Servicing Hitachi VT8000 Series VCRs

Derek Snelling

The Hitachi VT8000 series of VCRs comprises models VT8000, VT8300, VT8500 and VT8700. Similar models were released under the Granada name: in addition the mechanics were used in the Fidelity VTR1000. They were amongst the first "electronic" type VHS machines released in the UK, being on sale during the period 1980-2, and have proved to be very reliable. The VT8000 is the basic model, with a one-event, ten-day timer, visual search, freeze frame and frame advance (the noise bar is automatically shunted to the bottom of the screen), audio dub and a ten-function wired remote control system (some early machines had two-function only remote control, but the later units will work with them). The VT8500 was the "luxury" model, with a four-event timer, half and double speed playback without noise bars, a tape index system and infra-red remote control. These two initial models were subsequently replaced by the VT8300 and the VT8700 respectively. Apart from cosmetics, the main differences with these later machines are a redesigned bottom board to incorporate an improved power supply and the various modifications introduced during the production run of the earlier models, a flashing play light during search, and continuous frame advance while the button is kept depressed. While on the subject of boards, it's worth noting that the component reference numbers on the board and those on the layout diagrams in the manual can differ – in fact the numbers on the top and bottom of the panel for the same component can differ. If in any doubt, it pays to check with the circuit diagram.

Access

Access for servicing is as follows. The top is secured by four screws, three along the back and the other one under

Table 1: System control IC pin data

Pin	*Active level*	*Function*
		HD44801A05 (IC901)
1	—	Sync pulse to IC902
2	L	Activates 15V and not-PB12V lines when pin 41 is set high
3	L	Sets servo system to search mode
4	L	Capstan motor reverse
5	L	Loading operate
6	L	Unloading operate
7	L	Fast forward
8	L	Rewind
9	L	Slow reel motor drive to avoid tape slack when unloading
10	L	Reel and loading motor braking
11	L	Take-up reel braking
12	L	Main brake operate
13		Main brake off
15	H	Reset
21	—	5V supply
22	H	Auto rewind at tape end on supply side
23	H	Timer recording operate
24	H	Forward end sense: detects supply side tape end and stops after unloading
25	H	Rewind end sense: detects take-up side tape end and stops after unloading
26	H	High when safety tab present
27	H	Set by arrival of pause stand-by instruction
28	H	Set at completion of unloading to stop mechanism
29	H	Set at completion of loading to stop loading mechanism
30	H	Set to stop drum after unloading
31	H	Set to stop reels after unloading
32	H	Cassette holder: clears memory when pin 30, 31 or 33 is high during a timer recording
33	H	Set when dew detected or bulb fails: stops after unloading. Stop indicator will flash at 3Hz
36-9	H	4-bit data
40	H	Key signal AD conversion
41	H	Reads in the operate switch mode. When high sets pin 2 low
42		Search end
		HD44801A19 (IC901)
As above except:		
2	L	Activates 15V and not-PB12V lines when pin 13 high
13	H	Reads in operate switch mode. When high sets pin 2 low
41	L	Reads camera connected
42	L	Reads in camera data and precedes the camera pause
		HD38701A06 (IC902)
1	H	Stop indicator lights
2	H	Pause indicator lights in frame advance, still, RC pause, dub pause and stop pause
3	H	Rewind indicator lights
4	H	Fast forward indicator lights
5	H	Audio dub indicator lights
6	H	Record indicator lights in record and record pause
7	H	Play indicator lights in play, slow, quick, frame advance, still, record, record pause, dub, dub pause and visual search
8		Sync pulses from IC901
10	H	Reset
14		9V supply
15-8	H	4-bit data from IC901
19	H	Activates PB9V line in playback mode
20	H	Activates REC9V line in record mode
21	H	Activates audio dub
22	H	Activates pause mode
23	H	Inhibits servo and signal systems during loading
24	H	Drum rotate
25	H	Puts servo in frame advance mode
26	H	Tuner channel selection
27	H	Activates slow play mode
28	H	Activates fast play mode

the clock set flap. The bottom is secured by six screws. The front is secured by three screws along the top, revealed when the top is removed, and three screws along the front, two behind the tuner flap and one behind the memory switch flap. Removing these three items will give access to most of the machine. Note that the operate board is screwed and clipped to the front, so take care when removing this.

The audio board on the left-hand side of the machine is secured by two white nylon clips along its top edge. When these clips are released the board can be hinged down for service. The two panels sandwiched together at the rear of the machine are the visual search board (the smaller, outer one) and the luminance-chroma board (the larger, inner one). The visual search board is fixed to the other one by a white nylon hinge: just undo the two screws that secure its upper edge to the chassis and hinge it down to work on it. The luminance-chroma board is held in place by two nylon clips along its top edge, in a similar manner to the audio board, and can be hinged down in the same way. To the right of the machine are the tuner and i.f. boards, which are fairly inaccessible, and to the right of them there's the small rectifier board. Underneath there's the large servo/system control board. Access to this is by removing the four fixing screws located near each corner, then hinging the board up and rearwards. When refitting this board take care not to trap any of the wiring or distort the board too much. This leaves just a small panel tucked away to the left of the i.f. panel. This contains two regulator transistors in the VT8000/VT8500 and a large regulator i.c. in the VT8300/VT8700. The VT8500/VT8700 have an extra panel on the left-hand side of the bottom board – this is the remote receiver panel.

Booster and RF Lead

We'll start at the r.f. end. What sort of problems can you expect? Well, I've never had a booster fail on these machines and the sockets are of a robust construction which the manufacturers of many more recent machines would do well to copy. The r.f. lead supplied with these machines has a built-in isolator which often gives problems. Repair is a simple matter however: just undo the two screws and resolder the isolating capacitors to the cable.

Tuner, IF and Converter Sections

The tuner and i.f. sections rarely give trouble. The tuners occasionally go low gain at one end of the band or suffer from dry-joints which are made more difficult because of the number of thick-film type components used in the construction of the unit: replacement is usually necessary. The only problem with the i.f. section seems to be dry-joints at the earths where the case is soldered to the print, usually near the centre of the board, though I have had a couple of cases of dry-joints on the larger electrolytics. This board cannot be worked on in situ and has to be removed. I find that the best way of doing this is to remove the fixing screw and nylon clip from the top of the panel, open up the bottom board, then unsolder it from the small mother board it shares with the tuner. The alternative is to remove the tuner/i.f. assembly complete then remove the i.f. module from the board.

The r.f. converter (u.h.f. modulator) is reliable though I have had a couple of cases of no signals at the output. The range of the sound coil is sufficient to change from 6MHz to 5·5MHz – in fact if you get one from Hitachi it may be a German one with instructions to retune it to 6MHz.

Video-chroma Board

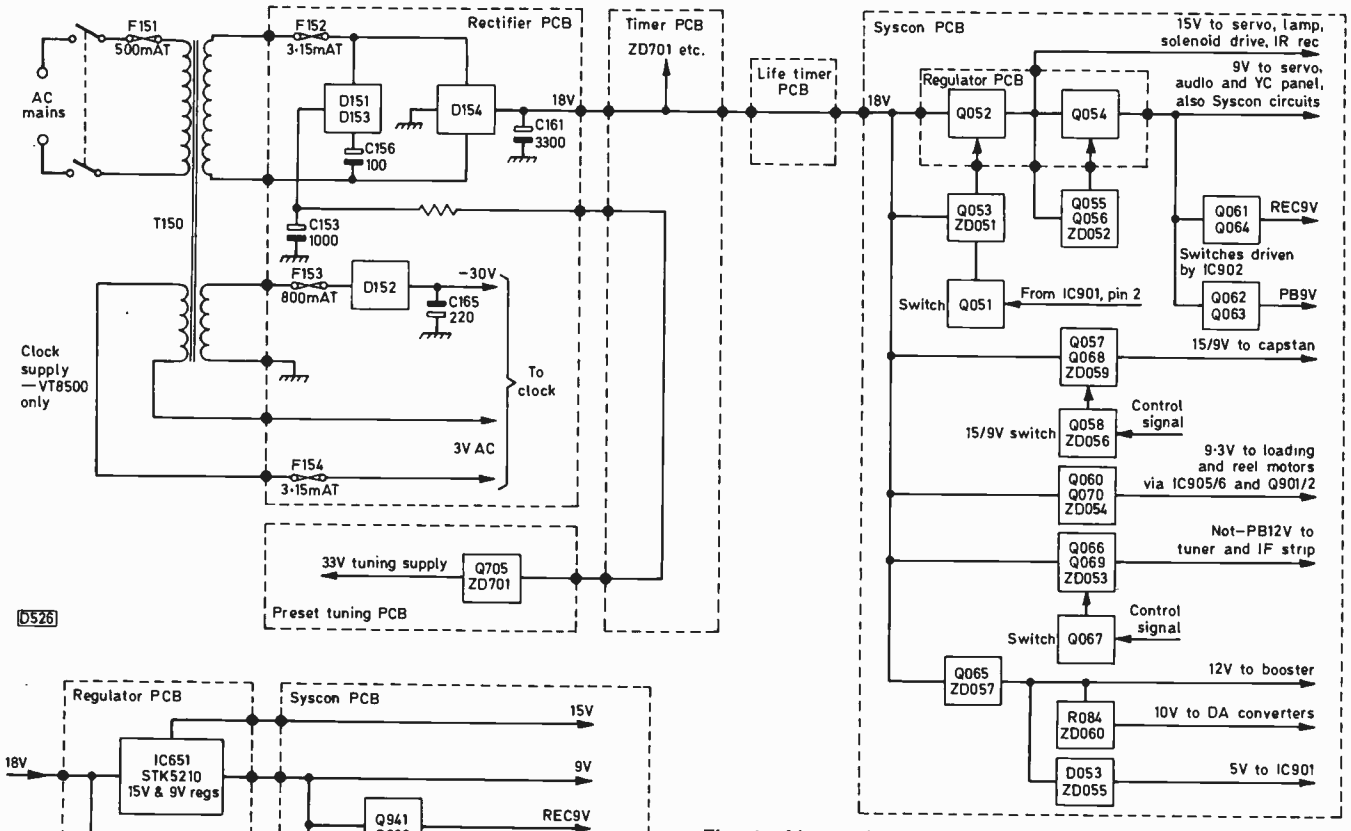
Most of the circuitry on the video-chroma board at the rear is contained in three hybrid modules – IC201 for the f.m., IC202 for the video and IC203 for the chroma. Be careful here when reading the circuit diagram: the individual components within the hybrid modules and their values are shown although they are not repairable – in fact the area covered by a particular hybrid circuit is not immediately obvious. Faults on this panel tend to be confined to IC203 giving no/intermittent colour. Other failures I've had include IC202 giving no video and failure of various filters giving colour or luminance problems, also one case of no playback due to failure of IC201. I've never had to adjust any of the presets on this board although the record chroma current control should in theory be set when the heads are changed.

Visual Search Board

The visual search board performs several functions. It shunts the noise bar off screen in pause, times how long the machine is in the pause mode, switching pause off after about ten minutes, and provides VD pulses during the various non-standard speeds. These are artificial field sync pulses that are necessary to prevent the picture rolling in the non-standard play modes. This board differs slightly from model to model. The VT8500/VT8700 have additional components for half and double speed playback. The VT8300/VT8700 have continuous frame advance while the frame advance button is depressed, unlike the VT8000/VT8500 which advance only one field until the button is released and then pressed again. The circuitry consists entirely of various logic chips so if you like these fault finding should present no problems. As yet I've not had a fault on this board. There are three or five adjustments on the board. With the VT8000/VT8300 there are controls for the speed of the frame advance (set for about one frame per second) and for the position of the noise bar (set for off screen at the bottom). Remember to advance the frame after each adjustment to check the effect. The third control is for VD pulse timing adjustment. Set this for minimum frame jitter in pause. The VT8500/VT8700 have these same three adjustments plus two extra VD pulse timing adjustments for half and double speed. The VD pulse adjustments are accessible through the rear of the cabinet, being behind a rubber plug. Different settings may be required with different TV sets.

Audio Board

The audio board on the left of the machine contains all the audio circuitry with the exception of the microphone input amplifier which is on the bottom board. In addition, in the VT8500/VT8700 it includes the tape index system. This superimposes the SW25 pulses on the full erase head during lace-up in record. The pulses thus put on the tape can be detected during fast forward or rewind by the tape index head fitted to the end of the tape tension arm. Faults on this board seem to be confined to the relays. There are two, one for audio dub and the other for record/playback. The "rest" position for the latter is in



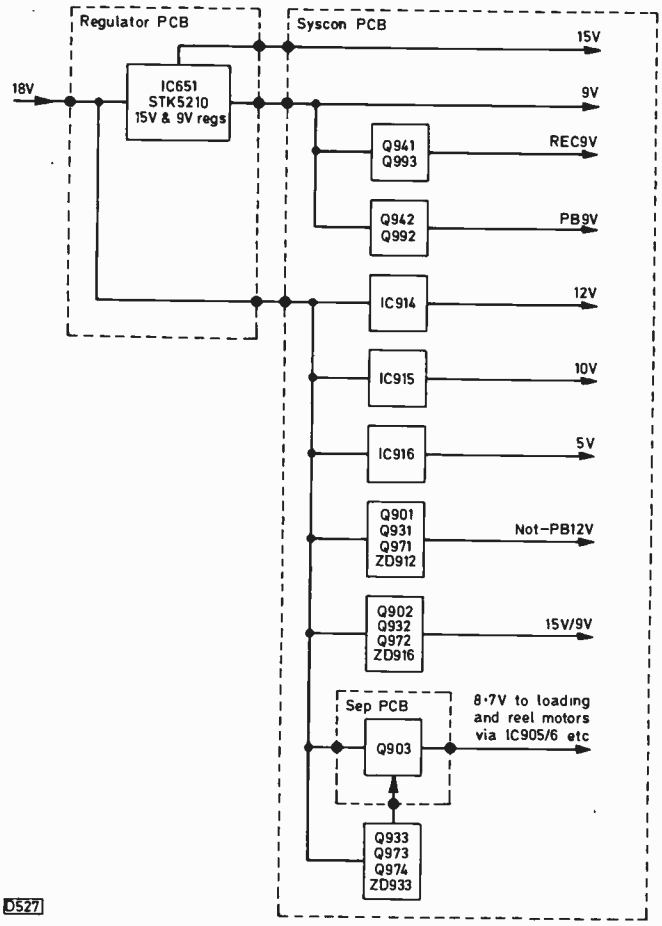


Fig. 1: Above, block diagram of the power supply arrangements used with the earlier VT8000/VT8500 machines. Left, changes introduced with the later VT8300/VT8700 machines.

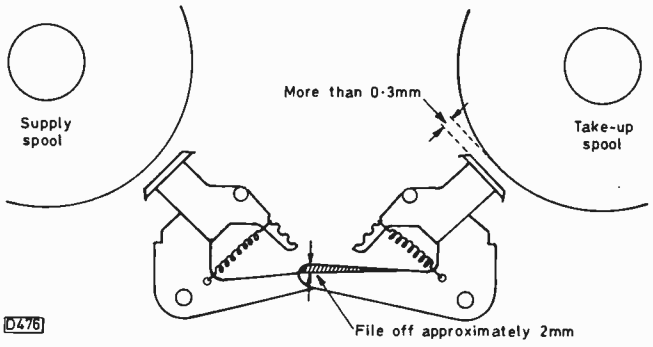


Fig. 2: Mechanical modification to cure tape damage due to looping when the machine stops after rewind.

record, so when it plays up it's usually playback that's affected, giving motorboating and other signs of instability. Sometimes switch cleaner works, sometimes the relay has to be replaced. The plastic covers just clip on, but remove them carefully.

Operate Board

The operate board at the front contains the various operation switches, LEDs and associated resistors, and in addition in the VT8300/VT8700 there's a transistor and diode to make the play light flash in visual search. A trouble-free board. With the VT8300/VT8700 however a problem sometimes encountered is failure of one of the hinged buttons on the front. Luckily these are part of a separate detachable unit that can be bought and fitted without the need to replace the whole front.

Clock-timer Board

The clock/timer board differs completely between the VT8000/VT8300 and the VT8500/VT8700. With the latter models there's a battery back-up and an extra −30V supply is required for the display. Faults on these panels are confined to the microcomputer chip or the various setting switches. A customer problem can arise on the VT8500/VT8700 due to the 50/60Hz switch: if this is put in the 60Hz position nothing happens until the machine is unplugged, whereupon next time it is connected the clock will assume 60Hz mains and lose time accordingly. This can sometimes happen due to a spike down the mains. In this case the cure is to unplug the machine, count to ten

and then reconnect it. Note that the battery back-up works only when the time switch is on.

Power Supply Arrangements

Most of the faults with these machines occur in the power supply. This is spread over three boards. First the board which contains the rectifiers – three in the case of the VT8000/VT8300, four in the case of the VT8500/VT8700 – and the smoothers. Secondly the power transistor or regulator board, which with the VT8000/VT8500 contains the 9V and 15V series regulator transistors and with the VT8300/VT8700 contains an encapsulated 9V/15V regulator, also the bulb feed resistor and open-circuit detector. The rest of the power supply circuitry is on the bottom board, mainly along the left-hand edge. Fig. 1 shows block diagrams for the two versions of the supplies.

When dealing with a power supply fault remember that most of the lines are derived from other supplies so check for the highest missing voltage and sort this out first – the others will then usually be o.k. Common power supply faults with the VT8000/VT8500 are as follows. R054 (1·5kΩ, 0·5W) goes open-circuit or high in value, giving no switched 15V or derived supplies. R069 (1·5kΩ, 0·5W) goes open-circuit or high in value, removing the not-playback 12V supply. Q051 or ZD051 faulty gives no switched 15V or derived supplies. ZD055 faulty results in no microcomputer chip 5V supply. R081 (2·2Ω, 0·25W) open-circuit gives no 10V supply for the reel or loading motors – this resistor was replaced with a posistor in the VT8300/VT8700 to overcome the problem. In addition to these common faults I've had most of the zener diodes fail at one time or another and a colleague had a faulty bridge rectifier which had the effect of extinguishing the clock display whenever play was selected. The different power supply arrangements in the VT8300/VT8700 result in greater reliability. IC651 on the regulator board can sometimes fail, removing the switched 15V and 9V supplies. R653 (220Ω, 0·5W) on the same board can fail with the result that the cassette lamp is without a supply although the machine will continue to operate because of the nature of the detection circuit.

When the switched supplies are missing I usually check first at the microcomputer chip (IC901) to make sure that the power control pins 41 and 2 (13 and 2 with the VT8300/VT8700) go up and down with the operate switch. If pin 2 does but pin 13/41 doesn't, the i.c. could be faulty but the problem is usually with one of the associated components. Check all voltages carefully, referring to Table 1.

Servo and System Control Circuits

The rest of the bottom board is occupied by the system control and servo circuits. The servo circuits are essentially the same on all models although the layout differs and the VT8500/VT8700 have a few additional components for the two extra capstan speeds and a slow tracking control. Faults are usually confined to failure of the tracking control to operate correctly, caused by either the HA11711 chip or slight misadjustment of the drum servo. Capstan faults are usually due to the motor.

System control is largely carried out by two chips, IC901 and IC902. The smaller one (IC902) is the same throughout the range but there's a different version of IC901 in the later models. There are also two versions of the system control circuit for the VT8000. Faults here are usually caused by the various diodes, especially the 5V zener diode previously mentioned (ZD055), or IC901. Failure of the index system was in one case traced to Q917. IC905 or IC906 can fail, giving no loading motor or reel motor operation respectively.

IR Remote Control Receiver Board

The VT8500/VT8700 have an extra board next to the bottom main board. This is the infra-red remote control receiver board. Faults in this area are confined to dry-joints/cracks – also check for dud batteries in the handset.

Solenoid Drive Board

The only board not mentioned so far is a small one present in the VT8000/VT8500. This is the solenoid drive board containing the drive transistors for the two brake solenoids – these transistors are on the main board in the VT8300/VT8700. Failure of the brakes was in one case traced to Q54.

The Mechanics

We now move on to the mechanics. As previously mentioned the capstan motor is a source of trouble, the usual symptom being wow on sound. The video heads give very little trouble even though some machines are now approaching five years old. The audio/sync head does wear however, giving low, muffled sound or varying sound level. There was at one point a bad batch of heads bearing the number 671. They produced vibration which affected both the sound and picture. Most other faults are only now beginning to show up, as wear sets in. These are mainly failure to complete loading due to a worn loading belt, poor rewind due to a worn tyre on the supply turntable (this can usually be roughened with a needle file then cleaned with methylated spirits), and tape looping after rewind – this means that the brakes and turntables need cleaning. Ejecting at high speed or jamming whilst ejecting is usually caused by failure of the eject damper mechanism – the nylon cog tends to fall in half. This is the same mechanism as fitted to the Ferguson 3V29/30. Failure to complete loading can also occasionally be caused by incorrect setting or failure of the two loading switches located to the rear of the mechanics.

Modifications

Finally, don't forget the various modifications that were introduced on this range. Though they've been mentioned in VCR Clinic we are repeating them here for the sake of completeness.

A hum bar on record with the VT8500/VT8700 – it can sometimes be seen in the E-E mode – can be cured by fitting a low-voltage (Mylar type suggested) 0·1μF capacitor across C760 on the tuner board and cutting the pink lead (chassis connection) between the tuner board and the tuning preset board.

The brake modification applies to all models. The problem is tape damage after rewind, caused by the fact that the supply spool brake comes on fractionally before the take-up spool brake, or the latter slips slightly, when the machine stops after rewind. The result is a tape loop which gets trapped in the cassette flap when the cassette is removed. There are two modifications for this, a mechanical one and an electronic one. The former consists of filing

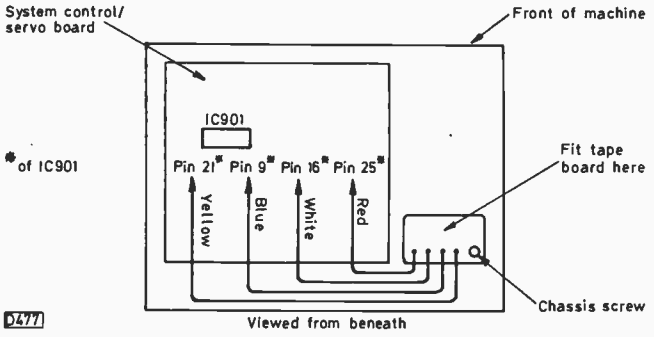


Fig. 3: Electronic modification to prevent rewind looping.

a piece off one brake arm (see Fig. 2) to ensure that this brake comes on fractionally before the other. The latter consists of fitting a small panel called the tape board next to the main board at the bottom, wiring this to IC901 as shown in Fig. 3. This is a very neat solution but requires the rewind end sensor to detect the tape end: with the VT8500/VT8700, which incorporate the tape index system, if this is switched on during rewind the tape stops when the next index pulse arrives so the modification doesn't operate. With these machines it's best to carry out both modifications.

The final modification applies to the VT8000/VT8500. The problem is that when play or record is selected the machine fails to lace up and switches off after a few seconds. The cure is to replace R081 (2·2Ω) on the bottom panel with a posistor, part number 0249794. Mount it in contact with the transistor heatsink on the edge of the main board.

Long-distance Television

Roger Bunney

September 1986 was an extremely rewarding month for long-distance TV reception in the UK and western Europe generally. Sporadic E conditions were active, with several periods of really strong signals, and from mid-month an almost stationary high-pressure system produced magnificent tropospheric propagation. The collated UK SpE log is as follows:

5/9/86 TSS (USSR) chs. R1, 2; MTV (Hungary) R1, 2; TVP (Poland) R1; NRK (Norway) E2, 3, 4; SR (Sweden) E2, 3, 4; DFF (East Germany) E4; RAI (Italy) IA; TVE (Spain) E2, 3.
6/9/86 TVE E2, 3, 4; TVE-2 E2; RTP (Portugal) E2; RUV (Iceland) E4.
7/9/86 TVE E2, 4; CP+ (Canal Plus – France) L3; ARD (West Germany) E2; ORF (Austria) E2a; RAI IA, B; MTV R1; CST (Czechoslovakia) R1, 2; TSS R1, 2; NRK E2, 3.
8/9/86 TVE E2; TVE-2 E2.
9/9/86 TVE E2; +PTT (Switzerland) E3.
10/9/86 TSS R1.
11/9/86 TSS R1, 2; MTV R1; TVP R1; JRT (Yugoslavia) E3; RAI IA; EPT (Greece) E3; TVE E2, 3, 4; RTP E2, 3; SR E3.
13/9/86 SR E2; TVP R1; TVE E2.
14/9/86 TVE E3; RAI IA, B; JRT E3; NRK E2, 3, 4; SR E3, 4; RUV E4.
16/9/86 TVE E2, 3, 4; TVE-2 E2.
17/9/86 NRK E2; RAI IA; TVE E2.
20/9/86 TSS R1, 2; TVP R1, 2; CST R1, 2; TVR (Rumania) R3; ORF E2a, E4; ARD E2, 3, 4; +PTT E2; RAI IA, B, C; JRT E3, 4; TVE E2, 3, 4; TVE-2 E2; RTP E3; NRK E2.
25/9/86 TSS R1, 2; NRK E2, 3; SR E2, 3, 4; ARD E4.
2/10/86 TVE E3.

The Italian ch. IC reception on the 20th was RAI-1 from Torino at 16kW.

Auroral activity was noted in Scotland on the 15th, 16th and 26th (evening), with Scandinavian Band I signals putting in an appearance. Good MS (meteor shower) activity was logged on the 16th.

Tropospheric Reception

Improved tropospheric propagation became evident from about the 19th, when a virtually stationary high-pressure system became established across southern UK. Although the conditions lasted for many days there were two specific peaks. Greatly enhanced reception occurred over the 19th-22nd, with E. German Band III signals, Swiss Band III/u.h.f. signals and the usual multiplicity of W. German Band III/u.h.f. signals. In the south/south east Dutch/Belgian stations provided signals of excellent entertainment quality daily! For many of those inland, as far as the Midlands, RTL+ (Luxembourg) provided good signals on ch. E7. Naturally the various French TV services, from Canal Plus in Band III through to TV5 and TV6 at u.h.f., provided consistently strong signals throughout the period.

The second, possibly more intense peak occurred on September 30th/October 1st. Danish Band III signals on chs. E5 through to E11 were received as far west as mid-Wales, together with DFF (E. Germany) ch. E6. Cyril

Photographs of 4GHz satellite TV reception from Frank Lumen in Colorado, USA. Right: the Pakistan PM5534 test card. Centre: International satellite feed to Australia and South Africa. Right: Another example of international programme exchange, this time with origination from the USSR. The signals were received from transponder 11 on the Domsat F1 satellite.