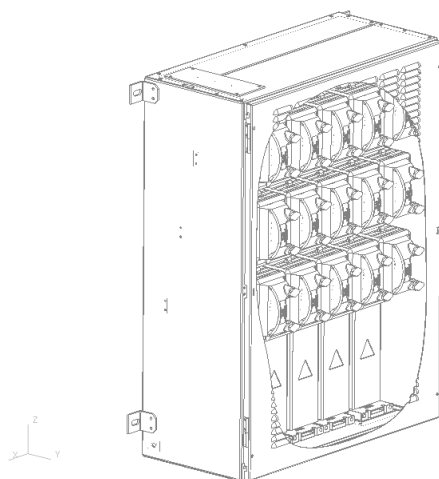


MERLIN GERIN
PUBLIC DISTRIBUTION PRODUCTS
SCARBOROUGH YO11 3DA ENGLAND

THE 'MODE' RANGE



FOR USE BY COMPETENT PERSONNEL

WARNING: ALL WORK ON THIS EQUIPMENT THAT MAY BE LIVE MUST BE CARRIED OUT IN COMPLETE COMPLIANCE WITH THE ELECTRICITY AT WORK REGULATIONS AND ALL SAFETY PROCEDURES MUST BE OBSERVED. IN PARTICULAR DUTY HOLDERS AND, PERSONS WORKING ON THIS ASSEMBLY OR ADJACENT TO IT, SHOULD NOTE THAT THE DEGREE OF PROTECTION IPXXB PROVIDED BY THIS ASSEMBLY (DOORS OPEN FOR OUTDOOR ASSEMBLIES) MAY NOT SAFEGUARD AGAINST THE POSSIBILITY OF SMALL DIAMETER OBJECTS E.G. CABLE STRANDS COMING INTO CONTACT WITH HAZARDOUS LIVE PARTS. IF WORK IS CARRIED OUT WITH ANY PART OF THE EQUIPMENT LIVE A RISK ASSESSMENT SHOULD BE CONDUCTED AND APPROPRIATE PROCEDURES SHOULD BE EMPLOYED.

DOCUMENT REFERENCE: **MODEL V2**

REVISION: **0**

DATE OF ISSUE: **06.10.2004**

The successful operation of all switchgear and fusegear depends largely upon systematic inspection at regular intervals and the maintenance of all parts in a satisfactory condition. If the equipment described in this manual receives the recommended attention, it will give many years of reliable service.

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1 MOUNTING OF THE 5X4D1A MODE BOX

The MODE box has four fixing points these consist of four slotted 14mm holes at the top and bottom, the fixtures in the wall must be fitted prior to the box being mounted. The box should then be lifted into position on the wall, correct working practice for lifting should be followed at all times.

For the larger sizes of box it is advised to reduce their weight before lifting in to position by removing any detachable items i.e. cutouts, fuse handles, shrouds, doors and screens.

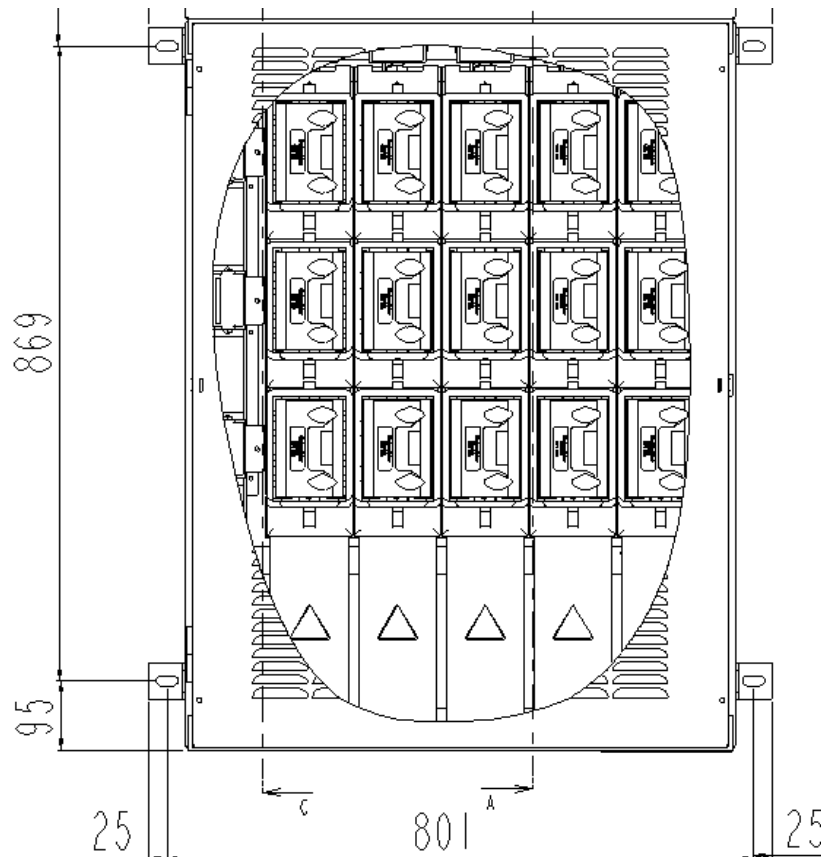


FIG 1.1

2 OPERATION OF SHIELDED FUSEWAYS

The shielded fuseway is a three phase vertical assembly consisting of three pairs of contacts, the upper contact of each phase is connected to the main busbar while the lower contact provides the cable termination point. The contacts are bridged by type GU HRC fuse links with wedge tightening contacts to IEC 60269-2-1 sect. V1. mounted within insulated carriers.

When a shielded fuseway has all screens and fuse handles in position a level of protection to IPXXB is achieved.

Switching of circuits is carried out by the manual insertion and removal of the fuse handles in accordance with standard instructions for operators. Switching a circuit is dependent upon the operators level of skill, diligence and protection, since he is exposed to the live conductors and arcing associated with switching of a load by this means.

3 CABLING THE SHIELDED WAYS

3.1 REMOVING THE BOTTOM FRONT CROSS MEMBER

The front half of the bottom front cross member may be removed to ease access to the adjustable cable clamp and so ease cabling.

First remove the two M6 screws and fixings in the front of the cross member and the six M6 screws and fixings in the bottom edges three at each side. Lift off the cross member

Remove the front section of adjustable cable clamp by releasing the M8 fixings. Slide off the front section

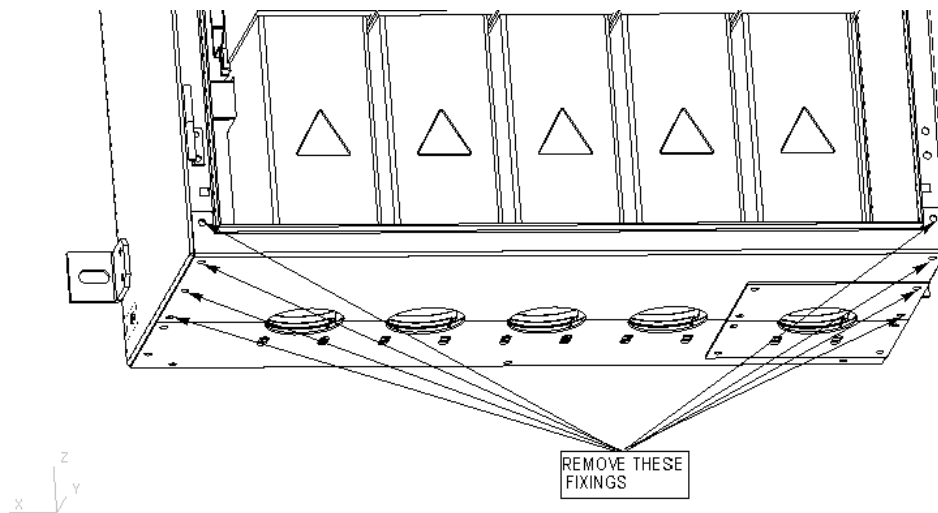


FIG 3.12

3.2 REMOVING THE TOP FRONT CROSS MEMBER

UNIT REFERENCES: 5XC6, 5XC10

The front half of the top front cross member may be removed to ease access to the adjustable cable clamp and so ease cabling.

First remove the gland plate on the top of the box by removing the four M6 screws and fixings in the corners of the gland plate. Then remove the two M6 screws and fixings in the front of the top front cross member and the two on the top in the front corners.

Remove the two M6 countersunk screws and fixings in the left hand edge of the top front cross member and the two M6 screws that holds the right hand edge of the cross member these must be removed from the inside of the box. Lift off the cross member and front section of the extension trunking in one go.

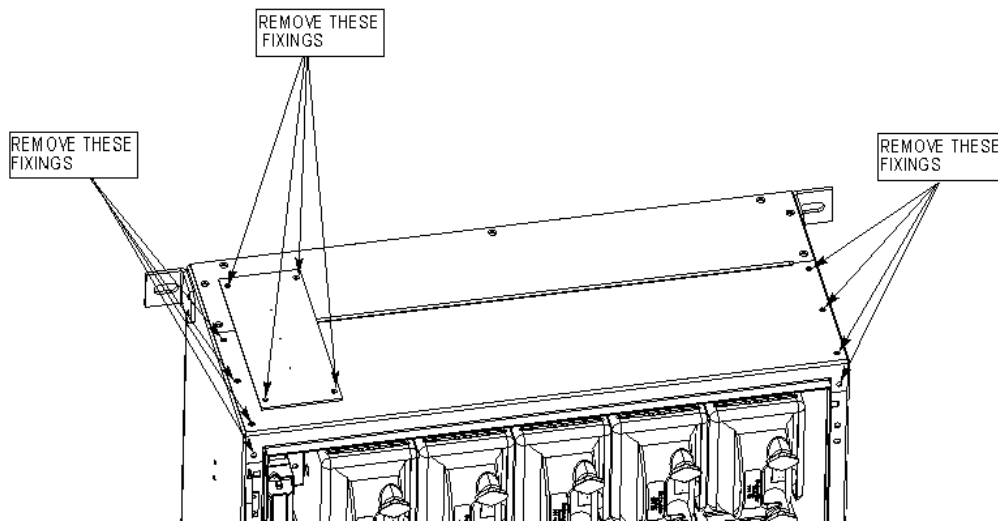


FIG 3.21

3.3 REMOVING THE FUSE HANDLES

Fuse handles (1) are normally supplied as loose items. Boxed and without fuse links.

If the fuse handles have been fitted for any reason they should be removed by slackening the thumb screws and pulling out the fuse handle.

3.4 REMOVING THE SHIELDS

Lift off the shields from the fuseway by removing the M5 screw securing the top shield in place. Lift the top shield approximately 15mm and remove with a forward movement. Lift off the middle and bottom shields. NOTE: The shields overlap each other and can only be removed in the sequence described.

Undo and remove the M16x50mm screws (6), washers, spring washers, nuts and spacers going through the copper contacts.

Remove the cable screen situated at the bottom of the fuseway by removing the M5 screw securing it in place.

3.5 TO TERMINATE THE CABLES

Clamp the cables in the adjustable cable clamp and terminate the cores in accordance with the instructions for the type of cable and termination method selected and the following.

3.6 TERMINATING PHASE CORES

3.61 TERMINATING USING CABLE SOCKETS

N.B. Cut the tapered end off the terminal shroud (15) to a secure fit over the blue phase cable core and fit the narrow end first over the cable core before making off the cable and socket.

Refit the screws, spacers, washers, spring washers and nuts from 2.14 from either direction into either of the two holes in the cable contact (4) to suit the position of the cable core as it rises from the cable crotch, there is no need to cross the cable cores. Ensure that the spacer (8) is adjacent to the cable contact (4) to allow the cable core to clear the shrouding of the phase below.

Cut one of the wings off the terminal shroud (15) to suit the position of the cable core onto the cable contact.

Slide the terminal shroud (15) back up the core and around the cable contact, push the plastic clip through the top flange of the terminal shroud and secure the bottom of the shroud with a plastic cable tie.

3.62 TERMINATING USING MECHANICAL CABLE CONNECTORS

Fit the mechanical connectors to the cable contacts (4) in the positions suited to the rise of the cable cores, but only to finger tightness.

Set the conductor to the required position, cut to length and strip the insulation equal to the length plus 5mm. Thoroughly abrade the exposed conductor.

Remove the connectors from the cable contacts (4) and assemble around the conductor. Tighten the screws sufficiently to secure the conductor but DO NOT shear the screw head at this stage.

Clean the cable contact (4) area corresponding to the position of the mechanical connector.

Assemble the connectors to the cable contacts (4), adjusting the position of the connector on the cable as necessary.

Check for correct alignment of the conductor and carefully tighten the double headed shear screw holding the conductor, USING THE OUTER HEAD ONLY, until the outer head shears.

N.B. A circlip is fitted at the point of shear between the two hexagon heads of the double headed shear screw and its sole purpose is an aid to ensuring that the socket or ring spanners do not engage with the lower hexagon head.

ENSURE: that all circlips and sheared heads are removed from fusegear enclosures.

NOTES

- (i) The connector is designed for use with cable contacts having a thickness of 8mm. When fitted to copper work of less thickness, suitable spacer washers must be fitted under the double-headed shear screw to achieve a nominal thickness of 8mm.
- (ii) Should it be necessary to disconnect the fitting from the cables and/or cable contact, it should only be refitted using genuine replacement double headed shear screws.

3.7 TERMINATING NEUTRAL CORES

3.71 TERMINATING NEUTRAL CORE USING CABLE SOCKETS

Remove the M12 screw, washer, spring washer and nut from the neutral busbar and position the core to line up with the hole in the busbar refit the M12 screw, washer, spring washer and nut and tighten.

3.72 TERMINATING NEUTRAL CORE USING MECHANICAL CABLE CONNECTORS

Remove the M12 screw, washer, spring washer and nut from the neutral busbar (discard these fixings).
Fit the cable clamp to the neutral busbar in place of the M12 screw, using the M12 nut and disc spring washer provided.

Set the conductor to the required position, cut to length and strip the insulation equal to the length plus 5mm. Thoroughly abrade the exposed conductor.

Check for correct alignment of the conductor and carefully tighten the double headed shear screw holding the conductor, USING THE OUTER HEAD ONLY, until the outer head shears.

N.B. A circlip is fitted at the point of shear between the two hexagon heads of the double headed shear screw and its sole purpose is an aid to ensuring that the socket or ring spanners do not engage with the lower hexagon head.

ENSURE: that all circlips and sheared heads are removed from fusegear enclosures.

NOTES

- (i) The connector is designed for use with cable contacts having a thickness of 8mm. When fitted to copper work of less thickness, suitable spacer washers must be fitted under the double-headed shear screw to achieve a nominal thickness of 8mm.
- (ii) Should it be necessary to disconnect the fitting from the cables and/or cable contact, it should only be refitted using genuine replacement double headed shear screws.

3.73 TERMINATING ARMOUR USING MECHANICAL CLAMP

Remove the M12 screw and fixings from the neutral busbar (discard these fixings).

Fit the cable clamp to the neutral busbar in place of the M12 screw, using the M12 nut and disc spring washer provided.

Set the conductor to the required position, cut to length and strip the insulation equal to the length plus 5mm. Thoroughly abrade the exposed conductor. Check for correct alignment of the conductor and carefully tighten the shear screw holding the conductor, until the head shears.

ENSURE that all sheared heads are removed from fusegear enclosures.

NOTES

- (i) Should it be necessary to disconnect the fitting from the cables, it should only be refitted using genuine replacement shear screw.
- (ii) When using a separate neutral and earth connection the neutral/earth link should be removed by take out the two M8 screws, washers, spring washers and nuts.

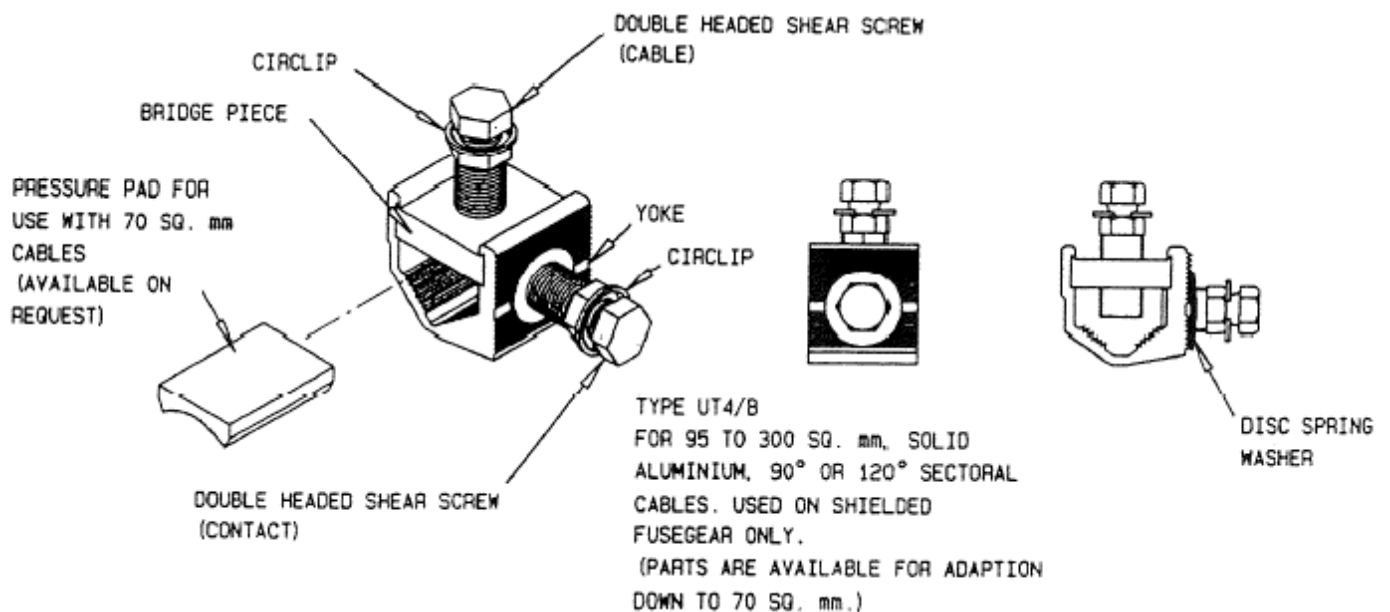


FIG 3.62

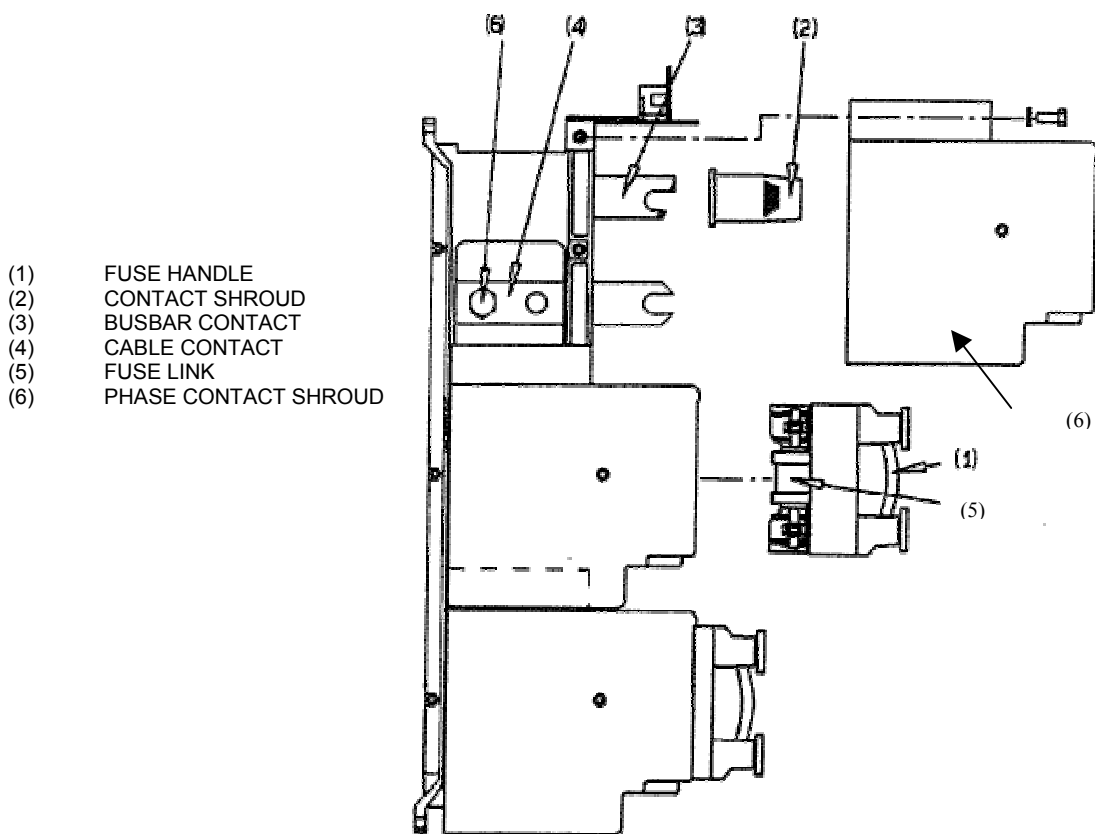


FIG 3.3

3.8 FITTING THE SHROUDS

Attach the cable screen to the bottom of the ways using the M5 screw (removed) screwed into the M5 square pressed nut.

Refit the shields removed in section 2.4 NOTE: Refitting the shields must be carried out in the reverse order.

3.9 FITTING THE CROSS MEMBER

Refit any items removed in section 2.1 or 2.2 NOTE: Refitting the items must be carried out in the reverse order.

4 INSERTION OF A FUSE HANDLE

WARNING Switching of circuits (removal or replacement of fuse handles) with the equipment live involves exposure to live conductors and possibly switching arcs. It is therefore strongly recommended the removal and replacement of fuse handles is carried out with the equipment totally de-energised. Where this is unreasonable, the requirements of the Electricity at Works Act must be fully met and in particular, Regulation 14. Switching of circuits with the equipment live must be carried out by competent personnel trained and skilled in this operation. They must wear appropriate protective clothing and work in accordance with a safe working procedure established by the Duty Holder.

To switch on a circuit the contact shield (16) must be removed (if fitted) to reveal the busbar contact (13). **CAUTION** the busbar contact (13) will be LIVE. The fuse handle (11) to be used must have a suitable fuse link (15) fitted. If no fuse link is fitted refer to section 2.4 for details on installing fuse links.

Before attempting to insert a fuse handle (11) ensure both thumbscrews (19) are slacked by turning the knobs anti-clockwise. Holding the fuse handle (11) by the insulated grip (17), position the lower clamp pin (22) onto the fork of the lower contact (14) at an angle of approximately 45°.

With a quick hinge action close the fuse handle (11) onto the busbar contact (13). With the fuse handle (11) inserted and whilst holding it in place, with your free hand turn both thumb screws (19) clockwise until fully tightened.

5 REMOVAL OF A FUSE HANDLE

To switch off a circuit, slacken both thumb screws (19) by turning the knobs anti-clockwise.

Holding the fuse handle (11) by the insulated grip (17) pull out the fuse handle (11) from the fuseway (12) with a sharp snatch action.

Fit the contact shield to the busbar contact (13).

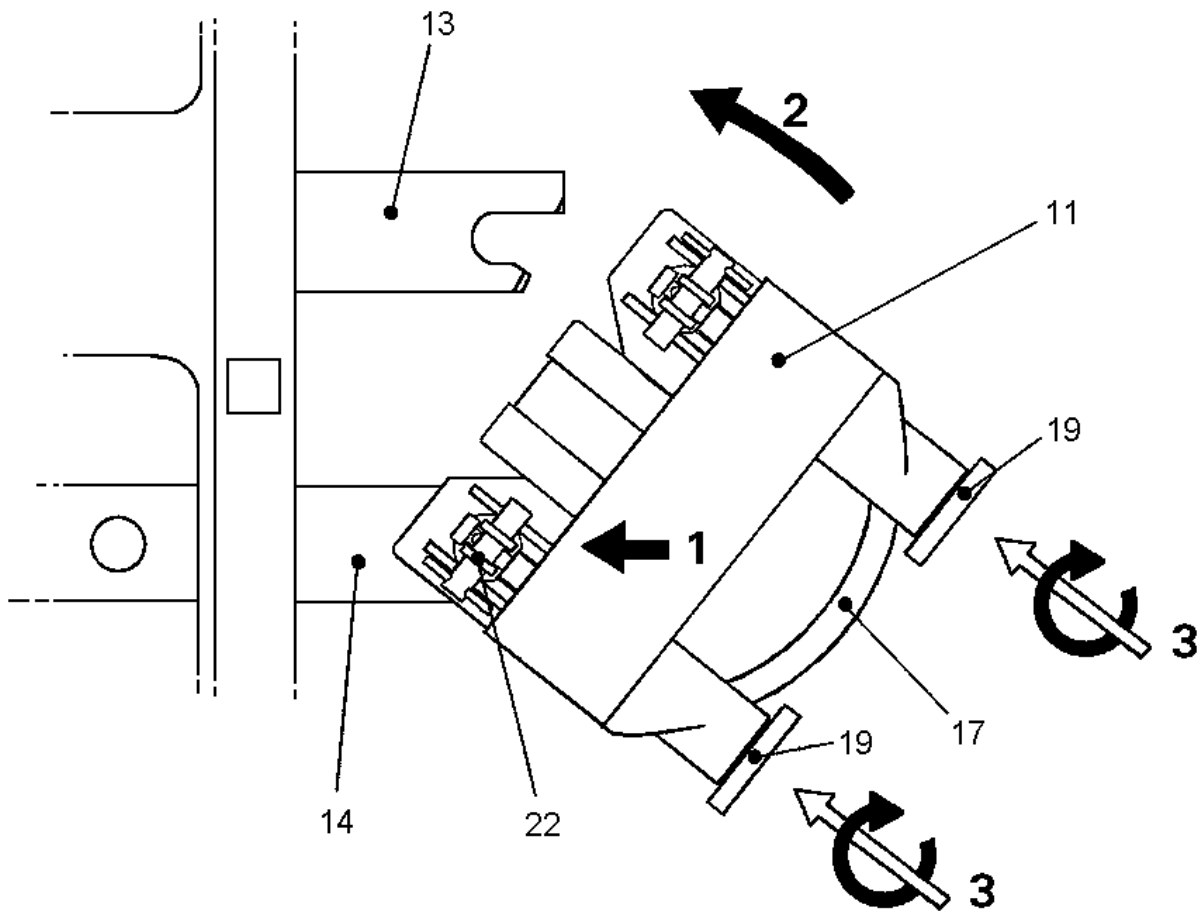


FIG 4.1

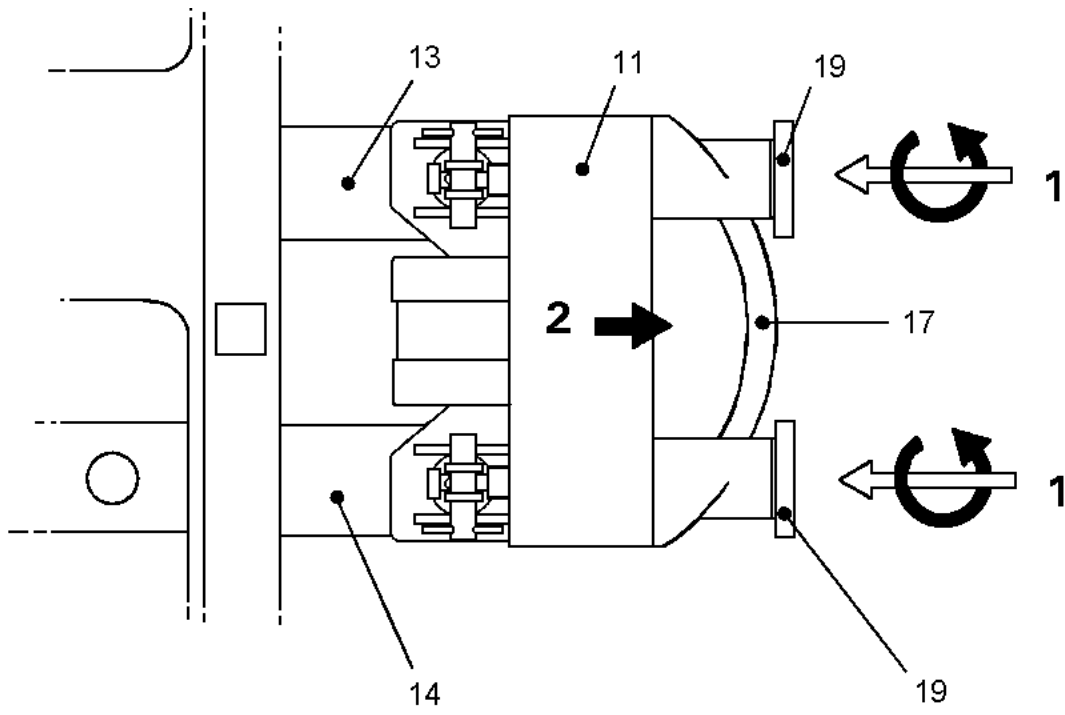


FIG 5.1

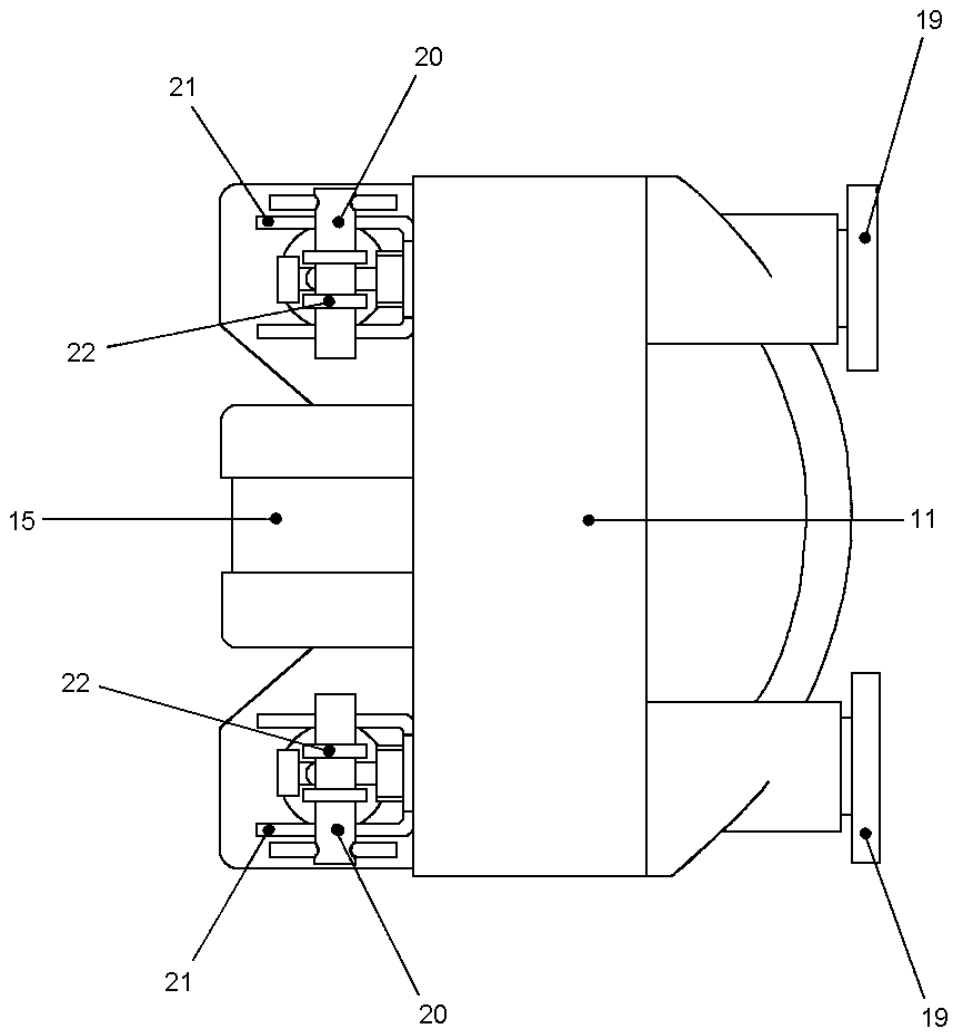


FIG 5.2

6 FUSE RELACEMENT 600 & 400A BS TYPES

Note: The YW6 fuse handle accepts 'J' type fuse links (92mm centres) to BS88 Part 5 ratings upto 800A. The YW4 fuse handle accepts 'J' type fuse links (82mm centres) to BS88 Part 5 ratings upto 400A.

Remove the fuse handle (11) from the fuseway (12) as described in 2.3.

Turn both the thumb screws (19) anti-clockwise until fully slackened, then turn back clockwise half a turn to release the wedge mechanisms.

Withdraw both the tee pins (20) from the wedges (21). This will release the fuse (15) and clamp pins (22), which can be lifted out of the fuse handle (11). Remove both clamp pins (22) from the slots of the fuse tags and discard the fuse (15).

Place the clamp pins (22) through the slots of the fuse tags of the new fuse (both clamp pins facing the same direction).

Position the fuse (15) and clamp pins (22) into the fuse handle (11) (the offset of the barrel MUST project into the fuse handle (11) and clamp pins (22) pointing towards the wedges (21). Ensure that both the wedges (21) are turned so that the straight side will be against the fuse tags.

Slide the prongs of both clamp pins (22) around the narrow section of the shafts that protrude through the wedges (21). Then push the tee pins (20) through the holes in the clamp pins (22) until the retaining ball is between the prongs of the clamp pins.

Replace the fuse handles as described in 4.

7 CABLING THE CUTOUTS

7.1 REMOVING THE TOP GLAND PLATE

Remove the gland plate by take out the four M6x20mm hex head screws and nylock nuts in the corners of the gland plate. Drill the gland plate

NOTE: the gland plate does not need removing if the gland plate is pre drilled.

7.2 REMOVING THE FUSE BANK

It is possible to remove a whole fuse bank to ease the cabling of the cutouts. This should only be done if it is necessary to ease cabling.

First remove the busbar connection screen by removing the M8 fixing at the top and bottom then slide the screen forward until it clears the unit.

Remove the M10 fixings connecting the busbars to the busbar connections.

The full fuse bank can then be removed with all the cutouts attached by taking out the two M6 fixings one in each end of the bracket.

7.3 CABLING THE PHASE CUTOUTS

Remove the fuse carriers from the cutouts. Holding the fuse carrier by the top and bottom insulated grips pull out the fuse carrier from the cutout with a sharp snatch action.

Remove the cutout cover by removing the M5 slotted screw and then pulling the cover away from the base.

Refit the gland plate if removed feed cable through the gland plate and appropriate glanding option.

Bend to the required position, cut to length and trip approximately 30mm of the insulation. Thoroughly abrade the exposed conductor

Slacken off the 3mm socket grub screws. Insert the cable and terminate by tightening the grub screws.

NOTE: The cutouts are numbered and the related neutral and earth should be terminated to the appropriate number.

7.3 CABLING THE NEUTRAL AND EARTH TERMINAL BLOCKS

Bend to the required position, cut to length and trip approximately 20mm of the insulation. Thoroughly abrade the exposed conductor.

Slacken off the 3mm socket grub screws. Insert the cable and terminate by tightening the grub screws.

8 FITTING AN EXTENTION TRUNKING

Remove the adjustable cable clamp plates by removing the eight M6 hex head screws and fixings.

Fit the clamp plates to the trunking using the fixings removed

NOTE: fit them to the end of the trunking with no inserts

Attach the rear half of the trunking first using the fixings supplied, the fixings need fitting from the inside of the box and screwing into the inserts. Repeat for front half.

9 DOOR REMOVAL AND REVERSAL

To remove the door simply release the screws holding it closed, open the door then lift off in an upward direction.

If the door is to be reversed the hinges will need removing from the door by releasing the M5 3mm socket cap screws and fixings. Fit the hinges supplied to the opposite side of the door make sure the pins face down.

Remove the fixed part of the hinge fixed to the box by removing the M5 socket cap screws and refit to the opposite side of the door remember to rotate 180^o, refit using the same fixings.

Remove the door lock bracket again by removing the M5 socket cap screws and fixings and refit to the opposite side of the door.

Remove the M8 door fixing screws by removing the retaining washer and refit to opposite side of door first remove the plastic inserts and swap these with the fixings, refit the retaining washers.

NOTE: any inserts/plugs that are removed must be refitted to maintain the IP rating.

13 FUSEWAY LOCKING OFF FACILITY (OPTIONAL ACCESSORY ME3)

The locking off device enables fuseways to be locked off when the fuse handles are removed, this prevents insertion of any fuse handle into the fuseway.

To lock a fuseway off, remove the fuse handles (11) from the fuseway (12). See section 5.

Take the locking off device (23) with the end with the hole uppermost and the retaining strip (24) towards the fuseway (12).

Engage the retaining strip (24) into the foremost ventilation slot (25) in the top of the lower shroud (18).

Hinge the device (23) towards the fuseway (12), the padlock eye (26) beneath the circuit label will project through the device (23).

Fit a padlock to the padlock eye (26) with the device (23) trapped behind, this now prevents insertion of any fuse handles (11) into the fuseway (12).

14 ROUTINE TEST ACCESS

Whilst fully complying with the requirements of IP2X protection to IEC 529, The design of Shielded fuseways allows a wide variety of routine monitoring tests to be carried, using standard lamps or voltmeter probes.

When a fuse handle (11) is in place, the busbar (top) contacts (13) are accessible through one of the ventilation slots in the top of the shroud (18), the cable (bottom) contacts (14) are accessible through a rectangular hole in the bottom of the shroud (18). This permits checks to see if the fuse has ruptured.

FUSEWAY LOCKING OFF FACILITY

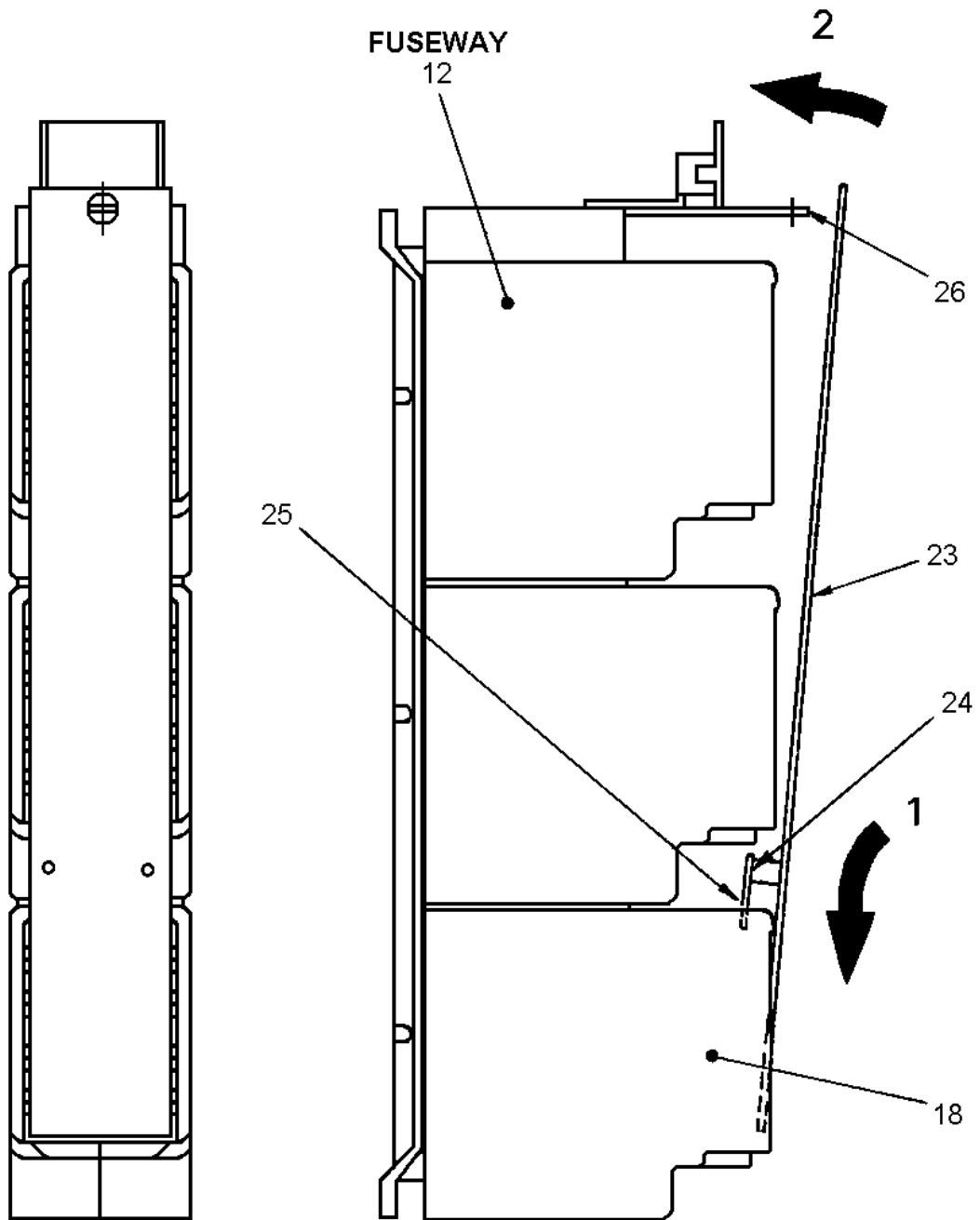


FIG 13.1

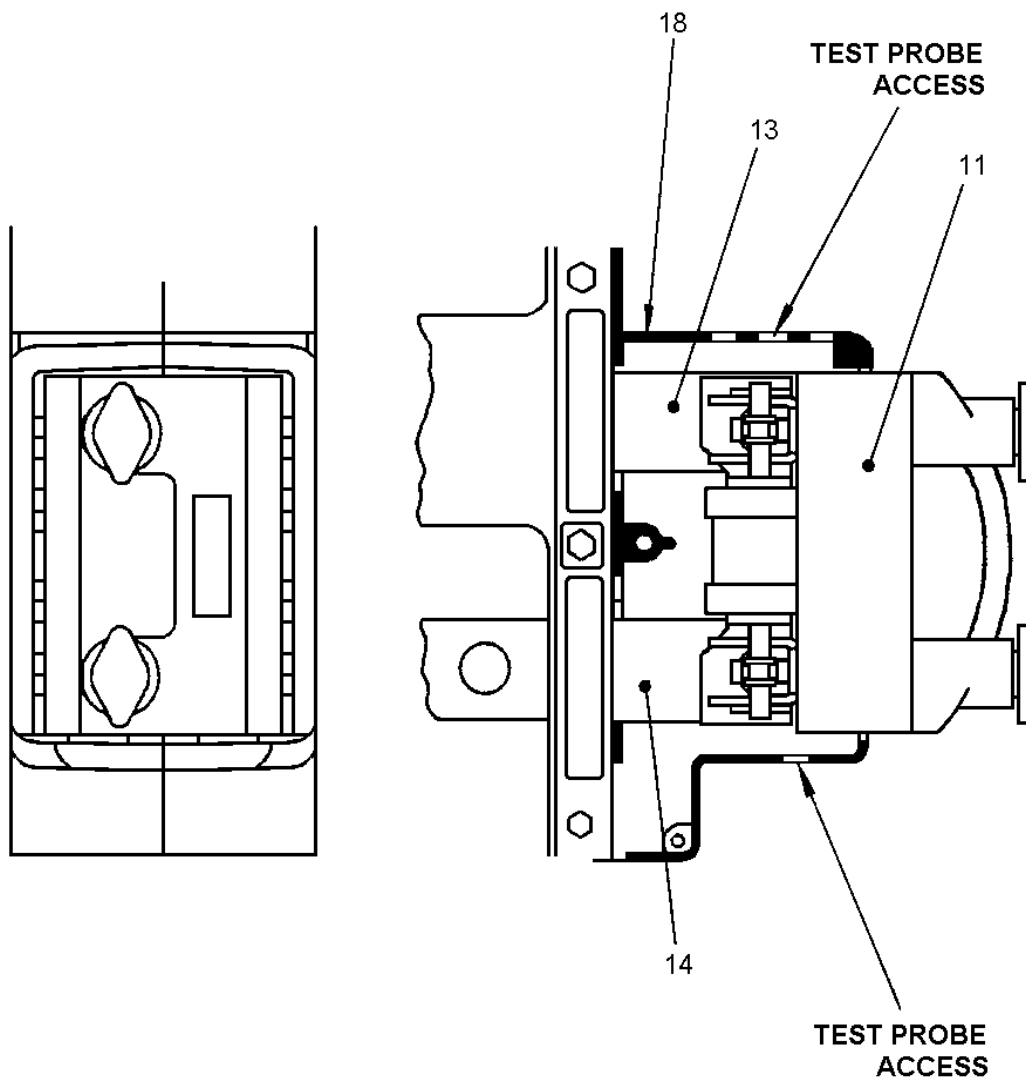


FIG 14.1

15 INSPECTION AND MAINTENANCE

15.1 GENERAL MAINTENANCE POLICY

This document is to be used as guide to the maintenance of shielded type low voltage assemblies. It should read in conjunction with BS6423: 1983, the current British Standard code of practice for the maintenance of electrical switchgear and controlgear for voltages upto and including 650V, which sets out recommendations for safe conditions during maintenance work and guidelines for maintenance procedures.

It is assumed throughout that the precautions necessary to render the apparatus safe to work on, including the isolation of normally live parts as required, have been taken. However, reminders are included where this is felt appropriate.

15.2 Frequency of Maintenance

Different environments, loadings, types of load and frequency of operation will affect the maintenance requirements of low voltage fuses, isolators, and boards, so that the following recommendations are for guidance only and are based on:

Indoor Equipment installed indoors in dry, well ventilated substations or switchrooms, with atmospheres which are not unduly corrosive, and employed on normal distribution duties.

It is recommended that the following intervals are considered but may be reduced to cater for any adverse conditions. Operational experience will determine how much more or less attention particular installations require.

In the case of units supplying bulk consumers, it may be possible to schedule substation outages with the customers own maintenance programmes. Where a number and variety of consumers are served by an installation, however, an escalating programme as follows is suggested.

15.3 Routine Inspection

Routine inspection is essentially visual and involving no operations or system outages, should be undertaken as frequently as possible and in any case at least once every 12 months. For specific details see below

On entering the substation or opening the enclosure doors, listen for any sizzling noise due to electrical discharge or rattling of loose components; sniff for any unusual smell which may indicate an electrical discharge or overheating; have a general look round.

Check that the room is clean, dry and well ventilated and that external ventilation grilles are clear. Clear any rubbish, provided that this does not involve interfering with the equipment.

As far as is reasonable practicable, look for signs of corrosion, damaged external insulation, loose earth connections and any other visible signs of abnormality.

Check as applicable, that any operating handle, locking off devices, spare fuses, spare fuse carriers or other equipment which should be there are present, accessible and in good conditions.

15.4 Examination and Service

should be undertaken at least every five years, during which:

- (i) **Fuseways** have their fuse handles removed for examination and lubrication of the contacts, and also an examination of the fuses. This involves an outage of the whole equipment. For specific details see 16.
- (ii) **Enclosures**, exterior and accessible interior parts are cleaned. This does not involve an outage of the whole equipment. For specific details see 17.

Where interrupting the supply could cause major problems, the period between services may be extended, but we would recommend extreme caution and very careful inspection between services.

15.5 Fuseway Replacement

Which may be indicated by the findings of an examination and service, involves making the whole low voltage assembly dead. For specific details see 18.

15.6 General Overhaul

Involves making the whole low voltage assembly dead and partially dismantling it to give access to the busbar and riser supports and other normally inaccessible components. Such an overhaul need only be undertaken when indicated by inspection, servicing or testing, or every fifteen years, whichever is the sooner. For specific details see below

MAKE THE BUSBARS DEAD BY ISOLATING ALL INCOMING SUPPLIES

Carry out all the inspection, servicing and overhaul procedures as described in 15.3 Carry out the procedures in 16 and 17 as required.

Unfasten and remove any front covers/screens as described in the instructions supplied with the equipment, as necessary for access.

Clean and inspect all insulation, looking for burning, cracks or other defects. Replace as necessary.

Clean all busbars, droppers and other copperwork. Check their fastenings for tightness. Examine the busbars and other copperwork supports. Check all main and secondary earth connections for continuity and tightness of fastenings.

Inspect the cable tails for overheating of connections or discolouration.

Clean and clear any dirt or rubbish, especially if metallic.

Check that external ventilation grilles are clear.

Refit all covers and make alive.

16 EXAMINATION AND SERVICE OF FUSEWAYS

ISOLATE THE PRIMARY/INCOMING SUPPLY, and prove dead before starting operation.

Remove each fuse handle (11) in turn as described in 5. Clean the fuseway contacts (13) and (14) of any hardened or discoloured grease using a suitable solvent, such as one based on electronics grade trichloroethane. Regrease the contacts with Electrolube Ltd's 'EMPL' grease.

A small amount of pitting is not significant, but if there are serious signs of overheating, severe pitting or large beads or ridges on the surface indicate that the fuse carrier should be replaced by another.

Check the condition of the fuse and replace if it shows signs of overheating.

If severe fuseway contact damage is found, an urgent fuseway replacement (see 18) is necessary.

Examine the moulded insulation for deterioration, cracks or breakage's. If there are any, scrap the affected fuseway or fuse handle and replace it with another, recovering the fuse if it is in good condition.

Regrease the contact surfaces with Electrolube Ltd's 'EMPL' grease.

Replace the fuse handles onto the fuseway as described in 4.

Check fuse continuity at every fuse handle as described in 14.

Repeat for all other fuseways.

RE-ENERGISING THE INCOMING SUPPLY.

17 EXAMINATION AND SERVICE OF ENCLOSURE

Clean any loose dirt from the equipment exterior and accessible parts of the interior. DO NOT use cotton waste or cleaning cloths having loose fibres, loose particles or metallic threads. DO NOT use brushes or blower nozzles contaminated with metallic material. DO NOT let tools, loose parts, metal filings, dust or dirt fall into the compartment. DO NOT use cleaning fluids other than those specified in 16 above.

18 FUSEWAY REPLACEMENT

ISOLATING ALL INCOMING SUPPLIES.

In the event that fuseway contact damage is found, or fuseway cracking observed, during a servicing operation, it is recommended that the fuseway concerned be removed and scrapped. Then replaced as described below.

Any outgoing Shielded fuseway can be removed as a complete, triple pole, unit as follows.

Remove the fuse handles (11) as described in 5 from the fuseway.

To remove the shrouds (18), unfasten and remove the fixing screw (28) that secures the top shroud in place. Remove the shrouds (18) starting at the top by lifting it until the lip (31) on the inside face of the shroud clears the peg (29) on the fuseway (12) (approx. 15mm), the shroud can now be moved away from the fuseway (12).

Repeat for the other two shrouds.

NOTE: In addition to the interlocking lip (31) the shrouds also overlap each other and can only be removed in the sequence described.

Unclip and slide the insulating boot (32) down the blue phase cable to reveal the cable termination.

Unfasten the screws that secure the cable end sockets or shear head connectors to the three phase contacts (14). Bend the cable tails clear of the fuseway (12).

Pull out the three blind square grommets (33) from the back of the fuseway moulding (12) to provide access to the busbar joints and remove the three comby nuts (34) from each joint.

Remove the lower fixing screw (35) and bush (36) from the bottom of the fuseway. Unclip the circuit label (37) and remove the upper fixing screw (38, the fuseway (12) can now be lifted out of the equipment.

Reverse the above procedure to fit the new fuseway.

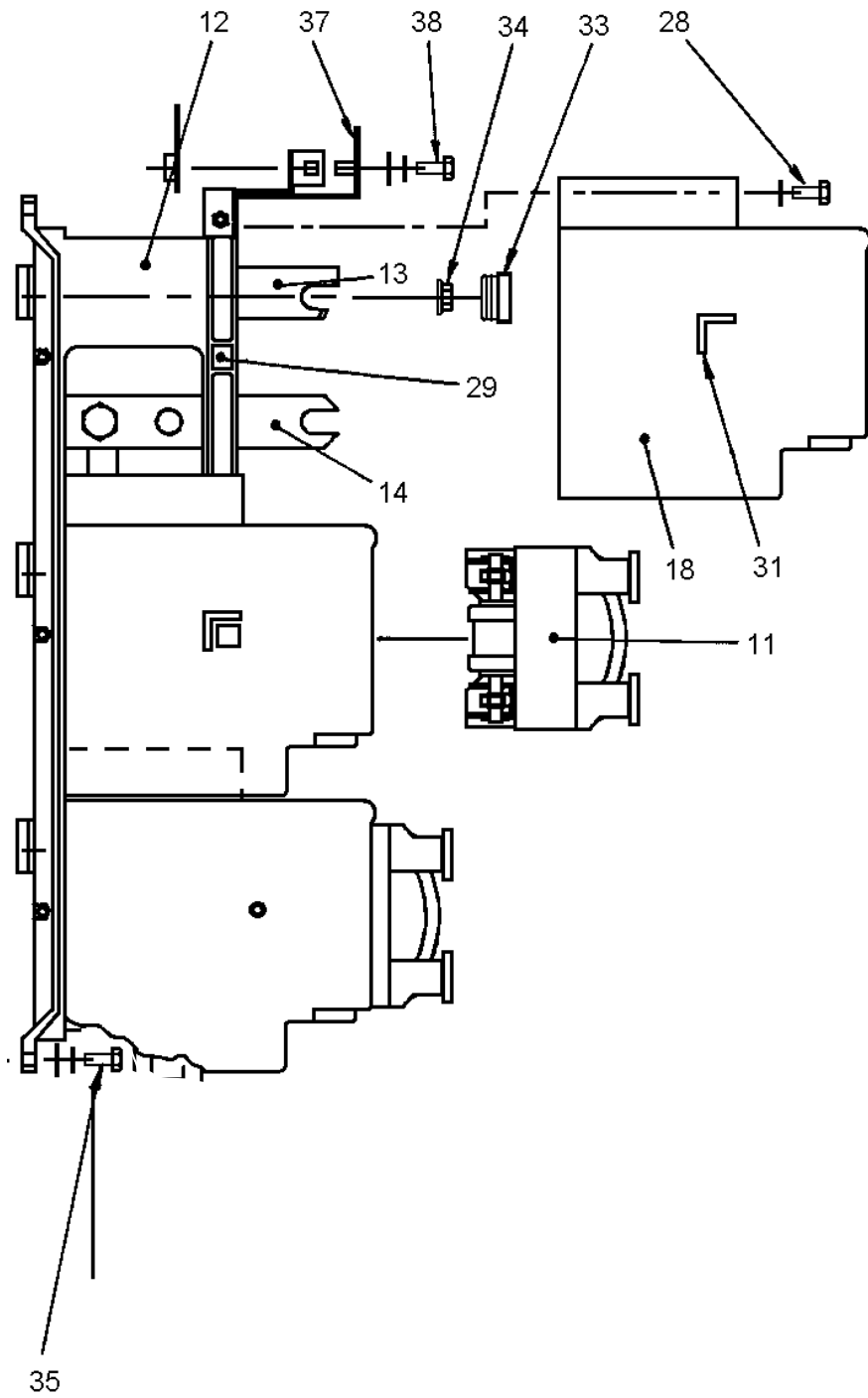


FIG 18.1