

by

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### Teletype System Information

An overall picture of the average small ship teletype system is shown in Figure 1.

This system will vary to some extent from ship to ship, but usually only in the manner in which the connecting leads from the various units are tied into the TT-23/SG control panel. Apparently various installing activities have different methods of connecting to the control panel according to their own local preferences, although a standard connection system is to be desired. The installations have been altered in many cases by shipboard personnel, and no explanatory diagrams prepared for aid to other repair personnel.

In any case, the method of patching used in the TT-23/SG panel will probably be more or less peculiar to any one installation. Therefore, this discussion is meant to serve as a guide to a starting point for an understanding of the workings of a shipboard teletype system.

### Transmitting and Receiving Techniques

The most commonly used methods of teletype reception and transmission are: (a) Tone keying; (b) Frequency-shift keying.

In the system of tone keying, the transmitter frequency is held constant, and the carrier is modulated by two separate audio tones, one corresponding to a "mark" (current) impulse, and the other corresponding to a "space" (no current) impulse, as seen by the receiving teletype machine. With this method, the output of the receiver is fed to a sharply-tuned filter network in the TTY converter. This filter has dual low-pass sections, one of which will pass the "space" tone and reject the "mark" tone, while the other accepts the "mark" tone and rejects the "space" tone. Thus the two tones are fed into separate channels for amplification from which they control polar relays which serve to make and break the d-c line to the printer, according to whether the received tone is representative of a mark or a space signal.

In the system of frequency-shift keying, which ships using an FRA converter employ, the transmitter is frequency modulated by the sending teletype machine through a frequency-shift converter. There is produced a resting frequency, corresponding to a mark impulse, and a slightly higher (or, in certain cases, lower) frequency, corresponding to a space impulse, as seen by the receiving teletype machine.

Output is taken from the plate circuit of the second intermediate frequency amplifier, is fed to a 6AB7 connected as a cathode follower, then through a low pass filter to the output jack, from where it is cabled to the input of the FRA converter.

The 400-kc, i-f frequency plus (or minus) the spacing frequency, is amplified in the FRA and beat against a locally-generated 400-kc signal. From there, the signal passes to a discriminator circuit which produces no output on the resting, or mark frequency, but does produce output voltage under spacing frequency conditions. This serves to produce a marking or spacing impulse by controlling an electronic keyer system using 6L6's, which make or break the d-c line to the printer in a mark or space manner.

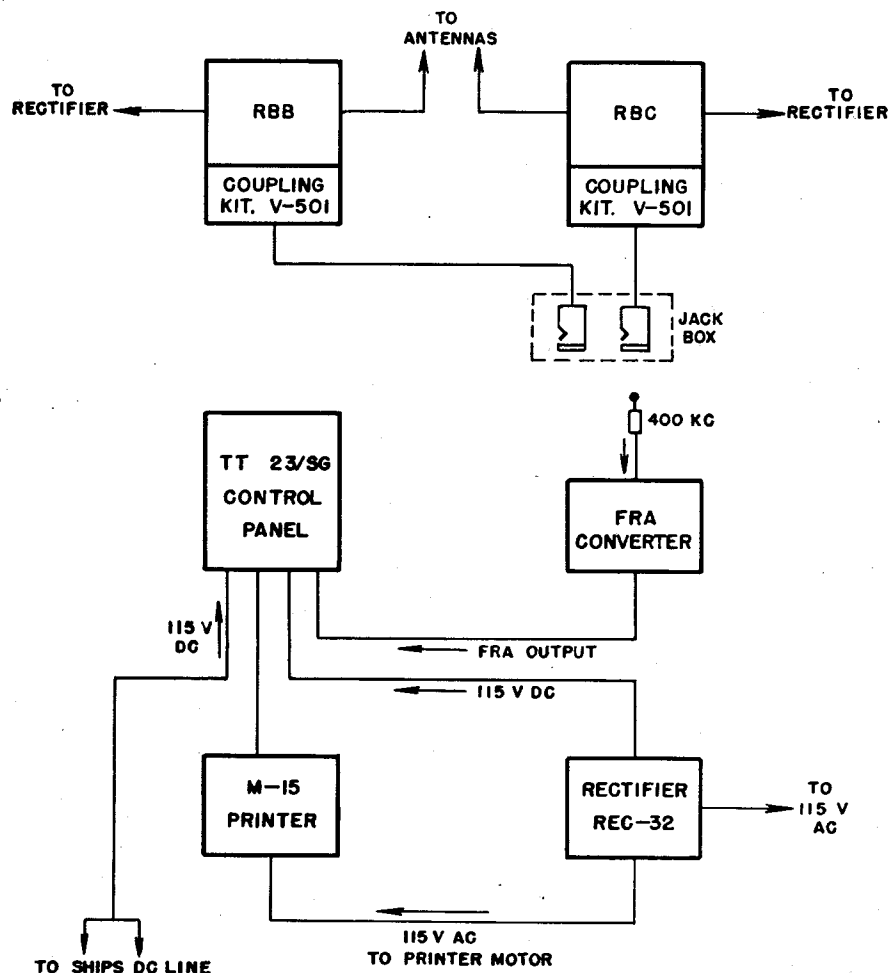
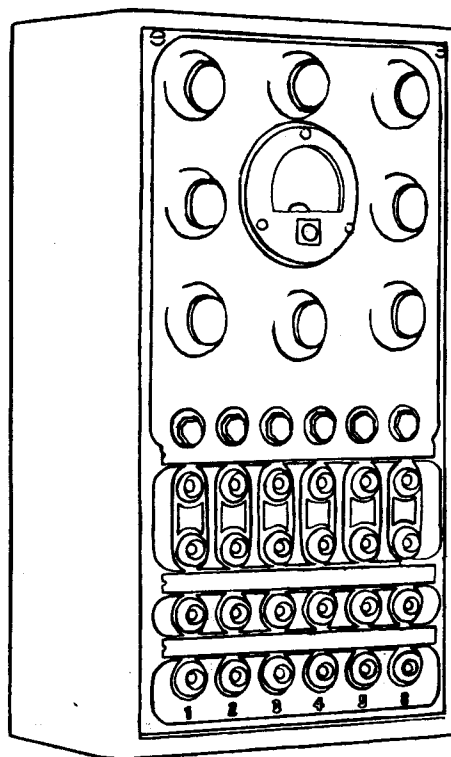
A meter and rheostat is connected to the printer circuit to control the current through the printer magnets in conjunction with the meter and rheostat in the TT-23/SG control panel.

The steady-current value of the printer d-c line, should be set to as near 60 ma. as possible, as the

printers are adjusted mechanically to operate with best results with that value of line current.

In the printer itself, a start (no current) pulse is used to trip off the machine and start the main shaft rotating in preparation for the reception of the five separate mark or space pulses. These serve to set up mechanical linkages, enabling the selection and printing of one particular character or function, (space, carriage-return, bell, and the like). After the machine has completed its selecting and printing operation, a stop (current) pulse is sent, allowing the main shaft to come to rest, and freeing the mechanical linkages from the preceding selection, so that they will be free to respond to a new character when the next start, select, stop signals arrive. This system of signalling is known as the start-stop, five-unit code, and consists of combinations of current and no current pulses in 32 arrangements corresponding to letters, figures and various machine functions.

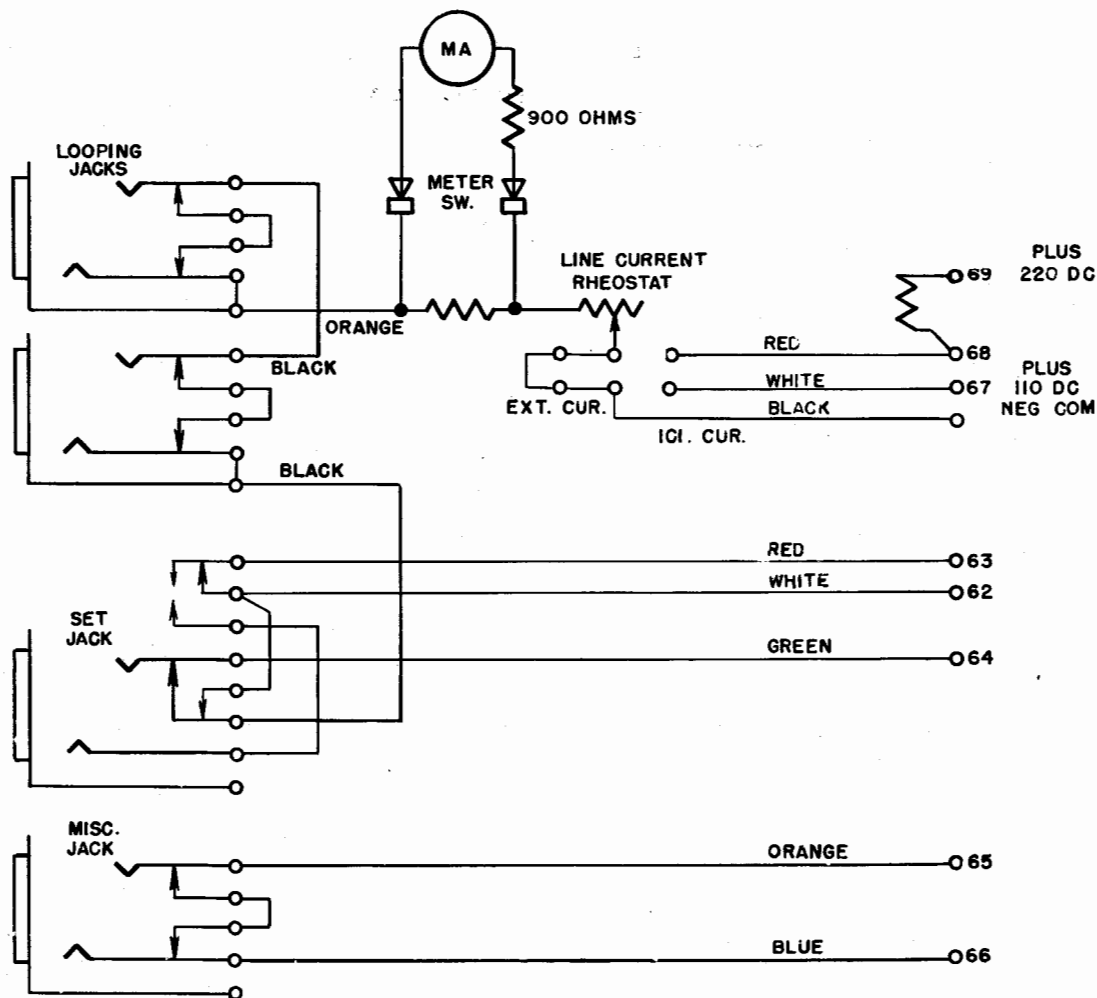
Teletype printers are precision-adjusted machines. This makes it absolutely essential that untrained personnel should not be permitted to attempt adjustments of the mechanism. Beyond the proper use of the "range-



finder", located behind the small flap-door on the left of the machine, no other adjustment should be made, except by technically-qualified personnel.

It is realized that due to the non-standard hookups of many of the TT-23/SG control panels, some changes of unit connections may, on occasion, seem desirable. This, however, should *never* be done without prior in-

A simplified diagram of one representative channel of the TT-23/SG control panel is included in this article (see Figure 2) to aid the shipboard technician in understanding the functioning of the jack system employed. This is necessary, not only because there is usually no instruction book on hand for this particular panel, but also because the main source of trouble in



MODEL TT-23/SG TTY PANEL

CHANNEL #6 SCHEMATIC

(CHANNEL TERMINALS COMMENCE WITH FIRST FIGURE OF CHANNEL USED)

FIGURE 2—Simplified diagram of one representative channel of the TT-23/SG control panel.

formation which can be secured from technicians qualified in teletype maintenance on the Staff of Commander Service Force, Atlantic Fleet, Electronic Service Group.

In any instance where such modification of a teletype installation seems warranted *due to non-standard wiring of the control panel*, a telephone call or work request to ESG should be made, and personnel familiar with teletype adjustment and repair will help solve the problems that may arise.

shipboard systems has come about because of open contacts through the jack system. This is caused by fatigue of the metal in the spring levers of the jacks themselves, and often necessitates removal of the jack and adjustment with a pair of longnose pliers. This operation, while not especially precise, is sufficiently touchy that it should not be attempted unless it becomes evident that the jack levers are making faulty contact due to loss of tension in the levers.

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