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NAVSHIPS 92288
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CONTRACTOR'S COMMERCIAL INSTRUCTION BOOK

KY-79 ( ) / UR KEYER

MANUFACTURER'S COMMERCIAL DESIGNATION

TYPE 102 MODEL 1

NORTHERN RADIO COMPANY, INC.
143-5 WEST 22ND STREET
NEW YORK 11, NEW YORK

NAVSHIPS 92288 Instruction Book

TONE KEYER

Type 102 Model 1

CONTENTS:

7-14-53ab

MANUFACTURERS' DESIGNATION SYMBOLS

AHH	Arrow-Hart & Hegeman Co.
ALB	Allen Bradley Corp.
AMP	American Phenolic Corp.
BUD	Bud Radio, Incorporated
CCC	Continental Carbon Company
CDC	Cornell-Dubilier Electric Co.
CLA	Clarostat Manufacturing Co.
DRA	Drake Manufacturing Co.
DLA	Dial Light Corp. of America
ERC	Erie Resistor Corporation
GEC	General Electric Co.
HUB	Harvey Hubbell, Inc.
ICA	Insuline Corporation of America
IRC	International Resistance Co.
LFU	Littlefuse, Incorporated
MAL	P. R. Mallory & Co., Inc.
NRC	Northern Radio Company, Inc.
SAN	Sangamo Electric Corp.
SPR	Sprague Products Co.
WEI	Weston Electrical Instrument Co.

Instruction Book
Tone Keyer

Type 102 Model 1

1. GENERAL

Purpose:

The Type 102 Model 1, Tone Keyer is used in communication systems for remote keying of a radio transmitter, or teleprinter machine. The intelligence pulses amplitude modulate any one of six audio tones. The amplitude modulated tones are then impressed on a telephone line, through a fixed attenuator.

Description:

The Tone Keyer makes use of a high stability RF oscillator with an adjustment for setting any of the desired frequencies to the exact value of 425, 765, 1105, 1445, 1785, or 2125 cycles per second. The oscillator drives a balanced modulated amplifier which is modulated by a special "mark" and "space" limiter. This keyer is complete with power supply. An external tone may be introduced instead of the local audio oscillator.

Technical Data:

Input Signals:	1. Polar relay contacts shorting to ground. 2. Amplitude modulated (keyed) audio tone 300-10,000 cps. 3. DC pulses positive or negative with respect to ground.
Input Level:	a. Audio: 0 db b. DC: ± 10 volts c. DC current pulses ± 30 ma., polar
Input Impedance:	1. Tone: 600 ohms 2. DC Voltage: 100,000 ohms, one side grounded 3. DC Current: 1800 ohms external load (one side grounded)
Output Frequencies:	425, 765, 1195, 1445, 1785, or 2125 cps.
Output Level:	Mark and Space: 0 db (6 mw)

Technical Data: (cont'd)

Output Impedance:	600 ohms balanced "H" pad
Keying Speed:	0-400 dot cycles per second
Controls:	1. Primary power switch 2. Output tone selector 3. Output level control 4. Keying wave selector switch
Power Requirements:	110/220 volts 50/60 cycles Approximately 75 watts Connection at rear of chassis
Dimensions:	3-1/2" x 19" x 13-1/2"
Weight:	Approximately 30 pounds
Tube Complement:	1 - 6SJ7 Oscillator 1 - 6V6GT Keyer Tube 1 - 6SH7 Keyed Amplifier 1 - 6SL7 Keyed Amplifier 1 - 5Y3GT Power Supply 1 - 6B6 Tone Rectifier 1 - 6V6GT Oscillator
Metering:	2-1/2" AC Voltmeter across output

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2. DESCRIPTION OF OPERATION

Audio Oscillator:

The purpose of the audio oscillator is to provide a continuous stable audio frequency to be modulated in accordance with the intelligence. The oscillator tubes V1 and V2 operate as a conventional amplitude stabilized RC oscillator commonly called "Wien" Bridge oscillator.

Since the behavior of this type of circuit is well known in the radio art, no further explanation of its operation is necessary.

Keyed Amplifier:

The Keyed amplifier (V4) is essentially a modulator stage in which the continuous audio tone from the audio oscillator is combined with the output of the keying amplifier to obtain a tone keyed on or off in accordance with the intelligence.

For satisfactory operation in a communication system where many tones may be impressed on a pair of telephone lines in multiplex, the tone keyer output must be reasonably free from harmonic distortion of the output tone and transients generated from the keying should be of negligible duration and magnitude.

Accordingly, when the keyed amplifier is keyed on, it operates as a push-pull class A amplifier, having a pure sinusoidal output.

Since the keying voltage is impressed in a "push-pull" manner, the transients generated in each half of V4 can be cancelled out effectively from the balanced output circuit.

Keying Amplifier:

The keying amplifier is effectively a limiter which removes the effect of input signal amplitude variations from the keyed output tones.

The actual keyer tube (V5) is connected from the cathode end of the cathode bias resistor R37 to +B. When the control grid of V5 is at chassis potential, the plate current of V5 is zero; (V5 bias is beyond cut-off) the output tube V4 then functions as an amplifier.

Keying Amplifier: (cont'd)

When the control grid voltage of V5 is sufficiently positive with respect to the chassis, the plate current of V5 flowing through R37 causes V4 to cut-off, thus reducing the output tone level to zero.

The variation of grid potential of V5 is obtained from the keyer amplifier tube V5 through one of neon coupling tubes V10 or V11.

For the explanation of the operation of V6, consider that S2 has been turned to positive DC polar keying (DC-) and that the input keying to terminals 2-3, is zero. The grid of V5 is then connected to V10 and current of plate 2 of V6 is cut off by bias voltage appearing across R47. Since the current through R44 is small, V10 is lit and the voltage impressed on the grid of V5 is sufficiently positive to cause cut-off of the output tube V4.

Applying sufficient positive voltage to grid #1 of V6 causes the plate current of plate #2 to flow through R44; the increased voltage drop across R44 extinguishes V10, thus the voltage drop across R41 becomes zero. Since this cuts off V5, V4 passes the tone.

For a negative polar keying voltage, the first section of V8 operates as a phase inverter and plate #5 controls V5 through V11.

For a keyed tone input signal, the tone is rectified by V7 and impressed to the keying circuit as a positive polar signal; the rest of the keying circuit operates in the manner outlined before.

For polar relay keying, V6 is connected in a usual "flip-flop" circuit, namely, grid 1 to plate 5, and grid 4 to plate 2. Shorting first one and then the other, grid to ground, causes keying as outlined before.

3. DESCRIPTION OF CONTROLS

Output Frequency:

The output frequency control inserts the proper R-C combination in the audio oscillator circuit to provide the specified fixed output frequencies.

Output Level:

The output level control is a balanced "L" pad by which the output level to the telephone line can be varied while keeping the load on the amplifier V4 nearly constant.

Keying Wave:

By the keying wave control, the connection of the keying amplifier can be altered to suit the type of keying input desired.

4. INSTALLATION

Mechanical Installation:

The Tone Keyer may be installed in any convenient location so that access is provided to the rear of the equipment for periodic maintenance checks.

Electrical Installation:

Before connecting the electrical lines to the Tone Keyer, it is desirable to check if the source of primary power is correct, the nature of the keying input and the load on the equipment.

The keying lines to the equipment should be twisted shielded pair, only one type of keying line should be connected to the equipment at any time to prevent one keying signal from interfering with another. If it is necessary to alternate frequently between various types of keying, it is usually best to bring out all the keying connections to a patch panel, so that quick changes in keying connections can be made.

If the keying is obtained from a current source such as used for teleprinting (60 ma in 1800 ohms) an 1800 ohm resistance of sufficient power rating should be bridged across the DC keying terminals (2, 3 on E1). Similarly, for other keying devices requiring output leads less than 500K ohms, a suitable resistance should be bridged across the DC keying terminals, to make the effective load on the keying device the desired value.

When keying by a polar sending head, no external resistance must be bridged across terminals 1, 2 and 3 on terminal board E1.

If it is desired that a external tone be keyed, remove the connecting link from the "external tone" terminal board (E2) and connect the source of external tone from the center terminal to ground. The external generator impedance can be any value from 200 ohms to 100,000 ohms. The external tone level should be set as high as possible without overloading the output amplifier V4; the desired output level then should be set by the "Output Level" control.

If the local audio oscillator is to be used, the various output frequencies should be checked against a suitable standard of audio frequencies; objectionable discrepancies should be corrected by the proper frequency trimmer at the rear of the Tone Keyer. For this test no external connections should be made to any part of the audio oscillator. The check

Electrical Installations (cont'd)

should be made on tone obtained at the output of monitor terminals. The Tone may be turned on by setting the "Keying Wave" switch to "Relay" (no external connections to relay terminals 1 and 3).

If aural monitoring is desired, the Tone Keyer "Monitor terminal may be connected to a loud speaker having about 1000 ohms balanced impedance. (For 600 ohms speakers, insert a 6 db pad, having 1000 ohms input and 600 ohms output impedances.) A front panel jack for earphone monitoring is also provided.

The output of the keyed amplifier is connected through a fixed attenuator providing about 20 db attenuation for a 600 ohm external load. The fixed attenuator effectively isolates the level meter and keyed amplifier V4 from other signals which may be simultaneously impressed across the same pair of telephone lines. With the fixed attenuator, the maximum output level of the Tone Keyer is approximately 0 db (6 mw).

5. OPERATING INSTRUCTIONS

A. Polar Positive DC Keying:

Set "Output Frequency" to the desired value, set "Keying Wave" to "DC+" and set output level to desired value. Note that output level is best set with a steady tone on, since during keying the level indicated by the output level meter is less than the tone level; the output meter will also fluctuate when the keying is relatively slow.

B. Polar Negative DC Keying:

Proceed as in "A", but set "Keying Wave" to DC-.

C. Reception of CW Signals by Diversity Receivers:

For this type of service, usually the second detectors of all diversity receivers are connected to the same diode load, and no receiver BFO issued. Connect the common diode load directly to the DC keying terminals 2 and 3 on terminal board E1. Set "Keying Wave" to "DC+" or "DC-" according to the polarity of the receiver output pulse. Set output frequency and level as in "A".

After the receiver is tuned accurately to the signal, lower the receiver RF gain control (or gain controls when receiver AVC circuits are independent) until satisfactory keying occurs. (If the RF gain control is set too high, the noise output of the receiver may be high enough to key the Tone Keyer.)

If the quality of the received signal is very poor, it may be necessary to install a fixed bias, which opposes the receiver output, in the input load to alter the quality of keying signal to better advantage.

D. Reception of CW Signals by Single Receiver:

For this type of service, the receiver output is usually an on-off audio tone obtained by beating the received signal with the receiver BFO.

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D. Reception of CW Signals by Single Receivers: (cont'd)

Connect the receiver output of the keyed tone input (Terminals 4 and 5 on terminal board #1). After the receiver is accurately tuned to the signal, adjust the receiver output tone to about 2000 cps and 10-15 volt level. Set the "Keying Wave" control to "Tone", then proceed as in "A".

In some instances, better results are obtained if the receiver RF gain control is set for an intermediate value before adjusting the receiver output level.

E. Keying by Polar Relay:

The most common source of this type of keying is a polar sending head. To operate, connect the armature to ground (terminal 2) and the "mark" and "space" contact terminals 1 and 3. When the relay is in "mark" position, tone is on.

Set "Keying Wave" control to "Relay" and proceed as in "A".

It should be pointed out that the leakage resistance across the telephone lines connected to the keying terminals must be high, otherwise the keying circuit will not operate reliably.

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6. MAINTENANCE

To obtain long and trouble-free operation from the Tone Keyer, it is recommended that a few routine checks be performed at reasonable intervals.

Check all tubes periodically for emission and mutual conductance. When any tube shows a mutual conductance and emission less than the minimum acceptable for its type, it should be replaced.

The output tone frequencies should be compared to a standard approximately once a month, and deviations rectified.

Similarly, the keyed amplifier balance should be checked monthly. This test can be easily performed in the following manner:

Connect an oscilloscope across the monitoring terminals. Set the "Keying Wave" to "DC—". Connect a 60 cps 50-100 volt sinusoidal keying voltage to the DC keying terminals.

Disable the local audio oscillator by holding the "Output Frequency" switch between detents. Adjust the balancing control R27 (at the rear) for minimum transient output indicated by the oscilloscope. If a reasonably good balance is unobtainable, change V4.

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TABLE OF TUBE SOCKET VOLTAGES

DATE:_____ EQUIPMENT: TONE KEYER TYPE: 102 MODEL 1 SERIAL:_____

Symbol	Function	Type	Pins	Volts	Pins	Volts	Pins	Volts	Pins	Volts	Pins	Volts	Pins	Volts
V1	Audio Oscillator	6SJ7	1-3	1.15	1-4	0	2-5	1.15	1-6	55	1-8	155	2-7	AC 6.2
V2	Audio Oscillator	6V6GT	1-3	195	1-4	175	1-5	0	1-8	12	2-7	AC 6.2		
V4	Output Amplifier	6SN7	G-1	37.5	G-2	275	G-3	46	G-4	32.5	G-5	275	G-6	46
V5	Keyer Tube	6V6GT	1-3	285	1-4	255	1-5	0	1-8	45	2-7	AC 6.2		
V6	Keyer Amplifier	6SL7	G-1	0	G-2	100	G-3	6.75	G-4	*6	G-5	35	G-6	6.3
V7	Tone Rectifier	6X6	1-3	0	1-4	.25	1-5	0	1-8	.25	2-7	AC 6.2		
V8	Power Rectifier	5Y3GT	G-4	AC 300	G-6	AC 300	2-8	AC 5						

CONTROL SETTINGS

Control	Function	Setting
S5	Freq. Sel.	2125 cps
R53	Output Level	Maximum
S2	Keying Switch	Relay

NOTE: All voltages measured with a 20,000 ohms/Volt DC Voltmeter

REMARKS: *50 volt range.

5. ELECTRICAL PARTS LIST

Symbol	Function	Description	Mfr.	Part No.
C1	Series frequency determining cond.	150 mmf ± 2% 500 volt silver mica	SAN	RR 1313
C2	Shunt frequency determining cond.	120 mmf ± 2% 500 volt silver mica	SAN	RR 1312
C3	Audio oscillator coupling cond.	.1 mfd ± 10% 400 volt paper	SAN	300401
C4	Audio oscillator plate bypass cond.	.1 - .1 mfd ± 20% 600 volt paper dual bathtub, side terminal. Part of C12	SAN	5006-.1x2
C5	Audio oscillator plate bypass cond.	1 mfd ± 20% 600 volt paper bathtub capacitor, side terminal.	SAN	5006-1
C6	Audio oscillator feedback cond.	2 mfd ± 20% 600 volt paper bathtub capacitor, side terminal	SAN	5006-2
C7	Power supply filter	4 mfd ± 20% 600 volt dykanol	CDC	TLA-6040
C9	Output amp. grid coupling	.01 mfd ± 20% 400 volt paper molded tubular	SAN	300401
C10	Output amp. grid coupling	Same as C9		
C12	Output amp. plate bypass	Same as and part of C4		
C13	Tone rectifier filter	500 mmf ± 20% 500 volt mica	SAN	C 1250
C16	Power supply filter cond.	4 mfd 600 volt dykanol	CDC	TLA-6040
C17	Same as C16	Same as C16		
C18	Audio osc. trimmer cond.	7-45 mmf ceramic trimmer	KRC	TS2A
C19	Same as C18	Same as C18		
C20	Same C18	Same as C18		

Symbol	Function	Description	Mfr.	Part No.
C21	Audio osc. trimmer cond.	7-45 mmf ceramic trimmer	ERC	TS-2A
C22	Same as C21	Same as C21		
C23	Same as C21	Same as C21		
E1	Keyer input terminal	5 terminal screw post	ICA	2405
E2	External tone input	3 terminal screw post	ICA	2414
E3	Tone Output	Same as E2		
E5	Monitoring bridging	2 terminal screw post	ICA	2420
F1	Primary power fuse	Class fuse 2 amps.	LFU	3AG
I1	Primary power pilot light	Pilot light assembly with 6-8 V. bayonet base lamp removable red disc.	DLA	67 BD
J1	Primary power connector	2 pole male chassis type connector	HUB	6808
J2	Output tone monitor jack	Open circuit telephone jack insulated	BUD	232
L1	Power supply filter choke	10 henries 250 ohms 75 ma. MRC # 112	FTC	14801
L2	Same as L1	Same as L1		
M1	Output level meter	0-20 V. rectifier type AC meter in 3-1/2" square bakelite case.	WEI	506
P1	Primary power connector	2 pole female cable connector	HUB	7259
P2	Same as P1	Rubber finger grip plug cap	HUB	9972
R1	Audio osc. series freq. determining resistor	2.07 megohm ± 1% precision resistor 1/2 watt	CCC	X-1/2
R2	Same as R1	1.15 megohm ± 1% precision resistor 1/2 watt	CCC	X-1/2
R3	Same as R1	793K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2

Symbol	Function	Description	Mfr.	Part No.
R4	Audio osc. series freq. determining resistor	610K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R5	Same as R4	492K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R6	Same as R4	414K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R7	Shunt freq. determining resistor	2.07 megohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R8	Same as R7	1.15 megohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R9	Same as R7	793K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R10	Same as R7	610K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R11	Same as R7	492K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R12	Same as R7	414K ohms ± 1% precision resistor 1/2 watt	CCC	X-1/2
R14	Shunt negative feedback resistor	6 watt 115 volt incandescent lamp with candelabra base	GEC	86
R15	Same as R14	Same as R14		
R16	Audio oscillator screen bleeder	33K ohms ± 5% 1/2 watt	ALB	EB 3335
R17	Same as R16	100K ohms ± 10% 1 watt	ALB	GB 1041
R18	Audio oscillator plate load	51K ohms ± 5% 1/2 watt	ALB	EB 5135
R19	Audio oscillator plate filter	10K ohms ± 10% 1/2 watt	ALB	EB 1031
R20	Audio oscillator grid res.	510K ohms ± 5% 1/2 wat	ALB	EB 5145
R21	Audio oscillator cathode resistor	470 ohms ± 10% 1 watt	ALB	GB 4711
R22	Audio oscillator screen bleeder	51K ohms ± 5% 2 watts	ALB	HB 5135

Symbol	Function	Description	Mfr.	Part No.
R23	Audio oscillator screen bleeder	20K ohms ± 5% 2 watts	ALB	HB 2035
R24	Audio oscillator plate load	5000 ohms 5 watts wirewound potentiometer, screwdriver adjustment	MAL	M5WP
R25	Audio oscillator plate filter	1000 ohms ± 10% 2 watts	ALB	HB 1021
R26	Keyer grid leak	470K ohms ± 10% 1/2 watt	ALB	EB 4741
R27	Keyer amplifier balance control	500 ohms wirewound miniature potentiometer with screwdriver shaft 3/8" 1/ 1/4" D.	IRC	W-500
R28	Audio oscillator negative feedback control	3000 ohms wirewound miniature potentiometer for screwdriver adjustment	MAL	M3WP
R29	Output Pad	1000 ohms ± 10% 1/2 watt	ALB	EB 1021
R31	Keyer amplifier bias res.	91K ohms ± 5% 2 watts	ALB	HB 9135
R32	Tone Transformer load	100K ohms ± 10% 1/2 watt	ALB	EB 1041
R33	Output Pad	1000 ohms ± 10% 1/2 watt	ALB	EB 1021
R34	Output amp. grid res.	100K ohms ± 10% 1/2 watt	ALB	EB 1041
R35	Same as R34	Same as R34		
R36	Keyed amp. bias resistor	15K ohms ± 10% 1/2 watt	ALB	EB 1531
R37	Output amp. cathode res.	5100 ohms ± 5% 2 watts	ALB	HB 5125
R38	Output amp. plate filter	1000 ohms ± 10% 1/2 watt	ALB	EB 1241
R40	Same as R39	75K ohms ± 5% 2 watts	ALB	HB 7535
R41	Keyer tube grid resistor	820 ohms ± 10% 1/2 watt	ALB	EB 8241
R42	Same as R41	Same as R41		

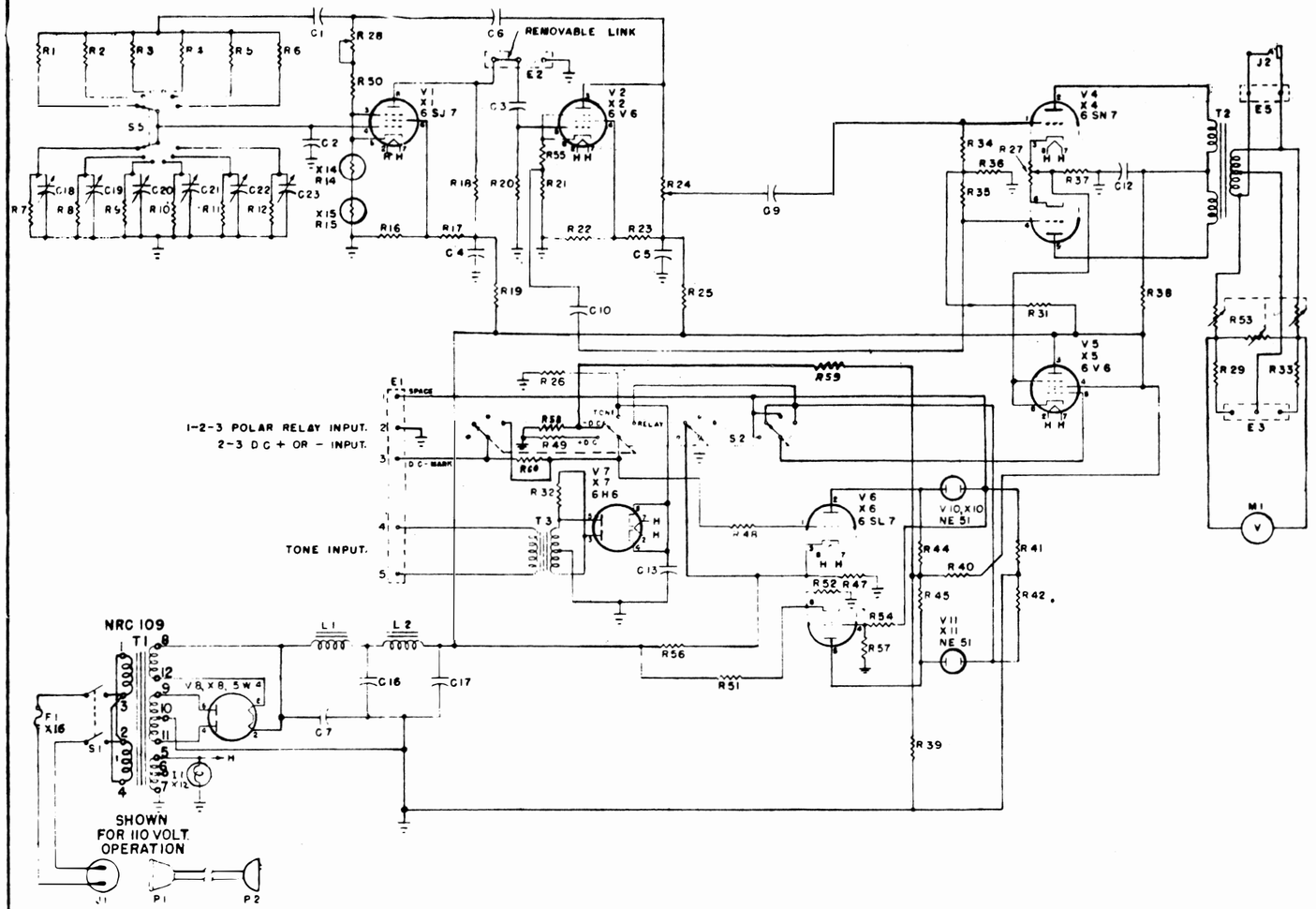
Symbol	Function	Description	Mfr.	Part No.
R44	Keyer amp. plate load	150K ohms ± 10% 1/2 watt	ALB	EB 1541
R45	Same as R44	Same as R44		
R47	Keyer amp. cathode	1K ohms ± 10% 1/2 watt	ALB	EB 1021
R48	Keyer amp. grid current limiter	470K ohms ± 10% 1/2 watt	ALB	EB 4741
R49	Keyer amp. grid resistor	470K ohms ± 10% 1/2 watt	ALB	EB 4741
R50	Negative feedback resister	3000 ohms ± 5% 1/2 watt	ALB	EB 3025
R51	Keyer amp. bias	50K ohms ± 10% 10 watts	SPR	10KT
R52	Keyer amp. bias	1000 ohms ± 10% 1/2 watt	ALB	EB 1021
R53	Output level control	600 ohms balanced L pad (T pad connected for this operation)	CLA	T-pad CIT 200 ohms
R54	Keyer amp. grid current limiter	470K ohms ± 10% 1/2 watt	ALB	EB 4741
R55	Audio oscillator cathode resistor	240 ohms ± 5% 1/2 watt	ALB	EB 2415
R56	Keyer amp. bias	50K ohms ± 10% 10 watts	SPR	10KT
R57	Keyer amp. grid res.	240K ohms ± 5% 1/2 watt	ALB	EB 2445
R58	Keyer Amp. grid res.	270K ohms ± 10% 1/2 watt	ALB	EB 2741
R59	Negative DC keying grid bleeder resistor	10 megohms ± 10% 1/2 watt	ALB	EB 1061
R60	DC Keying grid serier res	100K ohms ± 10% 1/2 watt	ALB	EB 1041
S1	Main power switch	DPST toggle 115 volt 3 amp.	ARH	81024
S2	Keying selector switch	3 circuit 4 position rotary 1/2" shaft	MAL	1325L
S5	Frequency selector switch	2 pole 6 position rotary, 1/2" shaft	MAL	3226J

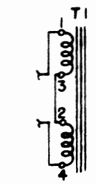
Symbol	Function	Description	Mfr.	Part No.
T1	Power supply transformer	Primary: 115 volts 50/60 cps Sec. #1: 295-0-295 volts 50 ma. Sec. #2: 6.3 V. 2 A. Sec. #3: 5 V. 2 A. NRC #109	FTC	14798
T2	Output transformer	P.P. plate to balance line, 20K ohms to 600 ohms, primary to carry 8 ma. DC NRC #111	FTC	14797
T3	Keyed tone input transformer	Balanced line to full wave diode 600 to 100K ohms, secondary center tapped NRC #110	FTC	14795
V1	Audio oscillator	Standard	Any	6SJ7GT
V2	Audio oscillator	"	"	6V6GT
V4	Output Tube	"	"	6SN7GT
V5	Keyer Tube	"	"	6V6GT
V6	Keyer amplifier	"	"	6SL7GT
V7	Tone rectifier	"	"	6H6
V8	Rectifier	"	"	5Y3GT
V10	Keyer coupling tube	1/25 watt neon lamp, bayonet base	GEC	NE51
X1	Socket for V1	Octal with ground lugs	CIN	9861
X2	Socket for V2	Same as X1		
X4	Socket for V4	Same as X1		
X5	Socket for V5	Same as X1		
X6	Socket for V6	Same as X1		
X7	Socket for V7	Same as X1		
X8	Socket for V8	Same as X1		
X10	Socket for V10	Lamp socket, bayonet base	UTA	67 BD
X11	Socket for V11	Same as X10		

Symbol	Function	Description	Mfr.	Part No.
X14	Socket for R14	Loop socket, candelabra base	DLA	615
X15	Socket for R15	Same as X14		
X16	Primary power fuse holder	Extractor type fuse holder for type 3 AG fuse	LFU	342001

FINISH:

ITEM	DESCRIPTION	DWG. NO.	QUAN.	PART NO.





CONNECTIONS FOR 220 VOLT. OPERATION

DWG NO. B-102101

ISSUE	DWN.	CKD.	APPR.	DATE	CHANGE
3.	TCR			1-20-53	ADDED 220V OPERATION (T1)
2	T.C.R.			10-2-51	ADDED 'R58, R59 & R60' FOR SERIAL NO. 463 & UP.
1	T.C.R.			6-13-51	ORIG. DWG. WAS SD 4 C 7

MATERIAL

SCALE

REFERENCE DWGS.
INDEX NO. A-102100

TOLERANCE (UNLESS SPECIFIED)
FRACT. ± 1/64 DECIMAL ± .005

DWN.	CKD.	APPR.	APPR.	DATE
TCR				6-13-51

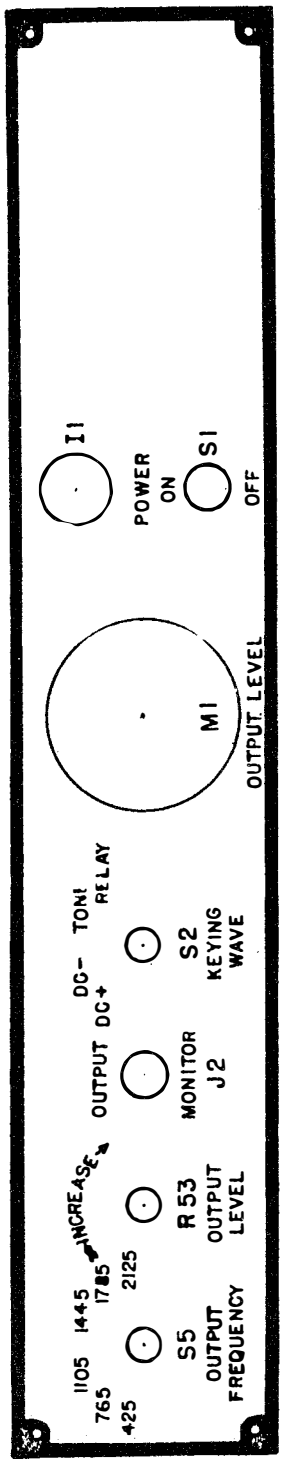
USED ON

TITLE
SCHEMATIC
TONE KEYER
TYPE 102 MODEL 1

NORTHERN RADIO COMPANY
145 W. 22ND ST. INCORPORATED N.Y., N.Y.

DWG NO. B-102101

S. A. Barone Co. New York 11, N. Y.



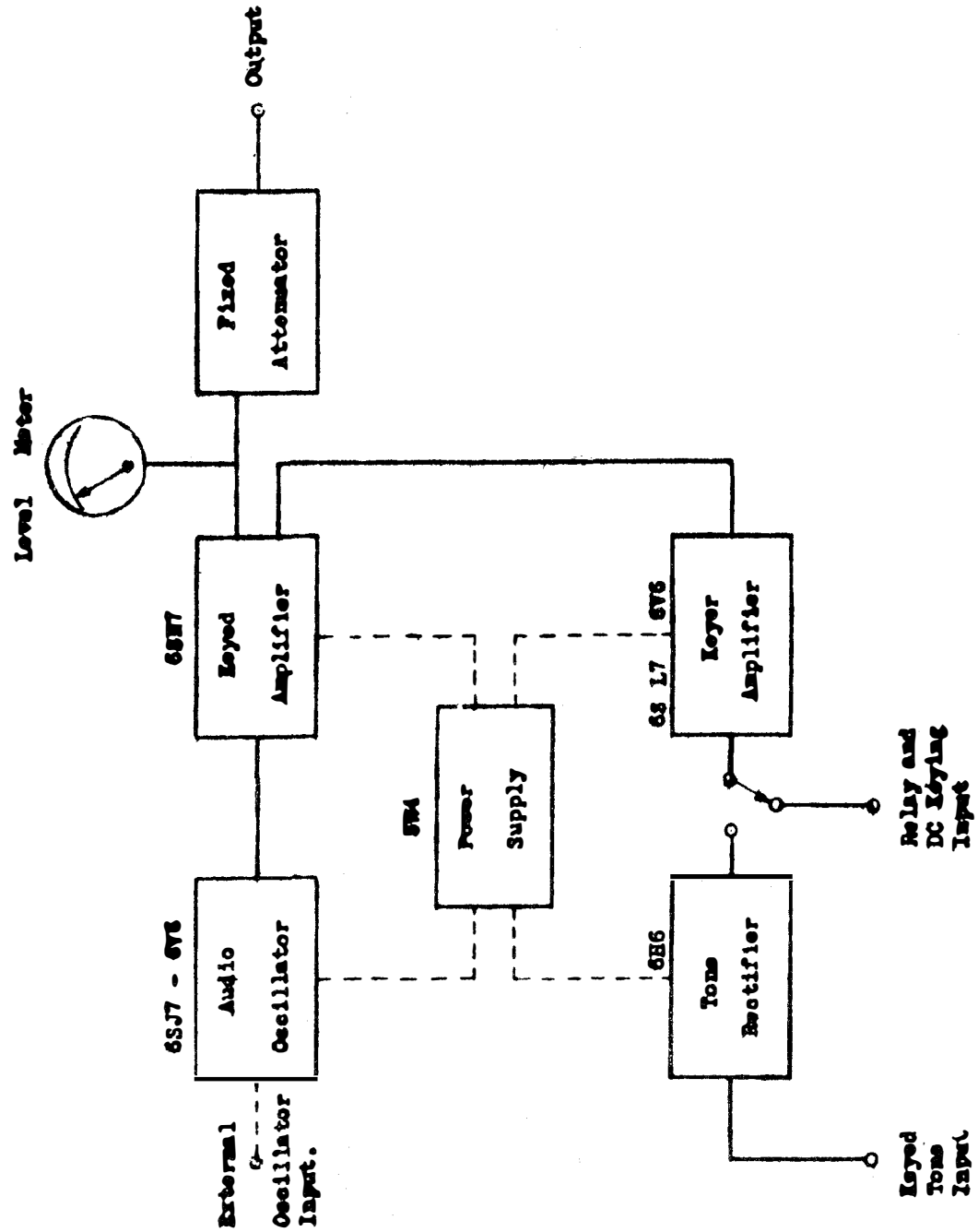
PANEL LAYOUT FOR
TONE KEYER
Type 102 Model 1

SHEET 1 OF 1

DRAWING NO. OR ARTICLE NO. SK 2 A 29 Issue 1

DATE 11/6/50 | DRN. BY TCR | CHKD. BY AP 11/8/50 | APP. BY DAL

S. A. BARONE CO. — NEW YORK 11, N. Y.



Overall Block Diagram of Tone Keyer Type 108 Model 1

SHEET 1

ARTICLE

DWG. NO. B D4 A 17

DATE 11/25/47 BY TCR APP. BY LH