

RESTORATION OF TELEGRAPH, TELEPHONE AND PROGRAMME SERVICES - PATCHING PROCEDURES.

(Reprinted without amendment previously E.I. TRANSMISSION Long Line Equipment A 5000 now cancelled)

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SECTION 1-GENERAL.

INTRODUCTION.

1.1 This E.I. specifies the procedure to be followed in making patches necessitated by the failure of lines and equipment used in the provision of Telegraph, Telephone and Programme services, and supersedes previous instructions on this subject.

The E.I. specifies in detail -

- (i) Type of patches to be made.
- (ii) Conditions under which each patch is to be made.
- (iii) The points in the circuit at which they are to be made.
- (iv) The method of making each class of patch.
- (v) The order in which various patches are to be made.
- (vi) The method of removing patches to restore the circuit to its original working order.
- (vii) The procedure for removing channels from telephone traffic when they are required to patch Telegraph circuits, Programme circuits or for engineering tests.

1.2 The E.I. also gives information on the allocation of patch bearers for all classes of traffic, and lists the precautions to be taken by maintenance staffs when performing line-ups to prevent unnecessary interruption of service and by line and equipment installation parties while carrying out work on working services.

2. OBJECT OF PATCHING.

- 2.1 Patching is employed to restore important services with a minimum of delay after the failure of associated lines and equipment and, in the event of failures of a serious nature, to provide a service which will meet the needs of the traffic sections most effectively. It is also employed to release a circuit for engineering tests without interruptions to traffic.
- 2.2 The methods of making patches must always be such that these objects are met and at the same time they must ensure that interruption to other services while the patches are being made is kept to a minimum.
- 2.3 The various patches which are detailed in Section 2 have been developed with these objects in view, and patches must be made in the specified manner.

3. PRIORITY OF PATCHING.

- 3.1 After a breakdown, the priority of restoration to be followed is set out below. When, special circumstances occur following a major breakdown the Assistant Director (Engineering) may authorise changes if warranted. The need for such departure from the specified order should however rarely occur.
- 3.2 In the case of either circuit failures or total breakdown, patching should be arranged to restore the various services, or to keep them in operation, in the following order of priority -
 1. Telegraph Services provided for the Department of Civil Aviation, and high speed circuits provided for the Overseas Telecommunications Commission. The V.F.T. systems over which these services operate will be indicated to each Supervising Technician concerned, and this information shall be displayed on the bay on which the patches are made.
 2. Essential Departmental and leased telegraph circuits.
 3. Essential Departmental and leased telephone circuits.
 4. Programme channels for the N.B.S. No. 1 (Interstate) Network, and one channel for the relay of the scheduled programme to Radio Australia.
 5. If after 6 p.m. E.S.T., Commercial Station Networks, all channels in use or about to be used for commercial broadcasting, and for the N.B.S. No. 2 (National) Network.
 6. Remaining Departmental telegraph circuits.
 7. Remaining Departmental telephone circuits.
 8. If before 6 p.m. E.S.T., programme channels for commercial stations and N.B.S. No. 2 (National) Network.
 9. Other leased telegraph circuits.
 10. Other leased telephone circuits.

3.3 Priority of Towns affected by Breakdowns. Groups of circuits should be restored in the following priority order -

- (i) Main interstate circuits.
- (ii) Intrastate circuits terminating in a capital city.
- (iii) Other intrastate circuits.

Exceptions to the above priority are allowed only in cases where provincial towns or centres are isolated, a condition which should arise rarely because of alternative routes.

3.4 Display. Paragraph 3 of this E.I. will be issued to all stations in poster form. This poster shall be prominently displayed in the Trunk equipment room.

4. SPECIFICATION OF PATCH CIRCUITS.

4.1 The Engineer-in-Chief will lay down the following information for all interstate services and the Assistant Director (Engineering) in each State for all intrastate services.

4.2 A first and second choice patch bearer shall be allocated for all voice frequency telegraph systems.

4.3 A patch bearer for every carrier telephone system. This shall list for each route separately the order of importance of every system and will therefore indicate the order in which systems are to be dropped from service to patch more important circuits.

4.4 Where alternate routes are available for carrier systems or other important circuits, the systems etc. which are to be patched to the alternate route in the event of failure of the main route, will be specified. This will also indicate the circuits on the alternate route which are to be dropped to allow the patches to be effected. When a patch requires application of this system of circuit priorities the traffic authorities should be consulted as the prevailing traffic may make a modification of the priorities desirable.

4.5 A first and second choice patch circuit for all programme lines will also be specified.

5. CORD TESTING.

5.1 All patch cords shall be tested prior to use.

5.2 Screened patch cords shall always be used for high frequency patching and shall be used for no other purpose.

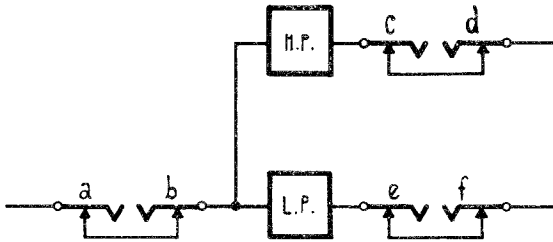
6. JACK DESIGNATIONS.

6.1 Jack designations for all telegraph normal and patch bearers shall be printed in Black on a Red background.

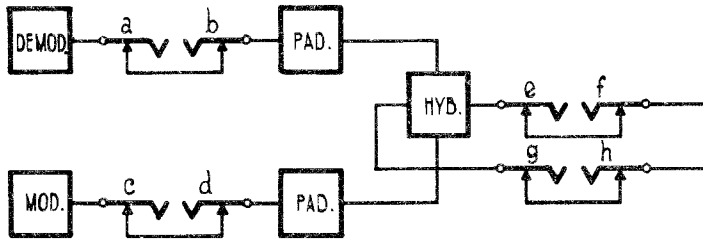
6.2 Jack designations for all programme circuits both normal and patch shall be printed in Black on a Blue background.

6.3 The designations used in this E.I. are the standard jack designations and existing designations should, where necessary, be altered to conform to the standard designations. The designations are shown in Fig. 1.

	12 CHANNEL O/W. EQUIPMENT	PROG. CARRIER EQUIPMENT	3,5 4 5-6 kc/s. LINE FILTERS
a	LINE	LINE	LINE
b	12 CHAN. FILTER LINE	FILTER LINE	FILTER LINE
c	12 CHAN. H.P.F. DROP	32 kc/s. H.P.F. DROP	H.P.F. DROP
d	12 CHAN. EQUIP.	PROG. EQUIP.	3 CHAN. EQUIP.
e	L.P.F. DROP	32 kc/s. L.P.F. DROP	L.P.F. DROP
f	3 CHAN. EQUIP	3 CHAN. EQUIP.	V.F. EQUIP.

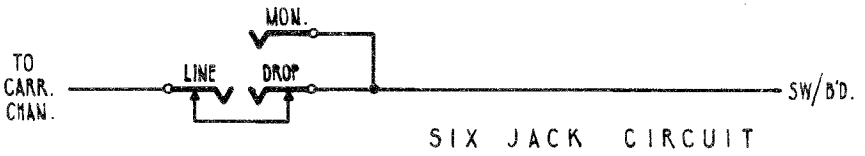
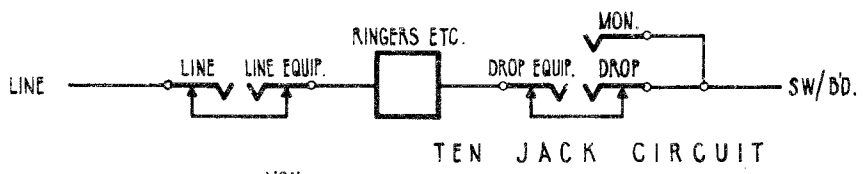


FILTER BAYS OR H.F. PATCH BAYS.

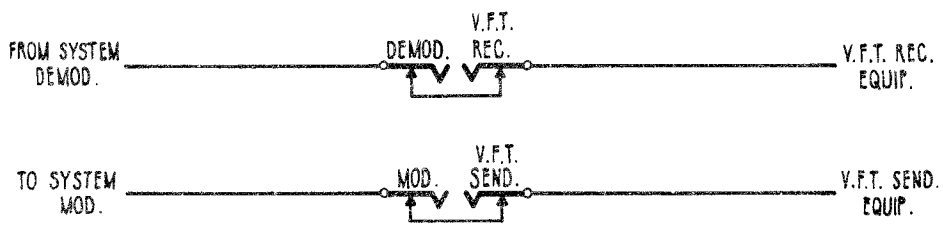


a	DEMOD. OUT
b	V.F. EQUIP. IN OR HYB. IN
c	MOD. IN
d	V.F. EQUIP. OUT OR HYB. OUT
e	HYB. LINE
f	V.F. LINE
g	HYB. NET.
h	V.F. NET.

V.F. TEST AND MON. BAY, TELEGRAPH PATCH BAY (SEE ALSO FIG. 2) OR SYSTEM CHAN. BAY.



T.T.B. OR PROGRAMME PATCH BAY.



4 WIRE PATCH BOARD (SEE ALSO FIG. 3).

FIG. 1. JACK DESIGNATIONS.

7. METHOD OF INSERTING PLUGS.

7.1 All twin plugs used in patching shall be inserted in the jacks with the serrated edge to the left or to the top.

8. PATCHING AT INTERMEDIATE OFFICES.

8.1 When patches are made at intermediate offices, the Control Station shall be immediately advised of the patches made. The Control Station shall also be advised when such patches are restored.

9. USE OF ORDER WIRES.

9.1 Where order wires are available they shall be used to contact other stations needed to complete a patch.

9.2 When no reply is received on an order wire after three minutes, a telephone channel shall be used to establish contact after obtaining approval for its use from the Telephone Traffic Section (see paragraph 11).

9.3 Where any particular station repeatedly fails to answer a call on an order wire promptly, the matter shall be reported to the responsible Engineer.

10. OFFICERS PERMITTED TO PATCH.

10.1 Where possible all telegraph and programme patches shall be carried out by or under the direct supervision of a Senior Technician or Supervising Technician.

10.2 In no case shall any patch be performed by an officer below Technician status unless he is under supervision either direct or by telephone.

11. REMOVAL OF SPEAKING CHANNELS FROM TRAFFIC.

11.1 Before any circuit, which is not a full time order wire, is removed from traffic for use as a speaking circuit while setting up or restoring patches, approval for its use shall be obtained from the Telephone Traffic Section.

12. FAULTY PATCHES.

12.1 If, after a patch is set up in accordance with the procedure laid down in paragraph 17 the required circuit re-arrangement is not obtained, the patches shall be removed. After testing all cords used, the patch shall again be set up. If this proves unsuccessful, a different circuit shall be used as the patch.

12.2 If, when restoring patched circuits, the restoration proves unsuccessful, the patch shall be immediately set up again and the cause of the unsatisfactory result found.

13. CHOICE OF SPEAKING CHANNEL.

13.1 Although it is satisfactory in some cases to use one of the channels being patched as a speaking circuit while arranging patches, under no circumstances must this be done when patching Programme or Voice Frequency Telegraph circuits.

14. BUSYING TELEPHONE CHANNELS.

14.1 Where trunk lines are connected to automatic switching equipment or to manual switching equipment with engaged test or free line signalling facilities, it is essential that any telephone channel lost as a result of patching be busied out. The method of busying the trunk circuits will be determined by the responsible Equipment Engineer.

15. DAILY CHECK OF PATCHES.

15.1 At a set time each day, preferably prior to 9 a.m., all patch bays shall be inspected and any circuits which are patched shall be checked to determine if the patches are still necessary. In cases where the need for the patch has disappeared, the patches shall be restored in accordance with the procedures for restoring patches as specified in this E.I.

16. FAULT REPORTING AND RECORDING.

16.1 This E.I. is concerned solely with patching and is not intended as a departure from the existing fault reporting and recording procedures. The existing specified fault reporting and recording procedure shall continue to be followed.

17. SEQUENCE OF ACTION WHEN PATCHING.

17.1 The following action shall be taken when it is necessary to patch a telegraph or telephone system, physical, phantom or cailho circuits :

- (i) The first choice bearer shall be checked to ensure that it is not faulty. This shall be done by monitoring the voice frequency circuit of the patch line. In the case of a V.F.T. system patch to a regulated telephone carrier system bearer it shall be done by observing the pilot indicator. If the first choice patch is faulty, the second choice patch shall be checked. If this is also faulty, a suitable bearer shall be selected.
- (ii) Where it is necessary to withdraw a telephone channel or channels from traffic, a request shall be made to the Telephone Traffic Staff to release the channel or channels.
- (iii) The distant station shall be contacted on the order wire (if provided) or, if not provided, on another telephone channel, and informed of details of the patch required.
- (iv) The patch cords shall be tested on the station Cord Tester and set up as detailed in the relevant description of individual patches in Section 2. The plugs shall be left resting in the jacks and not completely inserted.
- (v) On a count of three by the officer at the station requesting the patch, all plugs shall be fully inserted simultaneously. In the case of programme circuits a split is provided where possible from terminal to terminal as described in Section 2 paragraph 5, and this synchronising procedure described in (iv) and (v) is not required.
- (vi) The control station shall be advised of the completion of the patch (where it is not already aware) and the control station shall contact the relevant operating authority to ensure that the circuits are working satisfactorily. This may be Telephone or Telegraph Traffic Section, or the receiving Trunk Test Station in the case of programme. The Telephone Traffic Section shall be advised if any telephone circuits have been lost.
- (vii) The distant station shall be released.
- (viii) If any circuits employing ZVF signalling have been lost by completion of the patch (as where a low priority system is dropped in favour of a high priority system) they shall be cleared by transmission of the clear forward signal at the local end.

18. SEQUENCE OF ACTION WHEN RESTORING PATCHES.

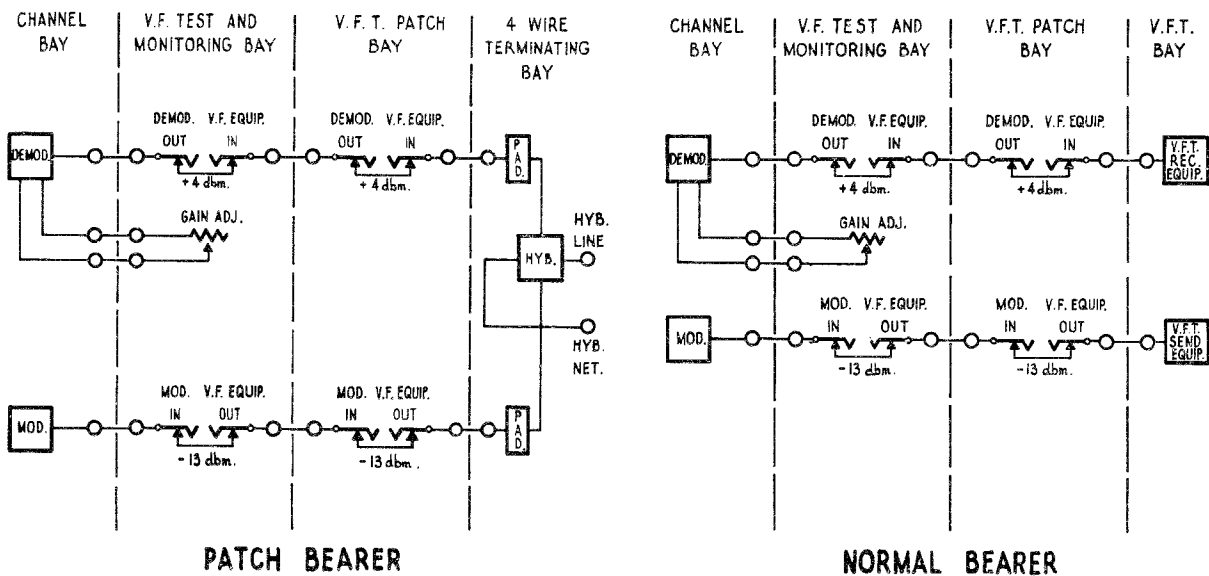
18.1 When it has been proved that the normal bearer circuit is again satisfactory for its purpose, systems or circuits shall be restored to the normal bearer. The following procedure will be adopted -

- (i) The station with whom it is necessary to restore the patches shall be contacted by order wire or suitable telephone channel.
- (ii) The action required shall be explained to the officer at the distant terminal. In the case of programme the originating station should make certain that the distant station is receiving programme on the normal circuit again.
- (iii) On the count of three by the officer requesting restoration of the patch all patch cords shall be removed simultaneously.
- (iv) The distant terminal shall be released. The control station should be advised, where it does not already know, and if the all clear is given by the control station, the distant station shall be released. The relevant traffic section (or receive station in the case of programme) shall be contacted to advise of restoration and ensure that it has been completed satisfactorily. In cases where Telephone channels are restored to Traffic (as when V.F.T. systems are restored to normal bearers) the Telephone Traffic Section should also be advised of this.

19. VOICE FREQUENCY TELEGRAPH SYSTEM PATCHES.

19.1 Patches for voice frequency telegraph systems are to be given highest priority at all times. In the event of failure of a number of V.F. Telegraph systems, the system carrying circuits leased to the Department of Civil Aviation or carrying a high speed circuit of the Overseas Telecommunications Commission shall be restored first. The systems carrying these circuits will be specified by the responsible Engineer.

19.2 V.F. Telegraph patches are to be made at the four wire telegraph patch board or where this is not provided at the Voice Frequency Test and Monitoring bay. Details of all V.F.T. patches normally met with are given in Section 2 paragraph 1. Where the patch has to be made to or from a bearer system which does not appear on either of the above bays the patch shall be made at the "MOD. IN" and "DEMOD. OUT" jacks on the bearer system. Schematics of two types of telegraph patch boards are shown in Figs. 2 and 3, while Fig. 4 shows a schematic of the V.F. Test and Monitoring Bay and associated equipment. Jack layouts of these Bays appear in Figs. 5, 6 and 7.



NOTE. V.F. EQUIP. IN IS SOMETIMES DESIGNATED HYB. IN &
 V.F. EQUIP. OUT IS SOMETIMES DESIGNATED HYB. OUT.

FIG. 2. TELEGRAPH PATCH BAY - SCHEMATIC.

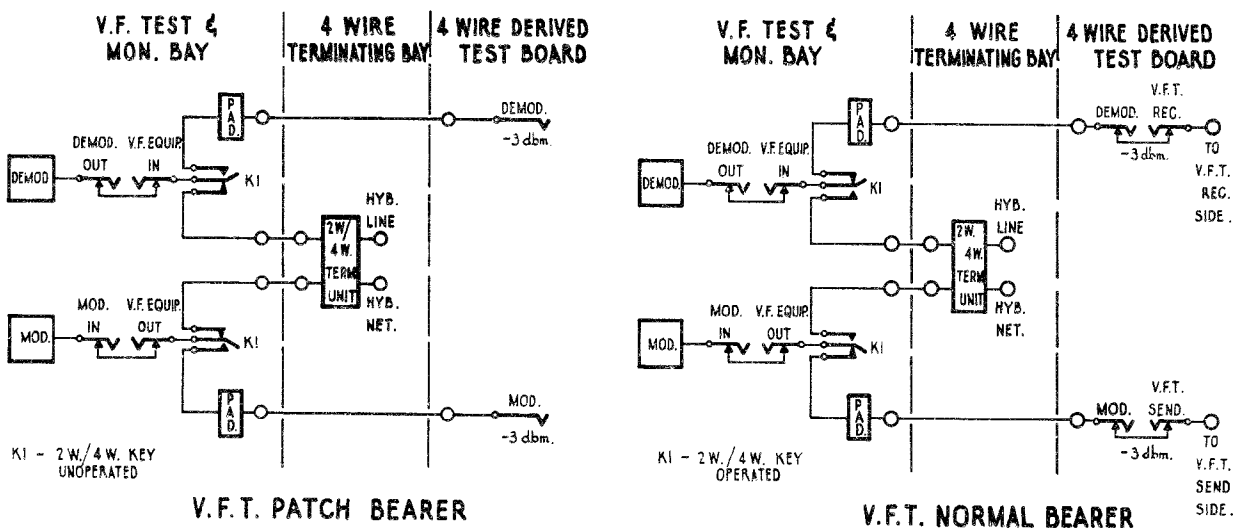


FIG. 3. V.F.T. PATCHING ARRANGEMENTS USING 4 WIRE DERIVED TEST BOARD.

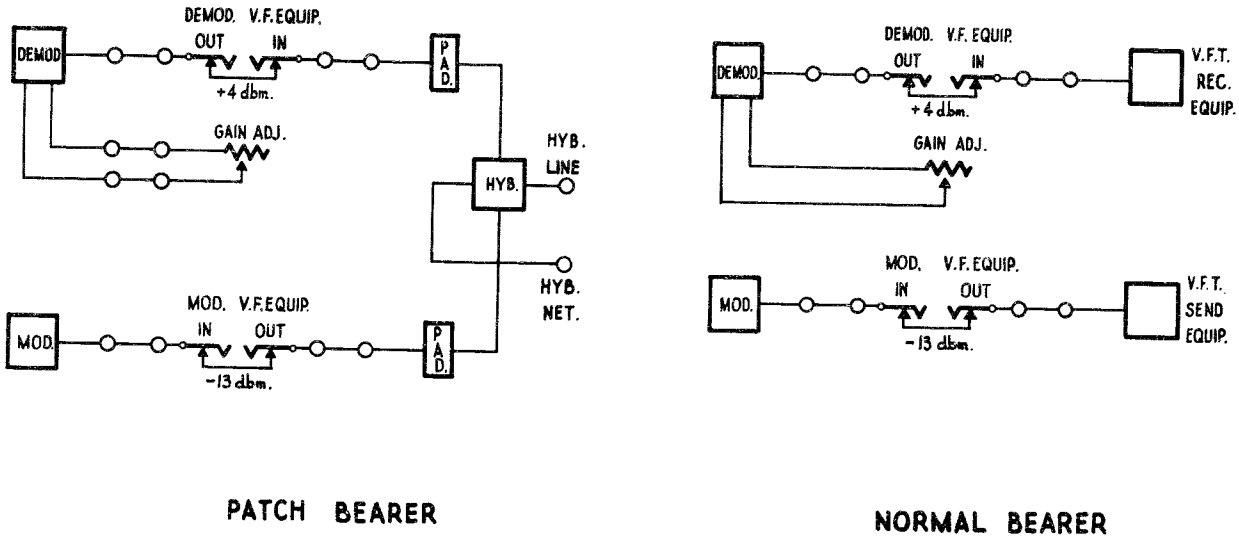


FIG. 4. STANDARD 4 WIRE JACKING - SCHEMATIC.

V.F. TEST AND MON. BAY.

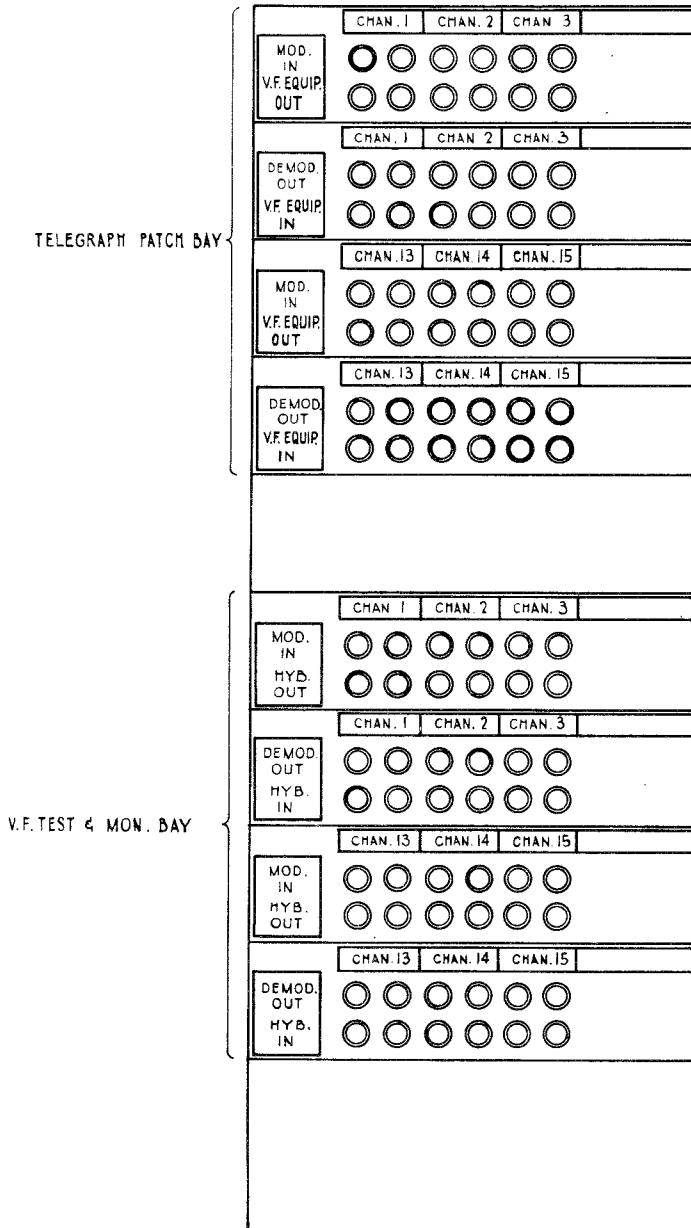


FIG. 5. JACK LAYOUT OF TELEGRAPH PATCH BAY.

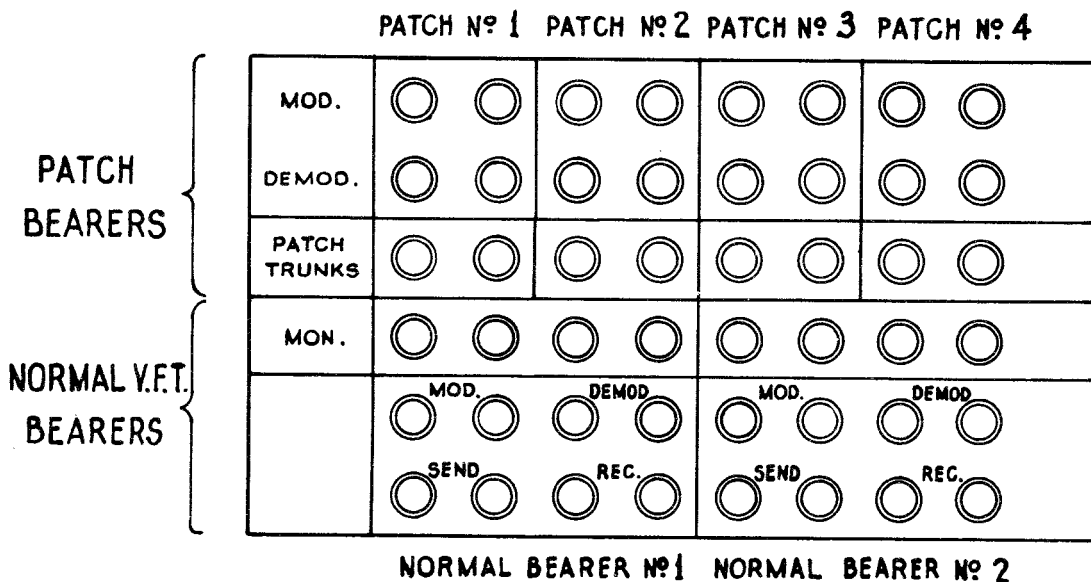


FIG. 6. JACK LAYOUT - 4 WIRE
DERIVED TEST BOARD.

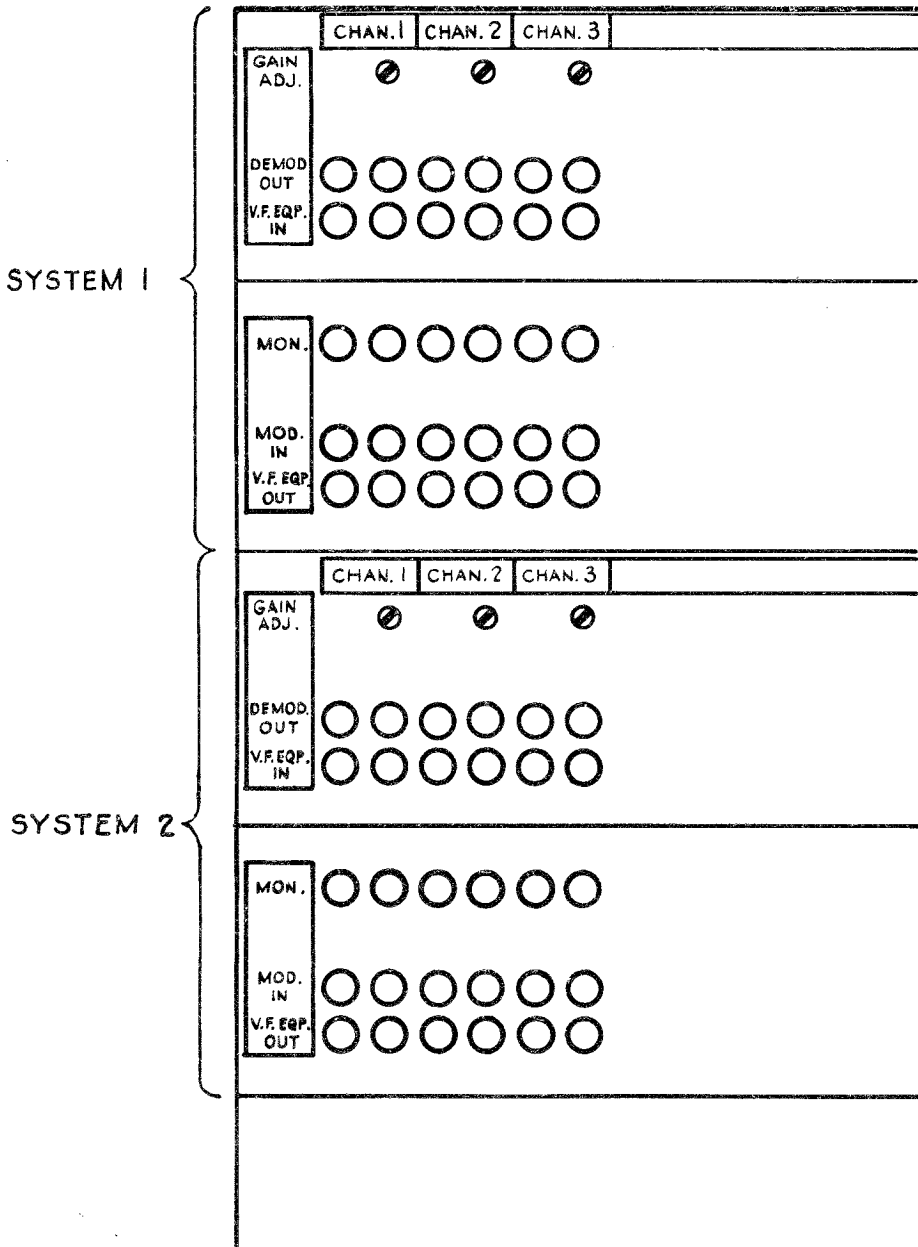


FIG. 7. JACK LAYOUT OF V.F. TEST
AND MON. BAY.

- 19.3 In the case of Figs. 2 and 4 the "MOD." and "DEMODO" levels are -13 dbm and +4 dbm respectively for all circuits. The "MOD." and "DEMODO" jacks of Fig. 3 are both points of -3 dbm. When patching on these bays the patch can therefore be made without inserting pads between the different points as the normal and patch bearers are identical from the transmission viewpoint.
- 19.4 When it is necessary to make patches at the bearer system bay, level differences will often occur and it will be necessary to insert suitable pads in the circuit when making the patch.
- 19.5 Where it is necessary to make V.F.T. patches at the bearer systems, direct patch trunks shall be wired between the normal and patch systems and terminated on jacks suitably designated. If level adjusting pads are required they shall be permanently wired in the patch trunk.
- 19.6 V.F.T. systems shall be patched to the patch bearer whenever the Telegraph Traffic Section report the system as bumping. They shall also be patched immediately it becomes known that the bearer system is faulty. If on regulated bearer systems the pilot is noticed to be unsteady the V.F.T. System shall be patched to a patch circuit on which the pilot has been checked and observed to be steady.
- 19.7 V.F.T. Bearer Channel Line-ups. Transmission Engineering Instructions, Long Line Equipment T 5310 and T 5610 specify the periodicity of channel line-ups on three and twelve channel carrier telephone systems. The line-ups are to be performed at the following intervals -

Three Channel unregulated systems - daily.
Three Channel regulated systems - monthly.
Twelve Channel systems - monthly.

Channels which are used as either the normal or patch bearer for a V.F. Telegraph system shall be lined up at "MOD. IN" and "DEMODO. OUT" jacks. The equivalent of both channels, in both directions, shall differ by not more than 0.5 db. While the normal bearer is being lined up the V.F.T. system shall be patched to another channel. Where the V.F.T. system can be patched to its regular patch bearer without the use of interbay trunks, this shall be done. Where this is not possible it shall be patched to another channel of the same system. The patches, which are shown in Fig. 8 are -

- (i) "V.F. Equip. Out" of the normal bearer to "MOD. IN" of the patch bearer.
- (ii) "V.F. Equip. In" of the normal bearer to "DEMODO. OUT" of the patch bearer.

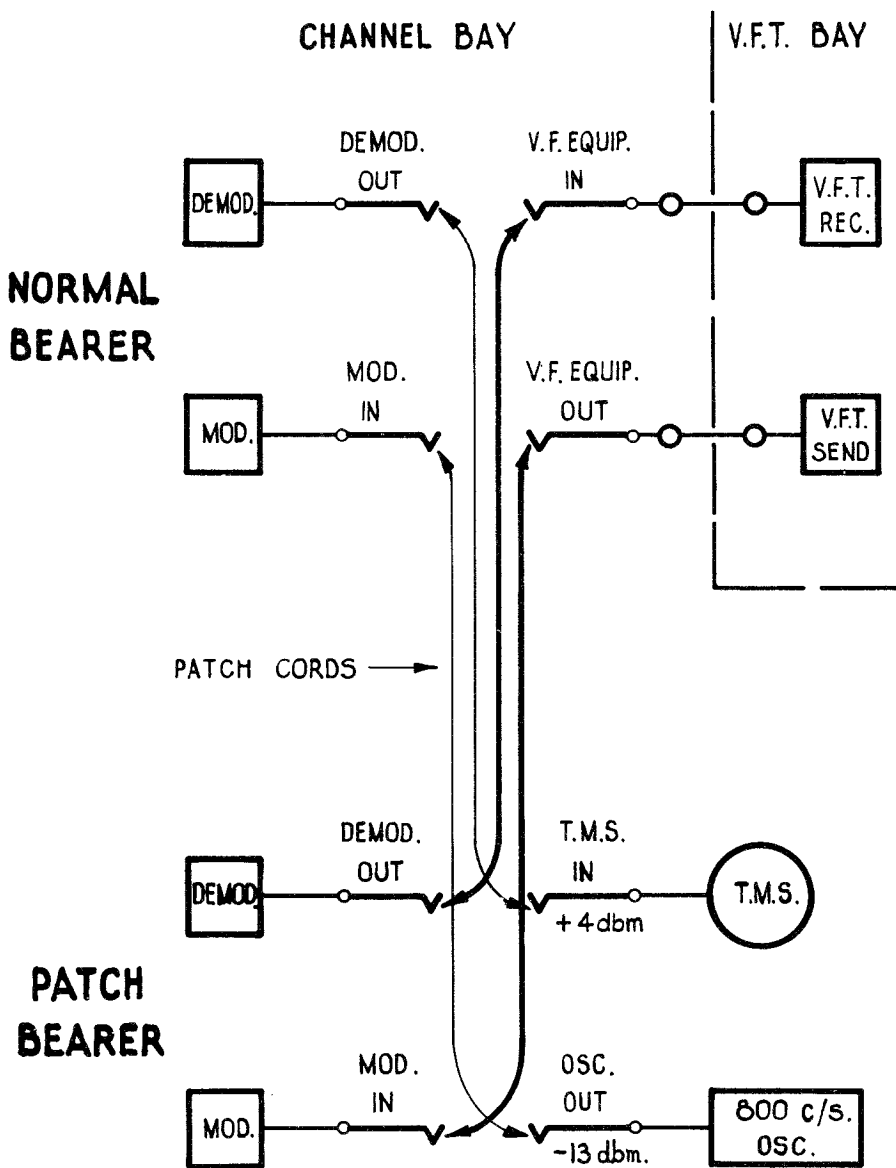


FIG. 8. PATCHING WHILE LINING UP BEARER CHANNEL.

19.8 V.F. Telegraph System daily line-up. A set time each day shall be fixed for the line-up of every V.F. Telegraph System. The time of each line-up shall be one that is mutually satisfactory to the Telegraph and Engineering Branches. Where only one telegraph system is operating between two centres and it carries circuits leased to the Department of Civil Aviation the line-up shall be performed in two parts, half of the channels to be lined up at each time. This will enable a continuous service to be given to the Department of Civil Aviation. The second half of the system shall be lined up at least 30 minutes after the first half.

19.9 V.F.T. Bearer Channel Routine Tests (Other than line-ups). Before carrying out routine tests which involve interruption of service on any carrier telephone terminal or repeater of a system which carries a V.F. Telegraph system, the V.F.T. System shall be patched to its regular patch circuit using the methods described in paragraph 17. The procedure for restoring is given in paragraph 18.

20. CARRIER SYSTEM PATCHING.

20.1 Carrier System patches are made when ever the system becomes faulty and another suitable bearer is available. In some cases where a repeater is faulty it is possible to patch out the faulty repeater without seriously affecting the operation of the system. Where this is possible and the repeater station concerned is not continuously staffed, the patch described in Section 2 paragraph 2 should be made before the station is left unattended.

20.2 Carrier System patches are made at the appropriate line filter bay or the "J" high frequency patch bay.

20.3 Systems are to be patched in accordance with the list of priorities which will be supplied to each station. (See paragraph 3.2 and 4.3).

20.4 Where regulated systems are involved, every repeater station which gets a pilot fail alarm shall contact the adjacent repeater station to determine if the line has failed in the adjacent section. In cases where it is proved that the adjacent section is faulty, the patch shall be made immediately without waiting on instructions from the Control Terminal Station.

20.5 In any other cases where it is known that the adjacent section of line is faulty, the superimposed systems shall be patched immediately, without waiting on instructions from the Control Terminal Station, and when the patch is completed effectively the Control Station shall be advised of the patch effected. If no patch is available the Control Station should be notified.

20.6 Priority in restoring carrier systems shall be given to the most important systems as determined from the principles of paragraph 3 and the list provided vide paragraph 4.

20.7 The procedure for patching and restoring carrier systems is given in paragraphs 17 and 18.

21. PATCHING FOR RE-ROUTING PURPOSES.

21.1 This section describes the methods of patching individual trunk carrier telephone circuits to re-route circuits to other than their normal offices. These patches may be necessitated by heavy traffic to one particular town or by the loss of circuits following a breakdown. The patches are to be made only at the request of the Telecommunications Division

21.2 These patches will be made at the Trunk Test Board.

21.3 Where these circuit rearrangements involve the interconnection of carrier channels at an intermediate office these patches shall be made on a four wire basis, i.e. from "DEMOD. OUT" to "MOD. IN" via suitable pads.

21.4 When a circuit rearrangement is requested by the Telephone Traffic Section the following action shall be taken -

- (i) Ascertain whether the signalling equipment at the two terminals is of a similar type.
- (ii) If the signalling facilities at the terminals are different determine which is to be retained. In general it will be necessary to use V.F. Ringing in such cases.
- (iii) Determine whether any intermediate patching is involved.
- (iv) Contact each intermediate station in turn and request them to speak on the circuit being rearranged. This shall be done on the order wire if available, or if not on a suitable telephone channel.
- (v) Explain details of the patch required.
- (vi) Complete the patch at each station in turn using the method described in Section 2, paragraph 3.
- (vii) Contact the distant station required to complete the patch and request them to speak on the channel being rearranged. This shall be done on the order wire if provided or if not on a suitable telephone channel.
- (viii) Explain details of the patch required.
- (ix) Complete the patch as described in Section 2, paragraph 3.
- (x) Check the operation of the circuit and then release the other stations.
- (xi) Hand the channel over to the Traffic section.

21.5 Restoration of the Patch. When the Telephone Traffic Section advise that the rearrangement is no longer required the circuits shall be restored in the following manner -

- (i) Contact the distant terminal office on the rearranged channel and advise details of the action required.
- (ii) Remove all patches.
- (iii) Contact each intermediate office in turn on the order wire if available or if not on a suitable telephone channel and advise details of the action required.
- (iv) Remove all patches at the Intermediate offices.
- (v) Check all circuits which were involved in the rearrangement.
- (vi) Advise the Telephone Traffic Section.

22. PHYSICAL, PHANTOM AND CAILHO PATCHING.

- 22.1 This section describes the procedure for patching the Voice Frequency Circuit of physical lines and for patching Phantoms and Cailhos.
- 22.2 These patches will be made at the Trunk Test Board or Programme Patch Board except that where the Line Filters are wired on the equipment side of the Line jacks on the Trunk Test Board, some patches will be necessary at the Filter Bay.
- 22.3 Programme, Telephone or Telegraph circuits may be involved in these patches.
- 22.4 The programme patches described in this section solely relate to patching out a faulty section on a physical programme channel after the channel has been withdrawn from service. This patching is done between the two stations on either side of the fault. The method of providing a complete patch channel and withdrawing the faulty channel from service is detailed in paragraph 23. In certain cases, however, where no terminal-to-terminal patch is available the programme patch described in this section may have to be performed under service conditions.
- 22.5 Telegraph patches will be made when a fault occurs on any section of a cailho telegraph circuit.
- 22.6 Telephone patches will normally be made at the request of the Telephone Traffic Section.
- 22.7 The procedure for patching and restoring physical lines is as described in paragraphs 17 and 18.

23. RESTORATION OF FAULTY PROGRAMME CIRCUITS.

- 23.1 This section details the procedure to be adopted and the precautions to be taken when restoring programme services which have been interrupted.
- 23.2 In the case of interruption to a programme relay restoration shall, wherever sufficient facilities are available, be performed in two stages. The first step entails obtaining a split of the interrupted programme on another programme channel, which may be a carrier telephone channel and restoring the programme at the earliest moment. When this has been done the faulty section shall be localised and a section patch effected. This will allow the programme to be restored on the original channel. In some cases the first step may be accomplished by key switching. Such cases are not covered here.
- 23.3 Where possible the transfer of the broadcast programme from the normal to the patch circuit or back to the normal circuit shall be performed at the studio of the station taking the relay.
- 23.4 For the relay of some important programmes, a split of the programme will be permanently provided on an alternative programme channel. This split shall be fed to studios concerned.
- 23.5 Whenever a permanent N.B.S. programme channel is not required for a programme transmission, a split of the National No. 1 Network programme shall be transmitted over it. This channel shall be extended to the studio concerned.
- 23.6 Programme circuits shall be patched whenever the circuit is observed to fail completely or to be noisy or distorted. A patch shall also be made when similar troubles are reported by a broadcasting station and they are localised to the programme channel.
- 23.7 The following action shall be taken whenever a programme transmission becomes unsatisfactory -

- (i) The transmitting terminal station of the programme channel shall be contacted by the receive terminal station and the fault localised to the programme channel or beyond the transmitting terminal. This shall be done on the order wire if available or if not on a suitable telephone channel.
- (ii) The procedure is then as laid down in paragraph 17 until the programme received over the new channel has been checked by the receive terminal station and the transmitting terminal station released.
- (iii) The new channel will be extended direct to the receive broadcast studio on a separate local line.
- (iv) The Broadcasting station shall be advised that a split of the programme is available.
- (v) When the receive terminal station has ascertained that the receive Studio has switched to the new channel, the faulty section of the original channel shall be located and a section patch as described in paragraph 20 for carrier channels or paragraph 22 for physical channels shall be performed.
- (vi) The Broadcasting station shall be advised that the original channel is again satisfactory.
- (vii) When the receive terminal station has ascertained that the receive Studio has switched to the original channel, the patch channel may be taken down if so required. In certain cases the patch channel may be left connected through as a safeguard against further interruptions.
- (viii) Where it is not possible to extend the split through to the receive broadcast studio an instantaneous patch on the count of three will be made between terminals if a through patch channel is available, or between stations on each side of the fault, if it is not.

23.8 Restoration of programme patches is described in paragraph 18.

23.9 Precautions. While making programme patches it is of the utmost importance that telephone conversations are not patched to working programme circuits and vice versa. This can be achieved by care in setting up patches and close co-ordination between officers performing the patch.

24. PREVENTION OF INTERRUPTIONS TO WORKING SERVICES.

- 24.1 This section specifies the action to be taken to prevent interruption to working services by line parties, equipment installation parties and transmission measurement parties.
- 24.2 The responsible Engineer in charge of parties who are required to carry out work which could cause interruptions to working services shall give prior advice to the Transmission Maintenance Engineer before such work is carried out. This advice shall include brief details of the work, its duration and the location of working parties.
- 24.3 Engineers in charge of parties who are required to carry out work which could cause interruption to working services should impress on staff concerned the need for avoiding such interruptions and shall where necessary specify the method of carrying out the work so that interruptions are avoided.
- 24.4 The Transmission Maintenance Engineer shall, where necessary, arrange for the cross patching of important services to ensure that they are not interrupted.
- 24.5 When considered necessary, the Transmission Maintenance Engineer may recommend to the responsible Lines Engineer that interruption cable be used while a specific job is in progress.

SECTION 2 - DETAILED PATCHING METHODS

1. V.F. TELEGRAPH PATCHES.

V.F. Telegraph patches shall be made in the following manner -

1.1 Patching at the Telegraph Patch Bay or V.F. Test and Monitoring Bays. (Figs. 2 and 4)

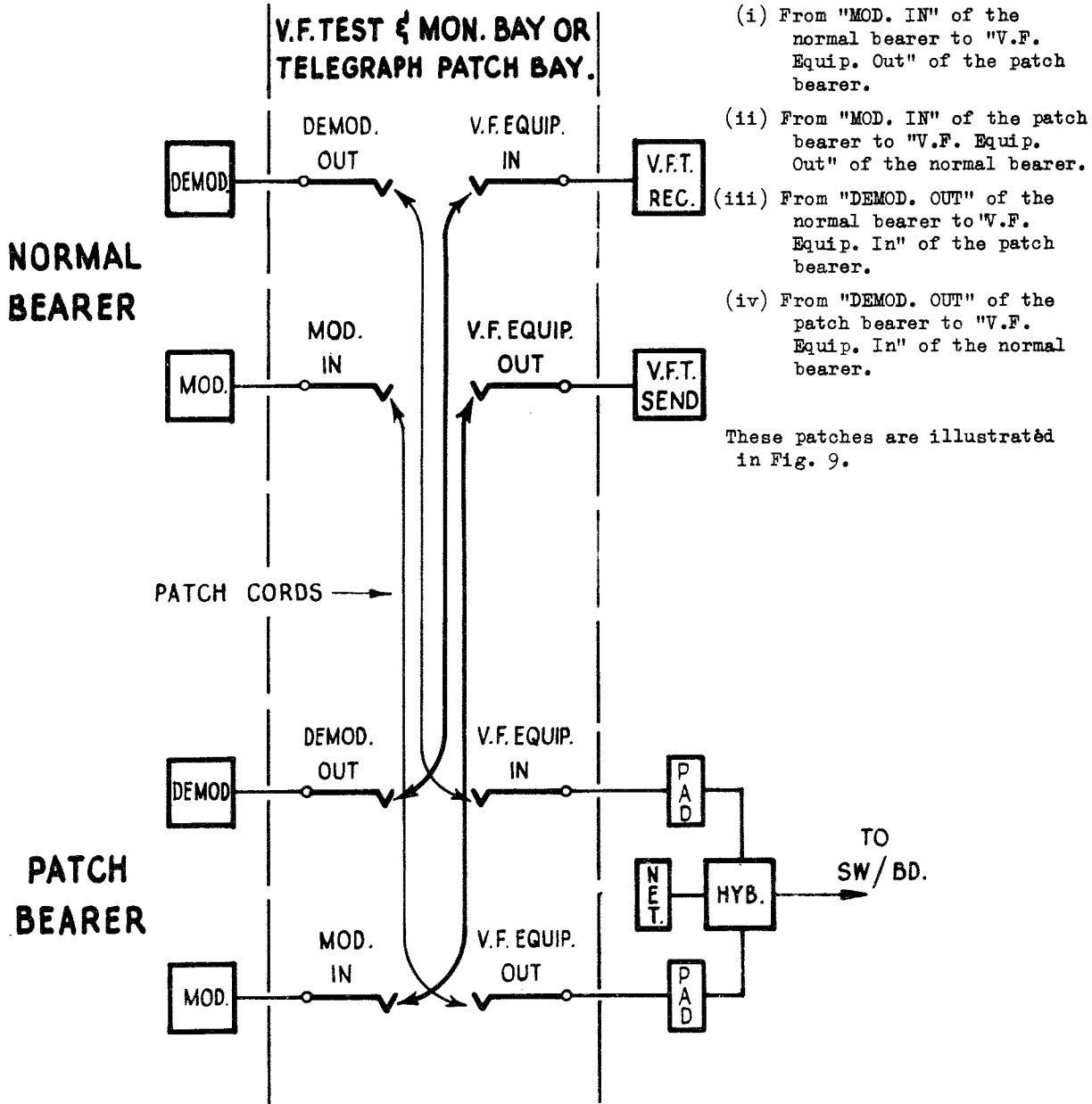


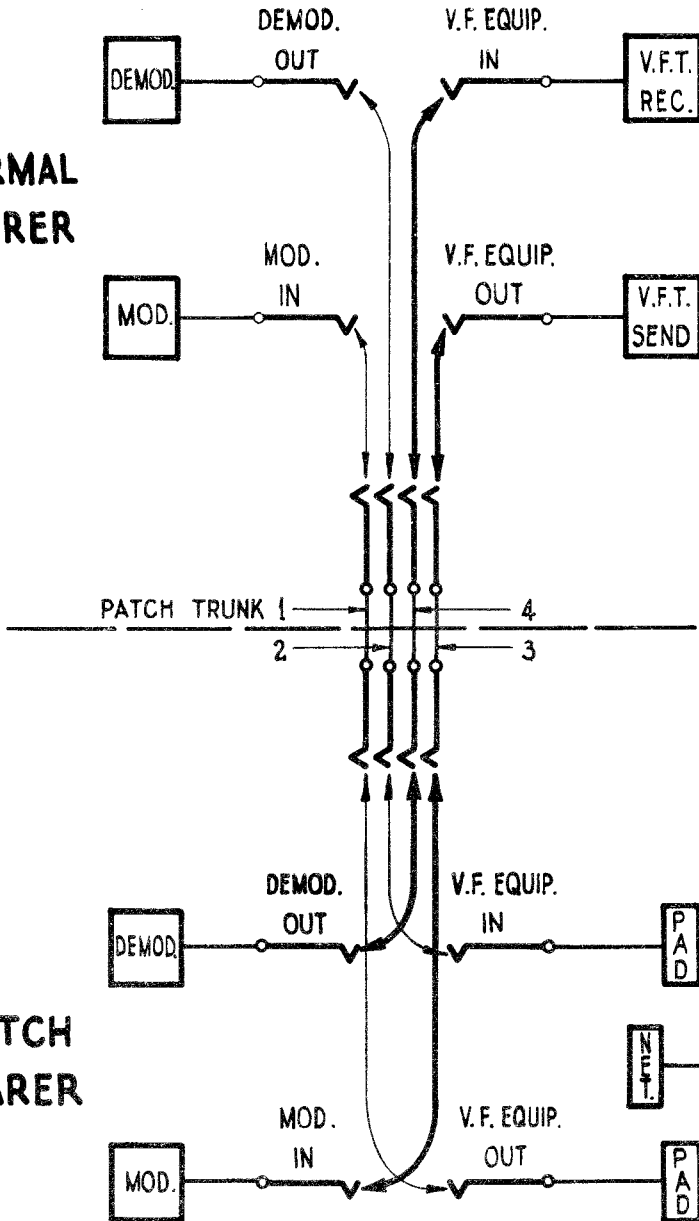
FIG. 9. CROSS PATCH AT CONCENTRATED V.F. TEST & MON BAYS OR TELEGRAPH PATCH BAY.

1.2 Patching at V.F. Test and Monitoring Bays not located together.

The patches required in this case are similar to those specified in paragraph 1.1, except that the use of interbay trunks requires the use of double the number of cords. Refer also to paragraph 19.5 Section 1.

V.F. TEST & MON. BAY
 N° 1

**NORMAL
 BEARER**



V.F. TEST & MON. BAY
 N° 2

V.F. TEST & MON BAYS NOT LOCATED TOGETHER.

The patches required at the V.F. Test and Monitoring Bay on which the normal bearer is located are:-

- (i) From "MOD IN" of the normal bearer to "Patch trunk No. 1".
- (ii) From "DEMOD OUT" of the normal bearer to "Patch trunk No. 2".
- (iii) From "V.F.Equip.Out" of the normal bearer to "Patch trunk No. 3".
- (iv) From "V.F. Equip. In" of the normal bearer to "patch trunk No. 4".

The patches required at the V.F. Test and Monitoring Bay on which the patch bearer is located are:-

- (i) From "Patch Trunk No.1" to "V.F.Equip. Out" of the patch bearer.
- (ii) From "Patch Trunk No.2" to "V.F.Equip. In" of the patch bearer.
- (iii) From "Patch Trunk No.3" to "MOD IN" of the patch bearer.
- (iv) From Patch Trunk No.4" to "DEMOD OUT" of the patch bearer.

These patches are shown in Fig.10.

FIG. 10. PATCHING AT

1.3 Patching at the Four-Wire Patch Bay (Fig. 3).

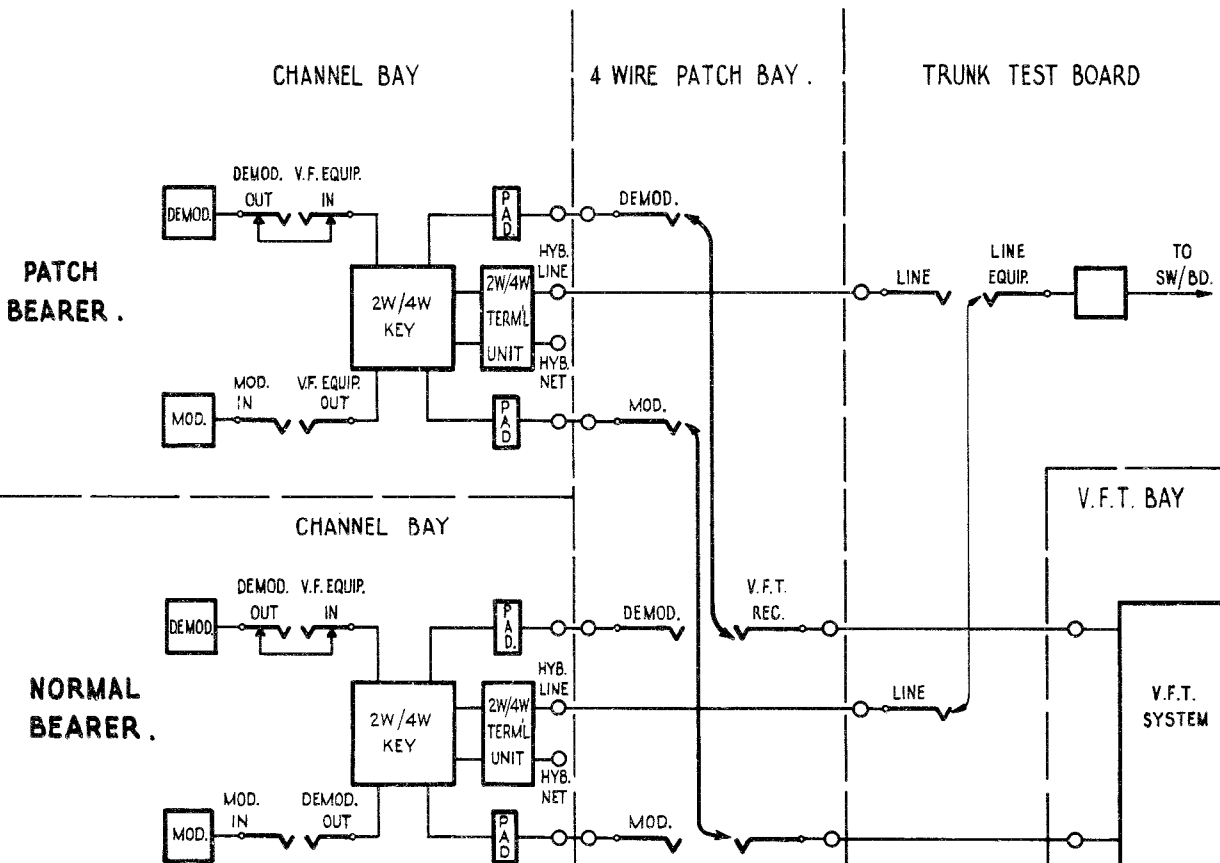
Although the V.F.T. system can be patched in this type of patch bay, it is not possible to complete the cross patch at this point. The cross patch must be completed at the Trunk Test Board. In addition it is necessary to operate two keys to complete the patch. The patches required at the four-wire Patch Bay are -

- (i) From "V.F.T. Send" of the V.F.T. system to "MOD" of the patch bearer.
- (ii) From "V.F.T. Rec." of the V.F.T. system to "DEMOM" of the patch bearer.

The patch required at the Trunk Test Board is -

From "Line" of the normal bearer to "Line Equip." of the patch bearer.

At the instant the patch is made it is also necessary to operate the 2-wire/4-wire key of the patch bearer to the 4-wire position, and the key of the normal bearer to the 2-wire position. These patches are illustrated in Fig. 11.



NOTE: WHEN MAKING PATCH, OPERATE -
2W./4W. KEY OF NORMAL CHANNEL TO 2 WIRE
2W./4W. KEY OF PATCH CHANNEL TO 4 WIRE.

FIG. 11. PATCHING AT 4 WIRE PATCH BAY.

1.4 Patching at Carrier Telephone System Bays.

Patches in this case are identical with those specified in paragraph 1.2. However as stated in Section 1 paragraph 17.5, pads should be permanently wired in the interbay patch trunks where level differences exist between the normal and patch bearer.

1.5 Patching between a V.F. Test and Monitoring Bay and a System Bay.

In this case the patches are again identical with those specified in paragraph 1.2 and the remarks made in Section 1 paragraph 19.5 are also applicable.

2. CARRIER TELEPHONE SYSTEM PATCHES.

Carrier Systems shall be patched in the following manner -

2.1 Twelve Channel Open Wire Systems with Line Filters located in the Office. The following patches are required -

- (i) From "12 channel Equip." of the system to be patched to "12 channel H.P.F. Drop" of the patch bearer.
- (ii) From "12 channel Equip." of the system which is to be displaced to "12 channel H.P.F. Drop" of the bearer which carried the system requiring the patch. In cases where the 12 channel patch bearer high pass is normally free (i.e. a twelve channel system is not operated over it), patch (ii) is not required.

These patches are shown in Fig. 12.

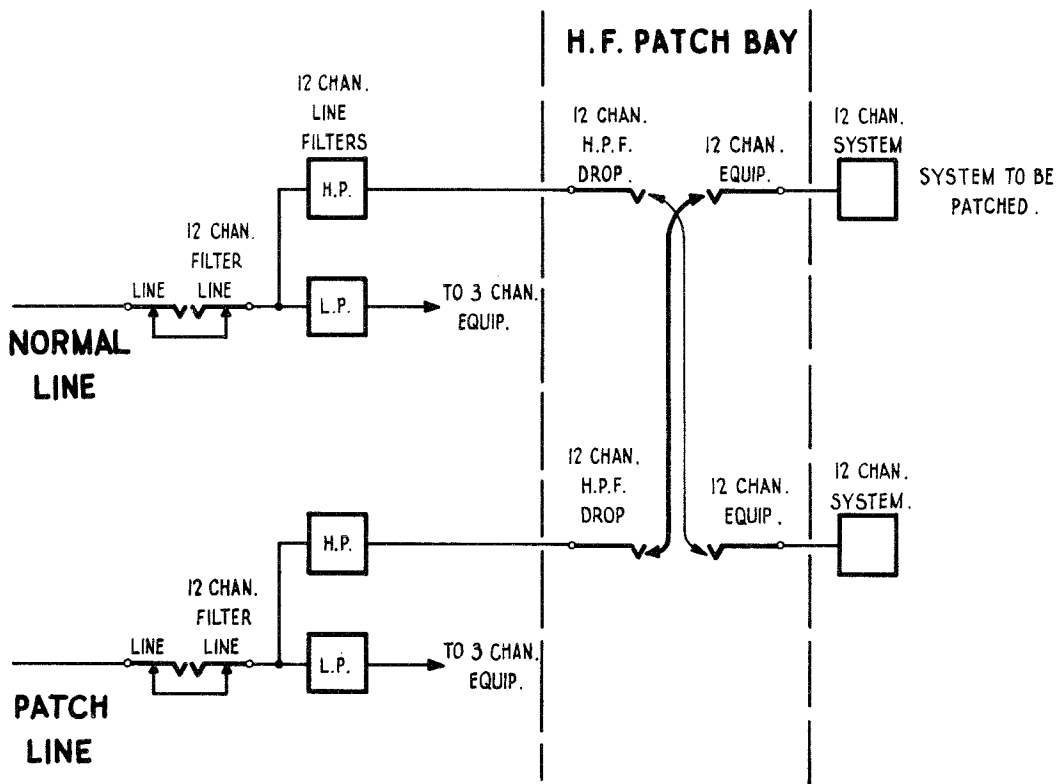


FIG. 12. 12 CHAN SYSTEM PATCH AT H.F. PATCH BAY.

2.2 Twelve Channel Open Wire Systems with Filter Huts (Fig. 13). As the 12 channel high pass circuit appears in both the filter hut and on the high frequency patch bay, the patching can be carried out at either place. Normally it will be done at the high frequency patch bay. The patches required are identical with those described in paragraph 2.1.

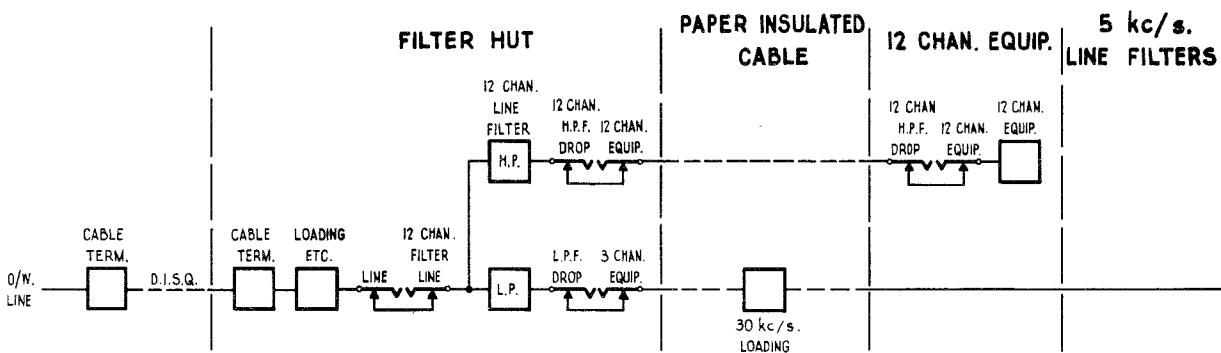


FIG. 13. 12 CHANNEL O/W EQUIPMENT WITH FILTER HUT.

2.3 Patching out a 12 channel open wire repeater. If a 12 channel open wire repeater becomes faulty, it is often possible to maintain service by patching it out.

The patch required is shown in Fig. 14 and is from "12 channel H.P.F. Drop" on the A side to "12 channel H.P.F. Drop" on the B side. In all cases where this patch is made the control station shall be advised. The control station will ensure that the regulators at other repeaters are suitably adjusted to compensate for the lost repeater and if necessary, arrange for the insertion of the Supplementary Amplifier.

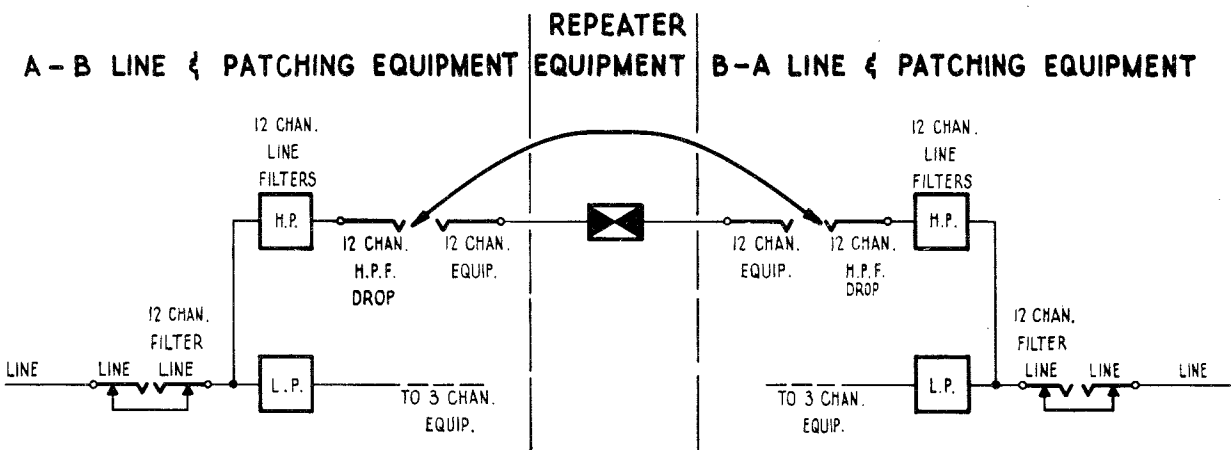


FIG. 14. PATCHING OUT 12 CHANNEL O/W REPEATER.

2.4 Permanent Patch on free 12 channel open wire Bearer H.P. At all attended repeater stations and at all terminal stations a 125 ohm plug shall be inserted in 12 channel high pass filter drop jacks of all free high pass circuits. When any repeater is left unstaffed a patch shall be inserted from "12 channel H.P.F. Drop" on the A side to "12 channel H.P.F. Drop" on the B side of any free high pass circuit. This patch is shown in Fig. 15.

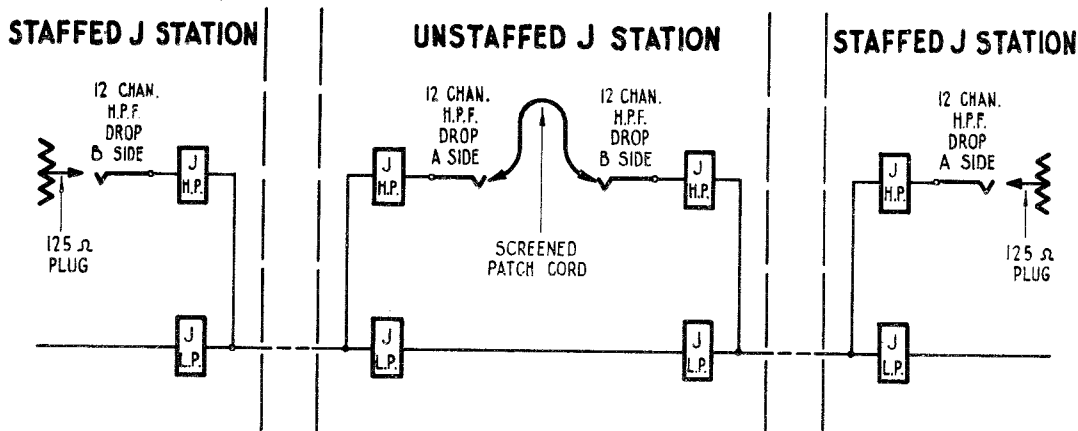


FIG. 15. 12 CHANNEL O/W SYSTEM PATCH H.P. BEARER SHOWING PERMANENT PATCH.

2.5 Utilisation of the Permanent Patch. Use may be made of the patch described in paragraph 2.4 when a line fails in the section adjacent to an unattended station located between two attended stations. This patch is made between the two attended stations and the patch is from "12 channel Equip." of the system to be patched to "12 channel H.P.F. Drop" of the free bearer. The normal bearer should also be terminated in 125 ohms at 12 channel H.P.F. Drop. This is illustrated in Fig. 16. As this patch removes one repeater from the system the advice to the control station specified in paragraph 2.3 shall be given.

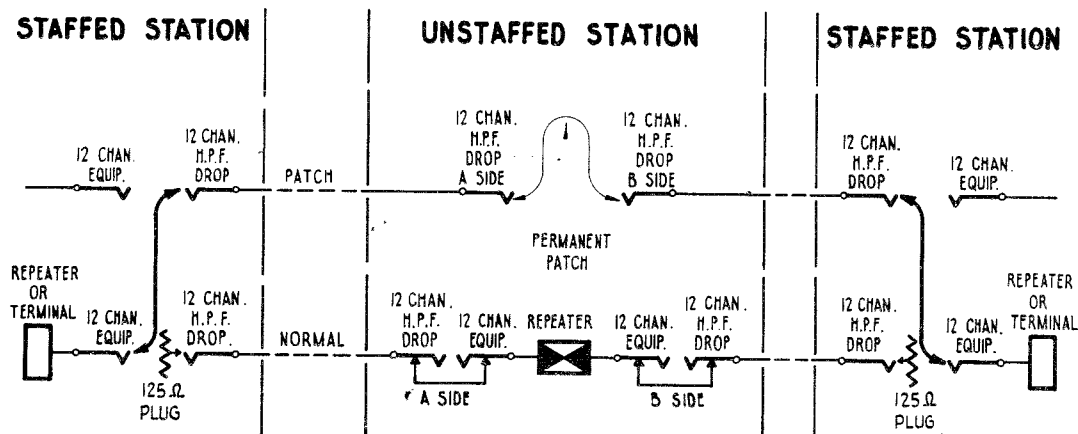


FIG. 16. UTILISATION OF PERMANENT BEARER PATCH.

2.6 12 and 24 Channel Carrier Systems on Cable. Where carrier systems are used over cable circuits a spare pair fully equipped with line amplifiers and equalisers is normally provided. In the event of the failure of one line or its associated line equipment service is to be restored by patching from -

- (i) "Trans Amp Out" of the working terminal to "Cable In" of the spare line.
- (ii) "Group Equip. In" of the working line to "Line Amp Out" of the spare line.

These patches are showing in Fig. 17 and are performed at the Transmitting Amplifier bay and the Line Amplifier bays.

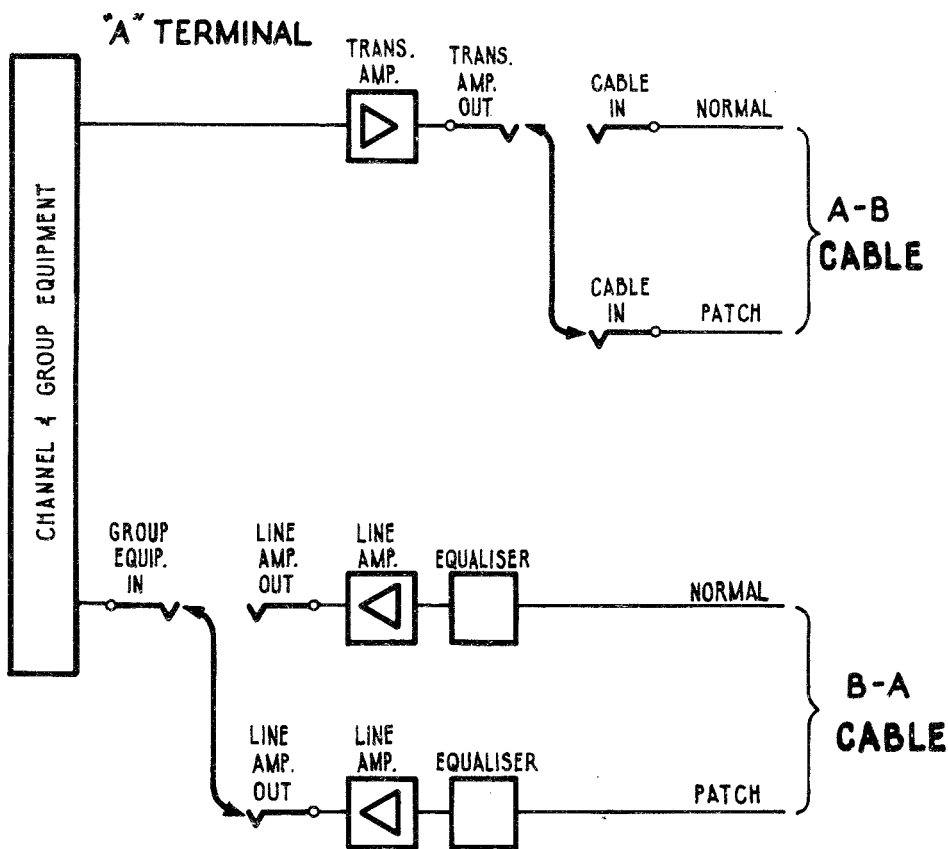


FIG. 17. CARRIER ON CABLE H.F. PATCHING.

2.7 Patching 17 Channel Carrier Systems. The patches required are similar to those specified for 12 and 24 Channel Carrier Systems except that patches are made by shifting U-links mounted on the Line Amplifier and Equaliser Bay. The U-link panels involved are those marked "Output" on either the "Send" side or "Rec." side of the Bay. The "Input" U-link panels remain unaltered when a patch is made. Fig. 18 shows the wiring arrangement of the Bay and also shows the position of the U-links in the circuit.

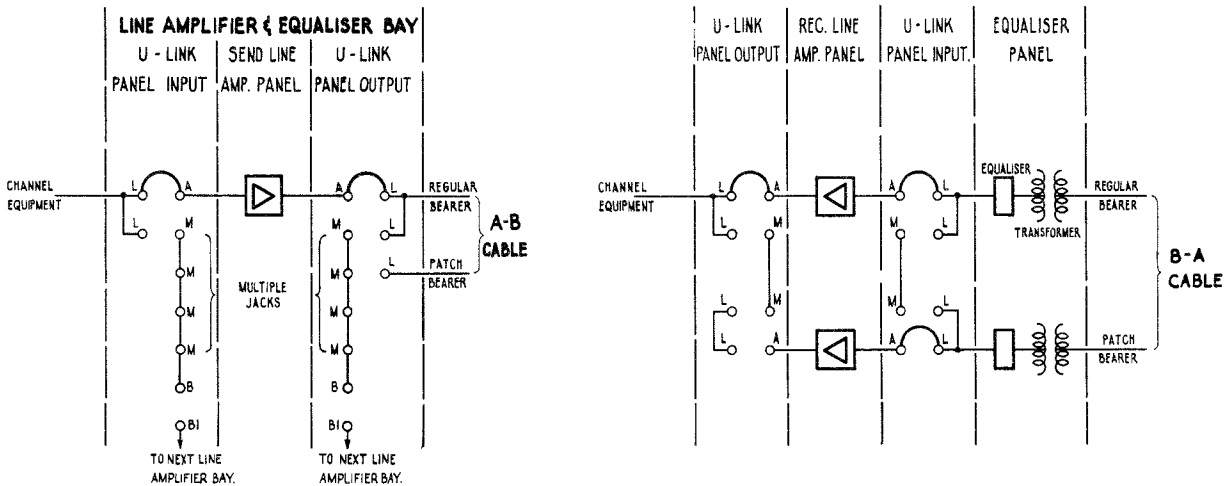
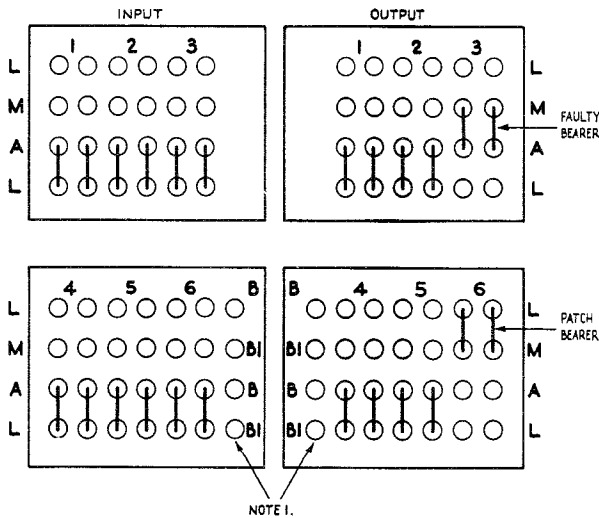


FIG. 18. 17 CHANNEL LINE EQUIPMENT.
 ARRANGEMENT SHOWING U-LINKS NORMAL.

It should be noticed that the "M" Jacks are multiplied and also that there are two commoned "L" Jacks for each circuit. A layout of the U-link panel is shown in Fig. 19. This figure shows also the system on line 3 patched to line 6.

SEND SIDE U-LINK PANEL



RECEIVE SIDE U-LINK PANEL

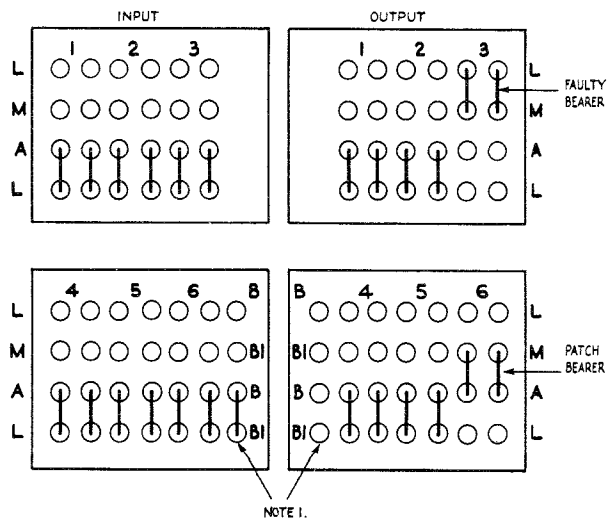


FIG. 19A. PATCHING A-B H.F. LINE OF 17 CHANNEL CABLE SYSTEM BY MEANS OF U-LINKS.

FIG. 19B. PATCHING B-A H.F. LINE OF 17 CHANNEL CABLE SYSTEM BY MEANS OF U-LINKS.

FIG. 19. PATCHING H.F. LINE OF 17 CHANNEL CABLE SYSTEM BY MEANS OF U-LINKS.

The patches required on the "Send" side are -

(i) Shift the U-links normally between L and A jacks of the faulty line and place them between A and M of the same line (line 3 in Fig. 19A).

(ii) Place U-links between L and M of the patch line (line 6 in Fig. 19A).

and on the "Receive" side -

(i) Shift the U-links normally between L and A of the faulty line and place them between M and L of the same line (line 3 in Fig. 19B).

(ii) Place U-links between A and M of the patch line (line 6 in Fig. 19B).

2.8 Type R Telegraph Carrier Systems. Line patches for type R telegraph carrier systems shall be carried out at the 3 Kc/s line filter bay. The patch required is -

From "3 Chan. Equip." of the normal circuit to "H.P.F. Drop" of the patch circuit.

This is shown in Fig. 20.

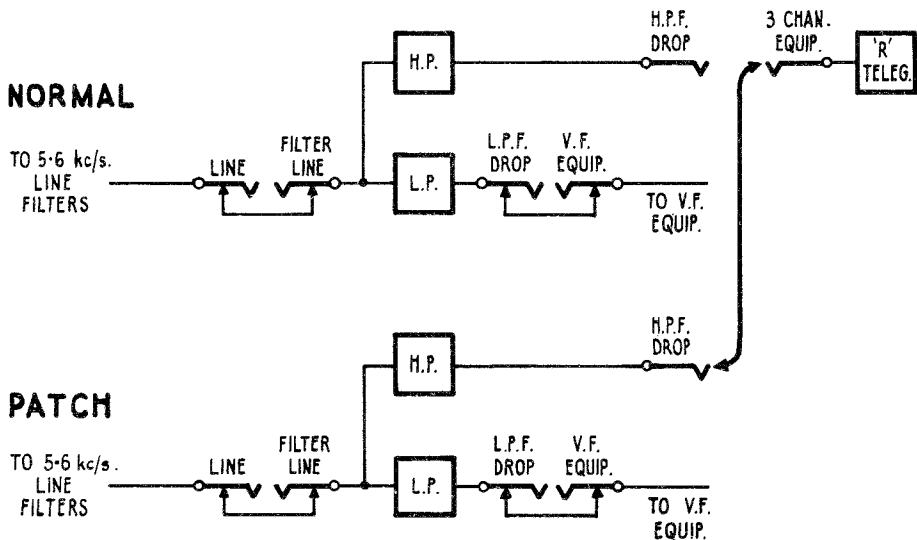


FIG. 20. PATCHING TYPE 'R'
 TELEGRAPH CARRIER SYSTEMS.

2.9 Carrier Programme Systems. The patches required shall be carried out at the 32 Kc/s line Filter Bay. The patch is shown in Fig. 21 and is -

From "Carr. Prog. Equip." to "32 Kc/s H.P.F. Drop" of the patch bearer.

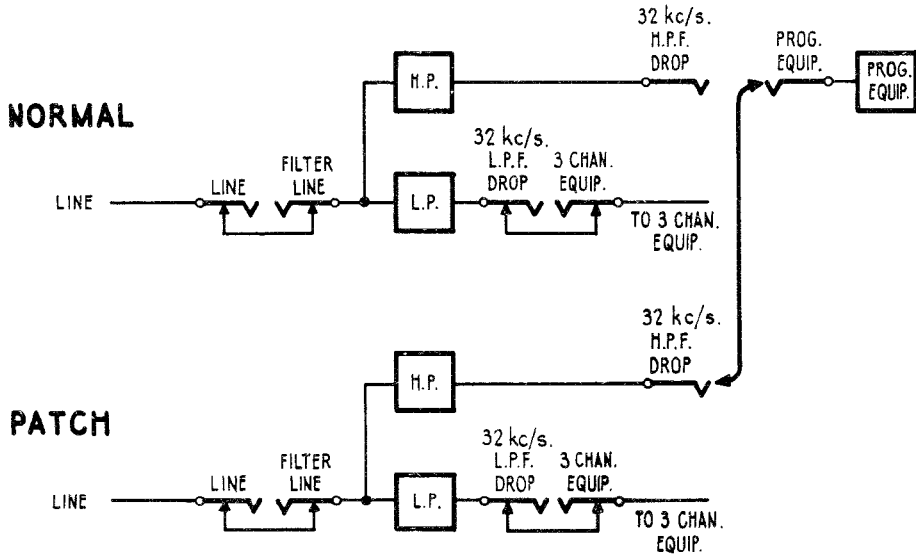


FIG. 21. CARRIER PROGRAMME EQUIPMENT PATCH.

2.10 Single, Three and Four Channel Systems. These systems shall be patched at the line filter bay. The patches required are shown in Fig. 22 and are -

- (i) From "3 Chan. Equip." of the normal bearer to "H.P.F. Drop" of the patch bearer.
- (ii) From "3 Chan. Equip." of the patch bearer to "H.P.F. Drop" of the normal bearer.

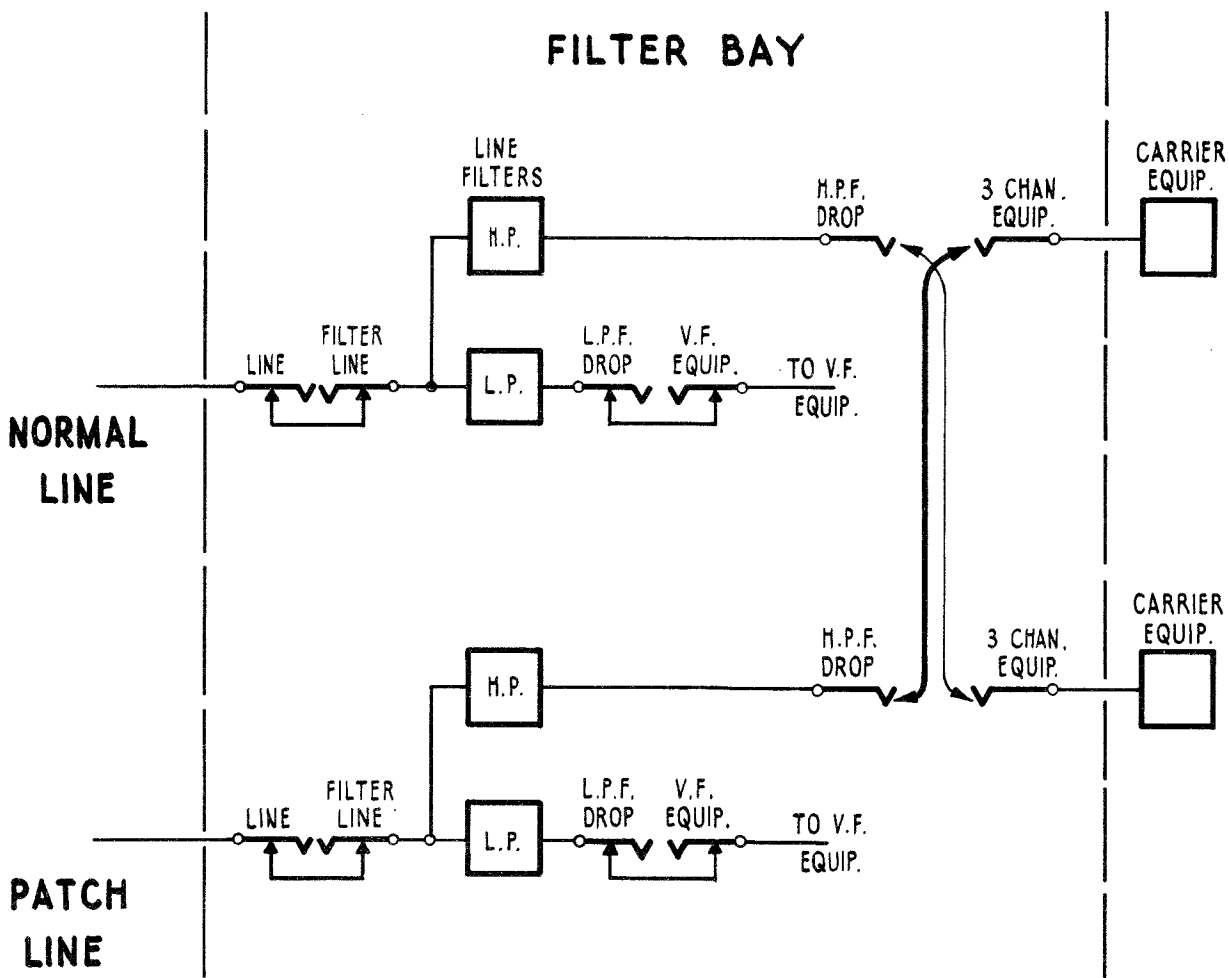


FIG. 22. 1, 3 & 4 CHANNEL CARRIER SYSTEM PATCH.

3. RE-ROUTING PATCHES.

3.1 Patching at Intermediate Offices. These patches will be made at the V.F. Test and Monitoring Bays or, if these are not provided, at carrier system bays.

3.2 Patching at V.F. Test and Monitoring Bay located together. The following patches, which are shown in Fig. 23, are required -

- (i) From "DEMOD OUT" of the first channel to "17 db pad (1) "In".
- (ii) From "17 db pad (1) out" to "MOD IN" of the second channel.
- (iii) From "DEMOD OUT" of the second channel to "17 db pad (2) In".
- (iv) From "17 db pad (2) Out" to "MOD IN" of the first channel.

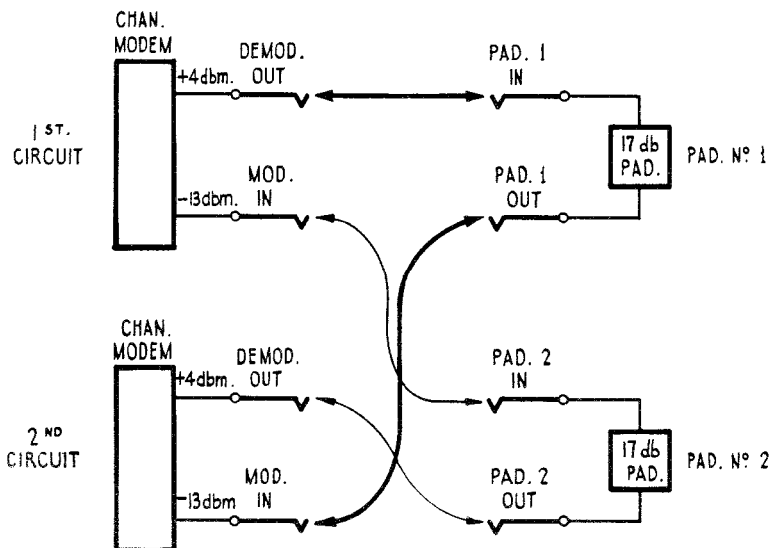


FIG. 23. PATCH AT CONCENTRATED V.F. TESTS & MON. BAYS. THROUGH CONNECTING CHANNELS AT INTERMEDIATE OFFICES.

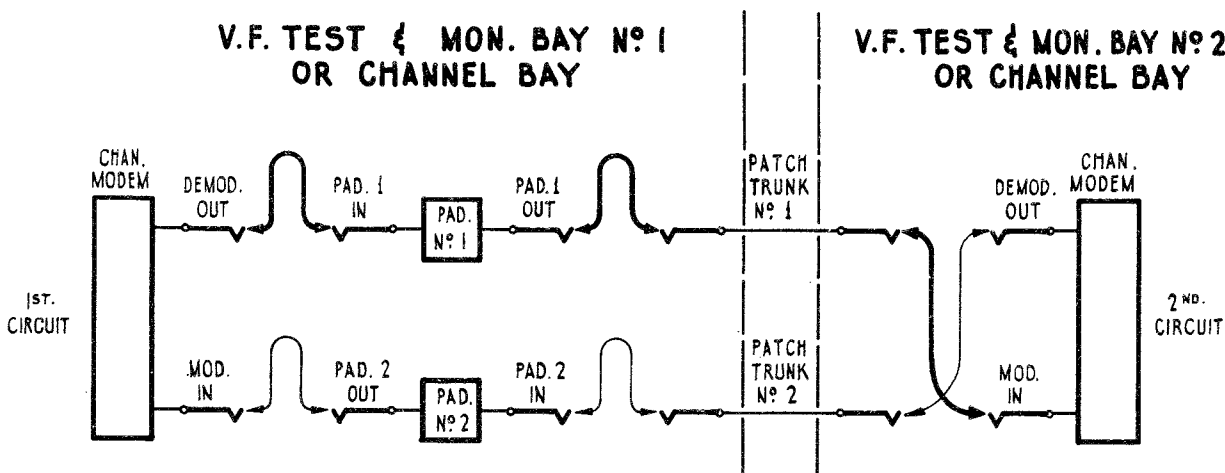
3.3 Patching at V.F. Test and Monitoring Bays not located together. The patches required are similar to those described in paragraph 3.2, except that the use of interbay patch trunks is necessary. The patches required at the first V.F. Test and Monitoring Bay are -

- (i) From "DEMOD OUT" of the first channel to "17 db pad (1) In".
- (ii) From "17 db Pad (1) Out" to "patch trunk No. 1".
- (iii) From "MOD IN" of the first channel to "17 db pad (2) Out".
- (iv) From "17 db Pad (2) In" to "patch trunk No. 2".

The patches required at the second V.F. Test and Monitoring Bays are -

- (i) From "patch trunk No. 1" to "MOD IN" of the second channel.
- (ii) From "patch trunk No. 2" to "DEMOD OUT" of the second channel.

These patches are shown in Fig. 24.



**FIG. 24. PATCHING BETWEEN BAYS
NOT LOCATED TOGETHER.
THROUGH CONNECTING CHANNELS AT
INTERMEDIATE OFFICES.**

3.4 Patching between System Bays or between one System Bay and One V.F. Test and Monitoring Bay. The patches required are similar to those specified in paragraph 3.3, except that the pad values may be different from 17 db. The values of the pads are given by -

$$P_1 = L \text{ DEMOD}_1 - L \text{ MOD}_2$$

$$\text{and } P_2 = L \text{ DEMOD}_2 - L \text{ MOD}_1$$

where P_1 = value of first pad in db.

P_2 = value of second pad in db.

$L \text{ DEMOD}_1$ = level in dbm at "DEMOD OUT" of the first channel.

$L \text{ DEMOD}_2$ = level in dbm at "DEMOD OUT" of the second channel.

$L \text{ MOD}_1$ = level in dbm at "MOD IN" of the first channel.

$L \text{ MOD}_2$ = level in dbm at "MOD IN" of the second channel.

For example, if the levels at "MOD IN" and "DEMOD OUT" of the first system are -13 and +4 dbm respectively, and the levels at "MOD IN" and "DEMOD OUT" of the second channel are -4 and +4 dbm respectively, then

$$P_1 = +4 - (-4) = 8 \text{ db}$$

$$\text{and } P_2 = +4 - (-13) = 17 \text{ db.}$$

3.5 Patching at Terminal Offices. The patching required at the terminal offices will depend on whether the existing signalling equipment is similar at both terminals and on whether six or ten jack appearances are provided on the Trunk Test Board, and whether a four wire patch is necessary.

3.6 Six Jack Appearances Where Existing Signalling Arrangements are Similar. The patch required is shown in Fig. 25, and is -

From "Drop" of the line having the switchboard appearance to "Line" of the line to be rearranged.

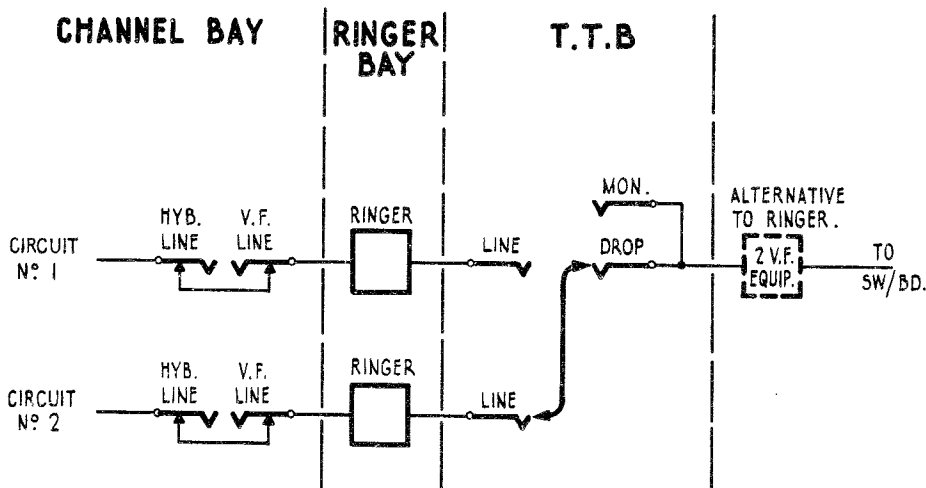


FIG. 25. SIX JACK TELEPHONE CIRCUITS WITH SIMILAR SIGNALLING.

3.7 Six Jack Appearances where existing signalling arrangements are dissimilar. This patch necessitates the patching in of a spare ringer, and is shown in Fig. 26. The patches are -

- (i) From "Drop" of the line having the switchboard appearance to "17 c/s" of the Ringer.
- (ii) From "1000/17 c/s" of the Ringer to "Line" of the line to be rearranged.

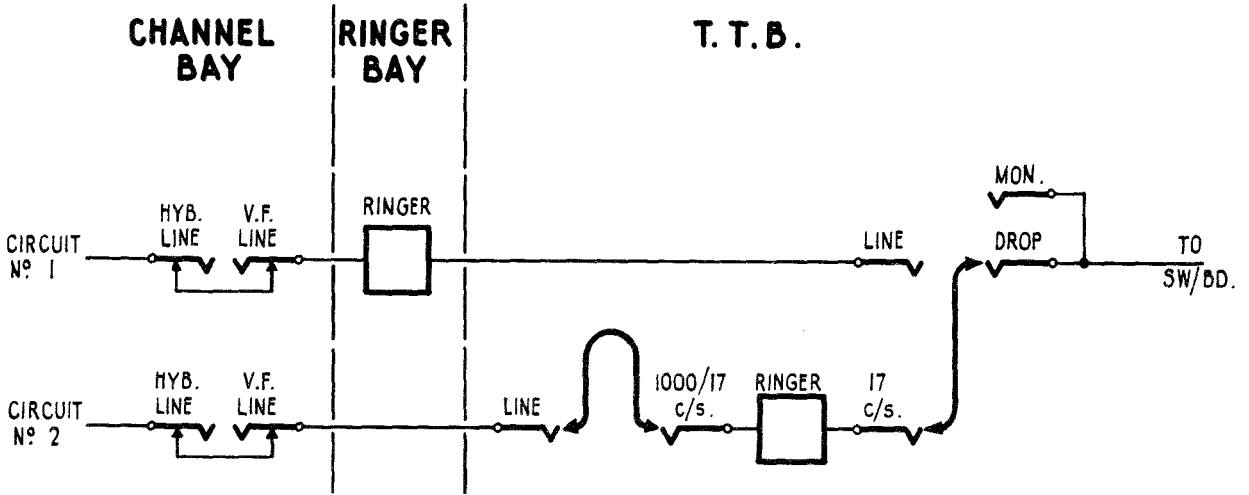


FIG. 26. PATCHING FOR SIX JACK TELEPHONE CIRCUITS WITH DISSIMILAR SIGNALLING.

3.8 Ten Jack Appearances where existing signalling arrangements are similar. The patch required is shown in Fig. 27, and is -

From "Drop" of the line having the switchboard appearance to "Drop Equipment" of the line being rearranged.

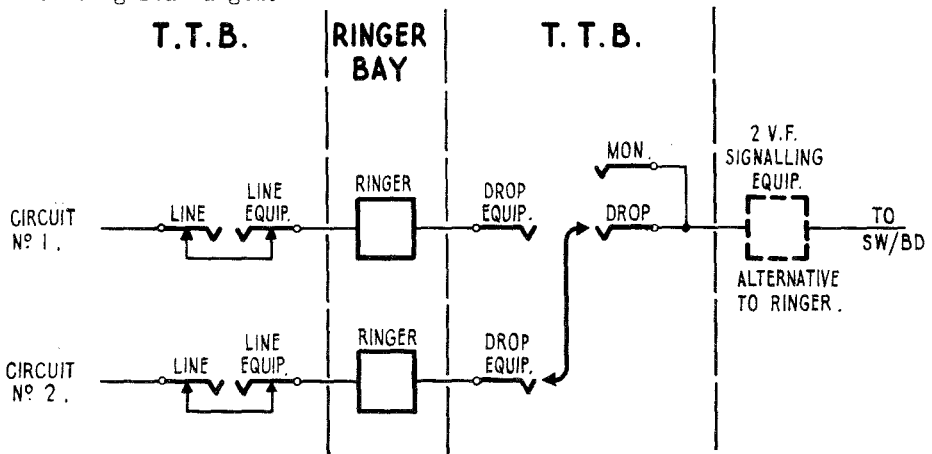


FIG. 27. PATCHING FOR TEN JACK TELEPHONE CIRCUITS WITH SIMILAR SIGNALLING.

3.9 Ten Jack Appearances where existing signalling Arrangements are dissimilar. This patch necessitates the patching in of a spare ringer, and is shown in Fig. 28. The patches are -

(i) From "Drop" of the line having the switchboard appearance to "17 c/s" of the Ringer.

(ii) From "1000/17 c/s" of the Ringer to "Drop Equip." of the line being rearranged.

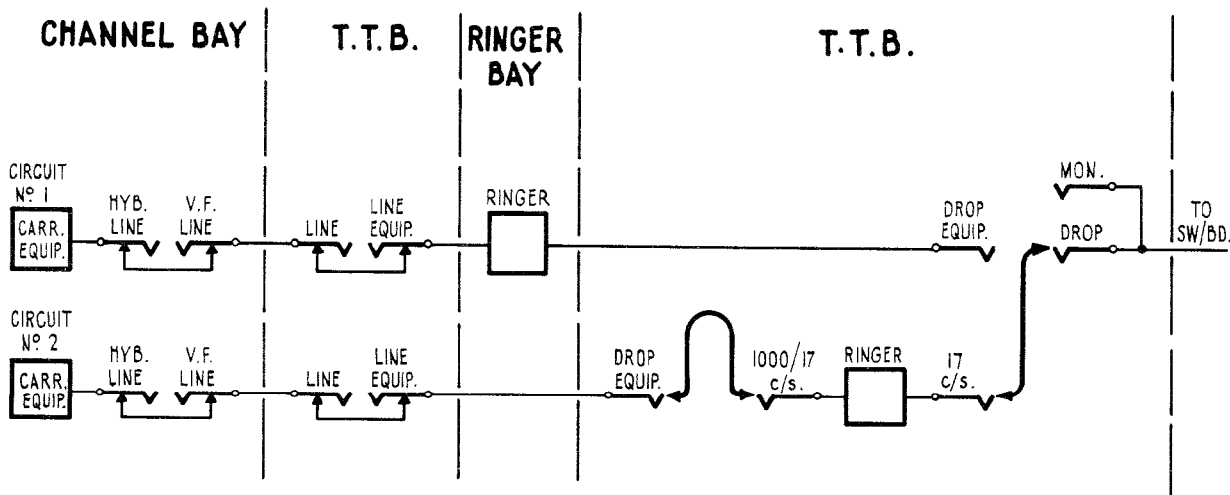


FIG. 28. PATCHING FOR TEN JACK TELEPHONE CIRCUITS WITH DISSIMILAR SIGNALLING.

4. PHYSICAL, PHANTOM AND CALLHO PATCHES.

4.1 Patching Voice Frequency Circuit of Physical Lines. These patches will be made at the Trunk Test Board or Programme Patch Bay.

(i) Patching at Six Jack Appearances. The patch required is shown in Fig. 29 and is -

From "Drop" of the regular circuit to "Line" of the patch circuit.

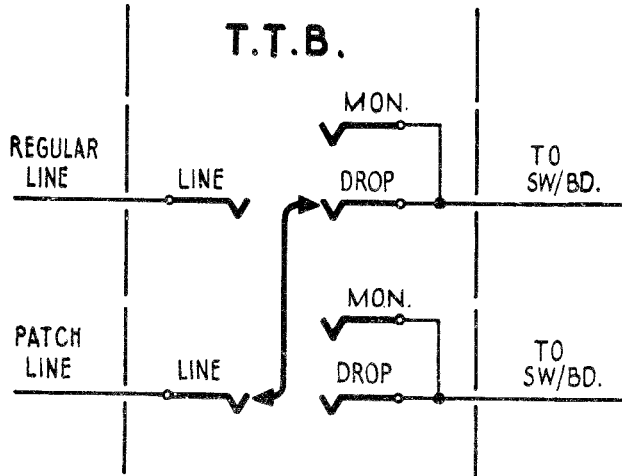


FIG. 29. PATCHING SIX JACK TELEPHONE CIRCUITS.

(ii) Patching at Ten Jack Appearances. The patch required is shown in Fig. 30 and is -

From "Drop" of the regular circuit to "Drop Equip." of the patch circuit.

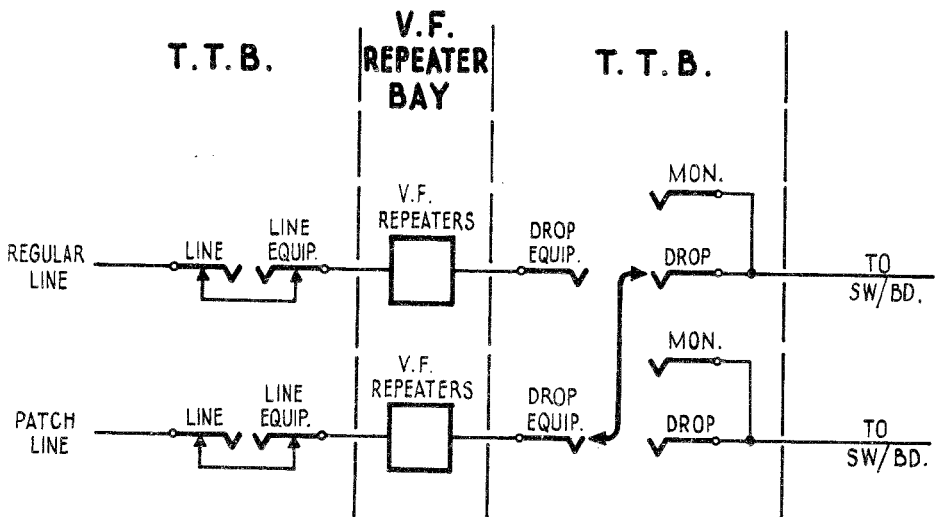


FIG. 30. PATCHING TEN JACK TELEPHONE CIRCUITS.

4.2 Phantom Patching. These patches will be made at the Trunk Test Board.

Complete Phantom Patch. This patch involves patching the two side circuits from which the phantom is derived. It is essential that this patch be made to lines which are phantom transposed. The patches required are shown in Fig. 31, and are -

- (i) From "Line Equipment" of the first regular side circuit to "Line" of the first patch side circuit.
- (ii) From "Line Equipment" of the second regular side circuit to "Line" of the second patch side circuit.

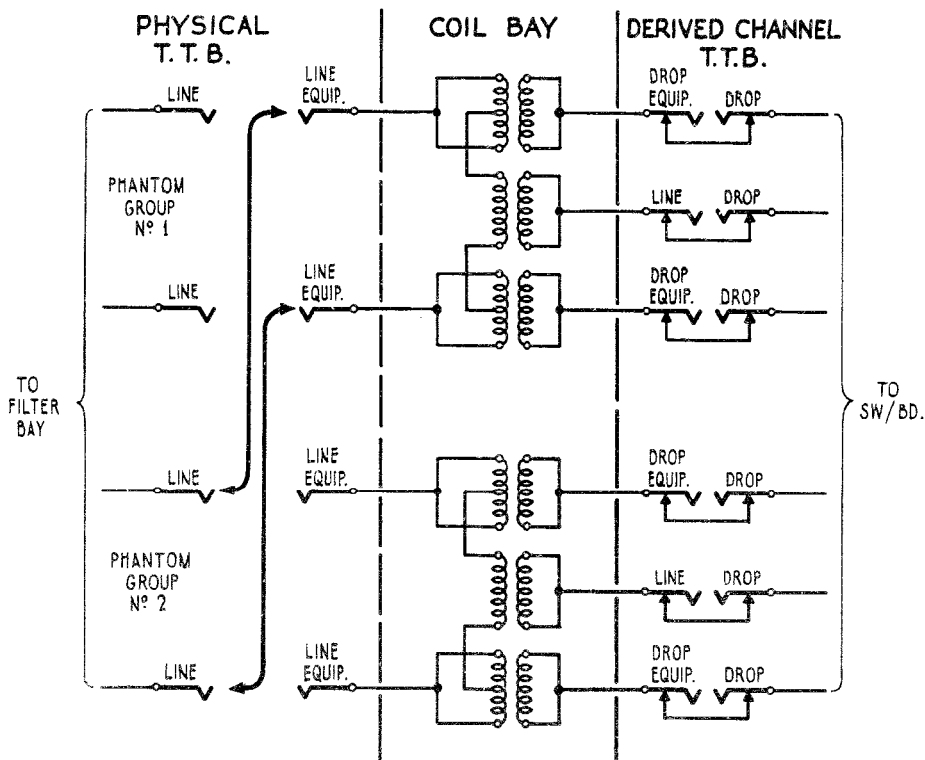


FIG. 31. PHANTOM PATCH AT PHYSICAL T.T.B.

4.3 Complete Phantom Patch. This patch is similar to that described in paragraph 4.2 except that, at certain offices as the line filters are wired on the equipment side of the "Line" jacks of the Trunk Test Board, the patch must be made at the line filter bay. The patches required are shown in Fig. 32, and are -

- (i) From "V.F. Equip." of the first regular side circuit to "L.P.F. Drop" of the first patch side circuit.
- (ii) From "V.F. Equip." of the second regular side circuit to "L.P.F. Drop" of the second patch side circuit.

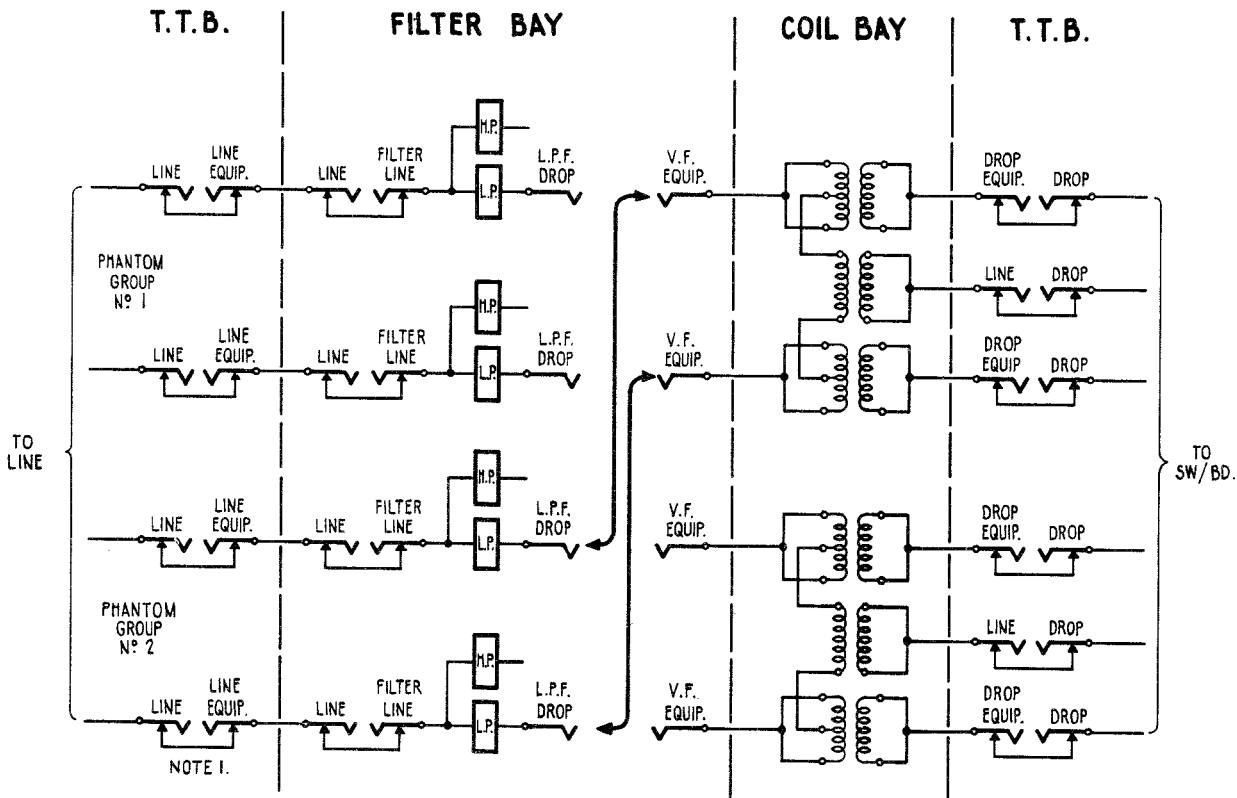


FIG. 32. PHANTOM PATCH AT FILTER BAY.

4.4 Patching the Drop Circuit of a Phantom (Six Jack Appearance). The patch is carried out at the Trunk Test Board and is shown in Fig. 33. The patch is -

From "Drop" of the Phantom Line being lost to "Line" of the phantom being placed in service.

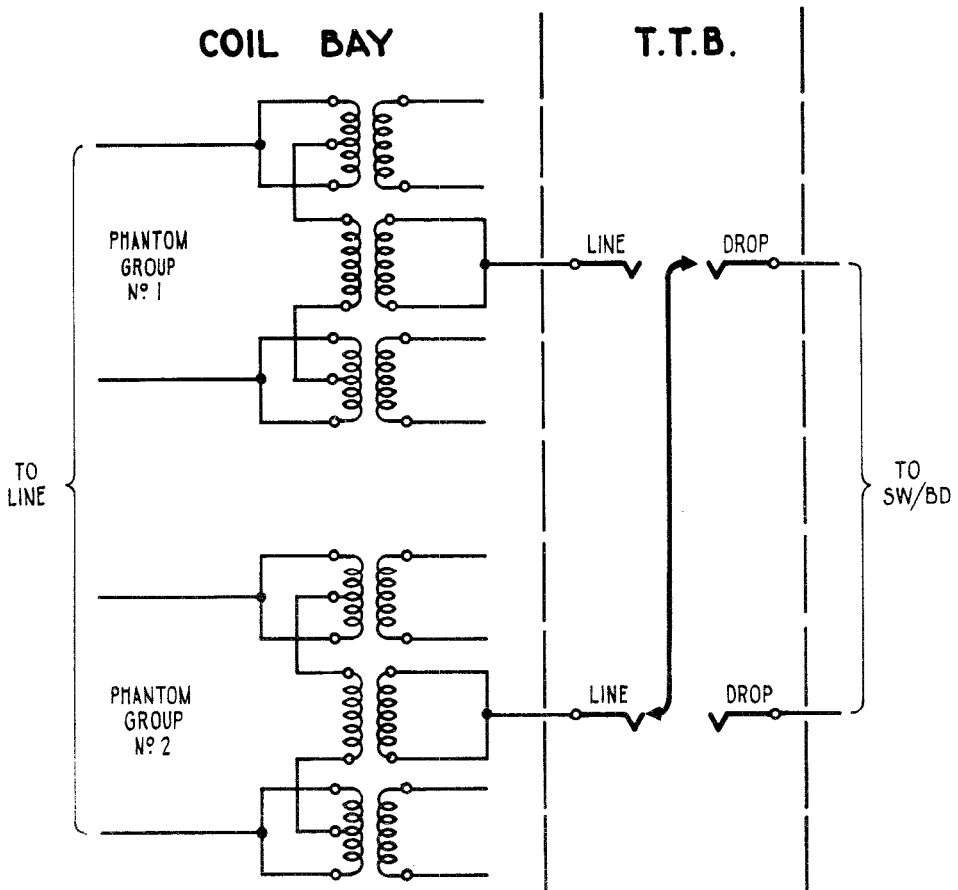


FIG. 33. PATCHING PHANTOM DROP
 ON 6 JACK APPEARANCE.

4.5 Patching the Drop Circuit of a Phantom (Ten Jack Appearance). This patch is carried out at the Trunk Test Board and is shown in Fig. 34. The patch is -

From "Drop" of the phantom line being lost to "Drop Equip." of the phantom line being placed in service.

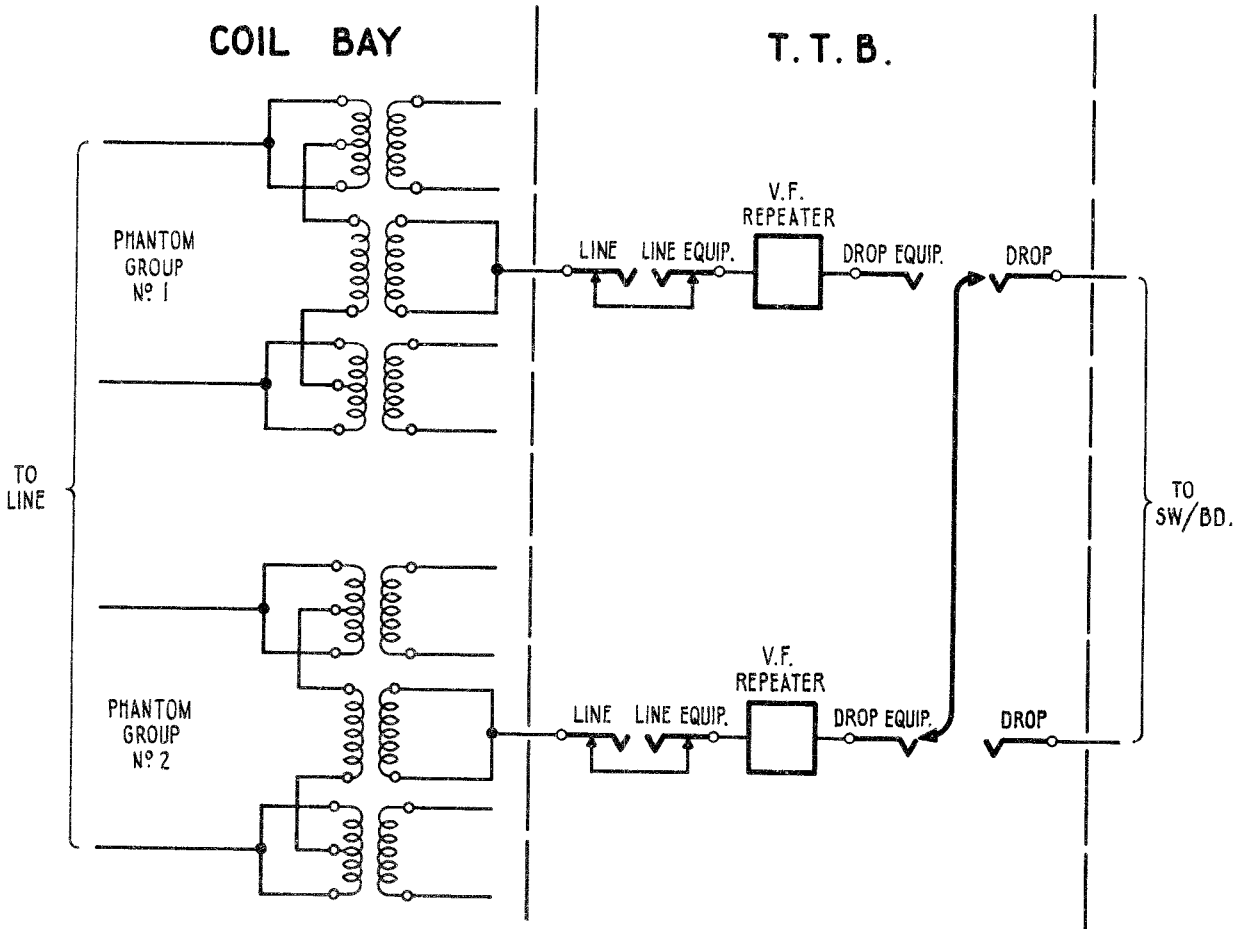


FIG. 34. PATCHING PHANTOM DROP
ON 10 JACK APPEARANCE.

4.6 Cailho Patching. This patch is carried out at the Trunk Test Board and is shown in Fig. 35. The patch is -

From "Drop" of the faulty cailho to "Line" of the patch cailho.

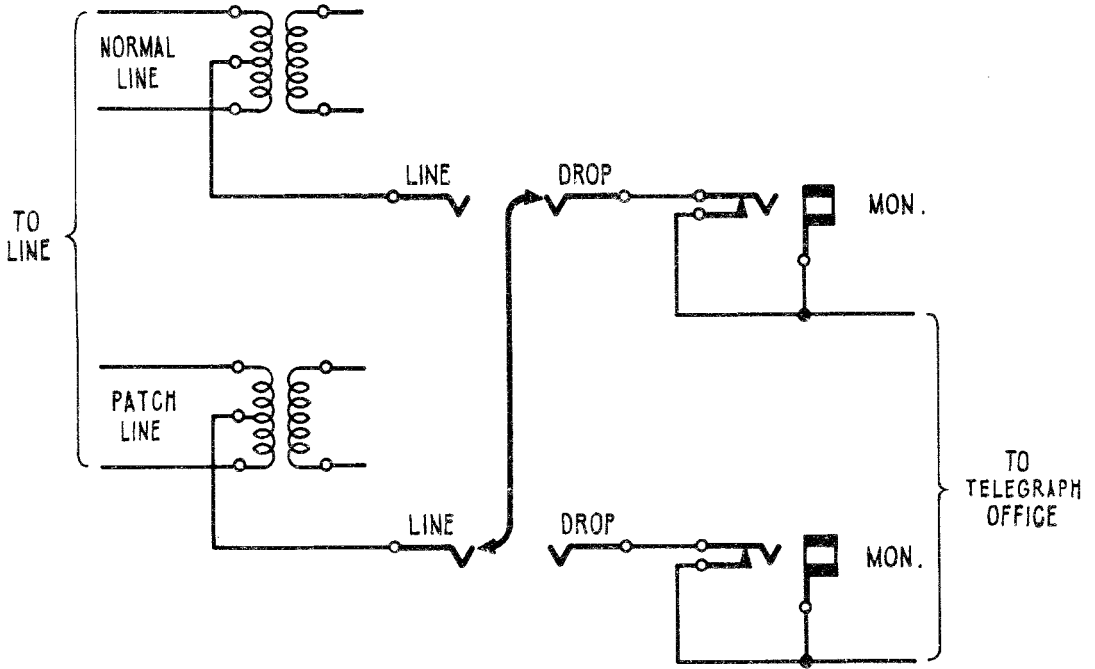


FIG. 35. CAILHO PATCH.

5. PROGRAMME PATCHES.

5.1 Patching Programmes to alternative channels. These patches shall be performed at the Programme patch bay. This entails all programme normal and patch circuits being jacked on this bay, except at minor stations where patches can be made on the programme equipment bay.

5.2 Patching to a Physical Programme Line. The patches required are shown in Fig. 36(a) and are -

At the Transmitting Terminal -

From "Line Amp Out" or "Branching Amp Out" of the required programme circuit to "Line" of the patch line.

At the Receiving Terminal -

From "Line Amp Out" of the patch line to "Line" of a circuit to the Receiving Broadcast Studio. Fig. 36(b) shows alternative patch if receive station is a splitting centre.

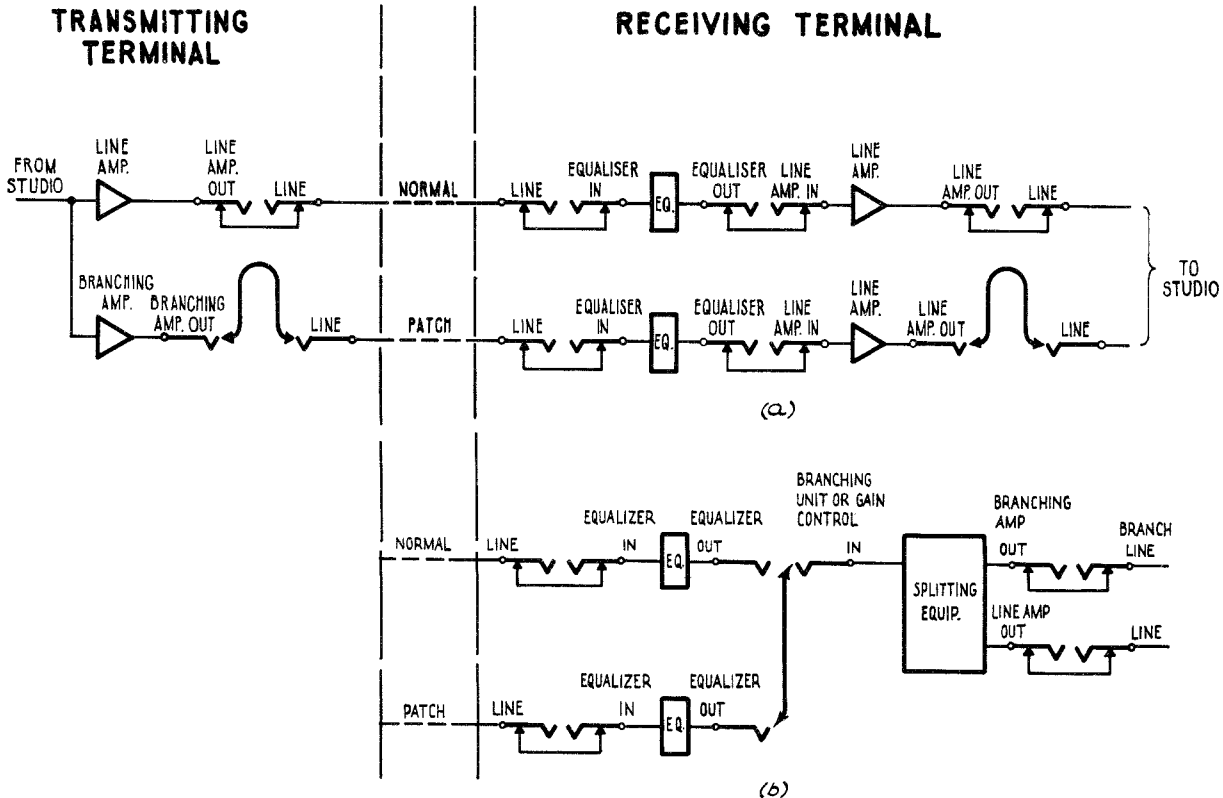


FIG. 36. PHYSICAL PROGRAMME PATCH.

5.3 Patching to a Physical Programme Line. This patch is similar to that described in paragraph 5.2 except that, as no line amplifier is provided at the receiving terminal of the patch line, one must be patched in. The patches required are shown in Fig. 37(a) and are -

At the Transmitting Terminal -

From "Line Amp Out" or "Branching Amp Out" of the required programme circuit to "Line" of the patch line.

At the Receiving Terminal -

- (i) From "Line" of the patch line to "Line Amp In".
 - (ii) From "Line Amp Out" to "Line" of the circuit to the Broadcast Station.
- Fig. 37(b) shows alternative patch if receive station is a splitting centre.

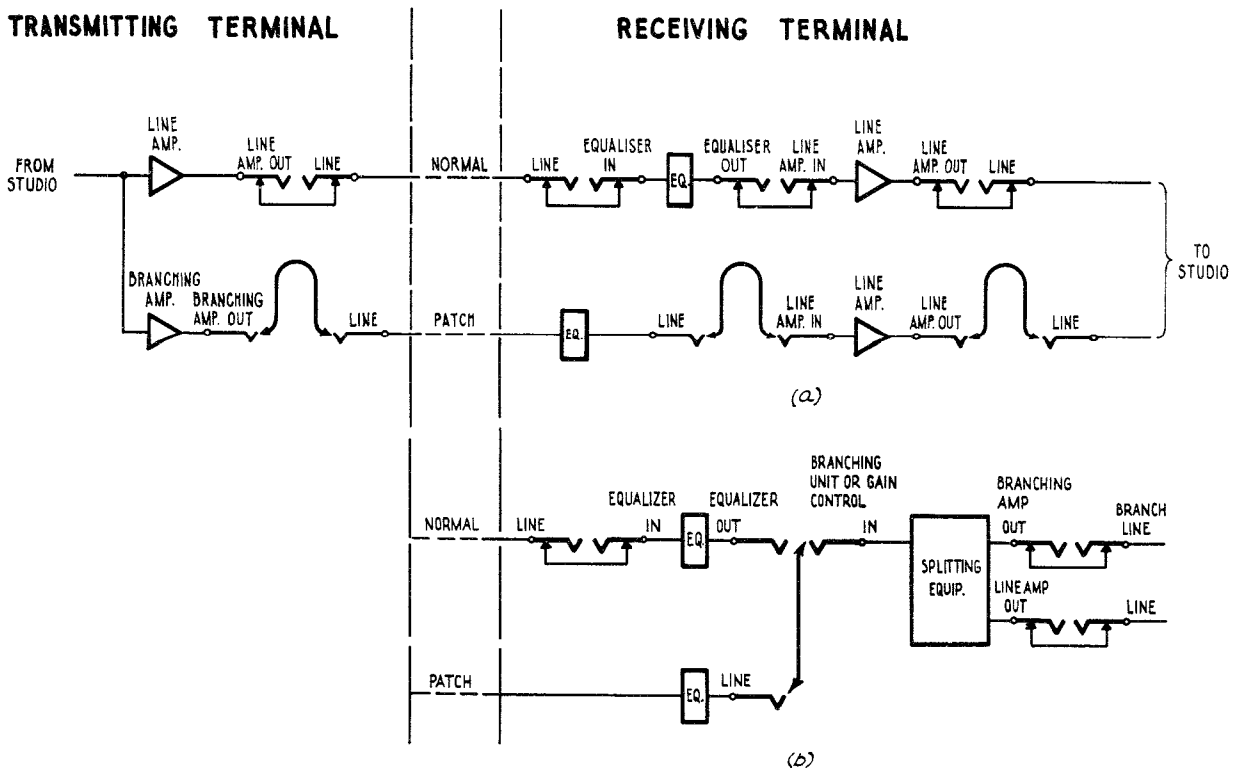


FIG. 37. PHYSICAL PROGRAMME LINE PATCH
(NO PERMANENT REC. AMP.)

5.4 Patching to a Programme Carrier Channel. The patches required are shown in Fig. 38(a) and are -

At the Transmitting Terminal -

From "Line Amp Out" or "Branching Amp Out" to "V.F. Equip. Out" of the Programme Carrier.

At the Receiving Terminal -

From "V.F. Equip. Out" of the Programme Carrier to "Line" of the circuit to the Broadcast Station. Fig. 38(b) shows alternative patch if Receive Station is a splitting centre.

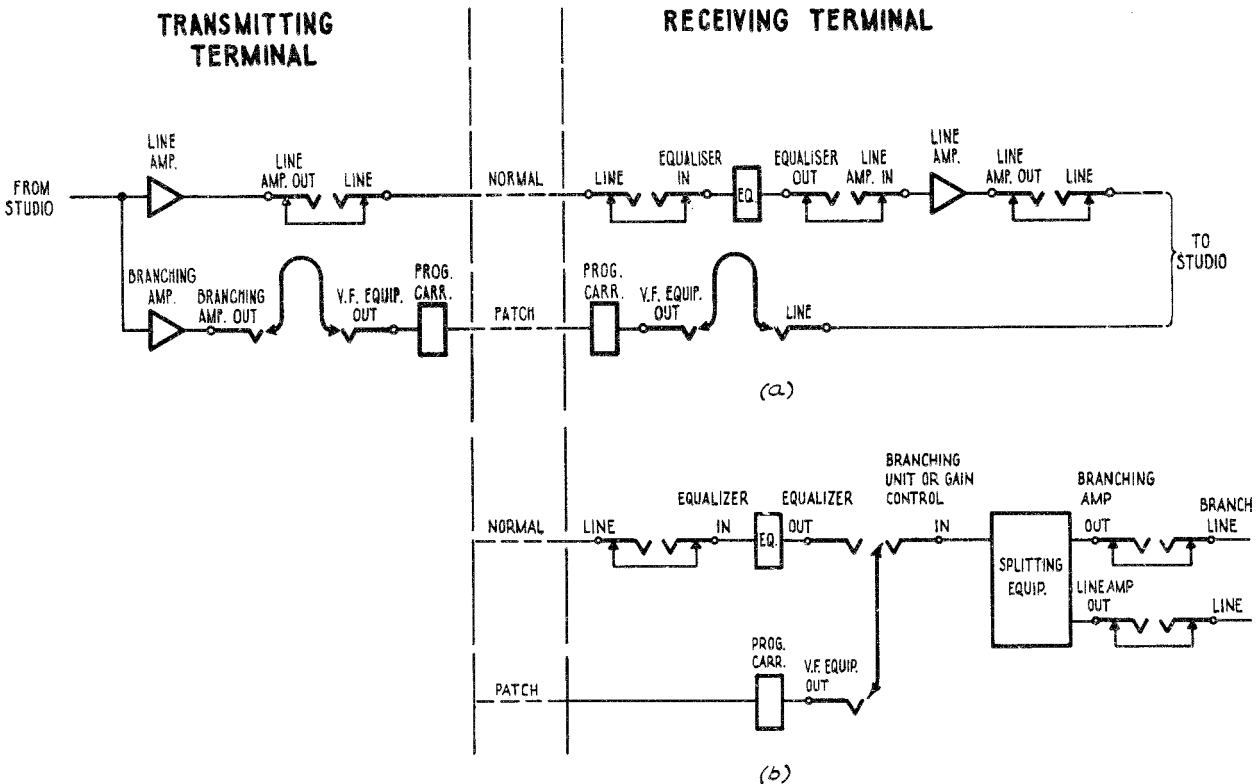


FIG. 38. PROGRAMME CARRIER PATCH.

5.5 Patching to a Carrier Telephone Channel with two-wire Jacking. When patching to a carrier telephone channel with two wire jacking, the two wire point which is jacked may be assumed to be a point of -3 dbm level. It is therefore necessary to insert an 11 db pad between the amplifier output and the telephone channel. The patches required are shown in Fig. 39(a) and are:-

At the Transmitting Terminal -

- (i) From "Line Amp Out" or "Branching Amp Out" to "11 db Pad In".
- (ii) From "11 db Pad Out" to "Line" of the patch circuit.

At the Receiving Terminal -

From "Line" of the patch channel to "Line" of the circuit to the Broadcast Station. Fig. 39(b) shows alternative patch if Receive Station is a splitting centre.

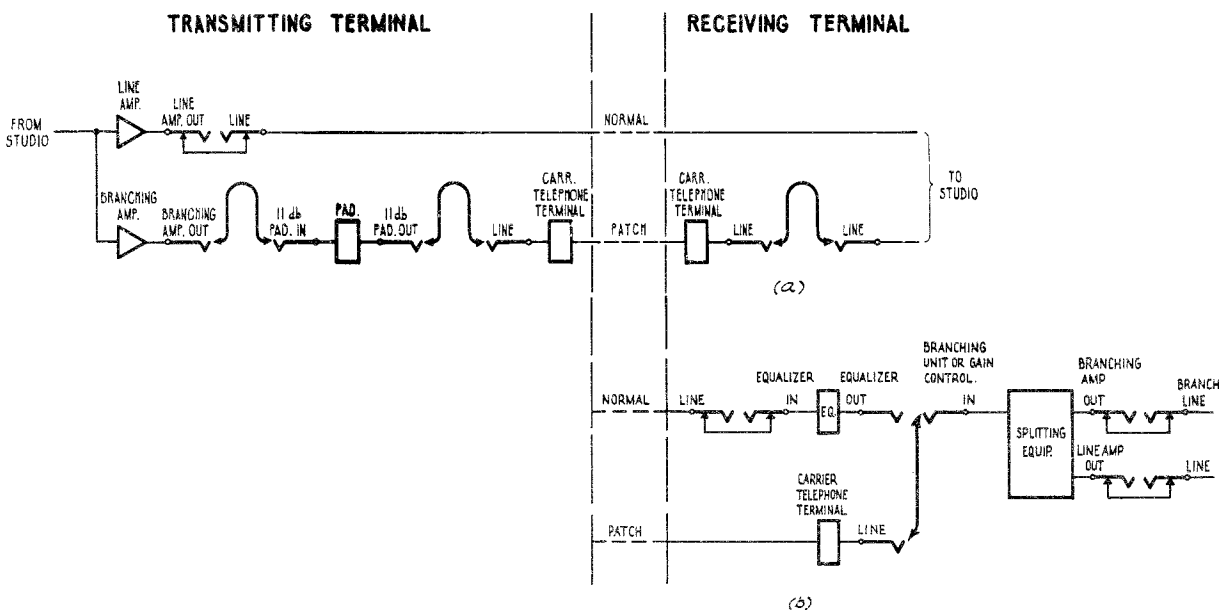


FIG. 39. PROGRAMME PATCH
TO A CARRIER TELEPHONE CHANNEL.

5.6 Patching to a Carrier Telephone Channel with four wire Jacking. An adjustment of level will be required in patching to the "MOD IN" jacks of a Carrier Telephone Channel, as in all cases the permissible level at "MOD IN" will be below that normally obtained at the output of programme amplifiers. The patches required are shown in Fig. 40(a) and are -

At the Transmitting Terminal -

- (i) From "Line Amp Out" or "Branching Amp Out" to "Pad In".
- (ii) From "Pad Out" to "Mod. In" of the patch channel.

At the Receiving Terminal -

From "DEMOD OUT" of the patch channel to "Line" of the circuit to the Broadcast Studio. Fig. 40(b) shows alternative patch if Receive station is a splitting centre.

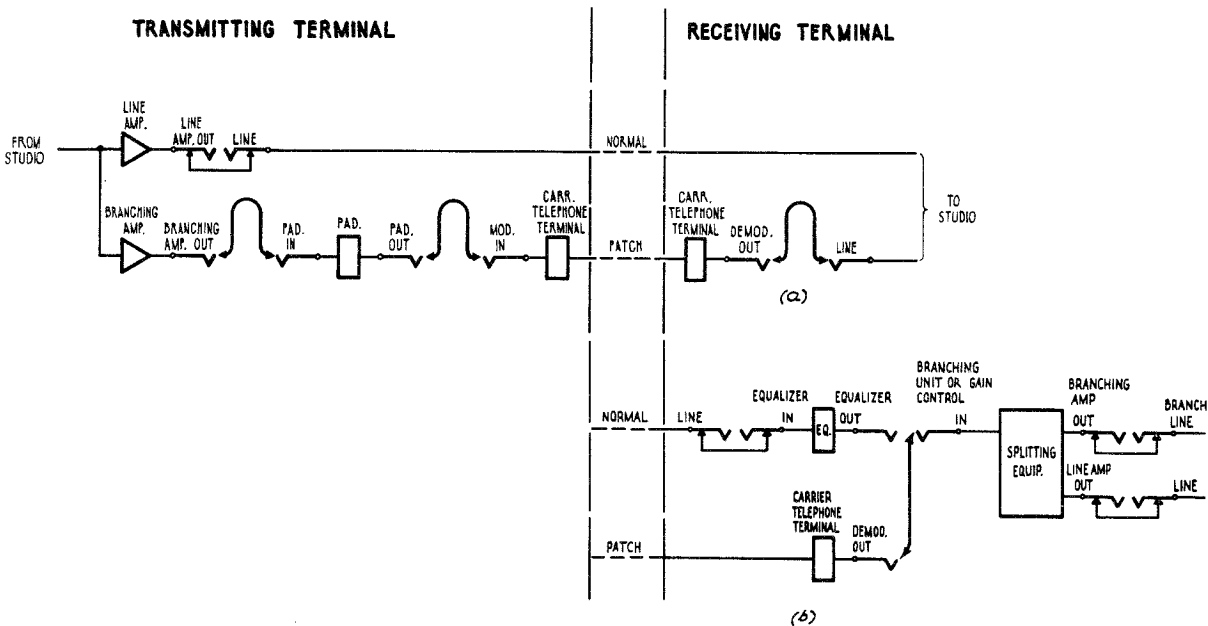


FIG. 40. PROGRAMME PATCH TO 4 WIRE JACKED CARRIER TELEPHONE CHANNEL.

END.