45. The regulated 9V supply also feeds the collector of switching transistor VT34. The base of the transistor is connected through R135 to the 12V input line and the transistor normally conducts to feed the 9V supply (9V RX) to the circuits used exclusively by the receiver.

46. When the PTT switch is operated, RL1/3 contact changes over to connect the 12V supply to the base of VT33. This transistor conducts and feeds the regulated 9V at its collector as the 9V TX supply to the transmitter low level circuits. At the same time the base of VT35 is also connected to the 12V line through R136. VT35 conducts and holds the base of VT34 at earth potential. VT34 is cut off and there is no 9V RX supply to the receiver circuits. When the PTT switch is released the 9V TX supply is cut off and the 9V RX supply restored.

47. The 9V TX supply is also fed to S4G, contact 6. When a.m. working is selected the resulting 9V TX to the collector of VT16 energises the crystal oscillator to provide the 10,7015MHz signal used as the carrier on a.m. transmission.

DC Converter

48. The unit provides the power supply for the power amplifier transistors VT20 to VT23. The supply is at either 12V when the front panel BAND switch S3 is set for low power (LP), or 36V when high power (HP) or TUNE is selected.

49. For low power working the battery input at PL1 pin 2 is routed as follows:
FS1
p.c.b. pin 1
T20 secondary centre tap
D25 and D28
T14 and T15 primary centre taps
VT20 and VT23 collectors
This collector supply is not switched: it is present at the collectors whenever the battery is connected and whether the set is switched on or not. Transmission is not, of course, available until the set is switched to the appropriate mode and the PTT switch operated.

50. High power operation is only available when the BAND switch is set to HP and the mode switch is set to the required operating mode. The battery input is then fed through S4C to normally open contact RL1/3 on the transmit/receive changeover relay. When the PTT switch is operated the supply is fed through BAND switch S3H and mode switch S4F to the centre tap on the primary of T20. It is also fed through R134 to the centre tap of T20 feedback winding. In the normal manner, conduction will start in one of the Darlington pairs and will increase until the transformer is saturated. The other Darlington pair will then start to conduct and so on. A fast switching action between the two pairs will induce a square wave into T20 secondary. This square wave is rectified by D25 and D28 and is fed at 36V d.c. to the collectors of VT20 to VT23.

51. Diode D24 is a protective device between the bases of the Darlington pairs and earth. The diode will conduct if the base potential of either pair falls to below about -0,7V during the switching action.

Charging from an External Supply

52. Charging may be carried out with the battery box in situ or removed from the transceiver. See paragraph 61 for the latter method of charging.

53. Charging the set with the battery box connected may be from any convenient 12V supply although if an unregulated charging source is used it is essential that an external ballast battery is connected between the charging source and the TR28.

54. The battery may be charged with the receiver switched on or off, that is, in either of the first two positions of the mode switch. With the switch set to CHARGE/REC. reception will be available. The transmitter cannot be energised while the set is being charged.

55. The external source is connected to either of the front panel AUDIO sockets (SK1 or SK2). The positive input at pin 7 is routed through FS2, D30 (reverse polarity protection) MODE switch S4F p.c.b. pin 3 to the centre tap on the primary of T20. This brings the oscillatory circuit formed by the two Darlington pairs into operation in the manner described in paragraph 50. T20 secondary output is rectified by D26, D27 and a negative charging voltage of about -20V is fed through p.c.b. pin 2 and PL1 pin 4 to the battery box (see circuit diagram Fig. 3.5). In the box, the charging current is through current regulator LP4 to PL1 pin 3. This pin is connected to earth through MODE switch S4B while the battery negative is connected directly to earth at PL1 pin 1. There is now a negative current flow through the battery to PL1 pin 4 and through FS1 back to the centre tap of T20 secondary. The battery will now charge and the receiver may be used if required.

TRANSMIT-RECEIVE SWITCHING

56. With the mode switch set to SSB or AM the relevant contact on S4C connects the coil of relay RL1 and the PTT switch in series between the internal battery positive and earth. Operating the switch energises RL1 the contacts of which change over to give the following:

(a) RL1/1 transfers the antenna from the receiver to the output from the transmitter power amplifiers.

(b) RL1/2 short circuits the receiver input and at the same time removes the earth from the overload protection circuit (paragraph 26).

(c) RL1/3 feeds the internal battery input to:

(i) The d.c. converter oscillatory circuit when the BAND switch is set to HP.

(ii) The base of VT33 to switch the 9V regulated supply to the transmitter circuits. (9V TX)

(iii) The base of VT35 to disable the 9V RX power supply circuit.

57. With the mode switch set to BK CW the PTT switch is still in circuit but the transmit-receive relay is energised by the key. In addition the emitter of VT13 is earthed through S4B and the tone oscillator runs continuously.

58. When CW is selected on the MODE switch the transmit-receive relay coil is permanently earthed through mode switch S4E. The relay is energised and the contacts maintain the transceiver in a transmit condition. The morse key, in this case, is connected directly to the emitter of VT13 in the tone oscillator.

BATTERY BOX

Figure 3.5

Battery Interconnections

59. The battery box contains the ten nickel-cadmium cells which comprise the 12V battery, together with protective diodes and the components required for the charging circuit. The cells are electrically connected in two banks of five. Under normal operating conditions a link between pins 5 and 6 of PL1 on the transceiver connect the negative end of one bank to the positive end of the second bank thus giving a single battery of ten cells. When the battery box is removed from the transceiver the two banks of cells are separate.

Charging

60. Charging with the battery connected to the transceiver has been described in paragraph 52 to 55.

61. When the battery box is removed from the transceiver it may be charged from any 12V d.c. source although if the source is unregulated a ballast battery must be connected between the source and the battery box. The battery may also be charged from a suitable 13,6V a.c. source. A mains operated unit, the RACAL MSU28 has been designed for this purpose.

62. When charging from either source the input to pins 5 (.d.c. positive) and 6 of SK5. Diodes D45 and D46 isolate the two banks of the battery from each other, prevent the application of a reverse polarity charge when charging from a d.c. source and act as half wave rectifiers when charging from an a.c. source. Lamps LP5 and LP6 limit the charging current to 500mA in each bank and at the same time indicate that charging is taking place.

DESICCATOR

63. A desiccator is fitted through the bottom of the transceiver case to keep the interior of the set dry. The window in the desiccator is normally blue but becomes pink when the desiccator is saturated. When this occurs it should be taken out and dried with warm air until the blue colour re-appears. It may then be replaced.

ANTENNAS AND EARTHING ARRANGEMENTS

64. The general earth for the set is the outer of the 50 ohm antenna socket. A special cover for this socket is attached to the set and incorporates a threaded stem with a knurled nut. When the cover is screwed on to the 50 ohm socket the nut and stem provide a connection point for earthing the set or for connecting it to a suitable couterpoise.

65. To improve antenna efficiency, two devices known as capacity wallets are provided. One is incorporated in the carry-bag supplied, the other is a separate item which may be hooked over the operator's belt or carried in a pocket. On both wallets a fairly long lead is provided and for normal operation either or both wallets may be connected to the earth point described in paragraph 64 above.

66. The types of antenna which may be used are:

(a) A 3,65m (12ft) whip (supplied)
(b) A retractable wire aerial
(c) A slant wire aerial
(d) A dipole

67. The whip will normally be used when the set is carried on the operator's back. One or both of the capacity wallets should be used.

68. One of the other antennas may be used if the set is standing on the ground. The retractable wire antenna is connected to the whip antenna socket and the earthing point on the 50 ohm socket cover may be connected to one or more suitable couterpoises such as:

(a) The separate capacity wallet which is then slipped into the operator's pocket.
(b) A length of wire laid out along the ground or weighted and thrown into water.
(c) A motor vehicle chassis.

69. If the slant wire antenna is used, this is connected to the 50 ohm socket and other earthing arrangements must be used. A suggested method is to solder a piece of wire to the outer of the plug used to connect the antenna to the 50 ohm socket.

70. A dipole is also fitted into the 50 ohm socket but in this case no earthing arrangements are required.