

TELECOMMUNICATION PRACTICE

BASIC NOTES

1/13
2/13

Telephone conversations take place over wires which have a great number of soldered joints. All these soldered joints must be electrically perfect.

SOLDER AND FLUXES.

- (1) Solder is an alloy of tin and lead; for telecommunications equipment, the best proportion is 65% tin and 35% lead. This solder has a relatively low melting point and it quickly changes from a solid to a liquid state.
- (2) Flux. The application of heat during soldering tends to oxidize the surfaces to be jointed. Oxidized surfaces are very difficult to solder. The use of flux assists a soldering connection because it :-
 - (a) Cleans the surface.
 - (b) Prevents oxidation by restricting air contact.
 - (c) Permits solder to flow more easily.

The only flux permitted for Telecommunications use is RESIN.

SOLDER RESIN-CORED 65% tin, 35% lead must be used for all internal plant purposes.

Corrosive fluxes must not be used.

SOLDERING TOOL.

The 50V. electric soldering tool (Tool 175) is the standard tool for internal plant installation.

RE-SHAPE-ING COPPER BIT OF ELECTRIC SOLDERING IRON.

Re-Shaping (or forging) Copper Bit.

- (a) Remove bit from iron.
- (b) Heat bit in gas flame or with a blow lamp until red hot.
(Use large size pliers, etc. to hold bit).
- (c) Hammer to the required shape, on an anvil whilst it is still red hot.
- (d) Quench in water (to soften), refit in iron.
- (e) Prepare a new surface for tinning as explained below.

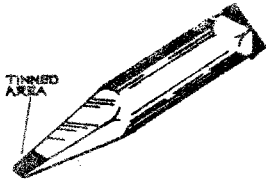
/ Correct Shape

Correct Shape



NEW SOLDERING TOOL.

NEW SOLDERING TOOL.



SOLDERING TOOL AFTER "TINNING".

SOLDERING TOOL AFTER "TINNING".

Re-Tinning of Bit.

With use, the tinned part of the bit becomes hollow, uneven and the tin creeps over the sides of the bit.

- (a) With iron HOT, file off all traces of solder and file soldering face flat.
- (b) Leave iron in stand five minutes, to allow all filed surfaces to become oxidized.
- (c) File soldering face only ($\frac{2}{8}$ "), and apply resin cored solder.

GENERAL NOTES.

When soldering, cleanliness of the parts to be soldered is of first importance.

Each block, shelf or unit of equipment must be soldered as soon as its termination is completed and should not be left unsoldered over night.

When soldering plastic covered wires to tags, the soldering tool must not be applied to the tag any longer than is necessary, because the heat may damage the plastic insulation.

Plastic covered wires must not rest on any other tag.

Objects to be soldered must be heated to the correct temperature to allow the solder to join properly.

Solder is applied to the job and not the iron (but keep iron well tinned).

Before soldering Check Temperature (Test with Solder).

The minimum amount of solder should be used and no burrs or solder tails left on tags or wires.

Dry joints and high resistance joints must not exist. (Reference I.P.I. - Wires and Cables - T.3010 para. 4.1).

SAFETY PRECAUTIONS.

The crude and dangerous practice of holding a hot soldering tool close to the cheek to assess its temperature must not be used. Check temperature by applying solder to tip and watching speed of melting.

The soldering tool must be placed in a safe container when not being held in the hand. The risk of fire with a hot iron is very high.

When cleaning tags, etc. the old excess solder should be drawn off on to the iron until the tag is clean. The use of a brush for cleaning tags, etc. is only permitted on dismantled equipment on the bench.

THE RISK OF SOLDER ENTERING THE EYE IS EXTREMELY HIGH.

Safety spectacles must be worn when soldering or un-soldering wires on equipment.

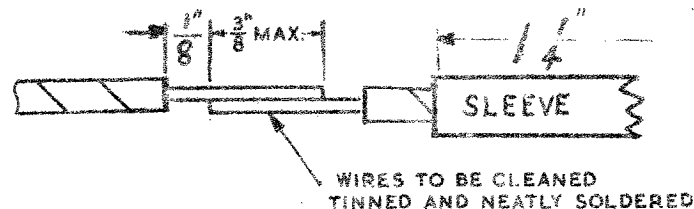
Read through - Internal Plant Installation
E.I. Practice - S.1010
Internal Plant Installation
Wires and Cables
T.3010 - Pages 14, 15, 16.



CLEANING A
HORIZONTAL TAG.

JOINTING SWITCHBOARD WIRES

Wires must not be jointed without the approval of the Officer-in-Charge.



JOINTING WIRES.

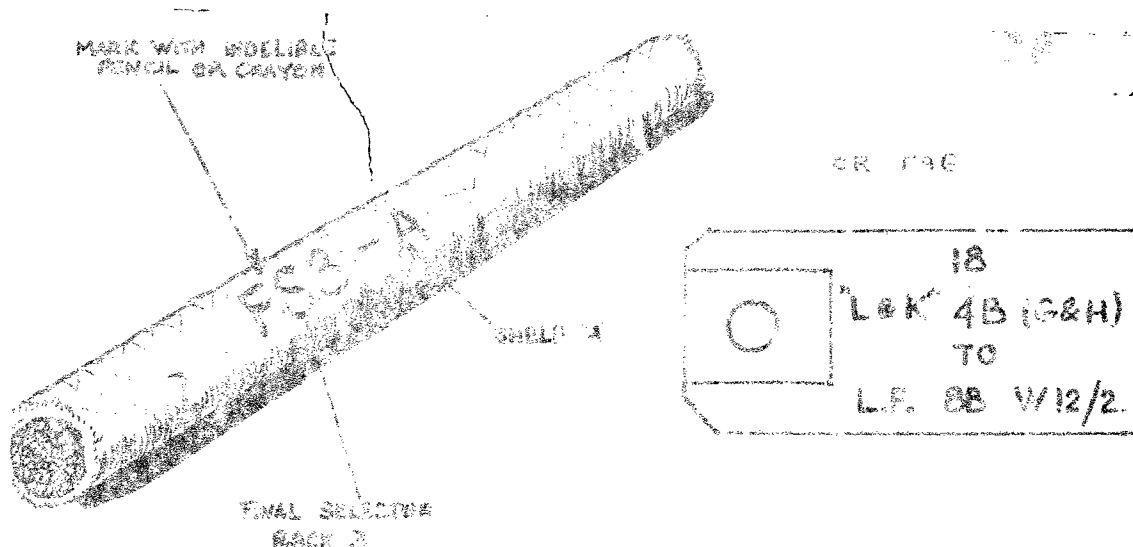
Slip SLEEVE over a wire. Strip the covering off both wires to approx 1".
Tin the bare wires, cut to 1/2", lay side by side for 3/8" and solder.
Sharp edges of wire or points of solder must not be left
Slide sleeve into position.

/ COLOUR CODE

BUTTING AND STRIPPING CABLE

IDENTIFICATION

Identify each cable to ensure that both ends are in the correct position. Use buzzer or test lamp before stripping.



BUTTING BRAIDED CABLE

BUTTING POINT

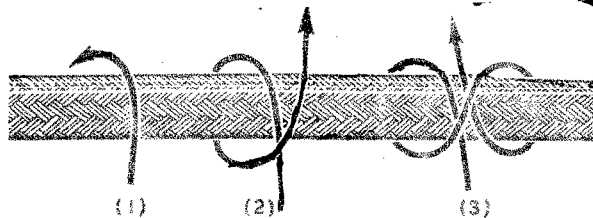
When fanning strips are provided in a vertical plane, the butt of the cable or cables serving one or more fanning strips will be in line with:

- (i) The top of the fanning strip in the case of the cable feeding downward; or
- (ii) The bottom of fanning strip in the case of the cable feeding upward.

In no circumstances will any cable or form of wires be laced on or to, untreated metal surfaces; the practices listed below must be used according to the circumstances.

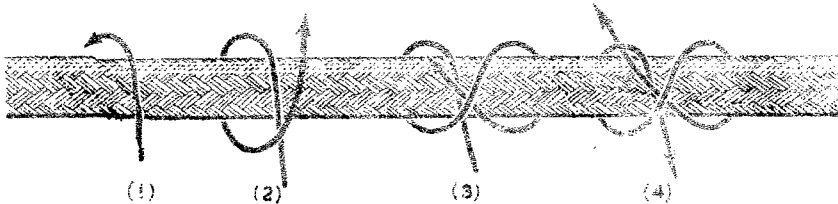
THE SURFACES OF POSTS, RODS, BRACKETS OR CHANNELS must be suitably insulated according to I.P.I. W.E.C. F.3015. e.g. paints, enamels, plastic sheathing or tape.

The cable is marked at the butting point, and, using waxed lacing twine, a modified clove hitch is tied at this mark.



Clove Hitch.

Refer to E.I.
I.P.I.
Wires & Cables
C.3010
Para. 2.1
" 3.1
Figure 1



Mod. Clove Hitch.

(b) Modified Clove Hitch.

KNOTS FOR BINDING BRAIDED CABLE BUTTS.

STRIPPING BRAIDED CABLE.

Determine the thickness of the outer covering.

Check the appearance of the cable to see that the wires are laid on neatly.

Check the sharpness or setting of the stripping tool.

Hold knife in such a manner that it cannot cause injury to body or hands if it slips off cable.

Hold spare hand behind cutting direction of knife. Cut away from body if possible. Knife must be on the angle to cable so as to avoid damage to wires, etc.



STRIPPING BRAIDED CABLE WITH POCKET KNIFE DRAWN TOWARDS USER.

STRIPPING BRAIDED CABLE WITH POCKET KNIFE DRAWN TOWARDS USER.

The outer covering is carefully stripped to the twine; the braid is then carefully trimmed to the twine with diagonal cutting pliers or scissors. The modified clove hitch is retightened, the ends of twine cut $\frac{3}{16}$ " and pressed flat.

STRIPPING PLASTIC SHEATH COVERED CABLE (If there is no drawing wire or thread provided).

At butting point, lightly score around plastic skin. (MUST NOT CUT THROUGH SKIN). Score a line similarly along cable to be stripped. Starting at end of cable tear skin off along score marks.

REFERENCE: Engineering Instruction,
Internal Plant Installation
Wires and Cables
C.3010
F.3015
L.4015

LACING FORMS I.P.I. Wires and Cables - L.4015 .

Lacing is not done when the form touches the fanning strip.



PANNED WITHOUT LACING

When forms are laced, the nearest cable will be in such a position that the butt is at least 2" back from the fanning strip.



LACED FORM

Lacing must start with a clove hitch placed against the butt. The lacing stitches must run in the same direction and support the stringers leaving the form. All knots are to be hidden on the finished job. Finish lacing by placing an ordinary stitch back over last stitch.



COMMENCE LACING WITH CLOVE HITCH.

(b) Finished.



START OF LACING.

FINISHING OFF RUNNING STITCH.

Under no circumstances will lacing twine be drawn so tight that the insulation of the wires is damaged or impaired. / The stitches

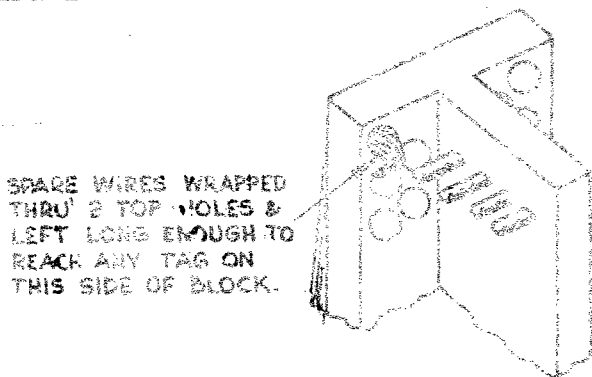
The stitches must be in a straight line and out of sight after the form has been installed. The ties around the form must be at right angles to the form. The twine must not be used to pull the form into shape.

SPARE WIRES. Refer I.P.I. Wire & Cables F.3015 Fig. 7, 8.

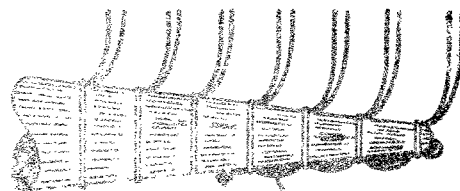
Spare must be 1" longer than longest stringer.

Where a form is laced, the spare is doubled back in the form and the whole form and spare laced up. Fig.(b)

Where a form is not laced, the spare is taken through the last fanning hole and passed back through the adjacent hole until all spare is accommodated. Fig. (c)



(a) Terminal Blocks.



(c) Shelf Forms.

TERMINATING METHODS

TERMINAL BLOCKS AND STRIPS

Reference: Engineering Instruction I.P.I. Wires and Cables T.3010

TERMINATING METHODS

Where double sided tag blocks are mounted vertically, the permanent cable and wiring must be terminated on the L.H.S. Jumpers and strapping on the R.H.S. (viewed from the front).

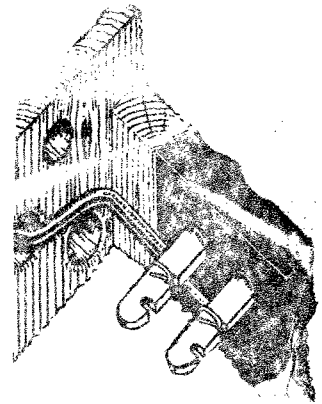
Where tag blocks are mounted horizontally, the permanent wiring or cabling must be terminated on the underside of the tags.

When terminating on blocks or strips, a length of wire is left to facilitate subsequent maintenance. The extra length is provided by:

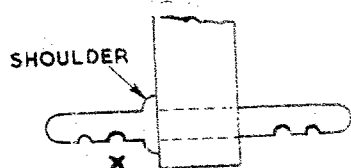
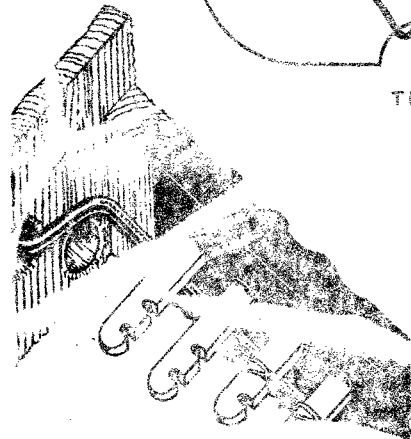
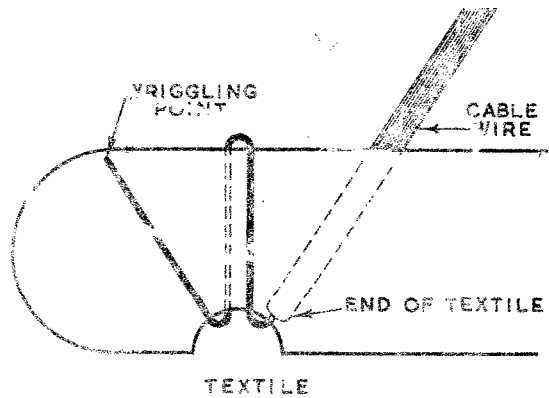
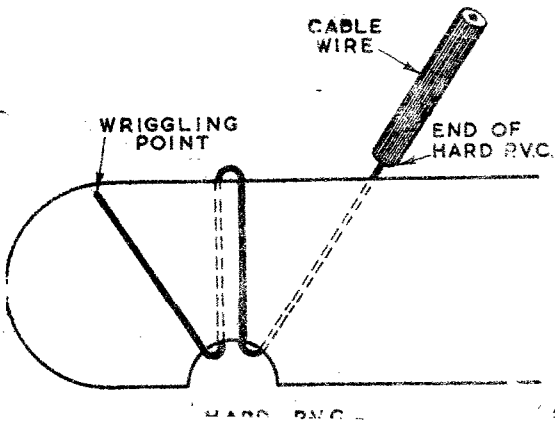
- (i) An allowance in laced forms (length of stringer from form to fanning strip)

Refer diagram page 8 (Lacing Forms). // (ii)

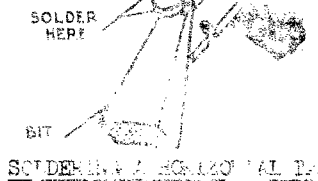
- (ii) The angle set into the corner of the block between fanning strip and tag assembly.



TERMINATING TAG BLOCKS. (Refer T.3010, Fig. 3)

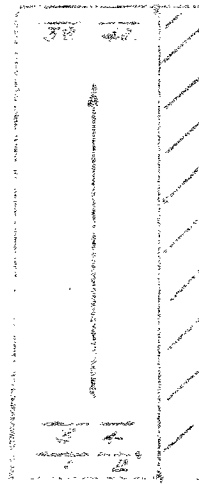
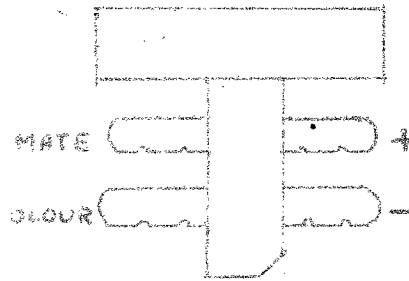
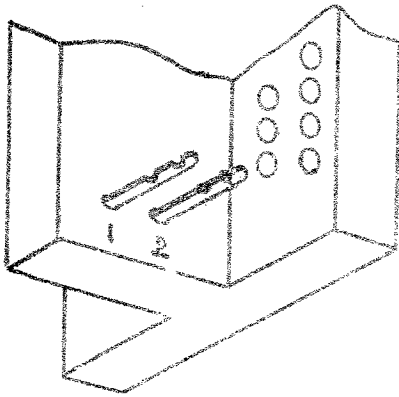


NOTE- CABLE WIRE MUST TERMINATE ON TAG WITH SHOULDER. X



SOLDERING A TAG ON A TAG

TAG BLOCK DESIGNATIONS

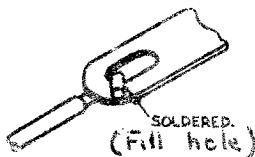


TAG BLOCK NUMBERING

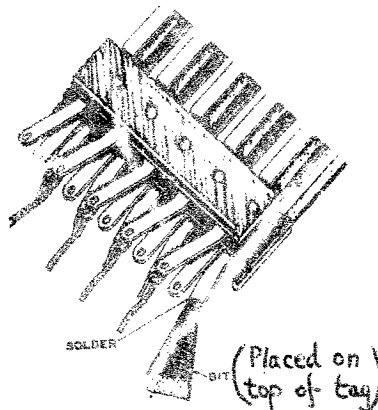
TERMINATING - JACK OR LAMP STRIP.

Stringer must be long enough to allow the jack strip to be removed from the equipment for maintenance. Stringers must leave the form at the centre of their respective jack.

- (a) When terminating textile covered wires, bring the insulation up to the front edge of the tag hole. This prevents un-ravelling of the covering.
- (b) When terminating P.V.C. (Plastic) covered wires, bring the insulation to the front of the tag only. Do not stretch the plastic covering because it will run back when heated.



JACK AND KEY SPRING
TYPE TERMINAL.



SOLDERING WIRES TO A JACK.

TAG BLOCK NUMBERING (Is numbered from Jumper Side
I.P.I. W & C T. 3012)

63 WIRE CABLE .

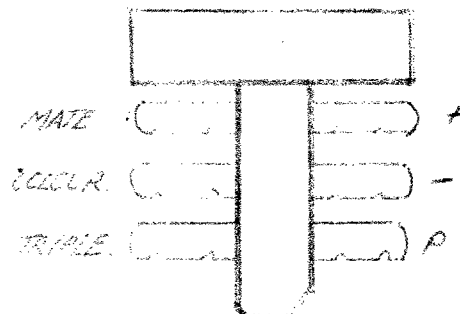
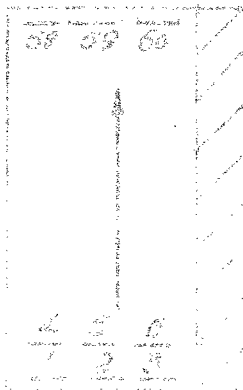
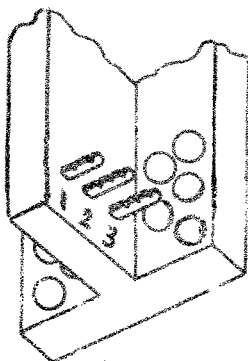
Colour Code 63 Wire Cable (20 triples & 1 spare triple).

<u>Circuit No.</u>	<u>Colour</u>	<u>Mate</u>	<u>Triple</u>
1	Blue	White	Red - Blue
2	Orange	"	Red - Orange
3	Green	"	Red - Green
4	Brown	"	Red - Brown
5	Slate	"	Red - Slate
6	Blue - White	"	Red - Blue-White
7	Blue-Orange	"	Red-Blue-Orange
8	Blue - Green	"	Red-Blue-Green
9	Blue - Brown	"	Red-Blue-Brown
10	Blue - Slate	"	Red-Blue-Slate
11	Orange - White	"	Red-Orange-White
12	Orange - Green	"	Red-Orange-Green
13	Orange - Brown	"	Red-Orange-Brown
14	Orange - Slate	"	Red-Orange-Slate
15	Green - White	"	Red-Green-White
16	Green - Brown	"	Red-Green-Brown
17	Green - Slate	"	Red-Green-Slate
18	Brown - White	"	Red-Brown-White
19	Brown - Slate	"	Red-Brown-Slate
20	Slate - White	"	Red-Slate-White

Spare Blue - Orange - White White Red-Black-Blue

63 WIRE CABLE

TAG BLOCK DESIGNATIONS



TERMINATING 2000 Type Equipment, Bank Multiple, Blocks

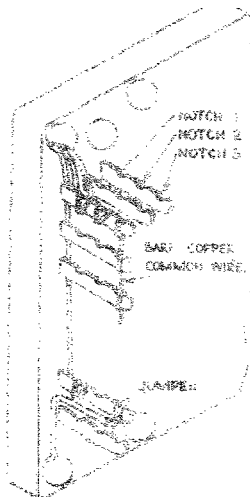
(Single sided moulded type)

The terminating, jumpering and grading for this modern type of selector is performed on these special blocks.

NOTCH ALLOCATION.

A Typical Arrangement

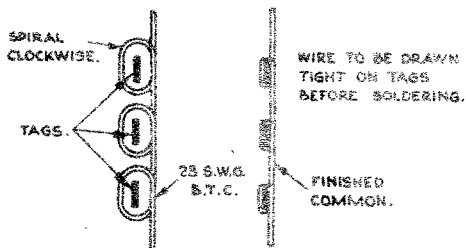
NOTCH 1	Bank Wiring (Contractors)
NOTCH 2	External Switchboard Cable
NOTCH 3	Common and bare Commons



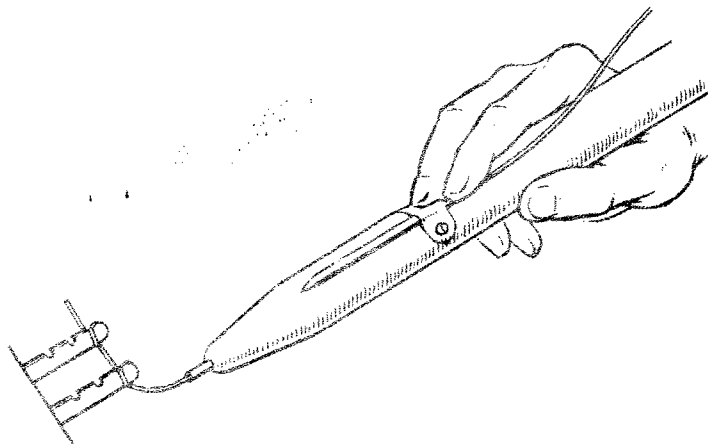
TERMINATIONS OF MOULDED TYPE BLOCK.

The number of $9\frac{1}{4}$ lb. insulated wires through any one fanning hole must not exceed 40.

- (i) All tags are strapped together to speed up the work.
- (ii) Surplus links are then cut away according to the grading plan.



(a) Looping B.T.C. Commons on Moulded Type Rack Terminal Strips.



(b) Using tool for Commoning.

COMMONING AND TOOL.