

-5 JULY 1978

HEAVY CABLING EQUIPMENT

Cable Pulling Unit

(As this Instruction has been completely REVISED, individual paragraphs have not been "starred").

1 **GENERAL** This Instruction describes the Cable Pulling Unit (CPU), which, together with a Cable Carrier, constitutes the Heavy Cabling Equipment (HCE).

2 **SCOPE** The equipment is designed to draw large cables into underground ducts in lengths up to 700 m at a single pull. It embodies a self reeling cabling winch and a guiding system which enables the winch rope to be extended into jointing chambers up to 7 m from the vehicle. A remote control box allows the operator to control the boom and winch from positions up to 10 m from the vehicle. An electric submersible pump for clearing water from jointing chambers is associated with the unit. The complete HCE is normally operated by a 4 man cabling team. Welfare facilities for the team and accommodation for tools and stores are provided on the CPU.

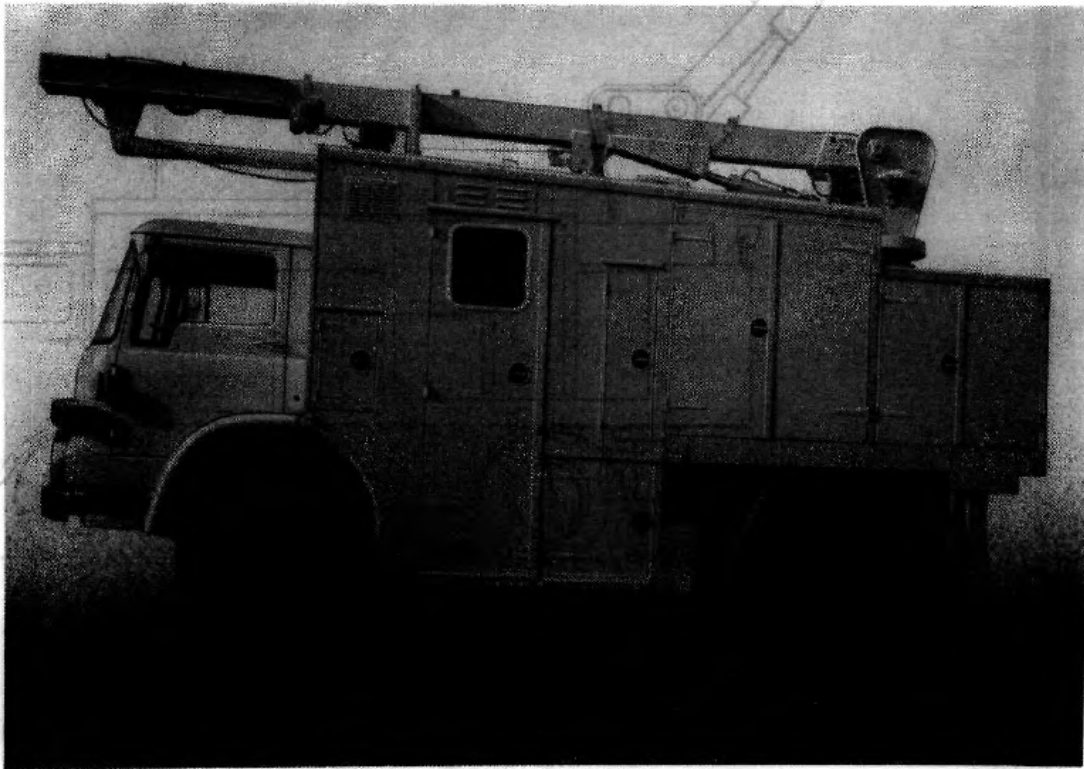


FIG.1 L.H. SIDE VIEW OF VEHICLE READY TO TRAVEL

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3 **DESCRIPTION** Fig 1 shows the LH side view of the vehicle ready to travel, while Fig 2 shows an off-side view of the vehicle with boom raised.

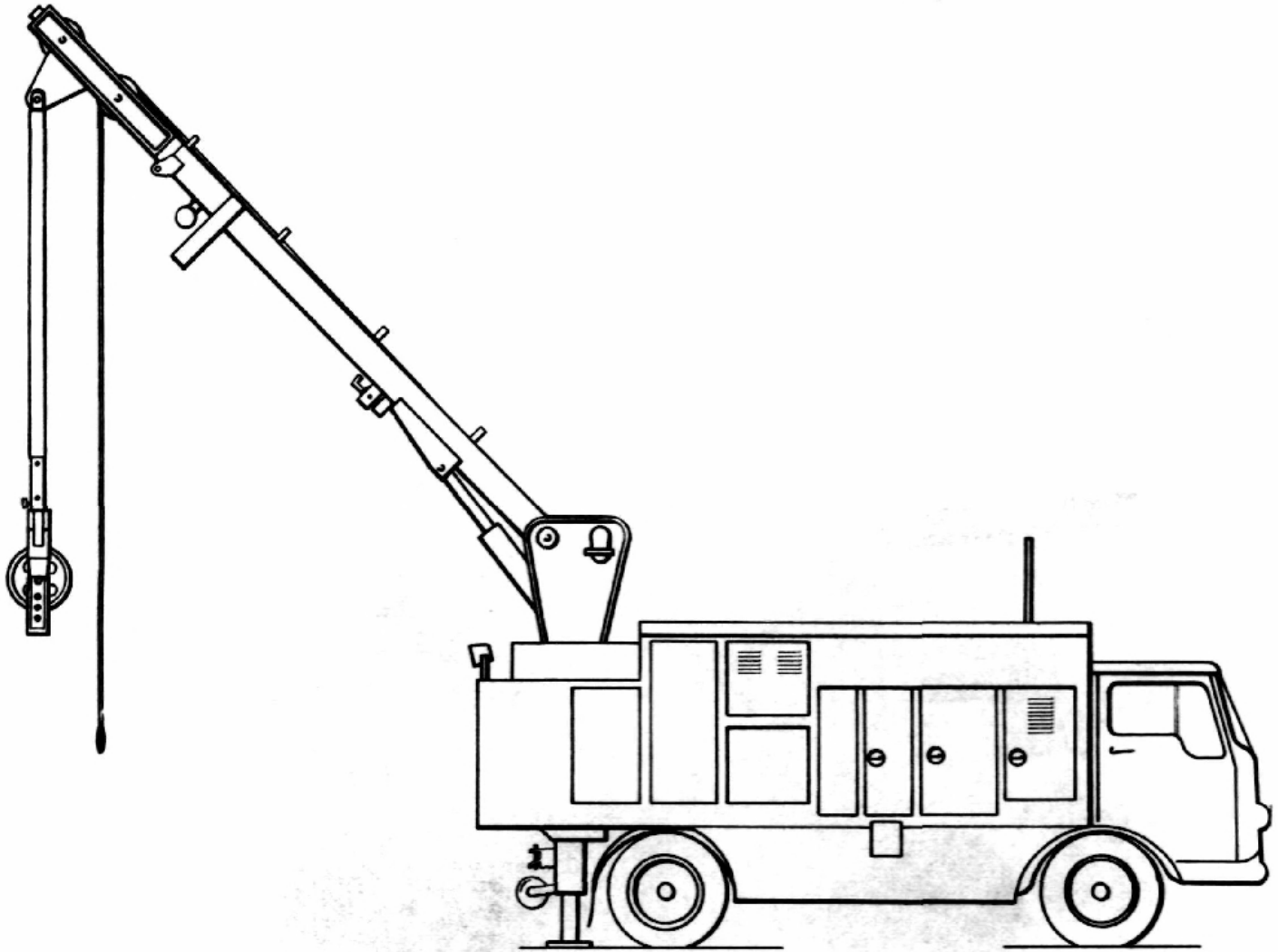
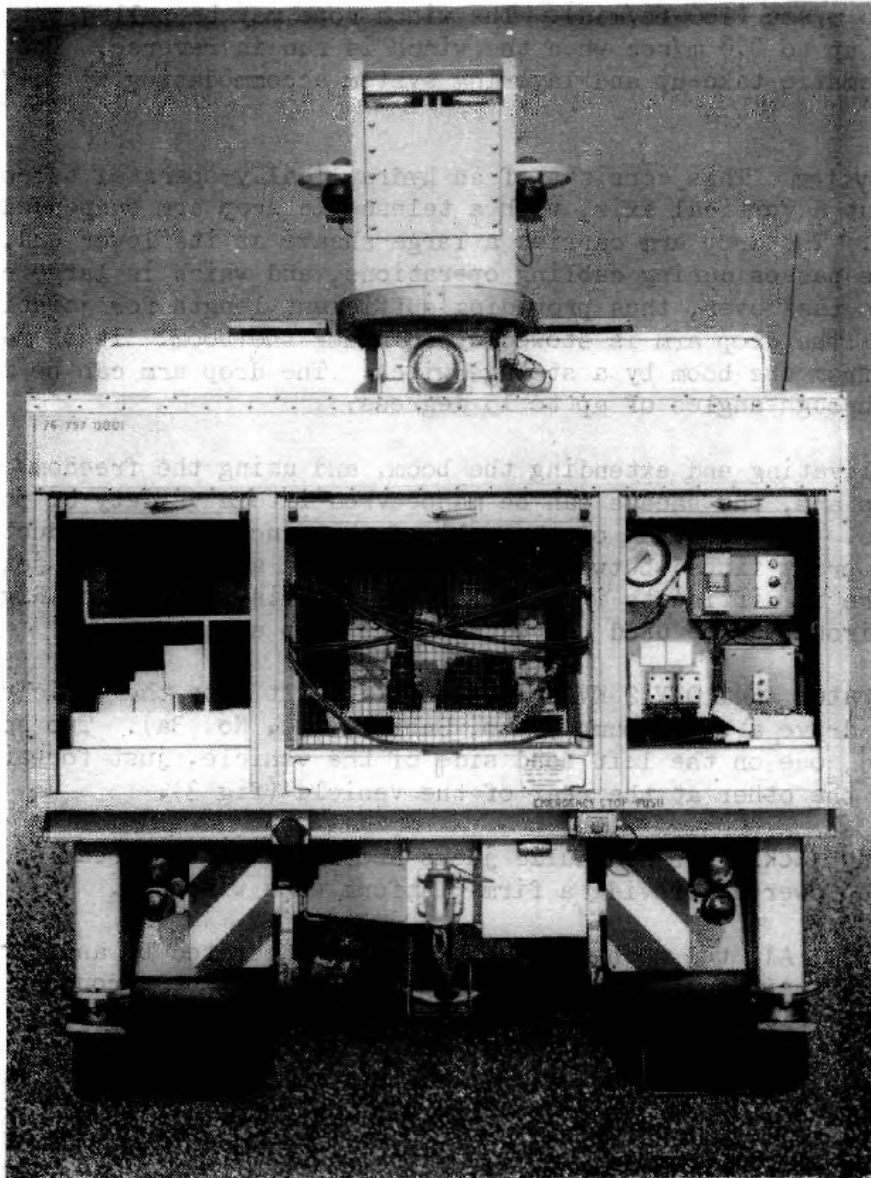


FIG 2 R H SIDE VIEW OF VEHICLE WITH BOOM RAISED .

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Fig 3 shows the rear of the vehicle with the roller shutters raised.

The vehicle is mounted on a 16 tonne Gross Vehicle Weight (GVW) chassis, and is a purpose-built unit incorporating a winch, 110 V generator, power-operated boom, and stabilising jacks. The driver or operator of this vehicle MUST be licenced to drive Class 3 Heavy Goods Vehicles (HGVs).



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FIG 3 REAR VIEW OF VEHICLE WITH ROLLER SHUTTERS RAISED

The body provides locker space for the storage of all tools and stores normally required for cabling operations, and includes a welfare compartment with simple cooking facilities for the crew. The rear of the body has three roller shutters which, when raised, give access to the Roadworks Guarding Signs and Cones and the controls for the unit.

A heavy towing hitch may be fitted to the rear of the vehicle. Complete 3-line air-braking connections are provided.

Flashing amber beacons are fitted on the boom mounting to serve as a hazard warning. A Transceiver 12a is fitted at the rear of the vehicle, to provide communication between the operator and the other members of the team. The main radio controls are located behind the top of the right hand roller shutter.

4 MECHANICAL EQUIPMENT

4.1 Winch A bull-wheel winch is fitted at the rear of the vehicle. It is capable of exerting a line pull of approx 3600 kgf (8000 lbf) at a variable rope-speed up to 0.8 m/sec (160 ft/min). The winch rope may be pulled out from the winch at speeds up to 0.8 m/sec when the winch is run in reverse. The winch incorporates an automatic take-up and layering system accommodating up to 750 m of steel-wire rope.

4.2 Guiding System This consists of an hydraulically-operated telescopic boom, rotatable about a vertical axis, with a telescopic drop arm suspended from its end (see Fig 2). The drop arm carries a large sheave at its lower end, over which the winch rope passes during cabling operations, and which is large enough for the cable end to pass over, thus providing sufficient length for jointing without 'flecting'. The drop arm is stowed close under the boom. It is raised and lowered to and from the boom by a stowage winch. The drop arm can be moved from side to side through angles of up to 15 degrees.

By rotating, elevating and extending the boom, and using the freedom of movement of the drop arm, the sheave can be manoeuvred into a variety of positions in jointing chambers. The reaction of the pull of the winch along the duct is taken by adjustable props fitted between the drop arm and a wall of the jointing chamber. Where there is difficulty in using a prop in this way, Chains Rigging, attached to anchor irons may be used to restrain the drop arm.

4.3 110v generator A 110 V 2 KVA generator is built into the vehicle. Its main function is to drive a water pump (Pump, Submersible, No. 3a). Two socket outlets are provided, one on the left hand side of the vehicle, just forward of the rear wheel, and the other at the rear of the vehicle (fig 3).

4.4 Stabilising jacks Two hydraulic jacks are fitted at the rear of the vehicle, which, when lowered, provide a firm platform when winching.

4.5 Power system All the mechanical equipment is operated by an hydraulic system. The main hydraulic pump is driven by the vehicle engine through a full-torque power-take-off (PTO).

5 CONTROLS The control panel and portable control box are used to control all functions on the unit, and incorporate the following main facilities.

- (i) Illuminated push-buttons, to indicate which function has been selected.
- (ii) Interlocking circuits to prevent the simultaneous operation of two or more functions.
- (iii) Automatic adjustment of engine speed when a function is selected.
- (iv) **Switches** For emergency operation of the boom and stabilising jacks. These are mounted on the fixed control panel with the button for operating the battery-driven emergency hydraulic pump.

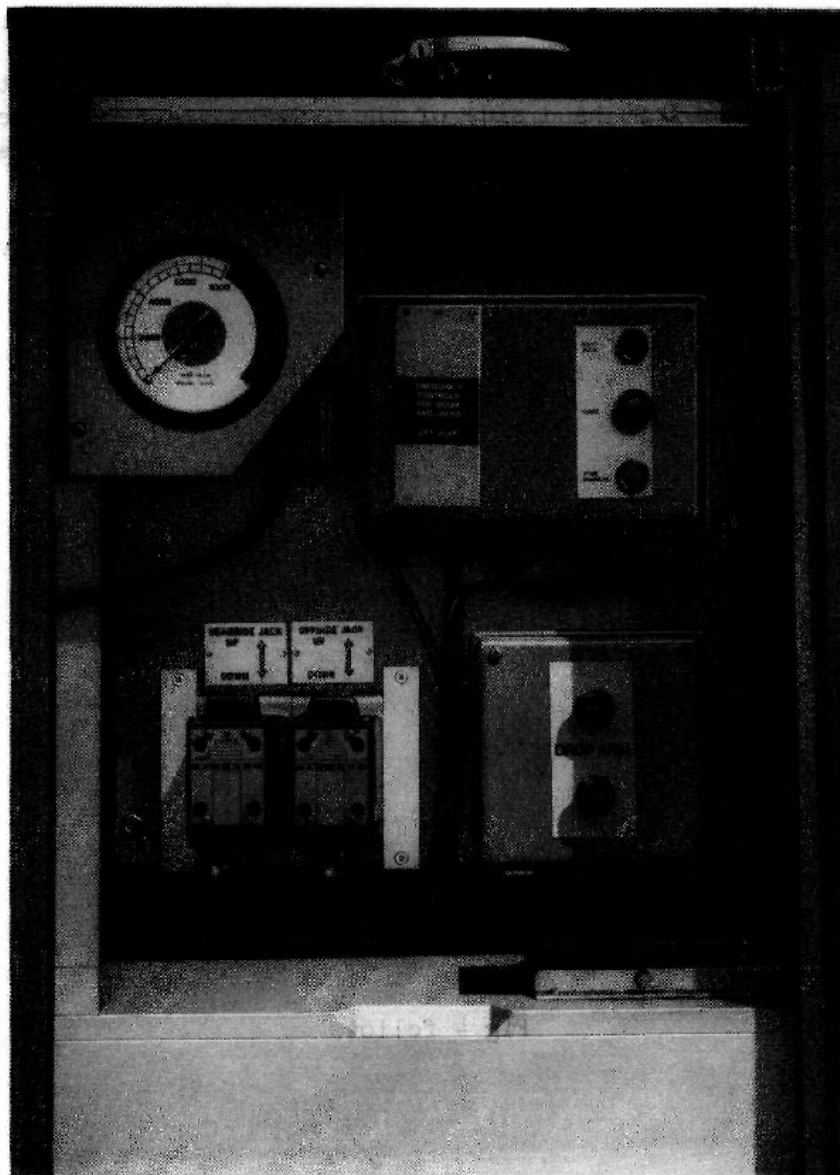
(v) The cable, connecting the fixed and remote control boxes, terminates on multipin connectors.

This enables the remote control box or its cable to be easily replaced.

5.1 Power Take-Off Engagement This is effected by pulling out the knob in the drivers cab, to the left hand side of the drivers seat, with the clutch pedal depressed, the engine idling, and the gear lever in neutral. An orange warning light on the dashboard glows when the PTO is engaged.

An interlock is provided to prevent the vehicle from being driven with the PTO engaged.

Fig 4 follows



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FIG 4 CONTROLS AND EQUIPMENT AT REAR OF VEHICLE

5.2 Stabilising Jack Controls These are lever-type controls mounted at the bottom left-hand side of the control panel at the rear of the vehicle (see Fig 4).

The jack controls only become effective, after an illuminated button labelled 'SELECT JACKS' on the fixed control box has been depressed.

There are separate controls for the left-hand and right-hand jacks, each operates in two directions, 'UP' and 'DOWN'. When the levers are returned to the neutral positions, the jacks are held locked in position. On completion of jack movements the "CANCEL" button on the fixed control box should be pressed.

5.3 110 V Generator Control The generator control is in the form of an illuminated push-button on the fixed control panel.

Operating the button marked "GENERATOR" will cause the generator to run until the "CANCEL" button is operated.

5.4 Boom Controls These are mounted on the remote control box (Fig 5).

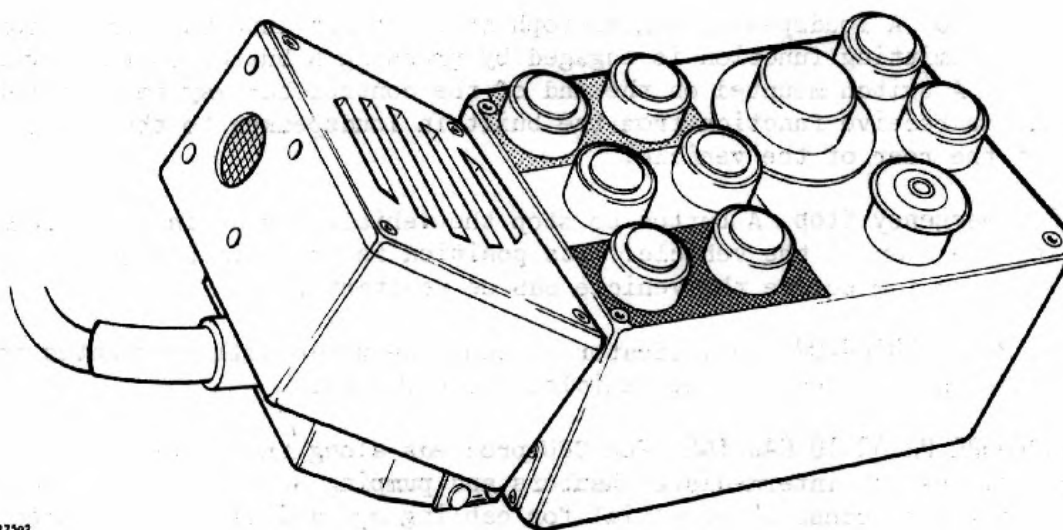


FIG. 5 PORTABLE CONTROL BOX

The boom functions are engaged by depressing the respective buttons which glow when a function has been selected.

No movement of the boom takes place until the speed control is turned.

WARNING: THE BOOM EXTENSION CONTROL MUST NOT BE OPERATED WITH THE DROP ARM STOWED.

5.5 Emergency Controls If the Hydraulic power provided by the PTO fails for any reason, it is possible to bring the boom to the stored position and raise the jacks, by using an emergency system powered by a small hydraulic pump driven from the vehicle battery. For this purpose there are four change-over switches fitted on the fixed control panel at the rear of the vehicle, one for each boom function, plus an "operate" switch. To "operate" the emergency system, select the desired movement using the appropriate switch or lever.

In addition hold the "operate" switch in the "boom" or "jacks" position for as long as the particular movement is required.

On release all switches return to a neutral position.

5.6 Winch Controls These also form part of the remote control box. Winch functions are engaged by depressing the respective buttons which glow when a function has been selected.

No movement takes place until the speed control is turned.

To obtain continuous "winch-out" facility the following procedure should be adopted.

Select "winch out" turn the speed control to maximum and press the "winch out" button a second time. The "winch out" lamp will then flash and the winch continue to operate at maximum speed after the speed control is released.

The CANCEL button on the portable control box disengages the winch and extinguishes the lamp.

5.7 Radio A loudspeaker and microphone are built into the remote control box; the transmitting function is engaged by pressing a button on the lower end of the box. A switch mounted on the end of the control box may be used for switching the receive function from the built-in loudspeaker to the loudspeaker mounted at the rear of the vehicle.

5.8 Emergency Stop A button to stop the vehicle engine in an emergency is mounted at the rear of the vehicle. Its position is shown in fig 3. It must be released by turning before the vehicle can be re-started.

6 LINE PULL INDICATOR An indicator to show the winch pull is mounted on the control panel at the rear of the vehicle. (see Fig 4).

7 PROCEDURE PRIOR TO CABLING The CPU proceeds along the route from the cable feeding end, opening intermediate chambers and pumping as necessary. Those chambers to which access is essential for cabling operations are left open and guarded, all others are closed down.

8 PRELIMINARY OPERATIONS AT WINCHING POINT

- (i) Drive the vehicle into a position with its back towards the jointing chamber, and approximately 4.5 m from the chamber.
- (ii) Guard the site, switch on the radio and check using a test call.
- (iii) Test for gas, remove the jointing chamber covers and erect box guards.
- (iv) Engage the PTO.
- (v) Lower the jacks.
- (vi) Pump out if necessary.
- (vii) Unstow the remote control box, and unwind the cable.
- (viii) Check for adequate space around the vehicle to manoeuvre the boom.
- (ix) Raise the boom until it is clear of obstructions.
- (x) Rotate the boom to the rear of the vehicle.
- (xi) Lower the boom until the drop arm Safety Latch is accessible by hand from ground level, as shown in Fig 6.

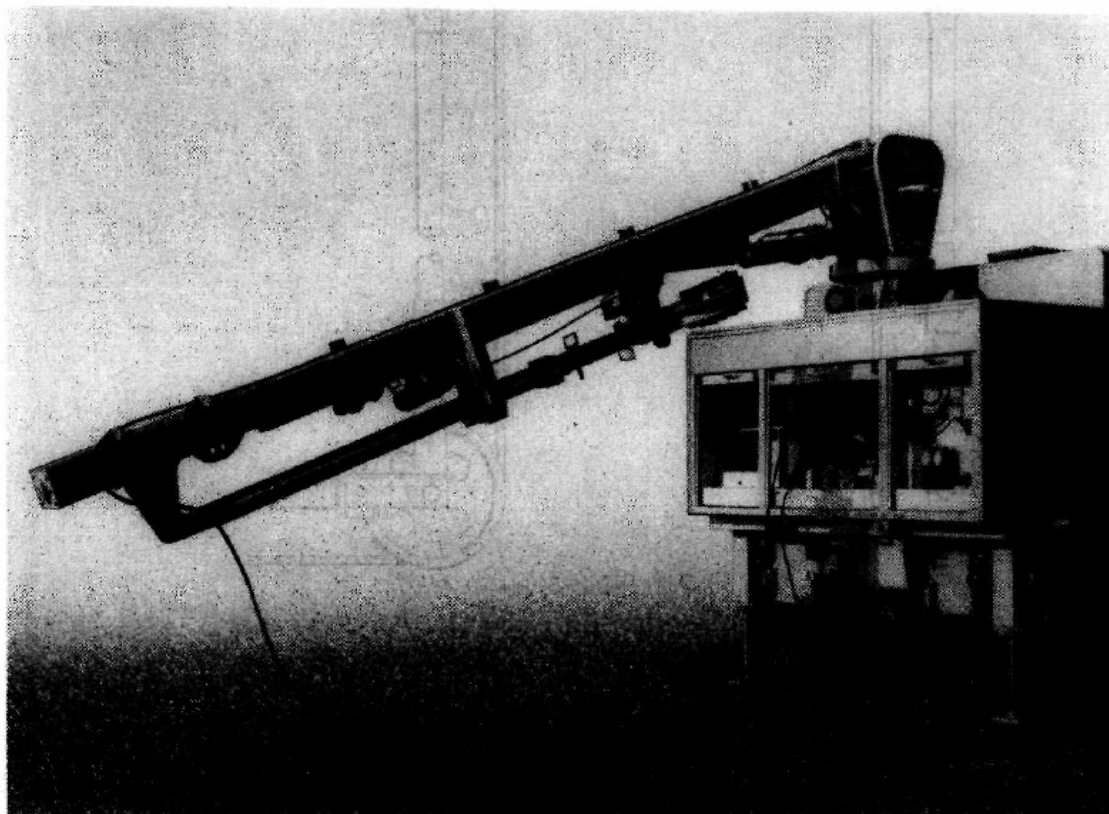
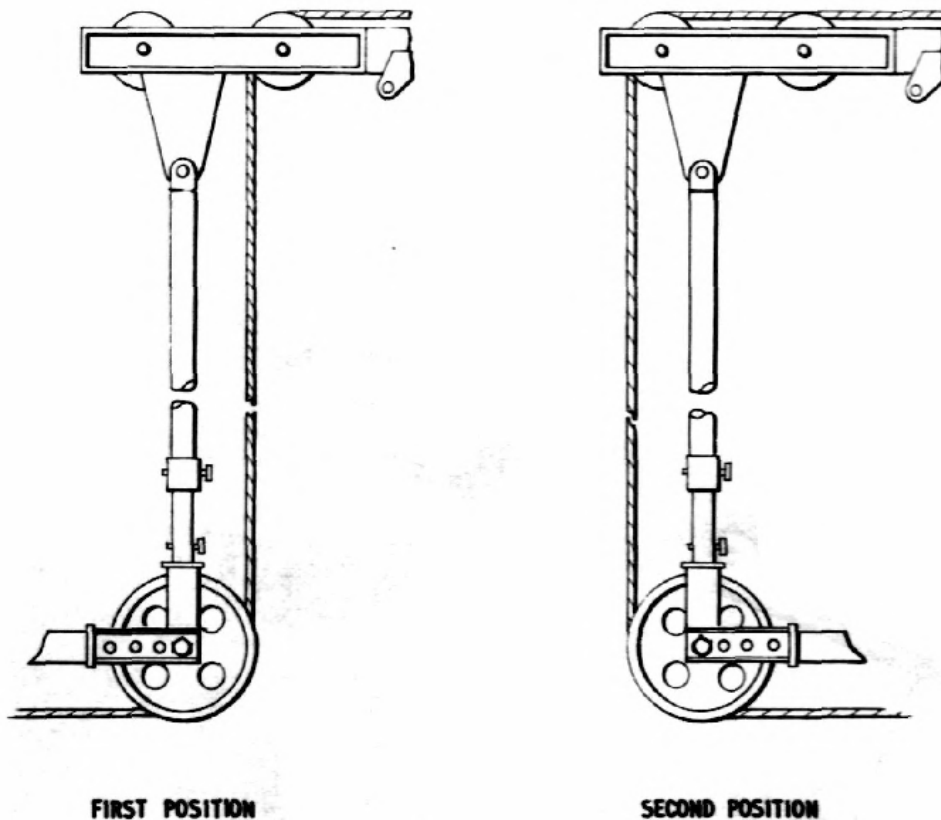


FIG.6

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(xii) At this stage check whether the winch rope is on the correct side of the drop arm for the direction of pull envisaged. If necessary, transfer the winch rope from one to the other - Fig 7 shows the alternative positions.

Fig 7 follows



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FIG. 7 ALTERNATIVE POSITIONS OF WINCH ROPE

(xiii) Release the safety latch retaining the drop arm to the boom.

WARNING:- NEVER STAND UNDER THE DROP ARM DURING A RAISING OR LOWERING OPERATION WHEN THE SAFETY LATCH IS OPEN.

Where it is known that the drop arm will need to be extended, omit stages (xiv) and (xv) and proceed to (xvi).

(xiv) Using the 'stowage' winch control (mounted on the rear of the vehicle Fig 4). Lower the drop arm and at the same time elevate the boom, in order to maintain the sheave close to the ground, until the drop-arm is vertical and the sheave is just clear of the ground.

Disconnect the stowage winch-rope and wind "up" out of the working area, to approximately $\frac{1}{4}$ m below the stop.

(xv) Raise and extend the boom as necessary until the drop arm is clear of the ground and obstructions, then manoeuvre as required to position the drop arm sheave in the jointing chamber. The end of the drop arm must be supported in the jointing chamber as shown in Fig 10 using a Prop 1A, 1B, 1C or 1D according to the length required. Chains Rigging may be used if it is not practicable to instal a prop, but props should be used where possible.

The sheave on the end of the drop arm is fitted with a swivelling yoke, which has a socket to accept the foot of the prop. The length of the prop should be adjusted, and the other end positioned against the wall of the jointing chamber, or against the duct face, and supported with a lashing of drawrope so that it will not fall when the tension in the cabling rope is removed.

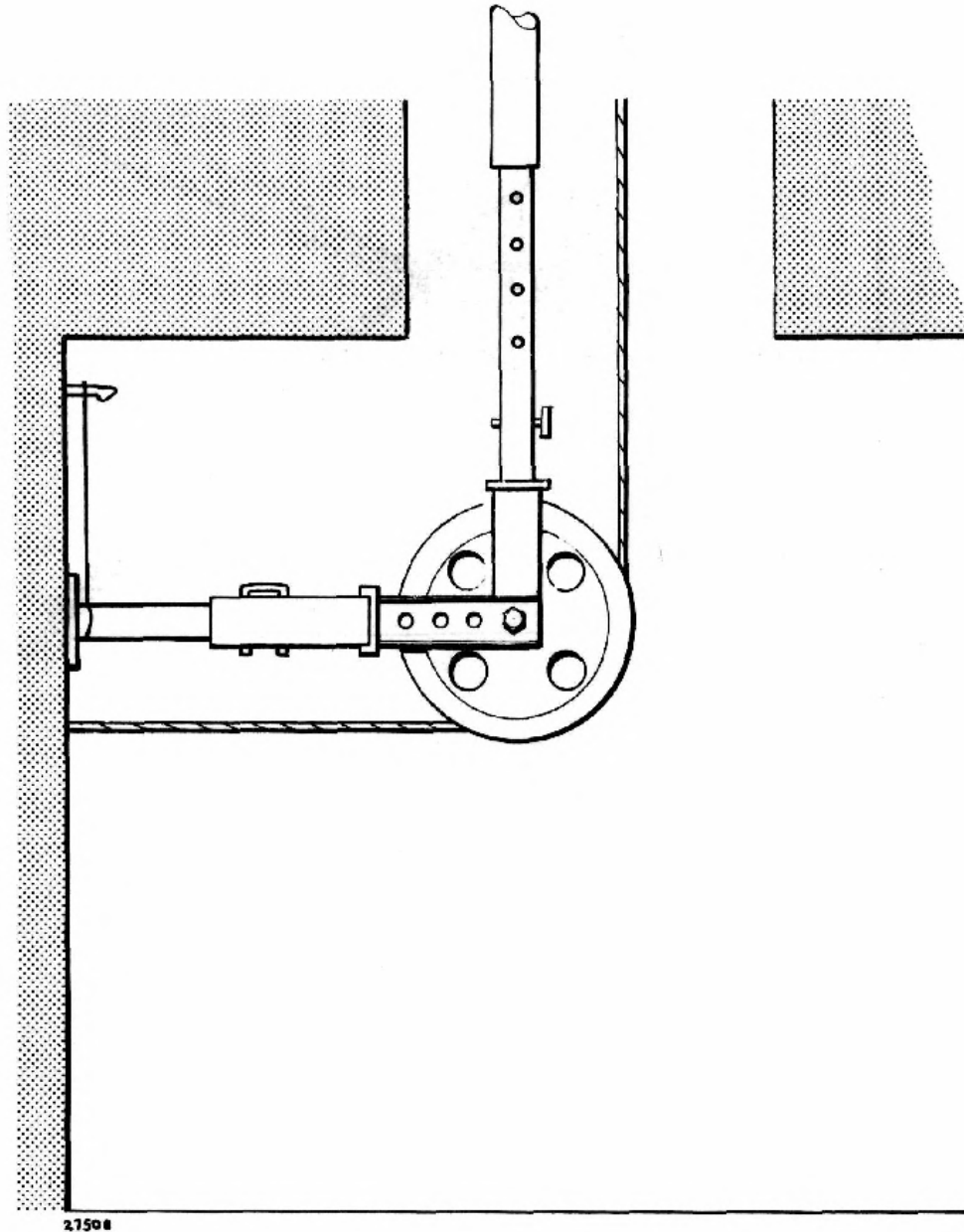


FIG 10 USE OF PROP

Where a prop cannot be used Chains Rigging, passed through the swivelling yoke and attached to the anchor irons in the jointing chamber as shown in Fig 11 may be used.

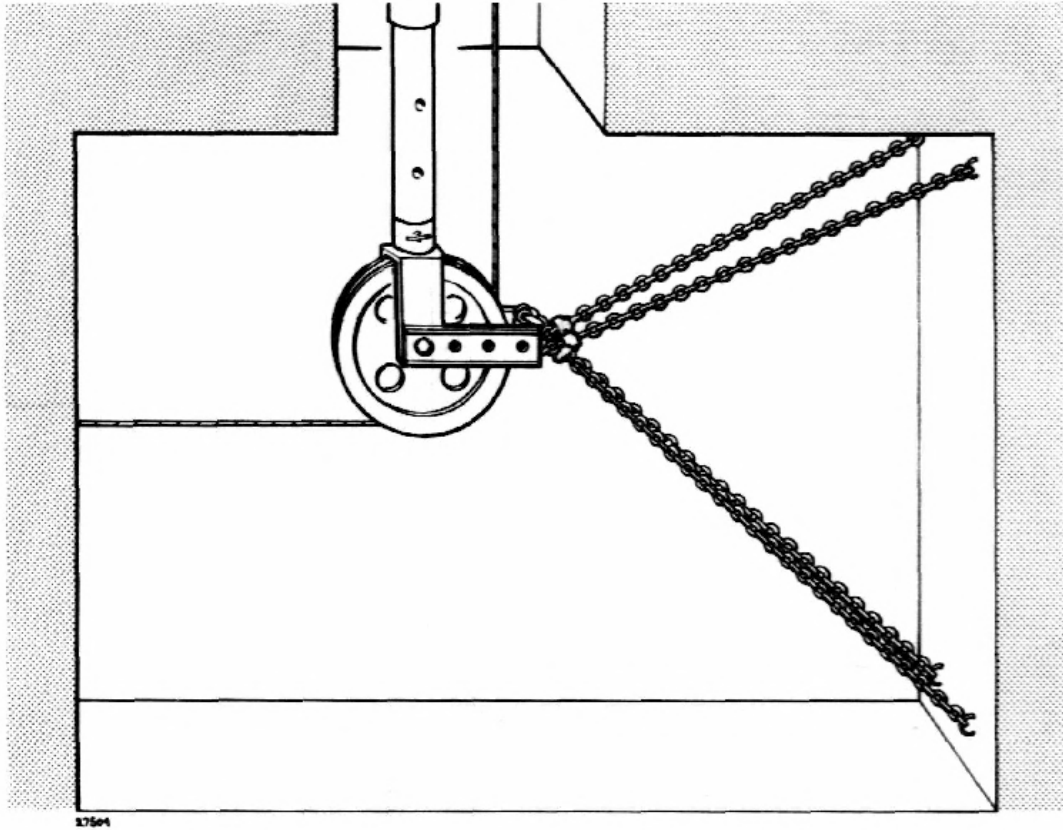
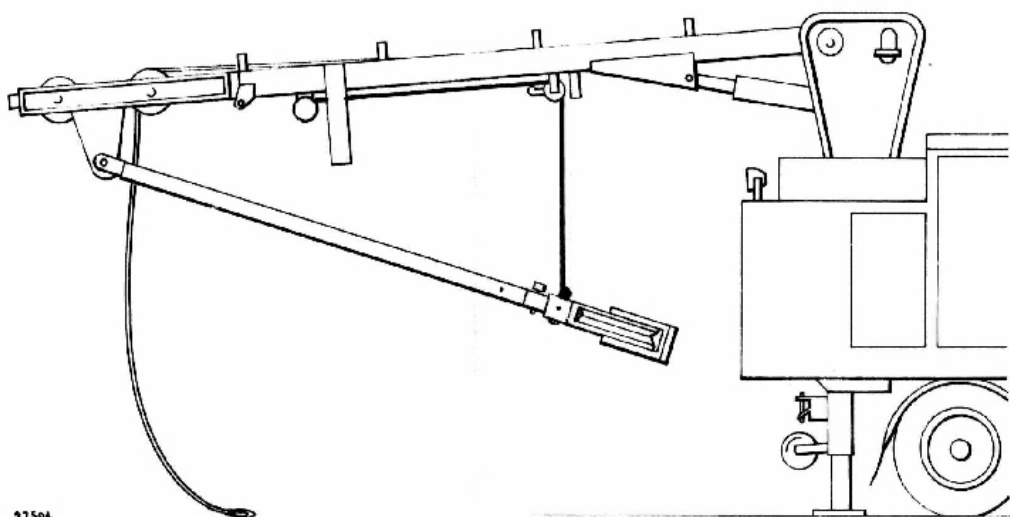


FIG 11 USE OF CHAINS

(xvi) Where it is required to extend the drop arm, omit items (xiv) and (xv) and lower the wheel to the ground as shown in Figs 8 and 9. Pull out sufficient main winch rope to allow for extension of the boom and drop arm. Both winch ropes must be detached from the drop arm.

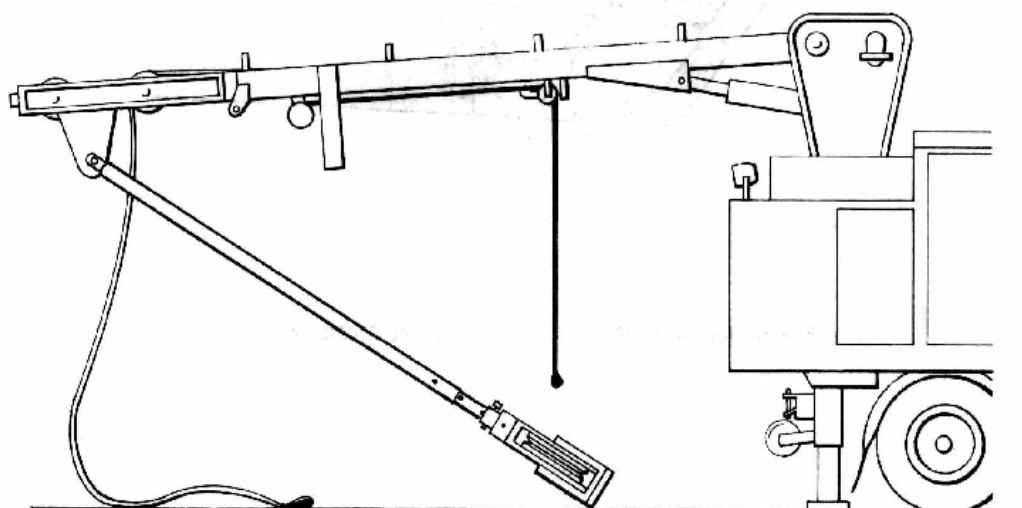
With the securing pin removed from the drop arm, extend the boom slowly to extend the telescopic section. When the drop arm has been extended sufficiently, replace the securing pin.

Figs 8 and 9 follow



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FIG 8



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FIG 9

(xvii) At this stage reconnect the stowage rope and carry out items (xiv) and (xv) to complete the unstowing of the drop arm.

To prevent sideways movement of the drop arm, a transverse prop (Prop No. 2A) must be fitted across the jointing chamber entrance.

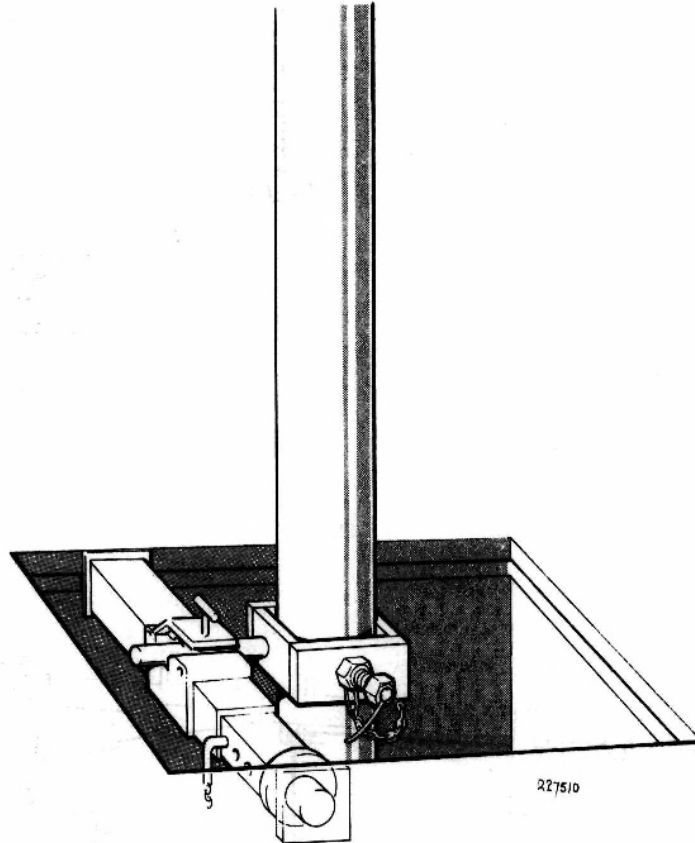


FIG. 12a USE OF PROP No 2A TO GIVE LATERAL STABILITY

The arrangement of the propping system for use in a manhole is shown in Fig 12a and that for use in a jointbox in Fig 12b.

Where a manhole is to be cabled, the prop should be fitted as near to the bottom of the shaft as possible. When the drop arm is to be rigged in a joint-box the props should be attached to the yoke of the cabling wheel.

Fig 12b follows

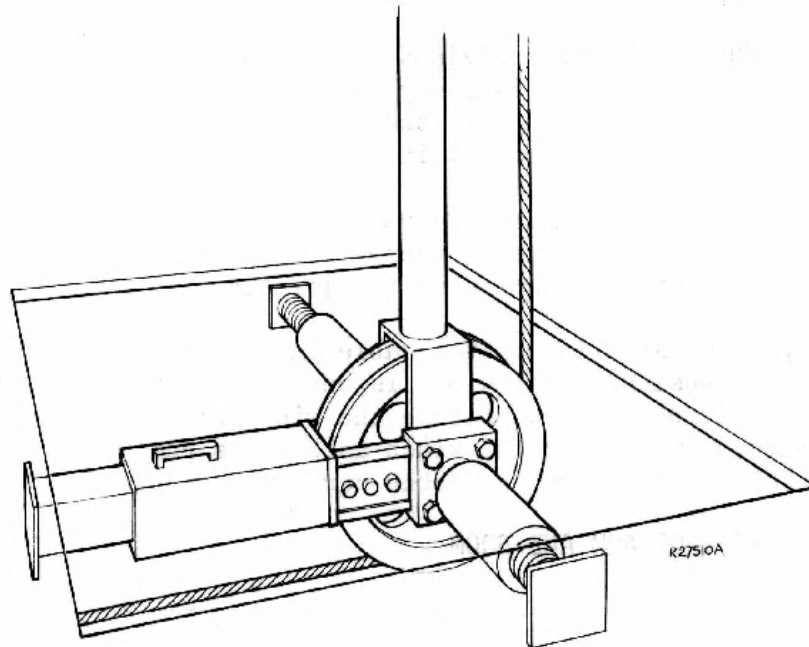


FIG. 12b

9 PULLING THE CPU WINCH ROPE INTO THE DUCT When the CPU has been positioned and the boom and drop arm set up check that the drop arm is stable.

Attach the draw-rope in the duct to the eye in the end of the CPU winch rope using a "quick splice". The CPU winch rope may then be pulled into the duct by the capstan winch on the Cable Carrier.

Where the length to be cabled exceeds 200 m or where the pull is expected to be difficult, a Rope Cabling No. 1 should be pulled in on the drawrope and used to pull in the CPU winch rope.

A mandrel and brush may be connected between the Rope Cabling No. 1 and the main winch rope (TI A2 D3010).

It is essential that the winch is maintained in the "winch out" condition at full speed, so that as little load as possible is placed on the drawrope. This pay out condition may be achieved as described in par 5.6. In the event of a failure of this device the speed control should be held manually in the maximum speed position.

When the above conditions have been achieved the crew member at the cable feeding end should be instructed to commence pulling the drawrope or Rope Cabling No. 1.

Continuous radio communication must be maintained throughout all winching operations.

The winching is continued until sufficient CPU winch rope has been obtained at the cable feeding end for attachment to the cable.

Markers of coloured tape applied to the cabling rope at distances of approximately 5 m, 10 m and 15 m from the end will give advance warning to the CPU operator of the approach of the cable end when cabling.

10 PULLING IN THE CABLE When advised by the feeding end that the cable is attached to the winch rope and is ready for pulling, select the "WINCH IN". After informing the cable feeding end, turn the speed control until the winch rope starts to move. When all is going smoothly increase the speed to maximum.

When the three marker bands referred to in para 9 appear, reduce speed. Pull the cable end over the sheave until there is sufficient cable available for setting round the jointing chamber and for jointing.

The CPU operator MUST inform the cable carrier operator EVERY TIME the winch rope is put under tension or the winch is operated in the WINCH IN condition. An acknowledgement must be received before the winch rope is moved. The winch rope should be released by reversing the winch as soon as pulling has been completed or at any time on request from the cable carrier operator.

11 RESTORING THE DROP ARM AND BOOM

(i) Remove the props and/or chains supporting the drop arm.

(ii) Raise the boom until the sheave is clear of the jointing chamber. Fully retract the boom then manoeuvre it so that the pulley of the sheave is just clear of the ground at the rear of the vehicle. Connect the stowage winch rope and winch up the drop arm, lowering the boom at the same time.

(iii) If the drop arm has been extended, place the pulley in the position shown in Fig 9. Remove the securing pin and retract the boom until the drop arm is fully contracted. Replace the securing pin.

(iv) Any boom extension remaining after this operation must be fully retracted before the drop arm is finally stowed.

(v) The drop arm may now be winched into its stowed position by the operation of the stowage winch.

The captive stowage winch rope passes over a small pulley on the underside of the boom, and is attached to the drop arm. In this position boom "extension" is inhibited.

The stowage winch will stop automatically when the drop arm is close to the boom. Replace the drop arm Safety Latch and its securing pin and locking pin. When the drop arm is properly secured push the end of the main winch rope into the tube provided.

(vi) Manoeuvre the boom back to the stored position.

(vii) Cancel the controls on the remote control box and stow the box in its position at the rear of the vehicle.

(viii) Raise the stabilising jacks.

(ix) With the vehicle clutch depressed disengage the PTO.

12 TOOLS AND STORES The tools and stores needed for use with the CPU and the positions in which they should be stored are given in TI A2 D3025.

References A2 D3010
A2 D3025

OP10.3.1

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