

Figure 4D.4 - EDC Duplex Working (Sub-channel 'A' in Repetition Sub-channel 'B' Error)

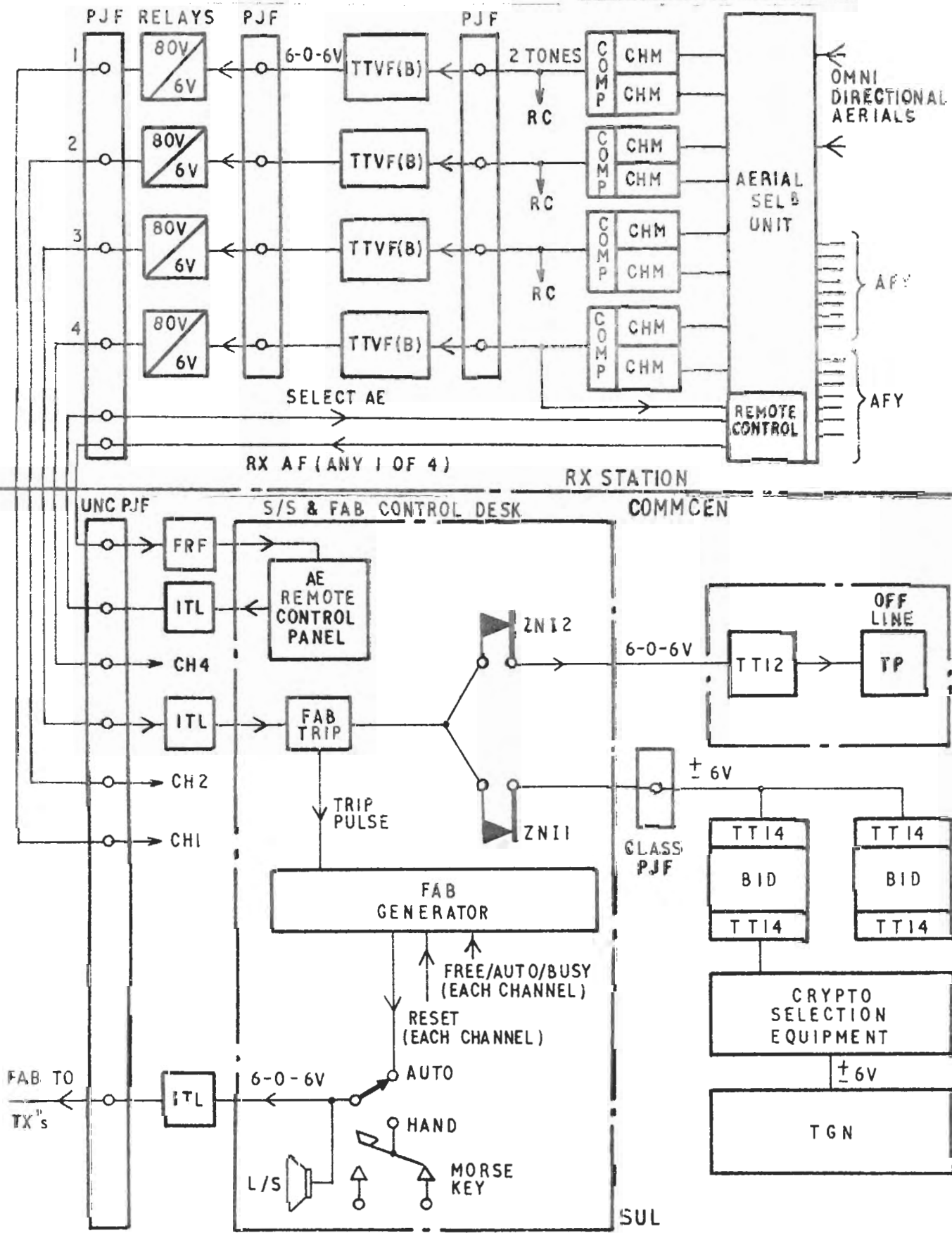


Figure 4E.1 - UK RATT Ship-Shore (Series B)

RN CRIMOND REMOTE CONTROL SYSTEM OUTFIT KST/KSN

INTRODUCTION

1. System consists of a transmitter station, designated CD, remotely controlled by one of two identically equipped communications centres, designated WL and FR.
2. Commands to, and revertive checks from, the transmitter station are conveyed over GPO lines using WESTRONIC remote control equipment. This employs the time division multiplex principle and enables transmission of all control functions over a single 4-wire circuit.
3. Communications Centre WL is the primary station and will normally be in control. Secondary station, FR, receives revertive checks from the transmitter station, but will only take control in special circumstances. A facility for seizing control is provided at each Commcen.

TRANSMITTER STATION

4. The remotely controlled equipments at the transmitter station are:
 - (1) Thirteen HF transmitters operating in range 4 to 27.5 MHz.
 - (2) Three LF transmitters operating in range 40 to 160 kHz.
 - (3) Fourteen frequency synthesisers (part of HF transmitter drive cabinets).
 - (4) One HF antenna exchange and test loads.
 - (5) Two line/traffic cross-bar switches.
 - (6) One rotatable log periodic antenna.
5. Equipments associated with the transmission of remote control information are:
 - (1) Westronic remote control and indicating equipment, to translate serial data from the Commcen into parallel form and vice versa. Termed the 'Master Station'.
 - (2) Interface rack suite containing interface units for all remote controlled equipments, together with power supply units, circuit breaker panels and terminal equipment failure detector circuits.

COMMUNICATIONS CENTRE

6. Both communications centres contain the following equipments associated with remote control:

- (1) Control and indicator rack suite containing the remote control and indicator panels and power distribution panels for all control functions.
- (2) Westronic remote control and indicating equipment to translate parallel data from the control panels into serial data for transmission to the transmitter station. This is termed the 'Outstation'.

EQUIPMENT - BRIEF DETAILS

HF Transmitters

7. HF Transmitters comprise two types:

- (1) Amplifier Type H1200 (WBL) and one half of a drive cabinet Type H1601 (TDZ) - eight in number fitted on a NATIONAL SUITE.
- (2) Transmitter Type WBN (two UK FRT 645 Transmitters driving a combiner unit - total output 20 kW) and one half of a drive cabinet Type H1601 (TDZ). Remote control of each amplifier comprises, OFF, STAND-BY, OPERATIONAL and initiating the AUTO-TUNE sequence. Drive cabinet remote control is emitted to transmission mode and frequency selection.

LF Transmitters

8. Each LF Tx comprise an amplifier Type H1211 (WBM) and one half of a drive cabinet Type H1610 (TDY).

Remote control of each amplifier is restricted to switching between off, stand-by and operational states.

The remote control is exercised over the drive cabinet, but revertive information is made available to both communication states.

HF Antenna Exchange

9. HF transmitters and antennas are arranged in two groups A and B. The Holdroman antenna exchange is capable of being remotely controlled to connect Tx's to antennas in the same group and a Tx in one group to an antenna in the other group. Provision is made for extension of the system to cover a third group.

Line and Traffic Switching

10. Two groups of cross-bar switch assemblies are provided, one for line and one for traffic switching.

Control Changeover and Alarms

11. Each communications centre is equipped with an alarm panel which provide audible and visible alarms for Tx station equipment failure and facilities for switching control of the Tx station between either communication centre.

Westronic Scanners

12. Two scanners are supplied, designated 'X' and 'Y'. Normally 'X' is connected to the system with 'Y' powered and in a stand-by mode. In the event of failure of the operational scanner, the master station will make an automatic changeover to the stand-by. Each outstation can initiate a changeover from 'X' to 'Y' and vice versa.

Equipment Failure Revertive Checks

13. The following equipments are monitored for fault conditions at the transmitter station:

- | | | |
|-----|--|------------------------------|
| (1) | LEDEX power supply | LEDEX PS FAIL |
| (2) | Frequency standard FSC | MASTER OSCILLATOR CHANGEOVER |
| (3) | Battery stand-by and float charger unit | BATTERY FLOAT FAIL |
| (4) | 6/24 V distribution unit | 6/24 V FAULT |
| (5) | 50 V power supply units
50 V MCBs (miniature circuit breakers)
Drive and Tx interface unit | -50 V FAULT |
| (6) | Terminal equipment failure detector unit | LINE FAIL 1-7 |

14. Receipt of equipment failure revertive checks lights an appropriate indicator lamp and energises a bell operating circuit.

15. In addition, DOE units at the transmitter station provide the following revertive checks:

- (1) Mains available.
- (2) Mains connected.
- (3) Stand-by power available.
- (4) Stand-by power connected.

16. Receipt of revertive checks lights an appropriate indicator lamp.

Alarms and Control Selection

17. Each communication centre has one panel to select controlling communications centre and receive equipment failure revertive checks. Main functions:

- (1) To provide audible and visual warning of local and transmitter station equipment failure.
- (2) To switch control of the transmitter station between the two communication centres.

18. The master station of the Westronic remote control equipment (CD) uses two addresses to determine which outstation (WL or FR) is in control of the system.

- (1) Address 1 causes outstation WL to respond with a status word.
- (2) Address 2 for outstation FR.

Station word transmitted from either outstation to the master station has bits to state either:

This outstation is in control or

This outstation permits the other to take control or

This outstation requests to take control

The master station transmits a status word to either outstation stating either:

The other outstation is in control or

The other outstation permits to hand over control or

The other outstation requests to take over control

19. At the master station the information is held in two registers. The register for each outstation is cleared when its address is transmitted and updated according to the reply. This ensures that if communication with the controlling outstation is lost, the system does not remain 'locked on' to that outstation. The outputs of the registers are cross-connected into the master station scanner so that the status word from outstation WL on address 1 is re-transmitted to FR on address 2 and vice versa.

20. If both outstations declare 'I am in control' or if neither does, the system will continue to scan and update the outstation displays, but will ignore control signals from either outstation, and the REMOTE CONTROL FAIL lamp will light.

Line and Traffic Switching

21. Each communications centre has a line traffic indicator panel, which provides control buttons for selection and indicators for monitoring.

Any one line can be switched to any multi-channel voice frequency (MCVF) input. Similarly in traffic selection, any one MCVF output can be switched to any one transmitter channel.

22. Each selection sequence has the following accompanying indications:

- (1) The READY light (Red) must be on.
- (2) LINE SELECT switch operated - switch latched mechanically.
- (3) MCVF INPUT switch depressed - SELECTED light (Green) on - switch released.
- (4) READY light extinguishes - SELECTED light remains illuminated, numerical display shows row number selected.

23. Once the SELECTED light is on, no further selection may be made until the READY light goes out. This operation may take between 15 and 20 seconds, during which time LINE INHIBIT and/or TRAFFIC INHIBIT lights will be illuminated.

24. Should an error be made in selection, the command signal may be stopped before completion by operation of the CANCEL switch. A LAMP TEST switch is provided, which when operated, lights all seven elements of each of the numerical displays.

25. If the 5 V supply fails, or is switched off, numerals on the display panels will be extinguished. When the supply is restored, the numerals will not appear, though the commands will still be intact. A rotary switch and counter reset button is provided to enable the numerals to be restored from information obtained from operators records.

SYSTEM OPERATION FACILITIES

Common Control and Indicator Rack Suite

26. Each contains control panels and revertive check monitoring facilities for all functions of the remote control system.

Facilities are as follows:

HF Transmitter Selection

27. One control panel for each of the 13 transmitters. The control panel can transmit up to four commands and receive up to seven revertive checks as follows:

ACTION

RESULT

REVERTIVE CHECK

START command.
Continuous command
unit cancelled by
STOP command.

Switches on the
amplifier power
supplies and tunes
amplifier to the
drive frequency.

TUNING - indicates that the
START sequence is in
progress.
HT ON & TUNED - indicates
completion of START
sequence and tuning
sequence.

STAND-BY command.
Continuous command
until cancelled by
START/RESTORE or
STOP command.

Switches amplifier
to stand-by condition
by removing HT
supplies when in a
'Started' condition.

STAND-BY - indicates
completion of the stand-by
command sequence.
HT ON & TUNED cancelled.

RESTORE command.
Restore START
command at the
amplifier.

Cancels the STAND-BY
command. Restores the
amplifier to a 'Started'
condition.

HT ON & TUNED - indicates
the amplifier is in a 'Started'
condition.
STAND-BY cancelled.

CHECK LEVEL
command.
Continuous command
until cancelled by
START/RESTORE or
STOP command.

Initiates a "final" tuning
of the amplifier.
Ineffective during
STAND-BY.

Cancels HT ON & TUNED.
TUNING - indicates that
amplifier final tune sequence
is in progress.
HT ON & TUNED restored
when sequence is
completed.

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AMPLIFIER AVAILABLE -
indicates amplifier and
interface unit set for remote
control.

-

-

LOCKOUT - indicates a
lockout condition at the
amplifier. Operates an
external bell.

-

-

TEST LOAD - indicates
amplifier connected to Test
Load.
OUTPUT - not used.

-

-

RF OUTPUT LOW - indicates
that rf output power of the
associated transmitter is less
than the predetermined
minimum level.

-

-

RF OUTPUT HIGH - indicates
that rf output power of
the associated transmitter
is greater than the
predetermined maximum
level.

28. No control is exercised over the LF drive cabinet but two revertive checks are monitored on the control panels as follows:

- (1) **MODULATOR AVAILABLE.** Indicates the associated modulator is set for remote control.
- (2) **MODULATOR FAULT.** Indicates a fault at the associated modulator.

29. The same control panels can be used to select the transmission mode, by transmitting up to seven commands and receiving up to nine revertive checks from the associated drive cabinet as follows:

<u>ACTION</u>	<u>RESULT</u>	<u>REVERTIVE CHECK</u>
CW DSB SSB (UPPER) TSK (UPPER) P/C TSK (LOWER) SSB (LOWER) Continuous Command	Sets the modulator to operate in the required transmission mode.	CW DSB SSB (UPPER) TSK (UPPER) P/C TSK (LOWER) SSB (LOWER)
-	-	MODULATOR AVAILABLE - indicates that the associated modulator is set for remote control.
-	-	MODULATOR FAULT - indicates a fault at the associated modulator.

Preset Frequency Selection

30. Two panels to select any one from 14 synthesisers and three panels to select any one from 36 preset frequencies.

31. To set a synthesiser to a particular preset frequency channel, two selections are required, one defining the synthesiser and one the channel. For example, to set synthesiser 1 to channel 1, the command and revertive check sequence is as follows:

<u>ACTION</u>	<u>RESULT</u>	<u>REVERTIVE CHECK</u>
SELECT CH 1. Continuous command until receipt of a revertive check. SELECT SYN 1.	Sets synthesiser 1 (in drive cabinet 1) to the Ch 1 preset frequency.	FREQUENCY SELECTED - indicates that the command sequence at the transmitter station has been completed, ie synthesiser 1 is set to the

Continuous command until receipt of a revertive check.

Ch 1 frequency. The revertive check is used to 'clear down' the selection panels for the next command sequence.

LF Transmitter Selection

32. One control panel for each of the three LF transmitters. Can transmit up to three commands and receive up to 10 revertive checks as follows:

<u>ACTION</u>	<u>RESULT</u>	<u>REVERTIVE CHECK</u>
HT ON command. Cancelled by a command transmitted from the interface unit on receipt.	Switches on the HT and filament supplies in the amplifier if an OFF condition or restores HT supplies if in a STAND-BY condition.	HT ON - indicates completion of the HT ON sequence.
STAND-BY command. Cancelled by a command transmitted from the interface unit on receipt.	Switches the amplifier to a STAND-BY condition by removing the HF supplies if in an HT ON condition or switching on the filament supplies if in an OFF condition.	STAND-BY - indicates the amplifier is in a STAND-BY condition. HT ON or OFF revertive check cancelled.
OFF command. Cancelled by a command transmitted from the interface unit on receipt.	Switches the amplifier to an OFF condition by turning off all supplies.	OFF - indicates the amplifier is switched OFF. HT ON or STAND-BY revertive check cancelled.
-	-	AMPLIFIER AVAILABLE - indicates associated amplifier and interface unit set for remote control.
-	-	AMPLIFIER LOCKOUT - indicates a lockout condition at the amplifier, used to operate an external alarm bell.
-	-	TEST LOAD - indicates that the amplifier is connected to a test load.

Antenna Selection (HF)

33. One panel for the column command (antenna co-ordinates) of each antenna exchange group and one panel for each row command (transmitter co-ordinate).

To connect a transmitter to an antenna in the same group, selection on two panels are required. For example, Tx 1 to AE 1, the command revertive check sequence is as follows:

<u>ACTION</u>	<u>RESULT</u>	<u>REVERTIVE CHECK</u>
SELECT AE 1 (Group 4 aerial selector panel).	Initiates a column 2 (frame 1) command to Group A of the antenna exchange.	-
SELECT Tx 1 (aerial exchange control/indicator panel associated with Tx 1).	Initiates a row 1 command to Group A of the antenna exchange.	-

When both row and column commands are present at the antenna exchange, the required selection is fulfilled and a Tx 1/AE 1 revertive check is transmitted to the Tx 1 aerial exchange control/indicator panel. This results in lighting the AE 1 lamp on the panel.

To connect a transmitter from one group to an antenna in the other group, selection on four panels are required. For example Tx 1 (Group A) to AE 7 (Group B), the command and revertive check sequence is as follows:

<u>ACTION</u>	<u>RESULT</u>	<u>REVERTIVE CHECK</u>
SELECT TRANSFER A-B (Group A aerial selector panel)	Initiates a column 5 (frame 2) command to Group A of the antenna exchange.	-
SELECT Tx 1 (aerial exchange control/indicator panel associated with Tx 1).	Initiates a row 1 command to Group A of the antenna exchange.	-
SELECT TRANSFER A-B (aerial exchange control/indicator panel associated with transfer A-B).	Initiates a row 7 command to Group B of the antenna exchange.	-

SELECT AE 7 - Initiates a column 2 (Group B aerial selector panel). (frame 3) command to Group B of the antenna exchange.

When all four commands are present at the antenna exchange, the required selection is fulfilled and two revertive checks are transmitted to the associated aerial exchange control/indicator panels. These are:

- TRANSFER A-B/AE 7 - Used to light the AE 7 lamp on the TRANSFER A-B panel.
- Tx 1/TRANSFER A-B - Used to light the TRANSFER A-B lamp on the Tx 1 panel.

Telegraph Terminal Failure Detector

34. Two printed circuit boards, each of which carries a test oscillator, providing 75 Baud reversals, and two switching devices. These apply the test signal through the appropriate signal path as determined by the line and traffic cross-bars. The assembly also includes a relay whose function is to remove the +10 V should the -10 V fail. One board feeds the CW circuits, the other the RATT circuits.

Ten PCBs contain circuitry for demodulating the tones for the CW and RATT signals. The demodulated signals are compared with their associated dc keying signals. If the tones do not correlate with the keying then an alarm relay is de-energised causing a local lamp to be lit and a closing contact to initiate a remote alarm. Each of the 10 boards operate independently and is adjusted for the required tone frequency.

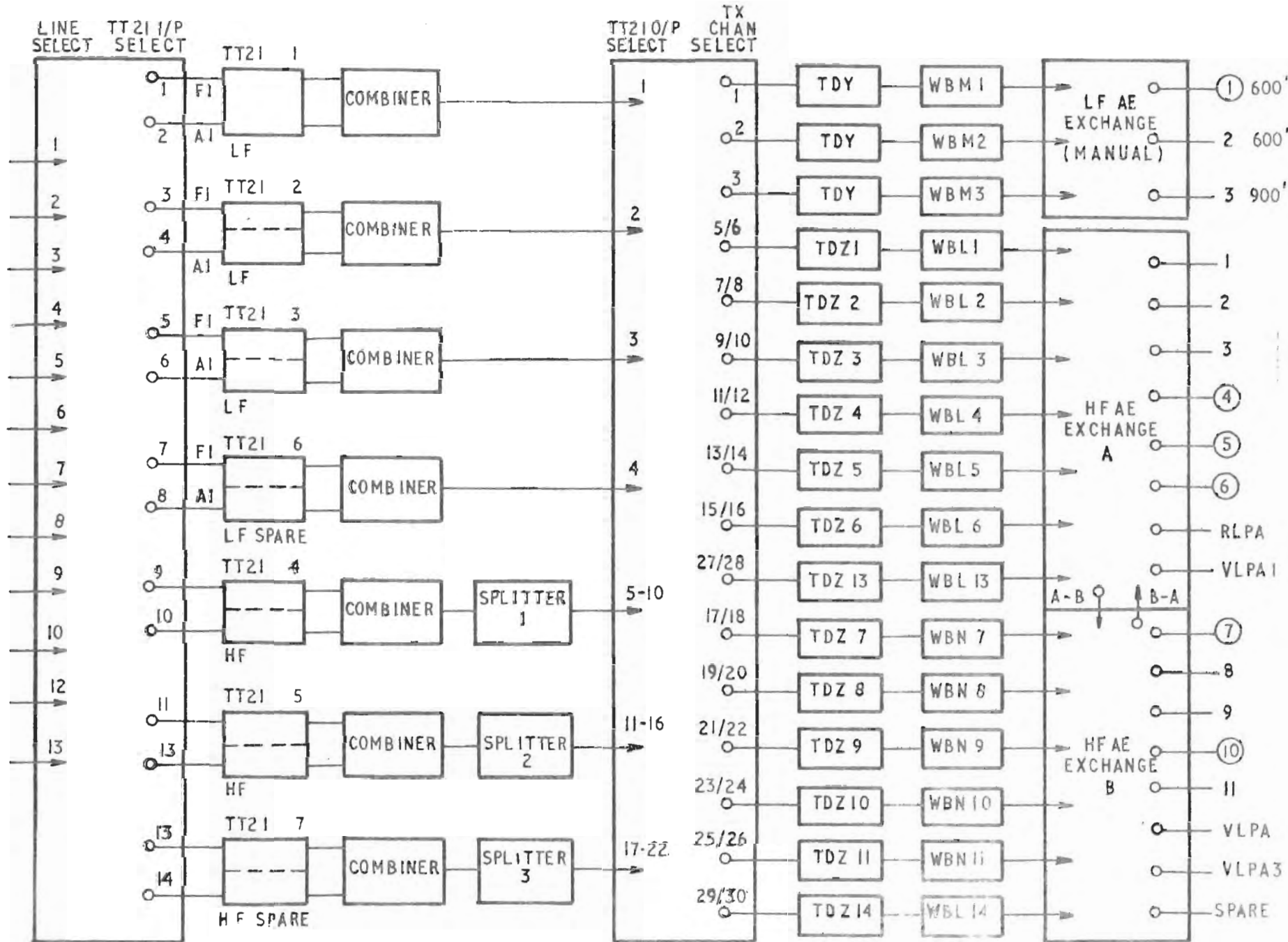
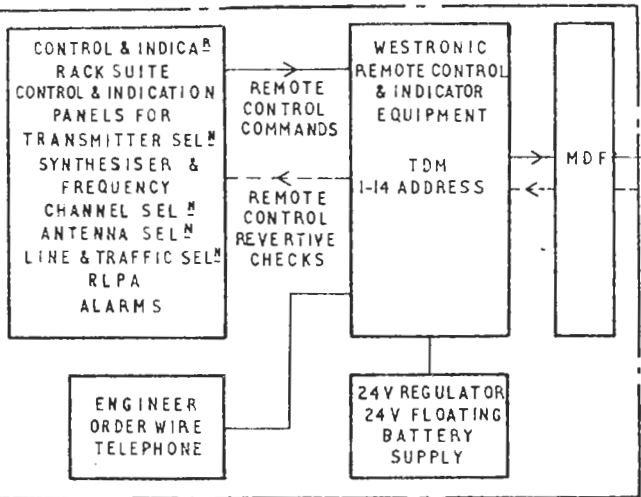


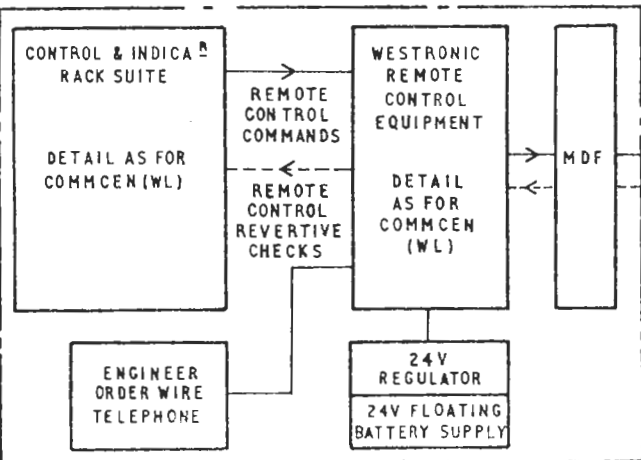
Figure 4F.1 - RNWS Crimond Block Schematic

WHITEHALL (PRIMARY) COMMUNICATIONS CENTRE (WL) SITE A

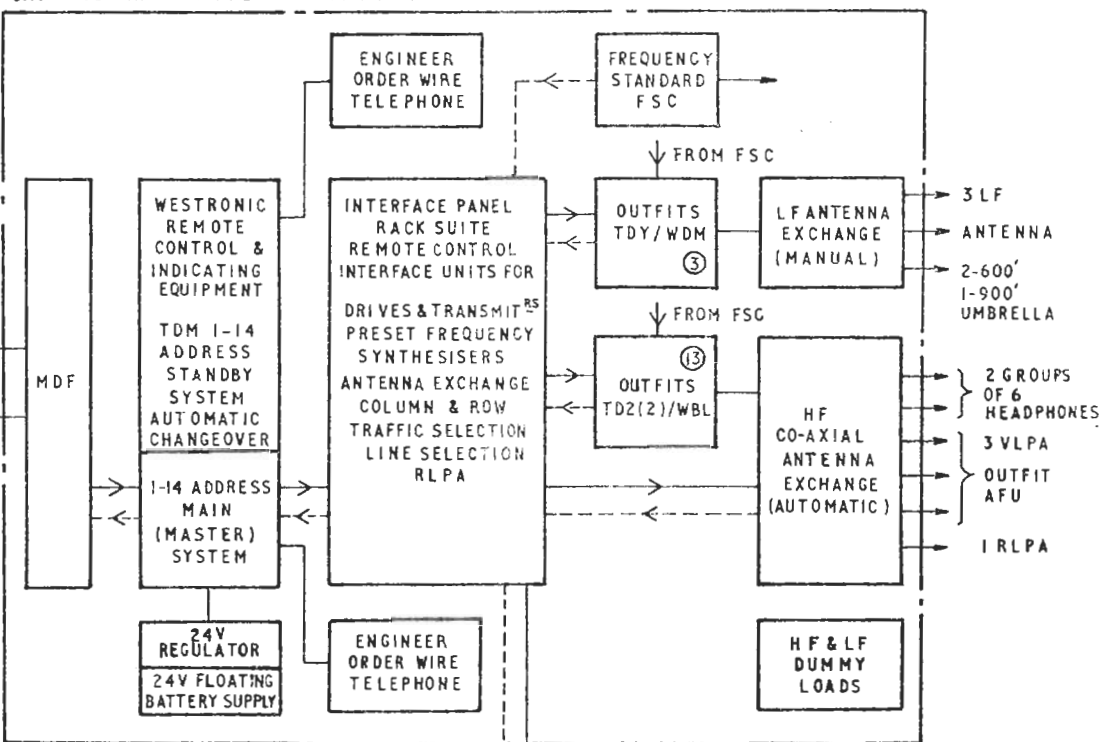


BEARER CIRCUIT
GPO TARIFF 'T'
END TO END
4-WIRE TERMINATED

FOREST MOOR (SECONDARY)
COMMUNICATIONS CENTRE (FR) SITE B



CRIMOND TRANSMITTER STATION (CD) SITE C



NOTE:-

- 1) OUTFIT TDY IS NOT REMOTELY CONTROLLED
- 2) REMOTE CONTROL INTERFACE UNIT PERFORMS 2 FUNCTIONS
 - a) CONVERTS DATA FROM WESTRONIC REMOTE CONTROL EQUIPMENT INTO A FORM ACCEPTABLE TO THE CONTROLLED EQUIPMENT
 - b) CONVERTS REVERTIVE INFORMATION FROM THE CONTROLLED EQUIPMENT INTO THE FORM REQUIRED BY THE TDM REMOTE CONTROL FOR TRANSMISSION BACK TO THE CONTROLLING STATION

Figure 4F.2 - Remote Control System Block Diagram