APPROVAL		SCALE: NONE SH: 1 OF 1 DWG. SIZE C

REV.	DWG. NO.	REVISIONS			
		SYM.	DESCRIPTION	DATE	APPROVAL



NOTE
1 - BASIC COLOR IS WHITE ON ALL WIRES.

UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	HGS	20APR70	WIRING DIAGRAM PRINTER DRIVER (POLAR HIGH LEVEL) SA174210
MATERIAL:	CHECKER RF	4-23-70	
FINISH:	ENGINEER		
	APPROVAL		SCALE: NONE SH 1 OF 1 DWG. SIZE B

NORTHERN RADIO COMPANY
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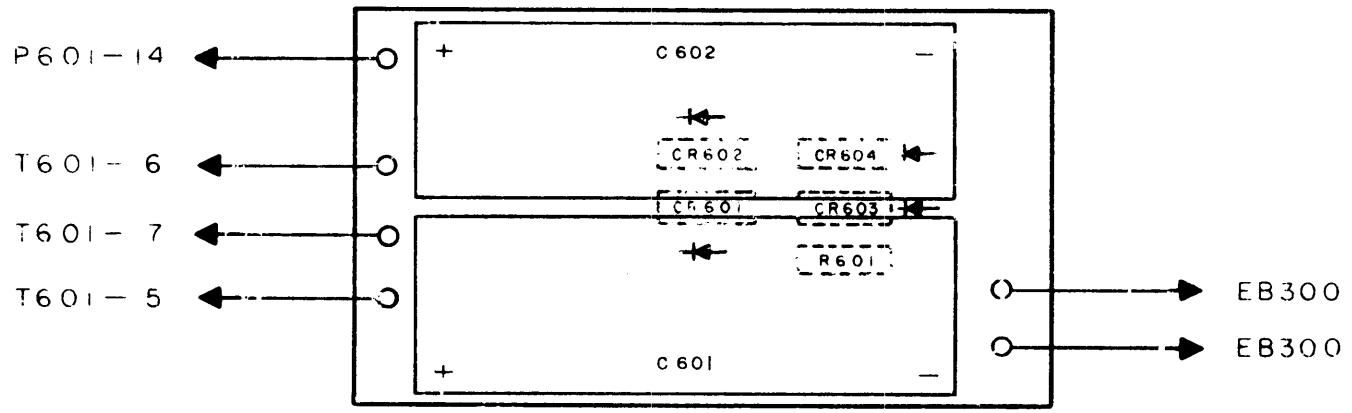
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA 174-2-0210

DWG. No. SA 174-2-0310	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

CIRCUIT BOARD SUB-ASSEMBLY NRC 2015
(CONSISTS OF ETCHED BOARD WITH COMPONENTS)
EB 300 (ETCHED BOARD ONLY)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	CHEN	4-22-70	COMPONENT LAYOUT SUB-ASSEMBLY NRC 2015 PRINTER DRIVER (POLAR HIGH LEVEL) SA 174210
MATERIAL:	CHECKER	4-22-70	
	ENGINEER		
FINISH:	APPROVAL		
	SCALE: NONE	SH. 1 OF 1	DWG. SIZE A

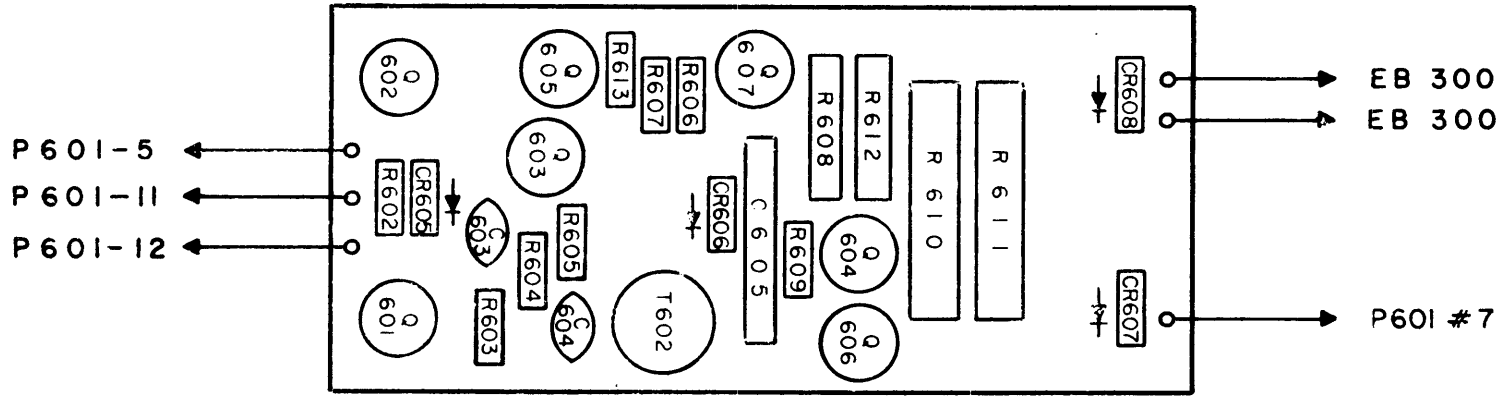
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. N. SA-174-2-0310

DWG No. SA174-2-0410	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

CIRCUIT BOARD SUB-ASSEMBLY NRC 2016
(CONSISTS OF ETCHED BOARD WITH COMPONENTS)
EB #301 (ETCHED BOARD ONLY)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	CHEN	4-22-70	COMPONENT LAYOUT SUB-ASSEMBLY NRC 2016 PRINTER DRIVER (POLAR HIGH LEVEL) SA 174210
MATERIAL:	CHECKER	4-23-70	
FINISH:	ENGINEER		
	APPROVAL		
	SCALE: NONE	SH 1 OF 1	DWG. SIZE A

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. N. SA174-2-0410

5 Dec mber 1969

ADDENDUM NO. 5

This addendum covers the Monitor, Part No. SA 174307A, which is directly interchangeable with the SA 174307 Monitor.

The description of the operation of the SA 174307 Monitor contained in Chapter I is applicable to the SA 174307A.

In addition, the SA 174307A may be used to monitor Low-Level DC Keying Systems (e. g. ± 6 VDC) by changing R725 in the differentiating network from 100,000 ohms to 33,000 ohms.

An Electrical Parts List for the Monitor SA 174307A forms a part of this addendum.

Symbol	Function	Description	Mfr.	Part No.
C701	CRT supply voltage doubler capacitor	0.1 mfd ± 10% 600 WVDC mylar capacitor	FDE ASC	MFF-104K or MQCP-6-1
C702A)) C702B)	CRT supply filter capacitor	2x0.1 mfd ± 10% 1000 volt bathtub capacitor (C702A and C702B in one case)	SAN	5010.2X1RT
C703	Transistor supply filter capacitor	4 mfd 250 volt electrolytic capacitor	AEO	PRS 1550
C704	Transistor supply filter capacitor	4 mfd 250 volt electrolytic capacitor	AEO	PRS 1550
C705	Q703 input coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
C706	Q703 output coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
CR701	CRT supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR702	CRT supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR703	Transistor supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR704	Q701 input wave shaping diode	225 volt 400 mA silicon diode	ANY	1N645

Symbol	Function	Description	Mfr.	Part No.
CR705	Q702 input wave shaping diode	225 volt 400 mA silicon diode	ANY	1N645
P701	Main connector plug	Male connector - 14 pin	AMP	57-10140
Q701	Horizontal amplifier transistor	NPN silicon high voltage transistor	NRC	1340
Q702	Horizontal amplifier transistor	NPN silicon high voltage transistor	NRC	1340
Q703	Vertical amplifier transistor	NPN silicon high voltage transistor	NRC	1340
R701	CRT supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R702	CRT supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R703	C702 discharge resistor	2.2 megohms ± 10% 1 watt composition resistor	ANY	RC32GF225K
R704	C702 discharge resistor	2.2 megohms ± 10% 1 watt composition resistor	ANY	RC32GF225K
R705	CRT intensity control resistor	100K ohms ± 10% 2 watt potentiometer	ANY	JA1N056P104UA
R706	CRT supply divider resistor	150K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF154K
R707	CRT focus control resistor	500K ohms ± 10% 2 watt potentiometer	ANY	JA1N056P504UA
R708	CRT supply divider resistor	1.5 megohms ± 10% 1 watt composition resistor	ANY	RC32GF155K
R709	Transistor supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R710	C703 discharge resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K

Symbol	Function	Description	Mfr.	Part No.
R711	Transistor supply filter resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R712	C704 discharge resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K
R713	Q701 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
R714	Q701 base shunt resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R715	Q701 input wave shaping resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
R716	Q701 collector resistor	330K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF334K
R717	CRT space signal amplitude control	2.5K ohms ± 20% 1/4 watt rectangular potentiometer	ALB ALB	RH252M or RP252M
R718	Q701, Q702 emitter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R719	Q701, Q702 emitter bias resistor	1 megohm ± 10% 1 watt composition resistor	ANY	RC32GF105K
R720	Q702 collector resistor	330K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF334K
R721	CRT mark signal amplitude control	2.5K ohms ± 20% 1/4 watt rectangular potentiometer	ALB ALB	RH252M or RP252M
R722	Q702 input wave shaping resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
R723	Q702 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
R724	Q702 base shunt resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K

	Symbol	Function	Description	Mfr.	Part No.
*	R725	Q703 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
	R726	Q703 base bias resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K
	R727	Q703 base shunt resistor	47K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF473K
	R728	Q703 collector resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
	R729	Q703 emitter resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
	R730	V701 vertical deflection electrode resistor	2.2 megohms ± 10% 1/4 watt composition resistor	ANY	RC07GF225K
	R731	V701 vertical deflection electrode resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
	T701	Power transformer	Power transformer Primary: 115/230 volts Sec. #1: 6.3 volts AC, 0.6 amp Sec. #2: 375 volts tapped at 150 volts, 10 mA	NRC	1322
	V701	Monitor Oscilloscope	Cathode Ray Tube, 1"	RCA	1EP1
	X701	Socket for Cathode Ray Tube	11 pin socket, 3 tabs	EFJ	124-311-100

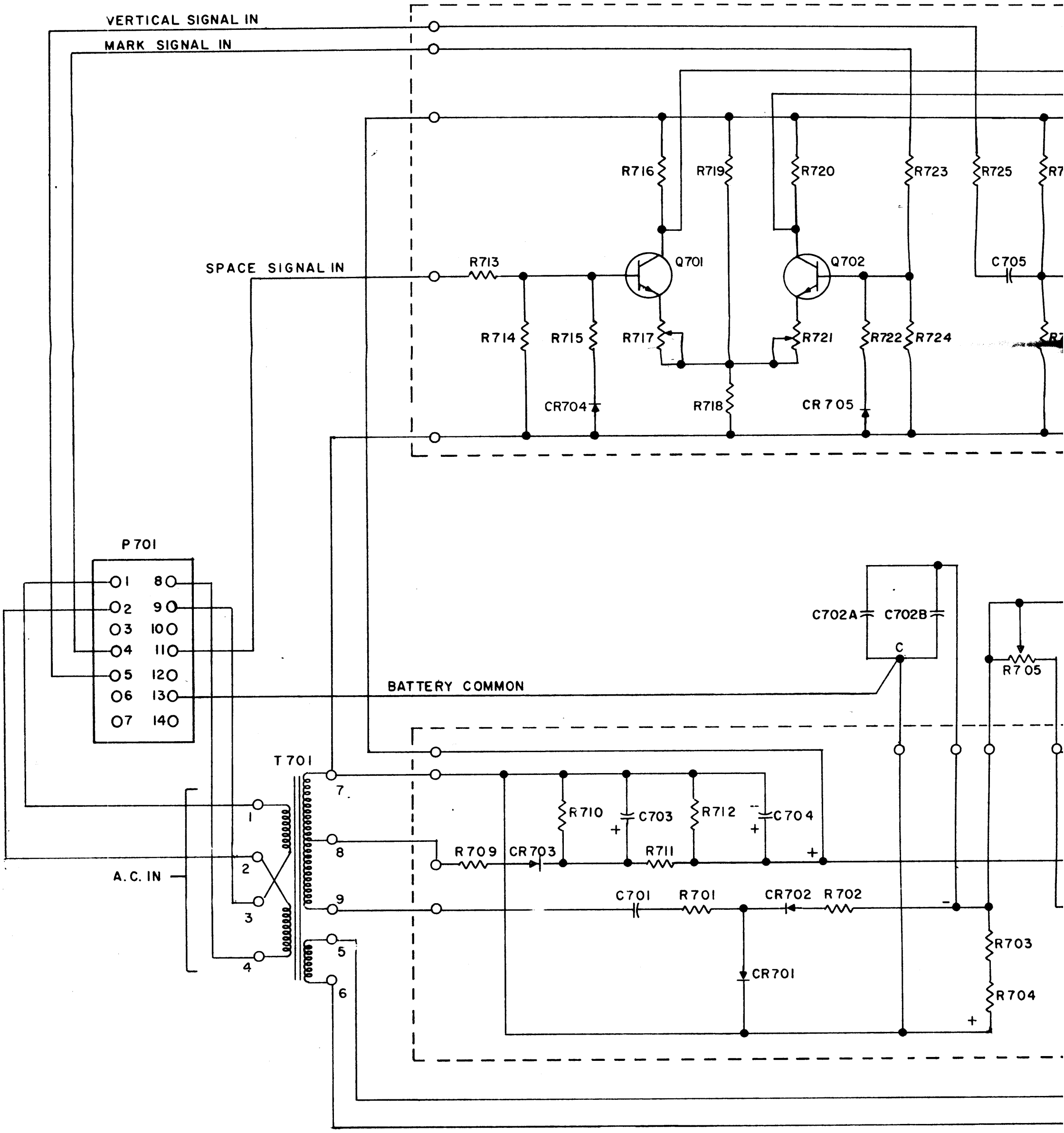
* For Low-Level DC Keying Systems (e. g. ± 6 VDC), R725 is:

33K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF333K

The following drawings are included:

Monitor Schematic	C-SA-174-3-0107A
Component Layout (Power Supply)	A-SA-174-3-0307A
Component Layout (Amplifier)	A-SA-174-3-0407A

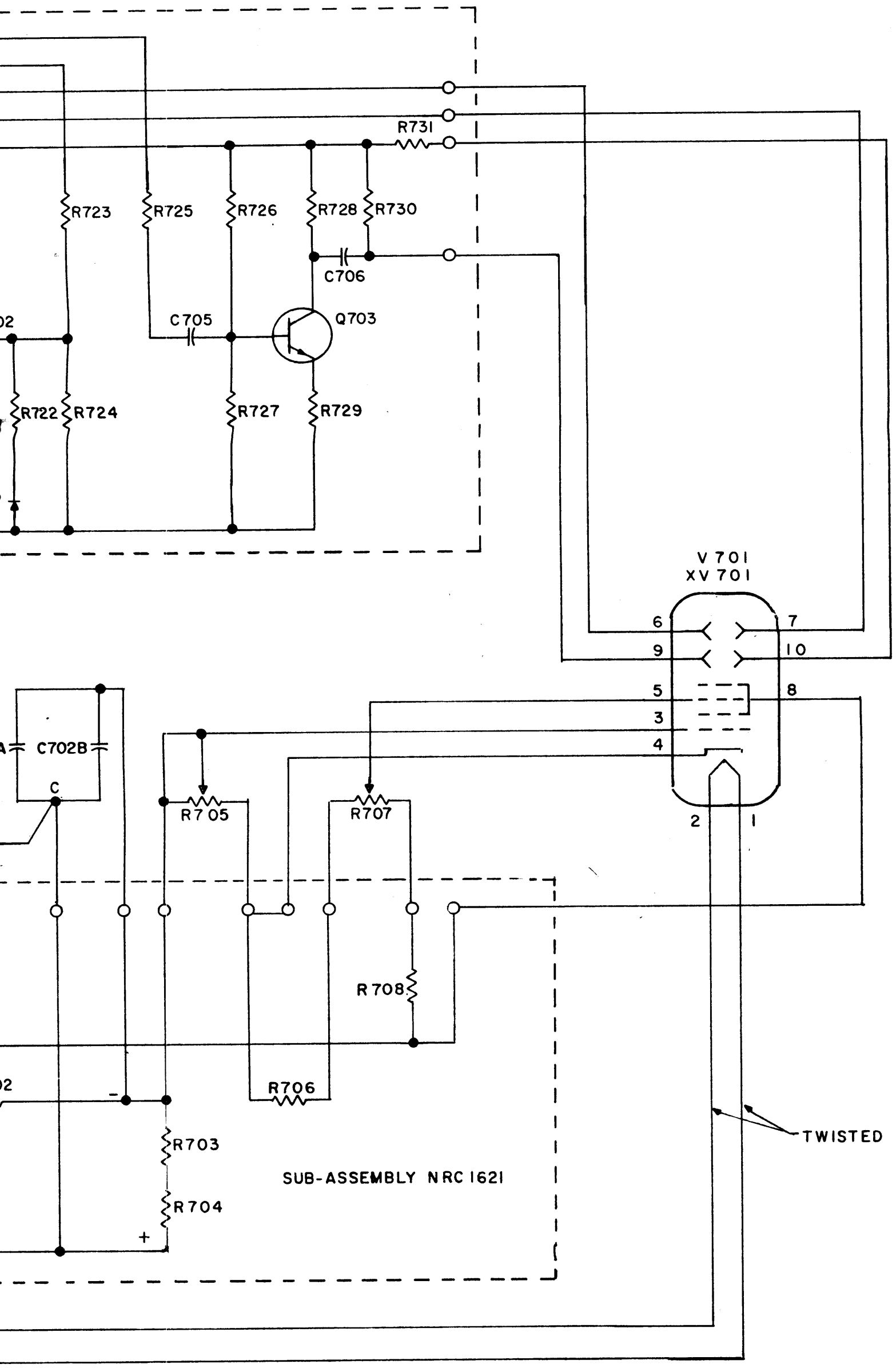
SUB-ASSEMBLY NRC 1620



UNLESS OTH
DIMENSION
TOLERANCES
FRACTIONS DE
± 1/64 ±
MATERIAL:
FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	TERMS. 2&9 OF P701 WERE CONN. TO 3&2 OF T701 RESPECTIVELY	10-12-67	

SUB-ASSEMBLY NRC 1620



REV.

DWG. No.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN L.D	DATE 8-30-67	NAME: SCHEMATIC MONITOR SA 174307A
MATERIAL:	CHECKER	8-31-67	
FINISH:	ENGINEER		
	APPROVAL		SCALE: NONE SHEET 1 OF 1

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

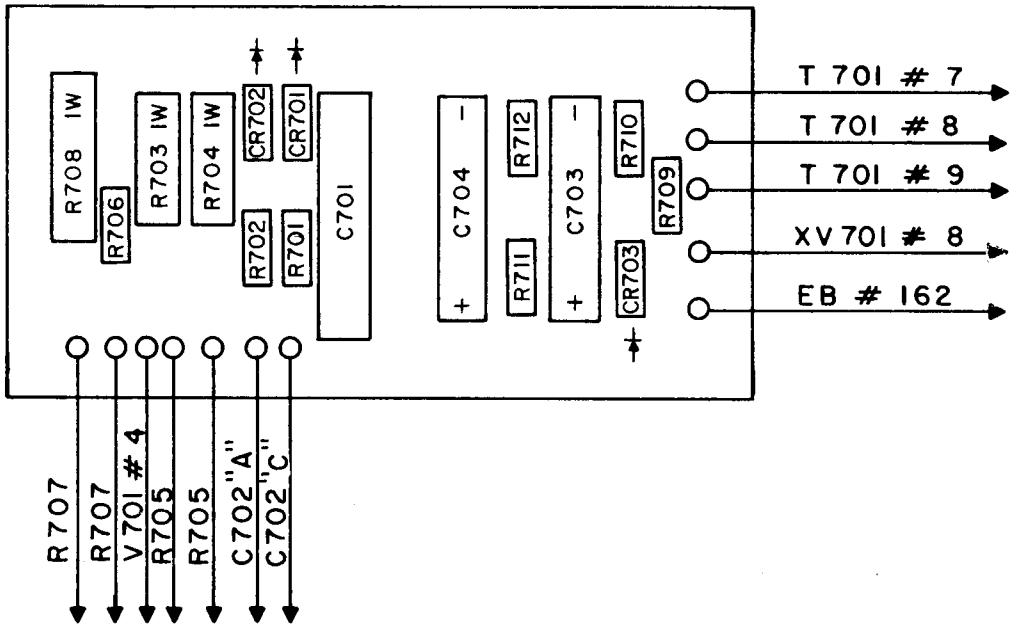
DWG. No. SA-174-3-0107A

DWG. SIZE

DWG. No. SA-174-3-0307A	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB-ASSEMBLY NRC 1621
(EB 163A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	J. B	8-29-67	COMPONENT LAYOUT (POWER SUPPLY) MONITOR SA174307A
MATERIAL:	CHECKER		
	ENGINEER		
FINISH:	APPROVAL		

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-3-0307A

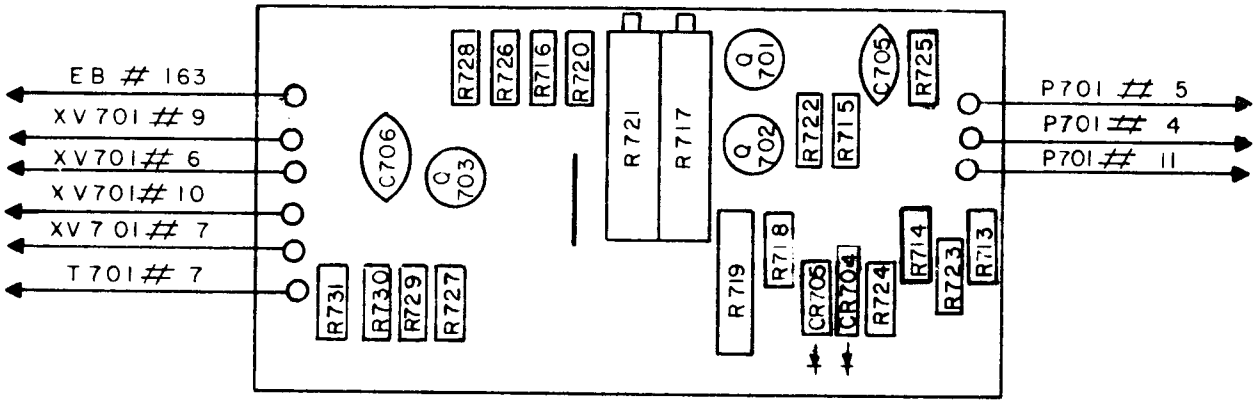
SCALE: NONE | SH. 1 OF 1 | DWG. SIZE A

DWG. No. SA-174-3-0407A	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB – ASSEMBLY NRC1620

(E B 162 A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	J.L.G	8-29-67	COMPONENT LAYOUT (AMPLIFIER) MONITOR SA174307A
MATERIAL:	CHECKER		
FINISH:	ENGINEER		
	APPROVAL		

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-3-0407A

SCALE: NONE | SHEET 1 OF 1 | DWG. SIZE A

NOVEMBER 6TH, 1967

ADDENDUM NO. 4

MODIFICATION OF NORTHERN RADIO TYPE 174 MODELS 2, 3, and 3A FREQUENCY SHIFT DIVERSITY CONVERTERS TO ADD "Mark-Hold" FEATURE.

In some applications of the Type 174 Converters it is desirable to have a "Mark-Hold" feature, to hold the Converter output signal in "Mark" condition, whenever the incoming tone signal disappears.

A Modification Kit (NRC 1642) is available for accomplishing this requirement. This Kit consists of an etched circuit board (EB 218) with components and a 2.5K ohm potentiometer. The etched circuit board is mounted on the underside of the main chassis and the potentiometer is mounted on the rear of the main chassis between terminal block E1 and the Test Jacks.

The circuit of the "Mark-Hold" Kit is shown on NRC Drawing No. B-9-0368. Functioning is as follows:

AGC voltages developed by the amplifiers for the two channels of the Converter are applied to the bases of transistors Q1001 and Q1002 and compared with the THRESHOLD voltage applied to the base of Transistor Q1003. If either (or both) of the channels is developing an AGC voltage greater than the THRESHOLD voltage then transistor Q1003 is "cut-off" and transistors Q1004 and Q1005 also are cut-off. In this case the Converter circuitry functions in its normal manner.

If neither AGC voltage is equal to the THRESHOLD voltage than Q1003, Q1004 and Q1005 are conducting and, through the connection from the junction of Resistor R1006 and R1007 to Pin 11 of Socket J6, the "Mark-Hold" circuitry forces the output of the converter to a "Mark" condition.

The THRESHOLD adjustment can be set to allow a dynamic signal level variation of approximately 40 dbm (from +10 dbm to -30 dbm) for operation of the Converter while still assuring that the output will be held in "Mark" condition for no signal input. It should be noted that this dynamic range is the range of the signal which is instantaneously stronger. That is to say, if either channel is at -30 dbm or greater the Converter will function properly.

Initial adjustment procedure is as follows:

1. Terminate Channel 2 input with a 600 ohm resistor.

2. Throw Diversity Switch to Channel 1 portion.

3. Apply a keyed tone signal to Channel 1 input at -40 dbm level.

4. Observe output signal (preferably with an oscilloscope) while adjusting the THRESHOLD control from full clockwise position in a counter clockwise condition until keying just stops. Output should then rest in "Mark" condition.

5. Increase input signal level until clean keying is observed. This should occur at approximately -35 dbm.

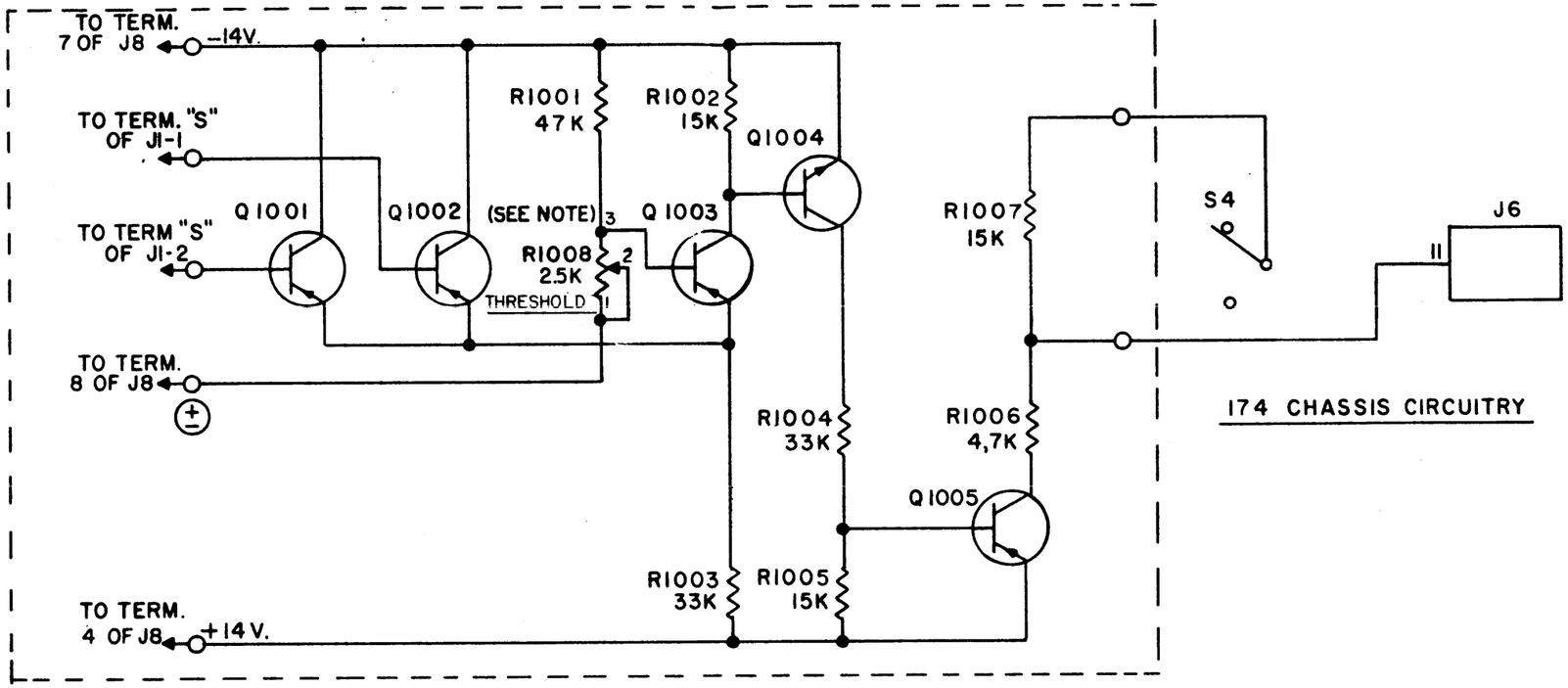
6. Apply normal signals to both channel input terminals and restore Diversity switch to DIVERSITY position.

7. Converter is now ready to handle traffic.

REV.	DWG. No.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	COMPONENT DESIGNATIONS REVISED. ADDITIONAL INFORMATION ADDED.	10-27-67	

SUB-ASSEMBLY NRC 1642
EB 218



NOTE: 1=Q1, Q2, Q3 AND Q5 ARE PNP SILICON TRANSISTORS, MOT. TYPE 2N3251 OR SIMILAR. Q4 IS AN NPN SILICON TRANSISTOR, MOTOROLA TYPE 2N2501 OR SIMILAR.

2= R1008 IS NOT LOCATED ON ETCHED CIRCUIT BOARD.

UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME: "MARK - HOLD"	NORTHERN RADIO COMPANY INCORPORATED
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	A.W.	2-6-67	CIRCUIT ADDITION TO NORTHERN RADIO F.S. DIVERSITY CONVERTERS TYPE 174- MODELS 2,3, &3A	143-147 WEST 22ND ST. N.Y. 11 NEW YORK
MATERIAL:	CHECKER	2-6-67		DWG. N. 9-0368
FINISH:	ENGINEER			
	APPROVAL	2/6/67	SCALE: NONE SH. 1 OF 1	DWG. SIZE B

ADDENDUM NO. 3

August 1st, 1967

This Addendum covers a modification to the chassis of the Type 174 Models 3 and 3A Converters to improve the functioning of the "Keying Speed" circuitry.

The modification is effected in the following manner:

On the Main Chassis - Socket "J5"

Grey-Green lead is moved from terminal "D" to terminal "E".
Purple-Grey lead is moved from terminal "H" to terminal "D".

On the Front Panel - Switch "S3"

Purple-Grey lead is moved from terminal "A" to terminal "A1".

A new capacitor (C3) 0.47 mfd ± 20% 25 volts is installed across terminals "A" and "A1" of the switch. SPR 5C11 or equal.

(Note: Terminal "A" is the center terminal, "A1" is the previously unused end terminal.)

This change has been incorporated into units with the following serial numbers and is recommended for all units:

Serial Numbers - Type 174 Model 3 Serial Nos. 318, 518 to 605 and up.
Type 174 Model 3A Serial Nos. 479 to 504 and up.

ADDENDUM NO. 2

August 24, 1966

This Addendum covers the features of the Type 174 Model 3A Converter which distinguish it from the Type 174 Model 3 unit.

For "Space Diversity" wideband operation the Type 174 Model 3A Converter utilizes a Discriminator Network different from the one used in the Model 3 Converter, and the "Tuning" switch (S6) on the Converter front panel has been changed to accommodate the new network.

Functionally, this new combination provides for two tuning bandwidths, with the channel center frequency fixed at the same frequency for either bandwidth, as opposed to the tuning arrangement of the Model 3 Converter where the "Mark" frequency is fixed and the "Space" frequency is varied to suit the required bandwidth.

The SA 174203A-WB3 Discriminator Network normally supplied with this Converter is tuned for a center frequency of 2550 hertz and the "Mark" and "Space" frequencies are as shown below:

Switch Position	"Space" Frequency	"Mark" Frequency	For Shift of
1	2337.5 Hz	2762.5 Hz	425 Hz (± 212.5 Hz)
2	2125 Hz	2975 Hz	850 Hz (± 425 Hz)

Networks for other center frequencies or shifts may be obtained on special order.

For "narrow band" "Space Diversity" or "Frequency Diversity" operation the functioning of the Type 174 Model 3A and Model 3 Converters is identical. For these modes of operation, the Discriminator Tuning is entirely determined by the Network components and the "Tuning" switch is automatically disconnected from the circuitry when Narrow Band Networks are used.

August 24, 1966

The Electrical Parts Lists of the Type 174 Model 3 and 3A Converters differ only in the type of switch used as S6 in the two units, as indicated below:

SYMBOL S6 TUNING SWITCH

Converter Model	Description	Mfr.	Part No.
Type 174 Model 3	2 circuit, 11 position non-shorting rotary switch, 1/2" shaft	CEN	2513
Type 174 Model 3A	4 circuit, 2-6 position non-shorting rotary switch, 3/8" shaft	CEN	PA 2011

Also for "wideband" operation Discriminator Networks, Type SA 174203A-WB() must be used with the Type 174 Model 3A Converter, while the Type SA 174203A-() Networks are used with the type 174 Model 3 Converter.

ADDENDUM NO. 1

April 19, 1966

The Electrical Parts List for the Printer Driver used in the Type 174 Model 3, Frequency Shift Diversity Converter, has been modified to change the value of R602 from 22K ohms to 220K ohms.

The corrected entry in the "Electrical Parts List for Printer Driver", SA174206A, is as follows:

Symbol	Function	Description	Mfr.	Part No.
R602	C602 bleeder resistor	220K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF224K

This change has been incorporated into units with the following serial numbers and is recommended for all units:

Serial Numbers 228, 307, 317, and above

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5-24-66 ns

6. DRAWINGS (cont'd)

Component Layouts:

A-SA-174-2-0201A
A-SA-174-2-0202A
A-SA-174-2-0203A
A-SA-174-2-0204A
A-SA-174-2-0205A
A-SA-174-2-0306A
A-SA-174-2-0406A
A-SA-174-2-0407
A-SA-174-2-0307
A-SA-174-3-0208
A-SA-174-2-0209A

Tuning Patterns A-174-2-20

Schematic - Discriminator for SA 174203A () C-SA174-2-0403A

Schematic - Discriminator for SA 174203A-WB3 C-174-2-0103A-WB3

Test Circuit B-6-1316

Instruction Book
Frequency Shift Diversity Converter Type 174 Model 3

1. GENERAL

Purpose:

The Northern Radio Company Frequency Shift Diversity Converter, Type 174 Model 3, is used to demodulate the frequency shifted audio output signal from one or two radio receivers into DC **pulses** suitable for operating printers or feeding information into data processing terminals. By means of plug-in frequency determining networks, wide or narrow shift signals, located at any reasonable part of the audio spectrum, may be accommodated.

Description:

The Northern Radio Company Frequency Shift Diversity Converter, Type 174 Model 3, is a fully transistorized two-channel diversity unit, for use with single receiver frequency diversity systems, or with two receiver space diversity systems. Either type of operation may be accomplished with the proper selection of subassemblies.

The audio tones of each channel are separately limited and demodulated before combining takes place. Combining action is controlled in such a manner that the signal channel which receives the stronger signal at its input terminals contributes the larger percentage of the combined output. The combined output signal is then low pass filtered and amplified to drive an "Electronic Relay". The output terminals of the Electronic Relay are electrically isolated from the chassis and from the other circuit "common" connections, and may be used as "dry contacts" to control an externally powered circuit, or may be connected to an internal source of DC power to provide nominal 60 or 20 milliampere signals to the external circuits.

Technical Data:

Input Impedance:	600 ohms unbalanced
Input Level:	-50 to +10 VU
Input Frequencies: (Frequency Diversity)	425 to 3315 cps channels at ± 42.5 cps shift, or 300 to 3300 cps channels at ± 30 cps shift. Other frequencies and shift available for special application.
(Space Diversity)	Center frequencies and shifts adjustable to meet operating requirements. Normally centered on 2550 cps for 850 cps shift.
Output:	1. "Dry Contact" keying of externally powered circuits up to 100 milliamperes and 260 volts open circuit.
	2. Internally powered 60 or 20 milliamperes (nominal) keying to 2000 ohm loads (floating). Neutral or polar output.

Technical Data: (cont'd)

Limiter Recovery Time:	Negligible for a 40 VU differential between Mark and Space frequencies.
Maximum Channel Keying Speeds:	50 dot cycles to 1200 dot cycles, consistent with bandwidth of networks in use.
Monitoring Facilities:	Cathode Ray Tube monitoring of keying and tuning. Input Level Indicator Meters (Two) Output Current Indicator Meter Input Level Jacks Output Current Jack "Output" Test Points on Plug-In Modules
Controls:	Primary Power Switch Input Monitor Switch Channel Switch Sense Switch Tuning (Space Diversity) Keying Speed Switch Output Current Control CRT Controls (Focus and Intensity)
Power Requirements:	115/230 ± 10% volts AC, 47/440 cps, 15 watts, approximately
Mounting:	Standard relay rack
Dimensions:	19" wide x 3-1/2" high x 14" deep, approximately
Weight:	Approximately 16 pounds

Bandpass Filters:

Bandpass Filters are contained in the "Plug-In" Frequency Determining Networks whenever necessary.

Automatic Gain Control Amplifier (SA 174201A):

The Automatic Gain Control (AGC) Amplifier serves two functions. By "compressing" the signal, it acts as part of the limiter chain, and it produces a control signal which is utilized in the Diversity Control functions.

The AGC Amplifier consists of a "variolosser" amplifier (including Transistors Q101 to Q104 inclusive), and a signal rectifier and filter section (including Transistors Q105 and Q106). The rectified and filtered signal developed at the amplifier output is fed back to the variolosser where any increase in control current causes an increase in the signal attenuation through the variolosser, with the result that the output signal from the AGC Amplifier is "compressed" in relation to the input signal.

Limiter Amplifier (SA 174202A):

Transistors Q201 to Q203 comprise a push-pull "limiter" amplifier which accepts the signal from the AGC Amplifier and delivers a signal which is of essentially constant amplitude for all input signals exceeding a level of approximately -50 dbm. The collector circuits of Q201 and Q202 are directly connected to the inputs of the Discriminator circuits where further limiting takes place.

Discriminator Circuits (SA174203A):

Transistors Q301-Q306 inclusive are used to drive the Discriminator Tank, including L1-L4 inclusive, and associated capacitors and resistors. Q301 and Q302 drive the "Mark" (High Frequency) Tank, while Q304 and Q305 drive the "Space" (Low Frequency) Tank. The amplitude of signal developed by the "Mark" tank circuit is controlled by variable resistor R301, while the amplitude of the "Space" tank is controlled by the variable resistor R302. The absolute amplitude of both signals may be reduced simultaneously by the application of a control signal (from the Diversity Control SA 174204A) to the junction of Resistors R307, R308, and R309. The function of the control signal is to reduce the bias voltage applied to the bases of "current sink" transistors Q303 and Q306 and thus reduce the drive power applied to the tank circuits. Diodes CR301 to CR304 inclusive, rectify the signal voltage developed across the "Mark" and "Space" tanks with the "Mark" signal developing positive voltage and the "Space" signal developing negative voltage.

Discriminator Circuits (SA 174203A): (cont'd)

The SA 174203A Network is normally used for "Space Diversity" operation where the outputs of two different radio receivers feed the two channel inputs of the Converter. Provision is made for accommodating frequency shift signals with different amounts of shift in the following manner. The "Mark" Tank in the SA 174203A is permanently tuned to a frequency of 2975 cps, while the "Space" Tank circuit is tunable from the front panel of the Converter ("Tuning" Control). The basic "Space" Tank circuit is tuned to a frequency of 1775 cps and this circuit may be retuned to other frequencies by adjustment of the tuning control switch. Approximate "Space" resonant frequencies, commencing with the "Tuning" switch, in its most counter clockwise position, are as follows:

Switch Position	"Space" Frequency	For Shift Of
1	2825 cps	150 cps (± 75 cps)
2	2775 cps	200 cps (± 100 cps)
3	2675 cps	300 cps (± 150 cps)
4	2575 cps	400 cps (± 200 cps)
5	2375 cps	600 cps (± 300 cps)
6	2125 cps	850 cps (± 425 cps)
7	1775 cps	1200 cps (± 600 cps)

In operation, the radio receiver is always tuned to place the "Mark" frequency at 2975 cps. The Converter "Tuning" Control is then tuned to resonate the "Space" frequency. Normally, the Converter will function without errors if the Space Tuning is within one position of the correct adjustment.

Combiner Circuits and Diversity Control (SA 174204A):

The rectified discriminator outputs from the two channels are fed to the bases of Transistors Q401 and Q402. These transistors, functioning as emitter followers, are used to minimize loading of the tank circuits by the rectification function. The emitters of Q401 and Q402 connect to a low pass RC filter (C401-C404 inclusive, and R403, R404, and R407). The filter output is connected to emitter followers Q406 and Q407, and the output of Q407 is connected to the Automatic Threshold Control unit, (SA 174209A).

If the channel switch is connected in the "Channel 1" position, the output of Channel 2, Discriminator is disconnected, or if it is in the "Channel 2" position, the output of Channel 1 is disconnected. When the switch is in the "Diversity" position, both channels are connected and contribute to the signal output as described below.

Diversity combining takes place in the following manner. If Channel 1 has a stronger "Mark" signal than Channel 2, the stronger positive output of Channel 1 will raise the cathodes of Diodes CR301 and CR302 (in Channel 2) positive, cutting off current flow from Channel 2 as long as Channel 1 has the stronger signal.

Similar action takes place at the base of Q402 for "Space" signals with the stronger negative signal cutting off the weaker one.

The Automatic Diversity Control has the following effect: It further decreases the limiter output of the channel with the weaker signal, thus assisting the combiner in selecting the stronger signals. The limiter output is controlled in the following way: The DC control voltages developed by the two AGC Amplifiers are applied to the bases of a differential Amplifier Q403-Q404, and the two collectors of the Differential Amplifiers control the base potentials applied to the current sink transistors Q303-Q306 in Channel 1 and the corresponding units in Channel 2. The connections are such that a stronger signal in Channel 2 reduces the base potentials of Q303-Q306 in Channel 1 and thus reduces the signal output from the discriminator of Channel 1. Similarly, a stronger signal in Channel 1 reduces the discriminator output from Channel 2.

D. C. Amplifier (SA 174[illegible])

The Discriminator output signal (which passes through the Automatic Threshold Control unit) is applied to the base of Q502, which is part of a differential amplifier including Q501 as the other amplifier and Q503 as a current sink. The base of Q501 receives a "reference voltage" from the Automatic Threshold Control unit which assures that the signal as seen at the differential amplifier input is a symmetrical polar signal thus minimizing output signal distortion due to slight mistuning of the radio receiver. The output signal from the collectors of Q501 and Q502 is applied to the bases of another differential amplifier, Q504-Q505, and the output of this stage is a square wave signal suitable for driving low level "logic" circuitry or a "Plug-In" Printer Relay.

Capacitor C502 is provided to produce additional low pass filtering of the discriminator output signal for low speed keying (approximately 75 baud or less) and is effective when the "Keying" Switch on the Converter front panel is in the "Slow" position.

Printer Driver (SA 1742[illegible])

The Plug-In Printer Driver includes a power transformer, rectifiers, and filter for self contained loop current supply.

DC Isolation between the output of the DC Amplifier (SA 174205A) and the Printer Driver output is obtained through use of a keyed oscillator (Transistor Q603) operating at approximately 50 kilocycles. Transistor Q601 and Q602 control the oscillator, keying it "On" for a "Mark" signal and "Off" for a "Space" signal. Transformer T602 serves as the inductance for the oscillator circuit and as the decoupling transformer feeding rectifier CR606. The rectified oscillator signal is filtered by C605 and applied to the base of a "Darlington Amplifier Circuit" consisting of Transistor Q604 and Q605. These transistors present a low impedance current path when the oscillator is "On" and a very high impedance current path when the oscillator is "Off". Diode CR608 protects the transistors against damage due to improper connection of an external battery.

Circuit connections through the main connector (P601) to the Output Terminal Strip (E2) on the rear of the Converter allow choice of external or internal loop battery. When the "internal" battery is to be used, the load is connected between Terminals 1 and 2 of Terminal Strip E2 (Pins 7 and 14 of P601). When an external battery is to be used, the loop (including the external battery) is connected between terminals 1 and 3 of Terminal Strip E2 (Pins 6 and 7 of P601), with the positive side of the loop connected to Terminal 1 (Pin 7 of P601). Either side of the external loop may be grounded (but not both) or the loop may be left "floating" if desired.

Printer Driver (SA 174206[illegible]) (cont'd)

Normally, it is desirable that one side of the loop be grounded either locally or at the far end of the loop. Whenever the loop is a metallic circuit with no ground at the far end, it is suggested that Terminal No. 3 of Terminal Strip E2 be grounded. Assuming that the Converter chassis is grounded through its rack mounting, this may be accomplished by connecting a "strap" between Terminals 3 and 5 of Terminal Strip E2.

CAUTION: Before connecting an external loop to the Converter or applying AC power, double check to assure that any external battery is properly connected to the loop (including polarity consideration); and that such battery is of suitable voltage (normally 120 volts maximum for 20 or 60 milliampere circuits); that any grounds are proper, and that the loop current adjusting control on the front panel of the Converter is at its maximum counter-clockwise position. After power is applied, the current control may be advanced to produce proper output current, as observable on the panel mounted meter.

NOTE: A polar Output Driver is available as an option in place of the Printer Driver, if polar operation is required.

Monitor Circuit (SA 174307):

The tuned circuit outputs from the discriminator are amplified by Transistor Q701 and Q702. Q701 amplifies the "Space" signal while Q702 amplifies the "Mark" signal. The monitor selects the channel to be monitored. The output signals from the collectors of Q701 and Q702 drive the horizontal deflection plates of the monitor cathode ray tube.

The vertical sweep signal is obtained by differentiating the output signal from the DC chain and amplifying the resultant signal with Transistor Q703.

The resultant oscilloscope pattern thus produced is as follows: When "Mark" frequency is present, a horizontal trace is produced on the right side of the Cathode Ray Tube, while the output of Q703 causes an upward sweep on the tube.

When "Space" frequency is present, the horizontal trace appears on the left side of the tube and Q703 causes a downward sweep.

Front panel controls are provided for adjustment of Cathode Ray Tube "Intensity" and "Focus".

Power Supply (SA 174308):

There are three separate power supplies for a complete Converter equipped with a Printer Relay.

The Main Supply includes positive and negative 14 volt regulated supplies for operation of all circuits except the Monitor and Printer Relay circuits.

The Monitor Power Supply includes an AC filament supply and the necessary DC high voltage supply for the cathode ray tube and high voltage for the amplifier transistors used in the Monitor.

The Printer Driver includes DC loop current supply as required for Neutral operation. The optional Polar Driver also includes necessary DC loop current supply.

All Power Supply transformers are arranged for operation from 115 or 230 volts AC sources and one common strapping function provided on the main chassis accomplishes the wiring change for the entire unit when the voltage requirement is changed.

Automatic Threshold Control Unit (SA 174209A):

This unit is a device which accepts the output signal from Q407 and determines the DC voltage applied for "Mark" and "Space" signals, and develops a "reference" voltage which is the average of the two applied voltages. This "reference" voltage and the signal voltage are applied to the D. C. Amplifier (SA 174205A).

2. INSTALLATION

Mechanical Installation:

Before installing the Converter, it should be inspected to assure that all plug-in units are properly installed and firmly seated in their appropriate sockets. Plug-in cards are identified by an "EB" number etched on the back side of the card, and should be seated in sockets bearing corresponding identification information. The component side of each card must be toward the front panel of the Converter chassis. Locking devices associated with subassemblies should be firmly seated in the locked position.

Determine whether the primary power to which the unit will be connected corresponds with the internal wiring of the Converter, and make any necesarry strapping connections as detailed in the next paragraph. NOTE: Converters are normally factory wired for operation on 115 volts AC

After the unit has been inspected and any necessary adjustments made, it may be installed in a standard cabinet or rack at a height convenient for observation of the Monitor and Meter on the unit.

Electrical Installation:

The Converter is normally wired for operation from 115 volt, 50/60 (or 400) cps primary supply unless otherwise specified on order.

The wiring option for 115 or 230 volt operation is accomplished at Terminal Board TB2 on the underside of the Converter chassis. A protective insulating cover installed above this board protects against possible accidental contact with the AC terminals, and must be removed for inspection or wiring change.

Two separate straps are installed (one between Terminals 1 and 2 and a second between Terminals 3 and 4) for 115 volt operation.

One strap is installed between Terminals 2 and 3 for 230 volt operation.

Before connecting an output load to the Converter, the "Output Current" control must be checked to assure that it is in its extreme counter clockwise position. After the Converter is turned on and receiving a "Mark" signal, the Output current may be adjusted to the proper value.

The Printer Driver output is "floating" with respect to the chassis so that either side of the load may be grounded. The Printer Driver section of this book should be reviewed before connecting a grounded load to the Converter.

Space Diversity Operation:

For Space Diversity operation, one receiver is connected to Channel 1 input (Terminals 1 and 2 of E1) and the other receiver is connected to Channel 2 input (Terminals 3 and 4 of E1). The receiver outputs should be 600 ohms impedance, and if unbalanced, the grounded sides of the receiver outputs should be connected to Terminals 2 and 4 respectively. Twisted pairs, preferrably shielded, should be used for connecting between the receivers and the Converters. When the output circuits of the receivers are ungrounded, it is usually desirable to ground Terminals 2 and 4 of E1 to the Converter chassis and/or the Converter electrical "common" circuitry.

The electrical "common" of the Converter circuitry is not internally grounded to the Converter chassis but appears at Terminal 5 of E1 and Terminal 4 of E2. Chassis ground is connected to Terminal 6 of E1 and Terminal 5 of E2. Normally, it is preferrable to tie the Converter circuitry to ground by means of a strap between the appropriate terminals of either E1 or E2.

Frequency Diversity Operation:

When the Converter is to be used for frequency diversity operation, one receiver output is connected to both channels.

Special discriminator networks, tuned to the desired frequencies, are available for frequency diversity operation.

These discriminator networks are, of course, narrow band networks in accordance with the standard 170 hertz spaced channels utilizing center frequencies of 425 to 2975 hertz or the CCITT standard 120 hertz spaced channels utilizing center frequencies of 420 to 3180 hertz.

Several converters may be operated from a single voice frequency channel as long as the individual discriminator networks in the converters are all on different frequencies so that there is no interference between their respective passbands. When the converters are operated in this manner, the single voice frequency line is connected to both channel inputs of all of the converters in use.

When narrow band discriminator networks are used, the tuning of the converter channels is completely determined by the networks and the "Tuning" switch located on the converter front panel is rendered ineffective, so that it cannot interfer with the discriminator circuit.

3. OPERATING INSTRUCTIONS

1. Before applying AC power to the Converter, check to assure that the Output Current control is in minimum output (extreme counter-clockwise) position, and that the signal input and output lines are properly connected.

2. Set the Converter Controls as follows:

Output Current	- Minimum Output
Sense Switch	- +
Keying Switch	- Slow
Diversity Switch	- Channel 1
Monitor Switch	- Channel 1
Power Switch	- On

3. For Frequency Diversity operation, the following tune up procedures should be followed:

   a. Receiver should be tuned for maximum deflection of S Meter for desired signal.

   b. Audio output level of receiver should be adjusted for full scale reading of Converter Meter (Ø dbm).

   c. The CRT pattern should correspond to one of the monitor patterns shown on Dwg. No. A-174-2-20.

   d. Steady "Mark" signal should be requested from the transmitting station.

   e. The CRT monitor pattern should correspond to the steady Mark pattern. Receiver tuning should be rechecked for maximum pattern deflection to right of scope center.

   f. The output current may now be checked and output current control may be adjusted to the proper operating value (normally 60 mA).

   g. Channel 2 tuning and level should be checked by throwing the "Monitor" switch to the Channel 2 position and the Channel 2 receiver should be adjusted for proper indications, as to signal level and tuning.

h. The transmitting station should now be requested to send a "test tape".

i. The "Tuning" Control should now be adjusted for best pattern on the Monitor scope.

j. Receiver tuning should be slightly readjusted for equal "Mark" and "Space" flag lengths if necessary.

k. Turn on motor power to the Printer and observe that proper printing is obtained when the "Diversity" switch is in any position.

l. Set "Diversity" switch to "Diversity" and commence normal traffic.

4. MAINTENANCE

In the event of malfunction of the Frequency Shift Diversity Converter, it is suggested the unit be removed to the test bench, and the procedure below followed.

In the infrequent instances when it is necessary to remove and replace components on the etched circuit board, it is highly desirable that an appropriate small soldering iron, with limited heat storage, be employed.

Test Equipment Required:

1. Variable Attenuator, 600 ohms, 0-58 db, three Daven Type T-332G or equivalent.

2. VU Meter, Northern Radio Type 254 Model 1 or equivalent.

3. VTVM, Simpson Model 303 or equivalent.

4. Oscilloscope, Dumont Type 304H or equivalent.

5. Teletype, Teletype Corporation Model 28 or equivalent.

6. EPUT Meter, Berkeley Type 554F or equivalent.

7. Transmitter Distributor, Teletype Corporation Model 14 or equivalent.

8. Keyer, Northern Radio Company Type 153 Model 3 or equivalent.

9. Oscillator, Hewlett-Packard Type HP200A or equivalent.

10. Test Set NRC 1084T, Northern Radio Company

Procedure:

1. Inspect the unit for damage to components, facings, etc.

2. With power switched off, connect the unit in the circuit of Northern Radio Drawing No. B-6-1316.

3. Turn the "output current" variable resistor to the maximum counter-clockwise position.

4. Arrange the Keyer to transmit at the marking frequency and adjust the Keyer's output level to zero dbm.

5. Apply power to the unit.

6. Operate the Meter Switch to the "current" position. The Meter should indicate approximately 20 mA.

   Turn the "output current" variable resistor clockwise until the Meter reads 60 mA.

6a. Measure the resistance from E2-1 to E2-4 and from E2-2 to E2-4.

   Requirement: The resistance should read at least 1 megohm.

Procedure: (Cont'd)

7. Operate the Diversity Switch to the "Diversity" position. Observe CH 1 Meter.

Requirement: The Meter should indicate full scale.

If the requirement is not met, adjust the variable resistor R123 of the Channel 1 AGC Amplifier as necessary.

8. Observe CH 2 Meter.

Requirement: The Meter should indicate full scale.

If the requirement is not met, adjust the variable resistor R123 of the Channel 2 AGC Amplifier as necessary.

9. Operate the Diversity Switch to the "Diversity" position and the Tuning Dial to Step 6. With keyed signals applied, observe the signal patterns on the Monitor Tube with the Monitor Switch operated alternately to the "CH 1" and "CH 2" positions.

Requirement: The pattern for both channels should be equal in size emanating from center 3/8" ± 1/16" length.

If the requirement is not met, turn the variable resistor of the AGC Amplifier of the channel which has the larger pattern clockwise slightly to make them equal.

10a. Reduce signal level into Channel 1 by 4 db.(USE ATT. A)

Requirement: The flag pattern associated with Channel 1 should disappear and the flag pattern associated with Channel 2 should become slightly larger.

10b. Reduce signal level into Channel 2 by 8 db. (USE ATT. B)

Requirement: The flag pattern associated with Channel 2 should disappear and the flag pattern associated with Channel 1 should increase slightly.

10c. Reduce signal level from Channel 1 by a further 4 db.

Requirement: The flag pattern associated with each channel should be equal in size emanating from center of screen 3/8" ± 1/16" length.

10d. Set ATT. A and ATT. B back to zero db again.

11a. Operate both the Diversity Switch and the Monitor Switch to the "CH 1" position. With VTVM connected to the Pin 1 of the Socket J3-1 (Space Tank) and to the Pin 13 of the Socket J3-1 (Mark Tank), observe the voltage on the VTVM.

Requirement: The amplitude of both "Mark" and "Space" signals should be 7.1 volts RMS ± 0.2.

11b. Operate both the Diversity Switch and the Monitor Switch to the "CH 2" position. With Oscilloscope connected to the Pin 1 of the Socket J3-2 and to the Pin 13 of the Socket J3-2, observe the voltage on the VTVM.

Requirement: The amplitudes of both "Mark" and "Space" signals should be 7.1 volts RMS ± 0.2.

If the requirement is not met, adjust the "Mark" and "Space" amplitude control variable resistors, R301 and R302, in the Channel Discriminator as required.

12. Dotter on. Operate the "CH 1" attenuator to the 50 db position and the Diversity Switch to "Diversity" position. No flag pattern will show on the Monitor Tube in "CH 1" and clean flag pattern will show in "CH 2". Return attenuator to zero db.

Operate the attenuator of "CH 2" to 50 db. No flag pattern will show on the Monitor Tube in "CH 2" and flag pattern will show in "CH 1". Return attenuator to zero db.

13. Connect scope probe to the Terminal E of the Socket EB-160. Operate the "Slow-Fast" Switch and observe the waveform on the Oscilloscope.

Requirement: The waveform, when the switch is operated to slow, should be more rounded that that when the switch is operated to "fast".

14. Operate Sense Switch to the (+) position. Observe reversals across 2K ohm load and adjust R914 in the Automatic Threshold for zero distortion.

Requirement: The printer should print correctly.

15. Operate the Sense Switch to the (-) position.

Requirement: The printer should not print correctly.

16. With Sense Switch operated to the (+) position, vary signal from Ø to -50 db on each channel separately and simultaneously.

Requirement: The printer should print correctly throughout.

17. Replace the Northern Radio Type 153 Model 3 Keyer with an Oscillator.

18. Operate the Tuning Switch to the Step 1 position. Adjust the Oscillator to transmit 2825 Hz at Ø dbm level.

19. Operate both the Diversity and the Monitor Switch to the "CH 1" and "CH 2" alternately. Observe the signal on the Monitor Tube.

    Requirement: A horizontal line should appear on the Monitor Tube. The line associated with each channel should be equal in length 3/8" ± 1/16".

20. Operate the Tuning Switch to the Step 2 position. Adjust the Oscillator to transmit 2775 Hz at Ø dbm level. Repeat Step 19.

21. Operate the Tuning Switch to the Step 3 position. Adjust the Oscillator to transmit 2675 Hz at Ø dbm level. Repeat Step 19.

22. Operate the Tuning Switch to the Step 4 position. Adjust the Oscillator to transmit 2575 Hz at Ø dbm level. Repeat Step 19.

23. Operate the Tuning Switch to the Step 5 position. Adjust the Oscillator to transmit 2375 Hz at Ø dbm level. Repeat Step 19.

24. Operate the Tuning Switch to the Step 7 position. Adjust the Oscillator to transmit 1775 Hz at Ø dbm level. Repeat Step 19.

5. ELECTRICAL PARTS LIST

Frequency Shift Diversity Converter:

Symbol	Function	Description	Mfr.	Part No.
C1	Output filter capacitor	0.002 mfd 1000WV ceramic capacitor	CEN	DD 202
C2	Output filter capacitor	0.002 mfd 1000WV ceramic capacitor	CEN	DD 202
C3	Low pass filter	0.47 mfd ± 20% 25 volt ceramic capacitor	SPR	5C11
E1	Input terminal strip	6 terminal screw type and solder lugs	KUL	600-6-Y-SI
E2	Output terminal strip	5 terminal screw type and solder lugs	KUL	600-5-Y-SI
F1	Main power fuse	1/2 amp "Slo-Blo" fuse	LFU	313.500
F2	Main power fuse	1/2 amp "Slo-Blo" fuse	LFU	313.500
I1	Primary power lamp	Bayonet base lamp, neon	GEC ANY	NE 51 or B1A
J1-1	Channel 1 AGC Amplifier socket	18 terminal printed circuit connector	AMP	225-21831-101
J1-2	Channel 2 AGC Amplifier socket	18 terminal printed circuit connector	AMP	225-21831-101
J2-1	Channel 1 Limiter socket	18 terminal printed circuit connector	AMP	225-21831-101
J2-2	Channel 2 Limiter socket	18 terminal printed circuit connector	AMP	225-21831-101
J3-1	Channel 1 Discriminator socket	24 prong female connector with floating bushing	AMP	57-20240
J3-2	Channel 2 Discriminator socket	24 prong female connector with floating bushing	AMP	57-20240
J4	Diversity Control socket	18 terminal printed circuit connector	AMP	225-21831-101
J5	D. C. Amplifier socket	18 terminal printed circuit connector	AMP	225-21831-101

Frequency Shift Diversity Converter: (cont'd)

Symbol	Function	Description	Mfr.	Part No.
J6	Printer Driver socket	14 prong female connector with floating bushing	AMP	57-20140
J7	Monitor socket	14 prong female connector with floating bushing	AMP	57-20140
J8	Main Power Supply socket	8 prong female connector with floating bushing	AMP	26-4201-8S
J9	Auto Threshold Control socket	18 terminal printed circuit connector	AMP	225-21831-101
J10	Extension Adapter socket (NRC 1360)	18 terminal printed circuit connector	AMP	225-21831-101
J11	Channel 1 monitor	3 conductor microphone jack	SWC	S112B
J12	Channel 2 monitor	3 conductor microphone jack	SWC	S112B
J13	Output monitor	2 conductor phone jack, tip continuation circuit, insulated sleeve	SWC	N112A
J14	B+ monitor jack	Tip jack - Red	ANY	MS16108-2
J15	"Common" monitor jack	Tip jack - Black	ANY	MS16108-3
J16	B- monitor jack	Tip jack - White	ANY	MS16108-1
M1	Meter, Channel 1 level	0-100 microammeter	INI	Model 1122HL100DCUA
M2	Meter, Channel 2 level	0-100 microammeter	INI	Model 1122HL100DCUA
M3	Meter, Output current	100-0-100 microammeter	INI	Model 1122HC200DCUA
P1	Main power connector	3 pin AC receptacle	SWC	AC3G
R1	Loop current control	5000 ohms 25 watt Model H with 1/8" screwdriver slot	OHM	0162
R2	Meter shunting resistor	12 ohms ± 10% 2 watts composition resistor	ANY	RC42GF120K

Frequency Shift Diversity Converter: (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R3	Meter series resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R4	Meter series resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R5	Meter series resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
S1	Monitor switch	DPDT toggle switch	CHC	8363K7
S2	Diversity switch	6 circuit, 2 to 3 position shorting rotary switch	MAL	3163J
S3	Speed switch	DPDT toggle switch	CHC	8363K7
S4	Sense switch	DPDT toggle switch	CHC	8363K7
S5	Main power switch	DPST toggle switch	CHC	8360K7
S6	Tuning switch	2 circuit, 11 position non-shorting rotary switch, 1/2" shaft	CEN	2513
XF1	Socket for F1	Panel mounting finger type knob fuseholder for 3AG fuse	LFU	342001
XF2	Socket for F2	Panel mounting finger type knob fuseholder for 3AG fuse	LFU	342001
XI1	Socket for I1	Pilot light assembly with clear lens and internal resistor	DLA	26408-1137
Z1	Power Supply Cord Assembly	Line Cord Assembly	NRC	1363

AGC AMPLIFIER, SA 174201A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
C101	Q101 bias filter capacitor	100 mfd ± 20% 10 volt tantalum capacitor, insulated sleeve	TXI	SCM107GP010D4
C102	Q101 collector filter capacitor	150 mfd ± 20% 15 volt tantalum capacitor, insulated sleeve	TXI	SCM157HP015D4
C103	Q102 "roll-off" capacitor	0.22 mfd ± 20% 25 volt ceramic capacitor	SPR	5C9
C104	Q103-Q104 "roll-off" capacitor	0.22 mfd ± 20% 25 volt ceramic capacitor	SPR	5C9
C105	Control signal filter capacitor	4.7 mfd ± 20% 15 volt tantalum capacitor, insulated sleeve	TXI	SCM475BP015D4
C106	Control signal filter capacitor	0.47 mfd ± 20% 25 volt ceramic capacitor	SPR	5C11
CR101	"Variolosser" diode	80 volt germanium diode	ANY	1N100
CR102	"Variolosser" diode	80 volt germanium diode	ANY	1N100
CR103	"Variolosser" diode	80 volt germanium diode	ANY	1N100
CR104	"Variolosser" diode	80 volt germanium diode	ANY	1N100
CR105	Q103-Q104 bias diode	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR106	Control signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR107	Control signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914

AGC AMPLIFIER, SA 174201A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
CR108	Control signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
Q101	1st amplifier transistor	PNP silicon transistor	MOT	2N3251
Q102	2nd amplifier transistor	PNP silicon transistor	MOT	2N3251
Q103	3rd stage amplifier	PNP silicon transistor	MOT	2N3251
Q104	3rd stage amplifier	PNP silicon transistor	MOT	2N3251
Q105	Control signal amplifier No. 1	PNP silicon transistor	MOT	2N3251
Q106	Control signal amplifier No. 2	NPN silicon transistor	MOT	2N2501
R101	Input loading resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R102	"Variolosser" resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R103	"Variolosser" resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R104	"Variolosser" resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R105	"Variolosser" resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R106	T102 loading resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R107	Q101 emitter resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K

AGC AMPLIFIER, SA 174201A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R108	Q101 collector resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R109	Q101 filter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R110	Q102 "roll-off" resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R111	Q102 emitter resistor	150 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF151K
R112	Q102 emitter resistor	150 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF151K
R113	Q103-Q104 bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R114	Q103-Q104 coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R115	Q103 emitter resistor	150 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF151K
R116	Q104 emitter resistor	150 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF151K
R117	Q103-Q104 "roll-off" resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R118	Q105 bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R119	Q105 emitter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R120	Filter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R121	Filter resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K

AGC AMPLIFIER, SA 174201A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R122	Q106 emitter resistor	10K ohms ± 10% 1/4 watt compositon resistor	ANY	RC07GF103K
R123	Variolosser control adjust resistor	2.5K ohms potentiometer	ALB	RH252M
R124	Q106 collector resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
T101	Input transformer	1500 ohms center tapped/10K ohms center tapped miniature transformer	NRC UTC	1329 DO-T25
T102	1st interstage transformer	1500 ohms center tapped/10K ohms center tapped miniature transformer	NRC UTC	1329 DO-T25
T103	2nd interstage transformer	1500 ohms center tapped/10K ohms center tapped miniature transformer	NRC UTC	1329 DO-T25
T104	Output transformer	1500 ohms center tapped/10K ohms center tapped miniature transformer	NRC UTC	1329 DO-T25

LIMITER UNIT, SA 174202A

Symbol	Function	Description	Mfr.	Part No.
C201	Emitter coupling capacitor	100 mfd ± 20% 10 volts tantalum capacitor, insulated sleeve	TXI	SCM107GP010D4
C202	Emitter coupling capacitor	100 mfd ± 20% 10 volts tantalum capacitor, insulated sleeve	TXI	SCM107GP010D4
C203	Output filter capacitor	0.001 mfd 600 volts ceramic capacitor	CEN	ID 102
C204	Input filter capacitor	0.01 mfd ± 20% 25 volts ceramic capacitor	AEO	TP89-103RM
CR201	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR202	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR203	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR204	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR205	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR206	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR207	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR208	Limiter diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
J201	Input monitor jack	Test probe receptacle, brown	API	3-582118-1
J202	Output monitor jack	Test probe receptacle, red	API	3-582118-2

Limiter Unit, SA 174202A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
Q201	Limiter amplifier	PNP silicon transistor	MOT	2N3251
Q202	Limiter amplifier	PNP silicon transistor	MOT	2N3251
Q203	Q201-Q202 current control	PNP silicon transistor	MOT	2N3251
R201	Q203 bias resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R202	Q203 bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R203	Q201 emitter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R204	Q202 emitter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R205	Q201 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R206	Q202 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R207	Q201-Q202 balance resistor	1K ohm potentiometer	ALB	RH102M
R208	Q203 emitter resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R209	Input filter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R210	Input filter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R211	Input monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R212	Output monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K

DISCRIMINATOR, SA 174203A

Symbol	Function	Description	Mfr.	Part No.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	2550 cps bandpass filter	NRC	1326
FL302	Discriminator tank circuit	Tuned circuit for frequency diversity operation	NRC	1327A
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1Kohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Discriminator, SA 174203A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305, Q306 bias control resistor	10K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

Sym-bol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-4			
	Carrier Frequency: 765 ± 42.5 hz	"High" Freq. 807.5 hz "Low" Freq. 722.5 hz		
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
FL301	Bandpass filter	765 hz bandpass filter	NRC	697
FL302	Discriminator tank circuit	Tuned circuit for 765 ± 42.5 hz operation	NRC	1480
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Sym-bol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-4			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

TYPE SA-174203A-5

Carrier Frequency: 935 ± 42.5 hz "High" Freq. 977.5 hz
"Low" Freq. 892.5 hz

Symbol	Function	Description	Mfr.	Part No.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	935 cps bandpass filter	NRC	698
FL302	Discriminator tank circuit	Tuned circuit for 935 ± 42.5 hz operation	NRC	1481
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Symbol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-5			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

Sym-bol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-7		"High" Freq. 1317.5 hz "Low" Freq. 1232.5 hz	
	Carrier Frequency: 1275 ± 42.5 hz			
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	1275 hz bandpass filter	NRC	700
FL302	Discriminator tank circuit	Tuned circuit for 1275 ± 42.5 hz operation	NRC	1483
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Symbol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-7			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

TYPE SA-174203A-8

Carrier Frequency: 1445 ± 42.5 hz "High" Freq. 1487.5 hz
"Low" Freq. 1402.5 hz

Sym-bol	Function	Description	Mfr.	Part No.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	1445 hz bandpass filter	NRC	701
FL302	Discriminator tank circuit	Tuned circuit for 1445 ± 42.5 hz operation	NRC	1484
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Sym-bol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-8			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

TYPE SA 174203A-56

Carrier Frequency: 1190 ± 85 hz "High" Freq. 1275 hz
"Low" Freq. 1105 hz

Symbol	Function	Description	Mfr.	Part No.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	1190 hz bandpass filter	NRC	781
FL302	Discriminator tank circuit	Tuned circuit for 1190 ± 85 hz operation	NRC	1618
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Symbol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-56			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

TYPE SA 174203A-72

Carrier Frequency: 2210 ± 85 hz

"High" Freq. 2295 hz
"Low" Freq. 2125 hz

Symbol	Function	Description	Mfr.	Part No.
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY ANY	1N659 or 1N914
FL301	Bandpass filter	2210 hz bandpass filter	NRC	784
FL302	Discriminator tank circuit	Tuned circuit for 2210 ± 85 hz operation	NRC	1619
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Symbol	Function	Description	Mfr.	Part No.
	TYPE SA-174203A-72			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

Symbol	Function	Description	Mfr.	Part No.
	TYPE **DISCRIMINATOR SA 174203A-WB3**			
CR301	Mark signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR302	Mark signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR303	Space signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
CR304	Space signal rectifier	50 volt 100 mA silicon diode	ANY	1N659 or 1N914
FL301	Bandpass filter	**2550 cps bandpass filter**	NRC	1326A
FL302	Discriminator tank circuit	**Tuned circuit**	NRC	1500
P301	Main connector plug	Male connector - 24 pin	AMP	57-10240
Q301	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q302	Mark tank driver transistor	NPN silicon transistor	MOT	2N2501
Q303	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q304	Space tank driver transistor	NPN silicon transistor	MOT	2N2501
Q305	Q301-Q302 current control transistor	NPN silicon transistor	MOT	2N2501
Q306	Q303-Q304 current control transistor	NPN silicon transistor	MOT	2N2501
R301	Mark tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M
R302	Space tank drive control resistor	1K ohm ± 20% 1/4 watt rectangular potentiometer	ALB	RH102M

Symbol	Function	Description	Mfr.	Part No.
	TYPE: **DISCRIMINATOR SA 174203A-WB3**			
R303	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R304	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R305	Q305 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R306	Q306 emitter resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R307	Q305 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R308	Q306 base bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R309	Q305,Q306 bias control resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R310	Q301 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R311	Q302 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R312	Q303 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R313	Q304 input coupling	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K

DIVERSITY CONTROL, SA 174204A

Symbol	Function	Description	Mfr.	Part No.
C401	Discriminator output filter capacitor	0.047 mfd ± 20% 25 volts ceramic capacitor	SPR	3C15
C402	Discriminator output filter capacitor	0.47 mfd ± 20% 25 volts ceramic capacitor	SPR	5C11
C403	Discriminator output filter capacitor	0.47 mfd ± 20% 25 volts ceramic capacitor	SPR	5C11
C404	Discriminator output filter capacitor	0.47 mfd ± 20% 25 volts ceramic capacitor	SPR	5C11
C405	Bypass capacitor	10 mfd ± 20% 20 volts tantalum capacitor, insulated sleeve	TXI	SCM106BP020D4
C406	Bypass capacitor	10 mfd ± 20% 20 volts tantalum capacitor, insulated sleeve	TXI	SCM106BP020D4
CR401	Q403 output coupling diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
CR402	Q404 output coupling diode	50 volts 100 mA silicon diode	ANY ANY	1N659 or 1N914
J401	Ch. 1 diversity control monitor jack	Test probe receptacle, brown	API	3-582118-1
J402	Ch. 2 diversity control monitor jack	Test probe receptacle, red	API	3-582118-2
J403	Discriminator monitor jack	Test probe receptacle, orange	API	3-582118-3
Q401	"Mark" amplifier transistor	NPN silicon transistor	MOT	2N2501
Q402	"Space" amplifier transistor	PNP silicon transistor	MOT	2N3251
Q403	Diversity control transistor	PNP silicon transistor	MOT	2N3251

Diversity Control, SA 174204A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
Q404	Diversity control transistor	PNP silicon transistor	MOT	2N3251
Q405	Q403-Q404 current control transistor	PNP silicon transistor	MOT	2N3251
Q406	Filter amplifier	NPN silicon transistor	MOT	2N2501
Q407	Output amplifier	PNP silicon transistor	MOT	2N3251
R401	Q401 base resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R402	Q402 base resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R403	Q401 emitter output resistor	1.5K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF152K
R404	Q402 emitter output resistor	1.5K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF152K
R405	Q401 emitter resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R406	Q402 emitter resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R407	Filter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R408	Q405 emitter resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R409	Q403 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R410	Q404 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R411	Q405 bias resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R412	Q405 bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K

Diversity Control, SA 174204A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R413	Q406 emitter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R414	Filter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R415	Q401 collector resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K
R416	Q402 collector resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K
R417	Q406 collector resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K
R418	Q403 output monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R419	Q404 output monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R420	Q407 collector resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K
R421	Q407 emitter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R422	Output coupling resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R423	Discriminator monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K

D. C. AMPLIFIER, SA 174205A

Symbol	Function	Description	Mfr.	Part No.
C501	Input filter capacitor	0.01 mfd ± 20% 25 volts ceramic capacitor	AEO	TP89-103RM
C502	Input filter capacitor	0.47 mfd ± 20% 25 volts ceramic capacitor	SPR	5C11
C503	Input bypass capacitor	0.47 mfd ± 20% 25 volts ceramic capacitor	SPR	5C11
J501	"Signal In" monitor jack	Test probe receptacle, brown	API	3-582118-1
J502	"Balance" monitor jack	Test probe receptacle, red	API	3-582118-2
J503	"Q504 Out" monitor jack	Test probe receptacle, orange	API	3-582118-3
J504	"Q505 Out" monitor jack	Test probe receptacle, yellow	API	3-582118-4
Q501	1st stage amplifier	PNP silicon transistor	MOT	2N3251
Q502	1st stage amplifier	PNP silicon transistor	MOT	2N3251
Q503	Q501-Q502 current control	PNP silicon transistor	MOT	2N3251
Q504	2nd stage amplifier	NPN silicon transistor	MOT	2N2501
Q505	2nd stage amplifier	NPN silicon transistor	MOT	2N2501
R501	Input filter resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R502	Q503 bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R503	Q503 bias resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R504	Q501 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K
R505	Q502 collector resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K

D. C. Amplifier, SA 174205A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R506	Q503 emitter resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R507	Q504-Q505 emitter resistor	220 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF221K
R508	Q504 collector resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R509	Q505 collector resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R510	"Signal In" monitor resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R511	"Balance In" monitor resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R512	Q504 Out monitor resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R513	Q505 Out monitor resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K

PRINTER RELAY, SA 174206A

Symbol	Function	Description	Mfr.	Part No.
C601	Filter capacitor	150 mfd 150 volt electrolytic capacitor	CDC	BR150-150
C602	Filter capacitor	150 mfd 150 volt electrolytic capacitor	CDC	BR150-150
C603	Input filter capacitor	0.01 mfd 50 volt ceramic disc capacitor	SPR	TG-S10
C604	Q603 base coupling capacitor	680 mmf ± 10% 500 volts ceramic capacitor	CEN	ID681
C605	Rectifier filter capacitor	0.1 mfd ± 20% 200 volt paper capacitor hermetically sealed	ASC FDE	MQCP-2-1 or MFC-104K
C606	Output filter capacitor	0.05 mfd 500 volt ceramic disc capacitor	CEN	ID503
CR601	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR602	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR603	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR604	Rectifier	225 volts 400 mA silicon diode	ANY	1N645
CR605	Input clamping diode	225 volts 400 mA silicon diode	ANY	1N645
CR606	Oscillator output rectifier diode	General purpose germanium diode	SYL	1N34AS
CR607	Q605 bias diode	225 volts 400 mA silicon diode	ANY	1N645
CR608	Output coupling diode	225 volts 400 mA silicon diode	ANY	1N645
P6C1	Main connector plug	14 pin male connector	AMP	57-10140
Q601	1st oscillator control transistor	High gain general purpose germanium transistor, 250 milliamperes, PNP Type	MOT	2N652A

PRINTER RELAY, SA 174206A (continued)

Symbol	Function	Description	Mfr.	Part No.
Q602	2nd oscillator control transistor	High gain general purpose germanium transistor 250 milliamperes, PNP Type	MOT	2N652A
Q603	Oscillator transistor	High gain general purpose germanium transistor 250 milliamperes, PNP Type	MOT	2N652A
Q604	Output driver transistor	NPN silicon high voltage transistor	NRC	1340
Q605	Output switch transistor	NPN silicon high voltage transistor	NRC	1340
R601	Filter resistor	100 ohms ± 5% 6.5 watt wirewound resistor or 100 ohms ± 5% 5 watt wirewound resistor	ANY WLE	RW67V101 or 5XM
R602	C602 bleeder resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R603	Input coupling resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R604	Q602 base bias resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R605	Q602 base shunt resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R606	Q603 base series resistor	33K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF333K
R607	C605 discharge resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R608	Q604 base series resistor	680 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF681K
R609	Q605 base shunt resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R610	Output filter resistor	470 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF471K

PRINTER RELAY, SA 174206A (continued)

Symbol	Function	Description	Mfr.	Part No.
T601	Power transformer	Power transformer Primary: 117/234 volts Secondary: 92 volts, CT 100 mA	NRC	1328
T602	Oscillator transformer	500 ohms CT/600 ohms 500 milliwatt miniature transformer	NRC	1357

Monitor, SA 174307

Symbol	Function	Description	Mfr.	Part No.
C701	CRT supply voltage doubler capacitor	0.1 mfd ± 10% 600 WVDC mylar capacitor	FDE ASC	MFF-104K or MQCP-6-1
C702A)) C702B)	CRT supply filter capacitor	2 x 0.1 mfd ± 10% 1000 volt bathtub capacitor (C702A and C702B in one case)	SAN	5010.2X1RT
C703	Transistor supply filter capacitor	4 mfd 250 volt electrolytic capacitor	AEO	PRS 1550
C704	Transistor supply filter capacitor	4 mfd 250 volt electrolytic capacitor	AEO	PRS 1550
C705	Q701 output coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
C706	Q702 output coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
C707	Q703 input coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
C708	Q703 output coupling capacitor	0.01 mfd GMV 600 volt ceramic disc capacitor, 11/16" dia.	SOL	CD20X-103Z
CR701	CRT supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR702	CRT supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR703	Transistor supply rectifier	1500 volt 100 mA silicon diode	MOT	1N3283
CR704	Q701 input wave shaping diode	225 volt 400 mA silicon diode	ANY	1N645
CR705	CRT horizontal positioning diode	225 volt 400 mA silicon diode	ANY	1N645
CR706	CRT horizontal positioning diode	225 volt 400 mA silicon diode	ANY	1N645
CR707	Q702 input wave shaping diode	225 volt 400 mA silicon diode	ANY	1N645
P701	Main connector plug	Male connector - 14 pin	AMP	57-10140
Q701	Horizontal amplifier transistor	NPN silicon high voltage transister	NRC	1340

Monitor SA 174307 (cont'd)

Symbol	Function	Description	Mfr.	Part No.
Q702	Horizontal amplifier transistor	NPN silicon high voltage transistor	NRC	1340
Q703	Vertical amplifier transistor	NPN silicon high voltage transistor	NRC	1340
R701	CRT supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R702	CRT supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R703	C702 discharge resistor	1 megohm ± 10% 1 watt composition resistor	ANY	RC32GF105K
R704	C702 discharge resistor	1 megohm ± 10% 1 watt composition resistor	ANY	RC32GF105K
R705	CRT intensity control resistor	100K ohms ± 10% 2 watt potentiometer	ANY	JA1N056P104UA
R706	CRT supply divider resistor	150K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF154K
R707	CRT focus control resistor	500K ohms ± 10% 2 watt potentiometer	ANY	JA1N056P504UA
R708	CRT supply divider resistor	1.5 megohms ± 10% 1 watt composition resistor	ANY	RC32GF155K
R709	Transistor supply surge resistor	100 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF101K
R710	C703 discharge resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K
R711	Transistor supply filter resistor	4.7K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF472K
R712	C704 discharge resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K
R713	Q701 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
R714	Q701 base shunt resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R715	Q701 input wave shaping resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K

Monitor SA 174307 (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R716	Q701 collector resistor	330K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF334K
R717	CRT space signal amplitude control	2.5K ohms ± 20% 1/4 watt rectangular potentiometer	ALB ALB	RH252M or RP252M
R718	V701 horizontal deflection electrode resistor	2.2 megohms ± 10% 1/4 watt composition resistor	ANY	RC07GF225K
R719	V701 horizontal deflection electrode resistor	2.2 megohms ± 10% 1/4 watt composition resistor	ANY	RC07GF225K
R720	Q701, Q702 emitter resistor	1K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF102K
R721	Q701, Q702 emitter bias resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
R722	Q702 collector resistor	330K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF334K
R723	CRT mark signal amplitude control	2.5K ohms ± 20% 1/4 watt rectangular potentiometer	ALB ALB	RH252M or RP252M
R724	Q702 input wave shaping resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
R725	Q702 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
R726	Q702 base shunt resistor	22K ohms ± 10% 1/4 watt compositon resistor	ANY	RC07GF223K
R727	Q703 input coupling resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
R728	Q703 base bias resistor	1 megohm ± 10% 1/4 watt composition resistor	ANY	RC07GF105K
R729	Q703 base shunt resistor	47K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF473K
R730	Q703 collector resistor	68K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF683K
R731	Q703 emitter resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K

Monitor SA 174307 (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R732	V701 vertical deflection electrode resistor	2.2 megohms ± 10% 1/4 watt composition resistor	ANY	RC07GF225K
R733	V701 vertical deflection electrode resistor	100K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF104K
T701	Power transformer	Power transformer Primary: 115/230 volts Sec. #1: 6.3 volts AC, 0.6 amp. Sec. #2: 375 volts tapped at 150 volts, 10 mA	NRC	1322
V701	Monitor Oscilloscope	Cathode Ray Tube, 1"	RCA	1EP1
X701	Socket for Cathode Ray Tube	Small button unidekar, 11 pin	ANY	JETEC 11-22

Main Power Supply SA 174308

Symbol	Function	Description	Mfr.	Part No.
C801	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
C802	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
C803	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
C804	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
C805	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
C806	Filter capacitor	Electrolytic capacitor 150 mfd, 50 volts DC	CDC	BR150-50
CR801	Rectifier	225 volts, 400 mA, silicon diode	ANY	1N645
CR802	Rectifier	225 volts, 400 mA, silicon diode	ANY	1N645
CR803	Voltage reference diode	15 volts ± 5% 1 watt zener diode	ANY	1N3024B
CR804	Rectifier	225 volts, 400 mA, silicon diode	ANY	1N645
CR805	Rectifier	225 volts, 400 mA, silicon diode	ANY	1N645
CR806	Voltage reference diode	15 volts ± 5% 1 watt zener diode	ANY	1N3024B
P801	Main connector plug	Male connector 8 pin	AMP	26-4101-8P
Q801	"Plus" regulator control	NPN silicon transistor	MOT	2N2501
Q802	"Plus" series control	PNP germanium power transistor	ANY ANY	2N618 or 2N1011
Q803	"Minus" regulator control	PNP silicon transistor	MOT	2N3251
Q804	"Minus" series regulator	PNP germanium power transistor	ANY ANY	2N618 or 2N1011

Main Power Supply SA 174308 (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R801	Q801 base resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R802	Q801 base resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R803	Q801 collector resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R804	Q802 base resistor	33 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF330K
R805	Q803 base resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R806	Q803 base resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R807	Q803 collector resistor	330 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF331K
R808	Q804 base resistor	33 ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF330K
T801	Power transformer	Power transformer Primary: 117/234 volts Secondary: 48 volts CT, 200 mA	NRC	1324
XQ802	Socket for Q802	Power transistor socket	CIN	14T24324
XQ804	Socket for Q804	Power transistor socket	CIN	14T24324

AUTO THRESHOLD, SA 174209A

Symbol	Function	Description	Mfr.	Part No.
C901	Storage capacitor	100 mfd ± 20% 10 volt tantalum capacitor insulated sleeve	TXI	SCM107GP010D4
C902	Output signal filter capacitor	100 mfd ± 20% 10 volt tantalum capacitor insulated sleeve	TXI	SCM107GP010D4
C903	Output signal filter capacitor	100 mfd ± 20% 10 volt tantalum capacitor insulated sleeve	TXI	SCM107GP010D4
CR901	Coupling diode	225 volt 400 mA silicon diode	ANY	1N645
CR902	Coupling diode	225 volt 400 mA silicon ciode	ANY	1N645
J901	Input monitor jack	Test probe receptacle, brown	API	3-582118-1
J902	Output monitor jack	Test probe receptacle, red	API	3-582118-2
Q901	Input isolating transistor	PNP silicon transistor	MOT	2N3251
Q902	Input isolating transistor	NPN silicon transistor	MOT	2N2501
Q903	Charge control transistor	NPN silicon transistor	MOT	2N2501
Q904	Charge control transistor	PNP silicon transistor	MOT	2N3251
Q905	Control switching transistor	PNP silicon transistor	MOT	2N3251
Q906	Control switching transistor	NPN silicon transistor	MOT	2N2501

AUTO THRESHOLD, SA 174209A (cont'd)

Symbol	Function	Description	Mfr.	Part No.
R901	Q901 collector resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R902	Q902 collector resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R903	Q903 emitter resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R904	Q904 emitter resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R905	Q905 collector resistor	15K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF153K
R906	Q906 collector resistor	15K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF153K
R907	Q905 collector resistor and Q903 base bias resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R908	Q906 collector resistor and Q904 base bias resistor	3.3K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R909	Control input resistor	22K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF223K
R910	Q902 emitter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R911	Q901 emitter resistor	6.8K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF682K
R912	Q903 collector resistor	1.5K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF152K
R913	Q904 collector resistor	1.5K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF152K

AUTO THRESHOLD, SA 174209A (cont'd)

Symbol	Function	Description	Mfr.	Part No
R914	"Balance" adjusting resistor	2.5K ohm potentiometer	ALB	BH252M
R915	"Signal" output coupling resistor	10K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R916	"Signal" output coupling resistor	10K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF103K
R917	"Balance" output coupling resistor	3.3K ohm ± 10% 1/4 watt composition resistor	ANY	RC07GF332K
R918	Input monitor resistor	2.2K ohms ± 10% 1/4 watt composition resistor	ANY	RC07GF222K

MANUFACTURERS' DESIGNATIONS

MFR. CODE NO.	FEDERAL CODE NO.	NAME
AEO	00656	Aerovox Corporation
ALB	01121	Allen-Bradley Company
AMP	02660	Amphenol-Borg Electronics Corporation
API	00779	Amp, Incorporated
ASC	82376	Astron Corporation
CDC	14655	Cornell-Dubilier Electronics
CEN	71590	Centralab
CHC	15605	Cutler-Hammer, Incorporated
CIN	71785	Cinch Manufacturing Corporation
DIA	72619	Dialight Corporation
GEC	24446	General Electric Company
INI	81030	International Instruments, Incorporated
KUL	75382	Kulka Electric Corporation
LFU	75915	Littelfuse, Incorporated
MAL	37942	P. R. Mallory Company, Incorporated
MOT	04713	Motorola Semiconductor Products, Incorporated
NRC	88183	Northern Radio Company, Incorporated
OHM	44655	Ohmite Manufacturing Company
RCA	92671	Radio Corporation of America
SAN	00853	Sangamo Electric Company
SOL	96296	Solor Manufacturing Corporation
SPR	56289	Sprague Electric Company

MFR. CODE NO.	FEDERAL CODE NO.	NAME
SWC	82389	Switchcraft Incorporated
SYL	88219	Sylvania Electric Products, Incorporated
TXI	01295	Texas Instruments, Incorporated
UTC	90223	United Transformer Company
WLE	73743	Warl Leonard Electric Company

E1

CH 1 INPUT

1

2

E

D

AGC AMPLIFIER

J1-1

K

L

S

K

L

LIMITER

J2-1

R

S

15

14

DISCRIMINATOR

J3-1

13

1

20

21

11

12

18

17

16

CH. 2

DIV.

CH. 1

S2

CH. 1 INPUT 0-100

M1

+

−

CH. 2 INPUT 0-100

M2

M

J4

D

E

S

R

N

DIVERSITY CONTROL

H

H

J1-2

AGC AMPLIFIER

J2-2

LIMITER

J3-2

CH.2 INPUT

3

4

E1

115V. A.C.

LINE CORD ASSEMBLY
NRC 1363

ADAPTER PLUG

LINE CORD

UNLESS OTHERWIS

DIMENSIONS ARE

TOLERANCES ON

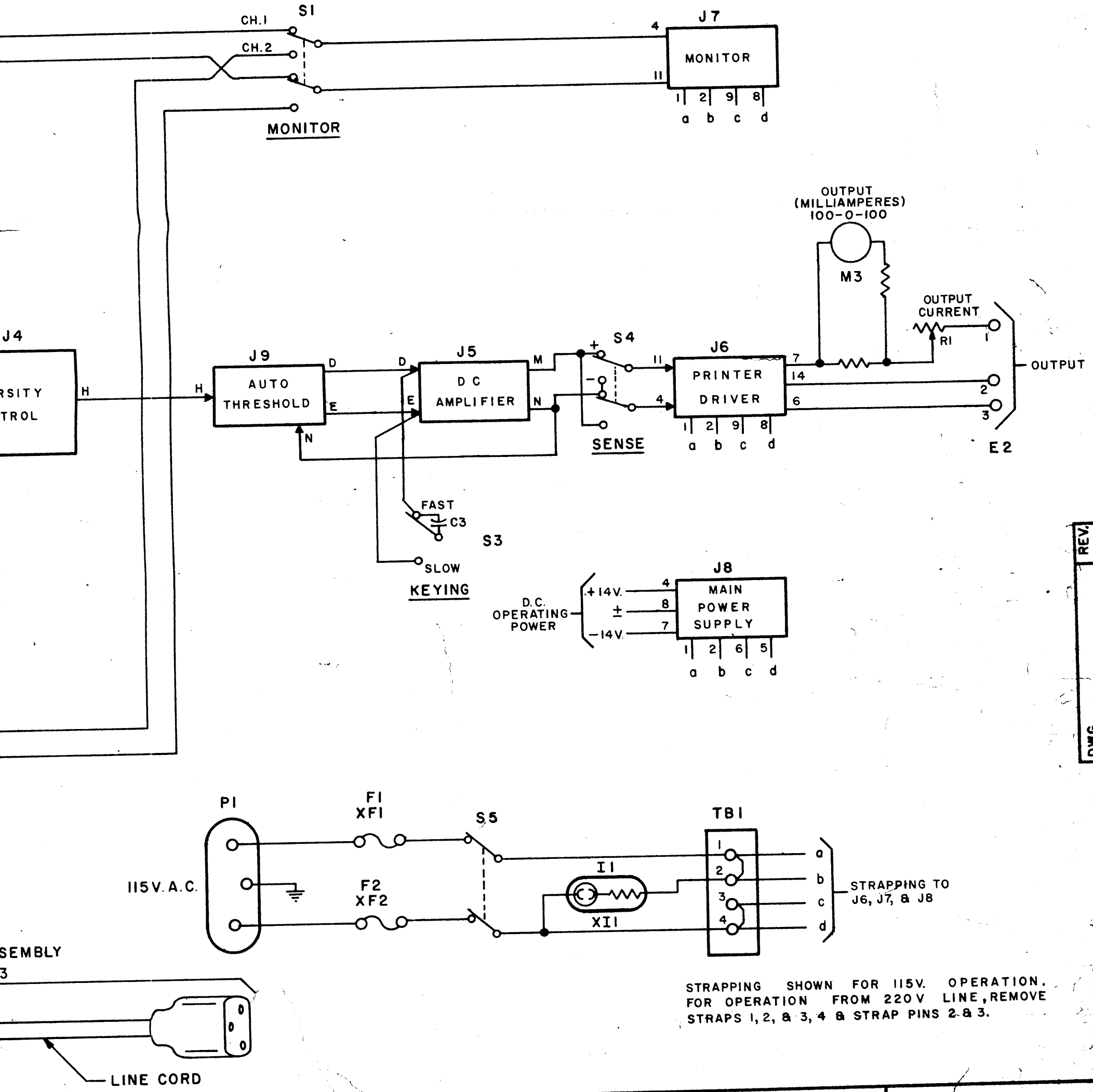
FRACTIONS ± 1/64

DECIMAL ± .005

MATERIAL:

FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	S3 CIRCUIT REVISED, C3 ADDED	7-31-67	
B	WIRES REVERSED ON DC AMPL. J5-D&E	5-2-69	



STRAPPING SHOWN FOR 115V. OPERATION.
FOR OPERATION FROM 220V LINE, REMOVE
STRAPS 1, 2, & 3, 4 & STRAP PINS 2 & 3.

REV.

DWG. No.

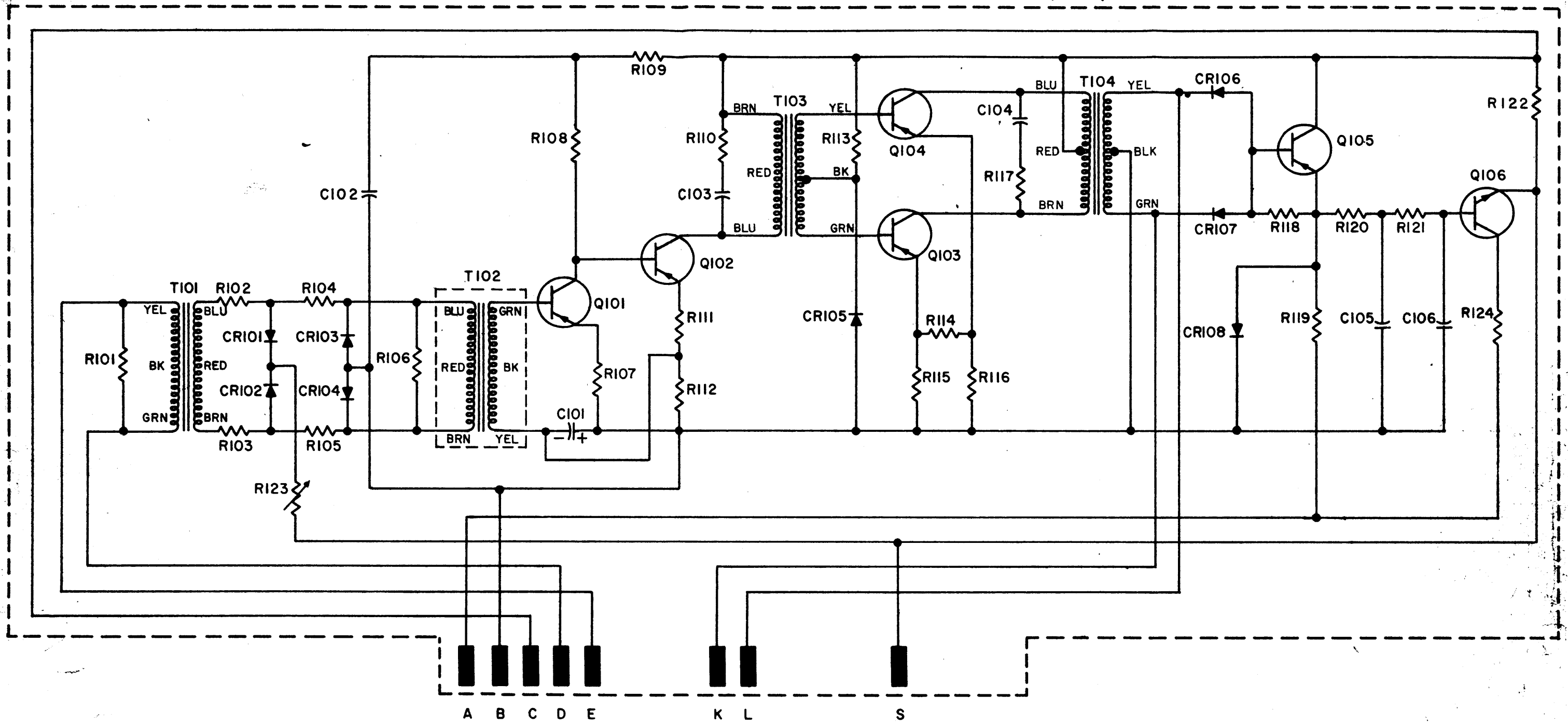
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN G P	DATE 5-26-65	NAME: SCHEMATIC FREQUENCY SHIFT DIVERSITY CONVERTER TYPE 174 MOD 3
MATERIAL:	CHECKER	5-26-65	
FINISH:	ENGINEER		
	APPROVAL	5/26/65	SCALE: NONE SH. 1 OF 1

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. 174-3-01
DWG. SIZE C

ETCHED CIRCUIT BOARD (EB166A)

REV.	DWG. NO.	REVISIONS			
		SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	3-5-65	SCHEMATIC AGC AMPLIFIER SA 174201A
MATERIAL:	CHECKER	4-28-65	
FINISH:	ENGINEER		
	APPROVAL	4/30/65	

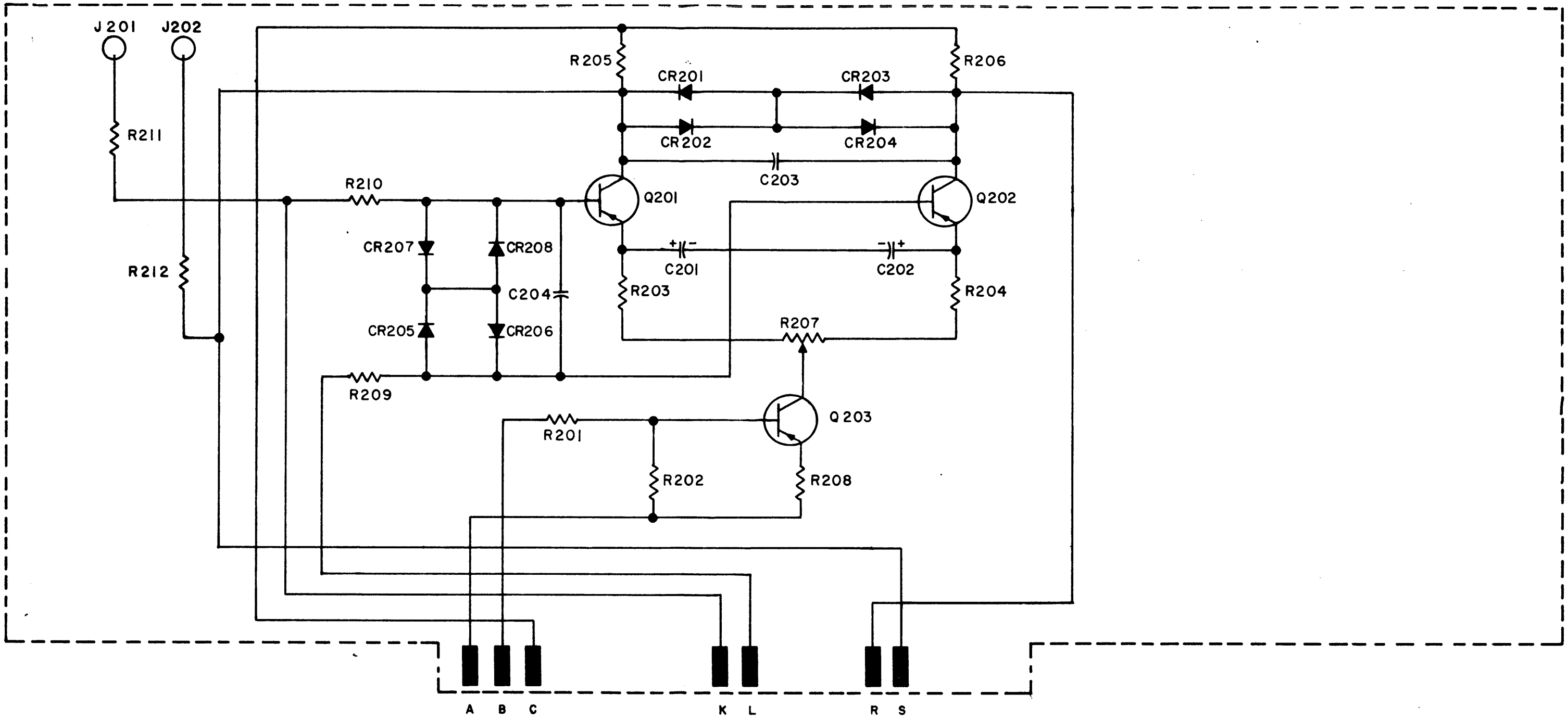
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11, NEW YORK

DWG. No. SA-174-2-0101 A

SCALE: NONE | SHEET: 1 OF 1 | DWG. SIZE B

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD (EB158A)



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN G. P	DATE 4-16-65	NAME: SCHEMATIC LIMITER SA174202A
MATERIAL:	CHECKER	4-26-65	
FINISH:	ENGINEER		
	APPROVAL	9/30/65	SCALE: NONE / SHEET 1 OF 1 / DWG. SIZE B

NORTHERN RADIO COMPANY INCORPORATED
143-147 WEST 22ND ST. N.Y. 11, NEW YORK

DWG. N. SA-174-2-0102

SUB- ASSEMBLY NRC 1338A (EB 164A)

R301
R303
R304
R305
Q305
R307
R308
R310
R311
R312
Q301
Q302
Q303
CR301
CR302
R309

P301

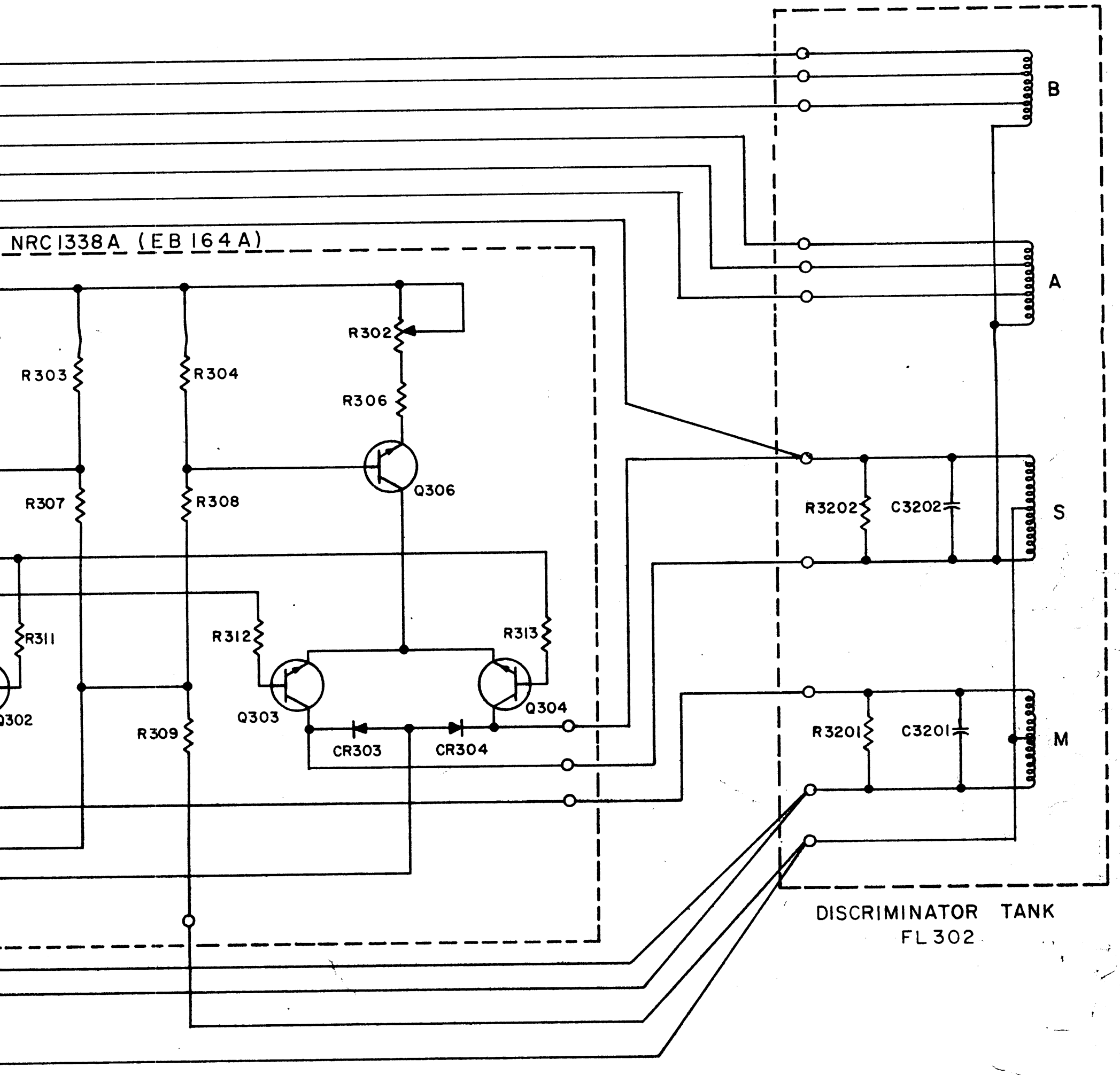
1	130	7	190
2	140	8	200
3	150	9	210
4	160	10	220
5	170	11	230
6	180	12	240

BAND PASS FILTER
FL 301

1
2
3
4

UNLESS OTHERWISE
DIMENSIONS ARE-
TOLERANCES ON
FRACTIONS ± 1/64
DECIMALS ± .005
MATERIAL:
FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	REDRAWN	5-7-65	GH
B	ADDED: PIN NUMBERS TO FL 301	7-15-66	
C	"TUNABLE" ADDED TO TITLE BOX	1-16-68	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN G P	DATE 5-7-65	NAME: SCHEMATIC TUNABLE DISCRIMINATOR
MATERIAL:	CHECKER	5-7-65	SA 174203A
FINISH:	ENGINEER		SCALE: NONE SH 1 OF 1
	APPROVAL GH	5/10/65	DWG. SIZE C

NORTHERN RADIO COMPANY INCORPORATED
143-147 WEST 22ND ST. N.Y. 11, NEW YORK

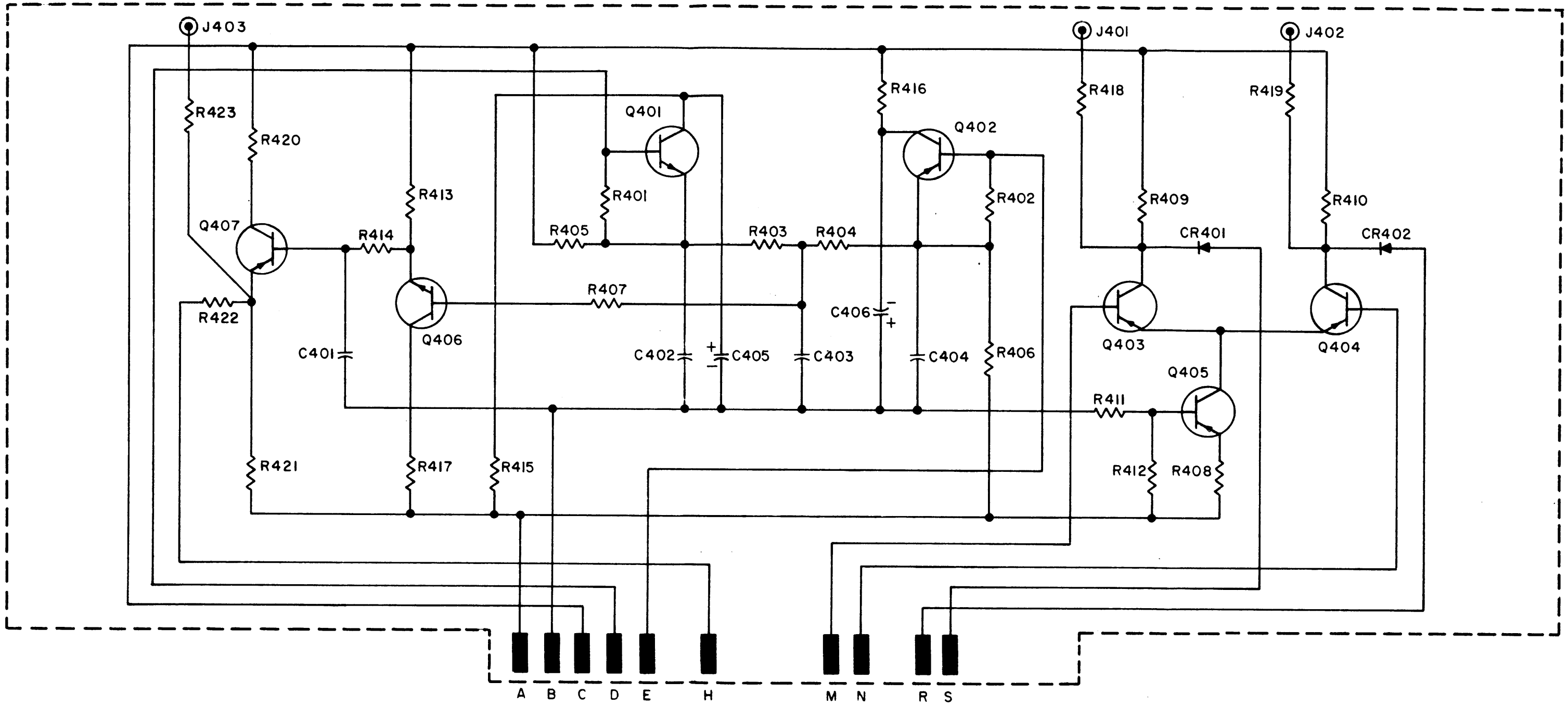
DWG. No. SA-174-2-

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

DWG. NO.

REV.

ETCHED CIRCUIT BOARD (EB161A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	2-25-65	SCHEMATIC DIVERSITY CONTROL SA174204A
MATERIAL:	CHECKER	2-25-65	
FINISH:	ENGINEER		
	APPROVAL	4/30/65	

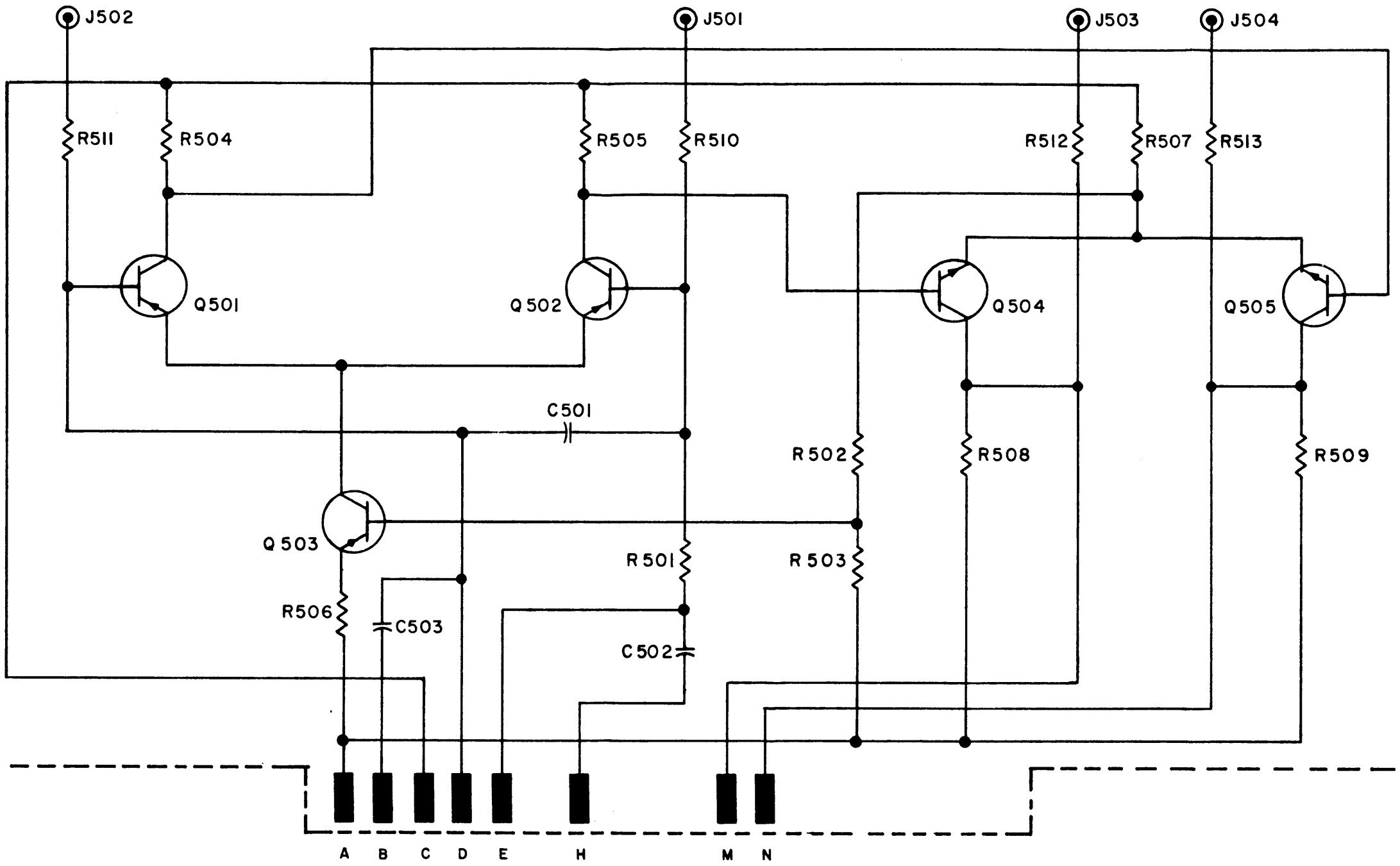
SCALE: NONE | SHEET: 1 OF 1 | DWG. SIZE B

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0104A

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD (EB160A)



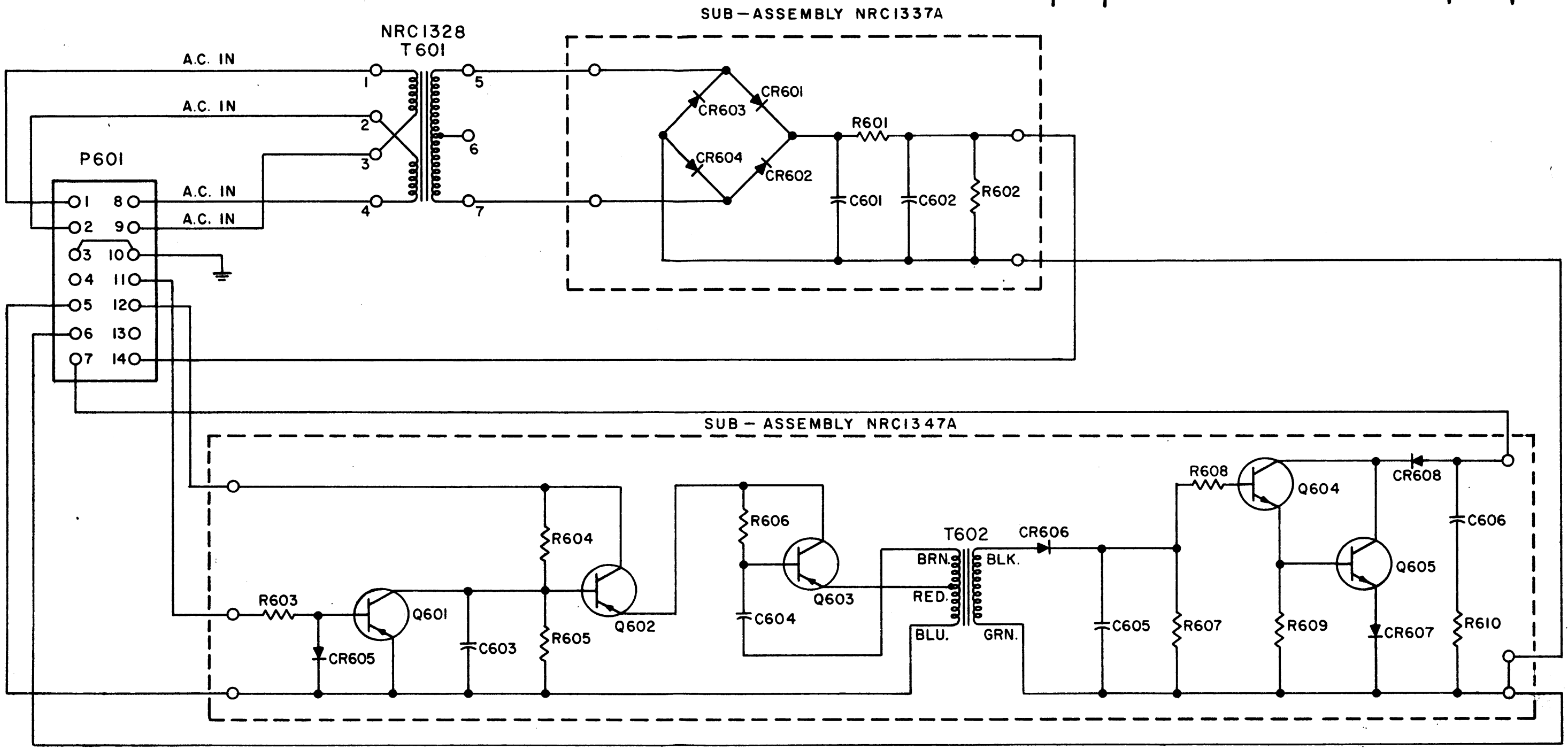
UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	2-26-65	SCHEMATIC D.C. AMPLIFIER SA174205A
MATERIAL:	CHECKER	4-26-65	
FINISH:	ENGINEER		
	APPROVAL	4/30/65	

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

SCALE: NONE | SHEET 1 OF 1 | DWG SIZE B

DWG. N. SA-174-2-0105A

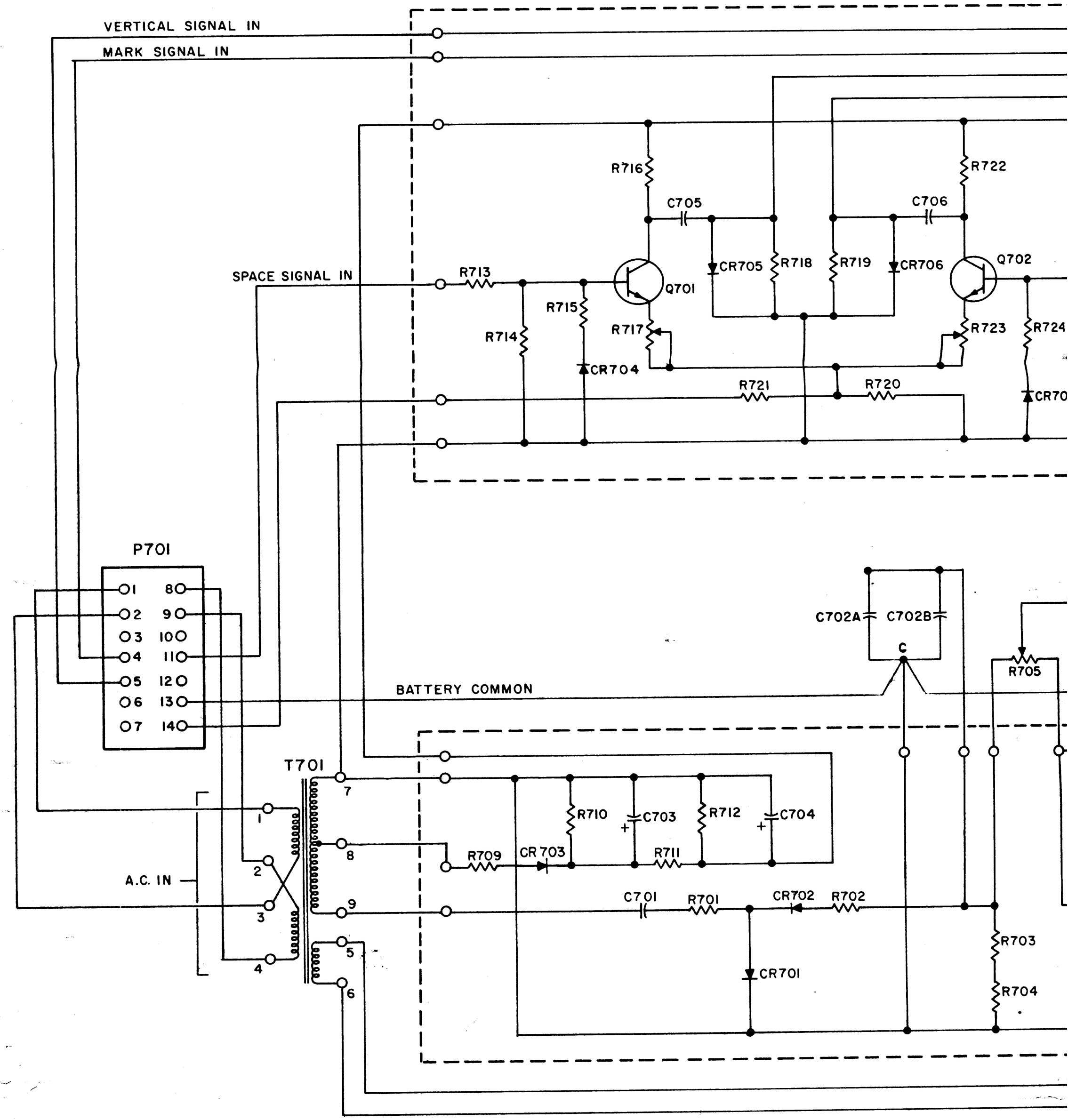
REV.	DWG. N.	REVISIONS			
		SYM.	DESCRIPTION	DATE	APPROVAL



SUB-ASSEMBLY NRC1347A

UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:	NORTHERN RADIO COMPANY
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	5-10-65	SCHEMATIC PRINTER DRIVER SA174206A	INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
MATERIAL:	CHECKER R.C.R.	5-10-65		DWG. N. SA-174-2-0106A
FINISH:	ENGINEER			
	APPROVAL Q.H.	5/10/65	SCALE: NONE SHEET: 1 OF 1	DWG. SIZE B

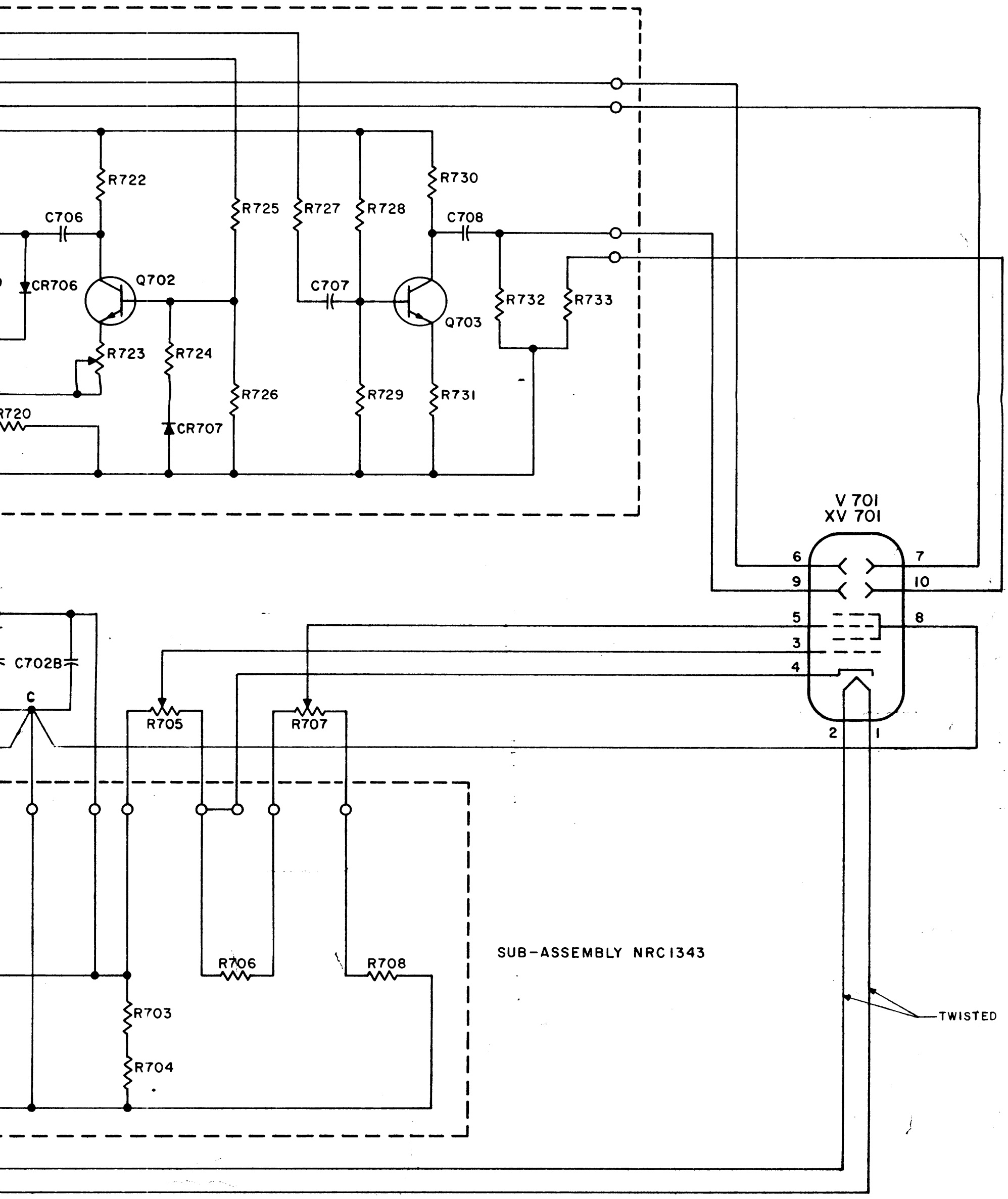
SUB-ASSEMBLY NRC1342



UNLESS OTHER
DIMENSIONS
TOLERANCES O
FRACTIONS DECI
± 1/64 ± .
MATERIAL:
FINISH:

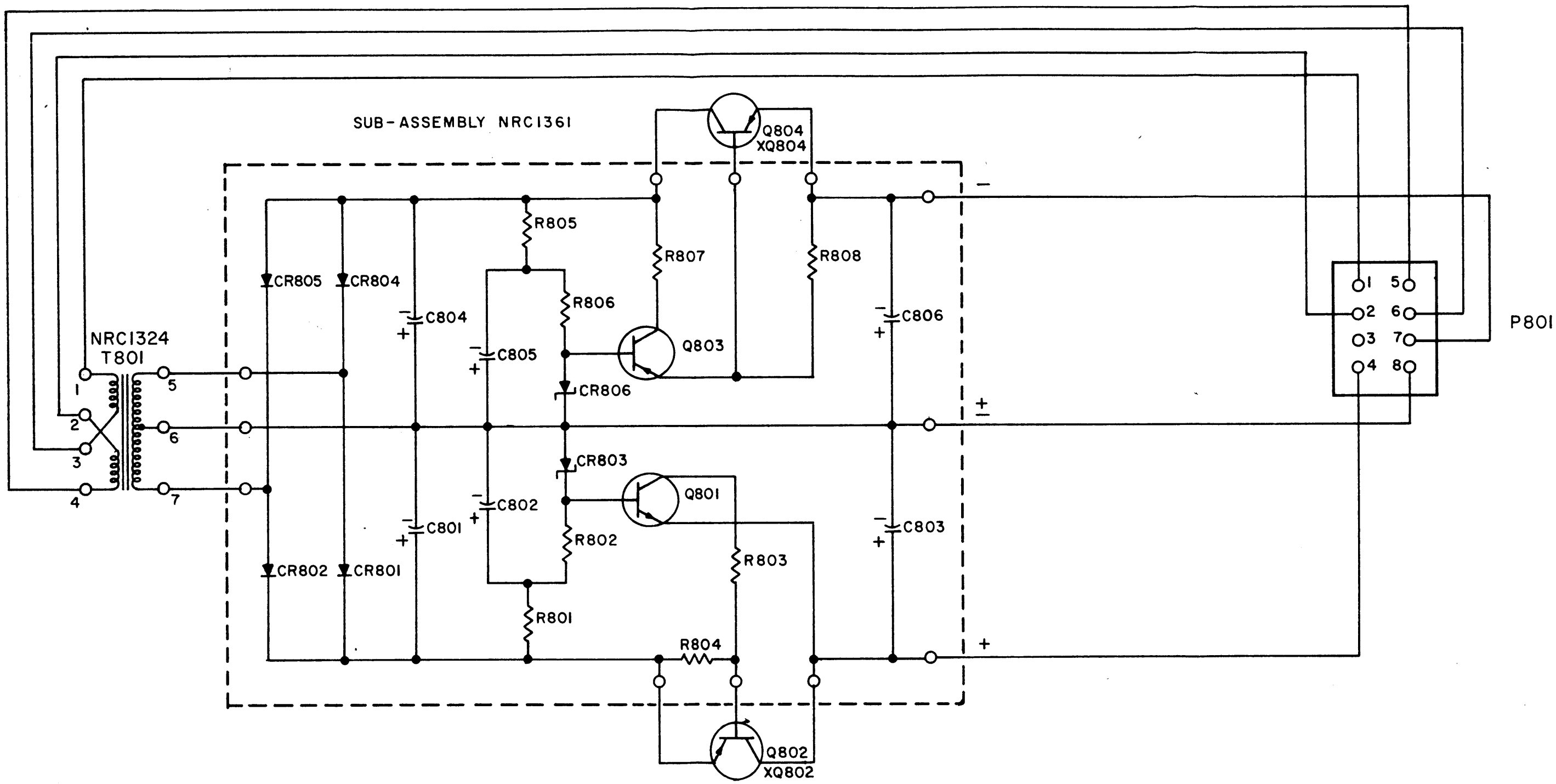
REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

-ASSEMBLY NRC1342



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:	NORTHERN RADIO COMPANY
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G.P.	5-27-65	SCHEMATIC MONITOR SA 174307	INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
MATERIAL:	CHECKER	5-27-65		DWG. No. SA-174-3-0107
FINISH:	ENGINEER			
	APPROVAL	5/27/65	SCALE: NONE	SHEET: 1 OF 1

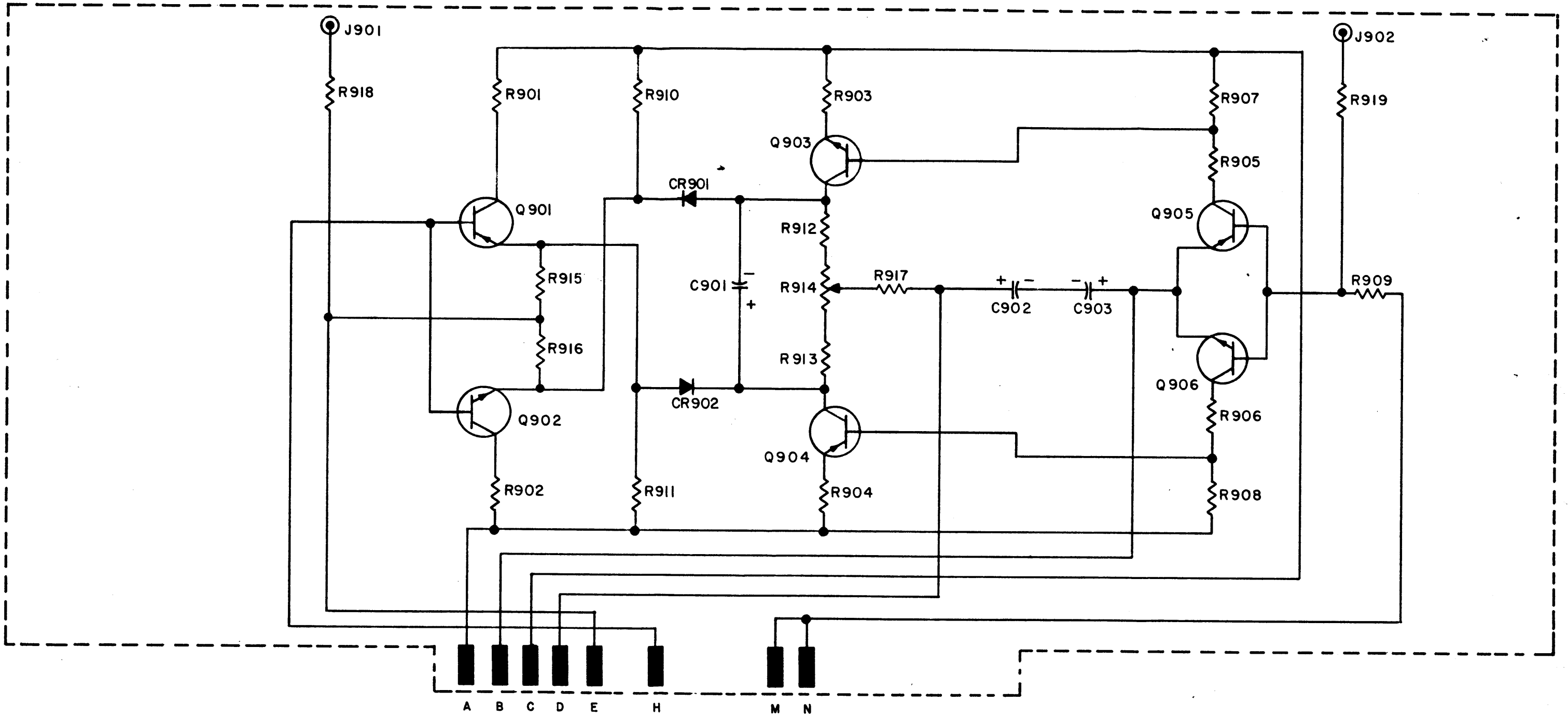
REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN S. S.	DATE 5-10-65	NAME: SCHEMATIC MAIN POWER SUPPLY SA174308
MATERIAL:	CHECKER	5-10-65	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
FINISH:	ENGINEER		DWG. No. SA-174-3-0108
	APPROVAL	5/10/65	SCALE: NONE SHEET 1 OF 1 DWG. SIZE B

REV.	DWG. N.	REVISIONS			
		SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD (EB159A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	2-25-65	SCHEMATIC AUTO THRESHOLD SA 174209A
MATERIAL:	CHECKER	4-28-65	
FINISH:	ENGINEER		
	APPROVAL	4/30/65	

SCALE: NONE | SHEET 1 OF 1 | DWG SIZE B

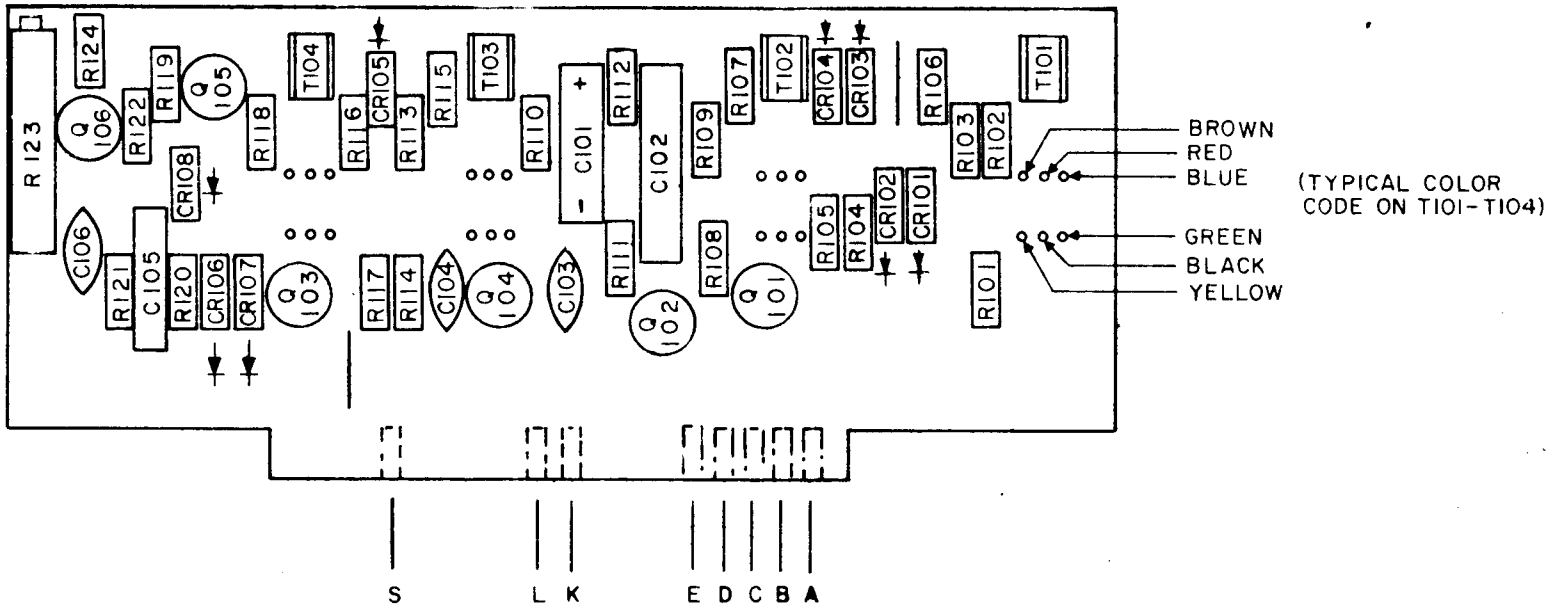
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. N. SA-174-2-0109

DWG. No.	REV.
SA-174-2-0201	A

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD
(EB 166A)



(TYPICAL COLOR CODE ON T101-T104)

UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G. P.	4-21-65	COMPONENT LAYOUT A.G.C. AMPLIFIER SA 174201A
MATERIAL:	CHECKER	4-22-65	
FINISH:	ENGINEER		
	APPROVAL	4/29/65	

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

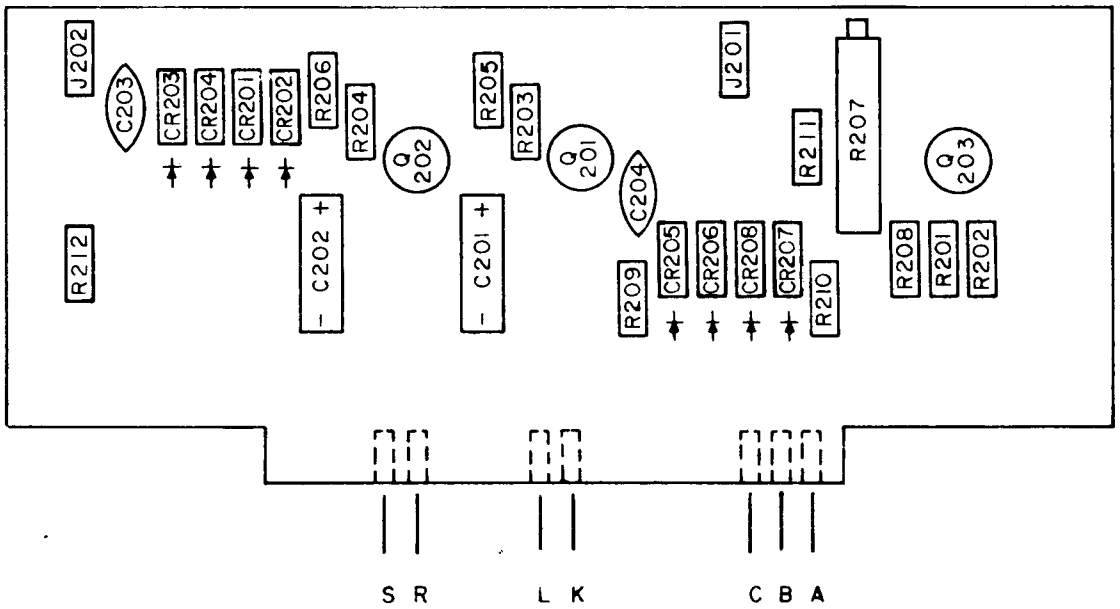
DWG. No. SA-174-2-0201A

SCALE: NONE | SH. 1 OF 1 | DWG. SIZE A

DWG. No. SA-174-2-0202A

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD
(EB 158 A)



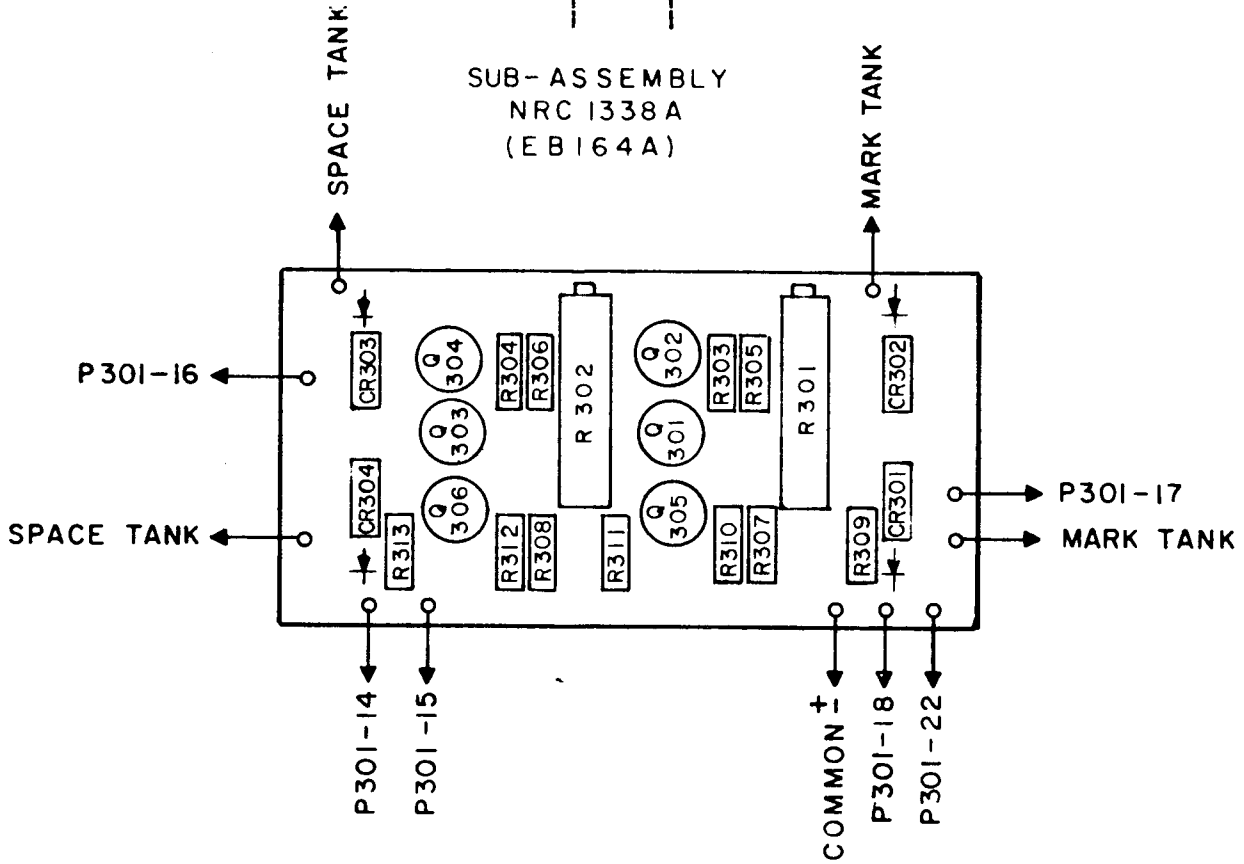
UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	4-16-65	COMPONENT LAYOUT LIMITER SA 174202A
MATERIAL:	CHECKER	4-22-65	
FINISH:	ENGINEER		
	APPROVAL	4/29/65	
	SCALE: NONE	SH. 1 OF 1	DWG. SIZE A

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0202A

DWG. No.	REV.
SA-174-2-0203	A

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	2-25-65	COMPONENT LAYOUT DISCRIMINATOR SA174203A
MATERIAL:	CHECKER	4-28-65	
	ENGINEER		
FINISH:	APPROVAL	4/28/65	

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

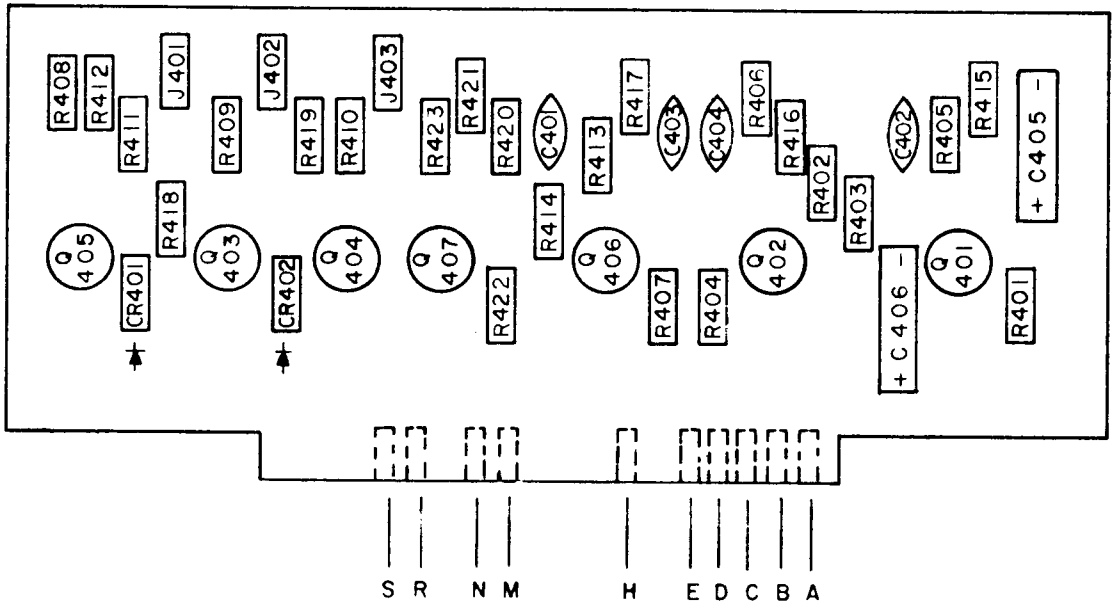
DWG. No. SA-174-2-0203 A

SCALE: NONE | SH 1 OF 1 | DWG. SIZE A

DWG. No.	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD
(EB 161A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	4-21-65	COMPONENT LAYOUT DIVERSITY CONTROL SA 174204A
MATERIAL:	CHECKER	4-22-65	
FINISH:	ENGINEER		
	APPROVAL	9/29/65	

SCALE: NONE	SH 1 OF 1	DWG. SIZE A

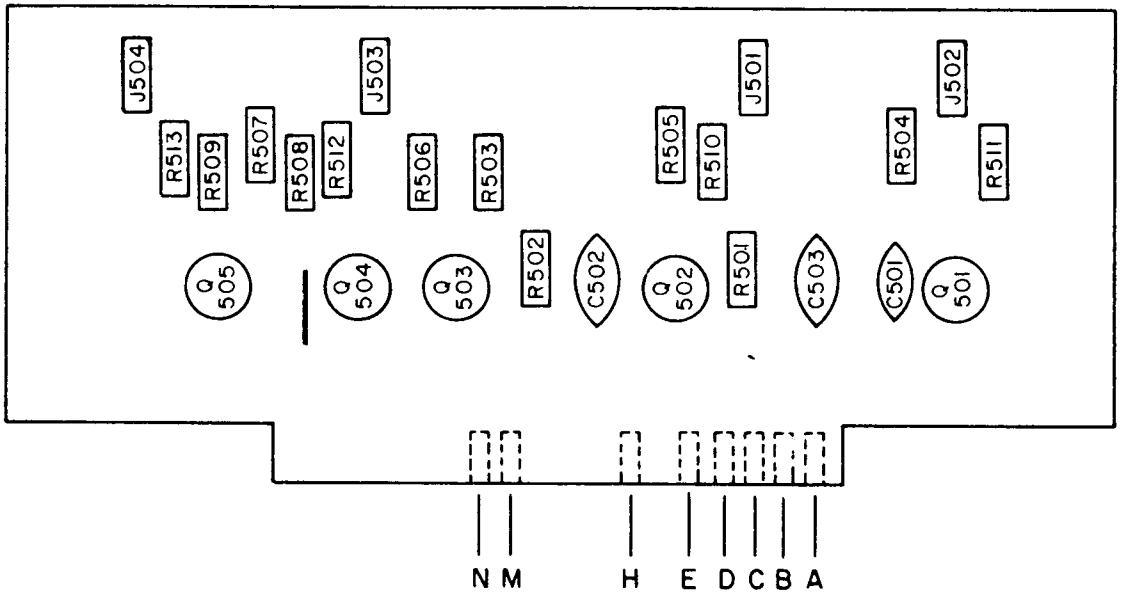
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0204A

DWG. No.	REV.
SA-174-2-0205A	

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD
(EB 160A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	4-15-65	COMPONENT LAYOUT DC AMPLIFIER SA 174205A
MATERIAL:	CHECKER	4-22-65	
FINISH:	ENGINEER		
	APPROVAL	4/29/65	

SCALE: NONE | SHEET: 1 OF 1 | DWG. SIZE A

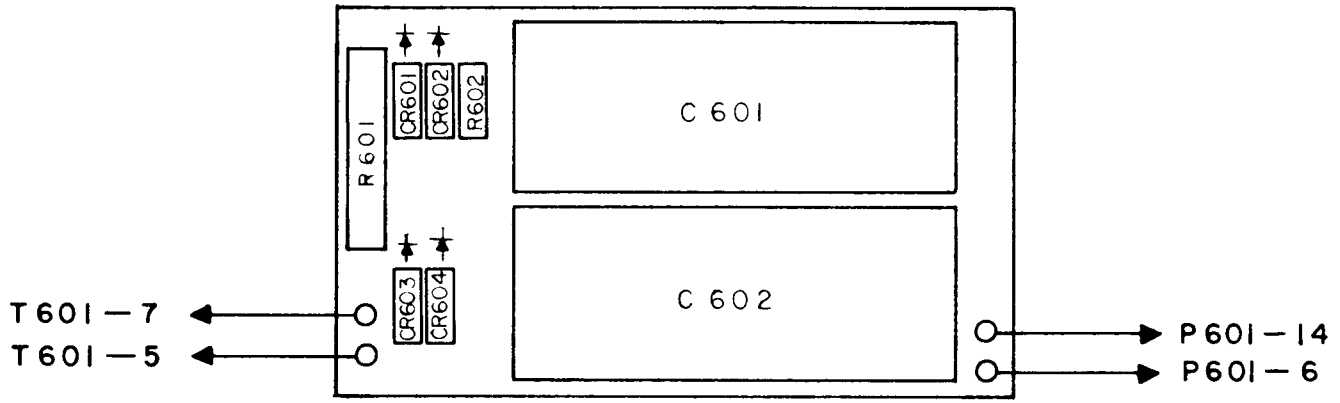
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0205A

DWG. No. SA-174-2-0306A	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB — ASSEMBLY
NRC1337A
(EB167A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	5-7-65	COMPONENT LAYOUT
MATERIAL:	CHECKER	5-7-65	PRINTER DRIVER
	ENGINEER		SA174206A
FINISH:	APPROVAL	5/7/65	SCALE: NONE SH 1 OF 1

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

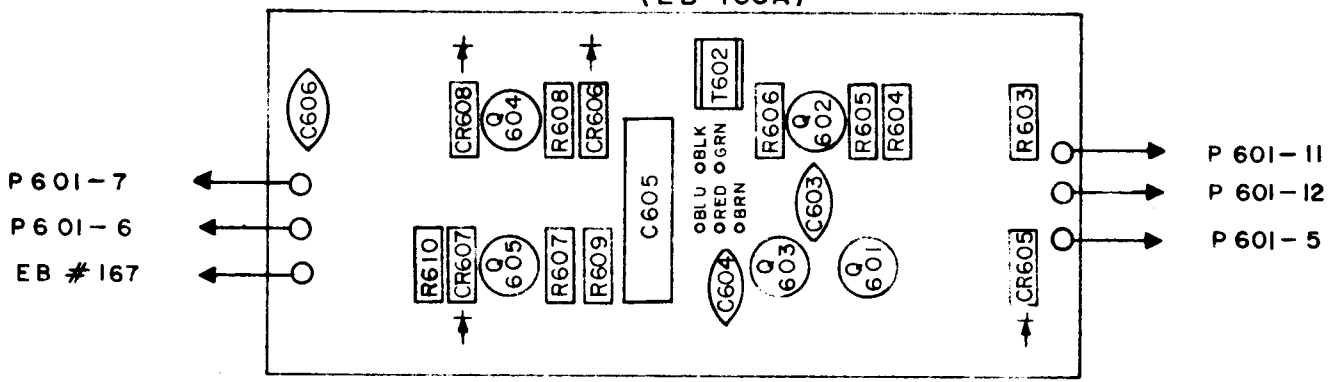
DWG. No. SA-174-2-0306A

DWG. SIZE A

DWG. No.	REV.
SA-174-2-0406A	

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB-ASSEMBLY NRC1347A
(EB 168A)



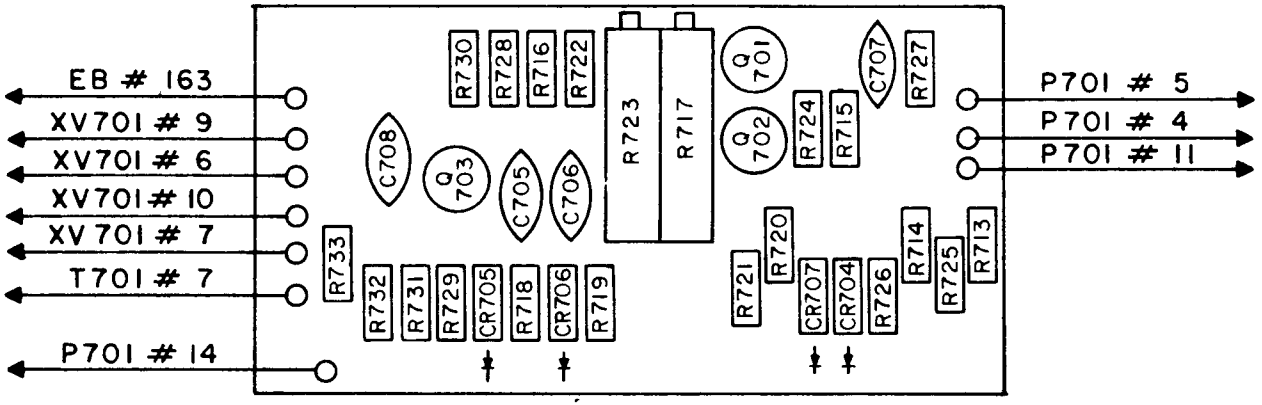
UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:	NORTHERN RADIO COMPANY
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	5-7-65	COMPONENT LAYOUT PRINTER DRIVER SA 174206A	INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
MATERIAL:	CHECKER	5-7-65		
FINISH:	ENGINEER			DWG. No. SA-174-2-0406A
	APPROVAL	5/7/65	SCALE: NONE SH 1 OF 1	DWG. SIZE A

DWG. No.	REV.
SA-174-2-0407	

NOTE:
THIS DWG. SUPERSEDES DWG. NO. SA-174-2-0207.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB-ASSEMBLY NRC 1342
(EB162)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	5-14-65	COMPONENT LAYOUT (AMPLIFIER) MONITOR SA174207
MATERIAL:	CHECKER	5-14-65	
FINISH:	ENGINEER		
	APPROVAL	5/14/65	

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

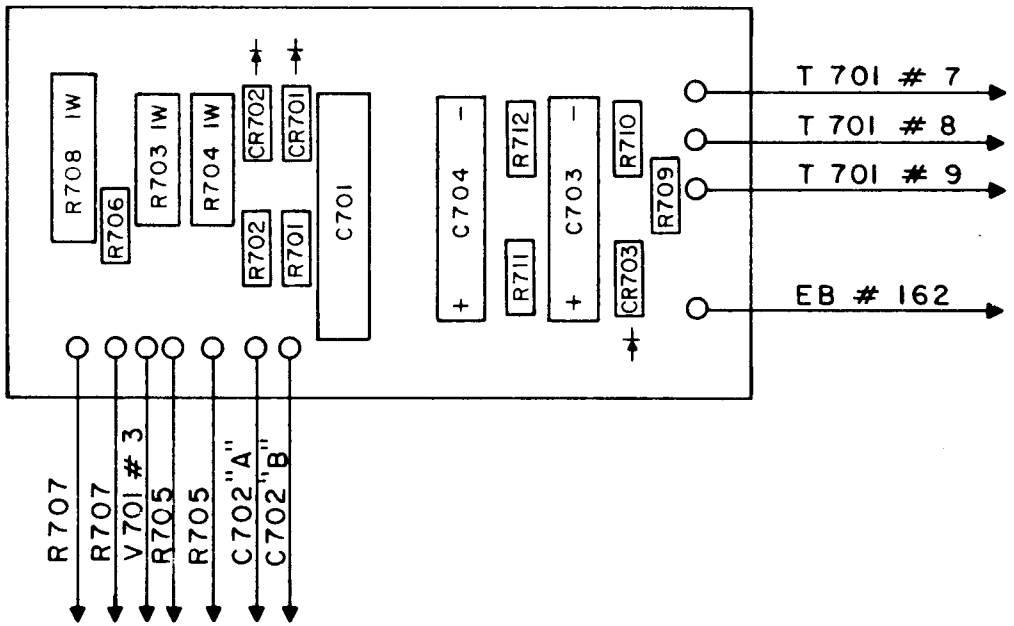
DWG. No. SA-174-2-0407

SCALE: NONE | SHEET: 1 OF 1 | DWG. SIZE A

DWG. No. SA-174-2-0307	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

SUB-ASSEMBLY NRC 1343
(EB 163)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	10-26-64	COMPONENT LAYOUT (POWER SUPPLY) MONITOR SA174207
MATERIAL:	CHECKER	11-11-64	
FINISH:	ENGINEER		
	APPROVAL	11-12-64	

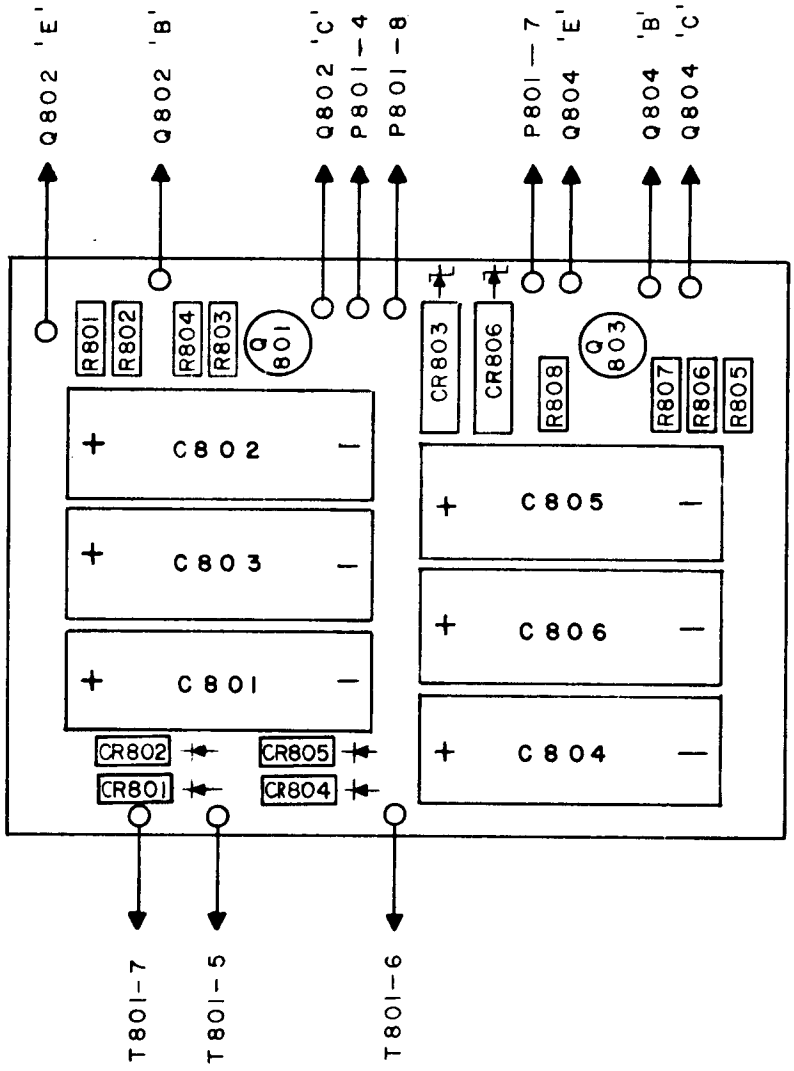
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0307

SCALE: NONE | SH. 1 OF 1 | DWG. SIZE A

DWG. No.	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



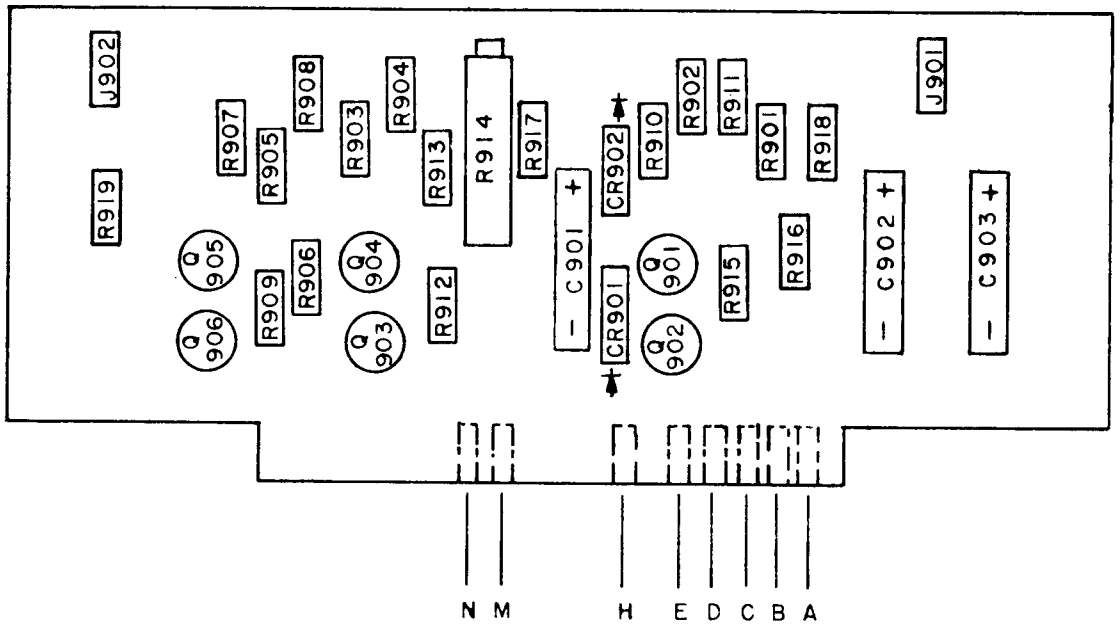
SUB-ASSEMBLY
NRC 1361
(EB 170)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± 1/64 ± .005	DRAFTSMAN G P	DATE 4-22-65	NAME: COMPONENT LAYOUT MAIN POWER SUPPLY SA 174308	NORTHERN RADIO CO. INCORPORATED 143-147 WEST 22ND ST. N.Y.11, NEW YORK
MATERIAL:	CHECKER	4-28-65		
FINISH:	ENGINEER			
	APPROVAL GH	4/29/65	SCALE: NONE SH. 1 OF 1	DWG. No. SA-174-3-0208 DWG. SIZE A

DWG. No.	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL

ETCHED CIRCUIT BOARD
(EB 159A)



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	G P	4-19-65	COMPONENT LAYOUT AUTO THRESHOLD SA 174209 A
MATERIAL:	CHECKER RF	4-22-65	
FINISH:	ENGINEER		
	APPROVAL JPH	4/29/65	

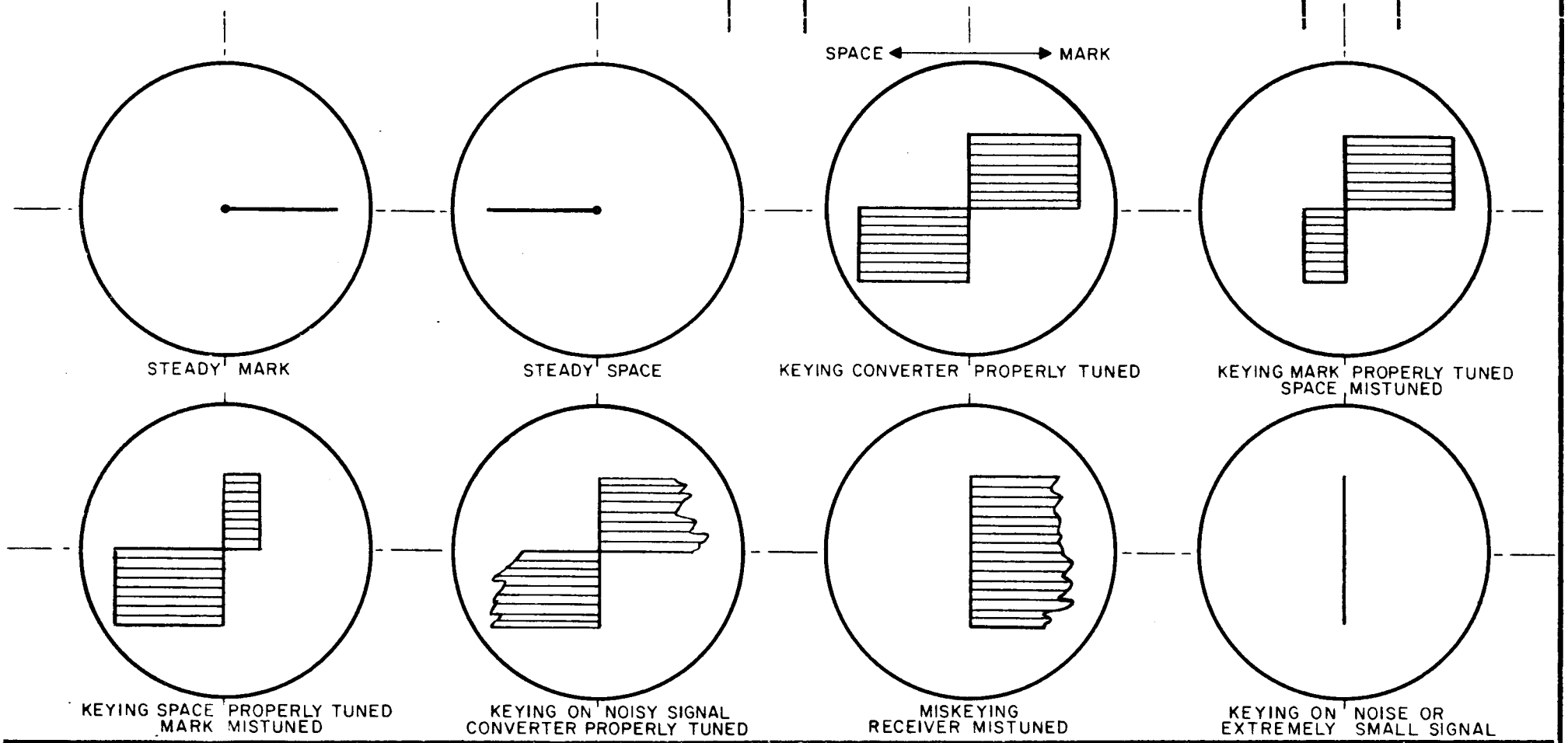
NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. SA-174-2-0209A

SCALE: NONE | SH. 1 OF 1 | DWG. SIZE A

DWG. No.	174-2-20	REV.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED	DRAFTSMAN	DATE	NAME:
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	S. S.	11-17-64	TUNING PATTERNS F S. DIVERSITY CONVERTER TYPE 174 MOD. 2
MATERIAL:	CHECKER R.F.	11-17-64	
FINISH:	ENGINEER		
	APPROVAL JPH	11/17/64	

NORTHERN RADIO COMPANY
INCORPORATED
143-147 WEST 22ND ST. N.Y. 11
NEW YORK

DWG. No. 174-2-20

SCALE: NONE | SHEET: 1 OF 1 | DWG. SIZE A

SUB- ASSEMBLY NRC 1338A (EB 164A)

P301

1 130
2 140
3 150
4 160
5 170
6 180
7 190
8 200
9 210
10 220
11 230
12 240

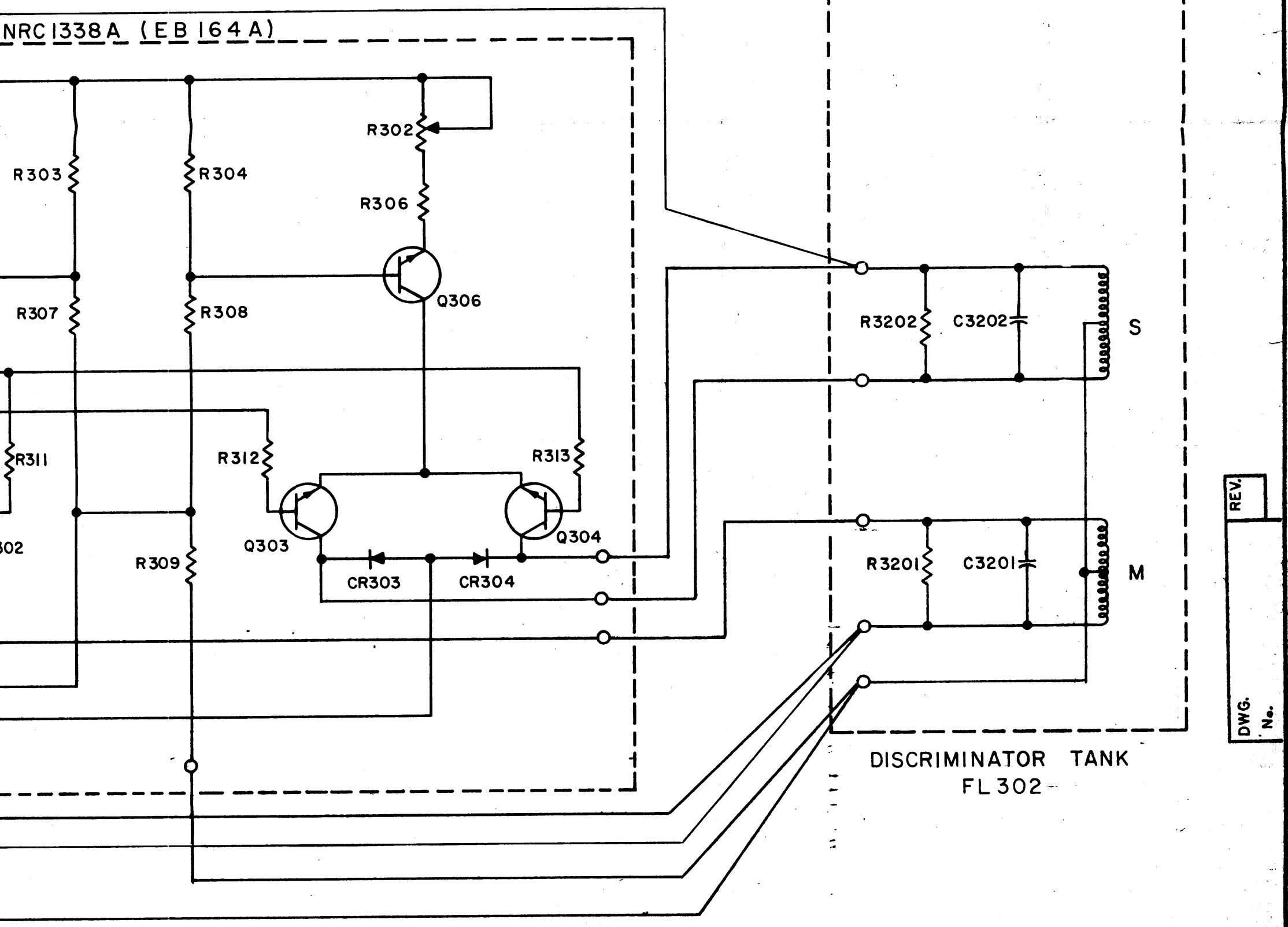
R301
R303
R304
R305
Q305
R307
R308
R310
R311
R312
Q301
Q302
R309
CR301
CR302

BAND PASS FILTER
FL 301

1
2
3
4

UNLESS OTHERW
DIMENSIONS A
TOLERANCES O
FRACTIONS ± 1/64 DECI ± .0
MATERIAL:
FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	DRAWING WAS C9-0304	1-16-68	



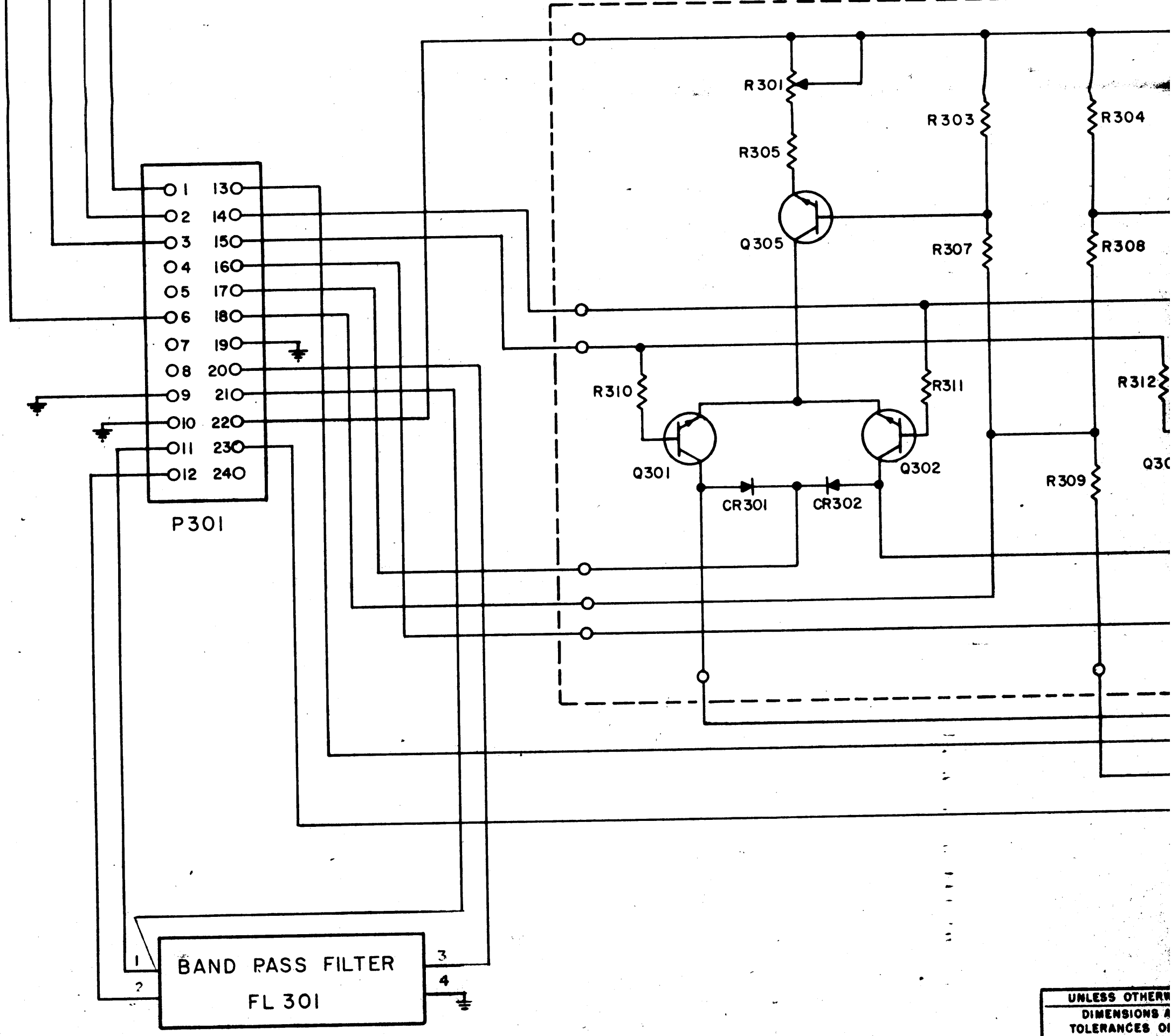
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN J. B.	DATE 6-14-66	NAME: SCHEMATIC FIXED FREQUENCY DISCRIMINATOR FOR SA 174203A-1,-2, ETC.
MATERIAL:	CHECKER		
FINISH:	ENGINEER		
	APPROVAL		

NORTHERN RADIO COMPANY INCORPORATED
143-147 WEST 22ND ST. N.Y.11. NEW YORK

DWG. No. SA-174-2-0403A

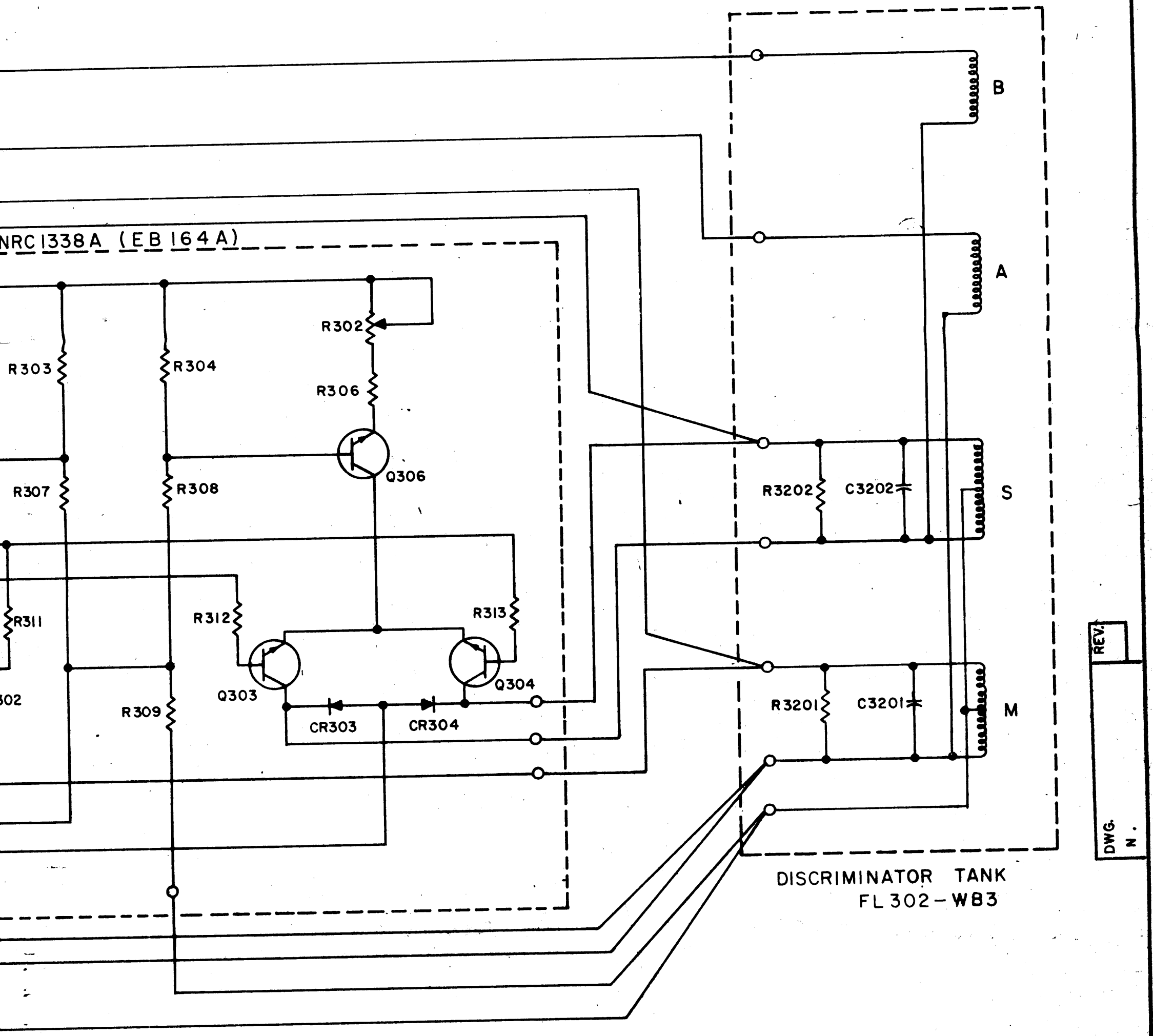
SCALE: NONE | SH 1 OF 1 | SIZE C

SUB- ASSEMBLY NRC 1338A (EB 164 A)



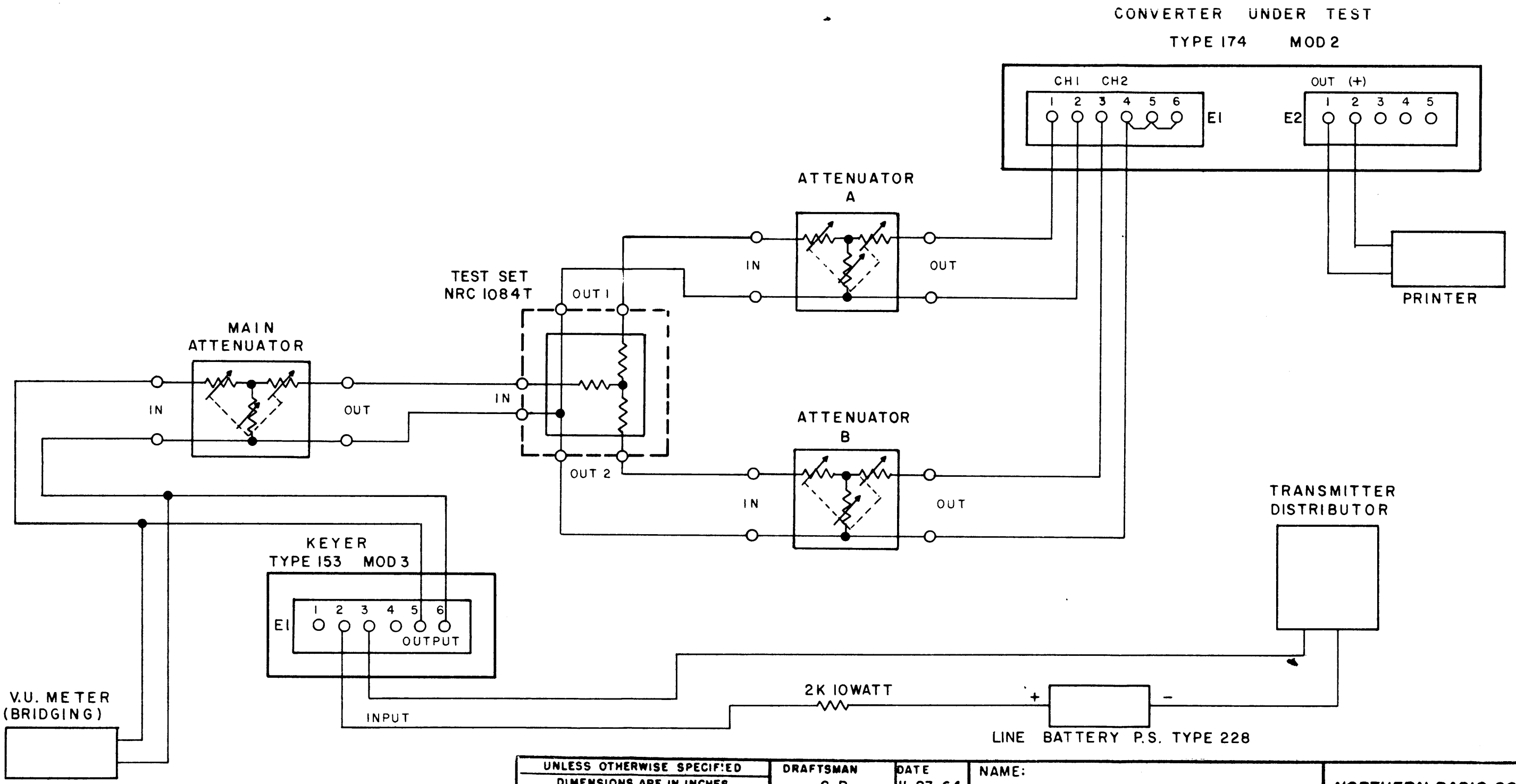
UNLESS OTHERW
DIMENSIONS A
TOLERANCES O
FRACTIONS DECI
± 1/64 ± .0
MATERIAL:
FINISH:

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
A	ADDED: PIN NUMBERS TO FL 301	7-15-66	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN G P	DATE 5-7-65	NAME: SCHEMATIC DISCRIMINATOR SA 174203A-WB3
MATERIAL:	CHECKER	5-7-65	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
FINISH:	ENGINEER		DWG. No. SA-174-2-0103A-WB3
	APPROVAL		SCALE: NONE SH 1 OF 1 SIZE C

REV.	DWG. No.	REVISIONS			
		SYM.	DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES	DRAFTSMAN G.P.	DATE 11-23-64	NAME: TEST CIRCUIT F.S DIVERSITY CONVERTER TYPE 174 MOD 2
MATERIAL:	CHECKER	12-3-64	NORTHERN RADIO COMPANY INCORPORATED 143-147 WEST 22ND ST. N.Y. 11 NEW YORK
FINISH:	ENGINEER		DWG. N. 6-1316
	APPROVAL	12-3-64	SCALE: NONE SH 1 OF 1 DWG. SIZE B