COMPLETE INSTRUCTIONS FOR THE

Meissner

DeLuxe "Signal Shifter"

Models: 9-1077, 9-1078, 9-1079, 9-1080

COILS

The Signal Shifter is supplied complete with tubes but less coils. The following tables indicate the catalog number and frequency range of each available Signal Shifter coil set. Coils may be ordered in accordance with the indicated catalog numbers.

CAT. No.	FREQUENCY RANGE
18-3321 Set of 3 coils.	1,000 to 1,170 kc.
18-3322 Set of 3 coils.	1,170 to 1,370 kc.
18-3323 Set of 3 coils.	1,370 to 1,600 kc.
18-3324 Set of 3 coils.	1,600 to 1,870 kc.
18,2915 Set of 3 coils.	1,775 to 2,050 kc.
18-2951 Set of 3 coils.	2,040 to 2,410 kc.
18-2952 Set of 3 coils.	2,395 to 2,835 kc.
18-2953 Set of 3 coils.	2,820 to 3,320 kc.
18-2954 Set of 3 coils.	3,190 to 3,760 kc.
18-2916 Set of 3 coils.	3,500 to 4,000 kc.
18-2955 Set of 3 coils.	3,975 to 4,690 kc.
18-2956 Set of 3 coils.	4,670 to 5,515 kc.
18-2957 Set of 3 coils.	5,480 to 6,470 kc.
18-2958 Set of 3 coils.	6,440 to 7,540 kc.
18-2959 Set of 3 coils.	7,510 to 8,870 kc.
18-2960 Set of 3 coils.	8,830 to 10,360 kc.
18-2961 Set of 3 coils.	10,300 to 12,100 kc.
18-2962 Set of 3 coils.	12,075 to 14,000 kc.
18-2963 Set of 3 coils.	13,940 to 16,500 kc.

In addition, the following "Bandspread" coils are avaiable for use with the Signal Shifter:

CAT. No.	FREQUENCY RANGE
18-2915 Set of 3 coils.	1,775 to 2,050 kc.
18-2916 Set of 3 coils.	3,500 to 4,000 kc.
18-2917 Set of 3 coils.	7,000 to 7,300 kc.
18-2918 Set of 3 coils.	14,000 to 14,400 kc.
*18-2918 Set of 3 coils.	14,000 to 15,000 kc.

*By doubling in the transmitter, these coils may be employed to cover a frequency range of 28,000 to 30,000 kc.

INTRODUCTION

The Meissner Signal Shifter is a variable-frequency exciter unit, permitting positive frequency control of a radio transmitter over the entire range of 1,000 to 16,500 kc. It may be used with any type of transmitter, eliminating the costly and 'hard-to-get' crystals that would otherwise be required. However, the versatility of the Signal Shiftter extends beyond the classification of "a crystal substitute". In brief, a crystal controlled transmitter is locked on the crystal frequency, an individual crystal being required for each transmission frequency employed. In comparison, the Signal Shifter provides complete coverage of the frequency range of 1,000 to 16,500 kc. The process of selecting any desired frequency within this range is as simple as "tuning" a modern broadcast receiver; a precision type tuning system, incorporated in the Signal Shifter, insuring positive accuracy in frequency selection by the operating personnel.

In addition, the Signal Shifter may be employed as a complete, self-contained, low power transmitter, delivering 7.5 watts (CW) to the antenna system..... ...on any frequency within its range of 1,000 to 16,500 kc. As a complete, "short-haul" or "emergency" transmitter, the Signal Shifter occupies a well deserved position in commercial and military service.

GENERAL INFORMATION

The Signal Shifter employs a 6F6G tube in a high-C electron coupled oscillator circuit. The tuned grid circuit of the oscillator stage operates either on a frequency equal to one-quarter or one-half the output frequency, depending on the type of coils employed.

In all cases, regardless of output frequency, the tuned plate circuit of the 6F6G oscillator stage operates as a frequency doubler. This circuit is capacitively coupled to the grid of the 6L6G output stage.

The 6L6G output stage operates as a neutralized power amplifier (See paragraphs headed "Neutralization"), when the following sets of coils are used in the Signal Shifter:—

18-3321	18-2915
18-3322	18-2951
18-3323	18-2952
18-3324	18-2953

With all other type coils, the 6L6G output stage operates as a frequency doubler and neutralization is **not** required.

The Meissner Signal Shifter incorporates a self contained power supply for operation on alternating current only. It will not operate on Direct Current supply.

The Signal Shifter is arranged for the addition of a crystal oscillator unit. This companion unit is known as the Meissner Signal Spotter. A receptacle is provided on the back edge of each Signal Shifter and by means of a cable assembly, supplied with the Signal Spotter, the two units can be easily coupled together. No other connections are required. A two position switch, located on the Signal Shifter front panel directly below the tuning control, enables the operator to select the type output desired; either crystal output from the Signal Spotter or ECO (Master Oscillator) output from the Signal Shifter.

OUTPUT—FREQUENCY RANGE

The Signal Shifter is conservatively rated at 7.5 watts R. F. output. On the lower frequencies, it will be found that the Signal Shifter provides considerably more output than its rated 7.5 watts.

The frequency range of the Signal Shifter is 1,000 to 16,500 kc.

STABILITY

Extremely high frequency-stability in the Signal Shifter is achieved by the use of a 6F6G tube operating in a high-C electron coupled oscillator circuit. Thermal characteristics of the 6F6G are ideal for electron coupled oscillator service and frequency drift, due to thermal variation, is practically nil. In addition, sturdy, high-quality components, together with temperature-coefficient condensers plus a unique "Stand-by" circuit are incorporated in the Signal Shifter to insure positive frequency stability. Variation in tube temperature, which would otherwise effect frequency stability, is eliminated through the medium of the "Stand-by" circuit which maintains the current, flowing in the tubes, at a practically constant value under either "operating" or "stand-by" conditions.

ADJUSTMENT

In the event a new set of tubes is installed in the Signal Shifter and re-alignment is found necessary, it is suggested that the following procedure be employed in making the initially required adjustments:—

Turn the AC switch (SW-3 left side of the panel) to OFF. Plug in the line cord to an AC outlet of suitable voltage and frequency.

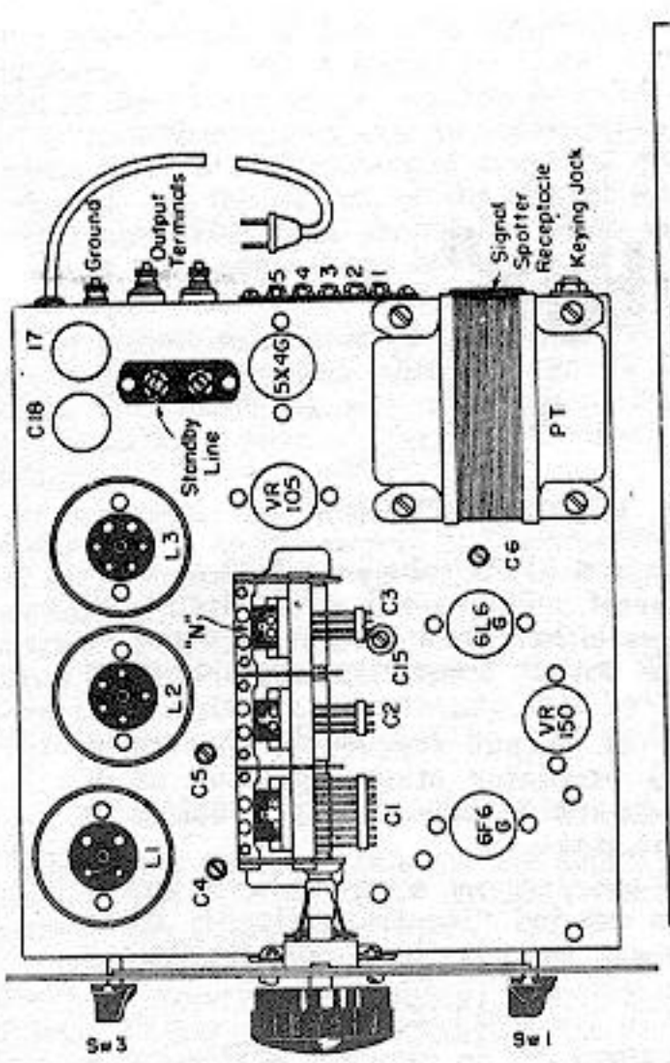

FIG. 1
SIGNAL SHIFTER-TOP VIEW

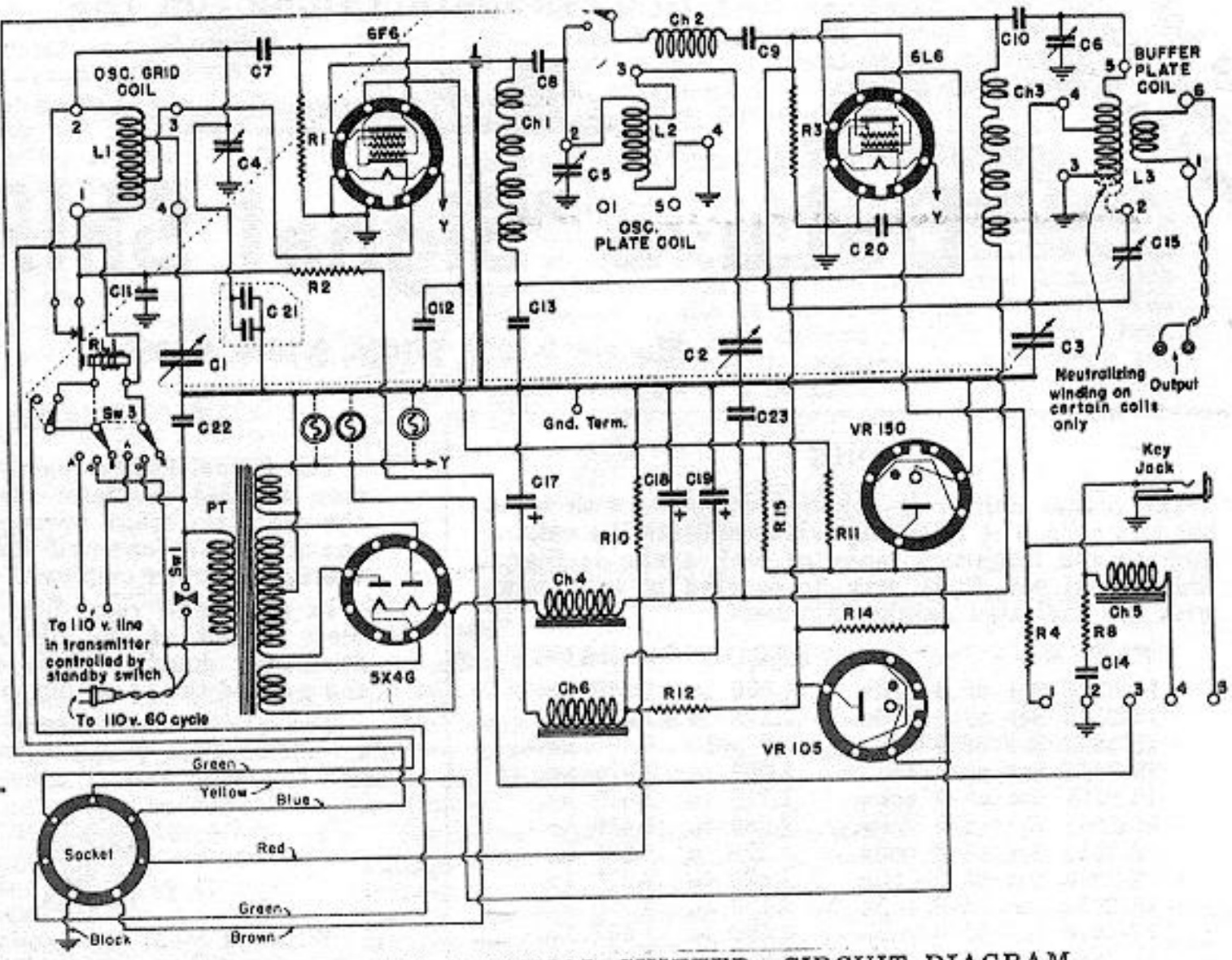

FIG. 2 SIGNAL SHIFTER—CIRCUIT DIAGRAM

A telegraph key or "bug", connected to an ordinary phone plug, is inserted into the key jack found on the back side of chassis. This jack is a 'closed circuit' type and for phone operation, it is only necessary to remove the plug. This automatically closes the keying circuit and permits the Signal Shifter to operate as an uninterupted oscillator; i. e., uninterupted by key or "Bug".

As shown in Figures 1 and 2, a five terminal strip is mounted on the back side of the chassis. This terminal strip enables the operator to select the desired method of keying the **Signal Shifter.** For oscillator keying, use short pieces of wire and connect terminal 1 with terminal 2 and terminal 3 with terminal 4. For amplifier keying, connect terminal 2 with terminal 3 and terminal 4 with terminal 5.

See that all tubes are correctly placed in their respective sockets as shown in Figure 1. Place one complete set of coils in their sockets. NOTE: THE SIGNAL SHIFTER SHOULD NOT BE TURNED "ON" OR PERMITTED TO RUN WITHOUT COILS AS THE ABSENCE OF COILS PLACES A HEAVY LOAD ON THE FILTER CIRCUIT.

Turn the operating switch (SW-1) to "Stand-by", turn the selector switch (SW-2, below tuning control) to "ECO" and turn the power switch (SW-3) to the "On" position. This permits the tubes to warm up and places the entire unit in operating condition, but does not allow the oscillator to start.

After a warm-up period of fifteen minutes, turn the operating switch (SW-1) to the "On" position and rotate the tuning knob to dial setting "95". At this point, an accurately calibrated receiver is required to indicate proper alignment. For extreme accuracy, receiver calibration may be checked against a frequency meter or crystal standard.

"Tune" the receiver to the frequency that corresponds with the high frequency limit specified for the particular set of coils employed. For example, if coil set No. 18-2955 is used, the specified high frequency limit is 4,690 kc. Both the high and low frequency limits are clearly indicated on each set of **Signal Shifter** coils.

With the receiver tuned to the proper frequency and with the **Signal Shifter** tuning knob adjusted to dial setting "95", adjust the band-setting condenser (C4 in Figure 1) to the point where the signal is audible in the receiver. Careful adjustment of C4 is required, highest accuracy being obtained when the signal is at "zero beat" with the receiver frequency. NOTE: If a superheterodyne receiver is used to check Signal Shifter adjustment, the receiver may produce beat notes as condenser C4 is adjusted. However there should be no question as to which is the false or beat signal and which is the true fundamental signal. The latter will be much stronger and easily recognized.

Now, with the KEY DOWN or with the key plug REMOVED from the jack (which automatically closes the keying circuit), adjust the trimming condensers (C-5 and C-6) to give maximum **Signal Shifter** output. The best indicator of **Signal Shifter** output is a grid milliammeter located in the grid circuit of the amplifier stage to which the Signal Shifter is connected. This meter will indicate the amount of grid driving power supplied by the **Signal Shifter** and trimming condensers (C-5 and C-6) should be adjusted to provide MAXIMUM READING on the grid millimeter. If no amplifier is used with the **Signal Shifter** and the instrument is connected direct to antenna, a small neon bulb held against the antenna feeder or a flash-light bulb connected in series with one of the feeders, can be used to indicate **Signal Shifter** output. Trimming condensers should be adjusted to provide maximum glow.

It is customary practice to "peak" the Signal Shifter to provide MAXIMUM OUTPUT ON THE HIGHEST FREQUENCY RANGE (COIL SET) EMPLOYED AT THE STATION. Once the Shifter is peaked on the highest frequency range, no further adjustments should be necessary when lower frequency coils are used. It is ABSOLUTELY UNNECESSARY to re-align the **Signal Shifter** when changing from one coil set to another providing the unit has been aligned for maximum output on the highest frequency range employed at the station.

NEUTRALIZATION

Neutralization of the 6L6G amplifier is required when any one of the following coil sets is used:—

18-3321	18-2915
18-3322	18-2951
18-3323	18-2952
18-3324	18-2953

Neutralization procedure is as follows: Turn the front panel switch to "Stand-By". Then carefully adjust the neutralizing condenser (C-15 on Fig. 1), using a long screw driver inserted through the chassis hole indicated. Adjust for MINIMUM GLOW in a small neon bulb held against the top lug of main gang condenser, section C3. This lug is pointed out by an arrow in Figure 1 and is labelled point "N". A neon bulb is a good indicator for determining the condition of neutralization, since with the front panel switch in "Stand-By" position and the keying circuit CLOSED (Key Down), almost no glow should be visible when the 6L6 is neutralized. If a bright glow does occur, adjust the condenser (C-15) until the neon bulb goes out or becomes dim.

Neutralization is not required with any coil sets other than those specified at the start of this section.

When tubes are replaced in the **Signal Shifter**, the instrument must be re-neutralized.

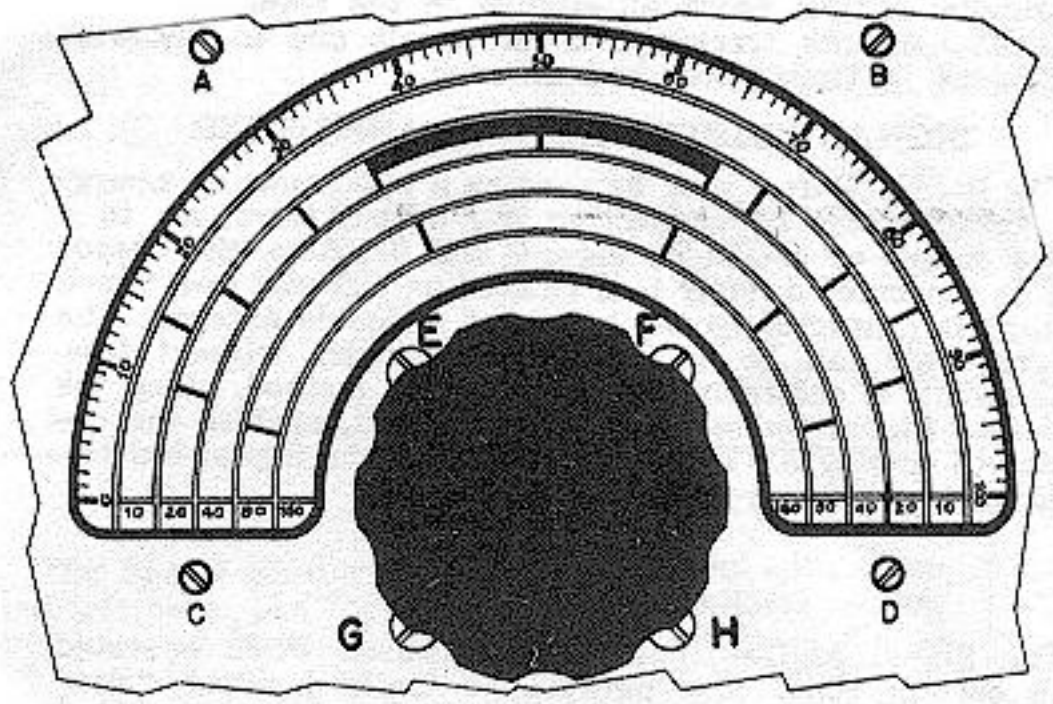

FIG. 11

DIAL SCALE CALIBRATION

The **Signal Shifter** is provided with a direct reading scale which can be easily calibrated by the individual user.

To insure the accuracy of calibration, care must be taken to permit a substantial warm-up before calibration is started. A warm-up period of 30 minutes is recommended. Whenever coils are changed, the coil shields as well as the coils proper must be firmly seated to prevent mechanical shift of the oscillator frequency. Actual calibration can be made by any standard frequency-checking procedure as outlined in radio technical handbooks, using a heterodyne frequency meter of known accuracy or a precision type frequency standard such as the Meissner crystal controlled **Signal Calibrator.**

Assuming the Signal Shifter has been allowed to warm-up for 30 minutes, the actual process of dial calibration can begin. First, remove panel screws "A" and "B" and loosen panel screws "C, D, E, F, G and H". These screws are clearly shown in Figure 11. Now remove the transparent sheet of "plastacelle" which covers and protects the scale. Removal is accomplished by pulling the sheet upward and out from its position between the scale and front panel. When the transparent sheet is removed, replace panel screws "A" and "B" and tighten all eight screws (A-B-C-D-E-F G-H) firmly in place. In tightening these screws, make certain the dial scale is properly centered in normal position behind front panel cut-out.

Since the calibration process is the same for all coil set ranges, Coil Set No. 18-2957, having a range of 5,480 to 6,470 kc. is used in the following paragraphs as a typical example of calibration procedure.

First, carefully tune the station receiver to the frequency corresponding to the low frequency limit of Coil Set No. 18-2957 which is 5,480 kc. It is highly advisable not to depend upon the calibration of the receiver itself but to insure the accuracy of the 5,480 kc. point by using a good heterodyne frequency meter or crystal controlled frequency standard.

Second, tune the **Signal Shifter** to ZERO BEAT with the 5,480 kc. setting of the receiver. If the adjustments made in both the receiver and **Signal Shifter** were carefully made, the **Signal Shifter** pointer indicates 5,480 kc. and this point may now be marked on the dial scale. Ordinary black fountain pen ink or pencil may be used to mark the scale. Extreme care should be used in marking the scale. If a line is drawn to mark a point, the line shoould follow the angle of the pointer line. See Figure 11. NOTE: if the scale is slightly "oily", it will not "take" ink readily. For this reason, the points where the marker lines are placed should be cleaned with ordinary "art gum", obtainable at any stationery store. Use care in cleaning with art gum and do not rub over the printed scale markings. Clean only the clear spaces where personal marks are to be made. If an error is made in marking, erase with an ordinary pencil eraser. DO NOT RUB OVER THE PRINTED SCALE LINES.

The procedure employed to locate the 5,480 kc. point on the Signal Shifter scale may be used to locate all other desired points over the coil range. Namely, tune the station receiver to the desired frequency, making certain the receiver point is accurate, tune the Signal Shifter to zero beat with the receiver and mark the indicated point on the dial

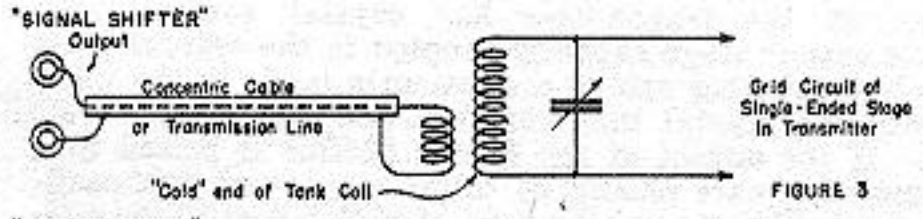

FIGURE 3

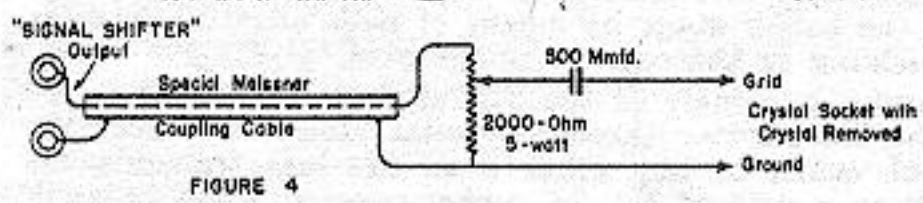

FIGURE 4

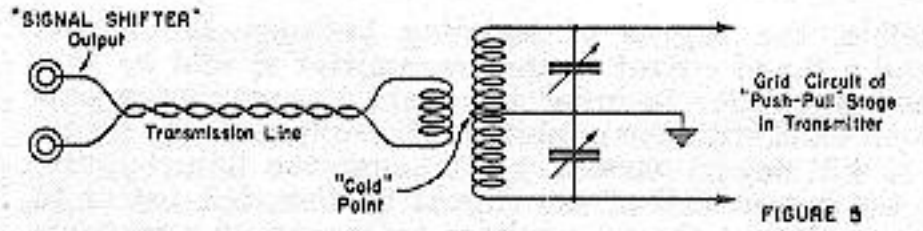

FIGURE 5

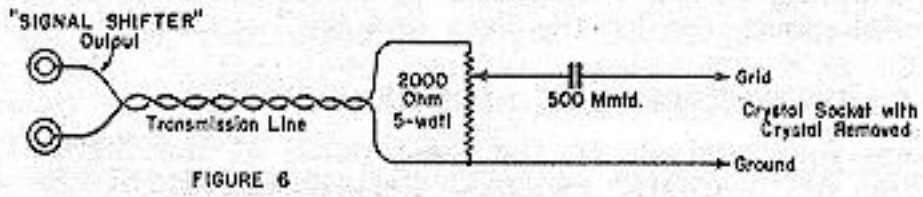

FIGURE 6

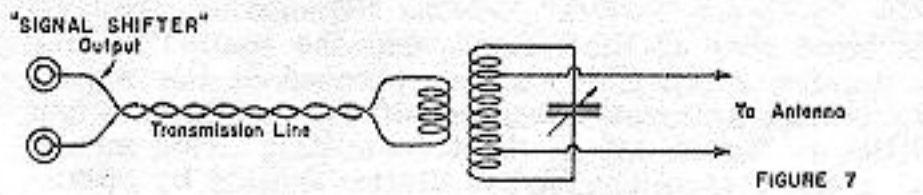

FIGURE 7

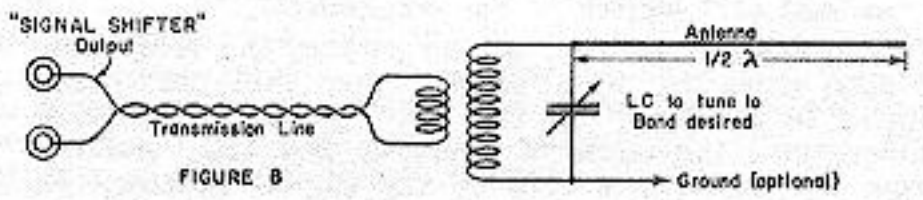

FIGURE 8

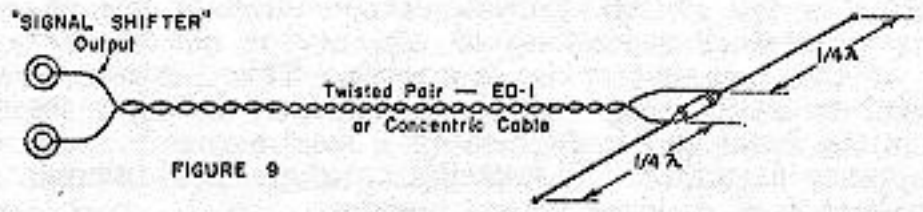

FIGURE 9

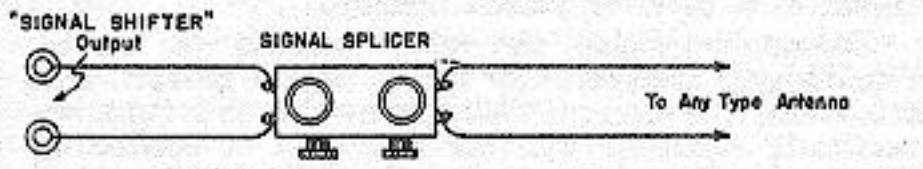

FIGURE 10

scale. Any number of points may be marked on the scale; Range limits, 100 kc. points, 50 kc. points, 10 kc. points, etc. The points may be identified by appropriate figures or wording, carefully printed on the scale by the operator. A "messy" job will ruin the appearance of the attractive **Signal Shifter** dial scale and dial calibration should be made with care and preciseness. Many operators do a good calibration job by first making temporary markings with pencil and after all marks have been made in this manner, removing the scale from the panel and making PERMANENT markings in INK, while the scale is resting on a desk or table.

When the calibration process is completed and the ink has been permitted to dry, the scale and transparent covering may be re-mounted behind the panel. This process is simple enough and the only necessary precaution to follow is to see that the scale occupies EXACTLY THE SAME POSITION as it did while being calibrated!

The high frequency end of each coil range is found between 80 and 95 on the Signal Shifter dial scale. If this point is found elsewhere, the band setting condensers should be readjusted in the manner described in the paragraphs headed "Adjustment".

Calibration should be re-checked at frequent intervals and must positively be checked whenever tubes are changed or replaced.

COUPLING TO THE TRANSMITTER

After the Signal Shifter has been adjusted, aligned, and calibrated, it is then ready to be coupled to the transmitter. This may be done by any of the standard methods of coupling. In a medium or low power transmitter, the Shifter may be link-coupled to the grid coil of the output stage in the transmitter. The exciter may also be coupled by means of a link to the buffer stage of the transmitter or the grid

or plate circuit of the tube previously used as a crystal oscillator. If the transmitter has crystal control with grid of the output stage capacity coupled to the crystal plate tube, the link-coupling can be conveniently made to the plate circuit with the crystal tube removed and the plate circuit re-tuned. If the output of the **Signal Shifter** is linked to a buffer amplifier, care should be taken to prevent self-oscillation in the buffer stage by means of neutralization or adequate shielding in the case of screen-grid tubes.

The output terminals of the **Signal Shifter** may be coupled to the transmitter through special Meissner concentric cable, E01 cable, or any other good low-loss transmission line, such as a pair of No. 14 rubber-covered wires twisted loosely.

If possible, the degree of coupling between the **Signal Shifter** and a tuned circuit in the transmitter should be varied at the transmitter in order to obtain the maximum output for each band with the minimum of coupling to the transmitter. It will not be necessary to change the link-coupling turns on the output coil of the **Signal Shifter**, but better to vary the coupling at the transmitter by means of a variable coupling link-circuit or by the "cut and try" method.

CONTROLLING THE SIGNAL SHIFTER

There are four controls on the front panel of the Signal Shifter, the AC "On-Off" switch... (left hand side of the panel), the "Selector Switch", ...the "Operating Switch" ... (right hand side of the panel), and the main "Tuning Dial". A standby relay (RL) is incorporated in the **Signal Shifter** to permit automatic standby of the oscillator when the amplifier is turned off in the transmitter. This means the operator can control the **Signal Shifter** merely by operating the **"on and off" switch of his transmitter.**

In the "Automatic" position of the switch, the relay contacts are open when the "final stage" is on, thus permitting the oscillator to function. In the "On" position, the relay is held down with the contacts open, by the 110 volts obtained from the power-line cord of the Signal Shifter. In this position of the switch, continuous operation of the oscillator is maintained regardless of whether or not the remainder of the transmitter is operating. This feature is very useful in calibrating the **Signal** Shifter, locating its position in the band and in furnishing a local signal for use as a frequency standard. The oscillator alone will furnish a weak signal in a receiver placed nearby.

In the "Standby" position, the relay contacts are closed, thus short-circuiting the oscillator in the **Signal Shifter.** Due to circuit balance, the current flowing in the 6F6 tube remains practically constant whether the tube is oscillating or not, thus preventing drift during the "Standby" period. The tube is thus kept at a constant temperature permitting instantaneous use of a desired frequency without warm-up or re-setting of the frequency control.

ADJUSTING TRANSMITTER TO SIGNAL SHIFTER

After coupling the exciter to a transmitter an adjustment should be made in the transmitter to provide efficient energy transfer from the **Signal Shifter.** While the basic idea of the **Shifter** is to provide single-dial, bandspread control of transmitter frequency, it is obvious that complete single-dial control (with all circuits in the transmitter and antenna net-work tracking) is impossible due to the wide variations in transmitter and antenna.

SIGNAL SHIFTER AS A TRANSMITTER

The **Signal Shifter** may be used as a low-power or emergency transmitter by connecting the output terminals to a tuned circuit as shown in Figs. 7 and 8. Also, the output can be connected directly to a twisted pair feeder line, which in turn is connected to the center of a double antenna. The twisted pair can be of any normal length, without loss. This circuit is shown in Fig. 9. Another method, using the Meissner **Signal Splicer** as a coupling unit, enables the operator to employ ANY type antenna with the Signal Shifter. This arrangement is shown in Figure 10.

—IMPORTANT— READ CAREFULLY!

The Signal Shifter must be neutralized when operated with certain coils. See paragraphs under heading "Neutralization".

The **Signal** Shifter must not be turned "on" when the coils are out of their sockets.

The **Signal** Shifter is designed to produce a T9-X signal. Failure to obtain a pure signal may usually be traced to a defective 6F6G oscillator tube. Replace the bad tube immediately.

The **Signal** Shifter incorporates a well designed key click filter. However, the presence or absence of "clicks" depends largely upon the manner in which the amplifier stages, following the **Signal Shifter,** are biased. See comprehensive articles on this subject, page 17, April 1941 QST.

Adequate ventilation in **Signal Shifter** cabinet is important. It is best not to cut off ventilation on the sides and top of cabinet ... especially the top.

If **Signal** Shifter output is normal on one band but far below normal on another band, it is logical to suspect the condition is caused by a partially defective coil or coils. The suspected coils should not be tampered with but returned to the factory for repair or replacement.

In case of trouble, carefully re-read this entire instruction folder. A faulty condition can often be caused by some point that has been overlooked in the preceeding sections.

IMPORTANT NOTICE

Due to the shortage of metal tubes, the Meissner **Signal Shifter** is equipped with a glass 6F6G and a glass 6L6G in place of the previously used metal tubes, 6F6 and 6L6. If the glass tubes are ever replaced with metal tubes, they must be replaced in pairs. When metal tubes are used, the 10,000 ohm Resistor (R15), which is connected directly across the 30,000 ohm Resistor (R11), should be removed, permitting only R11 to remain in the circuit. The 10,000 ohm Resistor (R15) is required only when glass tubes are used.

"SIGNAL SHIFTER" REPLACEMENTS PARTS LIST

Circuit Designation	Meissner Part No.	Description
C1, C2, C3	15176	3-Gang Special Tuning Condenser
C4	15177	Oscillator Grid-Tank Condenser
C5	15240	Oscillator Plate-Tank Condenser
C6	15260	Buffer Plate-Tank Condenser
C7, C9	14101	100-mmfd., Mica Condenser
C8, C10	14100	500-mmfd. Mica Condenser
C14	15142	0.1 mfd., 200-volt paper Condenser
C12, C20	14110	0.01-mfd., 400-volt Paper Condenser
C13	18131	0.01-mfd., 600-volt Paper Condenser
C15	6765	Align-Aire Neutralizing Condenser
C17	17193	15-mfd., 500-volt Electrolytic Condenser
C18, C19	17192	15-500, 10-450 Electrolytic Condenser
C21	24170	Temperature Compensator
C11, C22	14181	0.05-mfd., 400-volt Paper Condenser
C23	16166	0.1-mfd., 600-volt Paper Condenser
R1	15155	40,000-ohm, ½-watt Resistor
R2	15184	400-ohm, 1-watt Resistor
R3	15183	50,000-ohm, 1-watt Resistor
R4	15182	300-ohm, 2-watt Resistor
R8	16143	50-ohm, ¼-watt Resistor
R10	17165	60,000-ohm, 5-watt Resistor
R11	17168	30,000-ohm, ½-watt Resistor
R12	17166	4,000-ohm, 10-watt Resistor
R14	17154	60,000-ohm, ½-watt Resistor
R15	14193	10,000-ohm 1-watt Resistor
CH1, CH3	19-1996	4-pie RF Choke Coil
CH4	19251	7-Henry Filter Choke
CH5	19528	2-Henry Filter Choke
CH6	19341	6-Henry Filter Choke
PT	19253	Power Transformer 110-volt
PT	19428	Power Transformer 220-volt
RL	19229	Automatic Stand-by Relay
SW1	19223	3-Position Selector Switch
SW2	19639	Eco-Xtal Switch
SW3	19539	"On-Off" AC Line Switch
2 Req	8437	Ceramic Octal Tube Socket
3 Req	17917	Aluminum Coil Shield
3 Req	25-8222	Bakelite Bar Knob
3 Req	19370	6-8 V. Pilot Light
1 Req	19806	Dial Scale
1 Req	19782	Vernier Tuning Control
1 Req	01980	Dial Pointer Assembly
1 Req	01989	Front Panel
1 Req	9510	Cabinet
1 Req	12434	Line Cord
1 Req	19470	Key Jack
1 Req	19816	Cable Socket, less shell

THORDARSON-MEISSNER

SEVENTH AND BELLMONT

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J-147-D