# TRUNK TRANSFER EQUIPMENT

**Bulletin 618**

AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

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# P-A-X TRUNK TRANSFER EQUIPMENT

## 1. GENERAL

The trunk transfer equipment described herein provides public exchange service to ten stations of an otherwise isolated P-A-X (private automatic exchange). This apparatus unit may be installed in conjunction with a new P-A-X installation, or it may be added to an existing P-A-X, as the circumstances dictate. However, this particular type of trunk transfer equipment can be used in conjunction only with those P-A-X's which operate on a potential of either 12 or 24 volts. The 12-volt unit is detailed in stocklist B of drawing D-210152 and the 24-volt unit in stocklist C of the same drawing.

A salient feature of this trunk transfer unit is that Central-Office services may be provided without eliminating any of the local stations. The only requirement is that those stations which are to be trunk-connected must be supplied with key-in-base Monophones as described in the following sections.

Figure 1 depicts in a general way the manner in which the P-A-X switchboard, the Trunk Transfer unit, the trunk-connected Monophones, and the Local stations are associated with each other.

The P-A-X switchboard provides means whereby any station either trunk-connected or local can communicate with any other; the Trunk Transfer unit is a means for supplying Central-Office Trunk service to certain stations of the P-A-X. The trunk-connected Monophones are connected to both the P-A-X switchboard and the Trunk Transfer unit. The local stations are connected only to the P-A-X switchboard. A maximum of nine two-key (non-secret) and one three-key (secret) may be trunk-connected. The maximum number of local stations (no-key) varies with the size P-A-X.

## 2. SPECIFICATIONS AND BLUEPRINTS

Each trunk transfer unit supplied by Automatic Electric Company is covered by a job specification in the form of a set of shipping summary sheets. This specification indicates the type of P-A-X with which the trunk transfer equipment is to operate; and includes the associated installing instructions. The specification also details the material being shipped, and lists the drawings and bulletins furnished.

The shipment should, therefore, be checked against the job specification to determine that all of the material has been received. The job specification should also be checked for installing instructions and data concerning the material, with the exception of the trunk relay unit. As stated in the preceding section, the installing instructions for the trunk relay unit are given in this bulletin (618).

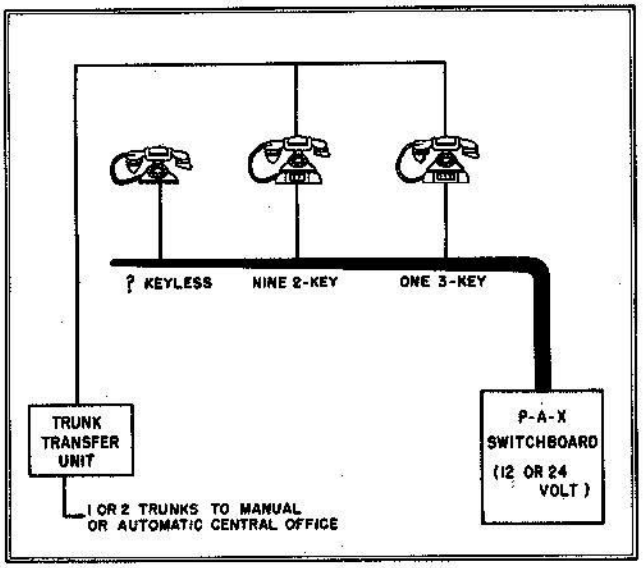


FIGURE 1

## 3. TRUNK TRANSFER UNIT AND ASSOCIATED EQUIPMENT

### 3.1 Trunk Connected Stations

Any of the stations may be arranged to answer incoming public-exchange calls, and such calls may be transferred to any of the local stations similarly arranged. These stations have access to both central-office trunks for originating calls.

### 3.2 Telephones

Stations equipped to answer and originate public-exchange calls, and for transferring these calls to other similarly equipped telephones, are provided with Monophone desk sets which are mounted on a sub-base. The sub-base contains two lever-type, locking keys (one for each central-office trunk), excepting at the station arranged for secret service operation where three keys are required. The third key is for disconnecting the engaged trunk from all other stations, thus assuring non-interference on toll and important trunk calls.

The keys are interlocked with the Monophone switch, and are restored to normal when the hand unit is placed in its cradle at the completion of a call. It is therefore, not necessary to check the position of the key levers before originating or answering a call.

The non-locking push button key in the top of the sub-base, and to the right of the lever keys, is used for "flashing" the central-office operator, when the P-A-B-X is connected to a manual exchange; or for releasing an incompleted connection, when the trunk-lines terminate in an automatic central office.

### 3.3 Trunk Signals

Conveniently located ringers associated with each trunk-line are regularly employed for indicating incoming trunk-line calls. Bells of different tones are generally used for the two trunks, in order to identify the trunk to be answered.

When desired, multiple lamp signals (operated by a relay associated with the trunk) may be employed for identifying the individual trunks. Colored lamps (or opals), corresponding with the color of the trunk key escutcheons, are preferable, i.e., red signals for the first trunk, and green for the second trunk.

### 3.4 Trunk-Transfer Unit

The trunk transfer unit consists of two standard relay base plates mounted side by side on cross angles, top and bottom. Two similar angles are attached, as shown in Fig. 2, for fastening to a mounting surface; they serve as hinges when it is desired to inspect the wiring in the rear.

Figure 2-A is a view of the trunk transfer unit with the metal dust covers on. Fig. 2-B illustrates the unit less covers.

The relays are mounted on the left-hand base. Each two-key station has an associated relay which serves to switch the telephone circuit from one trunk-line to the other. The three-key station has, in addition to the relay previously described, two other relays which serve to disconnect one or the other of the trunks from the remaining trunk-connected telephones.

The relays for the nine non-secret trunk-connected stations are designated B1 to B9; and the relays for the three-key secret-service station J, L and M respectively.

Directly below the relays is mounted a cartridge-type fuse for fusing the negative power-supply lead.

A 4 x 15 screw-type terminal strip is mounted on the right-hand base. It provides termination for the wiring of the trunk-lines, the trunk-connected telephones, and the current supply leads. The left-hand side of the terminal is wired to the relays, and the right-hand side is reserved for the wiring from the telephones and trunk lines. The wiring from the outside is brought in from the rear of the base and thru the lower opening in the plate, where it is distributed over the various terminals.

### 3.5 Wiring Diagram

Figs. 3 and 4 show the wiring diagram of the trunk relay unit. Fig. 3 shows the arrangement for 12-volt operation; and Fig. 4, for 24-volt operation. The difference between the two figures is merely the resistance values of the relay windings as listed in the table in the center of the diagram.

### 3.6 Power Supply

The trunk relay unit is designed to operate from the power supply of the associated P-A-X. Two terminals located near the bottom of the terminal strip and designated -MB and GRD respectively, provide facilities for connecting the power supply.

## 4. INSTALLATION

### 4.1 Trunk Transfer Unit

The trunk transfer unit may be mounted on a convenient wall or post in a vertical position. However, it should be located as near as practicable to the P-A-X switchboard to centralize the location of the automatic telephone equipment and to reduce the length of the power supply leads.

The top and bottom outside angles should be permanently attached to the mounting surface. These two angles serve as hinges when it is desired to obtain access to the rear of the relay unit, since top and bottom angles of the unit are bolted at each end to the mounting angles. The removal of the bolts at either end permits the opposite end to be swung away from the wall or post.

Two B.R.C. wires of sufficient capacity should be run from the P-A-X power supply to the two screw terminals mentioned in the sub-section 3.6. The cartridge fuse on the relay unit should be removed temporarily until the installation work is completed.

Care should be taken to see that the relays of the trunk unit are of the proper resistance for the power supply.

### 4.2 Connecting Telephone Stations

Each station which is to have trunk service is equipped with a Monophone as indicated in sub-section 3.2 depending upon whether the station is to have secret or non-secret service.

When a two-key (non-secret) Monophone is used, four conductors to the relay unit terminal strip are required in addition to the line wires to the P-A-X switchboard. These four conductors

are connected to terminals T1, T2, TA and GRD of the relay unit - circuit #1 is connected to terminal row #1, circuit #2 to terminal row #2, and so forth until circuit #9 is connected to terminal row #9.

When the three-key (secret) Monophone is installed, five conductors to the relay unit terminal strip are required in addition to the line wires to the P-A-X switchboard. These five conductors are connected to terminals T1, T2, TA, T, and GRD of the relay unit.

4.3 Trunk-Line Signals

Incoming trunk-line calls are signalled by means of alternating-current telephone ringers associated with each trunk. A condenser of 1 M.F. (or less) capacitance is connected in series with the ringer coils. These ringer boxes, which are not supplied with the trunk-transfer unit unless otherwise specified, should be suitably located so as to be audible at several or all stations. In case one signal will not suffice for all stations, additional ringers, connected in multiple, in series, or in series-multiple, as required, should be used. However,

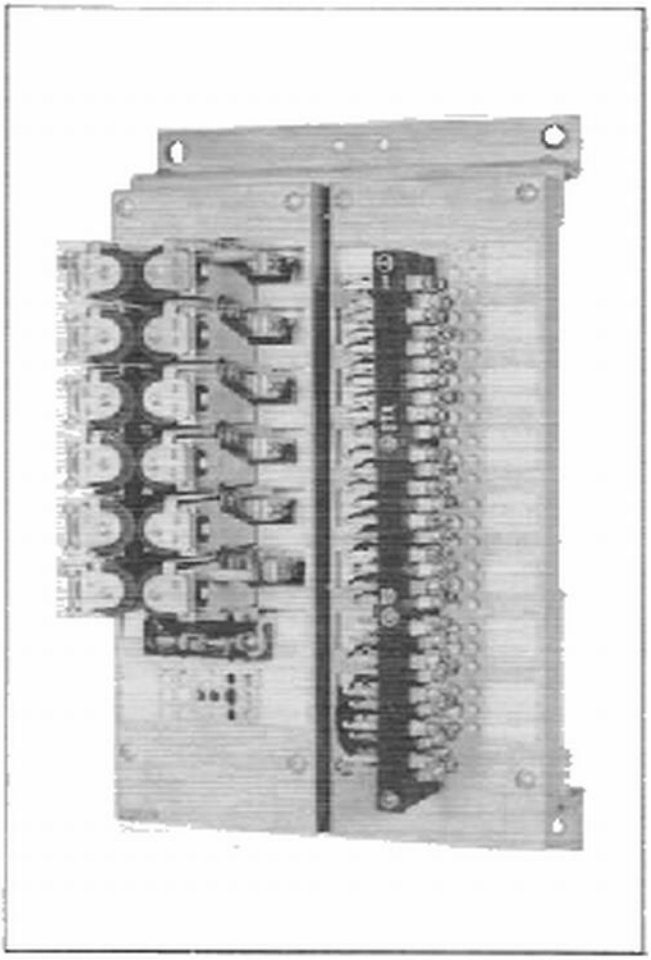

FIGURE 2B

FIGURE 2A

the combined capacitance of the associated condensers should not exceed 3 M.F. per trunk when the trunk-lines terminate in an automatic public exchange.

Conditions may exist where both audible and visual signals, such as lamps, are required. In such cases, a lamp per trunk may be installed at each telephone, or may be located so as to be visible at several or all stations. Any suitable style of lamp and lamp fixture may be employed and, likewise, any available current supply (excepting 12-volt current) may be used to light these signal lamps. When commercial power supply is used, it is recommended that a low voltage transformer be utilized to step the voltage down to not more than 25 volts in order to avoid the necessity of installing Underwriter's wiring; and that lamps of a similar rating be used.

A suitable alternating current relay, or contactor, having a 1 M.F. condenser connected in series with its winding, is required per trunk when trunk identifying lamps are employed.

These relays and associated condensers may be located adjacent to the switchboard or at any location conveniently accessible for wiring to the trunk-lines.

### 4.4 Connecting Public-Exchange Trunks to Relay Unit

The two public-exchange trunk circuits are connected to the - and + terminals in the 11 and 12th terminal rows designated TRK 1 and TRK 2 respectively. The trunk signals may also be connected to these terminals. When an alternating current relay is used for completing circuits to the trunk-line signals, the relay should be connected across its respective trunk terminals.

## 5. METHOD OF OPERATION

### 5.1 Local Calls

When the trunk keys of the ten stations associated with the trunk relay unit are in the normal position, the stations are connected directly to the P-A-X switchboard. Outgoing and incoming calls to and from the P-A-X may therefore, be made and received at these stations as long as the trunk keys are left undisturbed.

### 5.2 Outgoing Calls to Public Exchange

To originate a call to the public exchange, lift the handset from the cradle and then operate one of the trunk keys (the red key is associated with the first trunk and the green key with the second trunk). Listen on this trunk to determine whether it is idle or in use before proceeding with the call. If the trunk is engaged, restore that trunk key and operate the other trunk key.

In the event the trunk-line terminates in a manual central office, transmit the calling number to the operator in the usual manner. Should the operator make an error in establishing the connection, slowly depress the push button several times (without restoring the handset or the trunk key) to "flash" the operator.

If the trunk-line terminates in an automatic central office, wait until "dial tone" is heard, then proceed with the call by dialing the directory number of the wanted subscriber. In case an error is made in dialing, depress the push button for one second (to release the established connection), and then correctly dial the desired number.

Disconnection is accomplished in either case, by restoring the handset to the cradle.

### 5.3 Incoming Calls from Public Exchange

On incoming calls from the public exchange, the individual trunk is identified either by the tone of the trunk-line bell. or by the color of the associated trunk signal lamp (if employed). To answer an incoming call, first remove the handset of any station equipped to answer trunk calls. Then operate the key associated with the trunk-line over which the call is received; that is, operate the red key if the call is on the first trunk, and the green key if on the second trunk.

### 5.4 Transferring Incoming Call from Public Exchange

When an answered call from the public exchange is for another station equipped with trunk keys, the call may be transferred to the second station as follows:

Restore the trunk key, without replacing the handset on the cradle. This action places a "holding" bridge across the trunk circuit to prevent disconnect supervision being given to the public exchange. The restoring of the trunk key also connects the telephone to its P-A-X line circuit.

Next, dial the number of the desired station. When the called station answers, instruct the answering party to "take" the trunk call by operating the red or green trunk key, as the case may be. Then re-operate the trunk key (at the first station) to determine that the second station has "picked up" the trunk call. When the trunk call has been connected to the second station, restore the handset at the first station.

An incoming call may be successively transferred from one station to another; or, two or more stations may engage the same call, provided that the party at the secret-service station (three keys) does not operate the third (orange) key.

### 5.5 Secret Service

To secure secret service on either outgoing or incoming public exchange calls at the three-key station, operate the third (orange) key. This may be done at any time, either before or during conversation. However, on incoming calls which have been transferred to the three-key station, it is preferable not to operate the orange key until after conversation has started, in order to permit the person extending the call to check the transfer.

## 6. RELAY ADJUSTMENTS

The relays in the trunk unit were properly adjusted before shipment, and should operate for a long period without attention. When adjustment becomes necessary, the manufacturer will gladly supply information upon request.

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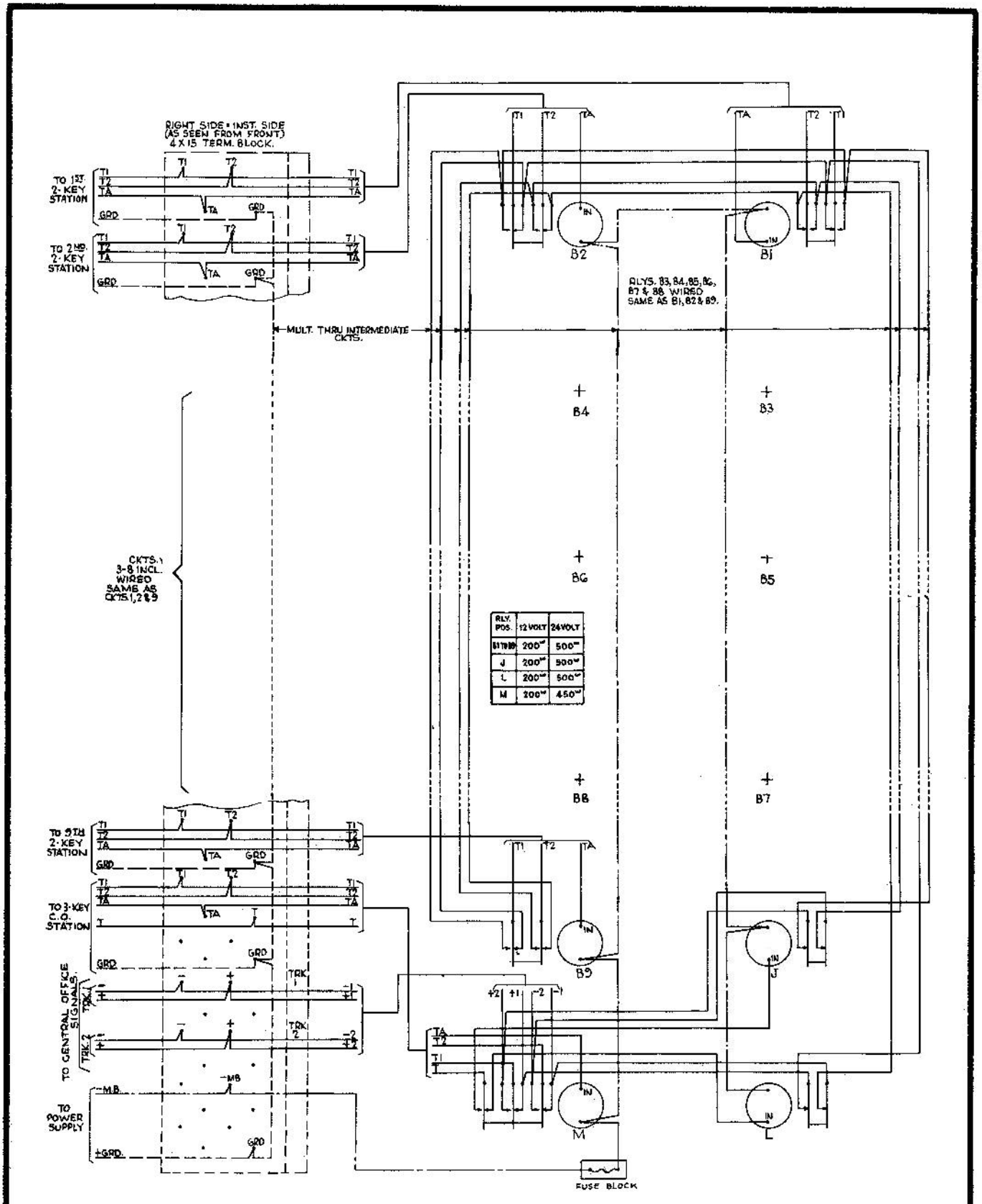


FIG. 3 (12 VOLT)
FIG. 4 (24 VOLT)

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