

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Data Stations**

**ADDENDUM P31.301**  
**Issue 1, September, 1959**  
**AT&TCo Standard**

# **INSTALLATION OF RADIO FREQUENCY INDUCTION SUPPRESSION FILTERS ON TELETYPEWRITERS AND ASSOCIATED EQUIPMENT**

## **1. GENERAL**

1.001 This addendum supplements Section P31.301, Issue 3.

1.002 This addendum is issued to add Part 4, SUPPRESSION OF RADIO FREQUENCY INDUCTION AT TELEVISION FREQUENCIES.

## **4. SUPPRESSION OF RADIO FREQUENCY INDUCTION AT TELEVISION FREQUENCIES**

4.01 Signal generators of 28 apparatus are factory-equipped with radio frequency induction suppression filters which are effective at both radio and television frequencies.

4.02 Radio frequency noise radiated from the selector coils may be reduced by inserting a 0.01 mf ceramic disc (or equivalent) capacitor between the "plus" terminal of each selector coil and frame ground.

4.03 A means of reducing radio frequency noise radiated from the 255A line relay is described in 3.05.

4.04 All components of a set should have good metal-to-metal contact. This can be improved by removing any paint or anodizing coatings which may prevent good grounding. Metal ground straps interconnecting the various frames may also be used.

- 4.05 Any current breaking contacts should be filtered.
- 4.06 To suppress conducted interference, adequate line filters such as TP151988 (ac power filter) and TP154651 (dc signal line filter) may be used on 28 apparatus. The TP154651 filter with 0.1 mf capacitor is not so good for radio frequencies but is good at signaling frequencies. With 0.5 mf capacitor it is not so good at signaling frequencies but good at radio frequencies.
- 4.07 Since it is very difficult to cover all possible sources of interference, it is suggested that unusual cases should be referred along the usual channels of engineering organization.

ASSOCIATED EQUIPMENT  
IN TELECOMMUNICATIONS AND  
COMMUNICATIONS ENGINEERING  
DEPARTMENT OF RADIO FREQUENCY  
INDUCTION

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INDUCTION

**BELL SYSTEM PRACTICES**  
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**SECTION P31.301**  
**Issue 3, July, 1959**  
**AT&TCo Standard**

# **INSTALLATION OF RADIO FREQUENCY INDUCTION SUPPRESSION FILTERS ON TELETYPEWRITERS AND ASSOCIATED EQUIPMENT**

## **1. GENERAL**

1.01 This section covers the general features of the installation of radio frequency induction suppression filters on teletypewriters and associated equipment.

1.02 This section is reissued to bring the instructions for wiring into agreement with the provisions of the National Electrical Code.

1.03 Whenever electrical contacts in a teletypewriter circuit are made, or broken, oscillations are set up which may cause objectionable noise currents in the circuits of nearby radio receiving sets. Such induction can be greatly reduced by suppressing the flow of the disturbing currents in parts of the teletypewriter circuit to which the radio circuits are exposed, or which might act as antennas to radiate energy. Filter circuits to accomplish this suppression consist generally of inductors, or resistors, in series with the contacts to impede the high-frequency currents; and capacitors connected across the contacts to bypass radio frequency currents.

1.04 Filter circuits have been designed for the various contacts in teletypewriter apparatus and for the power supply leads to the teletypewriter set. The filters are mounted on suitable brackets so that they can be conveniently installed.

1.05 Satisfactory suppression of radio frequency induction, from teletypewriters and associated equipment, should usually involve nothing more than careful installation of the appropriate filter units, and interconnecting (bonding) the several equipment units of the particular installation. This



section outlines general principles which, when applied, should assure desired results in practically all installations. Instances may be encountered in which recommended measures do not afford a satisfactory degree of suppression, possibly due to an unusual layout of equipment and wiring. In such cases the problem should be referred along the usual channels of organization.

1.06 A list of available radio induction suppression filters, together with the P section covering the installation information for each filter, is provided in Section P31.320.

## **2. CONNECTION OF FILTER UNITS**

2.01 Wherever practicable the filter units are furnished with the proper length of connecting leads. It is of primary importance that the input leads to the filter be kept as short as practicable, and be run direct. The filter leads should not be sewed into form wiring, and should be kept clear of adjacent wiring by a space of at least 1/4 inch.

2.02 It is essential that the mounting screws, which secure the filter bracket to the teletypewriter, be tight and make good electrical contact.

### **Exposure between Teletypewriter and Radio Receiver Circuits**

2.03 It is desirable, particularly where the teletypewriter loop runs within a few feet of the antenna or antenna lead to the receiver, to maintain as near a right angle relationship between the two as practicable. Consideration should be given to rerouting the run of the loop wiring if greater space separation appears to be required. The inductive relation between the antenna and entrance wiring should not be overlooked, particularly if overhead drop wire makes the connection of teletypewriter circuits from the pole to the building. It is preferable that the teletypewriter and radio set be served from separate power circuits, but in any case they should be served from different outlets.

## **3. SHIELDING OF EQUIPMENT AND WIRE**

3.01 The use of lead covered cable for loop circuit wiring is recommended in all cases where radio interference suppression is required. The lead cable should be carried right up to the teletypewriter table. It may be desirable under circumstances of severe exposure to use shielded loop wiring in the teletypewriter table but this should not ordinarily be necessary. If shielding is required, shielded wire per P-246314, or equivalent, should be used. Refer to Fig. 1.

3.02 For grounding the shield of the line cord when a shielded cord is required, proceed as follows:

- (a) Strip away about an inch of the braided cotton cover near the connector end so as to expose the shielding.
- (b) Unravel the exposed shielding down to the cotton braiding.
- (c) Pull the unraveled shielding to one side of the cable and twist into a single strand wire. The strands may be secured with solder.
- (d) Connect one end of a piece of tinned stranded jumper wire to the twisted shielding and solder.
- (e) Connect the other end of the jumper wire to the frame ground screw lug located on the right-hand side of the base in front of the TTY terminal board. This grounds the shield through the frame which, in turn, is grounded through the power cord.

3.03 In some cases it will be necessary, in order to obtain adequate suppression, to bond the teletypewriter cover to the frame. This may be done by providing a flexible lead, not over 4 inches long, to make the connection. A TP102940 ground lead may be used. The flexible lead should be fastened, at one end, under one of the screws which holds the padding to the cover; and at the other end to a convenient nut on the frame. The bond should be made at a point easily accessible upon opening the cover. The bond will be necessary on all governed motor sets causing induction. With synchronous motors the bond should be provided if tests indicate that the induction is too great without it.

3.04 The frame of the rectifier, or other associated equipment units, should be bonded to the outlet box ground lug using as short a lead as practicable. If more than one equipment unit is associated with the teletypewriter each of the associated units should be connected to the outlet box ground lug. Series bonding connections should be avoided, such as connecting the frame of one unit to another which is in turn connected to the central bonding point. If the associated units of equipment are not located on the teletypewriter table, but are some distance away, it would be desirable to run separate leads from their frames directly to ground rather than to run a long bonding lead. An illustration of typical recommended bonding connections is indicated in Fig. 1. It will be noted that mutual bonding impedances are avoided in the example by bonding the frames of each of the equipment units to a central point on the outlet box. It may also be noted that the teletypewriter frame is normally connected to the outlet box through the power cord.

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SUPPRESSION FILTERS ON

**P31.301**

TELETYPEWRITERS AND  
ASSOCIATED EQUIPMENT

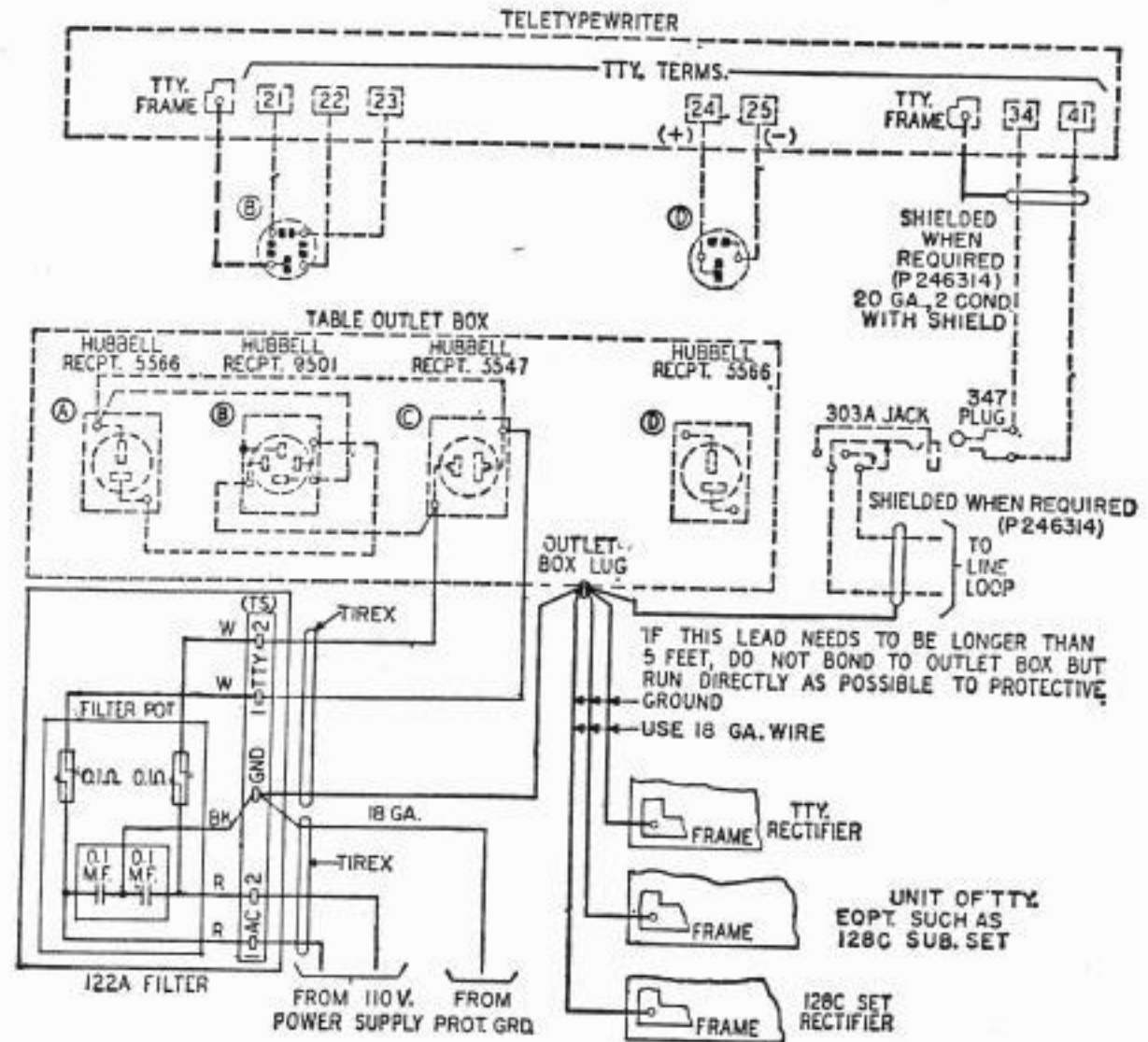


Fig. 1

3.05 In extreme cases, where the teletypewriter must be operated in close proximity to high-frequency radio equipment and where installation of the recommended filters does not provide adequate suppression, it is possible that radio frequency noise is being radiated from the 255A line relay. This noise may be reduced by using a metal relay cover and providing a lead from the cover locking plate to pin 8 of the relay base. Pin 8 of the relay connecting block must in turn be connected to ground.

**Grounding**

3.06 The protective ground, as illustrated in Fig. 1, should be provided in all cases where suppression filters are installed. In other situations, where suppression filters are not installed, the protective ground should be provided as required by underwriters' rules.



3.07 An installation may be encountered in which the suppression filters, over a particular range of radio frequencies, provide greater suppression without the protective ground. This may be due to the ground lead resonating at an odd quarter wave length of the frequencies involved. In such cases the suppression may be improved by changing the length of the ground lead, or by selecting a different ground. Situations of this nature will not usually be encountered except with unfavorable exposure conditions, or where the radio receiver is required to operate on weak signals.

3.08 The protective ground connection should be made to the steel frame of the building, water pipe, conduit, or other securely grounded structure using as direct a lead as practicable. Use of a ground common to that used by the radio receiver should be avoided. This may require installation of a driven ground either for the teletypewriter equipment, or for the receiver. The protective ground connection should be made with an 18-gauge wire as illustrated in Fig. 1. In addition the grounding should meet local Fire Underwriters' rules if any apply, and any rules set by local authorities.