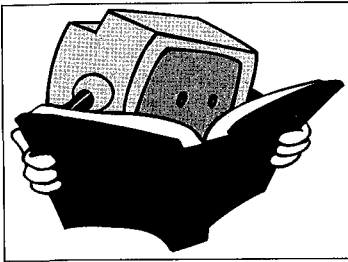


HITACHI

No. X831455



SERVICE MANUAL MANUEL D'ENTRETIEN WARTUNGSHANDBUCH



HITA-02917

C2575TN
C2576TN
C2577TN
C2975TN
C2976TN
C2977TN
CL2576TAN
CL2976TAN
CP2576TAN
CP2976TAN
C28300

CAUTION:

Before servicing this chassis, it is important that the service technician read the "Safety Precautions" and "Product Safety Notices" in this service manual.

ATTENTION:

Avant d'effectuer l'entretien du châssis, le technicien doit lire les "Précautions de sécurité" et les "Notices de sécurité du produit" présentés dans le présent manuel.

VORSICHT:

Vor Öffnen des Gehäuses hat der Service-Ingenieur die "Sicherheitshinweise" und "Hinweise zur Produktsicherheit" in diesem Wartungshandbuch zu lesen.

Data contained within this Service manual is subject to alteration for improvement.

Les données fournies dans le présent manuel d'entretien peuvent faire l'objet de modifications en vue de perfectionner le produit.

Die in diesem Wartungshandbuch enthaltenen Spezifikationen können sich zwecks Verbesserungen ändern.

TECHNICAL SPECIFICATIONS

TV Standard.....625 lines,
STANDARD I (UK)
B/G/H, L/L', (Export)

Channel coverageUHF Channels (UK)
UHF/VHF Hyper band (Export)

Aerial input impedance. 75 ohm
unbalanced

Programme Selectors. Channel UP/DOWN
buttons with 60 programme
remote control
CH direct input
Frequency direct input

Power Consumption

C2576/77/75	139 W
C2976/77/75	141 W
C28300TN	143 W

Picture tubes

C2576/77/75	59 cm type
C2976/77/75	68 cm type
C28300TN	66 cm type

Mains Voltage220V/240V 50 Hz

FuseT4.0A Type

FocusingElectro static

SPECIFICATIONS TECHNIQUES

Standard TV625 lignes,
STANDARD. R-U
B/G/H L/L': (Export)

Couverture de canaux. Canaux UHF (R-U)
UHF/VHF Band hyper (Export)

Impédance d'entrée d'antenne.75 ohms
non équilibré

Sélecteurs de programmes Touches de
sélection de canaux UP/DOWN (HAUT/BAS)
avec 60 programmes
Télécommande
Entrée directe canal (CH)
Entrée directe fréquence

Consommation propre

C2576/77/75	139 W
C2976/77/75	141 W
C28300TN	143 W

Tubes-images

C2576/77/75	type 59 cm
C2976/77/75	type 68 cm
C28300TN	type 66 cm

Tension secteur220V/240V 50 Hz

FusibleType T4 0A

Mise au pointElectrostatique

SPECIFICATIONS TECHNIQUES

Fernsehnorm625 Zeilen,
Fernsehnorm I (nur GB)
Fernsehnorm B/G/H, L/L

KanäleUHF-Bereich (GB)
UHF-/VHF-/Hyperband-Bereich (Export)

Antenneneingangsimpedanz.....75 Ohm
unsymmetrisch

Senderwahl.AUF/AB-Taste
auf Fernbedienung für 60 Sender
Senderdirekteingabe
Frequenzdirekteingabe

Leistungsaufnahme

C2576/77/75	139 W
C2976/77/75	141 W
C28300TN	143 W

Bildröhre

C2576/77/75	59 cm
C2976/77/75	68 cm
C28300TN	66 cm

Netzspannung.....220 V - 240 V, 50 Hz

Sicherung.....T4.0A

FokussierungElektrostatisch

THIS SERVICE MANUAL
SUPERCEDES AND REPLACES
THE PREVIOUS ENGLISH ONLY
VERSION PART NO. X831454

1997

ENGLISH

FRANÇAIS

DEUTSCH



SAFETY PRECAUTIONS

WARNING: The following precautions should be observed.

1. Do not install, remove, or handle the picture tube in any manner unless shatter proof goggles are worn. People not so equipped should be kept away while picture tubes are handled. Keep the picture tube away from the body while handling.
2. When service is required, an isolation transformer should be inserted between the power line and the receiver before any service is performed on the chassis.
3. When replacing the chassis in the cabinet, ensure all the protective devices are put back in place.
4. When service is required, observe the original lead dressing. Extra precaution should be taken to ensure correct lead dressing in the high voltage circuitry area.
5. Always use the manufacturer's replacement component. Always replace original spacers and maintain lead lengths. Especially critical components are indicated thus Δ on the parts list and should not be replaced by other makes. Furthermore, where a short circuit has occurred, replace those components that indicate evidence of overheating.
6. Before returning a serviced receiver to the customer, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock, and be sure that no protective device built into the instrument by the manufacturer has become defective, or inadvertently damaged during servicing.

Therefore, the following checks are recommended for the continued protection of the customers and service technicians.

INSULATION

Insulation resistance should not be less than 10M ohms at 500V DC between the main poles and any accessible metal parts.

Also, no flashover or breakdown should occur during the dielectric strength test, applying 3kV AC or 4.25kV DC for two seconds between the main poles and accessible metal parts.

HIGH VOLTAGE

High voltage should always be kept at the rated value of the chassis and no higher. Operating at higher voltages may cause a failure of the picture tube or high voltage supply, and also, under certain circumstances could produce X-radiation levels moderately in excess of design levels. The high

voltage must not, under any circumstances, exceed 29kV on the chassis.

X-RADIATION

TUBES: The primary source of X-radiation in this receiver is the picture tube. The tube utilised for the above mentioned function in this chassis is specially constructed to limit X-radiation.

For continued X-radiation protection, replace tube with the same type as the original HITACHI approved type.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in HITACHI television receivers have special safety related characteristics. These characteristics are often not evident from visual inspection, nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified by marking with a Δ on the schematics and the replacement parts list contained in this service manual.

The use of a substitute replacement component which does not have the same safety characteristics as the HITACHI recommended replacement one, shown in the parts list of this service manual, may create electrical shock, fire, X-radiation, or other hazards.

Product Safety is continuously under review, and new instructions are issued from time to time. For the latest information, always consult the current HITACHI service manual. A subscription to, or additional copies of HITACHI service manuals may be obtained at a nominal charge from your HITACHI SALES CORPORATION.

CE MARK

Some of these models may contain the CE mark on the rating plate.

This illustrates that the T.V. contains parts that have been specifically approved to provide electromagnetic compatibility to designated levels.

Therefore, when replacing any part in this T.V., please use only the correct part itemized in the parts list of this service manual to ensure this standard is maintained.

Also, take care to replace lead dressing to its original state, as this can also have a bearing on the electromagnetic radiation/immunity.

TUBE DISCHARGE

The line output stage can develop voltages in excess of 25kV; if the E.H.T. cap is required to be removed, discharge the anode to chassis via a high value resistor, prior to its removal from the tube.

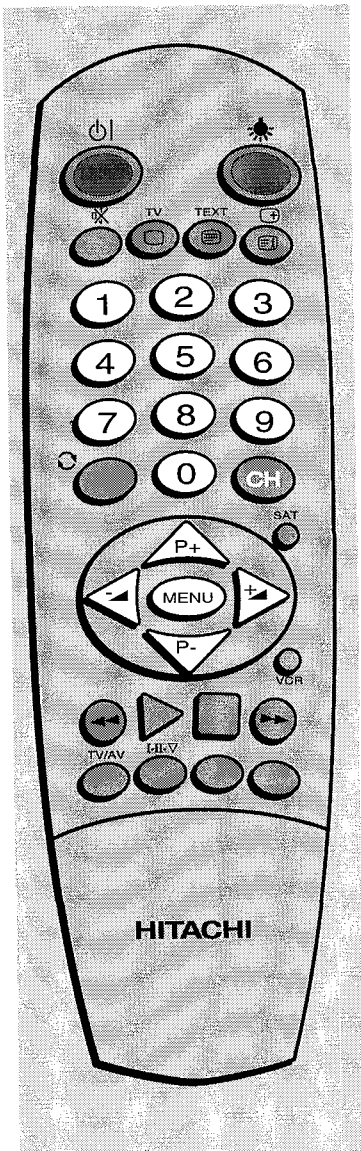
TV OPERATION SUPPLEMENT

**The following pages
are extracted from the
Customer Operating Guide
to assist Service Engineers
in TV set up**

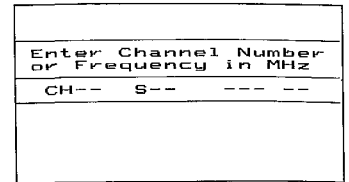
(NOTE: PAGE NUMBERS REFERRED TO WITHIN THIS SECTION ARE UNIQUE TO THE OPERATING GUIDE. THEY DO NOT REFER TO THE PAGE NUMBERS OF THE SERVICE GUIDE OF WHICH THIS SECTION FORMS AN INTEGRAL PART.)

Tuning in your T.V.

AUTOTUNE METHOD

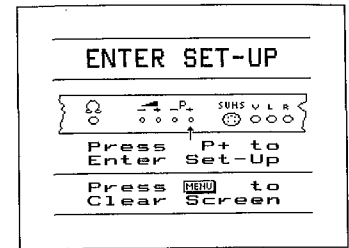


1. Press the CH button on handset. The menu shown will appear on-screen.



2. Now press the MENU button.

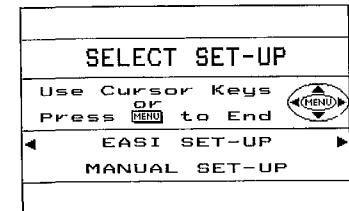
The ENTER SET-UP menu is then displayed.



3. As instructed, press the P+ button on the front control panel.

The SELECT SET-UP menu will now appear.

EASI SET-UP will be highlighted in colour.

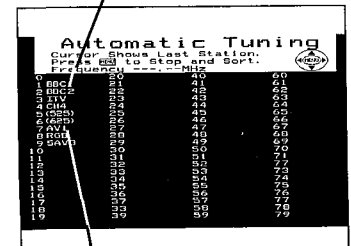


4. Press the ◀ or ▶ button to obtain the Automatic Tuning menu.

The search tune procedure will now begin. The first programme number will be coloured. The next programme number will become coloured when a broadcast is found and identified in the display.

If a broadcast has no identification transmitted, the frequency of that broadcast will appear in brackets instead.

Programme identification



Frequency of broadcast

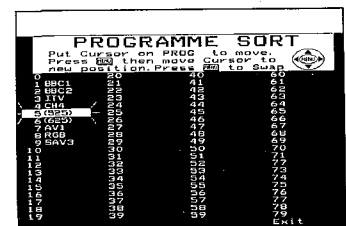
- NOTE:** Programme number 0 will not be tuned in. Also, please refer to SATELLITE NAME on page 18 if you have tuned into a satellite broadcast.

5. When all available broadcasts have been tuned in, the Programme Sort menu is then displayed.

This menu allows you to change the order in which the broadcasts appear. This can be done to suit your personal preference.

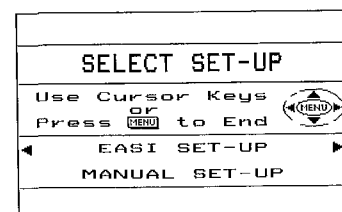
If you wish to do this, refer to page 19, and begin at step 6. This explains how to change a broadcast from programme number 5 to programme number 1 as an example.

If however you do not wish to use the programme sort facility, then press the ▼, ▲, ◀ or ▶ buttons to highlight EXIT at the bottom right hand corner of the display. The SELECT SET-UP menu will then re-appear.



Programme sort menu

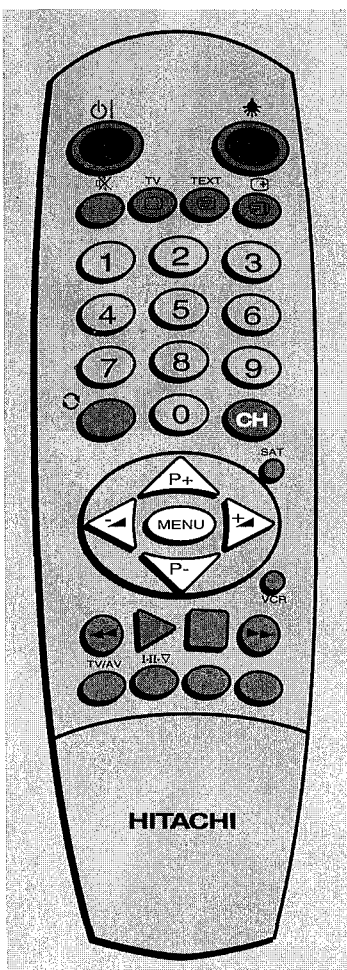
6. Press the MENU button once more. The on-screen menu will disappear.



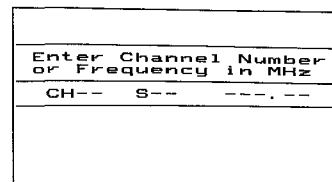
NOTE: After you exit the tuning menu, you can select the programme numbers by pressing the P+ or P- buttons, or by entering the programme number directly using the buttons 0 – 9.

Tuning in your T.V

MANUAL TUNING METHOD

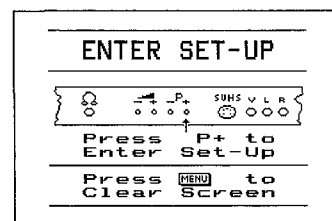


1. Press the CH button on handset. The menu shown will appear on-screen.



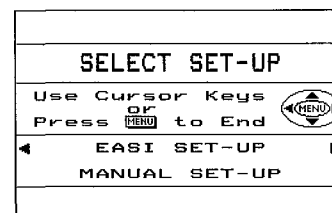
2. Now press the MENU button.

The ENTER SET-UP menu is then displayed.



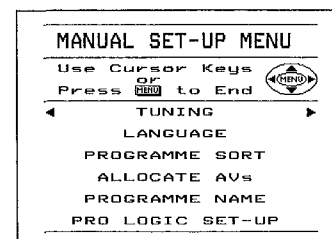
3. As instructed, press the P+ button on the front control panel.

The SELECT SET-UP menu will now appear.



4. Press the ▼ button of handset to highlight MANUAL SET-UP, then press one of the ◀ or ▶ handset buttons to display the MANUAL SET-UP menu.

TUNING will be highlighted.

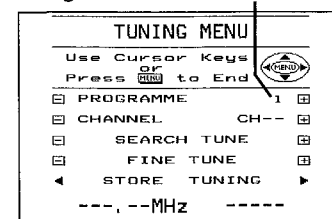


5. Press the ◀ or ▶ button to display the TUNING MENU.

PROGRAMME will be highlighted.

Press the ◀ or ▶ button until the first programme number on which you wish to tune a broadcast appears.

Programme 1 selected



6. Press the ▼ button until SEARCH TUNE is highlighted, then press the ◀ or ▶ button to begin tuning.

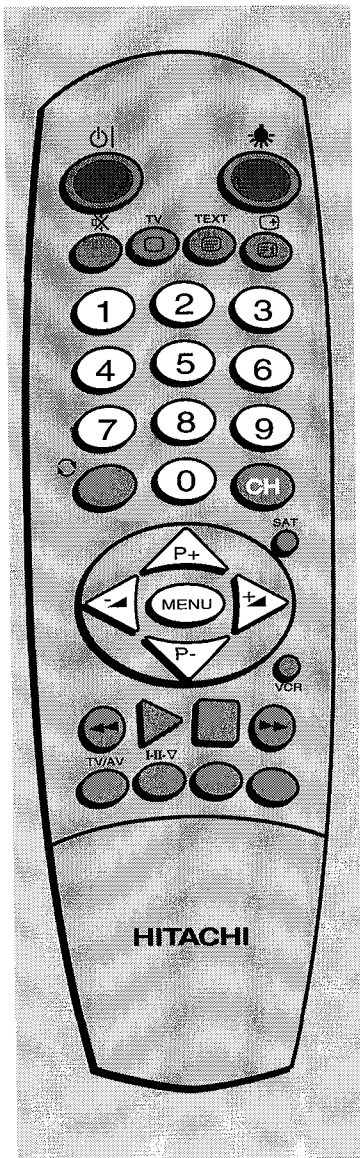
The present frequency will now appear in the ---.---MHz part of the display, and will increase or decrease in value until a broadcast appears on screen.

If transmitted, the broadcast identification will appear next to the MHz in the display.

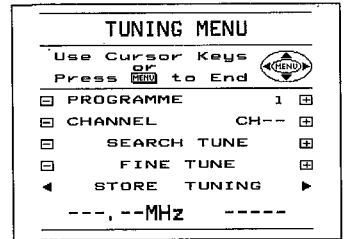
If this is not the broadcast you desire for the programme number chosen in step 5, then press the ◀ or ▶ button to repeat search tuning until the desired broadcast appears.

Alternatively, you can highlight the CHANNEL line in the display using the ▼ or ▲ buttons, then press the ▶ or ◀ button to step up or down through the available channels until the broadcast you desire is displayed.

Tuning in your T.V.



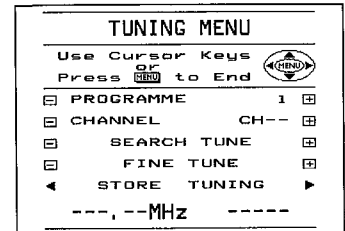
7. Fine tuning will be performed automatically. However, if you wish to make minor adjustments, press the ▼ button to highlight FINE TUNE in the display, then press the ◀ or ▶ button to obtain the optimum picture and sound.



Select FINE TUNE

8. When satisfied, press the ▼ button of handset until STORE TUNING is highlighted, then press the ◀ or ▶ button to store.

The words STORE TUNING will flash briefly to indicate storing has taken place.



Select STORE TUNING

9. Using the ▲ or ▼ buttons, highlight PROGRAMME in the display once again. Press the ▶ or ◀ buttons to select the next programme number you desire, then repeat steps 6 – 8.

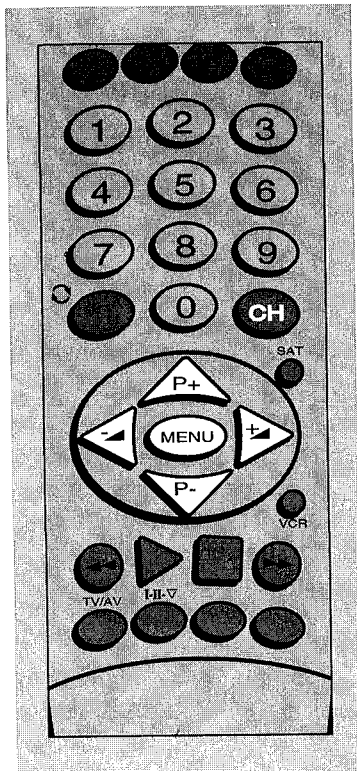
Continue this method until all the broadcasts in your area have been tuned in and allocated to the programme numbers of your choice.

10. Press the MENU button until all the on-screen menus disappear.

NOTE: After you exit the tuning menu, you can select the programme numbers by pressing the P+ or P- buttons, or by entering the programme number directly using the buttons 0 – 9.

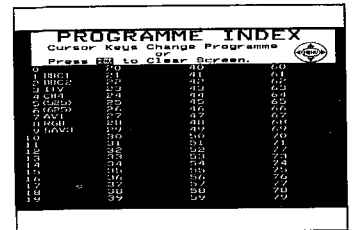
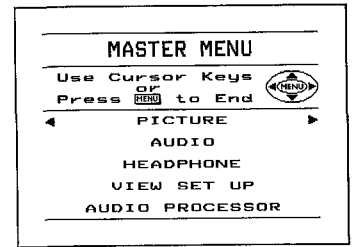
Tuning in your T.V

PROGRAMME INDEX MENU



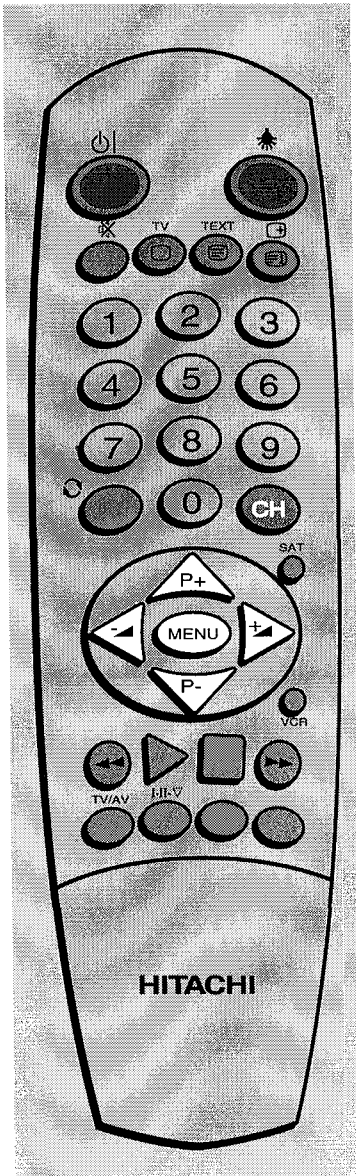
This menu is for guidance purposes only, i.e. you cannot perform any functional changes. However, as an example this menu can be of benefit when a lot of broadcasts have been tuned in previously, and although you cannot remember which programme number contains the broadcast you want, you do remember the name you gave to it. To find the broadcast follow this procedure:-

1. Press the MENU button to display the MASTER MENU.
2. Press the ▼ button to highlight VIEW SET-UP, then press the ◀ or ▶ button to display the Programme Index menu.
Look for the programme name you remember giving to the broadcast you require.
3. Use the ▲, ▼, ◀ or ▶ buttons to highlight that programme name in the display.
Once highlighted, the broadcast allocated to that programme number and name will appear on-screen, allowing you to confirm it is the correct one.
4. Press the MENU button.
The on-screen display will disappear.



Picture and Audio Settings

PICTURE

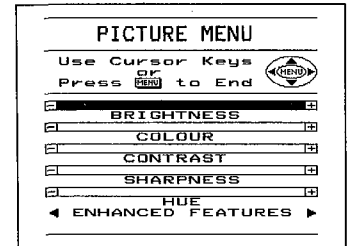


1. Press the MENU button once to display the MASTER MENU.
The word PICTURE will be highlighted, indicating it is available for selection.



2. Press one of the handset buttons ◀ or ▶ to display the PICTURE menu shown.

The BRIGHTNESS scale will be highlighted by a solid coloured bar.



3. Press the ◀ or ▶ handset buttons to adjust the brightness of the T.V. picture to the level you desire.
4. Press the ▼ button of handset to highlight the next function, i.e. COLOUR, then press the ◀ or ▶ buttons to adjust the colour of the T.V. picture to the level you desire.
5. Repeat this procedure to adjust the Contrast, Sharpness and Hue as required.

NOTE: The Hue function can only be adjusted when receiving NTSC signals.

When you highlight ENHANCED FEATURES and press the ◀ or ▶ button, the FEATURE MENU appears.

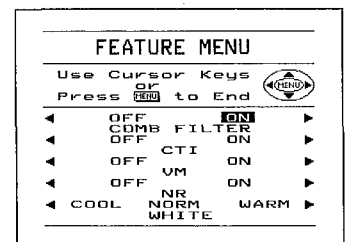
The features shown in the display can then be turned on or off as desired, and will depend mainly on personal preference. Try switching each one ON then OFF to see which result you prefer on the T.V. picture.

The ON or OFF in the display will be coloured, indicating the present status of each function.

To change the status of each function, first press the ▼ or ▲ handset button until the present status is highlighted, then press the ◀ or ▶ button to change.

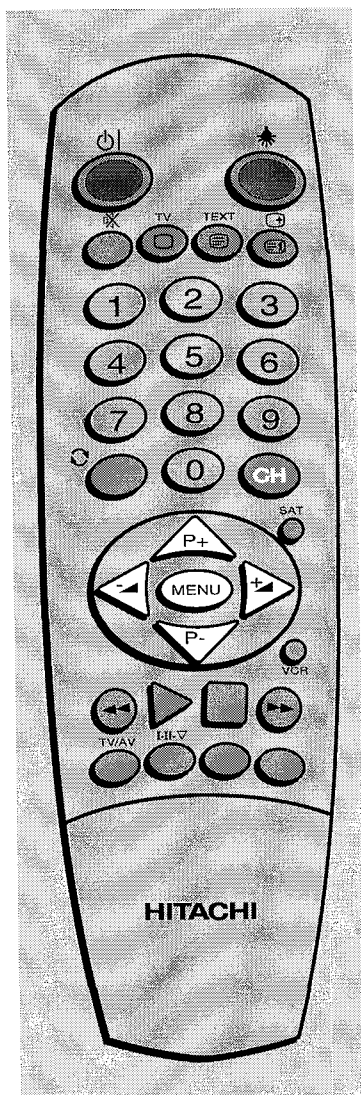
N.B. When this menu first appears, and also when each of its functions are selected, the menu will be displayed in the background of the picture. This allows you to clearly see the difference each effect has.

After a short time, it will be returned to normal.



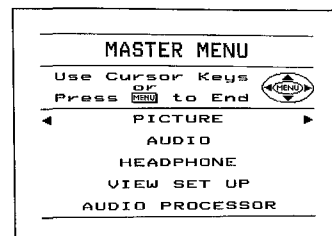
6. When you are satisfied with the settings of all functions, press the MENU button.
The on-screen menu will then disappear.

Picture and Audio Settings



AUDIO

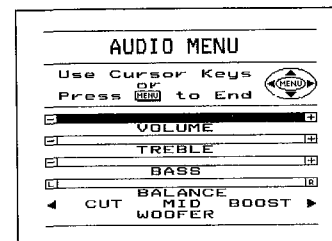
1. Press the MENU button once to display the MASTER MENU shown.
The word PICTURE will be highlighted.



2. Press the ▼ button of handset to highlight the next function in the menu, i.e. AUDIO.

3. Press the ◀ or ▶ button to display the AUDIO menu shown.

The VOLUME scale will be highlighted by a solid coloured bar.



4. Press the ◀ or ▶ handset buttons to adjust the volume level as desired.

5. Press the ▼ button of handset to highlight the next function, i.e. TREBLE, then press the ◀ or ▶ buttons to adjust to the level you prefer.

6. Repeat this procedure to select and adjust the BASS and BALANCE settings to suit your personal preference.

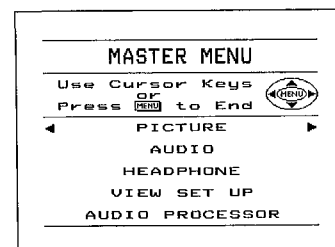
NOTE: If any of the DOLBY modes are selected from the sound effects menu (see next page), there will be no balance adjustment in the display.

The WOOFER function in this menu can be set to CUT, MID or BOOST. The present setting will be highlighted. Try each setting to find the one you prefer as follows:—
Press the ▼ or ▲ handset button until the present setting is highlighted, then press the ◀ or ▶ button to change to the setting you desire.

7. When you are satisfied with the settings of all functions, press the MENU button. The on-screen display will then disappear.

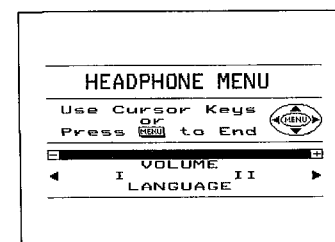
HEADPHONE MENU

1. Connect headphones to the socket situated behind the door on the front of this T.V. then press the MENU button once to display the MASTER MENU.
The word PICTURE will be highlighted.

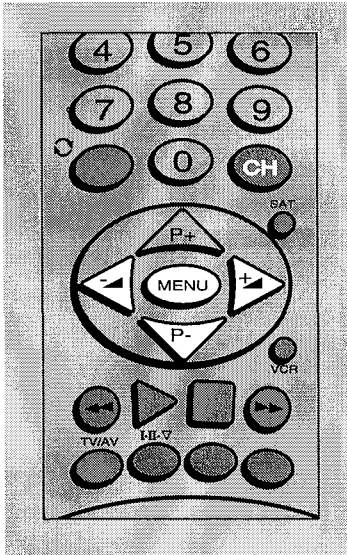


2. Press the ▼ button of handset until HEADPHONE is highlighted, then press the ▶ button to display the menu shown. The volume scale will be highlighted by a solid coloured bar.

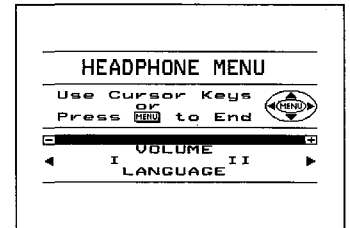
3. Whilst wearing your headphones, press the ◀ or ▶ buttons of handset to adjust the volume level to suit your personal preference.



Picture and Audio Settings



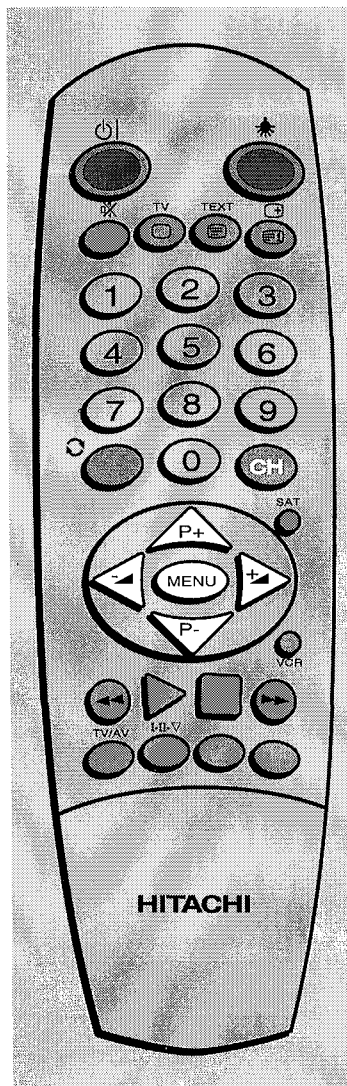
- If a broadcast contains a Dual language, you can set the headphone to output the language of your choice. The present language setting, i.e. I or II will be highlighted. If this is the one you desire, then no further action is required. If however, you wish to select the alternative language as your choice, press the ▼ button of handset to highlight the present setting, then press the ► button to select the other language.



- Press the MENU button. The on-screen menu will then disappear.

NOTE: After you exit the Audio menu, the volume level can be adjusted temporarily using the ◀ + or – buttons. However, The levels stored in the menu will always be returned every time the television is switched on.

SOUND EFFECTS MENU

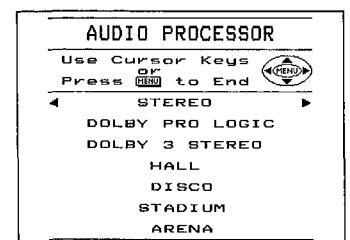
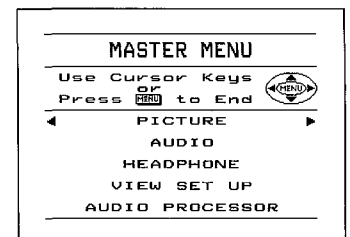


This menu enables you to try the various sound effects available, and choose the one most suited to the broadcast you are watching. The effects available are as follows:-

- STEREO:** Should you wish to change a Dolby Pro Logic broadcast to a normal Stereo/NICAM broadcast, then select this from the on-screen menu. Also, if a broadcast is not being transmitted in Dolby Pro Logic, for best results we recommend you select the T.V. to this effect.
- DOLBY PRO LOGIC:** This is the effect selected when the T.V. leaves the factory, and will ensure you enjoy the true sound reproduction of a Dolby Pro Logic Surround broadcast.
- NOTE:** The full surround effect can only be experienced when the two rear speakers are connected.
- DOLBY 3 STEREO:** If available space is a problem, and you decide not to connect the two rear speakers, then select this effect. This ensures the T.V. will give a true reproduction of Dolby Pro Logic broadcasts. However, you will not be able to enjoy the full surround effects that are available to you with all the speakers connected.
- HALL, DISCO, STADIUM and ARENA:** These effects can help to improve your enjoyment of musical broadcasts, or transmissions live from theatres etc. Select each one in turn to find your personal preference.
- 3DS:** The 3DS system gives a much wider spread of sound from the TV giving the impression of sound coming from the sides of the room rather than the in-built speakers, whilst the important centre dialogue channel is unaltered, still appearing to come from the centre of the screen.

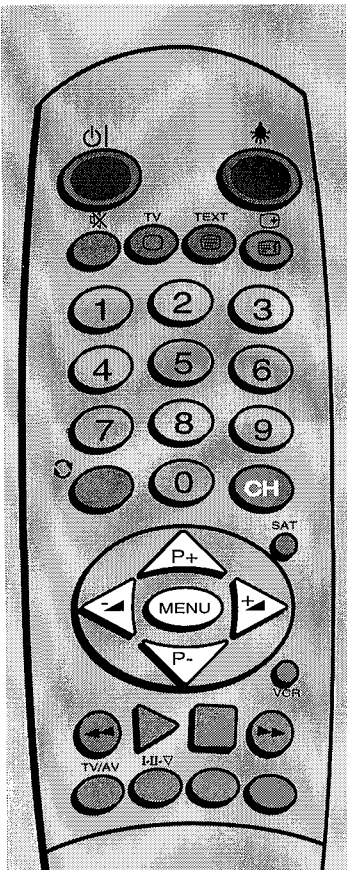
To access the sound effects menu, proceed as follows.

- Press the MENU button once to display the MASTER MENU. The word PICTURE will be highlighted.
- Press the ▼ button of handset until AUDIO PROCESSOR is highlighted, then press the ◀ or ► button to obtain the menu shown.
- Press the ▼ or ▲ button of handset to highlight each effect, then press the ◀ or ► button to activate that effect.
- Once you have found the effect you prefer, press the MENU button. The on-screen menu will then disappear.



Picture and Audio Settings

DOLBY SET-UP MENU



C28300 ONLY

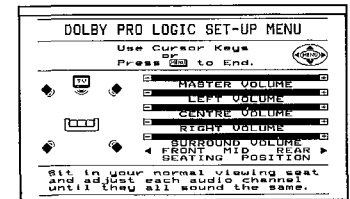
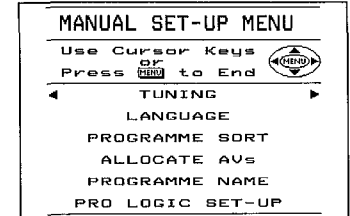
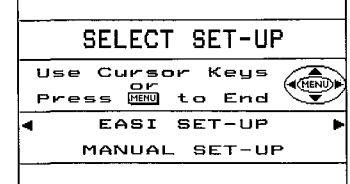
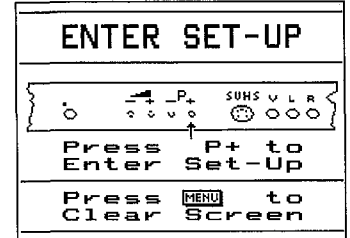
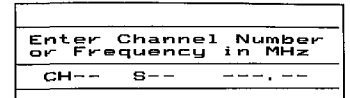
Once you have set this television in one of the DOLBY modes described on page 14, you should then carry out the following procedure to obtain the optimum performance, thereby creating even greater listening satisfaction.




NOTE: Please ensure that 3DS mode is de-activated (see below), before continuing with the Dolby Setup procedure.

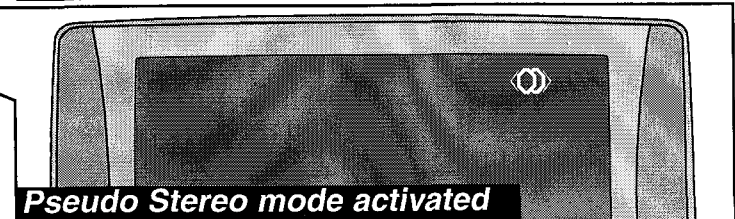
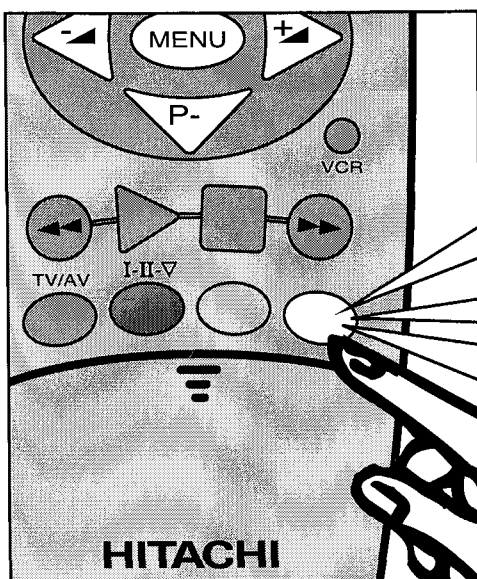
1. Press the CH button on handset. The menu shown will appear on-screen.
2. Now press the MENU button.
The ENTER SET-UP menu is then displayed.
3. As instructed, press the P+ button on the front control panel.
The SELECT SET-UP menu will now appear.
4. Press the ▼ button to highlight MANUAL SET-UP, then press the ► or ◀ button to display the MANUAL SET-UP menu.
5. Press the ▼ button to highlight PRO LOGIC SET-UP, then press the ► or ◀ button to display the menu shown.
This menu will automatically highlight the LEFT VOLUME, CENTRE VOLUME, RIGHT VOLUME and SURROUND VOLUME in sequence.
This allows you to adjust the volume output from each channel independently to obtain the correct listening balance relative to your viewing position.
You can only alter each level whilst it is highlighted by pressing the ► or ◀ buttons on the handset.
6. If you wish to alter the MASTER VOLUME, i.e. the overall volume level, press the ▲ button to highlight that function, then press the ► or ◀ buttons to alter the overall volume to the level you desire.

NOTE: Whilst this DOLBY PRO LOGIC SET-UP menu is on display, you can set the POSITION function if necessary.

Please refer to the next page for instructions.



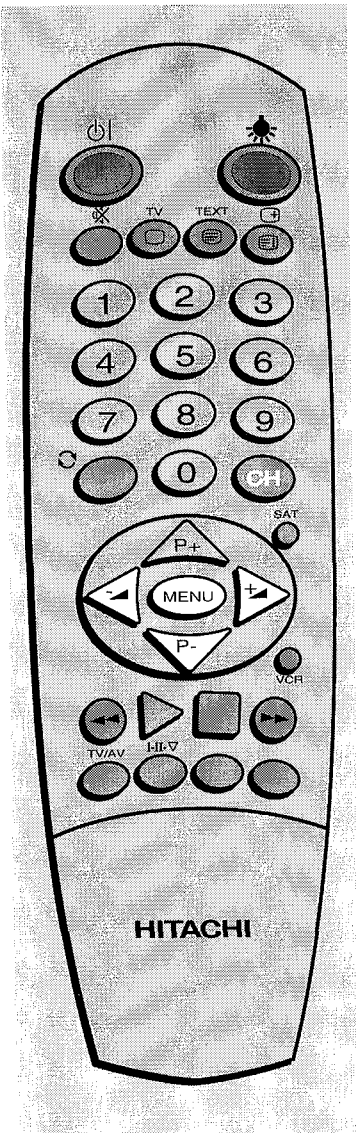
Activating the 3DS sound spatializer. Repeatedly press the blue coloured button on the handset so that the following display is shown on-screen , this indicates that 3DS is activated. A further press de-activates the 3DS mode, shown on screen as . Press once more selects the Pseudo Stereo mode, this mode is shown as  on-screen when selected. This function is particularly suited to monaural signals.



NOTE: In order to appreciate the effect of 3DS it is essential that you are listening to a stereophonic program with active left or right information. For example, certain programs containing only speech will appear to have no effect when 3DS mode is selected.

Picture and Audio Settings

TO SET THE POSITION FUNCTION



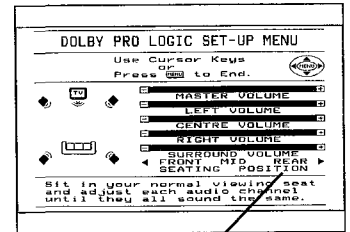
This function is only required if you have connected the rear surround speakers and have selected DOLBY PRO LOGIC from the sound effects as explained on page 14.

If your viewing position is not situated mid-way between the television and the rear speakers, the sound effects from the rear speakers may sometimes seem slightly out of step.

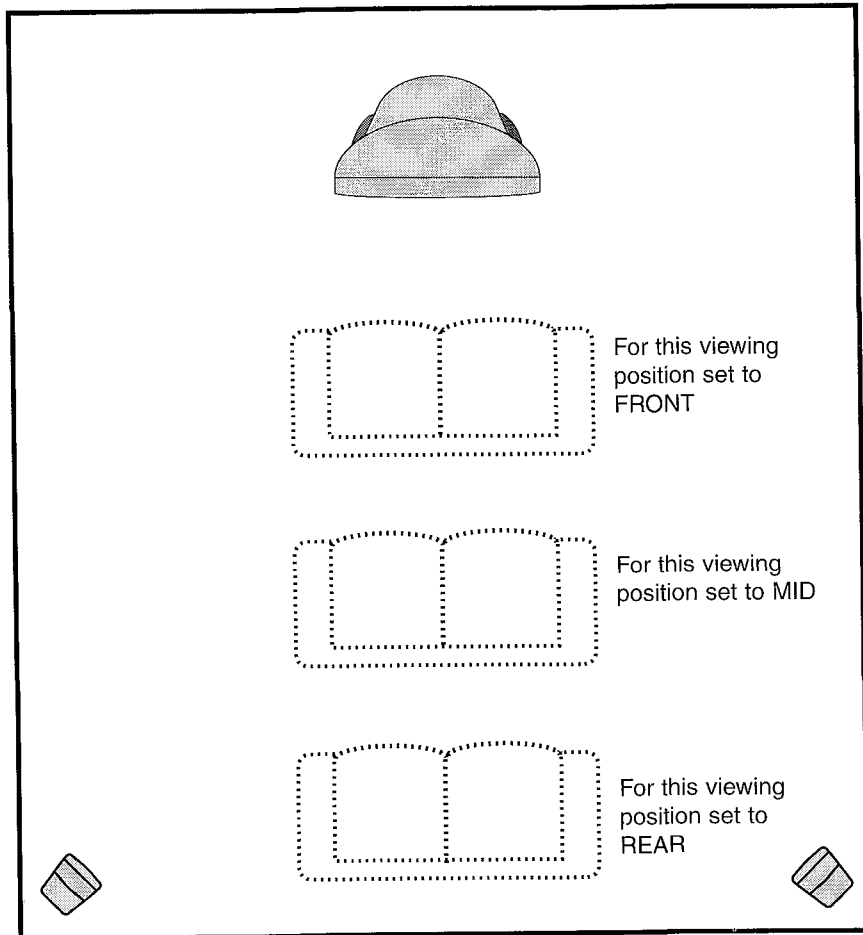
To overcome this, you can utilise the POSITION function in the DOLBY PRO LOGIC SET-UP menu.

Press the ▼ button to highlight the present setting of the POSITION function in the DOLBY PRO LOGIC SET-UP menu. This will be coloured, and will be either FRONT, MID or REAR.

Refer to the drawing below (which is similar to the one in the on-screen display), and use the ► or ◀ button of handset to set the POSITION function according to your viewing position.



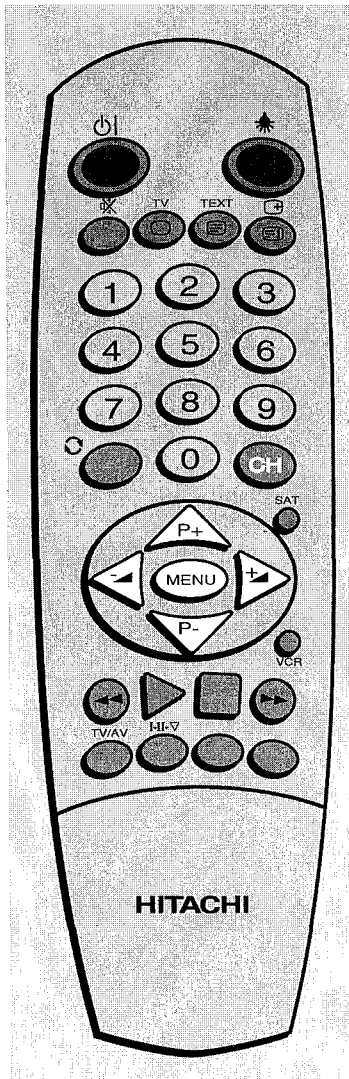
REAR Selected



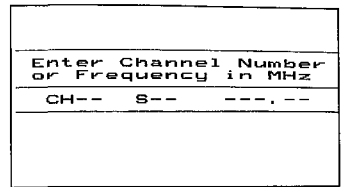
Once you have set all the functions in the DOLBY PRO LOGIC SET-UP menu as desired, press the MENU button until all on-screen menus disappear.

Programme Name

This facility allows you to add a programme name of your choice to each broadcast. This can be up to 5 characters long. To name a broadcast, proceed as follows:-

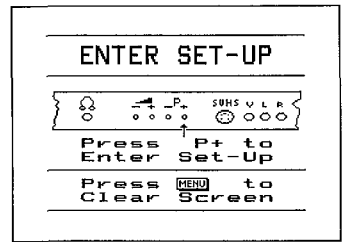


1. Press the CH button on handset. The menu shown will appear on-screen.



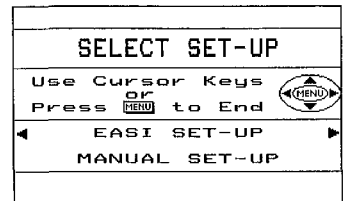
2. Now press the MENU button.

The ENTER SET-UP menu is then displayed.



3. As instructed, press the P+ button on the front control panel.

The SELECT SET-UP menu will now appear.

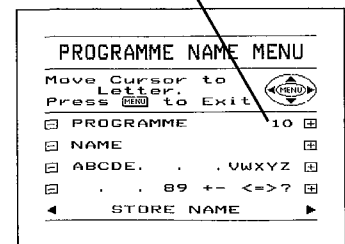


4. Press the ▼ button of handset to highlight MANUAL SET-UP, then press one of the ◀ or ▶ handset buttons to display the MANUAL SET-UP menu.



5. Press the ▼ or ▲ buttons to highlight PROGRAMME NAME, then press the ◀ or ▶ button. The PROGRAMME NAME MENU will now appear on-screen.

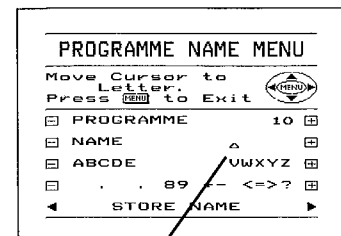
Programme 10 chosen



6. The first line in the display, i.e. PROGRAMME will be highlighted. Press the ◀ or ▶ buttons until the programme number of the broadcast you wish to name appears.

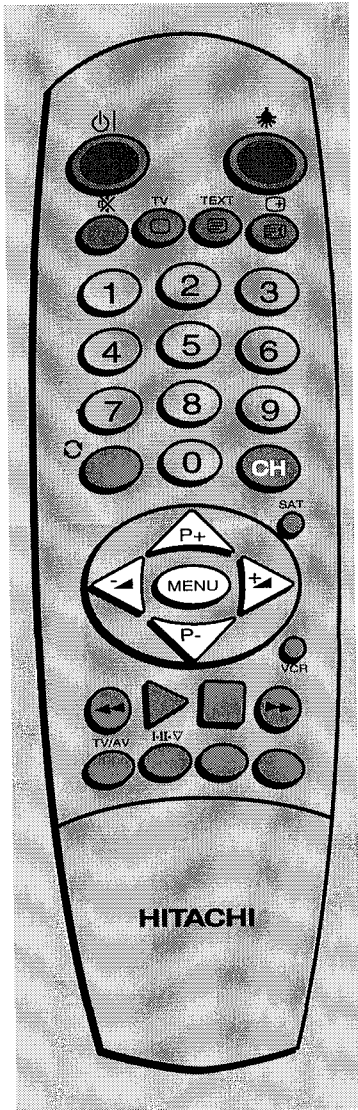
7. Press the ▼ button to highlight NAME in the display, then press the ◀ or ▶ button. A coloured indicating triangle then appears in that line.

If the programme number has been previously given a name, the triangle will appear under the first letter of the name.

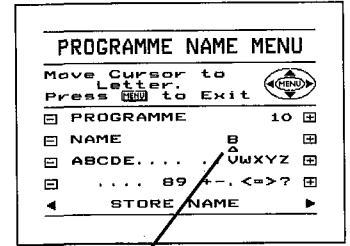


Indicating triangle

Programme Name

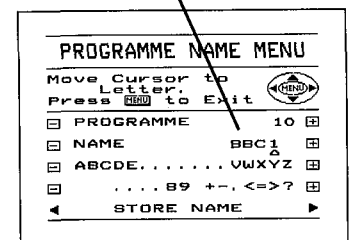


8. Press the ▼ button to highlight either the letter selection or number selection line of this display, then press the ◀ or ▶ button until the first letter or number you require appears in the NAME line of the display.
9. Press the ▲ button to highlight NAME once again, then press the ▶ button. The indicating triangle will now move to the right.
10. Repeat step 8 until your second letter or number appears in the NAME line of display.
11. Repeat this procedure until programme name is completed, then press the ▼ button to highlight STORE NAME in the display.
12. Press the ◀ or ▶ handset button to store. STORE NAME will flash briefly to indicate the programme name has been stored.
13. Press the MENU button until all the on-screen displays have disappeared.



Letter B chosen and placed

Name completed

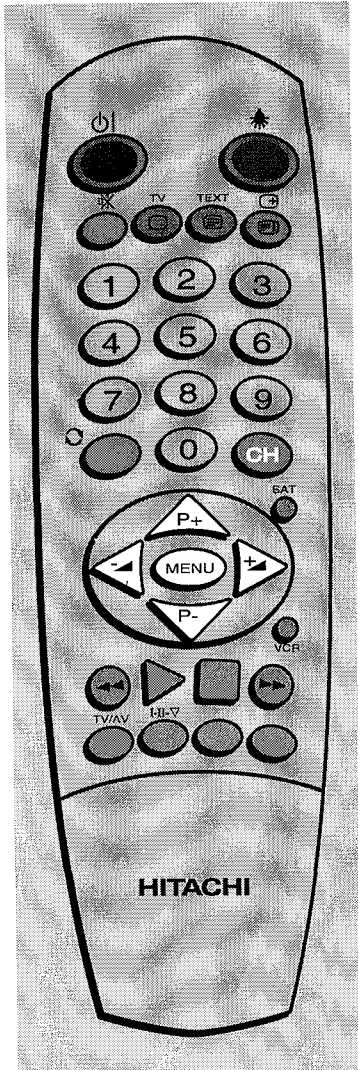


SATELLITE NAME

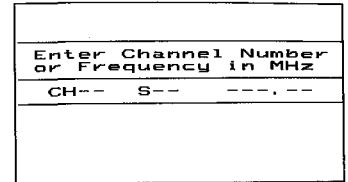
When a satellite broadcast has been found and identified during the tuning procedure, only the programme name of the captured transmission will be displayed on screen. Therefore, in order to avoid confusion, we recommend you use this programme name procedure to give a general name, e.g. SAT, to the programme number that contains the satellite broadcast.

Programme Swap

Should you desire, you can change the programme number order in which your broadcasts appear using this feature. The following example explains how to move the broadcast tuned to programme number 5, and allocate it to programme number 1.

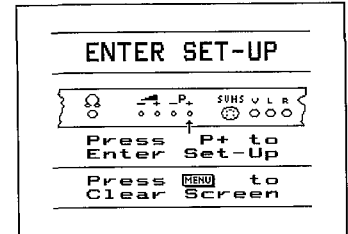


1. Press the CH button on handset. The menu shown will appear on-screen.



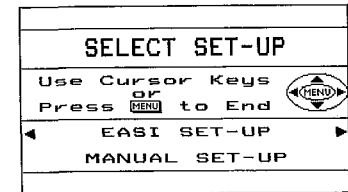
2. Now press the MENU button.

The ENTER SET-UP menu is then displayed.

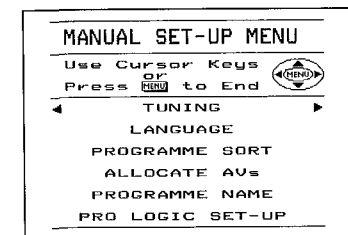


3. As instructed, press the P+ button on the front control panel.

The SELECT SET-UP menu will now appear.

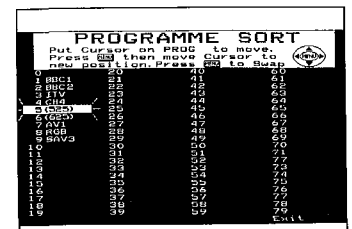


4. Press the ▼ button of handset to highlight MANUAL SET-UP, then press the ◀ or ▶ handset button to obtain the MANUAL SET-UP menu.



5. Press the ▼ or ▲ buttons to highlight PROGRAMME SORT in the display, then press ◀ or ▶ buttons to obtain the menu shown. This menu displays all the broadcasts in the order in which they were stored during the tuning in procedure.

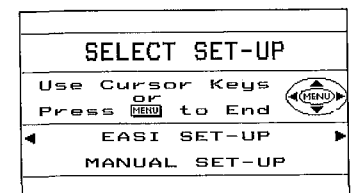
Programme number 5 selected



6. Press the ▶, ◀, ▼ or ▲ buttons until programme number 5 is highlighted, then press the MENU button. Programme number 5 will now begin to flash.

7. Press the ▶, ◀, ▼ or ▲ buttons until programme number 1 is highlighted, then press the MENU button. The broadcast that was previously on programme number 5 will now be allocated to programme number 1, and the broadcast that was previously on programme number 1 will be allocated to programme number 5.

8. Repeat this procedure with any other programme numbers you wish to swap, then press the ▶, ◀, ▼ or ▲ buttons until EXIT is highlighted. This is at the bottom right side of the on-screen display. The SELECT SET-UP menu will now be displayed.



9. Press the MENU button. The on-screen display will disappear.

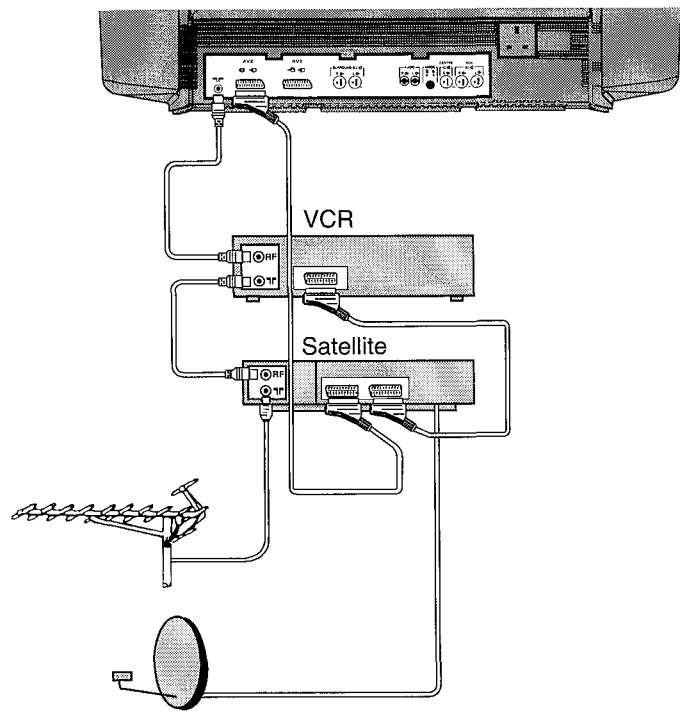
Connecting External Audio/Video Equipment

SATELLITE CONNECTION

Should you wish to connect a satellite receiver to this television for viewing, and also to a VCR for recording, we recommend you connect them to the scart sockets as shown.

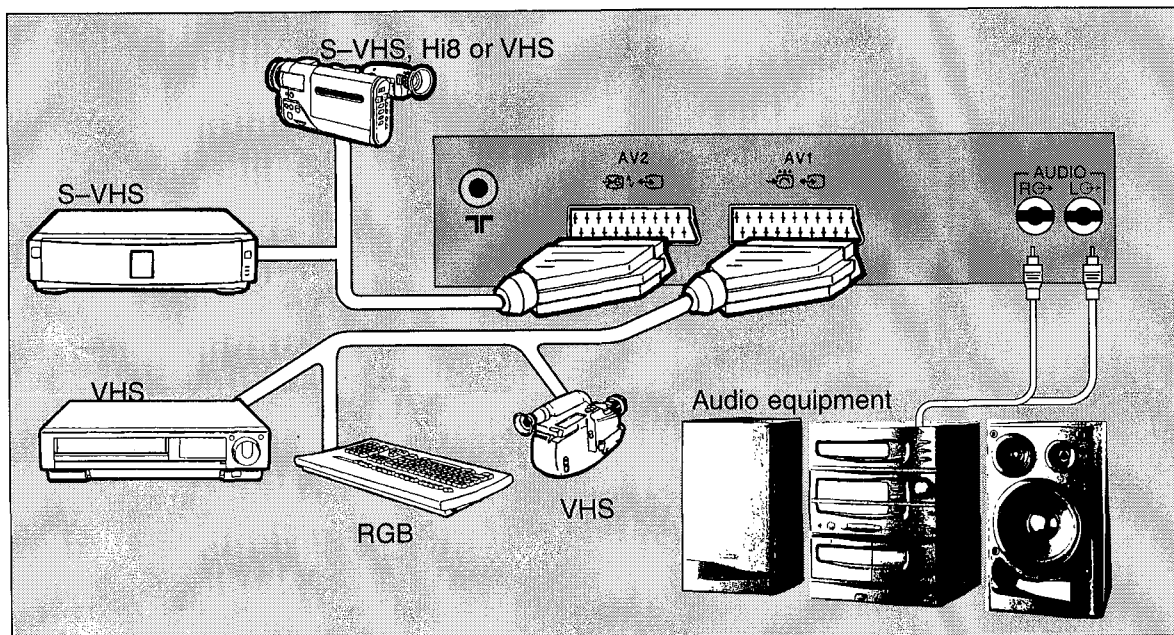
Using this method, you can still record satellite programmes whilst the television is switched OFF. Please refer to your satellite and VCR operating guides in conjunction with this operating guide.

NOTE: If your VCR or satellite receiver does not have an equivalent scart connector, do not forget to allocate a programme number to each of them as previously explained.



Connecting External Audio/Video Equipment

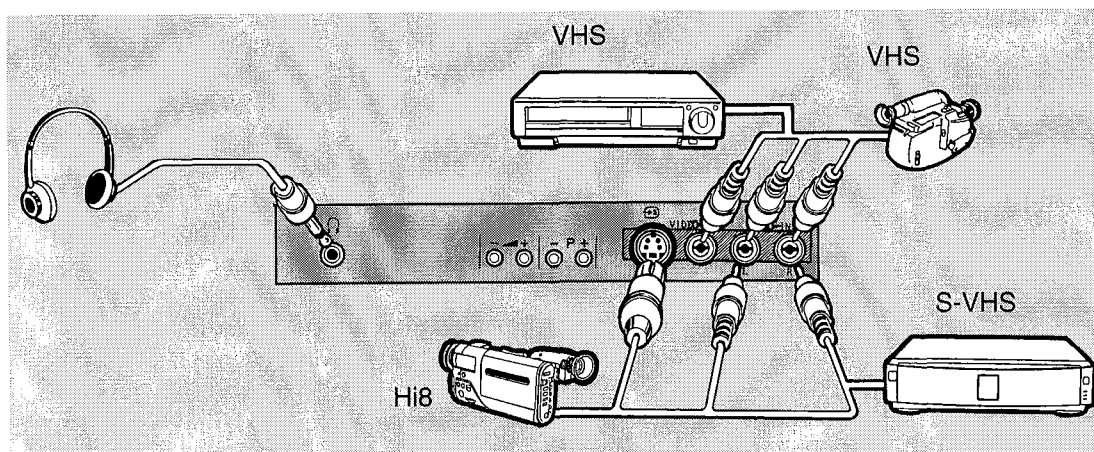
REAR OF T.V. VCRs can be connected to this television via the aerial socket as shown on page 4 of this operating guide. However, most VCRs now have scart sockets which enable direct connection to the scart sockets of this television. Other equipment can also be connected to these scart sockets as shown in the drawing below.



If your VCR or camcorder etc. has an equivalent scart socket, then to replace the T.V. broadcast with signals from your equipment, simply connect to the television's scart sockets using a scart connecting lead, then operate according to your equipment's instructions to view. However, for S-VHS equipment connected to AV2 socket, we recommend you select SAV in the AV Location menu. Please refer the next page for instructions on how to obtain this menu, and read the note after step 5.

NOTE: Stereo VCRs etc. must be connected to one of these scart sockets to assure stereo sound playback. Therefore, if your equipment has alternative connections for Audio/Video, obtain a suitably adapted lead from your dealer and refer to the instructions for "Allocating Programme Numbers To The Audio/Video Sockets" on the next page.

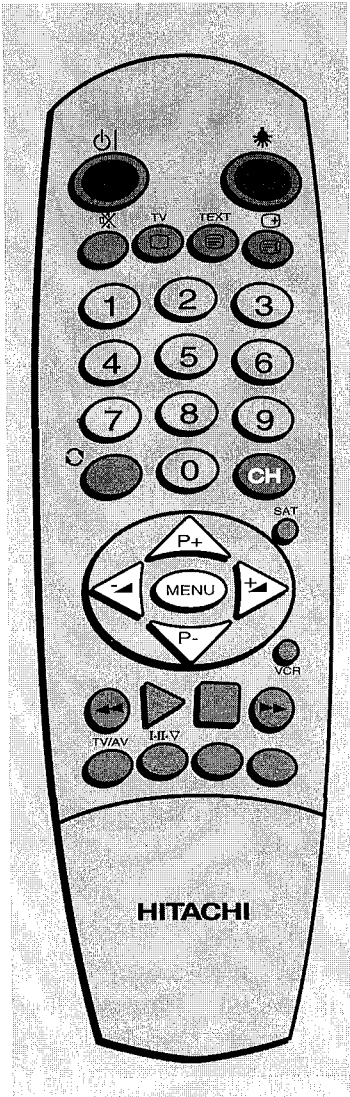
FRONT OF T.V. Push the door on the front of this television to gain access to the Audio/Video sockets. Camcorders and VCRs with Phono plugs can be connected to these sockets as shown in the drawing below. When an S-VHS VCR or an S-VHS or Hi8 camcorder is connected as shown, the T.V. broadcast will be replaced by the signals from the equipment once it is in operation. For other equipment connected to the phono sockets, please refer to the instructions for "Allocating Programme Numbers To The Audio/Video Sockets" on the next page.



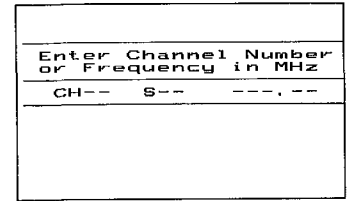
Connecting External Audio/Video Equipment

ALLOCATING PROGRAMME NUMBERS TO THE AUDIO/VIDEO SOCKETS

This feature is generally only required if your VCR or camcorder etc. does not have an equivalent scart socket for direct connection, or if you decide to connect them via the Audio/Video phono sockets on the front of this television. Connect your equipment to the desired socket using the Phono leads or an adapted scart lead supplied by your dealer, then proceed as follows:-

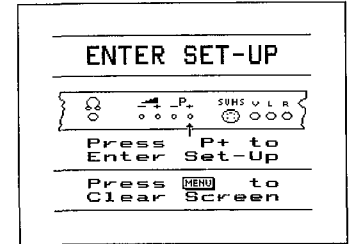


1. Press the CH button on handset. The menu shown will appear on-screen.



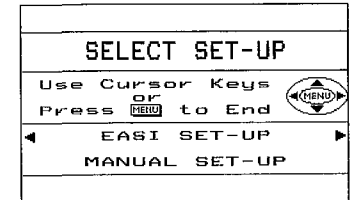
2. Now press the MENU button.

The ENTER SET-UP menu is then displayed.

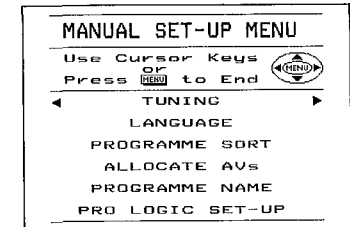


3. As instructed, press the P+ button on the front control panel.

The SELECT SET-UP menu will now appear.

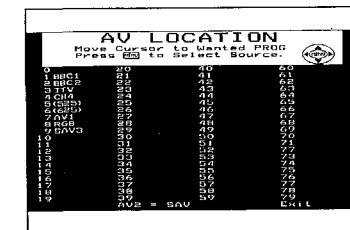


4. Press the ▼ button of handset to highlight MANUAL SET-UP, then press the ◀ or ▶ button to display the MANUAL SET-UP MENU. TUNING will be highlighted.



5. Press the ▼ button until ALLOCATE AVs is highlighted, then press the ◀ or ▶ button to display the AV Location menu.

This menu shows all the programme numbers 0 – 79 and the identification and/or programme names allocated to all the broadcasts that have been tuned in.



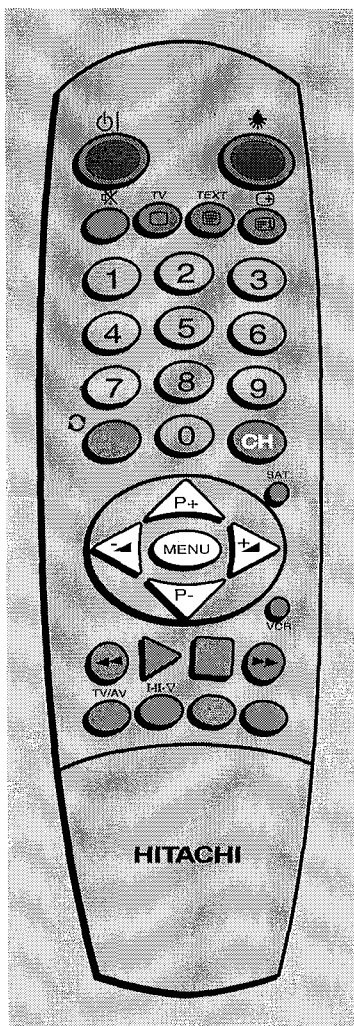
NOTE: Under programme number 39 in this display, AV2 = will be seen.

Use the ◀, ▶, ▼ or ▲ buttons on handset to highlight this, then press the MENU button to display SAV after the = sign.

If your S-VHS equipment has a scart connecting socket, playback can now be viewed on any programme number.

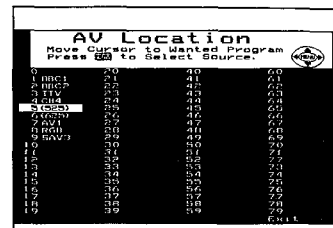
To allocate specific programme numbers to your external equipment, proceed as follows:

Connecting External Audio/Video Equipment

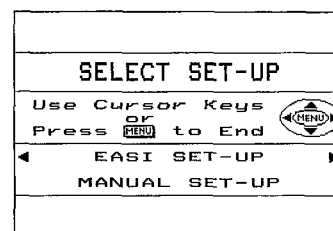
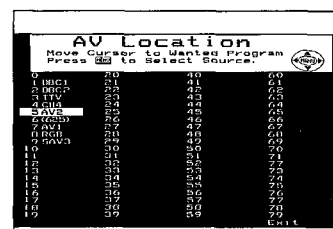


6. Using the ◀, ▶, ▼ or ▲ buttons, highlight the programme number you desire to use for viewing inputs from your VCR etc. Do not choose one that contains a broadcast you wish to keep. Programme number 5 is shown in example.
7. Press the MENU button until the letters representing the socket into which your equipment is connected, are displayed alongside the programme number. (see the table below.)
8. You cannot allocate more than one socket to each programme number. Therefore, should you desire to connect equipment to another socket, first press the ◀, ▶, ▼ or ▲ buttons to highlight a new programme number, then press the MENU button until the letters representing that socket appear alongside the programme number.
9. Repeat this procedure until all the equipment you wish to connect to the television have been allocated programme numbers, then press the ◀, ▶, ▼ or ▲ buttons to highlight Exit at the bottom right hand side of the T.V. screen. The SELECT SET-UP menu will then appear. Press the MENU button and the on-screen display will disappear.

Programme number 5 chosen



AV2 socket chosen



PLEASE NOTE: When you wish to view inputs from your equipment, do not forget to first select the programme number you have allocated to it in this procedure.

LETTERS DISPLAYED	SOCKET SELECTED	EQUIPMENT TO BE CONNECTED
AV1	AV1 SCART	VHS VCRs or CAMCORDERS
RGB	AV1 SCART	COMPUTERS or GAME CONSOLES etc.
AV2	AV2 SCART	VHS VCRs or CAMCORDERS
SAV2	AV2 SCART	S-VHS VCRs, Hi8 or S-VHS-CAMCORDERS
AV3	AUDIO/VIDEO PHONO SOCKETS	VHS VCRs or CAMCORDERS
SAV3	5 PIN SOCKET ON FRONT OF T.V.	S-VHS VCRs, Hi8 or S-VHS-CAMCORDERS

TEMPORARY CONNECTIONS

If you only wish to connect some equipment temporarily, there is no need to allocate a specific programme number to it.

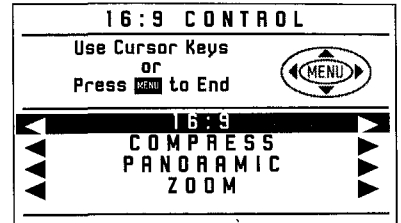
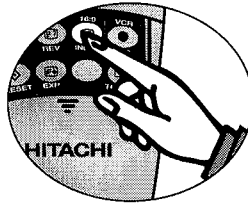
Simply connect to the desired socket using the Phono leads or adapted lead from your dealer, then press the TV/AV button on the handset until the letters representing that socket appears, i.e. AV1, AV2, RGB etc. Now operate your equipment according to instructions to view.

When viewing has ended, press the TV/AV button until the T.V. broadcast re-appears, then disconnect your external equipment from the socket.

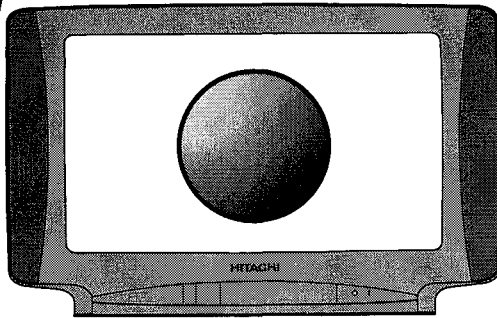
Wide Screen Functions

The 16:9 Menu allows the user to select between various wide screen options when viewing 16:9(wide screen) or 4:3 (normal screen) transmissions. Each option creates a visual effect which can be selected to suit your own personal taste. Follow the guide below to enter and select the 16:9 options.

To obtain the 16:9 menu, slide down the concealed compartment door on your handset. Press the 16:9 button once to activate. Use the ▼ ▲ cursor buttons to highlight an option, then use the ◀ ▶ buttons to select. Press the MENU button to store and quit.

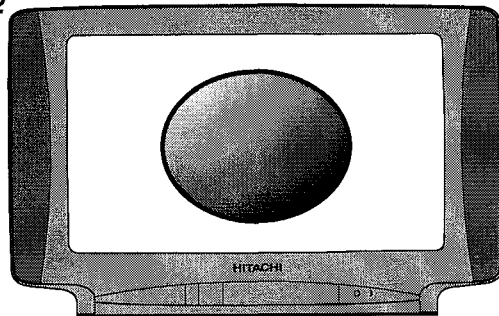


Example 1



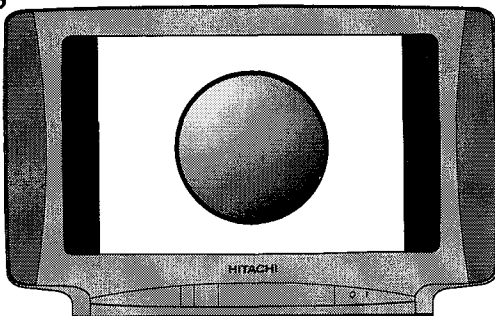
The 16:9 mode allows Wide Screen viewing of Wide Screen broadcasts. These broadcasts are often pre-announced before transmission i.e. the presenter may say that a movie will be shown in Wide Screen format before it is broadcast. Another method of distinguishing Wide Screen broadcasts is to observe object shapes on-screen. If 16:9 is selected for Wide Screen broadcasts, then the shapes will appear normal (Example 1). However, if 16:9 mode is selected to view a Normal Screen broadcast, then the shapes are shorter and wider as shown in Example 2.

Example 2



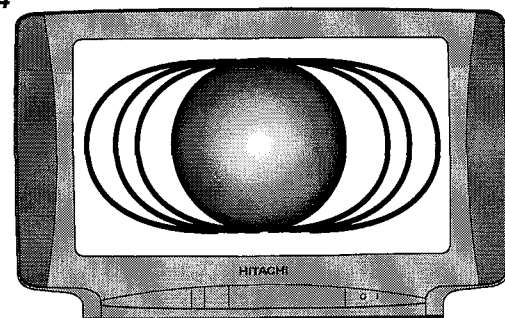
It is possible to view Normal Screen 4:3 transmissions on this TV. When COMPRESS is selected, the picture is compressed to a 4:3 ratio so that Normal Screen broadcasts may be viewed correctly (Example 3). Please note that the black bars that appear on the sides of the screen are a feature of the COMPRESS mode, these bars are normal.

Example 3



Another useful feature of the 16 x 9 CONTROL menu is the PANORAMIC mode. When viewing Normal Screen transmissions the Panoramic mode emulates that of a Wide Screen broadcast (Example 4). This is done by keeping the centre of the screen in normal proportions, while extending the edges of the screen, giving the viewer the illusion of a Wide Screen broadcast while actually watching Normal TV broadcasts.

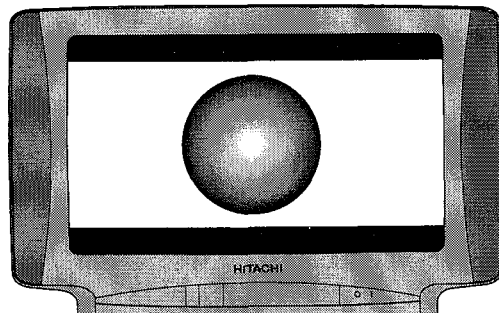
Example 4



We suggest that the PANORAMIC option is selected for the majority of TV viewing.

The ZOOM feature enables the viewer to enlarge a picture if a compressed 16:9 broadcast is being transmitted (Example 5). When selected the ZOOM feature expands the screen vertically, thus removing the upper and lower black bars to display the full TV screen.

Example 5




NOTE: When viewing TELETEXT while in ZOOM mode, only one half of the page can be viewed at any one time. To display either the TOP or BOTTOM half of the page, use P+ and P- cursor buttons on your handset respectively.

If you have external equipment connected that has automatic 16:9 capabilities (VCR or Satellite[refer to user guides]), then the TV will automatically detect a Wide Screen broadcast and switch to the 16:9 mode. Equipment must be connected to the AV1 socket in order for the 16:9 detection to function.

To Programme Handset For VCR or Satellite

This handset is capable of operating most makes of VCR or satellite receivers on the market today. This can be achieved by simply entering the correct three digit code allocated to the model you have, into the handset. The full CODE list can be found on pages 37 – 38.

VCR METHOD

1. Press the VCR button of handset, and before releasing it press the preset button .
2. Refer to the CODE list, then using the handset buttons 0 – 9, enter the correct three digit number for your equipment.

For example, if you have an Hitachi VCR, then enter 0, 2 and 6 for code 026 or 0, 6 and 8 for code 068.

After the last digit has been entered, the handset will return to its TV mode of operation.


3. This handset can now be used to operate the PLAY, RECORD, FAST FORWARD, REWIND and STOP functions your VCR, simply by pressing the corresponding buttons on this handset (refer to page 6).

ADDITIONAL OPERATIONS:


To increase or decrease the VCR programme number:-

Press the VCR button on the handset, and before releasing it press the P+ or P- button.

To turn the VCR power off (standby)

Press the VCR button on the handset, and before releasing it press the  button. Repeat this procedure to return the VCR to normal operation.

SATELLITE METHOD

1. Press the SAT button of handset, and before releasing it press the preset button .
2. Refer to the CODE list, then using the handset buttons 0 – 9, enter the correct three digit number for your equipment.


For example, if you have an Hitachi satellite receiver, then enter 4, 8 and 1 for code 481.

After the last digit has been entered, the handset will return to its TV mode of operation.

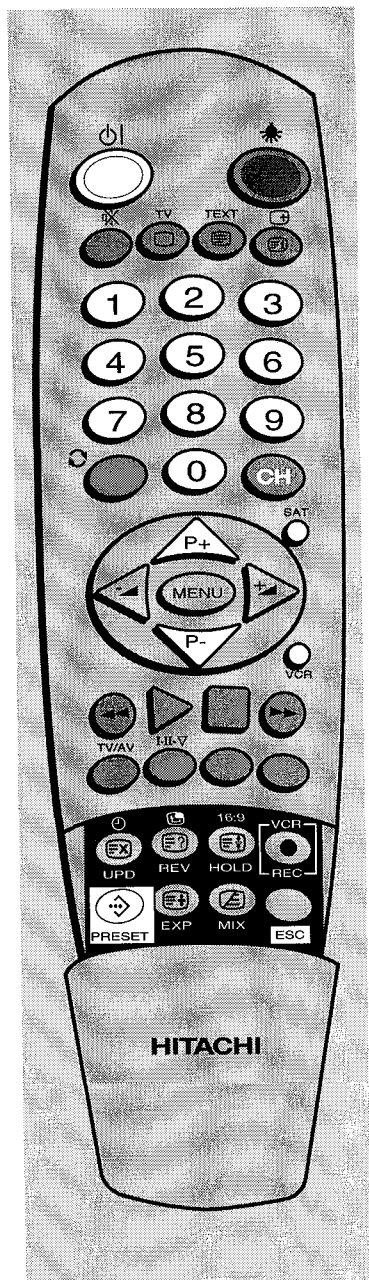
To increase or decrease the satellite programme number:-

Press the SAT button on the handset, and before releasing it press the P+ or P- button.

To turn the satellite power off (standby)

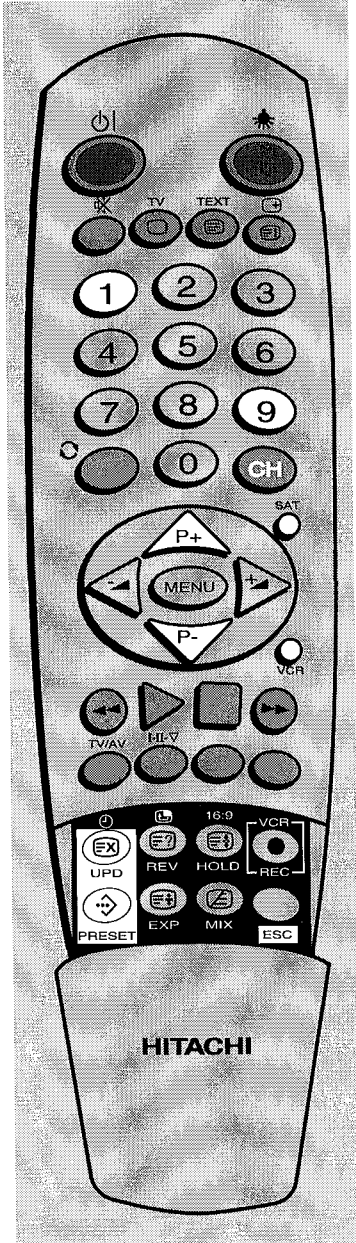
Press the SAT button on the handset, and before releasing press the  button. Repeat this procedure to return the satellite equipment to normal operation.

PLEASE NOTE: Whenever new batteries are inserted into this handset, the VCR and satellite codes may need to be re-entered.






To Programme Handset For VCR or Satellite

STEP AND SET METHOD



At some time in the future, new models may be released which will not be covered by the codes contained in the CODE list.

If this happens, the step and set method may be of help.

1. Press the VCR or SAT button on the handset, and before you release it, press the preset button .
2. Enter the code 991 by pressing the handset buttons 9, 9 then 1.
3. Aim the handset at the equipment selected in step 2 (VCR or satellite), and press the P+ or P- button.
If the programme number of the equipment changes, then the present setting of the handset is suitable.
Press the preset button  to store.
This handset will now operate the VCR or satellite features as explained on page 31.
4. If the programme number does not change, pull down the front cover of the handset and press the UPD button, then press the P+ or P- button again.
5. If the programme number still does not change, press the UPD then the P+ or P- buttons again, and keep repeating this step and set procedure until the programme number does change, then press the  button to store.

NOTE: If after 50 or so step and set operations, the handset still does not operate your equipment, then the code is probably not available.

CODE LIST FOR PROGRAMMING HANDSET

VCRs

MAKE	CODE
ASA	107 063
Adventura	026
Aiwa	026
Akai	132 341
Amstrad	026
Audiovox	063
Asuka	063
Baird	130
Bell & Howell	130
Blaupunkt	252 221 060
CGE	026
Calix	063
Carver	107
Citizen	063
Craig	063
Daewoo	071
DeGraaf	068
Decca	026 107
Dumont	026 130 107
Dynatech	026
Electrohome	063
Electrophonic	063
Emerex	058
Emerson	026 063 069
Fidelity	026
Finlandia	107 130
Finlux	026 130 107 068
Firstline	069 071 063
Fisher	130 072
Funai	026
GEC	107
Garrard	026
Goldstar	063
Goodmans	026
Graetz	130
Gradiente	026
Granada	130 107 072
Grandin	063 026
Grundig	221 252 107 373
Harley Davidson	026
Headquarter	072
Hitachi	068 026
ITT	130 072 132 410
ITV	063
Imperial	026
Interfunk	107
JVC	093 034 410
Kendo	132
Kenwood	072 093 410
Kodak	063
Loewe	063 107
Logik	240
Lloyd	026
Luxor	132 072 069
LXI	063
Magnavox	107

VCRs

MAKE	CODE
Manesth	071
Marantz	107
Marta	063
Mediator	107
M-Electronic	026
Memorex	130 063 026 072 074
Metz	221 188 373
MGA	069
Minerva	221
Minolta	068
Mitsubishi	069 107 093
Motorola	074
MTC	026
Multitech	026
Murphy	026
NEC	093
Neckermann	107
Nikko	063
Nokia	130 132 072 240
Nordmende	410
Oceanic	026
Okano	341
Olympus	252
Optimus	063 074 458
Osaki	026 063
Otto Versand	107
Palladium	063
Panasonic	252 188
Penney	063 068
Pentax	068
Perdio	026
Philips	107
Phonola	107
Pilot	063
Pioneer	093 107
Profitronic	240
Proline	026
Pye	107
Quarter	072
Quartz	072
Quelle	107
Radiola	107
Radio Shack	026 063
Radix	063
Randex	063
RCA	068 132
Realistic	072 072 026 063 130
Rex	410
Ricoh	060
Roadstar	063 240
SBR	107
SEG	240
SEI	107
Saba	410
Salora	069 072 132
Samsung	071 240 458

CODE LIST FOR PROGRAMMING HANDSET

VCRs

MAKE	CODE
Sansui	093
Sanky	074
Sanyo	072
Schaub Lorenz	026
Schneider	026 107
Scott	071 069
Sears	063 068 072 130
Sharp	074
Siemens	221 130 063
Silva	063
Sinudyne	107
Sontec	063
Sony -	060 058
STS	068
Sunstar	026
Sylvania	026 069 107
Symphonic	026
Tashiko	026
Tatung	026 107
Teac	026
Technics	188
Teknika	063 026
Telefunken	410
Tensai	026
Thomson	410
Toshiba	069 071 410
Totevision	063
Universum	221 026 132 107 063
Yoko	240

SATELLITE RECEIVERS

MAKE	CODE
Akai	541
Alba	481 541
Amstrad	278 371 487
Astra	134
BT	541
Cambridge	282 370 541
DNT	226
Ferguson	362
Fidelity	278
Finlux	134 481 370
Fuba	198
Gooding	597
Grundig	354 597
Hirschmann	423
Hitachi	481
ITT	198 134 541
JVC	541
Kathrein	226
Luxor	134 198
Manhattan	481
Marantz	226
Maspro	354 362
Matsui	370
Nokia	134 354 198 423 481
Oxford	370
Pace	354 481 366
Panda	481
Philips	226 481 354
Radiola	226
Saba	362
Sabre	481
Salora	134 198
Sat	481
Satec	354
Tantec	362 481
Thomson	481
TechniSat	288
Ventana	226
Wisi	481

CIRCUIT DESCRIPTION

1. Microprocessor and control circuits.

IC001 is the main microprocessor that controls all major functions included on this television. The device we use is ROMLESS, and as such, all program code is stored in an external EPROM (IC002). IC001 is a 16-bit microcontroller that can access up to 128K of external program code. As a result of this, the EPROM we use is 128K x 8 (1 MegaBit EPROM).

IC001 - THE ST90R28 MICROCONTROLLER

PIN 1- POWER GOOD:

This PIN is an interrupt input and is normally HIGH when the set is working correctly. If there is a static discharge or a fault in the power supply or when the T.V. is turned off, this line goes LOW and the microcontroller then puts the set into STANDBY.

On power-up this line can toggle between HIGH and LOW for a short time. The microcontroller ignores this PIN for this period so that the set doesn't trip into the STANDBY condition.

PIN 2 - AV1

This is an input PIN that detects if +12V appears on PIN 8 of SCART 1. If +12V is present on this pin, then the T.V. will switch into AV1 and will allow any video / audio signals at the input of SCART 1 to be switched to the T.V.'s picture / internal speakers.

PIN 3 - Infra Red:

This is an interrupt driven input that accepts the I.R. signal from the I.R. "can". The software then decodes the signal to perform the required customer function.

PIN 4 - AV2:

This is an input PIN that detects if +12V appears on PIN 8 of SCART 2. If +12V is present on this pin, then the T.V. will switch into AV2 or SAV2 and will allow any video / audio signals at the input of SCART 2 to be switched to the T.V.'s picture / internal speakers. The T.V. must know whether or not it should switch into VHS or SVHS mode. The user must select which mode to use by making the choice in the AV SELECTION menu.

PIN 5 - Shift Data:

This output pin is used to transmit the serial data to the Dolby Pro Logic and Dolby Surround Decoders (LA2785 and LV1010). This is NOT in I2C format. The pin is also used for transmitting serial data to the 74HC595 (IC007) shift register.

PIN 6 - Shift Clock:

This output pin is used to generate the necessary timings for the transmission of the Shift Data to the Dolby Decoders. It is also used as a clock for the shifting of data into the 74HC595 shift register (IC007).

PIN 8 - Mute:

This pin is an output that mutes the main audio amplifiers on power-up and also power down. When the pin goes high the amplifiers are muted. This hardware mute is primarily used to stop pop noise and other interference when the set is powered-up and also turned off. When the T.V. is disconnected from the mains, the POWER GOOD line on PIN 1 of IC001 immediately drops. The software detects this change and forces a hardware mute, thus allowing the amplifiers to be muted before the power supply rails fall.

PIN 9 - Shift Enable:

This pin is used to enable the data in the shift register (IC007) to be present at its output. On the rising edge of this pin, the data in the shift register is latched on its outputs.

PIN 10 - Dolby Enable:

This output pin is used to enable the shift data from pin 5 of the IC001 to control the Dolby Decoders. It is normally

high, but when data needs to be transmitted to the Dolby Decoders, it drops low for a short period of time.

PIN 11 - Service:

This output PIN is HIGH is factory mode and low when factory mode is disabled. Factory mode is when manufacturing / service personnel have access to the SERVICE MODE screen and the model description of the set is displayed.

PIN 12 - ON/OFF:

This output pin is used to switch the main deflection and power supply on at power-up and when exiting out of standby.

PIN 13 - OSCout:

4MHz output from this pin.

PIN 16 - OSCin:

4MHz input to this pin that provides the necessary timings for IC001.

PIN 18 - RESET:

This input pin is normally HIGH, but when the T.V. is powered-up or powered-down, this pin drops to 0V. This ensures that the microcontroller is properly reset before it commences execution of the program.

PINS 19 - 28 (not PIN 22):

These pins are used to insert the upper 8 bits of the address of the program code onto the address lines of the EPROM. They are NOT multiplexed.

PINS 29 - 35:

These pins are used in two different ways (i.e. they are multiplexed). When reading information from the EPROM, the lower 8 bits of the program code address is output on them. These lines are connected to the data latch (IC003) and the output of the data latch is used to generate the lower 8 bits of the EPROM code address.

After the EPROM has received this address, the data output from the EPROM is then inserted directly onto these pins. Thus, they are data and address pins.

PIN 39 - P/D:

This PIN is used to select external Program / Data memory. In our application we use it as an extra address line to select up to 1024K of program code.

PIN 40 - SDA:

The SDA pin is the I2C serial data output line. It is not an input.

PIN 41 - SCL:

The SCL pin is the I2C serial clock output line used to generate the necessary I2C timings for the devices connected to the bus.

PIN 44 - AS:

This output pin is known as the ADDRESS STROBE line. It is normally high but is low when the microcontroller inserts the address of a location in the EPROM onto its address lines.

PIN 45 - DS:

This output pin is known as the DATA STROBE line. It is normally high but is low when data from the EPROM is inserted onto the DATA lines (pins 29 - 35) of IC001.

PIN 46 - R/W:

This output pin is used to inform any external devices whether the microcontroller is to READ / WRITE data. When the microcontroller is reading data from the EPROM, the line is HIGH.

PIN 47 - SDI:

The SDI pin is the I2C serial data input line. It is not an output.

PIN 48 - LED:

This pin is used to switch the LED between full brightness (when the set is in standby) and slightly dim. When the set

is powering up or in standby, this pin is HIGH and the LED is fully bright. Also, when IR commands are received and decoded properly, the LED momentarily turns fully on. At all other times, this PIN is LOW and the LED is dim.

PIN 51 - PHANTOM:

This input pin detects whether the push button at the rear of the set is in PHANTOM mode or Dolby Pro Logic mode. It is low when the button is depressed (position B) and HIGH when the button is out (position A).

PIN 52 - VOL -:

This pin decreases the volume of the set when it is low.

PIN 53 - VOL +:

This pin increases the volume of the set when it is low.

PIN 54 - PROG -:

This pin decreases the programme number when it is low.

PIN 55 - PROG +:

This pin increases the programme number when it is low.

PIN 56 - SVHS:

This input pin is used to detect whether an SVHS HI-8 plug has been inserted into the front SVHS socket of the set (SAV3). This pin is normally HIGH (approx. 5V set by potential divider R361 / R364) but is pulled LOW when a plug is inserted into the socket.

IC002 - THE M27C1001 128K x 8 EPROM

This device is used to store the external program code so that the T.V. can function properly. 16 address lines plus the P / D line are used to select the required address of the EPROM. 8 data lines are used to output data from the EPROM.

PIN 22 is the CHIP ENABLE pin and is normally low.

PIN 24 is the OUTPUT ENABLE pin and is low when data needs to be output from this device. In this application the READ / WRITE pin needs to be HIGH (read) and the DS line needs to be low.

IC003 - 74LS373 OCTAL D-TYPE DATA LATCH

This data latch is used to hold the lower 8 bits of the EPROM address. It latches the address so that the DATA / ADDRESS lines on IC001 (pins 29 - 35) can accept data from the EPROM.

When the AS line from the microcontroller goes low the data latches to the outputs of this device .

IC004 - 74LS02 QUAD 2 INPUT NOR GATES

This device is used primarily to invert logic signals between IC001, IC003 data latch and IC002.

IC005 - CD4016 4 WAY 1 POLE ANALOGUE SWITCH

This device is used to connect / disconnect the I2C bus from IC001 / IC006 and all the other devices that use the I2C bus at power-up, power-down and in standby.

IC006 - ST24C16 EEPROM

This device is used to hold any non-volatile settings when the T.V. is power-off i.e. customer control setting, stored program information etc.

IC007 - M74HC595 SHIFT REGISTER

This device is used to control extra switching ports on the chassis. These are for the control of IC401, compression panel and the switching circuits needed to accommodate systems L and L .

2. Tuner, IF and Video signal processing

The tuner used is a frequency synthesis type, powered by the chassis +5V ,+12V and +33V covers UHF for the U.K. and VHF, UHF and CATV for non-UK models, with an AFC

input and balanced IF Output. The tuner is not used in the balanced output condition, IF Pin 1 is used for the vision path and IF Pin 2 for the audio path. Pin 3 is an analogue to digital converter used by the microprocessor to measure the IF AFC via the I2C bus.

When the tuning operation is performed, the clock and data outputs from pins 3 and 2 of IC005 are applied to pins 4 and 5 of the tuner, which will start to search.

The search routine will be stopped, when IC501 detects a broadcast signal and transmits this information to the micro processor via the clock and data lines.

VISION PATH

The IF signal from pin 1 of the tuner is fed to Q201, filters MF210 and MF211 are added to satisfy CE requirement (adjacent channel rejection). The VIF signal from the collector of Q201 is input to CP201 (BG Vision SAW filter) and CP202 (L Vision SAW filter). TDA9815 Pins 1 and 2 (BG) are active when Pin 30 is high and Pins 4 and 5 (L) active when Pin 30 is low. IC201 pin 30 control voltage comes from pin 2 of IC007, which is controlled by IC001 via the shift clock, shift data and the shift enable. On system L, the vision polarity is reversed, to overcome this, IC201 pin 9 is held low changing the polarity during processing ensuring the output polarity from pin 21 is common to all transmission systems. The tuner AGC level is controlled by IC201 Pin 19. The AGC current is fed to pin 13 of the tuner via a speed up circuit Q101 discharging C101 in the event of a decreased VIF level (positive modulation). The tuner take over point is set by VR201 pin 6. The AGC level is stored in C208 attached to IC201 Pin 28, setting VIF and tuner gain to keep a constant video level. For positive modulation an additional black level detector is employed to discharge the AGC capacitor (C208) in the event of a decreased VIF. The black level detector voltage applies a voltage to C203 Pin 3.

The current produced by the internal VIF Frequency / phase detector is converted to a DC voltage by the loop filter R206 / C204 attached to IC201 pin 7 to control the VCO. The VCO resonates using L202 and C216 across pins 24 and 25 of IC201. The AFC is set by L202. When system L' is selected the AFC tuning has to be altered, this is done using an internal varicap diode, controlled VR202. VR202 is switched into circuit by applying a voltage to Q202 base from IC007 pin 3 which pulls one end of VR202 to 0V. After demodulation the resultant 1v video emerges at pin 21 and re-enters at Pin 22 to a 7dB buffer stage. The 2V video re-emerges via Pin 10 and fed through filter MF201 to emitter follower Q203. The video is reduced to 1V by R209/R212 and fed to Pin 20 IC301, which is a video matrix switch, controlled by the I2C commands input at pins 2 and 4.

The composite video input to pin 20 of IC301 is output from pin 14 (unless digital comb filter fitted see later section), then applied to IC501 pin 26 via Q203. This is the composite video / luminance input pin.

IC501 (TDA 9160A) is a PAL / NTSC / SECAM decoder /sync. Processor which outputs the luminance from pin 1 which is fed to IC503 pin 16. This IC provides the Colour Transient Improvement (CTI) and luninance delay, with the required delay being controlled by IC001 via the I2C inputs at pins 9 and 10. For the correct operation this IC requires a sandcastle waveform which is input at pin 17. The luminance is output from pin 12, then input to pin 8 of IC505 the RGB, video processor. This IC then processes the luminance, adding it to the RGB matrix circuits, and applies the brightness and contrast settings, which are adjusted by the customer via the I2C inputs at pins 27 and 28.

IC501 also extracts the chrominance signal from the composite video input to pin 26. The demodulated signals are output as R-Y and B-Y signals from pins 2 and 3 respectively.

The colour standard identification is performed automatically by IC501.

The R-Y and B-Y signals are then input to pins 14 and 16 of IC502, which is a baseband chroma delay line. The sandcastle waveform from pin 6 of IC501 is input to pin 5 of IC502, which is used for timing the black level clamping and delay time control.

The R-Y and B-Y signals are output from pins 11 and 12 of IC502, then input to pins 3 and 7, of IC503, which performs the colour transient improvement. This feature can be turned on and off from the customer control menu, the IC is controlled by I2C commands input to pins 9 and 10 of IC503.

The output R-Y and B-Y signals from pins 4 and 6 of IC503 are then input to IC505 pins 7 and 6. These signals are then processed to produce the G-Y signal, then matrixed with the luminance to obtain the red, green and blue outputs, from pins 24, 22 and 20 then applied to the CRT base.

There are two types of beam current control on this chassis, they are average beam current limiting, and peak beam current limiting. For average beam current limiting the voltage on pin 4 of T701 follows the beam current. Should the beam current rise the voltage on pin 4 will fall. This reduction is passed via R731, R549 and R573, to IC505 pin 15. Once the level of pin 15 reaches 4V the contrast level begins to fall, and should it reach 2.5V, the brightness level is also reduced.

For peak current limiting, the beam current is monitored on the CRT base, and a voltage is fed back to IC505 pin 19 from transistors Q804, Q805 and Q806. Any change in this level will result in a change in the RGB outputs from pins 20, 22 and 24 of IC505 compensating for any change.

VELOCITY MODULATION CIRCUIT (Fig. 1, 2, 3)

On a television set, the picture quality is excellent if the video signal has steep leading and trailing edges in the brightness change area when a black-to-white-to-black pattern is received, for example, and an electron beam is applied to the cathode ray tube (CRT). Generally, however, a clear contour is not displayed on the screen because the video signal has gentle edges in the brightness change area due to signal deterioration in the process of transmission, the receiver frequency characteristics, etc. Hence, the speed modulation circuit has been designed to improve the picture quality, i.e. make the video signal edges steep, by controlling the horizontal scanning velocity of the electron beam, which is achieved by

applying the compensation signal (created in the brightness change area by differentiating the video signal) to the auxiliary deflection coil provided at the neck of the CRT. Fig. 1 shows the velocity modulation circuit.

In Fig. 1, ① indicates the video signal input terminal. The input video signal having gentle leading and trailing edges in Fig. 2 (a) is applied to this terminal. This input signal (a) then passes the buffer circuit, is differentiated by the first differentiating circuit ②, and is changed to the primary differentiated signal in Fig. 2 (b) in its brightness change areas, i.e. on its leading and trailing edges. This signal (b) includes the brightness change area of the video signal (a'), but is indicated as a signal approximate to a triangular wave because it cannot be changed to a completely differentiated signal due to the influences of the time constant of the differentiating circuit ③, floating capacity of each area, etc.

The primary differentiated signal (b) obtained as mentioned above is then applied to the second differentiating circuit ③ and differentiated there again to provide the secondary differentiated signal as shown in Fig. 2 (c). For the same reason, this secondary differentiated signal is also indicated as an approximate signal to a triangular wave.

The secondary differentiated signal (c) passes the buffer amplifier circuit and output circuit ④ and is then applied to the auxiliary deflection coil ⑤ at the neck of the CRT so that its auxiliary deflection current changes the horizontal scanning velocity of the electron beam.

The current that flows when the secondary differentiated signal (c) is applied to the auxiliary deflection coil is integrated as shown in Fig. 2 (d), which is similar to the primary differentiated waveform of the input signal (a). Hence, when the electron beam is deflected by applying the auxiliary deflection magnetic field obtained by the auxiliary deflection coil current (d) to the main deflection magnetic field obtained by the main deflection coil current, the equivalent deflection current corresponding to the total of those deflection magnetic fields is as indicated in Fig. 2 (e). Accordingly, during periods T1 and T4 of this equivalent deflection current (e), the screen brightness is reduced by increasing the scanning velocity of the electron beam on the raster to elongate the horizontal scanning distance. Conversely, during periods T2 and T3, the brightness is increased by decreasing the scanning velocity of the electron beam to reduce the horizontal scanning distance. For this reason, by controlling the scanning velocity on the leading and trailing edges of the

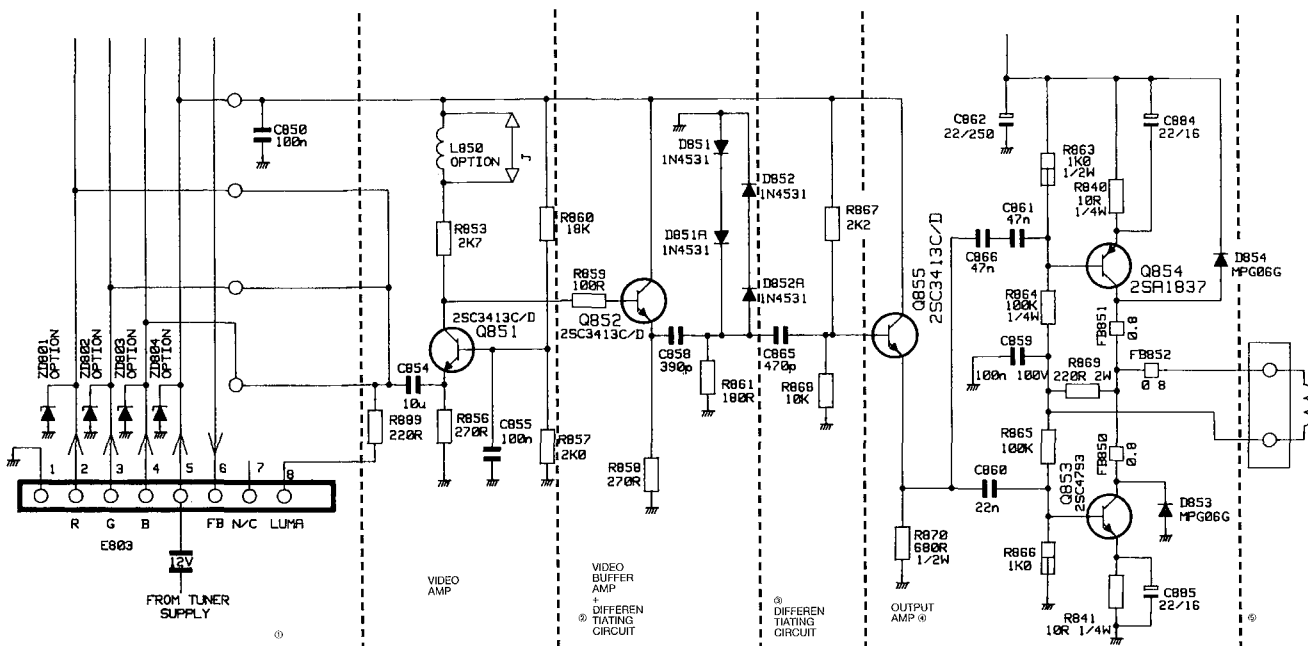


Fig. 1

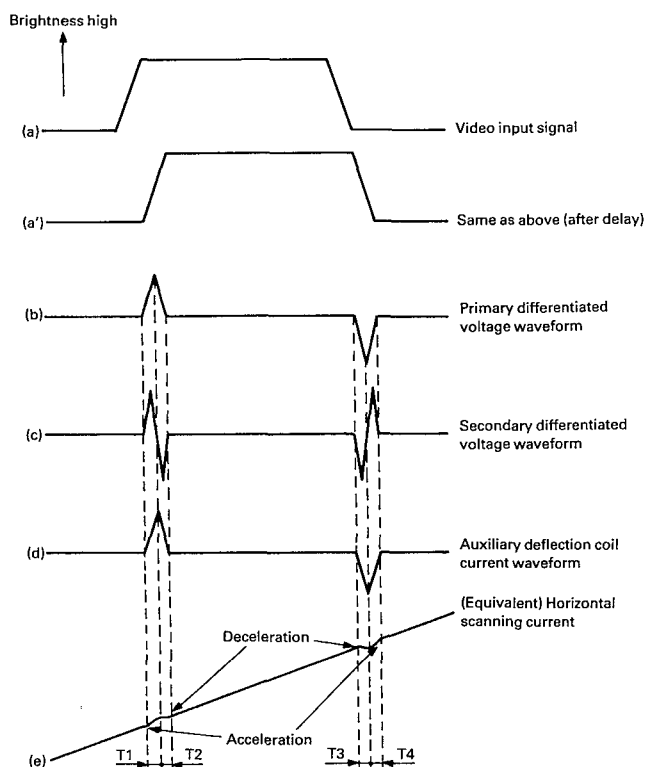


Fig. ②

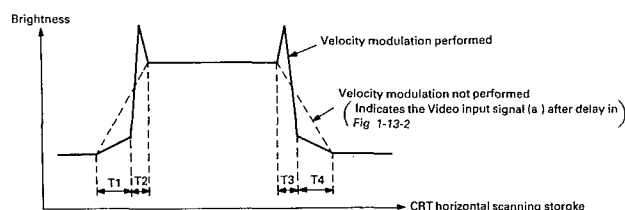


Fig. ③

video signal (a') as shown in Fig. ③ the screen brightness suddenly increases on the leading edge during period T2 and decreases during T1. On the trailing edge, the brightness increases during period T3 and suddenly decreases during T4.

As a result, the brightness change can be steepened in the video brightness change area, and at the same time, the bright video width can be reduced to ensure a clear picture image.

According to the above described operation principle, the velocity modulation coil is driven by the secondary differentiated signal. Considering the inductance and operation frequency of the modulation coil, the output circuit must be operated by a large voltage and a large current to produce a sufficient velocity modulation effect. Therefore, this circuit uses resistors R840 and R841 in series with the output stage transistors to reduce the power loss of the output circuit transistors, and further, uses C884 and C885 in parallel to the aforementioned resistors so that the emitter voltage may be varied in accordance with the emitter current of the output stage transistors Q854 and Q853.

DIGITAL COMB FILTER (68cm models only)

A composite video signal is made available from pin 17 of IC301. This is then input to pin 16 of IC5000 via Q5000 and the low pass filter network C5012, R5008, R5007 and C5011.

It is also input to pin 1 of IC5000 via the high pass filter network of C5000, C5001, R5000, R5001 and L5000.

The main function of IC5000 is to perform colour sub-carrier regeneration. The crystal on pin 4 of IC5000 provides the 4.43MHz oscillation frequency, which is phase locked to the video colour sub-carrier. An output of 4 times this frequency (17.73MHz) is obtained from pin 14, and input to pin 7 of the comb filter module. This input is applied to an analogue to digital 8 bits converter, after that composite signal is digitally separated the luminance and chrominance components.

These separate signals are then converted to analogue form by a digital to analogue converter, with the luminance being output from from pin 18, and the chrominance output from pin 16. They are then returned to IC301 pins 1 and 3 respectively. The luminance is output from pin 14 of IC301 and processed as previously described.

The chrominance is output from pin 13 of IC301 and fed via Q302 to IC501 pin 22 where the IC converts it to R-Y and B-Y signals which are processed as described earlier.

VIDEO OUTPUTS / EXTERNAL INPUTS.

The composite video at the emitter of Q203 is applied to Q301 / Q308 stage, then input to pin 19 of SCART 1 socket. This can then be applied to external equipment for display. This output is always the signal obtained from the tuner / IF stages. A composite video signal is output from pin 20 of IC501, this is fed via Q501 / Q502 stage to pin 19 of SCART 2, and can be applied to external equipment. This output is the same signal as being display on the CRT.

Composite video signals from an external source, can be input to pins 20 of SCART 1, SCART 2 or PHONO SOCKET. The signal from SCART 1 is input to pin 11 of IC301, whilst the signal from SCART 2 is input to pin 5. The PHONOSOCKET signal is input to pin 8 of IC301 via Q304 stage .

The switching configuration of IC301 is controlled by the 12C inputs at pins 2 and 4, the selected signal is then output from pin 14 and processed as previously described.

There are 2 S-VHS inputs one through SCART 2 and the other through the S-VHS socket on the front of the set. When SCART 2 is selected the luminance is input through pin 20 of SCART 2 to pin 5 of IC301, the Chroma is input through pin 15 of SCART 2 to pin 6 of IC301.

The set switches automatically to S-VHS mode when a plug is inserted into the S-VHS socket, the luminance is input through pin 2 to pin 8 of IC301, and the Chroma input through pin 1 to pin 10 of IC301.

When either S-VHS option is selected the C and Y are output from pins 13 and 14 of IC301 respectively . The C output from pin 13 is fed to pin 22 of IC501 via Q302, the Y output from pin 14 is fed to pin 26 of IC501 where both are processed as described in the vision path section.

There is also the option for RGB signals to be input directly through SCART 1, pins 15, 11 and 7 respectively. These are fed to R1, G1 and B1 inputs of IC501 pins 10, 11 and 12 respectively. A fast blanking signal is also required for RGB operation which is input through pin 16 of SCART 1 via Q306 to pin 13 of IC501. When this happens, only the external RGB signals are output from pins 20, 22 and 24 of IC505.

3. Sound Circuit

AUDIO PATH.

Pin 2 of the tuner feeds amplifier Q4004; its output is fed to Audio SAW filter CP4001 with exception to Multistandard models. For Multistandard models Q4004 applies a signal to D4001 and D4002 to be switched between BG/L and L' standards. When Q4001 base is low, D4001 anode is low and D4002 anode is high allowing the L / BG signal to be fed through D4002 to Pin 2 CP4001. When Q4001 base is

high, D4001 anode is High and D4002 anode is low allowing the L' signal to be fed through D4001 to Pin 1 CP401.

The SIF is applied to Pins 31 and 32. The SIF AGC level is stored on C4003 Pin 8. The SIF is converted to an intercarrier signal and fed to Pin 20. The intercarrier signal is then applied to MF4001, MF4003 and Pin 29 IC4201 (NICAM decoder). The 5.5MHz Audio signal from MF4001 is fed to Pin 17 and the AF1 demodulated signal fed out at Pin 12. The 5.74MHz Audio signal from MF4003 is fed to Pin 16 and the AF2 demodulated signal fed out at Pin 13. AF1, and AF2 AGC is stored on C4005 Pin 14 and C4006 Pin 15 respectively. The AF1 and AF2 outputs are applied to Pins 7 and 8 IC451 (A2 decoder) respectively. In positive modulation mode AM audio is detected and the AF signal output at Pin 12, then fed to Pin 7 and 16 of IC4201 (NICAM decoder).

SIF. SWITCHING, CP4001 INPUT PIN SELECTION

STANDARD	Q4001 BASE	CP4001 ACTIVE PIN
BG/L	HIGH	2
L'	LOW	1

A2 Decoder.

The AF1 and AF2 signal are fed into IC451 Pins 7 and 8. The NICAM signal is fed into the right input Pin 9 and the left input Pin 10 via amplifiers (Gain 13.5dB) Q4201 and Q4202. The dematrixed and de-emphasised signals or NICAM signals are fed out on Pins 11 and 12 to emitter followers Q405 and Q406 to Audio switch IC401 and scart Pins 1 and 3.

A 10MHz crystal on Pin 19 provides the IC with a reference frequency. The 54.7kHz pilot signal for stereo / dual sound detection is coupled to Pin 5 via R460 and C464. De-emphasis is performed by C460 Pin 15 and C462 Pin 17.

Although having a common output, the sound inputs to IC451 take separate paths, i.e. NICAM / AM audio signals are input to pins 9 and 10, whilst FM audio signals are input to pins 7 and 8. This is done so that the AM signal is not applied to the FM de-emphasis stage contained in IC451.

The left output from pin 12 of IC451 is fed via Q405 to the RF L input (pin1) of IC401, and the right output from pin 11 is fed via Q406 to the RF R input (pin 12) of IC401.

The outputs of IC401 left from pin 3 and right from pin 13 are selected from the available inputs dependent on the state of pins 9 and 10 (these are described in the section "Audio external input / output"). The outputs are then input to pins 3 and 5 of IC4400 (on the power and deflection panel), this is the HI-FI audio processor, the operation of which is controlled by the I2C inputs at pins 16 and 17. The main left and right audio signals are output from pins 9 and 24, fed to Q4400 and Q4401, then returned to pins 10 and 23 of IC4400 (via the DOLBY processing circuitry when fitted).

The decoded audio is then applied to internal stages, which are controlled by the 12C that operate the customer controls i.e. volume, treble, bass, balance and also the sound effects, such as pseudo stereo and wide stereo etc.

The audio signal is then output from pins 15 and 18 of IC4400, where the signals take three distinctly different paths. The first goes to IC4500, which is a 10Watt stereo amplifier. The left and right are input to pins 1 and 5 via potential dividers R4420/R4421 and R4422/R4423.

The amplified signals emerge at pins 8 and 10, then are applied to the speakers. The resistor networks R4501 /R4502 and R4503/R4504 control the gain of the amplifier. During power up or power down, IC001 will output a "high" from pin 8, this is applied to the base of Q4501 turning the transistor on. When this happens Q4501 pulls pin 3 of

IC4500 and IC4550 "low" this will mute these IC's to prevent any "popping" noises that may occur.

The second path is to the low pass filter and Bass amplifier. The left and right are both fed to pin 2 of IC4300 through R4300 and R4301, this is an op-amp and is used as a summing amplifier to add the left and right signals together. The single output emerges from pin 1 and is fed to the second op-amp via the level selecting circuitry of Q4300 and Q4301. These transistors are driven by the output pins 2 and 31 of IC4400, which will vary when the customer changes between the CUT, MID or BOOST options in the sub woofer section of the audio menu.

The output from pin 7 of IC4300 is input to the BASS amplifier IC4550 at pin 5. This amplifier is the same type as IC4500, but is run in bridge mode to get maximum power output from the one package using the common 27V supply. The output emerge from pins 8 and 10, which are then applied to the sub woofer speaker system built into the back cover of the set.

The third path is an output to the phono sockets via Q4450 and Q4451 for people who wish to use an external amplifier for the right and left channels.

A headphone output is made available from pins 20 and 26 of IC4400. The volume is controlled by 12C commands from IC001, which are set by the customer in the HEADPHONE menu. These are then input to IC4410 at pins 6 and 7, amplified and output to the headphone socket from pins 1 and 3.

NICAM.

The intercarrier signal appearing at pin 20 of IC201 is fed to pin 29 of IC4201 via filter C4220 and R4209. This IC is the nicam decoder which is controlled by I2C commands input to pins 49 and 50, in conjunction with the 8.192MHz crystal oscillator connected to pins 39 and 40. The AM audio provided on the multistandard models is fed to Pins 7 and 8. The decoded NICAM and AM audio are output on pin 8 (right) and pin 15 (left). Pins 8 and 15 are fed into low pass filters R4202, R4203, C4206 and R42005, R4204, C4210 to amplifiers Q4202 and Q4201, which is then input to IC451 pins 9 and 10. IC reset is provided by the psu power good line to Pin 47. From initial switch on Pin 47 is held low, until power up sequence is completed.

UK MODEL

The FM audio on UK models is fed to Pins 7 and 8 in place of the AM audio on multistandard models. The FM signal is then fed to amplifiers Q4201 and Q4202 via pins 15 and 8. IC451 (A2 decoder) is removed, therefor amplifiers Q4201, Q4202 and the emitter followers Q405, Q406 to the audio switching IC401 are linked together.

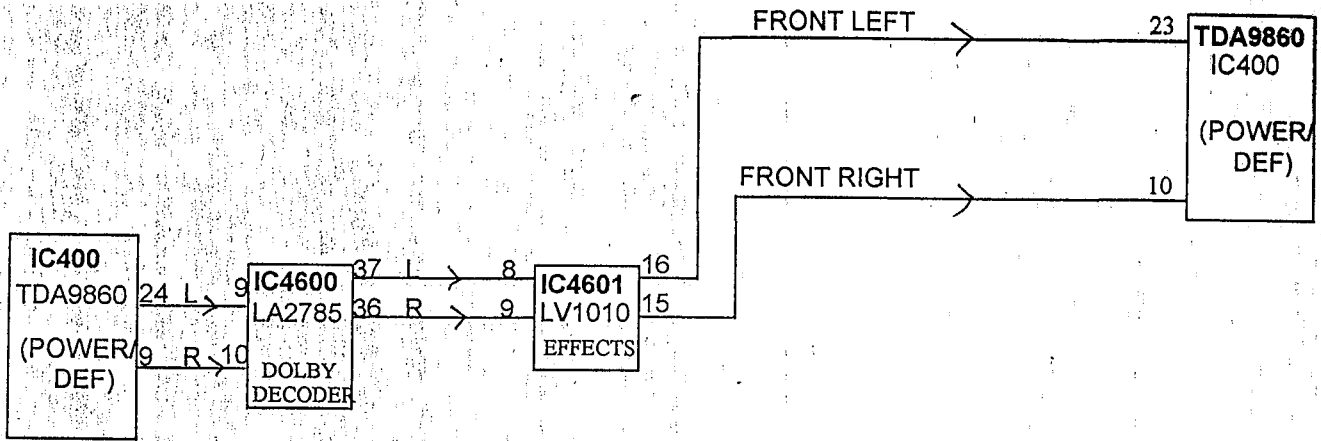
Audio external input/output.

The left and right audio signals from Q405 and Q406 are input to pins 1 and 3 of SCART 1, and are then output to external equipment.

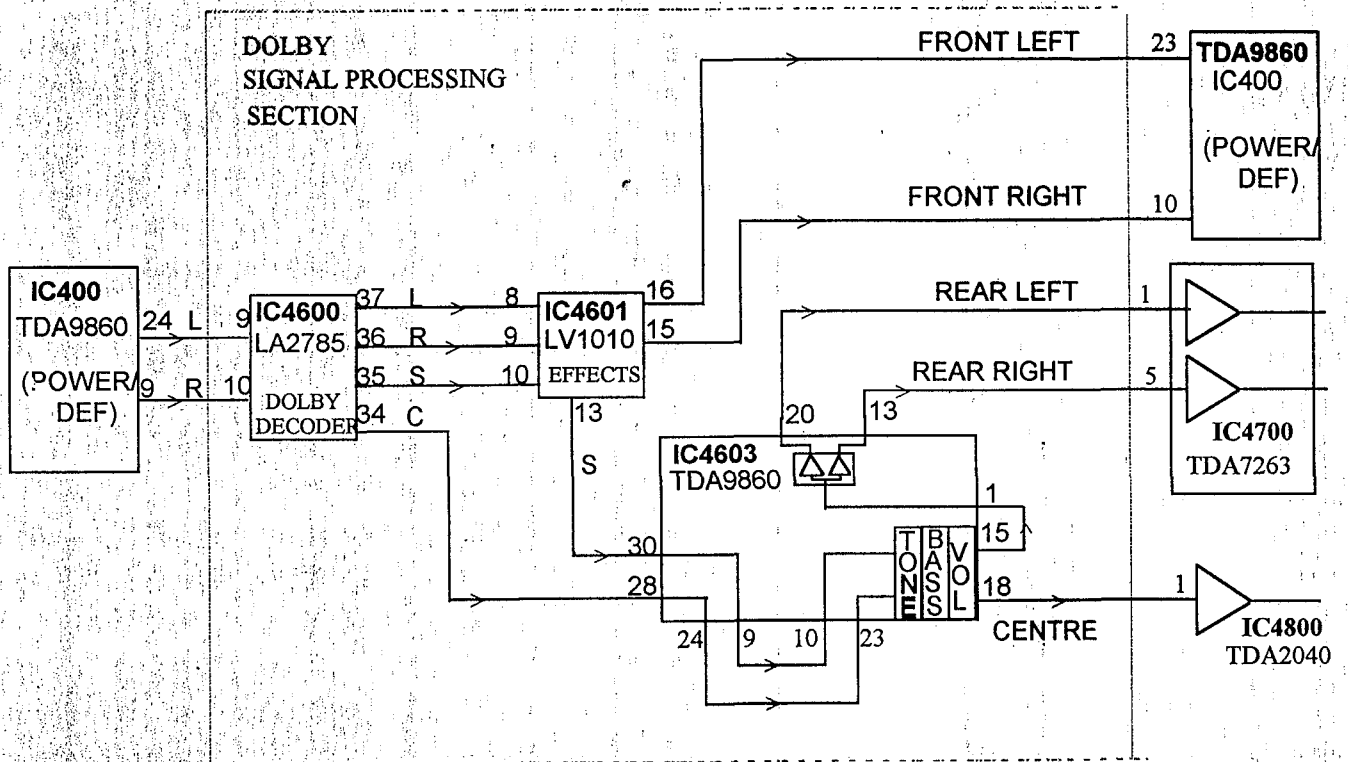
For SCART 2 the inputs to pins 1 and 3 are obtained from pins 7 and 26 of IC4400, which is situated on the power and deflection panel .

The audio switching is performed by a Dual 4 channel CMOS device IC401. RFL and RFR are applied to Pins 1 and 12. SCART 1 L1in and R1 in (pins 3 and 1 of SCART 1) are fed to Pins 2 and 15 of IC401 via Q411 and Q412. SCART 2 L2in and R2in (pins 3 and 1 of SCART 2) are fed to Pins 5 and 14 of IC401 via Q407 and Q408. Phono L3in and R3in are fed to Pins 4 and 11 of IC401 via Q409 and Q410. The audio is fed out on Pins 3 SO-L and 13 SO-R to Pins 6 and 5 IC4400 on the power pcb via pins 6 and 5 of connector E950. Selection of the required signal is performed by pins 9 and 10. The truth table indicates the necessary logic.

STEREO



DOLBY PRO-LOGIC



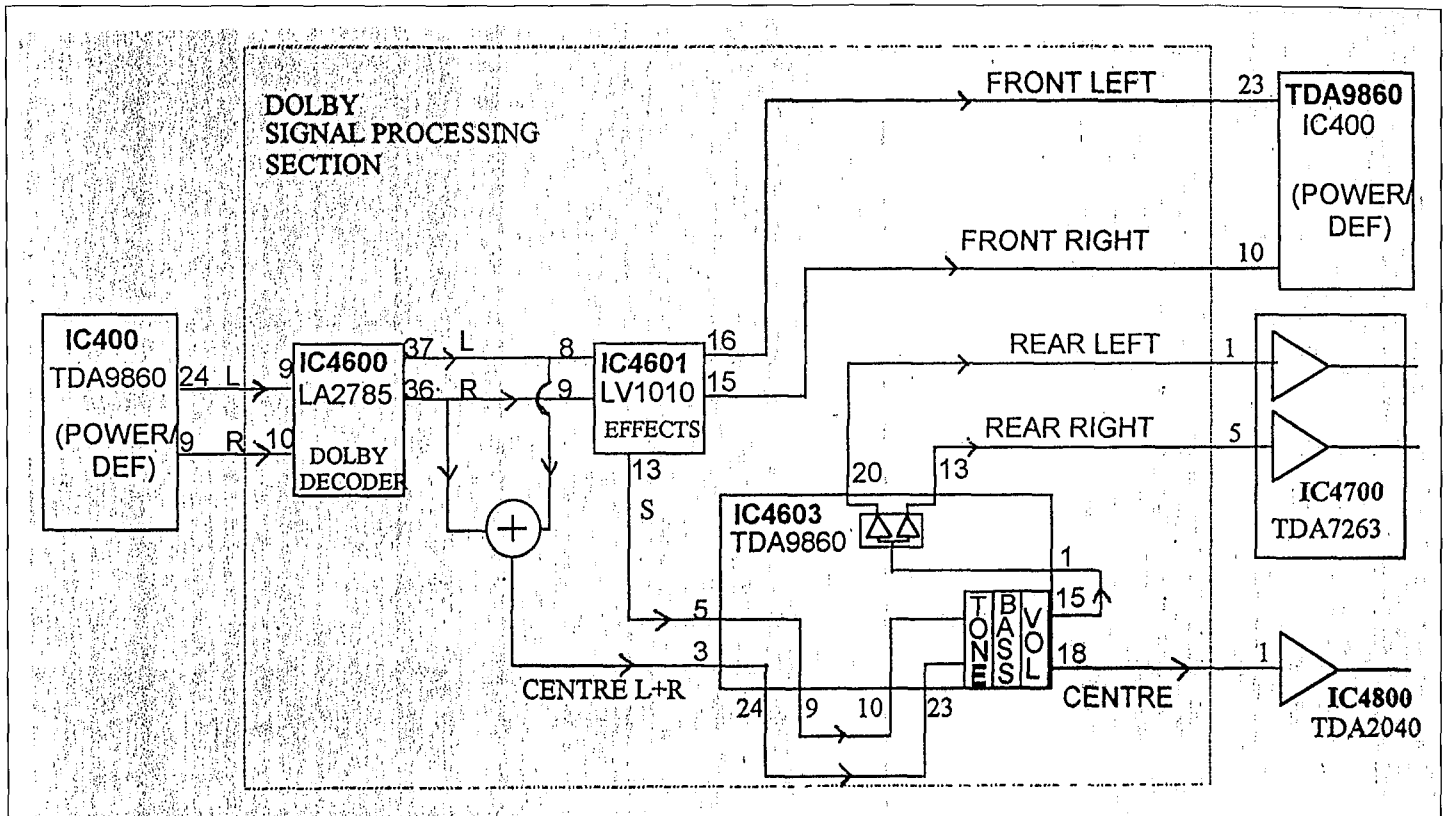
PHANTOM Mode:

WHEN IN PHANTOM MODE THERE IS NO CENTRAL CHANNEL. CENTRE INFORMATION IS ADDED TO LEFT AND RIGHT INSIDE IC4600.

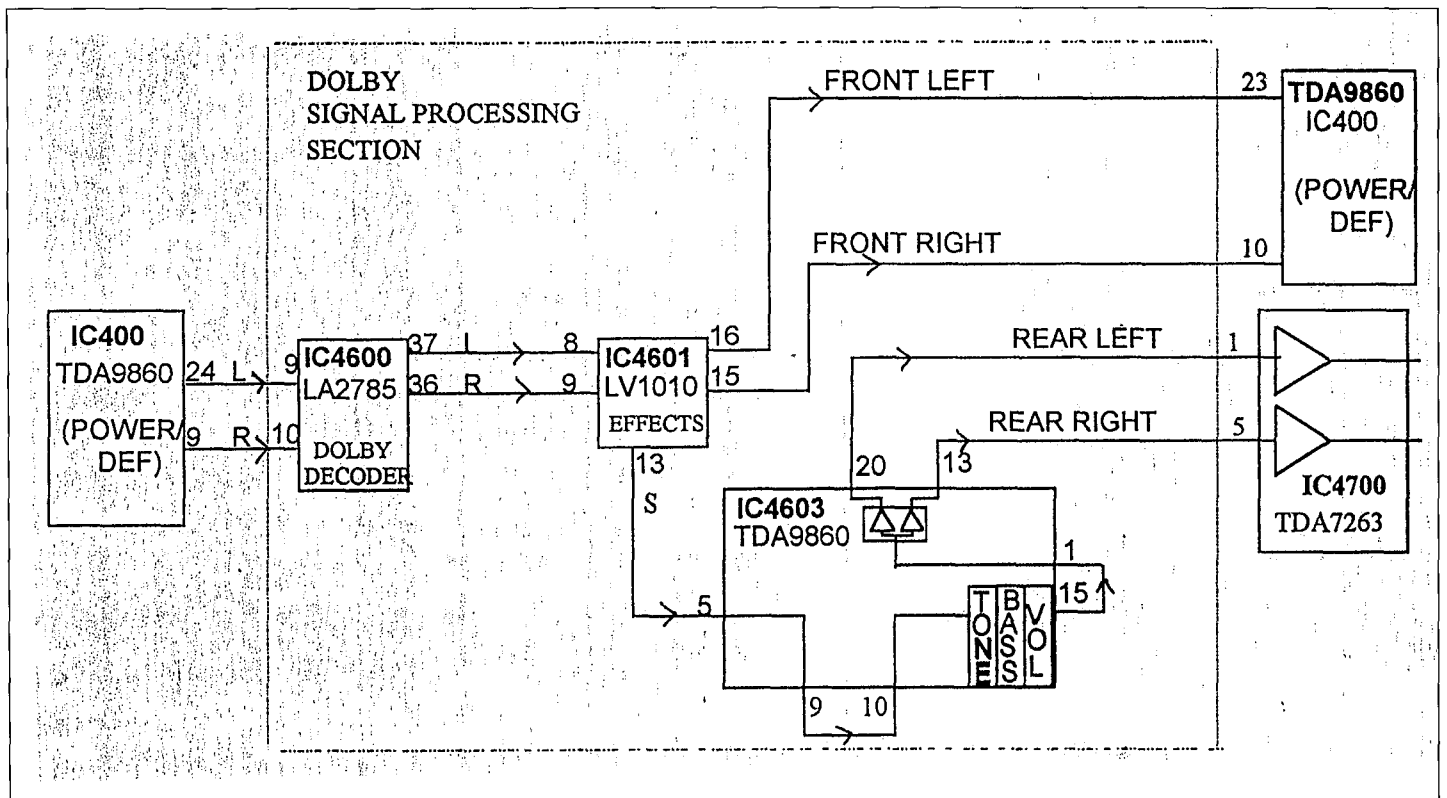
3 CHANNEL DOLBY:

WHEN IN 3 CHANNEL MODE THERE IS NO SURROUND CHANNEL. SURROUND INFORMATION IS ADDED TO LEFT AND RIGHT CHANNELS IN IC4600.

HALL and DISCO



STADIUM and ARENA



PIN	PIN	SELECTED INPUT	
9	10		
0 (RFL)	0 (RFR)	PIN 1	PIN 12
0	1	PIN 5 (L2)	PIN 14 (R2)
1	0	PIN 2 (L1)	PIN 15 (R1)
1	1	PIN 4 (L3)	PIN 11 (R3)

Dolby Circuits:

IC4600 is the DOLBY PRO LOGIC decoder.

Left and Right audio is input to pins 9 and 10 from pins 24 and 9 of IC4000, and the decoded signals emerge from pins 34 (centre), 35 (surround), 36 (right) and 37 (left). The I.C. is controlled by the clock, data and enable inputs at pins 42, 41 and 40. These originate from IC001 at pins 5, 6 and 9.

Centre Channel:

The centre channel from pin 34 of IC4600 is input to IC4603 at pin 28. After internal matrixing, it emerges from pin 24, then input to pin 23 after attenuation by R4600/R4601.

The I.C. then performs volume, tone and bass, and the centre output is made available from pin 18.

It is then applied to the amplifier IC4800 at pin 1.

This I.C. is a 10 Watt amplifier whose gain is set by R4806/R4807.

The output is available from pin 4 and supplies the centre speaker, when connected.

During power up or power down operation, the "High" output from pin 8 of IC001 is applied to Q4800, turning it on.

This will discharge the R/C network R4804/C4803 on pin 1 of IC4800, and the amplifier will cease to operate, thus preventing any "popping" noise from being output.

This centre channel output can supply an external speaker (or the console speaker if supplied), or if desired, the cabinet left and right speakers can be used to output the centre channel.

If the latter method is used, external left and right front speakers must be connected to the sockets provided, to output the Left and Right audio channel.

Note: When deciding how to connect the centre channel, care must be taken to set the MODE switch on the back of the T.V. to the correct position.

When an external centre speaker is connected, it must be set to position B, and when utilising the cabinet speakers as the centre channel, it must be set to position A.

Phantom Mode: If the customer has no external speakers, this T.V. is capable of producing a "Phantom" centre channel.

When the MODE switch is set to position B, but no centre speaker is connected, then the Left and Right channel is output by the internal speakers of the television.

As no centre speaker is connected, a "High" will be applied to the base of Q4801 via R4809, turning the transistor on, thus applying a "Low" to pin 51 of IC001.

When this happens IC001 instructs IC4600 to create a "Phantom" channel, which is directed equally to the front Left and Right channel output, thereby creating the illusion of a centre channel.

Left and Right Channels:

The Left and Right decoded audio is output from pins 36 and 37 of IC4600.

The signals are then input to pins 8 and 9 of IC4601, and emerge at pins 15 and 16.

They are then returned to pins 10 and 23 of IC4400 via Q4604 and Q4605, then processed as the Left and Right outputs as previously explained.

Surround Channels:

The surround channel is output from pin 35 of IC4600, then input to pin 10 of IC4601.

The signal is then fed internally to a Low Pass Filter circuit, a DOLBY B noise reduction circuit, and is then output from pin 13.

It is input to IC4603 at pin 30 and after internal matrixing, emerges at pin 9. It is then attenuated by R4602/R4603 and re-enters the I.C. at pin 10.

After receiving volume, tone and bass processing, it emerges from pin 15 and input once more to pin 1.

It finally emerges from pins 13 and 20 as the rear Left and Right signals.

These signals are then input to the amplifier IC4700 at pins 1 and 5. This amplifier is identical to IC4500, whose operation has been explained previously.

The outputs from pins 8 and 10 are then output to the surround speakers.

Noise Sequence Operation:

When the Pro Logic Set-Up operation is selected via the on-screen menus, commands from IC001 cause IC4600 to output white noise on each of the channels in sequence for approximately 2 second intervals.

This allows the customer to independently alter the volume level of each channel to obtain the correct overall balance.

Effects Mode:

This television has 4 effects to choose from; HALL, DISCO, STADIUM and ARENA.

HALL and DISCO:

When these modes are chosen the Left and Right inputs to pins 9 and 10 of IC4600 are output from pins 36 and 37 without any decoding.

They are then input to pins 8 and 9 of IC4601 and then follow the processing procedure previously explained to be output to the left and right speakers.

The Left and Right outputs from IC4600 are also used to produce the centre channel in these modes.

The Left and Right outputs are added together by Q4600 and Q4601, then input to pin 3 of IC4603. The internal switching matrix of IC4603 outputs this centre channel from pin 24. It is then processed and output to the centre speaker as previously explained for centre channel operation.

The surround channel is processed in IC4601 by adding the Left and Right signals for HALL mode, or the Left minus Right signals for DISCO mode.

The surround channel is output from pin 13 after passing through a 7KHz low pass filter stage and a 30m Second delay stage.

It is then input to pin 5 and due to the internal switching matrix is output from pin 9. After attenuation by R4602/R4603 it is returned to pin 10, then follows the path previously explained to be output to the rear surround speakers.

STADIUM and ARENA:

The Left and Right signals are processed and output to the speakers as explained for the HALL and DISCO modes. The only difference is that in the ARENA mode, a -4dB of reverb is added to produce the required effect.

The surround channel is processed and output as explained in the HALL and DISCO mode, but has a 60m Second delay added to produce the desired effect.

Note: In the STADIUM and ARENA mode, there is no centre channel required.

Power Supply and protection:

The power supply on this chassis is a self oscillating supply, with a variable frequency and pulse width.

The A.C. supply is rectified by D901 - 04, and produces 300v which is used to power Q903.

Current flowing through R901/R902 causes Q903 to initially turn on, secondary voltages are then induced in T901, and a feedback voltage obtained via D906, L903 etc., is applied to the base of Q903, thereby maintaining the transistors operation.

This circuit self oscillates at a frequency determined by the inductance of the transformer, the A.C. mains voltage, and the load conditions etc.

The transistor Q901 is held at negative potential to ensure a good turn off response of the Q903 stage.

D907 and D908, connected between the base and emitter of Q903, offer protection to Q901 / Q902 stages should Q903 become short circuit.

The secondary voltage induced in T901 winding 11/14 is rectified by D950, producing the H.T. voltage of 150v, which is smoothed by C953. This voltage is reduced to 135v during the standby condition.

Winding 9/14 produces approximately 12.5v via D951, which is smoothed by C954. This is then applied to IC950 and Q950.

IC950 produces the +5v supply which ensures that the micro processor remains operational whilst the T.V. is in its standby mode.

Q950 is a mosfet switch, which produces the +12v chassis supply, and the header voltage for IC951/IC952. These produce the +5v and +8v supplies required by this T.V.

Winding 7/8 produces approximately +25 via D952, which is smoothed by C967 and applied to Q960. This provides the audio output stages of IC4500/IC4550 with the required +25v.

H.T. regulation is controlled by Q954 stage. The base of Q954 is set to a predetermined level by the resistor network of R950, VR950 and R953. During normal operation, R954 is effectively out of circuit due to Q953 being turned on.

The emitter of Q954 is held at approximately 6v2 by ZD950. Should the H.T. level rise, the base voltage becomes more positive than the emitter, and this difference is amplified by the transistor and applied to opto-coupler IC901. The output produced from IC901 is applied to the transistor network Q901/Q902. This network governs the ON time of Q903, thereby controlling the H.T. level and hence maintaining H.T. regulation.

ZD951 is added to the H.T. rail after the filter L950. This zener offers protection to the H.T. circuits should the H.T. level rise excessively.

Q955 offers protection for the low voltage supplies of +5v, +12v and +27v etc. Should one of these supplies become short circuit, the base of Q955 will be pulled low via the relevant diode/resistor network: D959/R960 for the +12v supply, D961/R962 for the +5v and D960/R961 for the 8V supply. The low will then cause Q955 to turn on, applying a voltage to the gate of thyristor Q958, which then turns on and effectively removes the drive to Q952. As a result Q951 turns off, removing the +12v, +8v and +5v supplies, thereby placing the T.V. into the standby lockup mode.

N.B. Once the fault is cleared, the T.V. must be switched off using the ON/OFF switch order for the micro processor to reset and clear the standby lockup mode.

When the standby command is transmitted from the remote control handset pin 12 of IC001 becomes "low". This is then applied to the base of Q952 via R975, R972, turning the transistor off. As a result, Q951 becomes non operational, removing the +12V, +8V and +5V supplies. Consequently the deflection stages of IC501 are shut down, and EHT generation will cease until the standby command is removed.

Also, when Q952 is turned off, D969 ceases to conduct, and a voltage is then applied to the base of Q959 via R996, turning the transistor on. Q960 will then turn off, thereby removing the +25v supply from the audio output stages, ensuring that no noise is generated during the standby condition.

When in standby, the drive to Q953 is removed, turning the transistor off. R954 is then added to the potential divider network at the base of Q954, changing the drive to the opto-coupler IC901. The overall result is to reduce the H.T. voltage during the no load conditions created during standby.

Finally, when in standby, the +12v supply to IC902 is removed, as a result ZD905 will then follow the mains input sine wave to control the switching of Q904. Therefore R910 is held low for half a cycle, thus limiting the power to the secondary of T901, and maintaining regulation at minimum load conditions, this is known as burst fire mode. IC953 basically consists of 4 comparator stages.

Comparator 2 monitors the peak output voltage of the 12.5V winding at pin 9 of T901. This pin mirrors the A.C. input level, so a mains interruption can be detected before the low voltage supplies go out of regulation. Should an interruption occur, the voltage supplied to pin 7 of IC953 will fall below the reference voltage at pin 6 of IC953 (which is set by IC954). pin 1 of IC953 (known as the "POWER GOOD" line) is pulled "low", this "low" is then fed to IC001 pin 1, thereby causing a software reset to occur with in the micro processor .

Comparator 1 monitors the audio stages, potential divider networks R940/R902 and R904/R933 sample the voltage across R941 and supply pins 4 & 5 of IC953 respectively. Should the audio current increase to a high value, pin 2 will be pulled low. Pin 8 of IC953 will be pulled low via D971, as a result pin 14 is allowed to rise, the threshold value of ZD961 is exceeded, and a voltage is applied to the gate of thyristor Q958. This turns on placing the set into its standby lockup mode as previously described .

Comparator 4 monitors the deflection output stages. The potential divider networks R986/R987 and R932/R989/R730, set the bias levels of pins 10 & 11 of IC953 respectively. R703 samples the current flowing through the emitter of Q751, if the current rises due to a layer short within the FBT or excess current is taken by one of the transformers secondaries the voltage drop across R730 will increase causing pin 11 to rise above the reference voltage of pin 10. As a result pin 13 will be allowed to rise, applying a "high" to pin 9 of IC953 causing it to exceed the reference voltage at pin 8 as a result pin 14 rises triggering the standby lockup condition.

Comparator 3 monitors the 200V supply to the CRT base as this will rise proportionately with the H.T. potential divider network R718/R749/R719 sample the 200V supply the output taken from the junction of R749 and R719. This is fed to ZD717 which is a 36V zener diode, when its threshold voltage is exceeded a "HIGH" is supplied to IC953 pin 9 causing it to rise above the reference level at pin 8, as a result pin 14 goes "HIGH" put the set into it's standby lockup condition.

Sub Power Supply:

From switch on the A.C. voltage is rectified by D9001 - D9004, and produces approximately 300v at C9002. This is then applied to the collector of Q9000 via the primary winding of T9000.

The voltage at pin 7 of IC9000 will rise to approximately 16v via R9000 and D9005. This allows the internal circuitry of IC9000 to create a sawtooth waveform, from which a squarewave output is obtained at pin 6.

This output causes the F.E.T. Q9002 to turn on and off, producing an output in the secondary windings of T9000.

After initial startup, the operation is maintained by the feedback from the bias winding 13/14 of T9000. This is fed via R9001, L9001 and D9006 to pin 7 of IC9000.

ZD9000 and D9010 are protection diodes, and prevent the voltage levels from rising to a point where damage could occur to IC900 and Q9002.

A current sense circuit exists at pin 3 of IC9000, and this is used to monitor primary current. A voltage proportional to the primary current is obtained across R9005, which is then applied to pin 3 via R9008. C9005 is used to suppress the leading edge of this waveform to remove any switching noise that may occur. The voltage at pin 3 is compared to an internal reference voltage of approximately 0.8v, and should the voltage at pin 3 rise above this, the pulse width output from pin 6 is limited. In this way Q9002 is offered protection from changes in primary current.

R9023, C9013 and D9011 act as a soft start circuit. This circuit limits the duty cycle from pin 6 during the initial start up period, thus allowing a gradual rise to full output. Overvoltage in the primary winding is sensed by the bias winding. This rise is fed via R9001, L9001, D9013 and R9021 to pin 2 of IC9000. If this voltage rises above the internal reference voltage, the output from pin 6 will be limited by the internal error amp, therefore clamping the secondary voltage to a safe level.

There are two supply voltages generated by the secondary windings of T9000. D9100 provides the rectified +26v, which is smoothed by C9100, and D9101 provides a supply of +9.5v, which is smoothed by C9101. IC9102 ensures that the +9.5v supply remains stabilised. Should the +9.5v supply rise excessively, the voltage supplied to IC9100 via R9103 will increase, and once it exceeds the internal reference voltage, IC9100 will conduct, thus turning on the opto-coupler OP9000. This causes a decrease in the level at pin 1 of IC9000, which then reduces the pulse width output of the I.C., thereby offsetting the original rise in the +9.5v supply.

During the standby condition, the +8v on the main power supply is removed. As a result, the voltage drive to the base of Q9101 disappears, turning the transistor off.

Q9100 will then turn on due to the voltage supplied via D9103 and R9110, and as a result, the opto-coupler will remain permanently on. Pin 1 of IC9000 is therefore held at a low potential, and no output will exist at pin 6. Consequently, the secondary voltages of +26v and +9.5v are removed for as long as the standby condition exists.

Whilst in standby mode, the supply for the opto-coupler is obtained from R987 on the main power supply, then fed via D9103 and R9106 to pin 1 of the opto-coupler.

4. DEFLECTION CIRCUIT OPERATION

Horizontal and Vertical Timebase.

The deflection processor IC501 provides both a sync separator and a horizontal and vertical output driver ports. The sync separation is obtained using the video signal supplied to the video input at pins 26 of IC501.

The horizontal frequency is obtained from X501, connected to pin 30 of IC501. It is then applied internally to a divider/countdown circuit from which both the horizontal and vertical frequency is obtained. Using this method has the advantage that no external frequency adjustment is required.

The horizontal output drive pulse is made available via pin 18 of IC501, and the vertical output drive waveform is via pins 15 and 16 of this device. These outputs are asymmetrical current driven output ports. With respect to the parabola generation, for use with the correction of geometric errors of the picture tube. This function is generated within IC501 and is output via pin 17 of IC501.

Since IC501 is under full control of the I²C bus the register values for such functions as Vertical Amplitude, Horizontal Width, E/W Geometry e.t.c. can all be adjusted within the service option menu.

Deflection Output Stage.

The horizontal deflection output drive waveform from pin 18 of IC501 is applied to the base of Q705 which acts as a non inverting buffer and is then applied via a speed up network to the base of Q701. T702 couples the output from Q701 to the line output transistor Q751. Both these transistors are powered by the H.T. Voltage supply (Approximately 150V).

A line pulse available at pin 1 of the flyback transformer is rectified by D702, and supplies (Approximately 180V) to the power transistors on the C.R.T. base.

Under certain fault conditions, i.e. increased HT or reduced value of tuning capacitor (C704) e.t.c., an excessive E.H.T. could be developed. To prevent this happening, the rectified voltage of D702 is fed via the potential divider R718, R719 to ZD717 which feeds into the comparator IC953 on pin 9. If this voltage exceeds the desired threshold set by pin 8 the output of the comparator will cause the output of the comparator to go high causing the protection circuit to fire.

Vertical E/W Output

The vertical and E/W output stage are combined within IC601.

The vertical driver circuit is a bridge configuration. The deflection coil is connected between the output amplifiers, which are driven in phase opposition. An external resistor placed in series with the deflection coil R602, R603 provides internal feedback information. As stated earlier the differential output circuit of IC501 pins 15 and 16 drive directly into the differential input circuit of IC601 pins 1 and 2. Although an external resistor R601 is placed across the differential inputs and determines the output current through the deflection coils.

The device has two supplies. The first being the pin 4 supply voltage which is derived from the 27V winding on the FBT which is dropped and applied to a 18V regulator IC602 the output of which is then applied to pin 4 of IC601.

With respect to the Flyback generator voltage this is also generated from the 27V winding on the F.B.T. by use of a voltage doubler circuit. This voltage is then applied directly to pin 8 of IC601.

The East West Amplifier is also incorporated into the vertical output I.C. IC601. This amplifier is an inverting amplifier which is current driven with sink current capabilities. The parabola generated from IC501 pin 17 is fed directly to pin 11 of IC601 whilst the output of this inverting amplifier is connected via L751 to the centre of the diode modulator circuit.

5. TELETEXT

Teletext circuit consists mainly of three IC's:

IC2201 Data slicer

IC2202 Decoder

IC2210 Memory

The required video is output from IC301 pin 17, passed through a potential divider to emitter follower Q307. It is then fed to IC2201 via pin 12 of the text panel connectors. The video then passes through resistor R2213 and is then split up, the text data passes through C2204 to pin 3 of IC2201, and the synchronisation pulses pass through C2205 to pins 1 & 2 of IC2201.

The crystal X2201 provides the required oscillator for IC2201, from this a clock output is made available from pin 15 IC2201, which is then applied to pin 9 of IC2202.

IC2201 has two main functions, the first is to acquire the teletext information which it does from the video input to pin 3, secondly to supply a composite sync. signal derived from the inputs into pins 1 & 2.

The sliced teletext clock and data information is output from pins 12 & 13 of IC2201 and input to pins 12 & 11 of

IC2202 respectively. The sync. output from Pin 19 is input to IC2202 pin 3.

There is a window function that gives a pulse that enables the decoder to look at possible text lines and therefore the decoder will not look at lines where no window function is present.

IC2203 performs the reset function for IC2202 when the set is turned on, or brought out of standby. Until the voltage at pin 1 of IC2203 reaches 4V5, pin 3 remains "low", and this is applied to pin 29 of IC2202, initiating the reset condition. When pin 1 exceeds 4V5, the "low" is removed from pin 3 of IC2203 allowing pin 29 of IC2202 to become "high" by pull up resistor R2209, releasing the reset condition.

IC2210 is the memory, this stores all the relevant information for the operation of favourite pages etc.

All the text and On Screen Display functions are controlled by the I2C bus which is input to IC2202 at pins 36 and 37. IC2202 requires a horizontal pulse to be input to pin 33 and a vertical pulse to be input to pin 34, to determine the position of the text and On Screen Display.

When text is selected the RGB is output from pins 20, 18 & 16 of IC2202, as well as a "HIGH" from pin 15 of IC2202 this is fed to IC505 pin 1, which then connects the R2G2B2 inputs on pins 2, 3 & 4 of IC505 to the outputs to the CRT base. When the OSD or mix mode are used the only difference is the blanking from pin 15 of IC2202 is a 5Vpp pulsing waveform as opposed to a DC "HIGH" (5V) voltage.

Points to watch

If the text circuit fails it is possible that no picture is present even though the power supplies and video path appear to be functioning normally. It is also possible that the text circuit can "LOCK UP" the 12C causing the set to appear to be permanently in standby.

6. Picture in Picture circuit: (77 series models only)

This circuit allows the user to view an input from external equipment for example, whilst watching a normal T.V. broadcast.

The external signal will appear in a sub-picture box in one corner of the screen. It can then be moved around the 4 corners of the screen, or by using a "swap" function, the main picture and the external picture can be reversed, i.e. the external picture will fill the screen, whilst the T.V. broadcast will be displayed in the box.

The selected external signal source is input to IC301 as explained previously, and a composite signal is obtained from pin 16. If the external source is an S-VHS signal, the luminance signal will be output from pin 16, whilst the chrominance component will be output from pin 18.

The composite/luminance signal is then input to pin 23 of IC5101 for the luminance and pin 26 of IC5101 for the

composite video via Q5109. The chrominance signal is input to pin 22 via Q5110.

IC5101 will then process the signals and output the luminance signal from pin 1, and the R-y and B-y signals from pins 2 and 3. The R-y and B-y signals are then input to the delay line IC5102, with the delayed signals being output from pins 11 and 12. They are then input to pins 30 and 32 of IC5103.

The luminance signal from pin 1 of IC5101 is input to pin 28 of IC5103 via Q5101/Q5012 stage.

The R-y, B-y and luminance signals are then processed and mixed in IC5103 to produce red, green and blue outputs from pins 7, 8 and 9. These are then input to the switch IC5104 at pins 1, 4 and 6, then output from pins 11, 13 and 16.

They are then applied to IC505 on the signal panel.

When the picture in picture command is received, a blanking output is obtained from pin 13 of IC5103, input to pin 8 of IC5104, and output from pin 9.

This is then applied to pin 13 of IC505, causing IC505 to output the picture in picture box (containing the R.G.B. information) at a position determined by the software commands received by IC5103.

The actual position of the picture in picture box is determined by the horizontal and vertical blanking inputs from the deflection circuits, and the sub-horizontal and subvertical inputs generated by IC5101.

A sandcastle output and a vertical sawtooth output is made available from pins 6 and 11 of IC5101. These are processed by Q5103 / Q5104 and Q5105 to produce the H-sub and V-sub blanking inputs at pins 20 and 19 of IC5103.

The horizontal and vertical blanking signals from the deflection circuits are input to pins 17 and 18 of IC5103, with the horizontal input via Q5106/Q5107. These transistors provide some adjustment to the horizontal blanking so that the timing corresponds to the sub-horizontal input at pin 20. These are then processed by IC5103 to determine the position of the picture in picture box on the screen, with the output being made available from pin 13.

R.G.B. equipment can also be selected for picture in picture output. When this is done, the R.G.B. inputs are applied directly to IC5104 at pins 3, 5 and 7.

A "High" is also applied to pin 10 of IC5104, and this changes the internal switching so that the R.G.B. signals are output from pins 11, 13 and 16.

They are then applied to IC505 for display, as explained previously, the position of the display will be determined by the output from pin 13 of IC5103.

All the operating procedures for IC5101 and IC5103 are governed by the clock and data inputs at pins 4 and 5 of IC5101 and pins 22 and 23 of IC5103. These work in conjunction with the crystal oscillators X5101 and X5103.

ADJUSTMENT

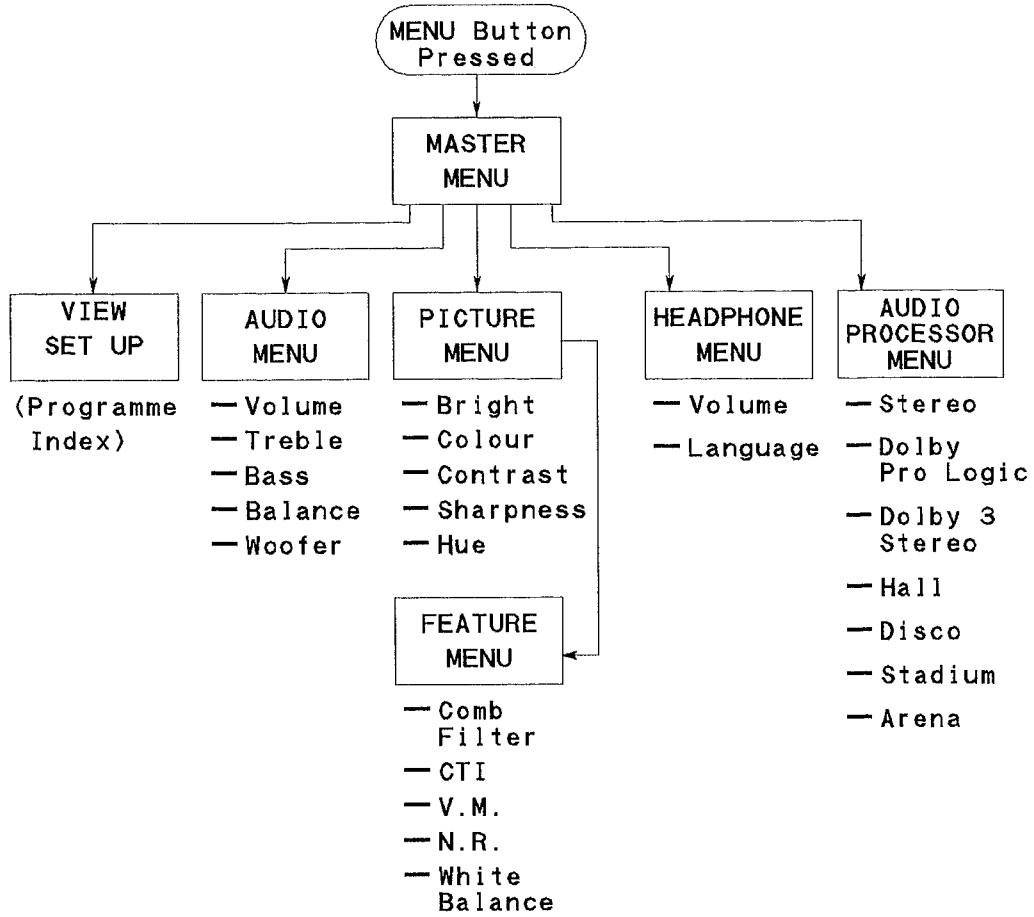


FIG 1. Main A5 Menu Tree

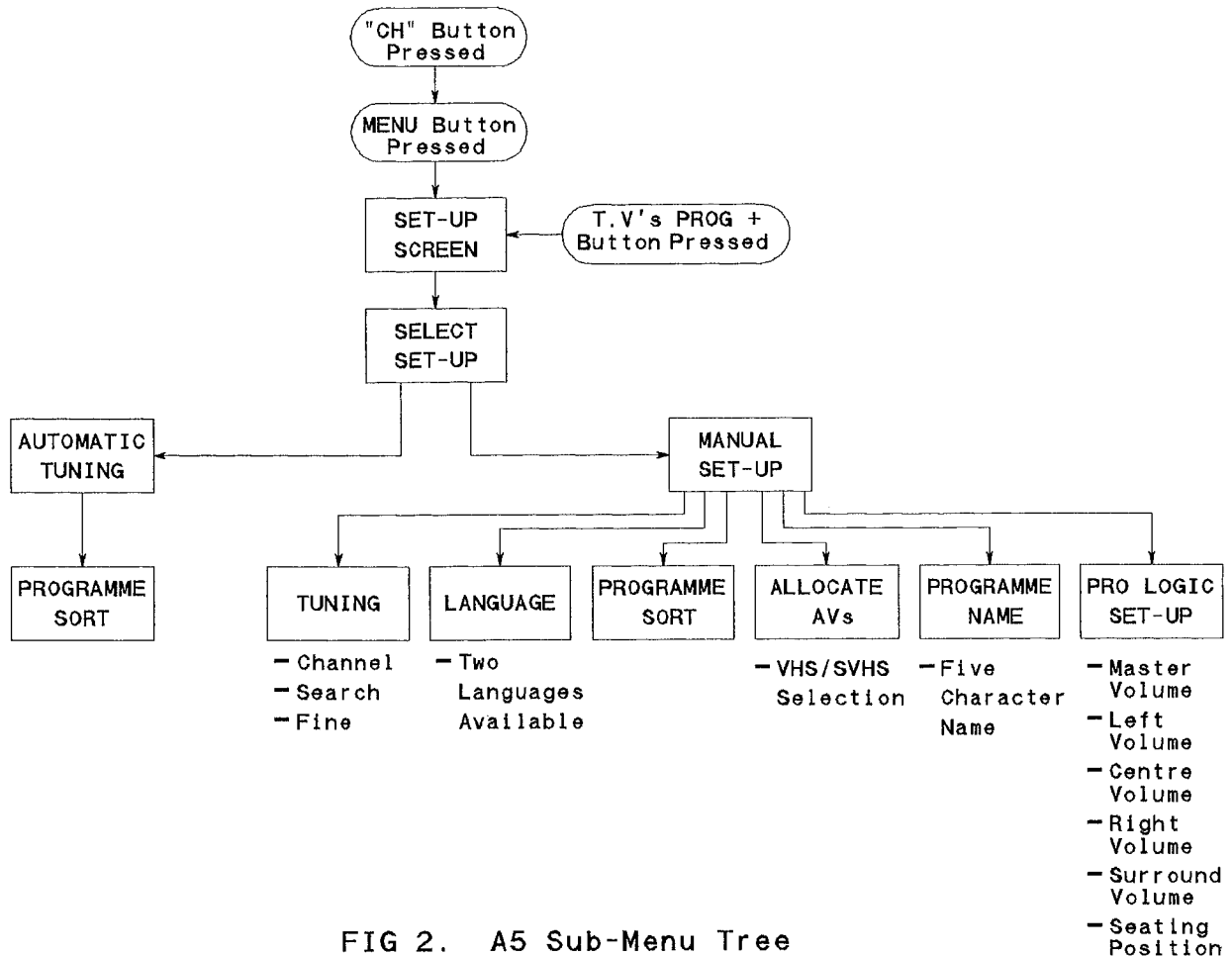


FIG 2. A5 Sub-Menu Tree

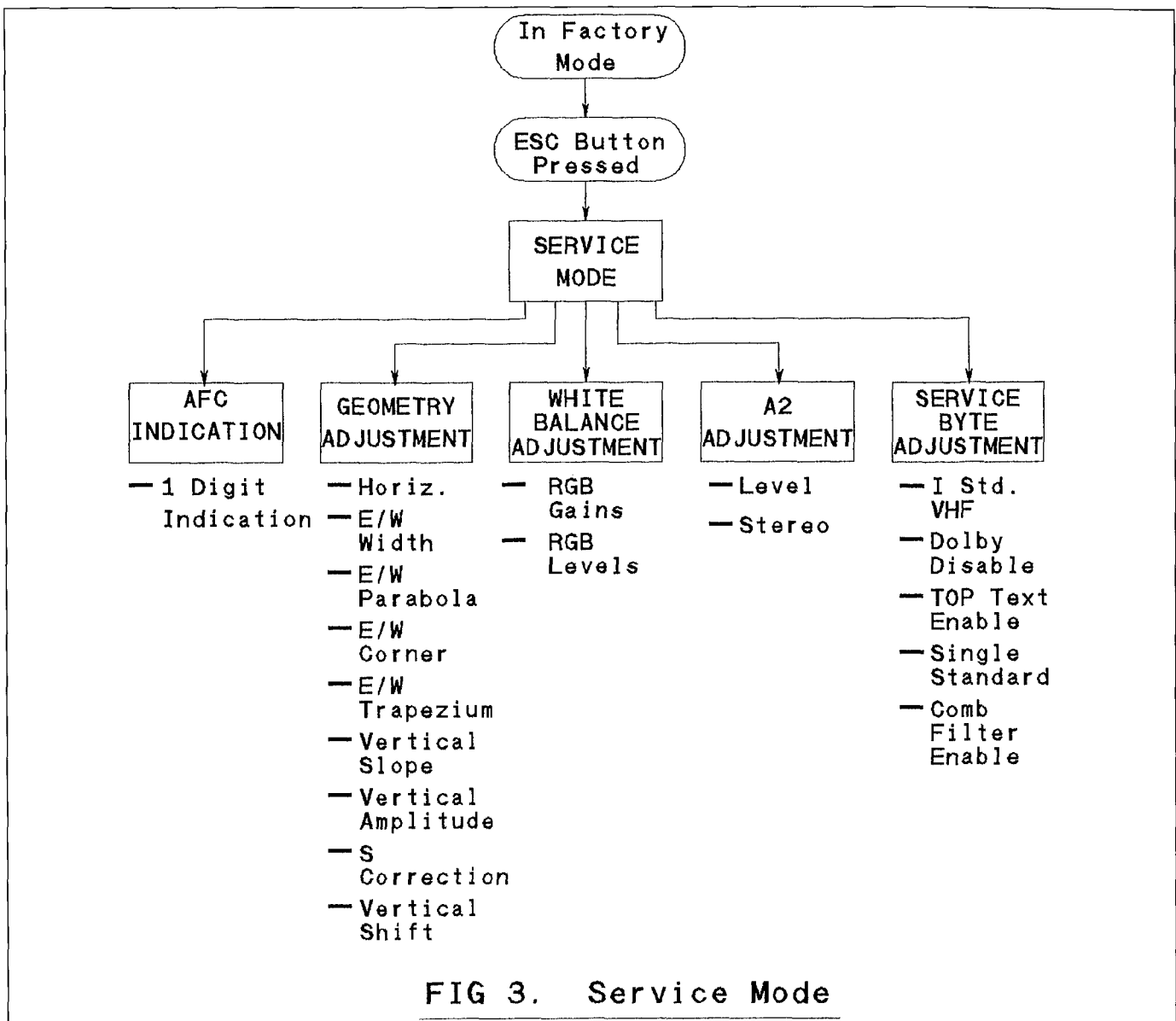


FIG 3. Service Mode

A5 SERVICE MODE OPTIONS

The SERVICE MODE screen is entered by pressing the 'ESC' button underneath the cover on the handset. The T.V. must, however, be in *factory mode* first. The T.V. can be switched into factory mode by pressing both VOLUME +/- buttons on the front of the set whilst it is powering up.

SERVICE MODE			
CODE	V1. F	E2 V1. F	
AFC = 0			
◀	GEOM	Reg.	00 ▶
	GEOM	Value	00
	GREY	Reg.	00
	GREY	Value	00
	A2	Level	00
	A2	Stereo	00
	BYTE		00000000
EXTERNAL I2C			

VERSION INDICATION

- 1) The Version number of the programme code in the EPROM is displayed after the word "CODE".
- 2) The Version number of the data in the external EEPROM (E2) is displayed after the word "E2".

AFC INDICATION

The service engineer can set the AFC coil (L202) without the use of a meter by ensuring that the AFC digit is on the boundary between 2 and 3. The range of the digit is between 0 and 4.

A2 ADJUSTMENT

- 1) The A2 input level can be adjusted to any desired value between 0 and 15 by using the cursor LEFT/RIGHT buttons on the handset. The normal value is 0.
- 2) The A2 Stereo separation can be adjusted to any desired value between 0 and 63 using the cursor LEFT/RIGHT buttons on the handset. The normal value is 0.

GEOMETRY ADJUSTMENT IN SERVICE MODE

GEOMETRY REGISTER NUMBER	GEOMETRY ADJUSTMENT SETTING
00	Horizontal Shift
01	East/West Width
02	East/West Parabola/Width
03	East/West Corner/Parabola
04	East/West Trapezium
05	Vertical Slope
06	Vertical Amplitude
07	S Correction
08	Vertical Shift

GREY SCALE (WHITE BALANCE) ADJUSTMENT IN SERVICE MODE

GREY SCALE REGISTER NUMBER	GREY SCALE ADJUSTMENT SETTING
00	RED Gain
01	GREEN Gain
02	BLUE Gain
03	RED Level
04	GREEN Level
05	BLUE Level

NOTE: These adjustments are for the current selected white balance setting in the FEATURE MENU. The user will have to swap between the FEATURE MENU and SERVICE MODE to adjust all 3 white balance settings (COLD, NORM and WARM).

SERVICE BYTE DESCRIPTION

Factory Mode	Auto Tuning	I Standard	Dolby Disable	TOP Text	Single Standard	NOT USED	Comb Filter
ON	ON	VHF OFF		Enable	Enable		Enable

NOTE 1: The user can NOT alter the FACTORY MODE or AUTO TUNE flags using the left/right cursor buttons on the handset when in SERVICE MODE.

NOTE 2: The Factory Mode flag is set to '1' when the T.V. is in Factory Mode. Factory mode can be entered by pressing

both VOLUME +/- buttons on the front of the set whilst it is being powered up.

NOTE 3: Auto Tune can be enabled so when the T.V. is switched on, it will start tuning in the T.V. (after the user has gone through the INSTALLATION MENU). This flag is enabled when the user presses the STANDBY button or switches the set off when the AUTOMATIC TUNING screen is displayed.

NOTE 4: The I Standard VHF disable flag informs the T.V. whether or not it should begin tuning at 441.10 MHz or 41.10 MHz. If this is set then tuning will begin at 41.10 MHz. If this is '0' and the single standard flag is '1', then tuning will begin at 441.10 MHz instead.

NOTE 5: For the A5 75 Model Range of T.V's, this flag will be set to indicate to the software that no Dolby board is present.

NOTE 6: For sets that should have TOP TEXT available, the TOP TEXT ENABLE flag should be set to '1'.

NOTE 7: For a single standard chassis (CP****TA, CP****TAN, and C****TN) this flag should be set to '1'.

NOTE 8: For A5 25" and 28" models, the COMB FILTER will not be fitted and as such this flag should be cleared to '0'.

The GEOMETRY, GREY SCALE, A2, and SERVICE BYTE values can be stored by pressing the MENU button whilst the SERVICE MODE screen is displayed. If the user makes any mistake, the T.V. (□) button can be pressed to clear the screen. The "ESC" button can then be pressed to re-enter SERVICE MODE again.

A5 CHASSIS ALIGNMENT PROCEDURE

1. APPLICATIONS
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 - 2.1.1 PREPARATION ADJUSTMENT
 - 2.1.2 AGC ADJUSTMENT
 - 2.1.3 AFC ADJUSTMENT
 - 2.2 FOR POWER AND DEFLECTION
 - 2.2.1 +B VOLTAGE ADJUSTMENT
 - 2.2.2 POWER GOOD LINE
 - 2.2.3 AUDIO FEEDBACK TRIM
 - 2.2.4 HIGH VOLTAGE LIMITER CIRCUIT CHECK
 - 2.2.5 ANODE/FOCUS SHORT-CIRCUIT TEST PROTECTION CIRCUIT
 - 2.2.6 SUB PSU +9.5 V VOLTAGE SET
 - 2.2.7 BASIC TEST SPECIFICATION
 - 2.2.8 PRIMARY CURRENT LIMIT (C28300 ONLY)
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4. PIN P ADJUSTMENT
5. ADJUSTMENT POINTS
6. SERVICE BYTE ASSIGNMENT INFORMATION

1. APPLICATIONS

THIS SPEC. SHOULD BE APPLIED TO C2576/77TN AND C2876/77TN (28300)

2. P.W.B ASSEMBLY ADJUSTMENT

2.1 FOR SIGNAL

2.1.1 PREPARATION ADJUSTMENT

- (1) +B adj. VR950.....Centre
- (2) Screen VR (FBT)Counter-clockwise fully
- (3) Turn on set. Adjust +B to approximately 150V. (Pre adjustment only - full adjustment in section 2.2.1)

2.1.2 AGC ALIGNMENT

- (1) With the signal received, apply heat run for more than two minutes to avoid the influence of circuit temperature drift.
- (2) Connect a voltmeter of at least 100K internal resistance to the A.G.C. terminal of the tuner.
- (3) Receive the channel below.
- (4) Adjust A.G.C. potentiometer VR201 until the following voltage is obtained.

	Receive signal		Voltage setting (V)
	CH	Level	
UK	40	+60dBuV	6.8 ± 0.1V
Export	40	+60dBuV	8V ± 0.1V

2.1.3 AFC ALIGNMENT

L202 ALIGNMENT

- (1) apply relevant RF signal.
Circle Pattern
- (2) on dual/multistandard receivers select BG standard.
- (3) Enter frequency on CTV controls to ensure AFC loop is off.
- (4) Connect oscilloscope and voltmeter to pin 23 IC201 (TDA9815) or pin 13 (TDA9800).
- (5) Adjust L202 until fast rate of change is seen on the oscilloscope.
- (6) Adjust L202 so that the voltmeter reads $2.5V \pm 0.2V$.

VR202 Alignment (CL**76/77TAN only)

- (1) Apply L standard RF signal.
- (2) Select L standard on CTV controls (system L VHF band 1).
- (3) Enter frequency on CTV controls.
- (4) Connect oscilloscope and voltmeter to pin 23 IC201.
- (5) Adjust VR202 until a fast rate of change is seen on the oscilloscope.
- (6) Adjust VR202 so that the voltmeter reads $2.5V \pm 0.2V$.

2.2 POWER AND DEFLECTION ADJUSTMENT

2.2.1 +B VOLTAGE ADJUSTMENT

- (1) AC input voltage = $230V + 5V/50Hz$.
- (2) Turn +B voltage VR (VR950) to mid-point (if pre-adjustment not done).
- (3) Receive Philips circuit pattern. Switch on chassis and set the brightness and contrast to maximum.
- (4) After applying heat run for 30 sec. or more, turn VR950 gradually and adjust +B (re-check after 2 minutes heat run).

Measuring point: +B voltage C955 + side
gnd C955 - side

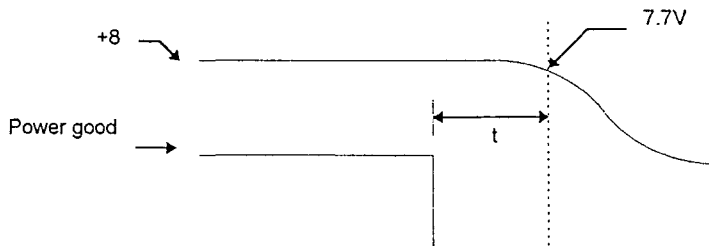
- (5) Set the value of +B voltage to the value shown in the table below.

Model	+B Voltage (V)
C2577 C2576	$150 \pm 0.2V$
C2877 C2876 C28300TN	$150 \pm 0.2V$

- (6) Short circuit test (all rails). PSU should go into standby/reset/lockup. (Supply may have to be removed to restart)
- (7) Standby check. +B should go to $120V < +B < 140V$. +8, +5, +12V should be 0V.

2.2.2 POWER GOOD LINE

- (1) Set picture to same conditions as above.
- (2) Measure pin 1 PL951. Should be HI, if LOW then cut R945 (if fitted).
If HI but no power down timing (see below) then cut R991.
- (3) Check power down logic timing ($>5mS$).



$t = >5mS < 500mS$

2.2.3 AUDIO FEEDBACK TRIM (For sound on vision)

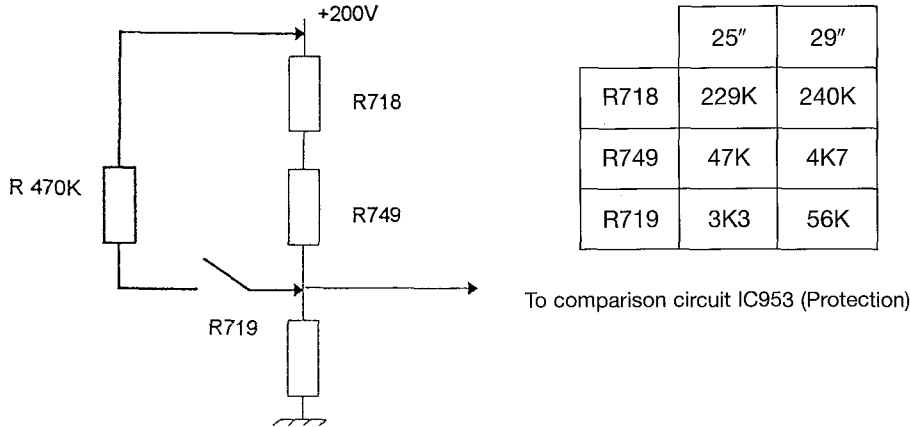
If sound on vision is seen with maximum bass 1/2 volume on normal Picture-STEREO Sound then cut trim resistor R969A (to change R969 value to 22K)

2.2.4 HIGH VOLTAGE LIMITER CIRCUIT CHECK

- (1) Mount the PW board to the set and adjust normally.
- (2) Receive the circle pattern signal.
- (3) Set the contrast and brightness to maximum.
- (4) Add R=470K in parallel with R718 and R749.
- (5) Check that picture and sound disappear when R is added.

NOTE:

High voltage limiter circuit jig:



2.2.5 ANODE/FOCUS SHORT-CIRCUIT TEST PROTECTION CIRCUIT CHECK

- (1) Receive the circle pattern signal.
- (2) Set the contrast/brightness to maximum.
- (3) Check trip point by adding an external D.C. supply across R730.
The set should not trip when a 0.8V supply is added.
The set should trip when a 1.2V supply is added.

2.2.6. SUB POWER SUPPLY ADJUSTMENT

- (1) Switch on power supply (mains input 230V \pm 5V 50Hz).
- (2) Measure +9.5V output. If output is greater than 9.8V then cut R9107 (220K 1/4W).
- (3) Re-check +9.5V output: output must be +9.5V \pm 0.3V.

2.2.7. SUB POWER SUPPLY TEST

Test for	TEST SPECIFICATION		TEST LOAD	
	+9.5V	+26V	+9.5V	+26V
(1) Load regulation	+9.5V + 0.3V - 0.7V	+26V+4V-1.5V	Max	200mA
(2) Voltage regulation	+9.5V + 0.3V - 0.7V	+26V+4V-1.5V	Min	50mA
(3) Ripple voltage (at 200V VAC IN)	300mV	400mV		2A
(4) Short circuit +9.5V and +26V	No Failure	No Failure		0.1A
(5) Standby (all rails should be at 0V)	0V	0V		
(6) Remote on/off operation	Hi/Low	Hi/Low		

2.2.8.C28300 POWER SUPPLY SETTING (MAIN BOARD)

- (1) Connect DVM to +B line.
- (2) Adjust a.c. mains input to 190V a.c.
- (3) Adjust VR923 and VR950 to mid-point positions.
- (4) Turn TV on and adjust VR950 until +B is as per table below.
- (5) Switch TV into standby.
- (6) Connect load A across C955 and load B across C967.
- (7) If set trips out with loads A and B then go to step 8, if not, then adjust VR923 clockwise until TV shuts down.
- (8) Disconnect a.c. mains input and loads A and B.
- (9) Connect load C across C955 and load D across C967.
- (10) Connect a.c. mains input.
- (11) If P.S.U. remains operative when switched on with loads C and D connected then alignment is correct.
- (12) If P.S.U. shuts down then alignment is incorrect. (Adjustment complete).
- (13) Disconnect a.c. mains input and loads C and D. Adjust VR923 to mid. point position and proceed from step 5.

MODEL	+B
C28300	149.8 → 150.2V

LOAD A: +B LOAD = 180R 123W (149V)

LOAD B: AUDIO LOAD = 10R 62W

LOAD C: +B LOAD = 200R 111W (149V)

LOAD D: AUDIO LOAD = 11.4 54.8W

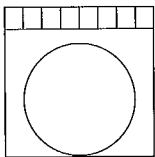
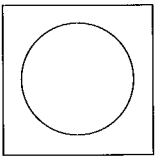
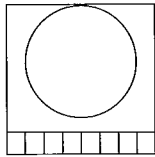
3.1 PICTURE POSITION/SHAPE

3.1.1 HORIZONTAL PHASE

VERTICAL CENTRE

VERTICAL AMPLITUDE

- (1) Wait 5 minutes minimum after switching on the mains before adjustment.
- (2) Receive the Philips circle pattern.
- (3) Set brightness and contrast to maximum.
- (4) The set should face North or South.
- (5) AC input should be 230V ± 5V 50Hz.
- (6) Adjust software control in service mode using appropriate controls.
- (7) Adjust control so that the centre of the picture is as in the diagram below.

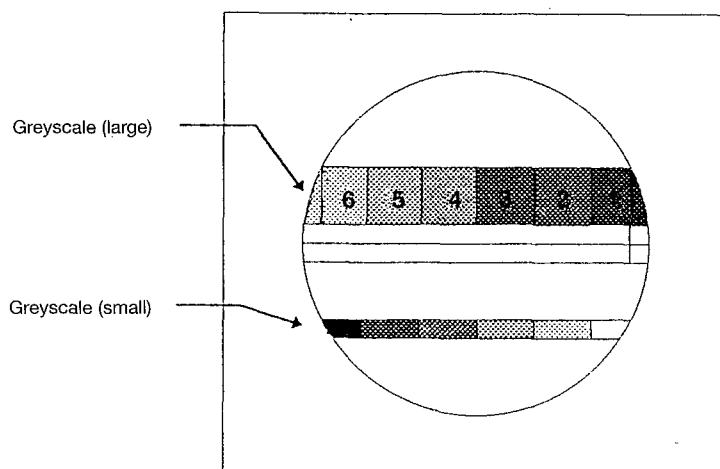
	Picture too low	Standard	Picture too high
Picture Condition			
Size	Adjust until upper part of castellations disappear.	Adjust until both sides of castellations disappear.	Adjust until lower part of castellations disappear.

3.1.2 TILT PARABOLA WIDTH

- (1) Allow 5 minutes warm up time before adjustment.
- (2) Receive Philips circle pattern.
- (3) Set brightness and contrast to nominal.
- (4) The set should face North or South.
- (5) AC input should be $230V \pm 5V$ 50Hz.
- (6) Adjust software in service mode using handset so that the vertical lines at the outside edges of the screen are adjusted to be roughly vertical.
- (7) Adjust the software in service mode using handset so that the (approximately) vertical lines at the sides of the screen are adjusted as vertical as the centre of the screen.
- (8) Adjust the software in service mode using handset so that the castillations at the sides of the picture are not quite visible. Reduce the brightness and contrast to make sure that the picture width has not reduced so that you can see beyond the castellations. You may have to repeat stages 6 and 7 again.

3.2 FOCUS ADJUSTMENT

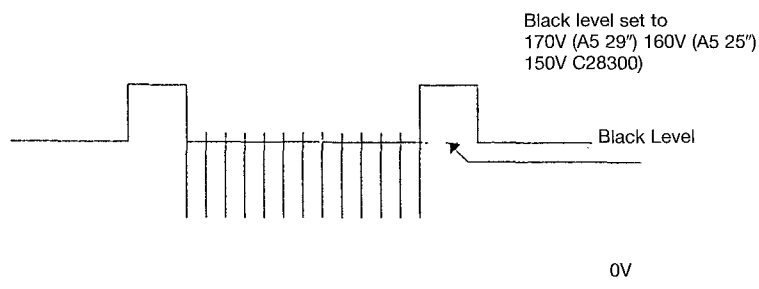
- (1) Receive the Philips circle pattern.
- (2) Adjust after horizontal/vertical has been adjusted.
- (3) Switch the received signal to the cross hatch signal.



- (4) Turn the focus VR gradually clockwise from the full counter clockwise position so that the focus of the vertical line in the centre part, furthest to the right is adjusted for best result (contrast - maximum, brightness - normal).

3.3 CUT-OFF ADJUSTMENT

- (1) Rough adjustment.
 - (1.1) Set to video mode with no signal.
 - (1.2) Turn screen pot of FBT until flyback lines disappear.
- (2) Fine adjustment
 - (2.1) Set contrast to min, brightness to mid, colour to mid.
 - (2.2) Receive cross hatch pattern.
 - (2.3) Connect probe to CRT green cathode.
 - (2.4) Adjust screen pot until black level is 170V (29") 160V (25") 150V C28300).



3.4 WHITE BALANCE ADJUSTMENT (After cut off set correctly)

- (1) Set white balance to 'Norm' in picture (enhanced features menu).
 Contrast - Minimum
 Brightness - Mid. Point (fine adjust using colour analyser)
 Colour - Mid point
- (2) Adjust red and blue level registers of TDA4780 to get correct low light according to colour temperature required (9300K or 7400K). See tables below.

7400K 'Norm' X - 304. y - 320

Colour Temp.	Red Gain	Green Gain	Blue Gain	Red Level	Green Level	Blue Level
Cool ~ 9300K	36	30	26	P-9	20	Q+12
Norm 7400K	40	30	18	P	20	Q
Warm ~ 6500K	43	30	16	P+7	20	Q 3

P and Q adjusted for correct reading on colour analyser in Norm mode. For Warm and Cool modes use offsets in table but do not adjust for exact colour temperatures.

C28300 9300K

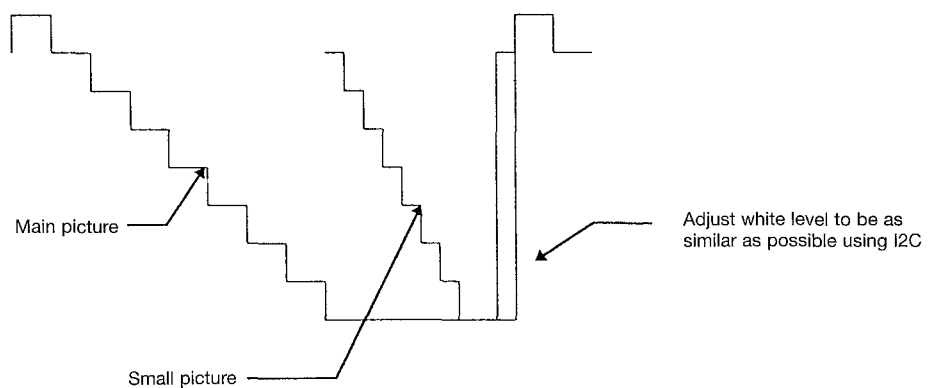
9300K 'Norm' X - 284. y - 299

Colour Temp.	Red Gain	Green Gain	Blue Gain	Red Level	Green Level	Blue Level
Cool ~ 10000K	32	30	20	P-7	20	Q+5
Norm 9300K	36	30	26	P	20	Q
Warm ~ 7400K	40	30	18	P+7	20	Q-12

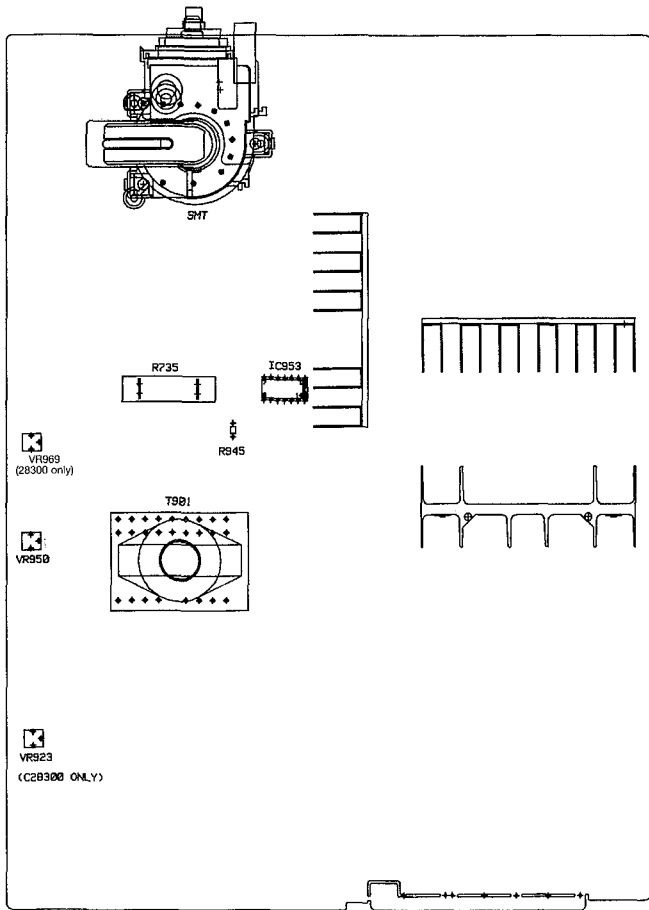
P and Q adjusted for correct reading on colour analyser in Norm mode. For Warm and Cool modes use offsets in table but do not adjust for exact colour temperatures.

4. PinP ADJUSTMENT

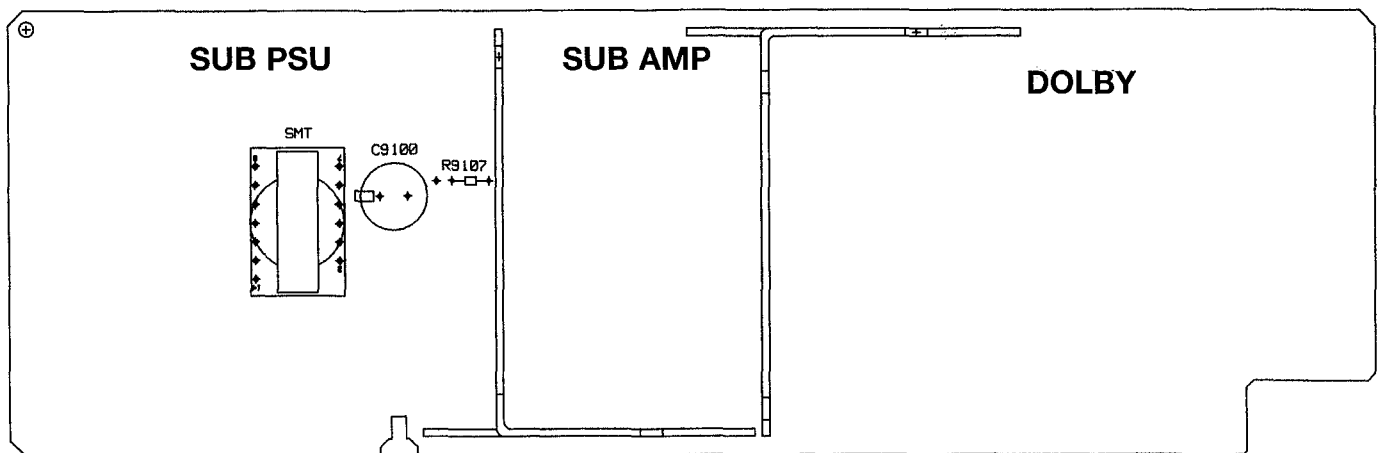
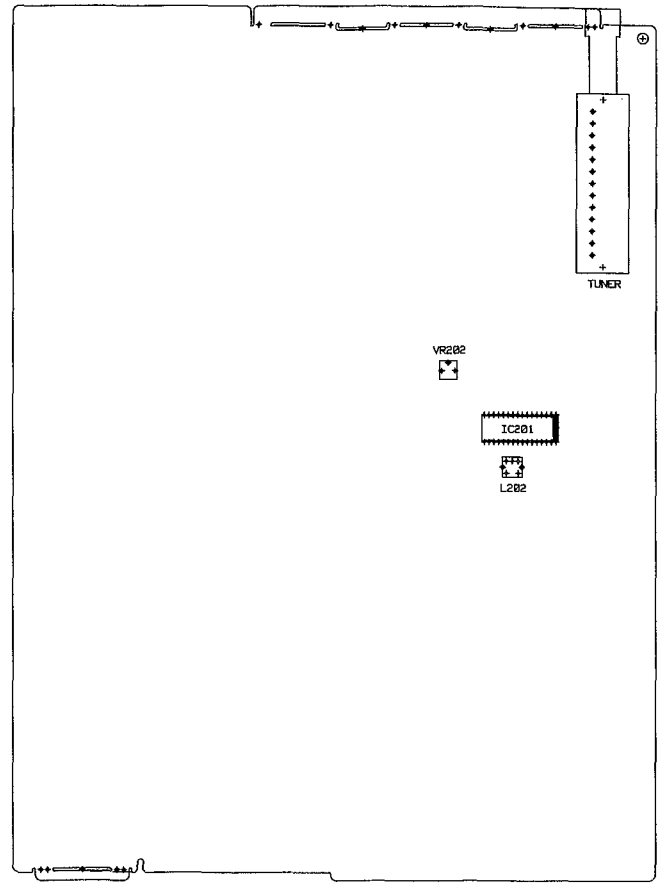
- (1) Receive grey scale pattern (more than 8 steps).
- (2) Connect oscilloscope to CRT green cathode.
- (3) Turn on PinP using handset and move to bright side of screen.
- (4) Adjust PinP contrast as follows.
 Contrast values stores in E² and will, indirectly, adjust PinP contrast. PC software may become available later.



POWER/DEFLECTION/AUDIO



SIGNAL



VOLTAGE MEASUREMENTS

IC001			
PIN	VOLTAGE	PIN	VOLTAGE
1	4.3V (Power good)	29	Use scope D1/A1
2	0V (AVI switch)	30	Use scope D2/A2
3	4.7V (R/C input)	31	Use scope D3/A3
4	0V (AV2 switch)	32	Use scope D4/A4
5	Use scope shift clock	33	Use scope D5/A5
6	Use scope shift clock	34	Use scope D6/A6
7	N/C	35	Use scope D7/A7
8	0V Mute	36	GND
9	Use scope shift enable	37	GND
10	5V D.EN.	38	GND
11	0V Customer mode (5V Service mode)	39	5V P/D
12	4.7V Out of ST.BY (0V in stand by)	40	4.7V SDA
13	1.7V OSC.OUT	41	4.7V SCL
14	0V VSS	42	5V VDD
15	0V Vss	43	5V VDD
16	Use scope OSC.Out	44	Use scope A5
17	N/C	45	Use scope D5
18	5V Reset	46	Use scope R\W
19	5V A8	47	Use scope SDI
20	5V A9	48	0V LED DIM (Norm 5V LED Bright stand by)
21	5V A10	49	N/C
22	0V N/C	50	N/C
23	5V A11	51	4.6V Mode switch position A
24	0V A12	52	V VOL-
25	0V A13	53	5V VOL+
26	5V A14	54	5V PROG -
27	0V A15	55	5V PROG +
28	Use scope D0/A0	56	5V SVHS switch (0V when SVHS plug inserted)

Pins marked as "use scope" are digital pulses between 0V and 5V giving irratic readings using a multi-meter or digital multi-meter.

IC002			
PIN	VOLTAGE	PIN	VOLTAGE
1	5V (Vcc)	17	2.7V (D0)
2	4.7V (P/D)	18	1.9V (D7)
3	1.4V (A9)	19	1.7V (D6)
4	3.3V (A8)	20	2.5V (D5)
5	1.9V (A4)	21	1.7V (D4)
6	2.1 V (A5)	22	0V (CE)
7	1.7V (A6)	23	0V (A15)
8	1.6V (A7)	24	2.2V (OE)
9	1.8V (A0)	25	0V (A14)
10	1.7V (A1)	26	4.4V (A13)
11	1.8V (A2)	27	4.7V (A12)
12	1.7V (A3)	28	3.0V (A11)
13	2.5V (D3)	29	1.4V (A10)
14	2.6V (D2)	30	5.0V (Vcc)
15	2.4V (D1)	31	5.0V (Vcc)
16	0V (GND)	32	5.0V (Vcc)

Voltages taken using a D.M.M. Data (D) and address (A) lines being digital pulse between 0V and +5V.

IC004			
PIN	VOLTAGE	PIN	VOLTAGE
1	1.8V	8	5.0V
2	0.1V	9	5.0V
3	2.7V	10	0V
4	2.3V	11	5.0V
5	1.9V	12	5.0V
6	0.1V	13	0V
7	0V	14	5.0V

IC003			
PIN	VOLTAGE	PIN	VOLTAGE
1	0V (OE)	11	1.0V (LE)
2	1.8V (A0)	12	1.6V (A7)
3	2.6V (D0)	13	1.8V (D6)
4	2.4V (D1)	14	1.8V (D7)
5	1.8V (A1)	15	1.7V (A6)
6	1.9V (A2)	16	2.1V (A5)
7	2.5V (D2)	17	2.5V (D5)
8	2.5V (D3)	18	1.7V (D4)
9	1.8V (A3)	19	2.0V (A4)
10	0V (GND)	20	5.0V (Vcc)

IC005	
PIN	VOLTAGE
1	4.7V SCL in
2	4.7V SCL out (set out of standby 0V set in standby)
3	4.6V SDA out (set out of standby 0V set in standby)
4	4.6V SDA in
5	4.8V Switch control supplied from +8V rail
6	0V Customer mode (5.0V service mode)
7	0V GND
8	4.6V SDA in
9	0V Customer mode (4.6V SDA out to Scart 1 service mode)
10	0V Customer mode (4.7V SCL out to Scart 1 service mode)
11	4.7V SCL in
12	0V Customer mode (5.0V service mode)
13	4.8V Switch control supplied from +8V rail
14	7.4V Set out of standby (4.7V set in standby)

IC006	
PIN	VOLTAGE
1	0V (GND)
2	0V (GND)
3	0V (GND)
4	0V (GND)
5	4.7V (SDA)
6	4.7V (SCL)
7	0V (GND)
8	5V (Vcc)

IC007	
PIN	VOLTAGE
1	5V TV/ 5V AV1 / 0V AV2 / 0V AV3 (A.SEL2)
2	5V (Pos/Neg)
3	5V (L/L)
4	5V (0V RGB)
5	0V
6	N/C
7	0V (Compress)
8	0V (GND)
9	N/C
10	4.3V (Power good)
11	5V (SC)
12	0V (SE)
13	0V (DS)
14	0V (SD)
15	5V TV/ 0V AV1 / 5V AV2 / 0V AV3 (A.SEL1)
16	5V (Vcc)

IC201			
PIN	VOLTAGE	PIN	VOLTAGE
1	3.3V (VIF)	17	2.7V (ViFM1)
2	3.3V (VIF)	18	0V (ViFM3)
3	0.7V (CBL/MAC)	19	8.4V (TAGC)
4	0.2V (VIF Export)	20	2.0V (V0Qss)
5	0.2V (VIF Export)	21	2.0V (V0VID)
6	1.4V (TADJ-AGC)	22	2.0V (V1VID)
7	2.7V (TPLL)	23	2V (AFC)
8	2.8V (CSAGC)	24	2.7V (VCO1)
9	3.5V (STD)	25	2.7V (VCO2)
10	2.4V (CVBS)	26	2.4V (CVP/2)
11	3.6V (FWLSWI)	27	0V (GND)
12	2.4V (V0AF1)	28	2.8V (CVAGC)
13	2.4V (V0AF2)	29	4.8V (VP)
14	2.3V (CAF1)	30	4.9V (INSWI)
15	2.3V (CAF2)	31	3.3V (VISIF)
16	1.9V (ViFM2)	32	3.3V (VISIF)

IC301			
PIN	VOLTAGE	PIN	VOLTAGE
1	4.3V (Comb Luma in)	11	3.9V (V1 in)
2	4.7V (SDA)	12	3.1V (N/C)
3	5.2V (Comb Chroma in)	13	5.8V (C out)
4	4.7V (SCL)	14	3.9V (CBS/Y out)
5	3.9V (V2/Y2 in)	15	3.8V (N/C)
6	5.3V (C2 in)	16	3V (CVBS/Y Pinp out)
7	0V (GND)	17	3.8V (CVBS Comb out)
8	3.9V (V3/Y3 in)	18	3.8V (C Pinp out)
9	10.4V (Vcc)	19	0V (Vss)
10	5.2V (C3 in)	20	4.3V (RF Video in)

IC401	
PIN	VOLTAGE
1	3.8V (RFL)
2	3.0V (AV1.L)
3	3.8V (Audio out L.)
4	2.9V (AV3.L)
5	3.1V (AV2.L)
6	0V (GND)
7	0V (GND)
8	0V (GND)
9	0V TV/ 8V (AV1) 0V (AV2) 8V (AV3)
10	0V TV/ 0V (AV1) 8V (AV2) 8V (AV3)
11	2.9V (AV3.R)
12	3.9V (RFR)
13	3.9V (Audio out R.)
14	3V (AV2.R)
15	3V (AV1.R)
16	8V (Vdd)

IC501			
PIN	VOLTAGE	PIN	VOLTAGE
1	2.5V (Y out)	17	0.8V (E/W Drive)
2	2.2V (R-Y out)	18	3.1V (H.Drive)
3	2.1V (B-Y out)	19	0.6V (H.Flyback)
4	4.7V (SCL)	20	3.3V (Pinp output)
5	4.7V (SDA)	21	3.9V (H.PLL Filter)
6	0.7V (Sandcastle)	22	0V (SVHS C in)
7	7.8V (Vcc)	23	3.8V (SNVHS Y in)
8	5V (Decoup)	24	2.6V (CVBS2 in)
9	0V (DIG.GND)	25	2.4V (N/C)
10	0.4V (N/C)	26	3.8V (CVBS1 in)
11	3.8V (Vert/Sawtooth)	27	0V (Analogue GND)
12	3.9V (I.RF)	28	3.4V (Filter REF)
13	0V (Analogue GND)	29	4.6V (Copper PLL Filter)
14	2V (EHT Track)	30	2.2V (REF XTAL)
15	2.3V (V.Drive A)	31	1.5V (2nd XTAL)
16	2.4V (V.Drive B)	32	0.1V (Secam Decoup.)

IC502			
PIN	VOLTAGE	PIN	VOLTAGE
1	5.7V (Vcc)	9	5.7V (Vcc)
2	0V (NC)	10	0V (GND)
3	0V (GND)	11	3V (R-Y out)
4	0V (GND)	12	3V (B-Y out)
5	0.7V (Sandcastle)	13	0V (N/C)
6	0V (N/C)	14	1.5V (B-Y in)
7	3.2V (N/C)	15	0V (N/C)
8	0V (GND)	16	1.5V (R-Y in)

IC503			
PIN	VOLTAGE	PIN	VOLTAGE
1	7.5V (Vcc)	10	4.7V (SCL)
2	2.1V	11	2.5V
3	2.5V (R-Y in)	12	4.7V (Y out)
4	2V (R-Y out)	13	2.5V
5	7.5V (Vcc)	14	2.5V
6	1.9V (B-Y out)	15	3.2V
7	2.5V (B-Y in)	16	3.1V (Y in)
8	0V (GND)	17	0.7V (Sandcastle)
9	4.7V (SDA)	18	0V (GND)

IC505			
PIN	VOLTAGE	PIN	VOLTAGE
1	0V (FSW)	15	5V (BCL)
2	5V (R2 in)	16	5V (CPDL)
3	5V (G2 in)	17	5.1V (CL)
4	5V (B2 in)	18	2.2V (W1)
5	8V (Vp)	19	5.7V (C1)
6	4V (B-Y in)	15	2.9V (B out)
7	4V (R-Y in)	16	3.3V (CB)
8	3.9V (Y in)	17	3.2V (G out)
9	0V (GND)	28	3.5V (CG)
10	5V (R1 in)	28	3.5V (R out)
11	5V (G1 in)	28	3.4V (CR)
12	5V (B1 in)	28	2.5V (VM Drive)
13	0.2V (FSW)	28	4.7V (SDA)
14	0.7V (Sandcastle)	28	4.7V (SCL)

IC601	
PIN	VOLTAGE
1	2.3V (V. Drive)
2	2.2V (V. Drive)
3	8.9V
4	18V (+18V Supply)
5	8.8V
6	N/C
7	0V (GND)
8	49.7V (V. Output supply)
9	9.3V (V. Output)
10	2.4V (V. Pulse)
11	16.3V (E.W. Output)
12	0.7V (E.W. Input)
13	0V (GND)

IC101	
	VOLTAGE
Input	21.8V
GND	0V
Output	12V

IC902	
PIN	VOLTAGE
1	12.6V
2	11.4V
3	N/C
4	- 8.2V
5	- 8.1V
6	N/C

IC901	
PIN	VOLTAGE
1	137.2V
2	137.0V
3	N/C
4	- 8.2V
5	0.6V
6	N/C

IC9101	
PIN	VOLTAGE
1	7.3V
2	6.2V
3	N/C
4	
5	
6	N/C

IC950	
	VOLTAGE
Input	12.5V
GND	0V
Output	5V

IC951	
	VOLTAGE
Input	10.9V
GND	0V
Output	8.1V

IC952	
	VOLTAGE
Input	7.7V
GND	0V
Output	5V

IC954	
	VOLTAGE
Input	12.5V
GND	0V
Output	2.5V

IC953			
PIN	VOLTAGE	PIN	VOLTAGE
1	11.4V (PG O/P)	8	2.5V (Comp.3 I/P-)
2	18.4V (Comp.1 O/P)	9	2.2V (Comp.3 I/P+)
3	18.5V (Vcc)	10	2.8V (Comp.4 I/P-)
4	8.1V (Comp.1 I/P-)	11	2.5V (Comp.4 I/P+)
5	9.1V (Comp.1 I/P+)	12	0V (GND)
6	2.5V (Comp.2 I/P-)	13	0.1V (Comp.4 O/P)
7	2.7V (Comp.2 I/P+)	14	0.1V (Comp.3 O/P)

IC4201			
PIN	VOLTAGE	PIN	VOLTAGE
1	N/C	27	2.5V (VCONT)
2	N/C	28	2.4V (MIXREF)
3	4.8V (VddA)	29	2.4V (DaPSK)
4	0V (VssA)	30	2.5V (COFF)
5	2.4V (VRCA)	31	N/C
6	N/C	32	1.7V (PUDET)
7	2.4V (FMR)	33	2.4V (VROF)
8	2.7V (OPR)	34	2.4V (IREF)
9	N/C	35	2.4V (VRCF)
10	N/C	36	2.4V (VddF2)
11	2.4V (VROA)	37	0V (VssF2)
12	2.7V (VssDAC)	38	N/C
13	N/C	39	4.3V (CLKLPF)
14	N/C	40	4.3V (XTAL)
15	2.7V (OPL)	41	2.5V (OSC)
16	2.7V (FML)	42	0V (VssX)
17	N/C	43	5Vpp Pulses (Data in)
18	2.7V (PORM)	44	0V (VssD)
19	2.7V (PORA)	45	N/C
20	2.7V (REMVE)	46	4.8V (VddD)
21	2.7V (REMO)	47	4.3V (Reset)
22	N/C	48	5Vpp Pulses (Data out)
23	2.7V (SOFF)	49	4.7V (SCL)
24	2.7V (VssF1)	50	4.7V (SDA)
25	N/C	51	N/C
26	2.7V (VddF1)	52	N/C

IC4300			
PIN	VOLTAGE	PIN	VOLTAGE
1	4V (OP. Amp.1 O/P)	5	4V (OP. Amp.2 I/P+)
2	4V (OP. Amp.1 I/P)	6	4V (OP. Amp.2 I/P-)
3	4V (OP. Amp.1 I/P)	7	4V (OP. Amp.2 O/P)
4	0V (GND)	8	8.1V (Supply)

IC4400			
PIN	VOLTAGE	PIN	VOLTAGE
1	N/C	17	4.7V (SDA)
2	0.2V (P1)	18	3.9V (L. O/P to Amp.)
3	3.9V (Main left in)	19	3.9V (L. Treble)
4	7.9V (Ref. V)	20	3.9V (L. Headphone O/P)
5	3.9V (Main right in)	21	3.9V (L. Bass)
6	7.9V (Vcc)	22	3.9V (L. Bass)
7	3.9V (R. Scart out)	23	3.9V (L. in)
8	0V (GND)	24	3.9V (L. out)
9	3.9V (R. out)	25	0V (GND)
10	3.9V (R. in)	26	3.9V (L. Scart out)
11	0V (R. Bass)	27	3.9V (Pseudo stereo)
12	3.9V (R. Bass)	28	N/C
13	3.9V (R. Headphone O/P)	29	3.9V (Pseudo stereo)
14	3.9V (R. Treble)	30	N/C
15	2.3V (R. O/P to Amp.)	31	0.7V (P2)
16	4.7V (SCL)	32	N/C

IC4410	
PIN	VOLTAGE
1	3.6V (Left output)
2	8V (Vcc)
3	3.6V (Right output)
4	0V (GND)
5	0.6V (R. I/P-)
6	0V (R. I/P+)
7	0V (L. I/P+)
8	0.6V (L. I/P-)

IC4550	
PIN	VOLTAGE
1	1.7V (R. I/P)
2	1.7V (R.F/B)
3	15.2V (Mute)
4	1.7V (L. F/B)
5	1.7V (L. I/P)
6	0V (GND)
7	0V (GND)
8	13.8V (L. O/P)
9	27.9V (Supply)
10	3.9V (R. O/P)
11	N/C

IC4500	
PIN	VOLTAGE
1	1.6V
2	1.7V
3	15.3V
4	1.7V
5	1.6V
6	0V
7	0V
8	13.8V
9	28.4V
10	13.8V
11	28.4V

IC4600			
PIN	VOLTAGE	PIN	VOLTAGE
1	4.5V	22	2.8V
2	4.5V	23	2.7V
3	4.4V	24	2.7V
4	4.4V	25	5.2V
5	4.4V	26	4.4V
6	4.4V	27	5.1V
7	4.4V	28	4.4V
8	4.4V	29	4.4V
9	4.4V (L. in)	30	4.4V
10	4.4V (R. in)	31	4.4V
11	0V (GRD)	32	4.4V
12	4.4V	33	4.4V
13	4.4V	34	4.4V (C. out)
14	4.4V	35	4.4V (S. out)
15	4.4V	36	4.4V (R. out)
16	5.1V	37	4.4V (L. out)
17	4.4V	38	8.8V (Vcc)
18	5.1V	39	0.1V
19	4.4V	40	5V (Enable)
20	4.4V	41	0V (Data)
21	4.3V	42	5V (CLK)

IC4603			
PIN	VOLTAGE	PIN	VOLTAGE
1	3.8V (S. In)	17	2.4V (SDA)
2	N/C	18	3.8V (C. Out)
3	3.8V (C. E+R Mix)	19	3.8V
4	7.5V (Ref. V)	20	3.8V
5	3.8V (S. In)	21	3.8V
6	7.6V (Vcc)	22	3.8V
7	N/C	23	3.8V
8	0V (GND)	24	3.8V
9	3.8V	25	7.6V
10	3.8V	26	3.8V
11	3.8V	27	3.8V
12	3.8V	28	3.8V (C. In)
13	3.8V	29	3.8V
14	3.8V	30	3.8V (S. In)
15	3.8V (S. Out)	31	0V
16	2.4V (SCL)	32	N/C

IC4601			
PIN	VOLTAGE	PIN	VOLTAGE
1	0V (D. GND)	13	4.4V (Surround out)
2	5V (CLK)	14	4.4V
3	0V (Data)	15	4.4V (Front R. out)
4	5V (Enable)	16	4.4V (Front L. out)
5	2.4V	17	0V (A. GND)
6	7.5V	18	4.4V
7	8.9V (Supply)	19	4.4V
8	4.4V (L. in)	20	4.4V
9	4.4V (R. in)	21	4.4V
10	4.4V	22	4.8V
11	4.4V	23	2.3V (XTAL)
12	4.4V	24	2.2V (XTAL)

IC4700	
PIN	VOLTAGE
1	1.7V (Left surround in)
2	1.7V (L. surround F/B)
3	14.3V (Mute)
4	1.7V (R. surround F/B)
5	1.7V (Right surround in)
6	0V (GND)
7	0V (GND)
8	12.8V (R. surround out)
9	26.2V (Supply)
10	12.8V (L. surround out)
11	0V (GND)

IC4800	
PIN	VOLTAGE
1	12.4V (Centre in)
2	12.5V (-VE I/P)
3	0.1V (GND)
4	12.5V (Centre out)
5	26.2V (Supply)

	Q001	Q002	Q003	Q101
In	5V	0V	5V	Dependent on agc
Control	0V	2.2V	-1.9V	0V
Out	5V	0V	5V	Dependent on agc

	Q201	Q202	Q203
B	3.8V	0V	2.3V
C	12.1V	0V	1.6V
E	3V	0V	4.9V

	Q301	Q302	Q303	Q304	Q305	Q306	Q307
B	3.6V	3.9V	4.9V	3.7V	0V	2.6V	7.3V
C	7.3V	7.4V	4.9V	7.9V	0V	7.6V	5.6V
E	2.9V	3.2V	0V	3V	0.7V	1.9V	7.9V

	Q402	Q403	Q405	Q406	Q407	Q408	Q409
B	4.9V	4.9V	4.4V	4.6V	3.7V	3.7V	3.6V
C	0V	0V	12V	12V	3.1V	3.1V	2.9V
E	0V	0V	3.8V	3.9V	7.9V	7.9V	7.9V

	Q410	Q411	Q412
B	3.5V	3.7V	3.7V
C	2.9V	3.1V	3V
E	7.9V	7.9V	7.9V

	Q501	Q502	Q510
B	3.3V	7.3V	12.3V
C	7.3V	5.1V	0V
E	2.7V	7.9V	12.2V

	Q701	Q705	Q751
B	-1V	3.1V	0.5V
C	33.3V	8.2V	164.5V
E	0V	2.8V	0.6V

	Q810	Q811	Q812	Q813
B	11.7V	8V	7.9V	7.6V
C	12.5V	7.3V	7.2V	6.8V
E	11.0V	9.9V	0.1V	9.9V

	Q851	Q852	Q856	Q857	Q859
B	0.7V	0.1V	3.6V	3.7V	0.4V
C	0.5V	5.8V	7.5V	7.5V	0V
E	6.5V	11V	4.3V	4.3V	1V

	Q860	Q861	Q862	Q863
B	0.4V	0.4V	2.1V	3.7V
C	0V	0V	3.2V	0V
E	1V	1V	1.4V	4.3V

	Q901	Q902	Q903	Q904
B	-3.2V	0.6V	-4.2V	-8V
C	-4.6V	-3.2V	398V	-4.6V
E	-8.1V	0V	0V	-8.1V

	Q950	Q951	Q952	Q954	Q953	Q955	Q959	Q960	
B	27.2V	27.9V	0.7V	6.8V	0.7V	3.2V	0.2V	G	37.2V
C	12.7V	28.7V	0V	138.1V	0V	3.2V	37.2V	D	28.5V
E	12.6V	28.7V	0V	6.2V	0V	0V	0V	S	28.5V

	Q4201	Q4202
B	2.2V	2.3V
C	4.4V	4.6V
E	1.6V	1.6V

	Q4300	Q4301
B	0.7V	0V Woofer sat at mid.
C	0V	0V
E	0V	0V

	Q4400	Q4401
B	4V	4V
C	8V	8V
E	3.3V	3.3V

	Q4501
B	0.1V
C	15.3V
E	0V

	Q4450	Q4451
B	4V	4V
C	8.2V	8.2V
E	3.3V	3.3V

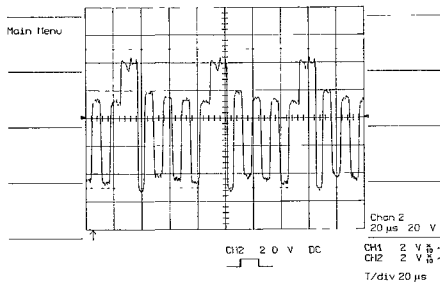
	Q4600	Q4601	Q4604	Q4605
B	4.4V	4.4V	4.4V	4.4V
C	3.7V	3.7V	3.7V	3.7V
E	9V	9V	9V	9V

	Q4700	Q4800	Q4801
B	0V	0V	0.7V
C	0V	0V	0V
E	14.3V	12.5V	0V

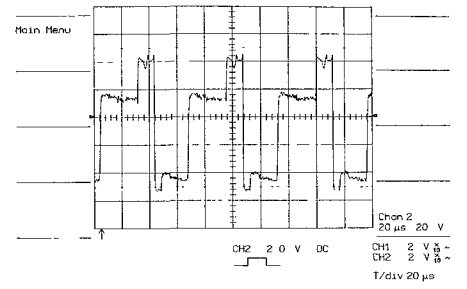
	Q5000
B	3.8V
C	3.1V
E	7.9V

WAVEFORMS

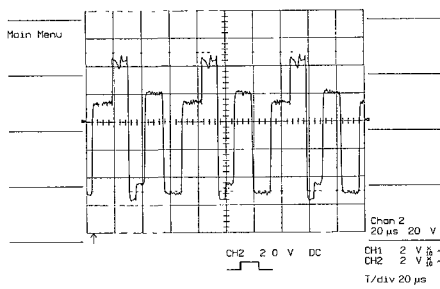
Q802 collector
98v p.p.
at 20 μ sec/div



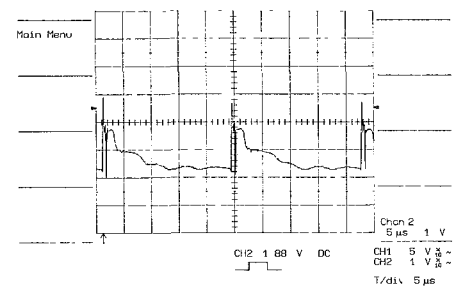
Q802 collector
100v p.p.
at 20 μ sec/div



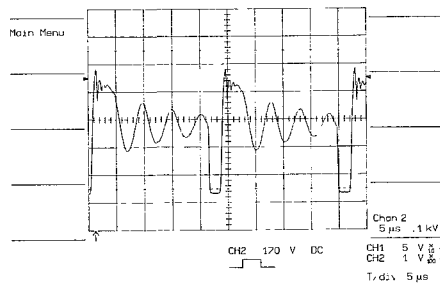
Q801 collector
104.5v p.p.
at 20 μ sec/div



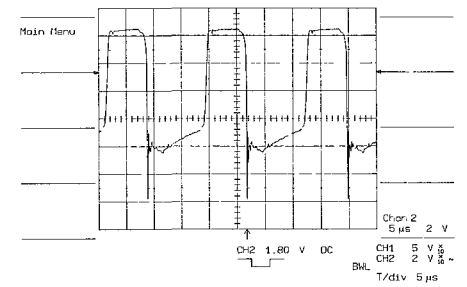
Q9002 base
2.9v p.p.
at 5 μ sec/div



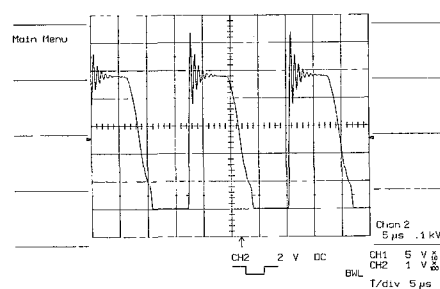
Q9002 collector
456v p.p.
at 5 μ sec/div



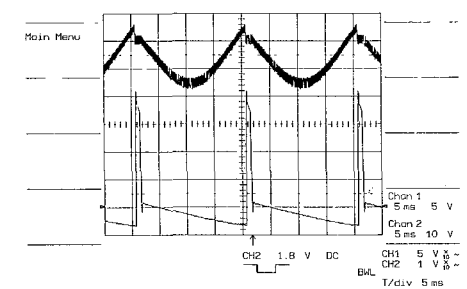
Q903 base
12.4v p.p.
at 5 μ sec/div



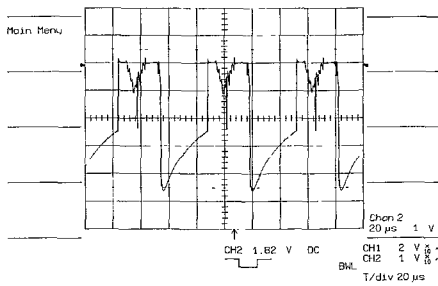
Q903 collector
640v p.p.
at 5 μ sec/div



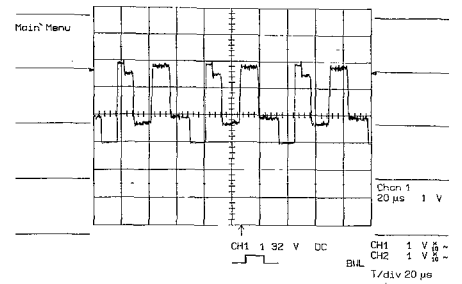
IC601/11
11.8v p.p.
IC601/9
490 p.p.
at 5m sec/div



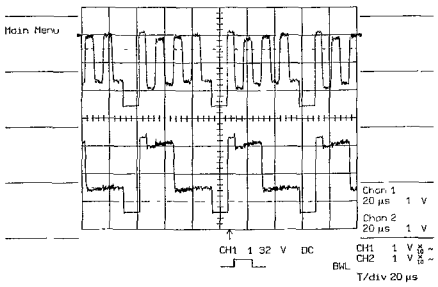
Q701 base
4.7v p.p.
at 20 μ sec/div



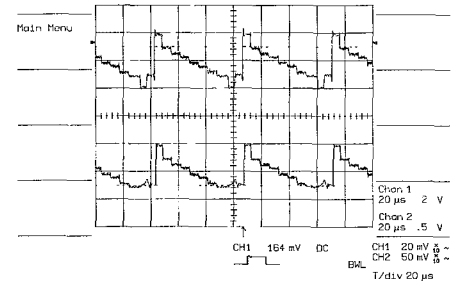
IC505/24
3.0v p.p.
at 20 μ sec/div



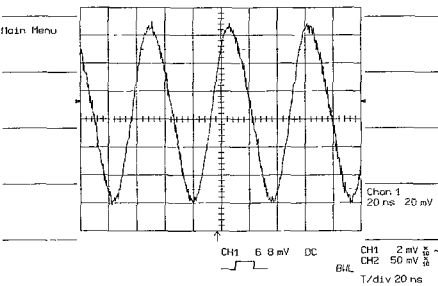
IC505/20
2.6v p.p.
IC505/22
2.7v p.p.
at 20 μ sec/div



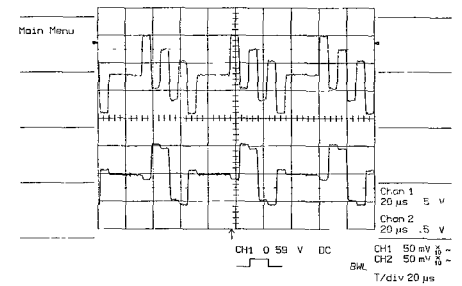
IC505/8
0.4v p.p.
IC505/26
0.7 v.p.p.
at 20 μ sec/div



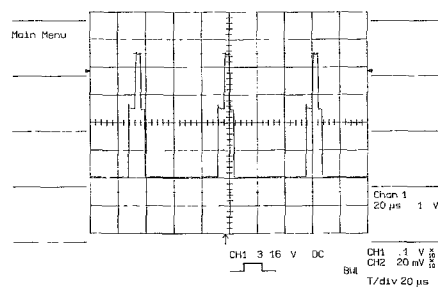
A5000
(comb filter)/7
130m μ p.p.
at 20 μ sec/div



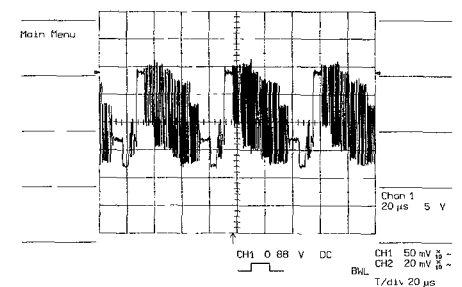
IC505/6
1.4v p.p.
IC505/7
1.1v p.p.
at 20 μ sec/div



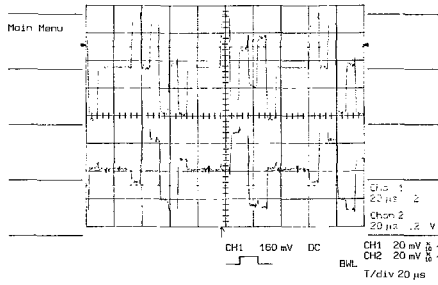
Sand castle pulse
IC501/6
IC502/5
IC503/17
4.5v p.p.
at 20 μ sec/div



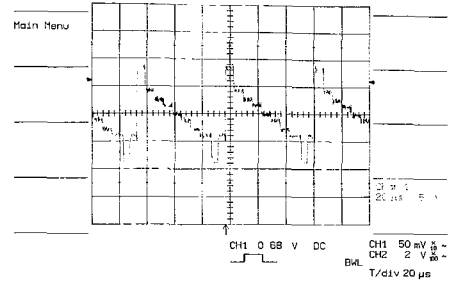
IC301/18
1.9v p.p.
at 20 μ sec/div



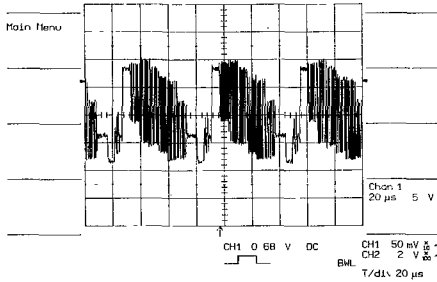
IC501/3
760m μ
IC501/2
600m μ
at 20 μ sec/div



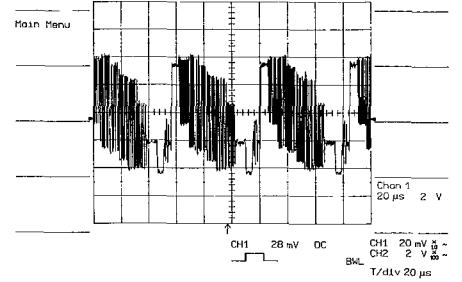
IC301/14
comb filter on
1.8v p.p.
at 20 μ sec/div



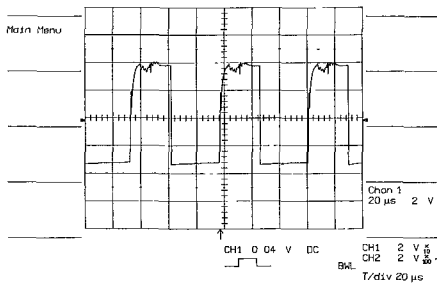
IC301/14
comb filter on
1.8v p.p.
at 20 μ sec/div



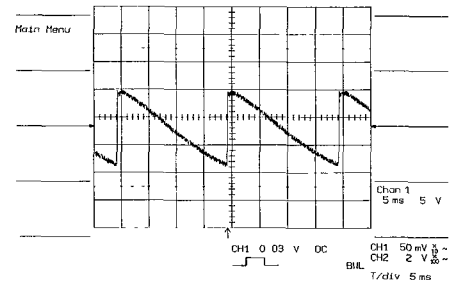
IC301/20
870m μ p.p.
at 20 μ sec/div



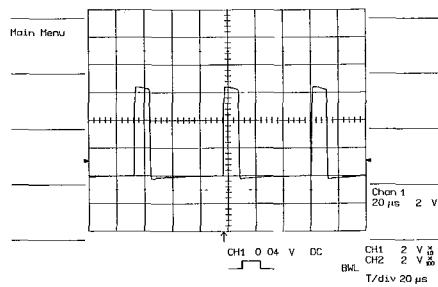
IC501/18
7.4 μ p.p.
at 20 μ sec/div



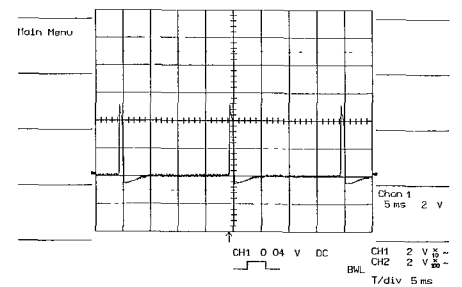
IC501/16
1.4 μ p.p.
at 5 μ sec/div



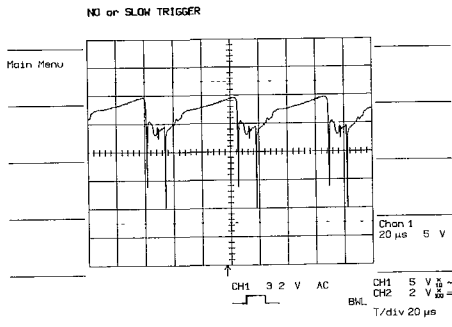
U501 H.Blk
6.7 μ p.p.
at 20 μ sec/div



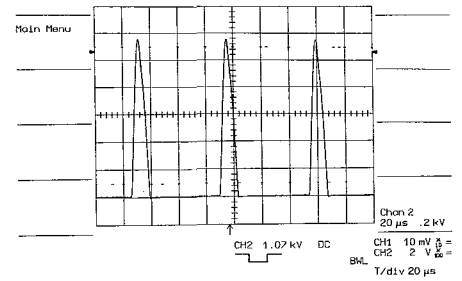
U501 V. Blk
5.7 μ p.p.
at 5 μ sec/div



Q751b
19.6v p.p.
at 20 μ sec/div



Q751 collector
9.16kv p.p.
at 20 μ sec/div



Q701 collector
92v p.p.
at 20 μ sec/div

