INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE JZ LINE COUPLING TUNERS
50 to 150 and 150 to 300 Kilocycles

CAUTION Before working on this equipment turn off the power supply to the carrier equipment and ground or open circuit the R.F. lead to the coupling capacitor.

APPLICATION

The Type JZ Line Coupling Tuners are a combination impedance matching and tuning device to provide, in conjunction with a coupling capacitor, low loss coupling of a carrier transmitter-receiver to a power line. The tuners are suitable for coupling (to a hiline) through a coupling capacitor having any capacitance between .0007 mfd and .004 mfd. These tuners are most often used for phase-to-ground coupling, or for a phase-to-ground carrier by-pass. The tuner will match impedances between 25 and 1300 ohms, and will handle a 37.5 watt unmodulated signal, or 100 watts peak power of a modulated signal.

CONSTRUCTION

The 50-150 KC type JZ line coupling tuner is identified as Style #867484A for mounting on the coupling capacitor base; Style #867485A for open wire connection to the coupling capacitor; Style #867486A for coaxial cable connection to the coupling capacitor. The 150-300 KC Type JZ tuner is Style #1352340 for any mounting. This unit is provided with accessory package Style #867729A for direct connection, or Style #1352445 accessories for cable or open wire connection. The accessories include the items listed in this I. L. under Parts List for the 50-150 KC tuners. All of the electrical components are mounted on a single vertical panel contained in a weather-proof cabinet for outdoor mounting.

The outline and mounting dimensions are shown in figure 5. The electrical circuits are as indicated schematically in figure 1. The function of transformer T-1 is to couple the unequal characteristic impedances of the power transmission hiline and the coaxial cable with higher power transfer efficiency. The function of inductances L-1 and L-2 is to cancel the reactance of the coupling capacitor. By making the total reactance of these inductances equal to the reactance of the line coupling capacitor, series resonance is obtained. The result is that in effect, transformer T-1 is connected directly to the hiline at carrier frequency.

INSTALLATION

The type JZ line coupling tuner as supplied includes an accessory package in addition to the main cabinet. The items received should be carefully checked against the Parts List included in this book and also against the order or requisition for the equipment. Any shortage should be reported immediately to the transportation company and to the nearest district office of the manufacturer. The equipment should be very carefully checked for damaged or missing parts and particular attention should be given to any parts which have become loose in shipment or wires which have broken due to vibration.

The tuner should be mounted as near to the line coupling capacitor as possible. The base of the type PCA capacitor potential device, or the type PC carrier current coupling device with the large base are arranged so that a tuner can be fastened to it as shown in figure 4. To install the tuner, remove from the cabinet the panel on which all of the electrical components are mounted. Remove the plate on the coupling capacitor base opposite the ground switch. A spacer, reinforcing strip,

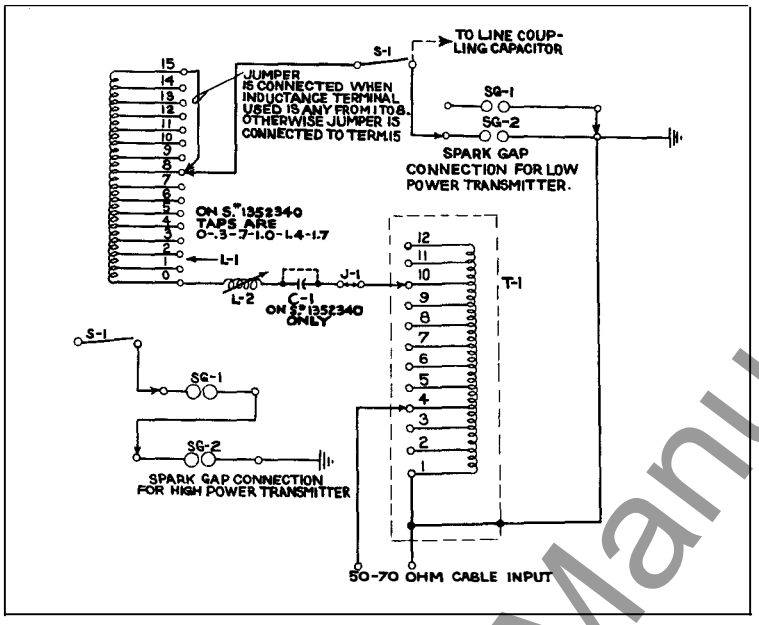

Fig. 1—Internal Schematic of Type JZ Tuner.

two gaskets, and four bolts are provided. Place the reinforcing strip inside the tuner box to aid in making the top gasket tight. Place the four bolts in the corner holes. This will locate the spacer. Use the insulator bushing and stud supplied with this style where the connection lead passes through the back of the tuner cabinet. Assemble the two parts of this thimble and plug bushing through the knockout hole in the cabinet. Connect the lead which is supplied from the stud through this thimble bushing to the terminal on the panel marked "Line Coupling". Replace the panel in the cabinet. In these cases the connection lead from the tuner to the capacitor can be completely enclosed.

Where this is not possible, the lead-in wire from the capacitor may be run through the porcelain bushing which is supplied, for open wire connection to the coupling capacitor. This lead-in should be connected to the terminal stud marked "Line Coupling." The insulation of this lead-in cable with respect to ground must be much better than is ordinarily employed for the voltage which exists between these points, as it effectively shunts the reactive elements of the resonant circuit at carrier frequency. The impedance of this resonant circuit is several thousand ohms and leakage resulting from rain, snow, sleet, too long a lead-in wire, or too many supporting insulators will reduce the power output of the transmitter equipment and the sensitivity of the receiver equipment. This lead should not be enclosed in conduit, since the capacitance of the lead to ground should be as small as possible. A cable insulated with a high grade rubber and suitable for at least 7500 volts service is recommended. The actual current carrying capacity of this conductor need not exceed that of #14 wire. However, for mechanical reasons, a somewhat larger size will usually be desirable. A suitable length of #12 cable (19 strands of .0185 wire) with a rubber insulation .308 inch thick is supplied with most coupling capacitors for connecting to the carrier set or tuner. It is recommended that copper bonding cable be connected from the ground frame of the coupling capacitor to the cabinet of the tuner. This bonding conductor should be placed parallel with the carrier frequency lead-in cable and approximately one foot from it.

In locations where sleet is a problem and the lead-in cable cannot be protected from it readily, the use of 7/8 inch copper tube, air di-electric, high frequency, coaxial, transmission line is recommended. This line is hermetically sealed and is unaffected by rain,

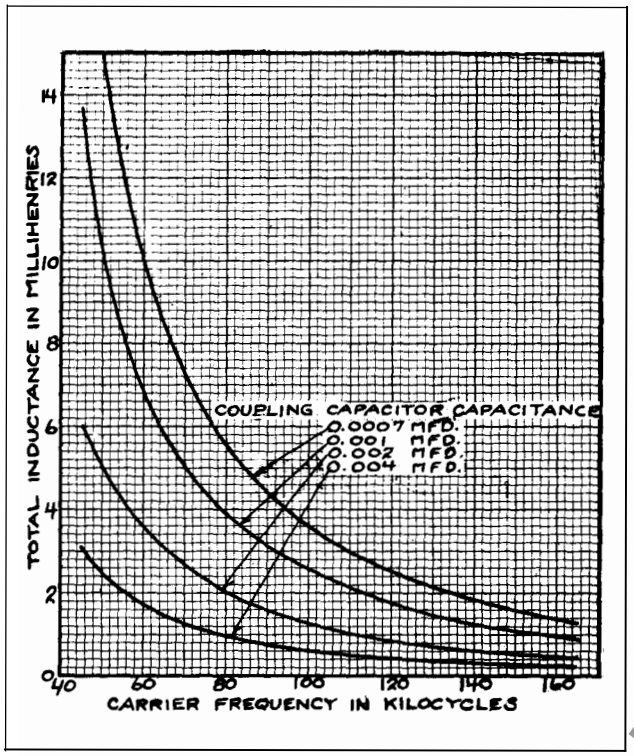

Fig. 2—Typical Frequency-Inductance Curves of the 50-150 Kc. Line Tuner.

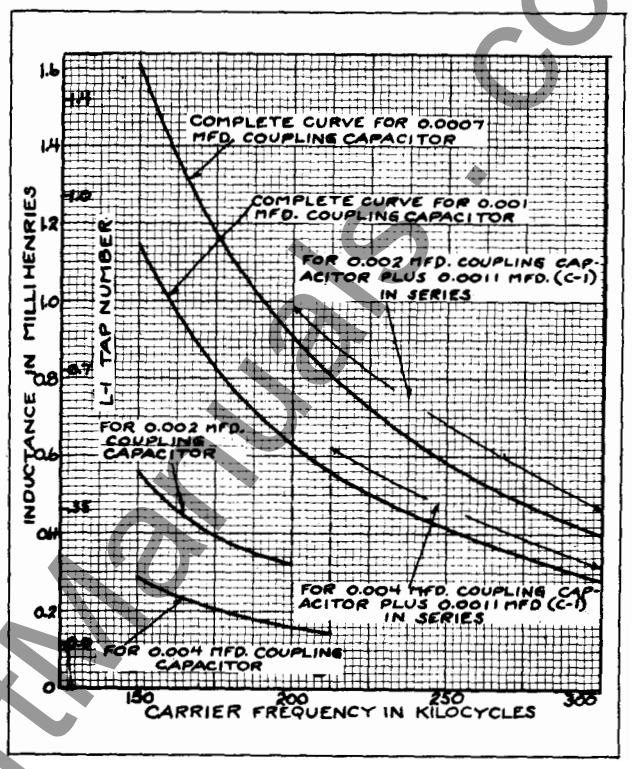

Fig. 3—Typical Frequency-Inductance Curves of the 150-300 Kc. Line Tuner.

sleet, snow, etc.

ADJUSTMENTS

The first consideration in adjusting this equipment will be the choice of carrier frequency. As soon as the operating frequency and the capacitance of the coupling capacitor are known the approximate value of inductance in the tuner necessary for resonance may be calculated by using the formula:

$L = \frac{25}{F^2C}$ Where L is inductance in millihenries, C capacitance in microfarads, F is frequency in kilocycles per second.

Figures 2 and 3 are based upon this equation. In addition to the capacitance of the coupling capacitor, there is sometimes an appreciable amount of stray capacitance due to the lead-in cable from the capacitor to the tuner. Also, the power transmission hiline may be slightly reactive. Appreciable variation from the values shown by the curves may be expected in any actual installation. Tap numbers on inductance L-1 correspond approximately to millihenries.

Variometer L-2 has sufficient inductance to cover the range between taps on the tapped inductance L-1. The sum of the two inductances L-1 and L-2 should be the value indicated by the curve. Whenever using tap 8 or lower, connect the shorting link provided between the used tap and tap 15. When using a tap higher than 8, connect both ends of the shorting link to terminal 15.

For 150-300 KC operation, refer to figure 5. Fixed capacitor C-1 should be unshorted for the two following conditions:

1. If the frequency is above 200 KC when using a 0.002 mfd coupling capacitor.

2. If the frequency is above 210 KC when using a 0.004 mfd coupling capacitor.

In order to get maximum coupling efficiency, it is important that the proper taps on transformer T-1 be used. The average power transmission hiline has a characteristic impedance

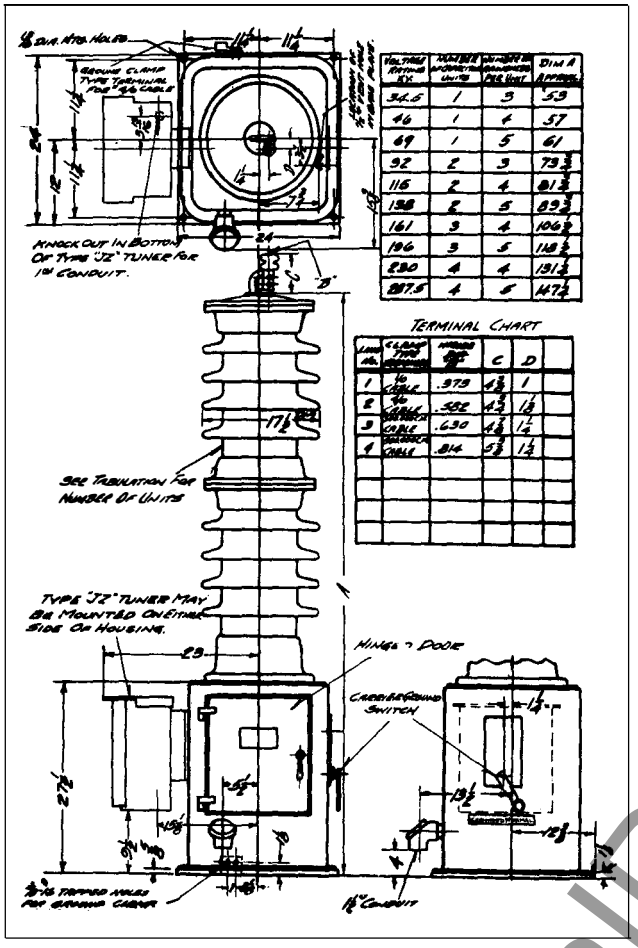

Fig. 4—Installation of the S#867484 Type JZ Tuner on the large base of Westinghouse Coupling Capacitor.

of 500 to 600 ohms for phase-to-ground carrier relaying operation where line traps are used and carrier is fed into only a single-line. With communication or telemetering channels, if line traps are not used, the input impedance may be much lower because of the presence of other lines connected to the bus at the station. The usual coaxial cable impedance is 50 to 70 ohms. Since the hiline impedance at carrier frequency is somewhat difficult to measure, it is usually desirable to assume the average values. Use coaxial cable tap 4 and line tap 10 for the preliminary tuning.

Refer to the schematic diagram Figure 1 and make the proper spark gap connections. The single, or parallel connection is generally used with low power transmitters, up to 15 watts. The series connection is used with transmitters with a peak power capability of 100 watts. For example, a 25 watt transmitter which is 100% modulated provides a peak power of 100 watts. Since the voltage developed is also dependent on the power line impedance, the series connection must sometimes be used with the low-power transmitter, if the power line impedance is high enough to cause a breakdown of the gaps when carrier is transmitted.

After all of the connections are properly made, close the circuit to the tuner by closing the disconnect switch. Turn on the transmitter (un-modulated) at the selected frequency, and rotate the tuner variometer dial. Adjust for the maximum current to the coupling capacitor. A test link J-1 is provided to facilitate the insertion of an ammeter in this circuit to check the current.

If the current is still increasing at zero on the dial, use a higher numbered tap on the inductance. If the maximum current is obtained at 100 on the dial, use a lower numbered tap. The maximum current point must occur on the marked portion, preferably not closer than 5 or 10 divisions from either end of the dial. As the tuning will usually be quite broad, the maximum current point may be difficult to determine. Take dial readings at equal current on either side of the peak current and average the dial readings to obtain the final setting. If the adjacent tap indicates resonance at the high end of the dial, it is preferable to use the former tap.

Do not fail to open the safety disconnect switch S-1 before changing any tap on inductance L-1 or transformer T-1. Although the safety gap SG-1 is set sufficiently close to protect the equipment from surges, it is possible for the operator to receive a severe shock unless the disconnect switch is open.

It will usually be satisfactory to use the tap on transformer T-1 which results in the highest current to the coupling capacitor at resonance. However, if two taps give approximately the same output, the higher numbered tap should be used. For each transformer tap change, recheck the variometer tuning. The

transformer is designed for impedances approximately as follows:

Tap	50-150KC Turns	150-300KC Turns	Impedance (Ohms)
2	28	14	26
3	34	17	38
4	42	21	58
5	50	25	82
6	60	30	118
7	75	37.5	185
8	90.5	45.5	272
9	100.5	55.5	405
10	134.5	67.5	597
11	164.5	82.5	894
12	200.5	100.5	1300

The above tabulation is based on the transformer characteristic formula:

$$\frac{Z\ (Pri)}{Z\ (Sec)} = \frac{N^2\ (Pri)}{N^2\ (Sec)}$$

In the above formula: Z is impedance in ohms

N is number of turns

Since the transformer has only one winding, the section between the transmitter, or cable connection and ground is designated as the primary, and the section between the output tap (connecting to jack J-1) and ground is the secondary.

The line coupling tuner is properly adjusted when the transformer primary and secondary taps are set for maximum current with the tuning at resonance. Lock the tuning dial in position, remove the r-f ammeter, and replace the link.

OPERATION

The type JZ line coupling tuner requires no attention on the part of the operator except maintenance as explained in the following section. However, if it is desired to discontinue the operation of this equipment for long periods of time, disconnect switch S-1 may be opened.

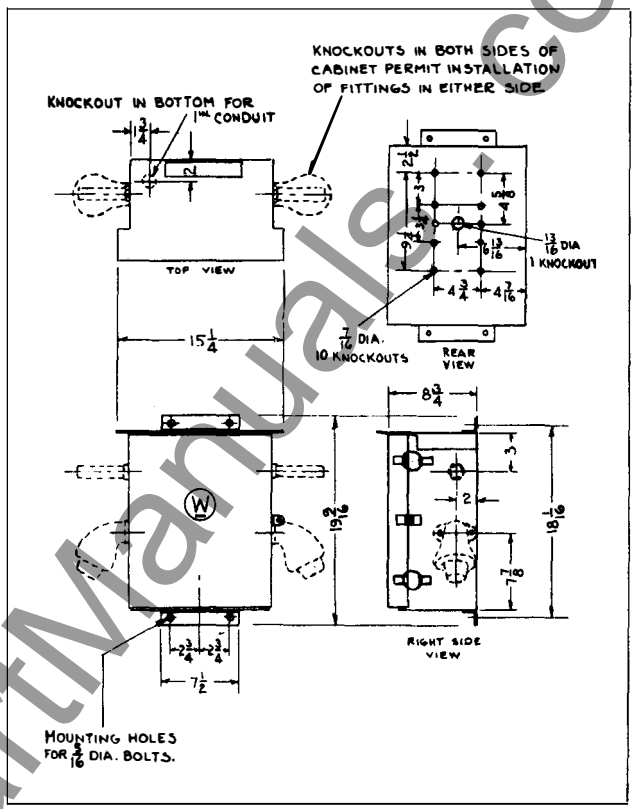

Fig. 5—Outline of the Type JZ Tuner.

MAINTENANCE

The Type JZ line coupling tuner requires almost no maintenance. However, it is advisable to inspect it occasionally to see that no excessive corrosion has taken place due to fumes or condensation of atmospheric moisture. Although the cabinet is weatherproof, it is usually necessary to clean out the dust and other dirt at least once a year.

Whenever these inspections are made, the dial setting and taps should be checked to see that they have not been disturbed since the installation or previous inspection was made. For this purpose, it is recommended that a tabular record form be prepared. The date of each inspection as well as the settings observed should be recorded on this form. If correspondence with the manufacturer relative to performance is necessary, a copy of this record should be submitted with the inquiry.

PARTS LIST

Shipping Lists for Type JZ Line Coupling

Tuners.

Style #867484A for mounting on the coupling capacitor case is also identified by the manufacturer as type JZ-3 DL-7502307, Group 3, and includes:

1 Line Coupling Tuner, DL-7502307, G1 and
1 Accessories Package, DL-7502307, G2, which includes:

1 Spacer, Dwg. 7607208-G2
1 Strap, Dwg. 7607208, Pt-10
2 Gaskets, Dwg. 7407831, Pt-1
8 Bolts 3/8-16 x 3-3/4, Hex. Head C Alloy #4901-1
1 Insulator Bushing, Am. Lava Co. #1175
1 Connector Stud, 10-32 x 2-5/8 with 5 nuts and 7 washers
1 Connector Cable, 12 inches Packard #334 with terminals
1 Nameplate, #30871

Style #867485A for open wire connection to coupling capacitor is also identified by the manufacturer as type JZ-5, DL-7502307, Group 5, includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-4 which includes:
1 Insulator Bushing, S#1014436
1 Gasket, S#651569
1 Flange, S#776613
2 Set Screws, S#804514
1 Pressure Ring, S#776603
1 Can Cement, 2 lbs., #693
1 Ground Terminal Lug, Burndy #QA4C-F
1 Nameplate, #30871

Style #867486A for coaxial line connection to coupling capacitor is also identified by manufacturer as type JZ-7, DL-7502307, Group 7, and includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-6 which includes:
1 End Seal, Isolantite #352B
1 Ground Connector, Dwg. 7607208, Pt-11
1 Line Connector, 12 inches, Packard #344 with terminals
1 Gasket, Dwg. 7407831, Pt-2
1 Nameplate #30871
1 Pipe Plug, Mueller Brass Co., Cat. No. A-249-1/4".

TYPE JZ LINE COUPLING TUNER ADJUSTMENT DATA

The data shown in this table are correct for the conditions of frequency, coupling capacitor, and characteristic impedance indicated. At installation, the actual conditions and adjustment settings should be recorded.

Condition or Adjustment	Units	Max.	Norm.	Min.	Actual
Carrier Frequency	Kilocycles	101	100	99	_____
Line Coupling Capacitance	Microfarads	.001	.001	.0009	_____
Equivalent Hiline Resistance	Ohms	550	500	450	_____
Coaxial Cable Impedance	Ohms	55	52	50	_____
Inductance Indicated By Tap L-1	Millihenries	2	1	1	_____
Tuning Variometer L-2	Dial	100	50	0	_____
Hiline Tap on Transformer T-1	Tap	10	10	9	_____
Cable Tap on Transformer T-1	Tap	4	4	4	_____

COMPONENT PARTS OF TYPE JZ LINE COUPLING TUNER

Diagram Symbol 50-150 KC	Diagram Symbol 150 300 KC	Required	Name	Rating
L-1		1	Tapped Inductance	15.5 Mh.
	L-1	1	"	1.75 "
L-2		1	Variometer	.7-1.7 "
	L-2	1	"	.053-.575 Mh.
T-1		1	Transformer	50-150 KC 100 Watts Peak
	T-1	1	"	150-300 KC 100 Watts Peak
SG-1	SG-1	1	Type RVS Arrester	10,000 Amp.
			Protective Gap	Surge
J-1	J-1	1	Line Current Jack	2 Binding Post
S-1	S-1	1	Disconnect Switch	30A. 240V D.C.

WESTINGHOUSE ELECTRIC CORPORATION

METER DIVISION **NEWARK, N.J.**

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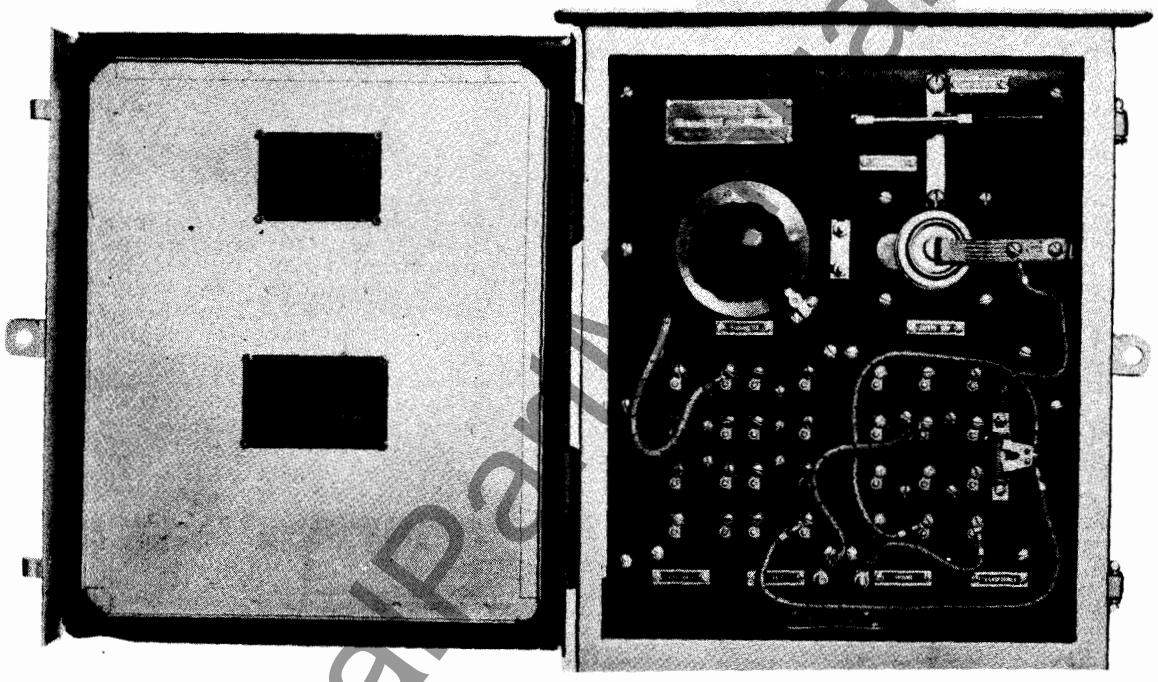
Westinghouse

TYPE JZ LINE COUPLING TUNER

50 - 150 KILOCYCLES
0.2 - 15 MILLIHENRIES

INSTRUCTIONS

Issued Feb D 1947



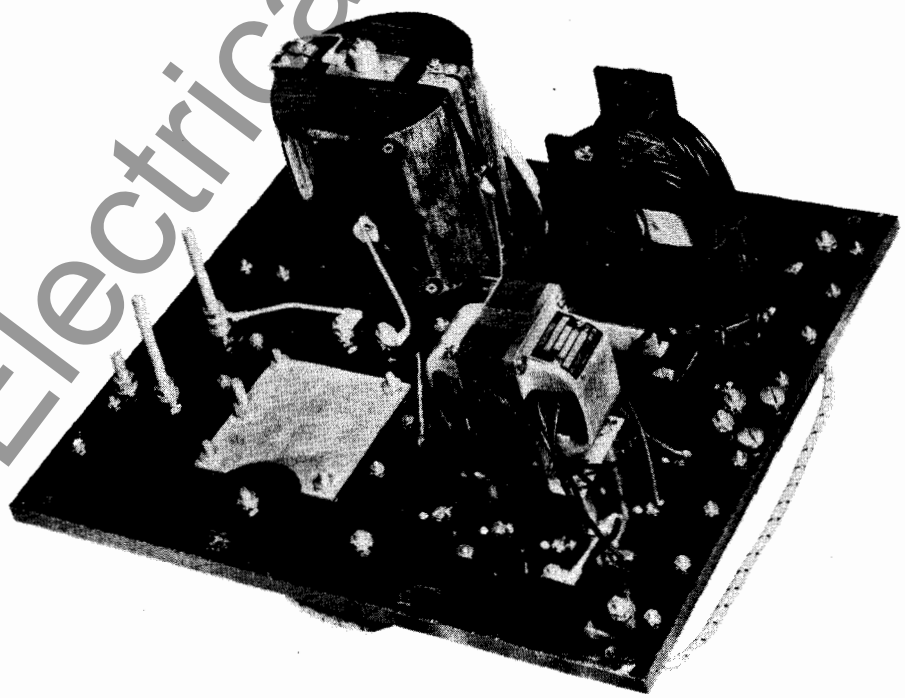


Figure 1 and 2
Front View and Rear View of the Panel of the Type JZ Tuner

Westinghouse Electric & Manufacturing Company
Meter Division, Newark, N. J.

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SAFETY WARNING!

ALWAYS OPEN SAFETY DISCONNECT SWITCH S-1 BEFORE TOUCHING ANY TAP ON INDUCTANCE COIL L-1 OR TRANSFORMER T-1. ALWAYS CLOSE THE SAFETY GROUND SWITCH ON THE COUPLING CAPACITOR BEFORE SAFETY GAP SG-1 OR REMOVING THE TUNER ASSEMBLY FROM THE CABINET.

APPLICATION

The type JZ line coupling tuner was designed primarily for use with power line carrier relaying equipment. When used in conjunction with either a type GO or type JY transmitter-receiver, the type JZ tuner is suitable for coupling through a coupling capacitor having any capacitance between .0007 mfd. and .002 mfd. To any hiline having a characteristic impedance measured at a carrier frequency between 50 and 150 kc. of between 25 and 1000 ohms. While it is intended that coaxial cable having a characteristic impedance of 50 to 55 ohms should be used for the connection between the transmitter-receiver and the tuner any low loss (at carrier frequencies) circuit may be substituted provided that the characteristic impedance is between 25 and 1000 ohms.

CONSTRUCTION

The type JZ line coupling tuner is identified as Style #867484 for mounting on the coupling capacitor base. Style #867485 for open wire connection to the coupling capacitor. Style #867486 for coaxial line connection to the coupling capacitor. The general appearance and construction of this tuner is shown in figures 1 and 2. All of the electrical components are mounted on a single vertical panel contained in a weatherproof cabinet for outdoor mounting. The outline and mounting dimensions are shown in figure 6. The electrical circuits are as indicated schematically in figure 3. The function of transformer T-1 is to couple the unequal characteristic impedances of the power transmission hiline and the coaxial cable with high power transfer efficiency. The function of inductances L-1 and L-2 is to cancel the reactance of the coupling capacitor. By making the total reactance of these inductances equal to the reactance of the line coupling capacitor, series resonance is obtained. The result is that in effect, transformer T-1 is connected directly to the hiline at carrier frequency.

INSTALLATION

The type JZ line coupling tuner as supplied includes an accessory package in addition to the main cabinet. The items received should be carefully checked against the parts list included in this book and also against the order or requisition for the equipment. Any shortage should be reported immediately to the transportation company and to the nearest district office of the manufacturer. The equipment should be very carefully checked for damaged or missing parts and particular attention should be given to any parts which have become loose in shipment or wires which have broken due to vibration.

The tuner should be mounted as near to the line coupling capacitor as possible. The base of the type PCA capacitor potential device, or the type PC carrier current coupling device with the large base are arranged so that S#867484 tuner can be fastened to it as shown in figure 5. To install the tuner, remove the panel on which all of the electrical components are mounted from the cabinet. Remove the plate on the coupling capacitor base opposite the grounding switch. A spacer, reinforcing strip, two gaskets, and four bolts are provided. Place the reinforcing strip inside the tuner box to aid in making the top gasket tight. Place the four bolts in the corner holes. This will locate the spacer. Use the insulator bushing and stud supplied with this style where the connection lead passes through the back of the tuner cabinet. Assemble the two parts of this thimble and plug bushing through the knockout hole in the cabinet. Connect the lead which is supplied from the stud through this thimble bushing to the terminal on the panel marked line coupling. Replace the panel in the cabinet. In these cases the connection lead from the tuner to the capacitor can be completely enclosed.

Where this is not possible, the lead-in wire from the capacitor may be run through the porcelain bushing which is supplied, for open wire connection to the coupling capacitor. This lead-in should be connected to the terminal stud marked line coupling. The insulation of this lead-in cable with respect to ground must be much better than is ordinarily employed for the voltage which exists between these points, as it effectively shunts the reactive elements of the resonant circuit at carrier frequency. The impedance of this resonant circuit is several thousand ohms and leakage resulting from rain, snow, sleet, too long a lead-in wire, or too many supporting insulators will reduce the power output of the transmitter equipment and the sensitivity of the receiver equipment. This lead should not be enclosed in conduit, since the capacitance of the lead to ground should be as small as possible. A cable insulated with a high grade rubber and suitable for at least 7500 volts service is recommended. The actual current carrying capacity of this conductor need not exceed that of #14 wire. However, for mechanical reasons, a somewhat larger size will usually be desirable. A suitable length of #12 cable (19 strands of .0185 wire) with a rubber insulation .308 inch thick is supplied with most coupling capacitors for connecting to the carrier set or tuner. It is recommended that a copper bonding cable be connected from the ground frame of the coupling capacitor to the cabinet of the tuner. This bonding conductor should be placed parallel with the carrier frequency lead-in cable and approximately one foot from it.

In locations where sleet is a problem and the lead-in cable cannot be protected from it readily, the use of 7/8 inch copper tube, air dieleotric, high frequency, coaxial, transmission line is recommended. This line is hermetically sealed and is unaffected by rain, sleet, snow, etc.

ADJUSTMENT

The first consideration in adjusting this equipment will be the choice of carrier frequency. As soon as the operating frequency and the capacitance of the coupling capacitor are known the approximate value of inductance in the tuner necessary for resonance may be calculated by using the formula.

$$L = \frac{1}{4\pi^2 F^2 C}$$

Where L is inductance in henries C capacitance in farads F is frequency in cycles per second.

Figure 4 is based upon this equation. In addition to the capacitance of the coupling capacitor, there is sometimes an appreciable amount of stray capacitance due to the lead-in cable from the capacitor to the tuner. Also, the power transmission hiline may be slightly reactive. Appreciable variation from the values shown by the curve may be expected in any actual installation. Taps 0 to 15 on inductance L-1 correspond approximately to millihenries.

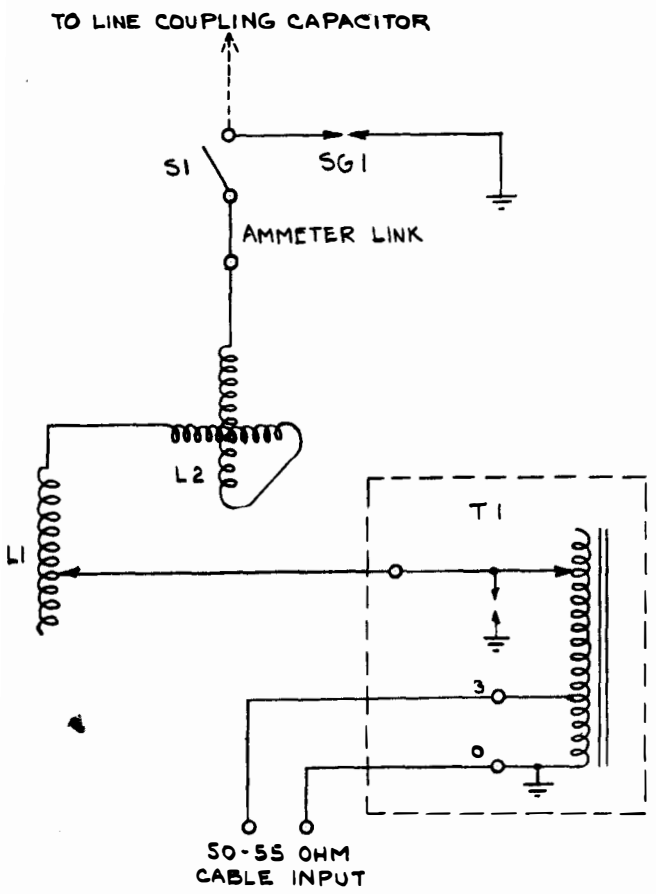


Figure 3
Schematic Connections of the Type JZ Tuner.

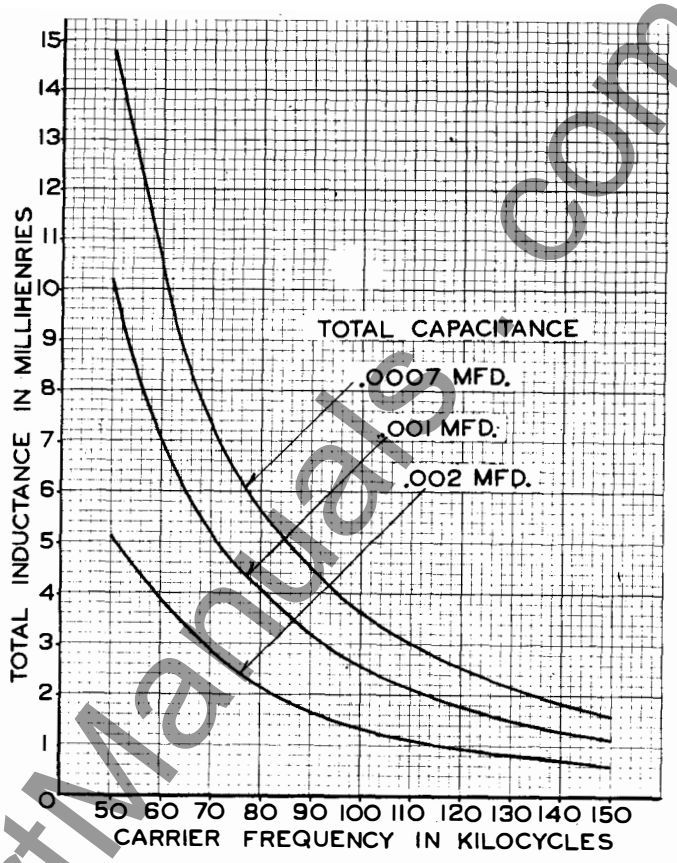


Figure 4
Line Tuning Calibration Curve Showing Approximate Inductance of Coils L-1 & L-2 to Establish Series Resonance in Circuit L-1 & L-2, Coupling Capacitor and Transmission Line.

Variometer L-2 has an inductance range of approximately 0.17 to 1.7 millihenries. The sum of the two inductances L-1 and L-2 should be the value indicated by the curve.

In order to get maximum coupling efficiency, it is important that the proper taps on transformer T-1 be used. The average power transmission hiline has a characteristic impedance of 500 ohms. With a 50 to 55 ohm coaxial cable connected between terminals 0 and 3, inductance L-1 should be connected to terminal 9 for a 500 ohm hiline. Since the hiline impedance at carrier frequency is somewhat difficult to measure, it is usually desirable to assume the average value and operate on tap 9 during the preliminary tuning.

The proper adjustments for L-1 and L-2 are determined by adjusting them for maximum current to the line coupling capacitor. A test link is provided to facilitate the insertion of an ammeter in this circuit to check the current. If resonance is indicated with the variometer L-2 at a dial setting near 100, it is advisable to try one less millihenry in coil L-1. Conversely, if resonance occurs at zero on the variometer dial, more inductance should be included by increasing the tap on inductance coil L-1.

Do not fail to open the safety disconnect switch S-1 before changing any tap on inductance L-1 or transformer T-1. Although the safety gap SG-1 is set sufficiently close to protect the equipment from surges, it is possible for the operator to receive a severe shock unless the disconnect switch is open.

It will usually be satisfactory to use the tap on transformer T-1 which results in the highest current to the coupling capacitor at resonance. However, if two taps give approximately the same output, the higher numbered tap should be used. The transformer is designed for impedances approximately as follows, Tap 1-23.3 ohms, 2-34.3, 3-52.5, 4-74.2, 5-107, 6-165, 7-243, 8-363, 9-535, 10-807, 11-1200.

OPERATION

The Type JZ line coupling tuner requires no attention on the part of the operator except maintenance as explained in a separate section of this book. However, if it is desired to discontinue the operation of this equipment for long periods of time, disconnect switch S-1 may be opened.

MAINTENANCE

The Type JZ line coupling tuner requires almost no maintenance. However, it is advisable to inspect it occasionally to see that no excessive corrosion has taken place due to fumes or condensation of atmospheric moisture. Although the cabinet is weatherproof, it is usually necessary to clean out the dust and other dirt at least once a year. In some cases, a monthly inspection and cleaning is required.

Whenever these inspections are made, the dial setting and taps should be checked to see that they have not been disturbed since the installation or previous inspection was made. For this purpose, it is recommended that a tabular record form be prepared similar to that shown in the adjustment section of this book except that several columns for actual readings should be provided. The date of each inspection as well as the settings observed should be recorded on this form. If correspondence with the manufacturer relative to performance is necessary, a copy of this record should be submitted with the inquiry.

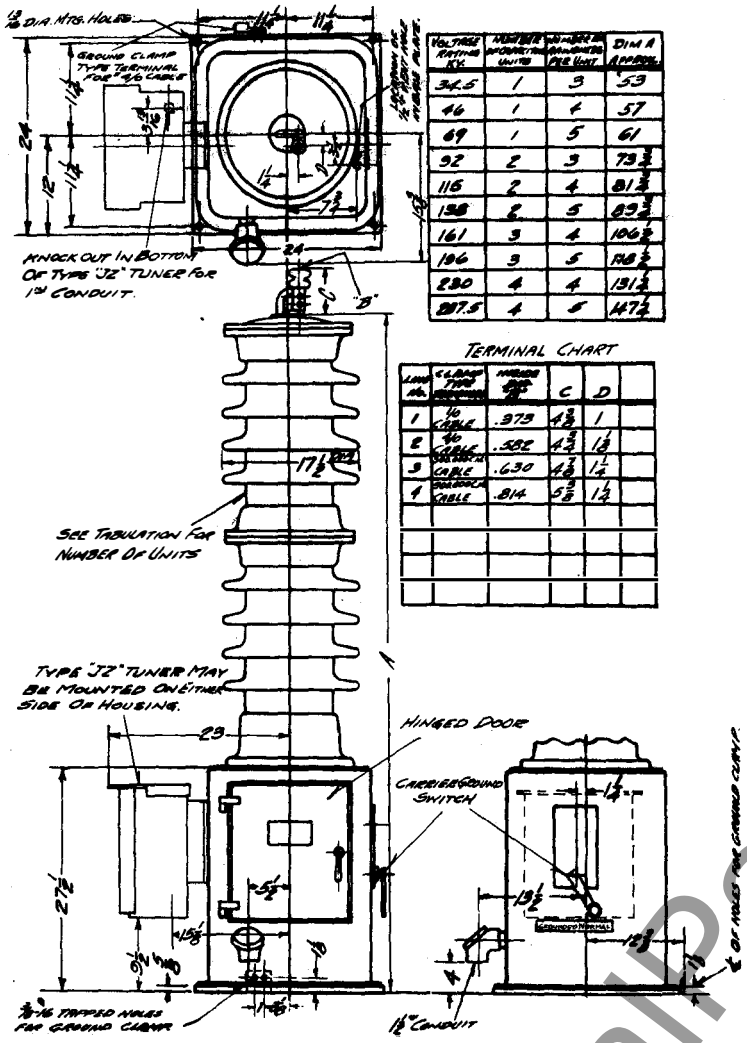


Figure 5
Installation of the S#867484 Type, JZ Tuner on the large base of Westinghouse Coupling Capacitor.

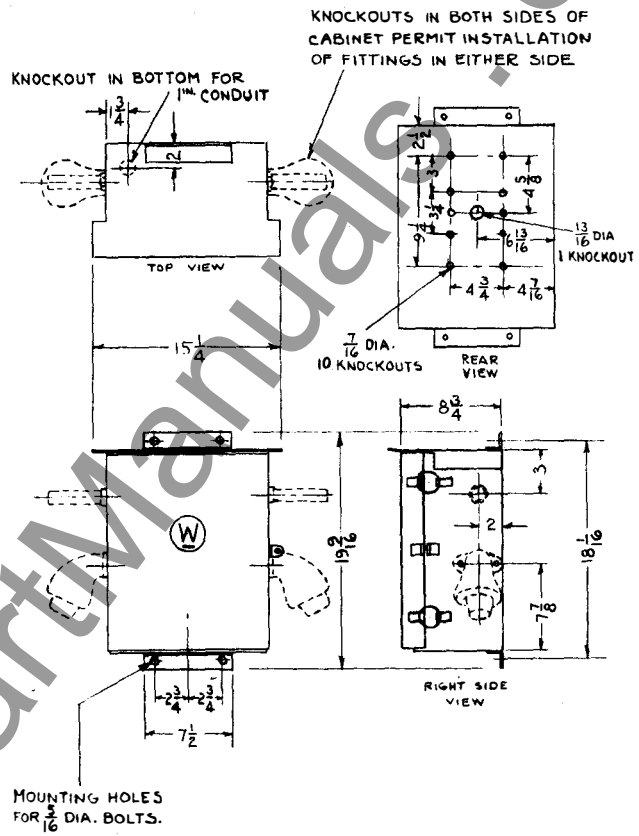


Figure 6
Outline of the Type JZ Tuner

PARTS LISTS

Shipping Lists for Type JZ Line Coupling Tuners

Style #867484 for mounting on the coupling capacitor case is also identified by the manufacturer as type JZ-3 DL-7502307, Group 3, and includes:

1 Line coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-2, which includes:
- 1 Spacer, Dwg. 7607208, Pt-12
- 1 Strap, Dwg. 7607208, Pt-10
- 2 Gaskets, Dwg. 7407831, Pt-1
- 4 Bolts 3/8-6 x 3-3/4, Hex. Head C Alloy #4901-1
- 1 Insulator Bushing, Am. Lava Co.#1175
- 1 Connector Stud, 10-32 x 2-5/8 with 5 nuts and 7 washers
- 1 Connector Cable, 12 inches Packard #344 with terminals
- 1 Nameplate, #30871

Style #867485 for open wire connection to coupling capacitor is also identified by the manufacturer as type JZ-5, DL-7502307, Group 5, and includes

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-4 which includes:
- 1 Insulator Bushing, S#1014436
- L Gasket, S#651569
- 1 Flange, S#776613
- 2 Set Screws, S#804514
- 1 Pressure Ring, S#776603
- 1 Can Cement, 2 lbs. #693
- 1 Ground Terminal Lug, Burndy #QA4C-F
- 1 Nameplate, #30871

Style #867486 for coaxial line connection to coupling capacitor is also identified by the manufacturer as type JZ-7, DL-7502307, Group 7, and includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-6, which includes:
- 1 End Seal, Isolantite #352B
- 1 Ground Connector, Dwg. 7607208, Pt-11
- 1 Line Connector, 12 inches, Packard #344 with terminals
- 1 Gasket, Dwg. 7407831, Pt-2
- 1 Nameplate, #30871

TYPE JZ LINE COUPLING TUNER ADJUSTMENT DATA

The data shown in this table are correct for the conditions of frequency, coupling capacitor, and characteristic impedance indicated. At installation, the actual conditions and adjustment settings should be recorded.

Condition or Adjustment	Units	Max.	Norm.	Min.	Actual
Carrier Frequency	Kilocycles	101	100	99	_____
Line Coupling Capacitance	Microfarads	.0011	.001	.0009	_____
Equivalent Hiline Resistance	Ohms	550	500	450	_____
Coaxial Cable Impedance	Ohms	55	52	50	_____
Inductance Indicated By Tap L-1	Millihenries	2	1	1	_____
Tuning Variometer L-2	Dial	100	50	0	_____
Hiline Tap on Transformer T-1	Tap	10	9	8	_____
Cable Tap On Transformer T-1	Tap	3	3	3	_____

COMPONENT PARTS OF TYPE JZ LINE COUPLING TUNER

Symbol	Name	Rating	Designation	Supplier
L-1	Inductance	15MH	Dwg. 7707816, G-1	W
L-2	Variometer	.17-1.7MH	Dwg. 7705336, G-1	W
S-1	Disconnect Switch	30A250V	S#554195	W
SG-1	Protector Gap Discs.		S#949357, Mica S#948956	W
T-1	Transformer	50-150 Kc. Auto	L Spec. 382506	W

The Westinghouse Electric and Manufacturing Company is prepared to supply any of the listed parts for use in servicing this equipment. Orders should specify that they are for Type JZ Line Coupling Tuner and mention the circuit symbol. All orders must specify the rating and supplier's designation.

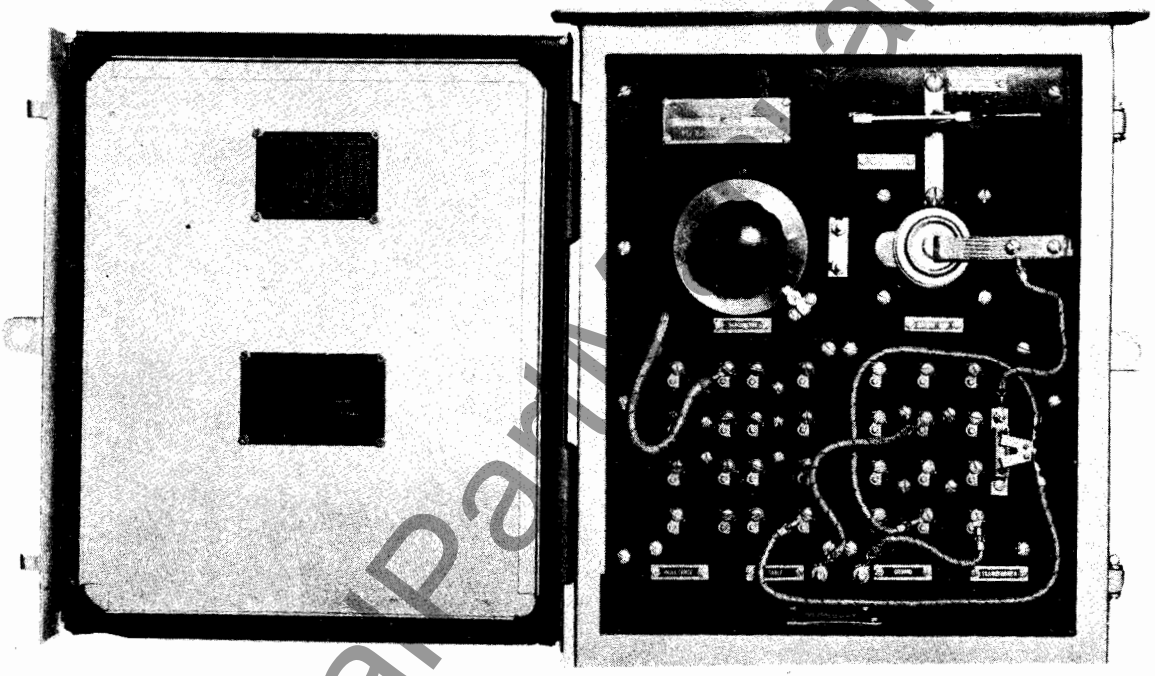
Superseded Sub E 2/49

Westinghouse

TYPE JZ LINE COUPLING TUNER

50 - 150 KILOCYCLES
0.2 - 15 MILLIHENRIES

INSTRUCTIONS



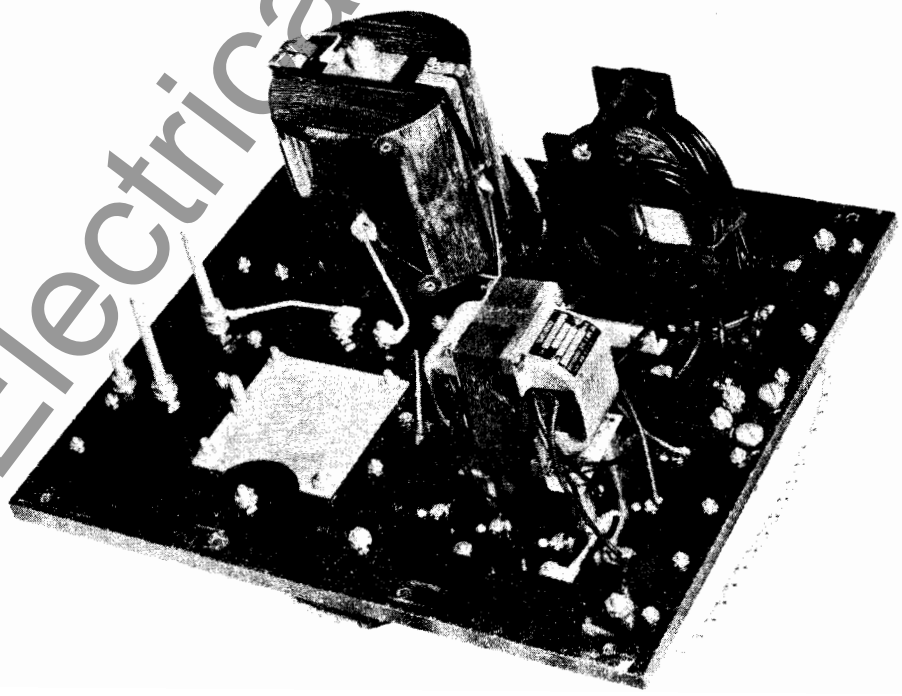


Figure 1 and 2
Front View and Rear View of the Panel of the Type JZ Tuner

Westinghouse Electric & Manufacturing Company
Meter Division, Newark, N. J.

PRINTED IN U.S.A.

5-42

SAFETY WARNING!

ALWAYS OPEN SAFETY DISCONNECT SWITCH S-1 BEFORE TOUCHING ANY TAP ON INDUCTANCE COIL L-1 OR TRANSFORMER T-1. ALWAYS CLOSE THE SAFETY GROUND SWITCH ON THE COUPLING CAPACITOR BEFORE SAFETY GAP SG-1 OR REMOVING THE TUNER ASSEMBLY FROM THE CABINET.

APPLICATION

The type JZ line coupling tuner was designed primarily for use with power line carrier relaying equipment. When used in conjunction with either a type GO or type JY transmitter-receiver, the type JZ tuner is suitable for coupling through a coupling capacitor having any capacitance between .0007 mfd. and .002 mfd. to any hiline having a characteristic impedance measured at a carrier frequency between 50 and 150 kc. of between 25 and 1000 ohms. While it is intended that coaxial cable having a characteristic impedance of 50 to 55 ohms should be used for the connection between the transmitter-receiver and the tuner, any low loss (at carrier frequencies) circuit may be substituted provided that the characteristic impedance is between 25 and 1000 ohms.

CONSTRUCTION

The type JZ line coupling tuner is identified as Style #867484 for mounting on the coupling capacitor base; Style #867485 for open wire connection to the coupling capacitor; Style #867486 for coaxial line connection to the coupling capacitor. The general appearance and construction of this tuner is shown in figures 1 and 2. All of the electrical components are mounted on a single vertical panel contained in a weatherproof cabinet for outdoor mounting. The outline and mounting dimensions are shown in figure 6. The electrical circuits are as indicated schematically in figure 3. The function of transformer T-1 is to couple the unequal characteristic impedances of the power transmission hiline and the coaxial cable with high power transfer efficiency. The function of inductances L-1 and L-2 is to cancel the reactance of the coupling capacitor. By making the total reactance of these inductances equal to the reactance of the line coupling capacitor, series resonance is obtained. The result is that in effect, transformer T-1 is connected directly to the hiline at carrier frequency.

INSTALLATION

The type JZ line coupling tuner as supplied includes an accessory package in addition to the main cabinet. The items received should be carefully checked against the parts list included in this book and also against the order or requisition for the equipment. Any shortage should be reported immediately to the transportation company and to the nearest district office of the manufacturer. The equipment should be very carefully checked for damaged or missing parts and particular attention should be given to any parts which have become loose in shipment or wires which have broken due to vibration.

The tuner should be mounted as near to the line coupling capacitor as possible. The base of the type PCA capacitor potential device, or the type PC carrier current coupling device with the large base are arranged so that S#867484 tuner can be fastened to it as shown in figure 5. To install the tuner, remove the panel on which all of the electrical components are mounted from the cabinet. Remove the plate on the coupling capacitor base opposite the grounding switch. A spacer, reinforcing strip, two gaskets, and four bolts are provided. Place the reinforcing strip inside the tuner box to aid in making the top gasket tight. Place the four bolts in the corner holes. This will locate the spacer. Use the insulator bushing and stud supplied with this style where the connection lead passes through the back of the tuner cabinet. Assemble the two parts of this thimble and plug bushing through the knockout hole in the cabinet. Connect the lead which is supplied from the stud through this thimble bushing to the terminal on the panel marked line coupling. Replace the panel in the cabinet. In these cases the connection lead from the tuner to the capacitor can be completely enclosed.

Where this is not possible, the lead-in wire from the capacitor may be run through the porcelain bushing which is supplied, for open wire connection to the coupling capacitor. This lead-in should be connected to the terminal stud marked line coupling. The insulation of this lead-in cable with respect to ground must be much better than is ordinarily employed for the voltage which exists between these points, as it effectively shunts the reactive elements of the resonant circuit at carrier frequency. The impedance of this resonant circuit is several thousand ohms and leakage resulting from rain snow, sleet, too long a lead-in wire, or too many supporting insulators will reduce the power output of the transmitter equipment and the sensitivity of the receiver equipment. This lead should not be enclosed in conduit, since the capacitance of the lead to ground should be as small as possible. A cable insulated with a high grade rubber and suitable for at least 7500 volts service is recommended. The actual current carrying capacity of this conductor need not exceed that of #14 wire. However, for mechanical reasons, a somewhat larger size will usually be desirable. A suitable length of #12 cable (19 strands of .0185 wire) with a rubber insulation .308 inch thick is supplied with most coupling capacitors for connecting to the carrier set or tuner. It is recommended that a copper bonding cable be connected from the ground frame of the coupling capacitor to the cabinet of the tuner. This bonding conductor should be placed parallel with the carrier frequency lead-in cable and approximately one foot from it.

In locations where sleet is a problem and the lead-in cable cannot be protected from it readily, the use of 7/8 inch copper tube, air dielectric, high frequency, coaxial, transmission line is recommended. This line is hermetically sealed and is unaffected by rain, sleet, snow, etc.

ADJUSTMENT

The first consideration in adjusting this equipment will be the choice of carrier frequency. As soon as the operating frequency and the capacitance of the coupling capacitor are known the approximate value of inductance in the tuner necessary for resonance may be calculated by using the formula

$$L = \frac{1}{4\pi^2 F^2 C}$$

where L is inductance in henries, C capacitance in farads, F is frequency in cycles per second.

Figure 4 is based upon this equation. In addition to the capacitance of the coupling capacitor, there is sometimes an appreciable amount of stray capacitance due to the lead-in cable from the capacitor to the tuner. Also, the power transmission hiline may be slightly reactive. Appreciable variation from the values shown by the curve may be expected in any actual installation. Taps 0 to 15 on inductance L-1 correspond approximately to millihenries.

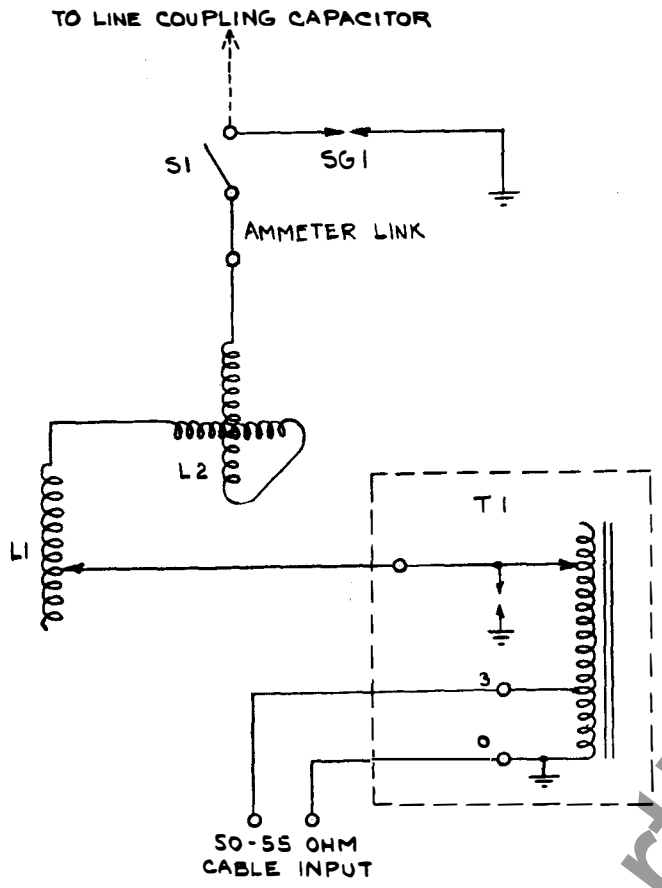


Figure 3
Schematic Connections of the Type JZ Tuner.

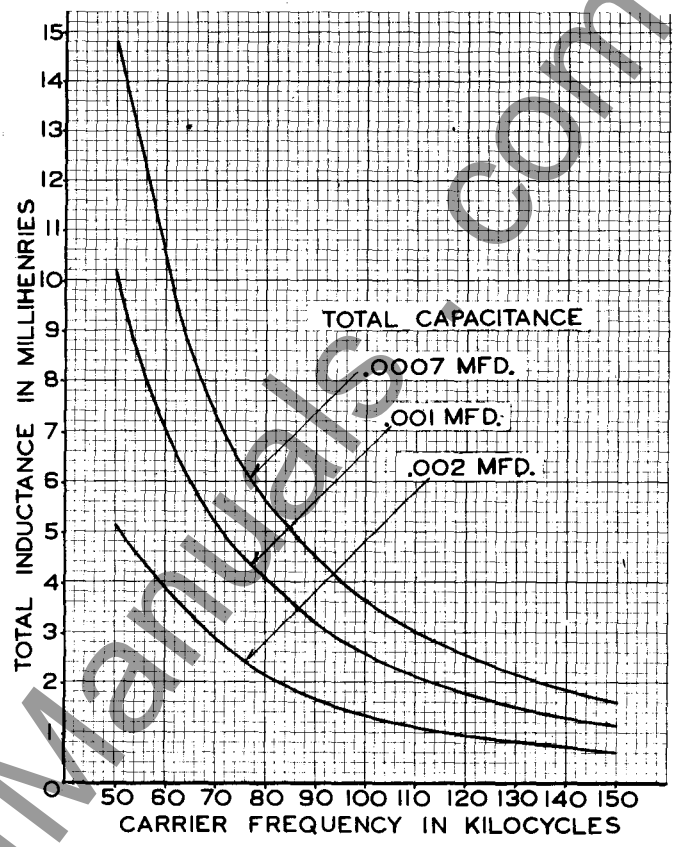


Figure 4
Line Tuning Calibration Curve Showing Approximate Inductance of Coils L-1 & L-2 to Establish Series Resonance in Circuit L-1 & L-2, Coupling Capacitor and Transmission Line.

Variometer L-2 has an inductance range of approximately 0.17 to 1.7 millihenries. The sum of the two inductances L-1 and L-2 should be the value indicated by the curve.

In order to get maximum coupling efficiency, it is important that the proper taps on transformer T-1 be used. The average power transmission hiline has a characteristic impedance of 500 ohms. With a 50 to 55 ohm coaxial cable connected between terminals 0 and 3, inductance L-1 should be connected to terminal 9 for a 500 ohm hiline. Since the hiline impedance at carrier frequency is somewhat difficult to measure, it is usually desirable to assume the average value and operate on tap 9 during the preliminary tuning.

The proper adjustments for L-1 and L-2 are determined by adjusting them for maximum current to the line coupling capacitor. A test link is provided to facilitate the insertion of an ammeter in this circuit to check the current. If resonance is indicated with the variometer L-2 at a dial setting near 100, it is advisable to try one less millihenry in coil L-1. Conversely, if resonance occurs at zero on the variometer dial, more inductance should be included by increasing the tap on inductance coil L-1.

Do not fail to open the safety disconnect switch S-1 before changing any tap on inductance L-1 or transformer T-1. Although the safety gap SG-1 is set sufficiently close to protect the equipment from surges, it is possible for the operator to receive a severe shock unless the disconnect switch is open.

It will usually be satisfactory to use the tap on transformer T-1 which results in the highest current to the coupling capacitor at resonance. However, if two taps give approximately the same output, the higher numbered tap should be used. The transformer is designed for impedances approximately as follows, Tap 1-23.3 ohms, 2-34.3, 3-52.5, 4-74.2, 5-107, 6-165, 7-243, 8-363, 9-535, 10-807, 11-1200.

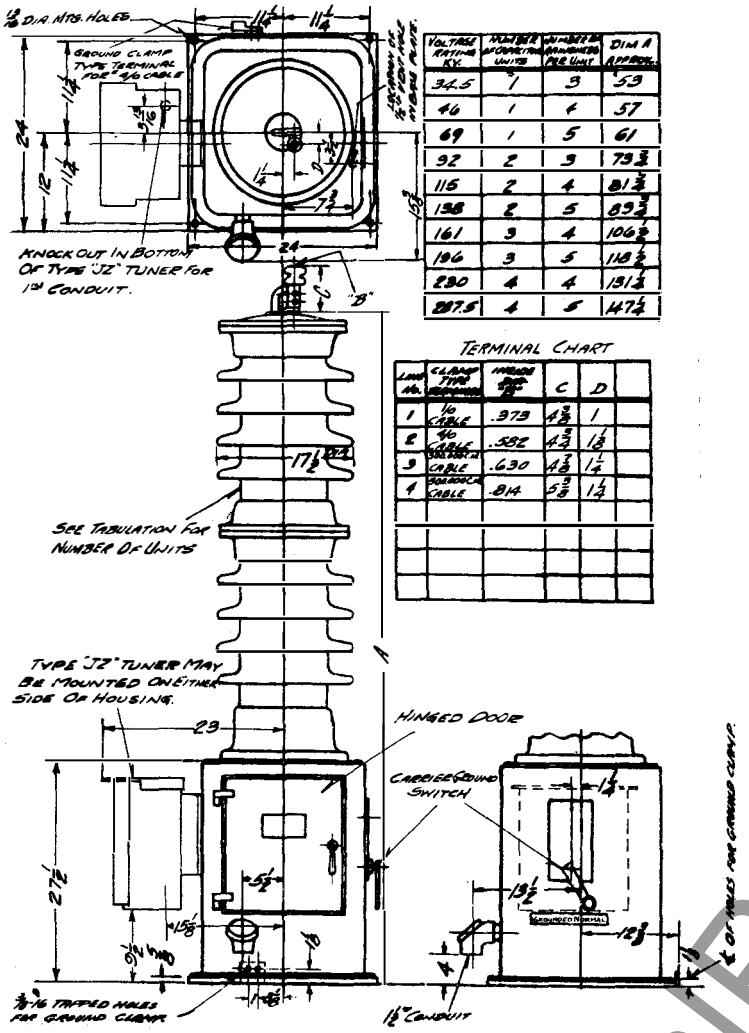
OPERATION

The Type JZ line coupling tuner requires no attention on the part of the operator except maintenance as explained in a separate section of this book. However, if it is desired to discontinue the operation of this equipment for long periods of time, disconnect switch S-1 may be opened.

MAINTENANCE

The Type JZ line coupling tuner requires almost no maintenance. However, it is advisable to inspect it occasionally to see that no excessive corrosion has taken place due to fumes or condensation of atmospheric moisture. Although the cabinet is weatherproof, it is usually necessary to clean out the dust and other dirt at least once a year. In some cases, a monthly inspection and cleaning is required.

Whenever these inspections are made, the dial setting and taps should be checked to see that they have not been disturbed since the installation or previous inspection was made. For this purpose, it is recommended that a tabular record form be prepared similar to that shown in the adjustment section of this book except that several columns for actual readings should be provided. The date of each inspection as well as the settings observed should be recorded on this form. If correspondence with the manufacturer relative to performance is necessary, a copy of this record should be submitted with the inquiry.



VOLTAGE RATING KV.	NUMBER OF UNITS	NUMBER OF MOUNTING BOLTS PER UNIT	DIM A APPROX.
34.5	1	3	53
46	1	4	57
69	1	5	61
92	2	3	79 3/8
115	2	4	81 3/8
138	2	5	89 3/8
161	3	4	106 3/8
196	3	5	118 3/8
230	4	4	131 3/8
287.5	4	5	147 1/8

LINE NO.	CLAMP TYPE TERMINAL FOR CABLE	MAXIMUM DIA. OF CABLE	C	D
1	#6 CABLE	.373	4 3/8	1
2	#4 CABLE	.582	4 3/8	1 3/8
3	CABLE	.630	4 3/8	1 1/4
4	ACSR CABLE	.814	5 3/8	1 1/4

Figure 5
Installation of the S#867484 Type, JZ Tuner on the large base of Westinghouse Coupling Capacitor.

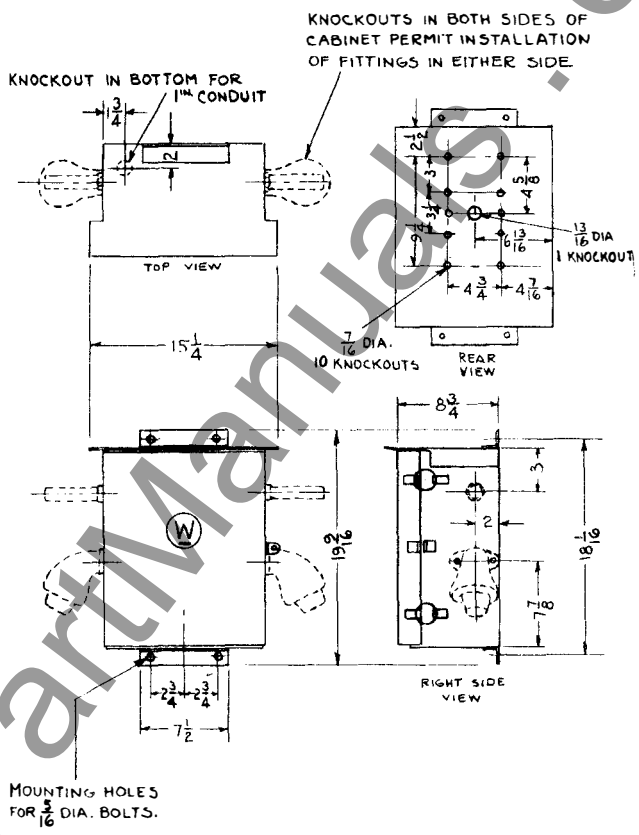


Figure 6
Outline of the Type JZ Tuner

PARTS LISTS

Shipping Lists for Type JZ Line Coupling Tuners

Style #867484 for mounting on the coupling capacitor case is also identified by the manufacturer as type JZ-3 DL-7502307, Group 3, and includes:

1 Line coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-2, which includes:
- 1 Spacer, Dwg. 7607208, Pt-12
- 1 Strap, Dwg. 7607208, Pt-10
- 2 Gaskets, Dwg. 7407831, Pt-1
- 4 Bolts 3/8-6 x 3-3/4, Hex. Head C Alloy #4901-1
- 1 Insulator Bushing, Am. Lava Co.#1175
- 1 Connector Stud, 10-32 x 2-5/8 with 5 nuts and 7 washers
- 1 Connector Cable, 12 inches Packard #344 with terminals
- 1 Nameplate, #30871

Style #867485 for open wire connection to coupling capacitor is also identified by the manufacturer as type JZ-5, DL-7502307, Group 5, and includes

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-4 which includes:
- 1 Insulator Bushing, S#1014436
- L Gasket, S#651569
- 1 Flange, S#776613
- 2 Set Screws, S#804514
- 1 Pressure Ring, S#776603
- 1 Can Cement, 2 lbs. #693
- 1 Ground Terminal Lug, Burndy #QA4C-F
- 1 Nameplate, #30871

Style #867486 for coaxial line connection to coupling capacitor is also identified by the manufacturer as type JZ-7, DL-7502307, Group 7, and includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-6, which includes:
- 1 End Seal, Isolantite #352B
- 1 Ground Connector, Dwg. 7607208, Pt-11
- 1 Line Connector, 12 inches, Packard #344 with terminals
- 1 Gasket, Dwg. 7407831, Pt-2
- 1 Nameplate, #30871

TYPE JZ LINE COUPLING TUNER ADJUSTMENT DATA

The data shown in this table are correct for the conditions of frequency, coupling capacitor, and characteristic impedance indicated. At installation, the actual conditions and adjustment settings should be recorded.

Condition or Adjustment	Units	Max.	Norm.	Min.	Actual
Carrier Frequency	Kilocycles	101	100	99	_____
Line Coupling Capacitance	Microfarads	.0011	.001	.0009	_____
Equivalent Hiline Resistance	Ohms	550	500	450	_____
Coaxial Cable Impedance	Ohms	55	52	50	_____
Inductance Indicated By Tap L-1	Millihenries	2	1	1	_____
Tuning Variometer L-2	Dial	100	50	0	_____
Hiline Tap on Transformer T-1	Tap	10	9	8	_____
Cable Tap On Transformer T-1	Tap	3	3	3	_____

COMPONENT PARTS OF TYPE JZ LINE COUPLING TUNER

Symbol	Name	Rating	Designation	Supplier
L-1	Inductance	15MH	Dwg. 7707816, G-1	W
L-2	Variometer	.17-1.7MH	Dwg. 7705336, G-1	W
S-1	Disconnect Switch	30A250V	S#554195	W
SG-1	Protector Gap Discs.		S#949357, Mica S#948956	W
T-1	Transformer	50-150 Kc. Auto	L Spec. 382506	W

The Westinghouse Electric and Manufacturing Company is prepared to supply any of the listed parts for use in servicing this equipment. Orders should specify that they are for Type JZ Line Coupling Tuner and mention the circuit symbol. All orders must specify the rating and supplier's designation.

41-646

W E S T I N G H O U S E

POWER LINE CARRIER RELAYING

TYPE JZ LINE COUPLING TUNER

STYLES 867484, 867485, & 867486

0.2 - 15 MILLIHENRIES

50 - 150 KILOCYCLES

SAFETY WARNING!

ALWAYS OPEN SAFETY DISCONNECT SWITCH S-1 BEFORE TOUCHING ANY TAP ON INDUCTANCE COIL L-1 OR TRANSFORMER T-1. ALWAYS CLOSE THE SAFETY GROUND SWITCH ON THE COUPLING CAPACITOR BEFORE TOUCHING SAFETY GAP SG-1 OR REMOVING THE TUNER ASSEMBLY FROM THE CABINET.

EQUIPMENT DESIGNED AND MANUFACTURED IN U. S. A.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

INSTRUCTION BOOK #41-646

CF-310

Superseded by Sub A. 5/42

TYPE JZ LINE COUPLING TUNER

APPLICATION

THE TYPE JZ LINE COUPLING TUNER WAS DESIGNED PRIMARILY FOR USE WITH POWER LINE CARRIER RELAYING EQUIPMENT. WHEN USED IN CONJUNCTION WITH EITHER A TYPE GO OR TYPE JY TRANSMITTER-RECEIVER, THE TYPE JZ TUNER IS SUITABLE FOR COUPLING THROUGH A COUPLING CAPACITOR HAVING ANY CAPACITANCE BETWEEN .0007 MFD. AND .002 MFD. TO ANY HILINE HAVING A CHARACTERISTIC IMPEDENCE MEASURED AT A CARRIER FREQUENCY BETWEEN 50 AND 150 KC. OF BETWEEN 25 AND 1000 OHMS. WHILE IT IS INTENDED THAT COAXIAL CABLE HAVING A CHARACTERISTIC IMPEDENCE OF 50 TO 55 OHMS SHOULD BE USED FOR THE CONNECTION BETWEEN THE TRANSMITTER-RECEIVER AND THE TUNER, ANY LOW LOSS (AT CARRIER FREQUENCIES) CIRCUIT MAY BE SUBSTITUTED PROVIDED THAT THE CHARACTERISTIC IMPEDENCE IS BETWEEN 25 AND 1000 OHMS.

CONSTRUCTION

THE TYPE JZ LINE COUPLING TUNER IS IDENTIFIED AS STYLE #867484 FOR MOUNTING ON THE COUPLING CAPACITOR BASE. STYLE #867485 FOR OPEN WIRE CONNECTION TO THE COUPLING CAPACITOR. STYLE #867486 FOR COAXIAL LINE CONNECTION TO THE COUPLING CAPACITOR. THE GENERAL APPEARANCE AND CONSTRUCTION OF THIS TUNER IS SHOWN BY THE PHOTOGRAPHS. ALL OF THE ELECTRICAL COMPONENTS ARE MOUNTED ON A SINGLE VERTICAL PANEL CONTAINED IN A WEATHERPROOF CABINET FOR OUTDOOR MOUNTING. THE OUTLINE AND MOUNTING DIMENSIONS ARE AS SHOWN BY DRAWING 7707832. THE ELECTRICAL CIRCUITS ARE AS INDICATED SCHEMATICALLY BY DRAWING 7407824. THE FUNCTION OF TRANSFORMER T-1 IS TO COUPLE THE UNEQUAL CHARACTERISTIC IMPEDENCES OF THE POWER TRANSMISSION HILINE AND THE COAXIAL CABLE WITH HIGH POWER TRANSFER EFFICIENCY. THE FUNCTION OF INDUCTANCES L-1 AND L-2 IS TO CANCEL THE REACTANCE OF THE COUPLING CAPACITOR. BY MAKING THE TOTAL REACTANCE OF THESE INDUCTANCES EQUAL TO THE REACTANCE OF THE LINE COUPLING CAPACITOR, SERIES RESONANCE IS OBTAINED. THE RESULT IS THAT IN EFFECT, TRANSFORMER T-1 IS CONNECTED DIRECTLY TO THE HILINE AT CARRIER FREQUENCY.

INSTALLATION

THE TYPE JZ LINE COUPLING TUNER AS SUPPLIED INCLUDES AN ACCESORY PACKAGE IN ADDITION TO THE MAIN CABINET. THE ITEMS RECEIVED SHOULD BE CAREFULLY CHECKED AGAINST THE PARTS LIST INCLUDED IN THIS BOOK AND ALSO AGAINST THE ORDER OR REQUISITION FOR THE EQUIPMENT. ANY SHORTAGE SHOULD BE REPORTED IMMEDIATELY TO THE TRANSPORTATION COMPANY AND TO THE NEAREST DISTRICT OFFICE OF THE MANUFACTURER. THE EQUIPMENT SHOULD BE VERY CAREFULLY CHECKED FOR DAMAGED OR MISSING PARTS AND PARTICULAR ATTENTION SHOULD BE GIVEN TO ANY PARTS WHICH HAVE BECOME LOOSE IN SHIPMENT OR WIRES WHICH HAVE BROKEN DUE TO VIBRATION.

THE TUNER SHOULD BE MOUNTED AS NEAR TO THE LINE COUPLING CAPACITOR AS POSSIBLE. IF A PEDESTAL TYPE OF CAPACITOR IS USED, IT WILL, IN SOME CASES, BE DESIRABLE TO BOLT THE TUNER DIRECTLY TO THE BASE OF THE CAPACITOR. TO INSTALL THE TUNER, REMOVE THE PANEL ON WHICH ALL OF THE ELECTRICAL COMPONENTS ARE MOUNTED FROM THE CABINET. REMOVE THE PLATE ON THE COUPLING CAPACITOR BASE OPPOSITE THE GROUNDING SWITCH. A SPACER, REINFORCING STRIP, TWO GASKETS, AND FOUR BOLTS ARE PROVIDED. PLACE THE REINFORCING STRIP INSIDE THE TUNER BOX TO AID IN MAKING THE TOP GASKET TIGHT. PLACE THE FOUR BOLTS IN THE CORNER HOLES. THIS WILL LOCATE THE SPACER. USE THE INSULATOR BUSHING AND STUD SUPPLIED WITH THIS STYLE WHERE THE CONNECTION LEAD PASSES THROUGH THE BACK OF THE TUNER CABINET. ASSEMBLE THE TWO PARTS OF THIS THIMBLE AND PLUG BUSHING THROUGH THE KNOCKOUT HOLE IN THE CABINET. CONNECT THE LEAD WHICH IS SUPPLIED FROM THE STUD THROUGH THIS THIMBLE BUSHING TO THE TERMINAL ON THE PANEL MARKED LINE COUPLING. REPLACE THE PANEL IN THE CABINET. IN THESE CASES THE CONNECTION LEAD FROM THE TUNER TO THE CAPACITOR CAN BE COMPLETELY ENCLOSED.

WHERE THIS IS NOT POSSIBLE, THE LEAD-IN WIRE FROM THE CAPACITOR MAY BE RUN THROUGH THE PORCELAIN BUSHING WHICH IS SUPPLIED, FOR OPEN WIRE CONNECTION TO THE COUPLING CAPACITOR. THIS LEAD-IN SHOULD BE CONNECTED TO THE TERMINAL STUD MARKED LINE COUPLING. THE INSULATION OF THIS LEAD-IN CABLE WITH RESPECT TO GROUND MUST BE MUCH BETTER THAN IS ORDINARILY EMPLOYED FOR THE VOLTAGE WHICH EXISTS BETWEEN THESE POINTS, AS IT EFFECTIVELY SHUNTS THE REACTIVE ELEMENTS OF THE RESONANT CIRCUIT AT CARRIER FREQUENCY. THE IMPEDENCE OF THIS RESONANT CIRCUIT IS SEVERAL THOUSAND OHMS AND LEAKAGE RESULTING FROM RAIN, SNOW, SLEET, TOO LONG A LEAD-IN

WIRE, OR TOO MANY SUPPORTING INSULATORS WILL REDUCE THE POWER OUTPUT OF THE TRANSMITTER EQUIPMENT AND THE SENSITIVITY OF THE RECEIVER EQUIPMENT. THIS LEAD SHOULD NOT BE ENCLOSED IN CONDUIT, SINCE THE CAPACITANCE OF THE LEAD TO GROUND SHOULD BE AS SMALL AS POSSIBLE. A CABLE INSULATED WITH A HIGH GRADE RUBBER AND SUITABLE FOR AT LEAST 7500 VOLTS SERVICE IS RECOMMENDED. THE ACTUAL CURRENT CARRYING CAPACITY OF THIS CONDUCTOR NEED NOT EXCEED THAT OF #14 WIRE. HOWEVER FOR MECHANICAL REASONS, A SOMEWHAT LARGER SIZE WILL USUALLY BE DESIRABLE. A SUITABLE LENGTH OF #12 CABLE (19 STRANDS OF .0185 WIRE) WITH A RUBBER INSULATION .308 INCH THICK IS SUPPLIED WITH MOST COUPLING CAPACITORS FOR CONNECTING TO THE CARRIER SET OR TUNER. IT IS RECOMMENDED THAT A COPPER BONDING CABLE BE CONNECTED FROM THE GROUND FRAME OF THE COUPLING CAPACITOR TO THE CABINET OF THE TUNER. THIS BONDING CONDUCTOR SHOULD BE PLACED PARALLEL WITH THE CARRIER FREQUENCY LEAD-IN CABLE AND APPROXIMATELY ONE FOOT FROM IT.

IN LOCATIONS WHERE SLEET IS A PROBLEM AND THE LEAD-IN CABLE CANNOT BE PROTECTED FROM IT READILY, THE USE OF 7/8 INCH COPPER TUBE, AIR DIELECTRIC, HIGH FREQUENCY, COAXIAL, TRANSMISSION LINE IS RECOMMENDED. THIS LINE IS HERMETICALLY SEALED AND IS UNAFFECTED BY RAIN, SLEET, SNOW, ETC.

ADJUSTMENT

THE FIRST CONSIDERATION IN ADJUSTING THIS EQUIPMENT WILL BE THE CHOICE OF CARRIER FREQUENCY. AS SOON AS THE OPERATING FREQUENCY AND THE CAPACITANCE OF THE COUPLING CAPACITOR ARE KNOWN THE APPROXIMATE VALUE OF INDUCTANCE IN THE TUNER NECESSARY FOR RESONANCE MAY BE CALCULATED BY USING THE FORMULA.

$$L = \frac{1}{4\pi^2 F^2 C}$$

WHERE L IS INDUCTANCE IN HENRIES
C IS CAPACITANCE IN FARADS
F IS FREQUENCY IN CYCLES PER SECOND

CURVE 226391 IS BASED UPON THIS EQUATION. IN ADDITION TO THE CAPACITANCE OF THE COUPLING CAPACITOR, THERE IS SOMETIMES AN APPRECIABLE AMOUNT OF STRAY CAPACITANCE DUE TO THE LEAD-IN CABLE FROM THE CAPACITOR TO THE TUNER. ALSO, THE POWER TRANSMISSION HILINE MAY BE SLIGHTLY REACTIVE. APPRECIABLE VARIATION FROM THE VALUES SHOWN BY THE CURVE MAY BE EXPECTED IN ANY ACTUAL INSTALLATION. TAPS 0 TO 15 ON INDUCTANCE L-1 CORRESPOND APPROXIMATELY TO MILLIHENRIES.

VARIOMETER L-2 HAS AN INDUCTANCE RANGE OF APPROXIMATELY 0.17 TO 1.7 MILLIHENRIES. THE SUM OF THE TWO INDUCTANCES L-1 AND L-2 SHOULD BE THE VALUE INDICATED BY THE CURVE.

IN ORDER TO GET MAXIMUM COUPLING EFFICIENCY, IT IS IMPORTANT THAT THE PROPER TAPS ON TRANSFORMER T-1 BE USED. THE AVERAGE POWER TRANSMISSION HILINE HAS A CHARACTERISTIC IMPEDENCE OF 500 OHMS. WITH A 50 TO 55 OHM COAXIAL CABLE CONNECTED BETWEEN TERMINALS 0 AND 3, INDUCTANCE L-1 SHOULD BE CONNECTED TO TERMINAL 9 FOR A 500 OHM HILINE. SINCE THE HILINE IMPEDENCE AT CARRIER FREQUENCY IS SOMEWHAT DIFFICULT TO MEASURE, IT IS USUALLY DESIRABLE TO ASSUME THE AVERAGE VALUE AND OPERATE ON TAP 9 DURING THE PRELIMINARY TUNING.

THE PROPER ADJUSTMENTS FOR L-1 AND L-2 ARE DETERMINED BY ADJUSTING THEM FOR MAXIMUM CURRENT TO THE LINE COUPLING CAPACITOR. A TEST LINK IS PROVIDED TO FACILITATE THE INSERTION OF AN AMMETER IN THIS CIRCUIT TO CHECK THE CURRENT. IF RESONANCE IS INDICATED WITH THE VARIOMETER L-2 AT A DIAL SETTING NEAR 100, IT IS ADVISABLE TO TRY ONE LESS MILLIHENRY IN COIL L-1. CONVERSELY, IF RESONANCE OCCURS AT ZERO ON THE VARIOMETER DIAL, MORE INDUCTANCE SHOULD BE INCLUDED BY INCREASING THE TAP ON INDUCTANCE COIL L-1.

DO NOT FAIL TO OPEN THE SAFETY DISCONNECT SWITCH S-1 BEFORE CHANGING ANY TAP ON INDUCTANCE L-1 OR TRANSFORMER T-1. ALTHOUGH THE SAFETY GAP SG-1 IS SET SUFFICIENTLY CLOSE TO PROTECT THE EQUIPMENT FROM SURGES, IT IS POSSIBLE FOR THE OPERATOR TO RECEIVE A SEVERE SHOCK UNLESS THE DISCONNECT SWITCH IS OPEN.

IT WILL USUALLY BE SATISFACTORY TO USE THE TAP ON TRANSFORMER T-1 WHICH RESULTS IN THE HIGHEST CURRENT TO THE COUPLING CAPACITOR AT RESONANCE. HOWEVER, IF TWO TAPS GIVE APPROXIMATELY THE SAME OUTPUT, THE HIGHER NUMBERED TAP SHOULD BE USED. THE TRANSFORMER IS DESIGNED FOR IMPEDENCES APPROXIMATELY AS FOL OWS. TAP 1-23.3 OHMS, 2-34.3, 3-52.5, 4-74.2, 5-107, 6-165, 7-243, 8-363, 9-535, 10-807, 11-1200.

TYPE JZ LINE COUPLING TUNER ADJUSTMENT DATA

THE DATA SHOWN IN THIS TABLE ARE CORRECT FOR THE CONDITIONS OF FREQUENCY, COUPLING CAPACITOR, AND CHARACTERISTIC IMPEDENCE INDICATED. AT INSTALLATION, THE ACTUAL CONDITIONS AND ADJUSTMENT SETTINGS SHOULD BE RECORDED.

CONDITION OR ADJUSTMENT	UNITS	MAX.	NORM.	MIN.	ACTUAL
CARRIER FREQUENCY	KILOCYCLES	101	100	99	
LINE COUPLING CAPACITANCE	MICROFARADS	.0011	.001	.0009	
EQUIVALENT HILINE RESISTANCE	OHMS	550	500	450	
COAXIAL CABLE IMPEDENCE	OHMS	55	52	50	
INDUCTANCE INDICATED TY TAP L-1	MILLIHENRIES	2	1	1	
TUNING VARIOMETER L-2	DIAL	100	50	0	
HILINE TAP ON TRANSFORMER T-1	TAP	10	9	8	
CABLE TAP ON TRANSFORMER T-1	TAP	3	3	3	

OPERATION

THE TYPE JZ LINE COUPLING TUNER REQUIRES NO ATTENTION ON THE PART OF THE OPERATOR EXCEPT MAINTENANCE AS EXPLAINED IN A SEPARATE SECTION OF THIS BOOK. HOWEVER, IF IT IS DESIRED TO DISCONTINUE THE OPERATION OF THIS EQUIPMENT FOR LONG PERIODS OF TIME, DISCONNECT SWITCH S-1 MAY BE OPENED.

MAINTENANCE

THE TYPE JZ LINE COUPLING TUNER REQUIRES ALMOST NO MAINTENANCE. HOWEVER, IT IS ADVISABLE TO INSPECT IT OCCASIONALLY TO SEE THAT NO EXCESSIVE CORROSION HAS TAKEN PLACE DUE TO FUMES OR CONDENSATION OF ATMOSPHERIC MOISTURE. ALTHOUGH THE CABINET IS WEATHERPROOF, IT IS USUALLY NECESSARY TO CLEAN OUT THE DUST AND OTHER DIRT AT LEAST ONCE A YEAR. IN SOME CASES, A MONTHLY INSPECTION AND CLEANING IS REQUIRED.

WHENEVER THESE INSPECTIONS ARE MADE, THE DIAL SETTING AND TAPS SHOULD BE CHECKED TO SEE THAT THEY HAVE NOT BEEN DISTRUBED SINCE THE INSTALLATION OR PREVIOUS INSPECTION WAS MADE. FOR THIS PURPOSE, IT IS RECOMMENDED THAT A TABULAR RECORD FORM BE PREPARED SIMILAR TO THAT SHOWN IN THE ADJUSTMENT SECTION OF THIS BOOK EXCEPT THAT SEVERAL COLUMNS FOR ACTUAL READINGS SHOULD BE PROVIDED. THE DATE OF EACH INSPECTION AS WELL AS THE SETTINGS OBSERVED SHOULD BE RECORDED ON THIS FORM. IF CORRESPONDENCE WITH THE MANUFACTURER RELATIVE TO PERFORMANCE IS NECESSARY, A COPY OF THIS RECORD SHOULD BE SUBMITTED WITH THE INQUIRY.

PARTS LISTS

SHIPPING LISTS FOR TYPE JZ LINE COUPLING TUNERS

STYLE #867484 FOR MOUNTING ON THE COUPLING CAPACITOR CASE IS ALSO IDENTIFIED BY THE MANUFACTURER AS TYPE JZ-3 DL-7502307, GROUP 3, AND INCLUDES

1 LINE COUPLING TUNER, DL-7502307, G-1 AND
1 ACCESSORIES PACKAGE, DL-7502307, G-2, WHICH INCLUDES
- 1 SPACER, DWG. 7607208, PT-12
- 1 STRAP, DWG. 7607208, PT-10
- 2 GASKETS, DWG. 7407831, PT-1
- 4 BOLTS 3/8- 6 x 3-3/4, HEX HEAD C ALLOY #4901-1
- 1 INSULATOR BUSHING, AM. LAVA CO. #1175
- 1 CONNECTOR STUD, 10-32 x 2-5/8 WITH 5 NUTS AND 7 WASHERS
- 1 CONNECTOR CABLE, 12 INCHES PACKARD #344 WITH TERMINALS
- 1 NAMEPLATE, #30871

STYLE #867485 FOR OPEN WIRE CONNECTION TO COUPLING CAPACITOR IS ALSO IDENTIFIED BY THE MANUFACTURER AS TYPE JZ-5, DL-7502307, GROUP 5, AND INCLUDES

1 LINE COUPLING TUNER, DL-7502307, G-1 AND
1 ACCESSORIES PACKAGE, DL-7502307, G-4, WHICH INCLUDES

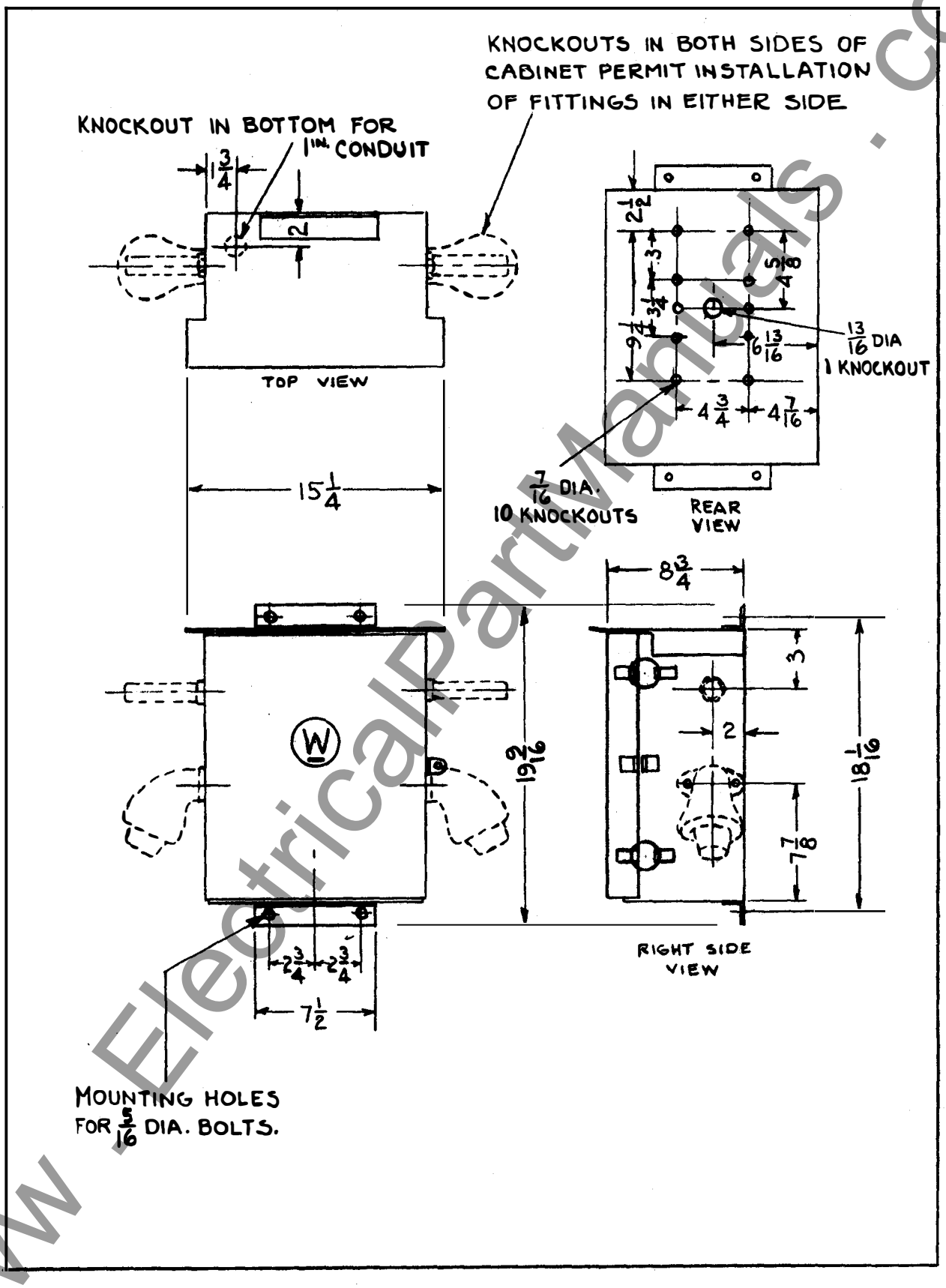
1 Insulator Bushing, Style #1014436
1 Gasket, Style #651569
1 Flange, Style #776613
2 Set Screws, Style #804514
1 Pressure Ring, Style #776603
1 Can Cement, 2 lbs. #693
1 Ground Terminal Lug, Burndy #QA4C-F
1 Nameplate, #30871

Style #867486 for coaxial line connection to coupling capacitor is also identified by the manufacturer as type JZ-7, DL-7502307, group 7, and includes
1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-6, which includes
1 End Seal, Isolantite #352B
1 Ground Connector, Dwg. 7607208, Pt-11
1 Line Connector, 12 inches, Packard #344 with terminals
1 Gasket, Dwg. 7407831, Pt-2
1 Nameplate, #30871

COMPONENT PARTS OF TYPE JZ LINE COUPLING TUNER

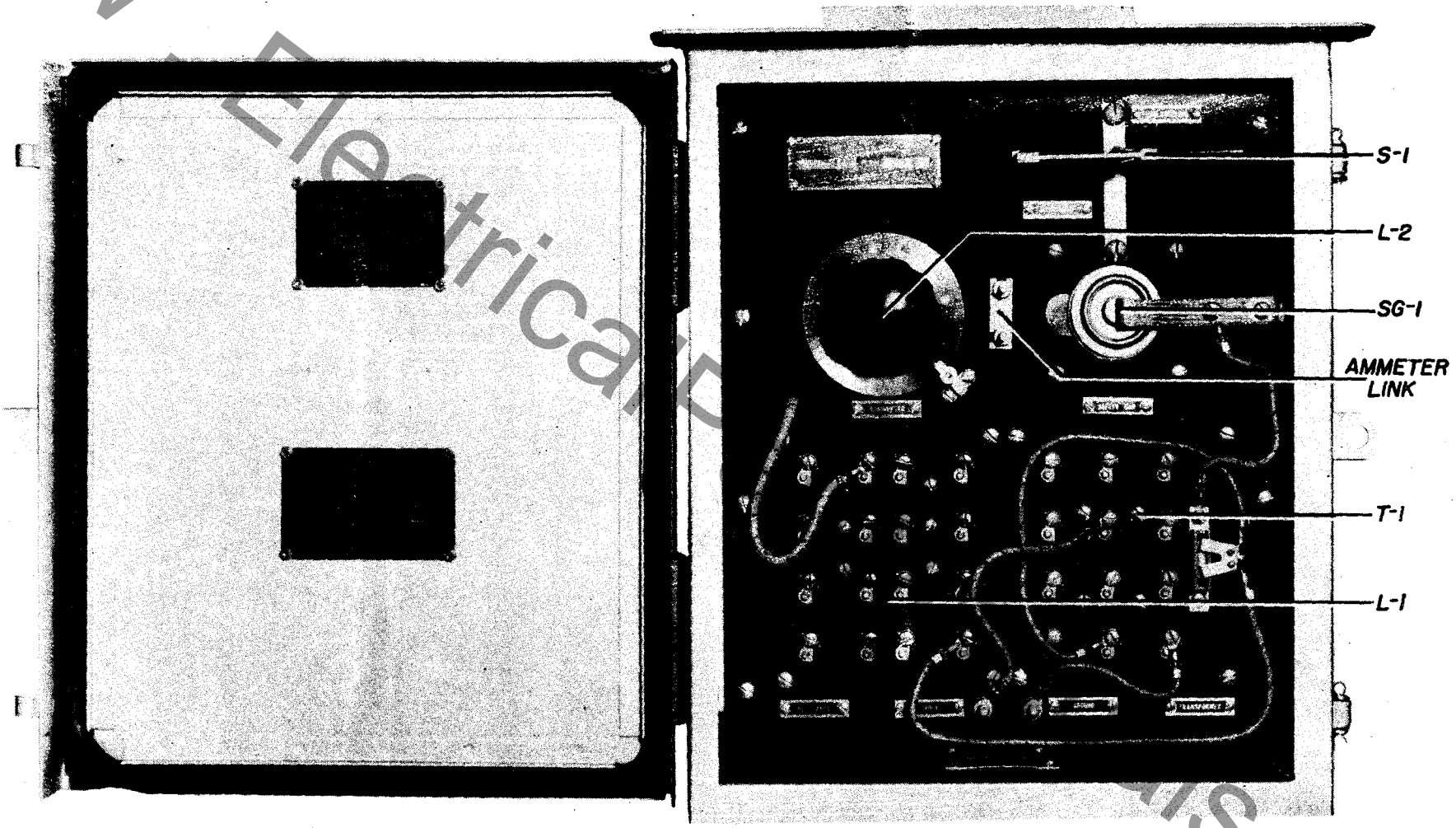
Symbol	Name	Rating	Designation	Supplier
L-1	Inductance	15MH	Dwg. 7707816, G-1	W
L-2	Variometer	.17-1.7MH	Dwg. 7705336, G-1	W
S-1	Disconnect Switch	30A250V	S#554195	W
SG-1	Protector Gap Discs		S#949357, Mica S#948956	W
T-1	Transformer	50-150 Kc. Auto	L Spec. 382506	W

The Westinghouse Electric and Manufacturing Company is prepared to supply any of the listed parts for use in servicing this equipment. Orders should specify that they are for type JZ line coupling tuner and mention the circuit symbol. All orders must specify the rating and supplier's designation.



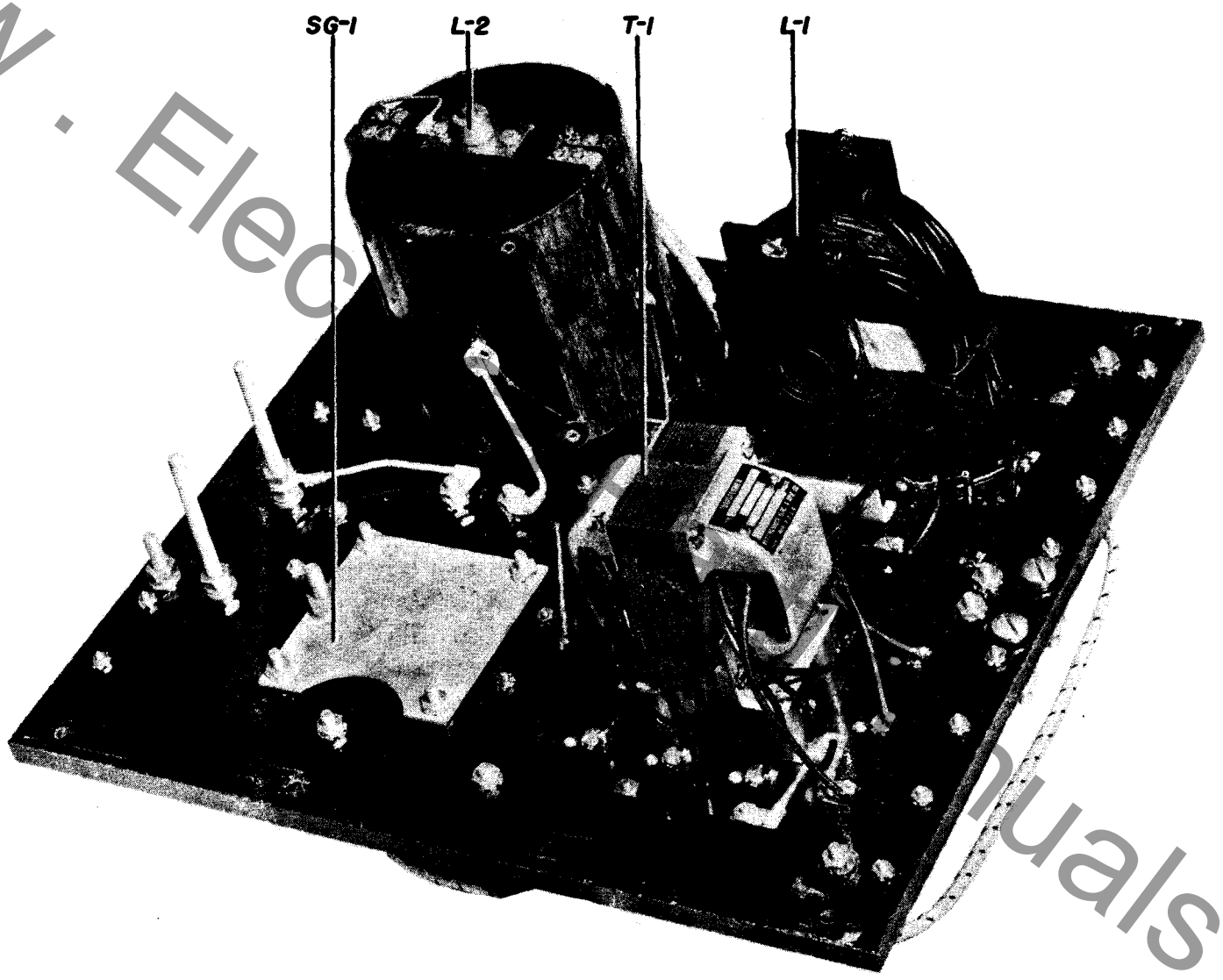
OUTLINE OF CABINET

DWG. 7707832 SUB 0



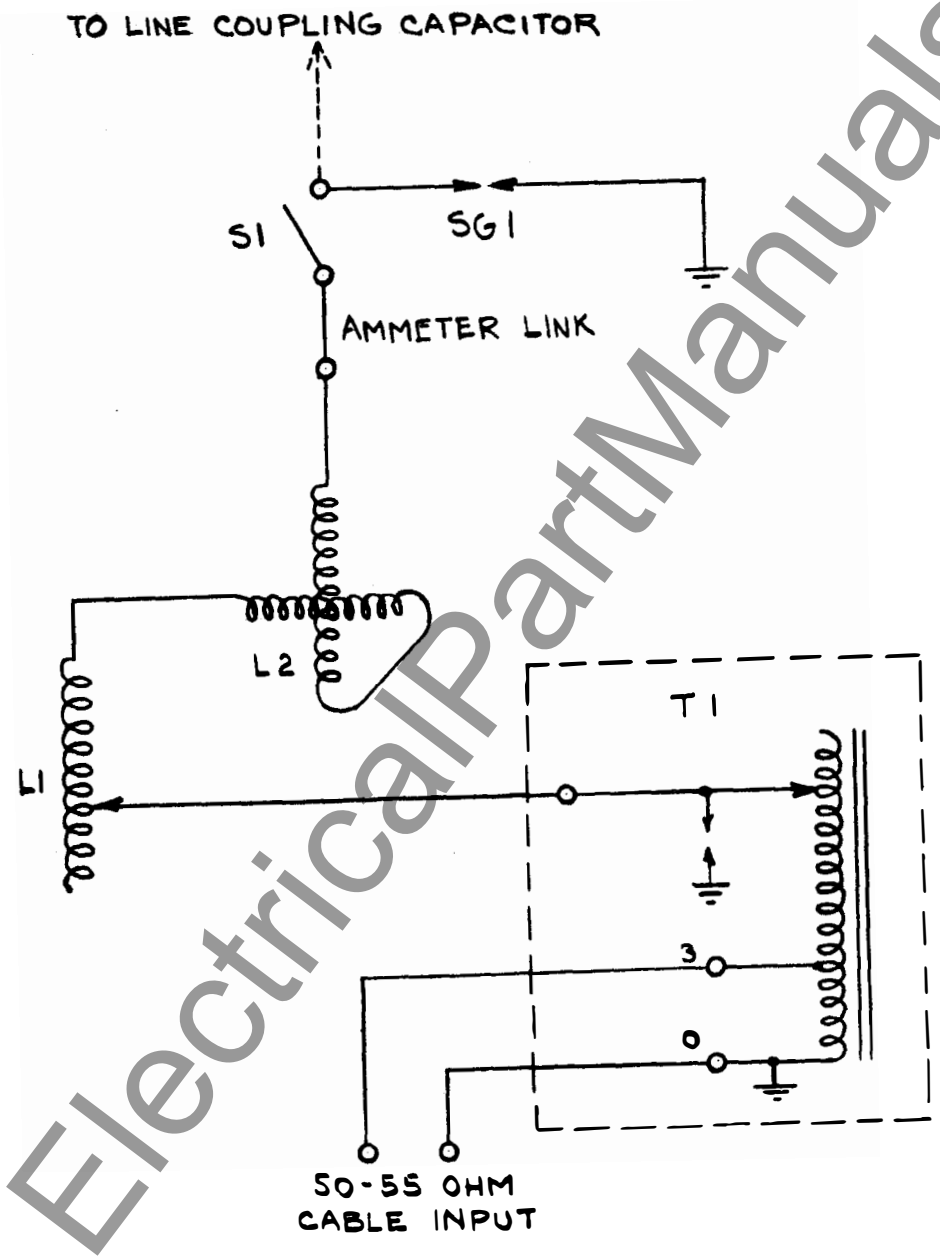
TYPE JZ LINE COUPLING TUNER

C-4891

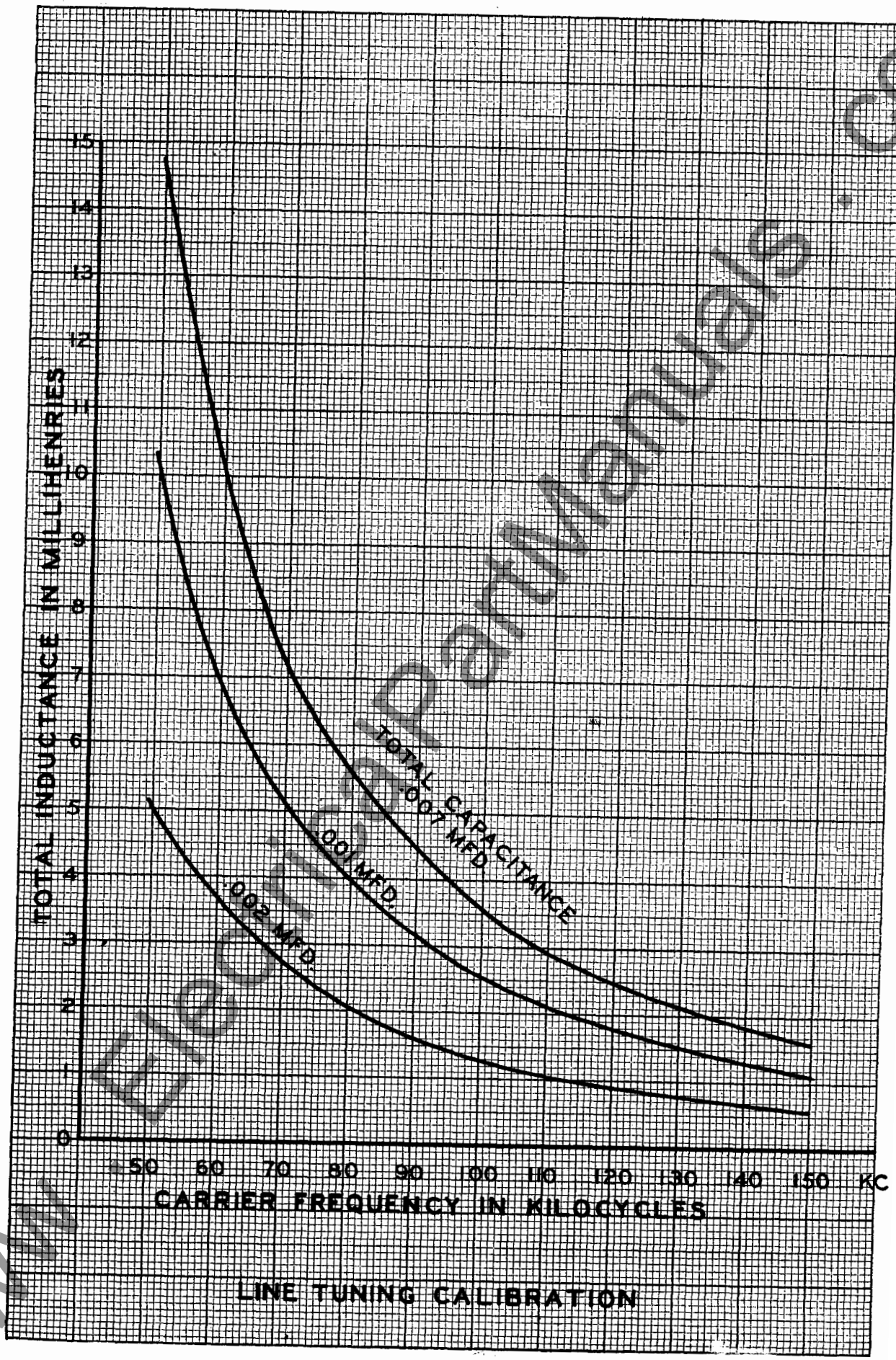


C-4890

TYPE JZ LINE COUPLING TUNER
(REAR VIEW OF PANEL)



DWG. 7407824 SUB 0



LINE TUNING CALIBRATION

226391

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE JZ LINE COUPLING TUNERS
50 to 150 and 150 to 300 Kilocycles

CAUTION Before working on this equipment turn off the power supply to the carrier equipment and ground or open circuit the R.F. lead to the coupling capacitor.

APPLICATION

The Type JZ Line Coupling Tuners are a combination impedance matching and tuning device to provide, in conjunction with a coupling capacitor, low loss coupling of a carrier transmitter-receiver to a power line. The tuners are suitable for coupling (to a hiline) through a coupling capacitor having any capacitance between .0007 mfd and .004 mfd. These tuners are most often used for phase-to-ground coupling, or for a phase-to-ground carrier by-pass. The tuner will match impedances between 25 and 1300 ohms, and will handle a 37.5 watt unmodulated signal, or 100 watts peak power of a modulated signal.

CONSTRUCTION

The 50-150 KC type JZ line coupling tuner is identified as Style #867484A for mounting on the coupling capacitor base; Style #867485A for open wire connection to the coupling capacitor; Style #867486A for coaxial cable connection to the coupling capacitor. The 150-300 KC Type JZ tuner is Style #1352340 for any mounting. This unit is provided with accessory package Style #867729A for direct connection, or Style #1352445 accessories for cable or open wire connection. The accessories include the items listed in this I. L. under Parts List for the 50-150 KC tuners. All of the electrical components are mounted on a single vertical panel contained in a weather-proof cabinet for outdoor mounting.

The outline and mounting dimensions are shown in figure 5. The electrical circuits are as indicated schematically in figure 1. The function of transformer T-1 is to couple the unequal characteristic impedances of the power transmission hiline and the coaxial cable with higher power transfer efficiency. The function of inductances L-1 and L-2 is to cancel the reactance of the coupling capacitor. By making the total reactance of these inductances equal to the reactance of the line coupling capacitor, series resonance is obtained. The result is that in effect, transformer T-1 is connected directly to the hiline at carrier frequency.

INSTALLATION

The type . line coupling tuner as supplied includes an accessory package in addition to the main cabinet. The items received should be carefully checked against the Parts List included in this book and also against the order or requisition for the equipment. Any shortage should be reported immediately to the transportation company and to the nearest district office of the manufacturer. The equipment should be very carefully checked for damaged or missing parts and particular attention should be given to any parts which have become loose in shipment or wires which have broken due to vibration.

The tuner should be mounted as near to the line coupling capacitor as possible. The base of the type PCA capacitor potential device, or the type PC carrier current coupling device with the large base are arranged so that a tuner can be fastened to it as shown in figure 4. To install the tuner, remove from the cabinet the panel on which all of the electrical components are mounted. Remove the plate on the coupling capacitor base opposite the ground switch. A spacer, reinforcing strip,

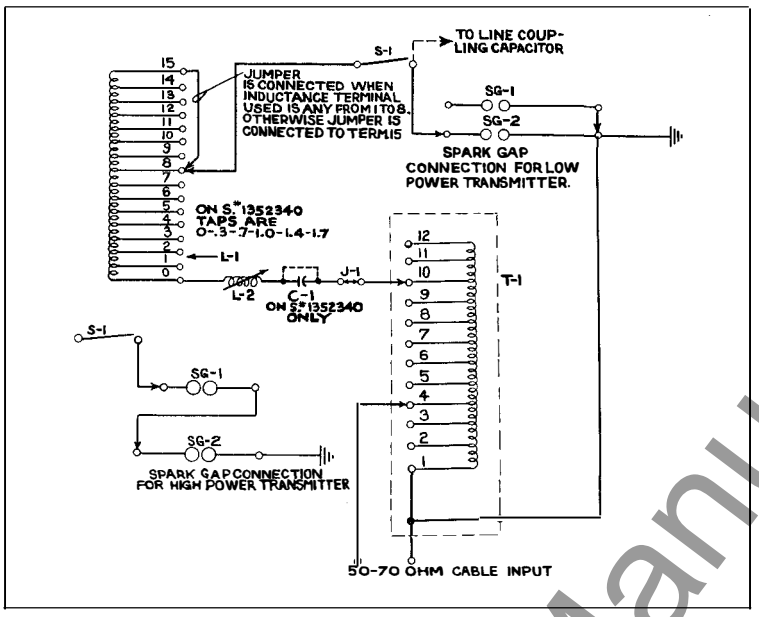


Fig. 1—Internal Schematic of Type JZ Tuner.

two gaskets, and four bolts are provided. Place the reinforcing strip inside the tuner box to aid in making the top gasket tight. Place the four bolts in the corner holes. This will locate the spacer. Use the insulator bushing and stud supplied with this style where the connection lead passes through the back of the tuner cabinet. Assemble the two parts of this thimble and plug bushing through the knockout hole in the cabinet. Connect the lead which is supplied from the stud through this thimble bushing to the terminal on the panel marked "Line Coupling". Replace the panel in the cabinet. In these cases the connection lead from the tuner to the capacitor can be completely enclosed.

Where this is not possible, the lead-in wire from the capacitor may be run through the porcelain bushing which is supplied, for open wire connection to the coupling capacitor. This lead-in should be connected to the terminal stud marked "Line Coupling." The insulation of this lead-in cable with respect to ground must be much better than is ordinarily employed for the voltage which exists between these points, as it effectively shunts the reactive elements of the resonant circuit at carrier frequency. The impedance of this resonant circuit is several thousand ohms and leakage resulting from rain, snow, sleet, too long a lead-in wire, or too many supporting insulators will reduce the power output of the transmitter equipment and the sensitivity of the receiver equipment. This lead should not be enclosed in conduit, since the capacitance of the lead to ground should be as small as possible. A cable insulated with a high grade rubber and suitable for at least 7500 volts service is recommended. The actual current carrying capacity of this conductor need not exceed that of #14 wire. However, for mechanical reasons, a somewhat larger size will usually be desirable. A suitable length of #12 cable (19 strands of .0185 wire) with a rubber insulation .308 inch thick is supplied with most coupling capacitors for connecting to the carrier set or tuner. It is recommended that copper bonding cable be connected from the ground frame of the coupling capacitor to the cabinet of the tuner. This bonding conductor should be placed parallel with the carrier frequency lead-in cable and approximately one foot from it.

In locations where sleet is a problem and the lead-in cable cannot be protected from it readily, the use of 7/8 inch copper tube, air di-electric, high frequency, coaxial, transmission line is recommended. This line is hermetically sealed and is unaffected by rain,

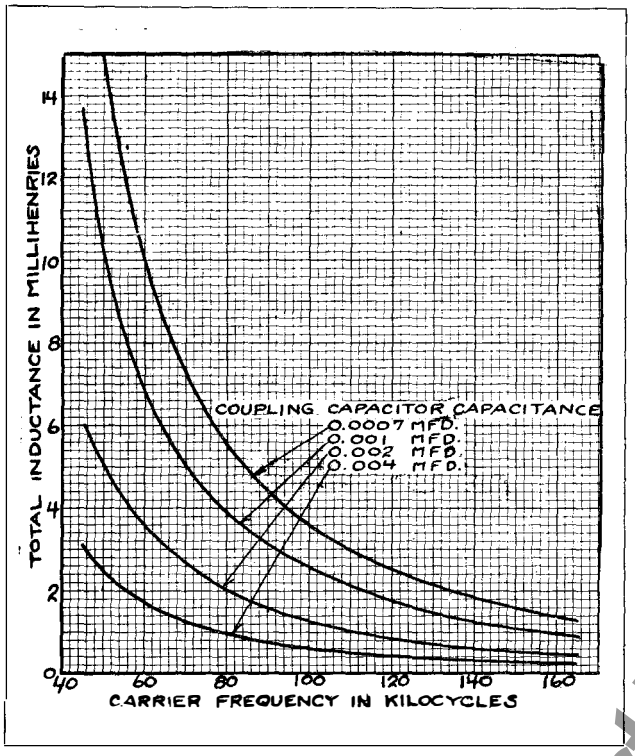


Fig. 2—Typical Frequency-Inductance Curves of the 50-150 Kc. Line Tuner.

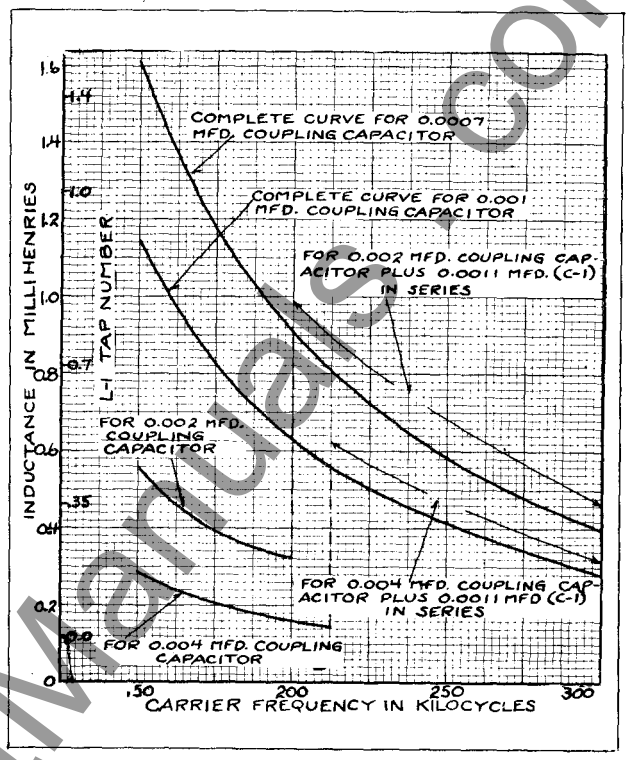


Fig. 3—Typical Frequency-Inductance Curves of the 150-300 Kc. Line Tuner.

sleet, snow, etc.

ADJUSTMENTS

The first consideration in adjusting this equipment will be the choice of carrier frequency. As soon as the operating frequency and the capacitance of the coupling capacitor are known the approximate value of inductance in the tuner necessary for resonance may be calculated by using the formula:

$L = \frac{25}{F^2C}$ Where L is inductance in millihenries, C capacitance in microfarads, F is frequency in kilocycles per second.

Figures 2 and 3 are based upon this equation. In addition to the capacitance of the coupling capacitor, there is sometimes an appreciable amount of stray capacitance due to the lead-in cable from the capacitor to the tuner. Also, the power transmission hiline may be slightly reactive. Appreciable variation from the values shown by the curves may be expected in any actual installation. Tap numbers on inductance L-1 correspond approximately to millihenries.

Variometer L-2 has sufficient inductance to cover the range between taps on the tapped inductance L-1. The sum of the two inductances L-1 and L-2 should be the value indicated by the curve. Whenever using tap 8 or lower, connect the shorting link provided between the used tap and tap 15. When using a tap higher than 8, connect both ends of the shorting link to terminal 15.

For 150-300 KC operation, refer to figure 5. Fixed capacitor C-1 should be unshorted for the two following conditions:

1. If the frequency is above 200 KC when using a 0.002 mfd coupling capacitor.

2. If the frequency is above 210 KC when using a 0.004 mfd coupling capacitor.

In order to get maximum coupling efficiency, it is important that the proper taps on transformer T-1 be used. The average power transmission hiline has a characteristic impedance

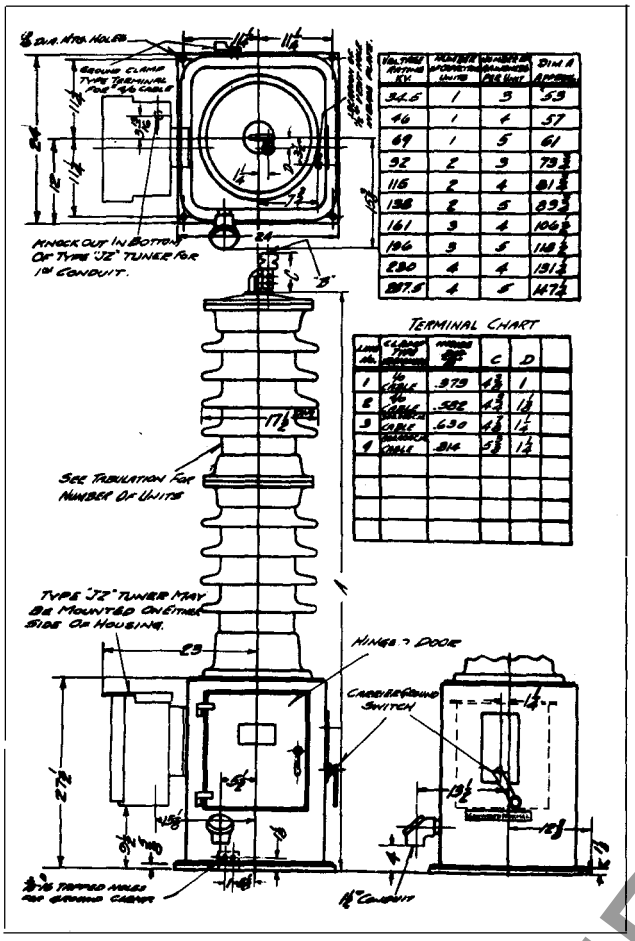


Fig. 4—Installation of the S#867484 Type JZ Tuner on the large base of Westinghouse Coupling Capacitor.

of 500 to 600 ohms for phase-to-ground carrier relaying operation where line traps are used and carrier is fed into only a single-line. With communication or telemetering channels, if line traps are not used, the input impedance may be much lower because of the presence of other lines connected to the bus at the station. The usual coaxial cable impedance is 50 to 70 ohms. Since the hiline impedance at carrier frequency is somewhat difficult to measure, it is usually desirable to assume the average values. Use coaxial cable tap 4 and line tap 10 for the preliminary tuning.

Refer to the schematic diagram Figure 1 and make the proper spark gap connections. The single, or parallel connection is generally used with low power transmitters, up to 15 watts. The series connection is used with transmitters with a peak power capability of 100 watts. For example, a 25 watt transmitter which is 100% modulated provides a peak power of 100 watts. Since the voltage developed is also dependent on the power line impedance, the series connection must sometimes be used with the low-power transmitter, if the power line impedance is high enough to cause a breakdown of the gaps when carrier is transmitted.

After all of the connections are properly made, close the circuit to the tuner by closing the disconnect switch. Turn on the transmitter (un-modulated) at the selected frequency, and rotate the tuner variometer dial. Adjust for the maximum current to the coupling capacitor. A test link J-1 is provided to facilitate the insertion of an ammeter in this circuit to check the current.

If the current is still increasing at zero on the dial, use a higher numbered tap on the inductance. If the maximum current is obtained at 100 on the dial, use a lower numbered tap. The maximum current point must occur on the marked portion, preferably not closer than 5 or 10 divisions from either end of the dial. As the tuning will usually be quite broad, the maximum current point may be difficult to determine. Take dial readings at equal current on either side of the peak current and average the dial readings to obtain the final setting. If the adjacent tap indicates resonance at the high end of the dial, it is preferable to use the former tap.

Do not fail to open the safety disconnect switch S-1 before changing any tap on inductance L-1 or transformer T-1. Although the safety gap SG-1 is set sufficiently close to protect the equipment from surges, it is possible for the operator to receive a severe shock unless the disconnect switch is open.

It will usually be satisfactory to use the tap on transformer T-1 which results in the highest current to the coupling capacitor at resonance. However, if two taps give approximately the same output, the higher numbered tap should be used. For each transformer tap change, recheck the variometer tuning. The

transformer is designed for impedances approximately as follows:

Tap	50-150KC Turns	150-300KC Turns	Impedance (Ohms)
2	28	14	26
3	34	17	38
4	42	21	58
5	50	25	82
6	60	30	118
7	75	37.5	185
8	90.5	45.5	272
9	100.5	55.5	405
10	134.5	67.5	597
11	164.5	82.5	894
12	200.5	100.5	1300

The above tabulation is based on the transformer characteristic formula:

$$\frac{Z\ (Pri)}{Z\ (Sec)} = \frac{N^2\ (Pri)}{N^2\ (Sec)}$$

In the above formula: Z is impedance in ohms

N is number of turns

Since the transformer has only one winding, the section between the transmitter, or cable connection and ground is designated as the primary, and the section between the output tap (connecting to jack J-1) and ground is the secondary.

The line coupling tuner is properly adjusted when the transformer primary and secondary taps are set for maximum current with the tuning at resonance. Lock the tuning dial in position, remove the r-f ammeter, and replace the link.

OPERATION

The type JZ line coupling tuner requires no attention on the part of the operator except maintenance as explained in the following section. However, if it is desired to discontinue the operation of this equipment for long periods of time, disconnect switch S-1 may be opened.

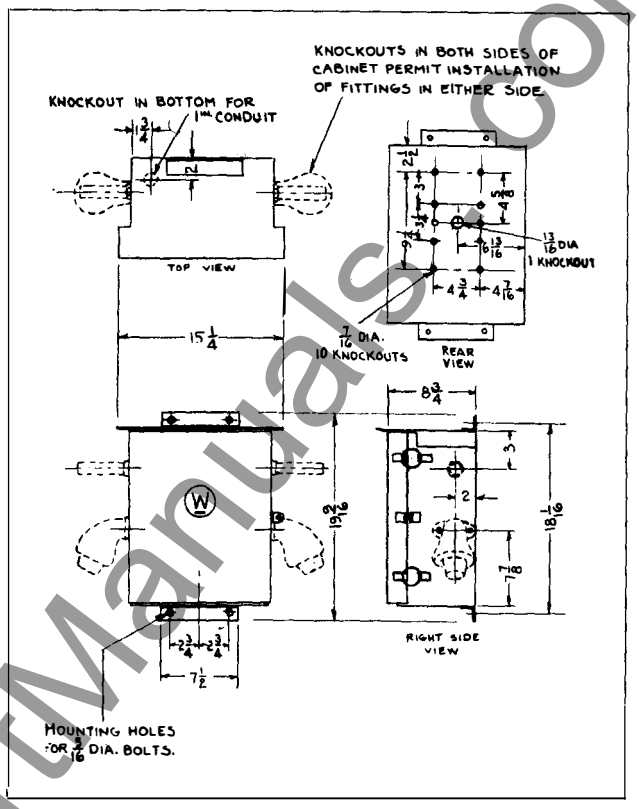


Fig. 5—Outline of the Type JZ Tuner.

MAINTENANCE

The Type JZ line coupling tuner requires almost no maintenance. However, it is advisable to inspect it occasionally to see that no excessive corrosion has taken place due to fumes or condensation of atmospheric moisture. Although the cabinet is weatherproof, it is usually necessary to clean out the dust and other dirt at least once a year.

Whenever these inspections are made, the dial setting and taps should be checked to see that they have not been disturbed since the installation or previous inspection was made. For this purpose, it is recommended that a tabular record form be prepared. The date of each inspection as well as the settings observed should be recorded on this form. If correspondence with the manufacturer relative to performance is necessary, a copy of this record should be submitted with the inquiry.

PARTS LIST

Shipping Lists for Type JZ Line Coupling

Tuners.

Style #867484A for mounting on the coupling capacitor case is also identified by the manufacturer as type JZ-3 DL-7502307, Group 3, and includes:

1 Line Coupling Tuner, DL-7502307, G1 and
1 Accessories Package, DL-7502307, G2, which includes:

1 Spacer, Dwg. 7607208-G2
1 Strap, Dwg. 7607208, Pt-10
2 Gaskets, Dwg. 7407831, Pt-1
8 Bolts 3/8-16 x 3-3/4, Hex. Head C Alloy #4901-1
1 Insulator Bushing, Am. Lava Co. #1175
1 Connector Stud, 10-32 x 2-5/8 with 5 nuts and 7 washers
1 Connector Cable, 12 inches Packard #334 with terminals
1 Nameplate, #30871

Style #867485A for open wire connection to coupling capacitor is also identified by the manufacturer as type JZ-5, DL-7502307, Group 5, includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-4 which includes:

1 Insulator Bushing, S#1014436
1 Gasket, S#651569
1 Flange, S#776613
2 Set Screws, S#804514
1 Pressure Ring, S#776603
1 Can Cement, 2 lbs., #693
1 Ground Terminal Lug, Burndy #QA4C-F
1 Nameplate, #30871

Style #867486A for coaxial line connection to coupling capacitor is also identified by manufacturer as type JZ-7, DL-7502307, Group 7, and includes:

1 Line Coupling Tuner, DL-7502307, G-1 and
1 Accessories Package, DL-7502307, G-6 which includes:
1 End Seal, Isolantite #352B
1 Ground Connector, Dwg. 7607208, Pt-11
1 Line Connector, 12 inches, Packard #344 with terminals
1 Gasket, Dwg. 7407831, Pt-2
1 Nameplate #30871
1 Pipe Plug, Mueller Brass Co., Cat. No. A-249-1/4".

TYPE JZ LINE COUPLING TUNER ADJUSTMENT DATA

The data shown in this table are correct for the conditions of frequency, coupling capacitor, and characteristic impedance indicated. At installation, the actual conditions and adjustment settings should be recorded.

Condition or Adjustment	Units	Max.	Norm.	Min.	Actual
Carrier Frequency	Kilocycles	101	100	99	_____
Line Coupling Capacitance	Microfarads	.001	.001	.0009	_____
Equivalent Hiline Resistance	Ohms	550	500	450	_____
Coaxial Cable Impedance	Ohms	55	52	50	_____
Inductance Indicated By Tap L-1	Millihenries	2	1	1	_____
Tuning Variometer L-2	Dial	100	50	0	_____
Hiline Tap on Transformer T-1	Tap	10	10	9	_____
Cable Tap on Transformer T-1	Tap	4	4	4	_____

COMPONENT PARTS OF TYPE JZ LINE COUPLING TUNER

Diagram Symbol 50-150 KC	Diagram Symbol 150-300 KC	Required	Name	Rating
L-1		1	Tapped Inductance	15.5 Mh.
	L-1	1	"	1.75 "
L-2		1	Variometer	.7-1.7 "
	L-2	1	"	.053-.575 Mh.
T-1		1	Transformer	50-150 KC 100 Watts Peak
	T-1	1	"	150-300 KC 100 Watts Peak
SG-1	SG-1	1	Type RVS Arrester	10,000 Amp.
			Protective Gap	Surge
J-1	J-1	1	Line Current Jack	2 Binding Post
S-1	S-1	1	Disconnect Switch	30A. 240V D.C.
	C-1	1	Series Capacitor	.0011 mfd.

WESTINGHOUSE ELECTRIC CORPORATION

METER DIVISION **NEWARK, N.J.**

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