TANDBERG
Television

ST.TM.TT1220.1
Issue 1
ENGLISH (UK)

INSTRUCTION MANUAL

TT1220 Professional Receivers and Decoders

Software Version 2.2.0 (and later)

M2/TT1220CIF/S, M2/TT1220CIF/D
M2/TT1220CIF/S-EXT, M2/TT1220NDS/S

ENGLISH (UK)

READ THIS FIRST!

If you do not understand the contents of this manual
DO NOT OPERATE THIS EQUIPMENT.

Also, translation into any EC official language of this manual can be made available, at your cost.

ITALIANO

LEGGERE QUESTO AVVISO PER PRIMO!

Se non si capisce il contenuto del presente manuale
NON UTILIZZARE L'APPARECCHIATURA.

È anche disponibile la versione italiana di questo manuale, ma il costo è a carico dell'utente.

SVENSKA

LÄS DETTA FÖRST!

Om Ni inte förstår informationen i denna handbok
ARBETA DÅ INTE MED DENNA UTRUSTNING.

En översättning till detta språk av denna handbok kan också anskaffas, på Er bekostnad.

NEDERLANDS

LEES DIT EERST!

Als u de inhoud van deze handleiding niet begrijpt
STEL DEZE APPARATUUR DAN NIET IN WERKING.

U kunt tevens, op eigen kosten, een vertaling van deze handleiding krijgen.

PORTUGUÊS

LEIA O TEXTO ABAIXO ANTES DE MAIS NADA!

Se não compreende o texto deste manual
NÃO UTILIZE O EQUIPAMENTO.

O utilizador poderá também obter uma tradução do manual para o português à própria custa.

SUOMI

LUE ENNEN KÄYTTÖÄ!

Jos et ymmärrä käsikirjan sisältöä
ÄLÄ KÄYTÄ LAITETTA.

Käsikirja voidaan myös suomentaa asiakkaan kustannuksella.

FRANÇAIS

AVANT TOUT, LISEZ CE QUI SUIT!

Si vous ne comprenez pas les instructions contenues dans ce manuel
NE FAITES PAS FONCTIONNER CET APPAREIL.

En outre, nous pouvons vous proposer, à vos frais, une version française de ce manuel.

DANSK

LÆS DETTE FØRST!

Udstyret må ikke betjenes
MEDMINDRE DE TIL FULDE FORSTÅR INDHOLDET AF DENNE HÅNDBOG.
Vi kan også for Deres regning levere en dansk oversættelse af denne håndbog.

DEUTSCH

LESEN SIE ZUERST DIESEN HINWEIS!

Sollte Ihnen der Inhalf dieses Handbuches nicht klar verständlich sein, dann
BEDIENEN SIE DIESE GERÄTE NICHT!

Eine Übersetzung des Handbuches in diese Sprache ist gegen Berechnung lieferbar.

ΕΛΛΗΝΙΚΑ

ΔΙΑΒΑΣΤΕ ΠΡΩΤΑ ΑΥΤΟ!

Αν δεν καταλάβετε το περιεχόμενο αυτού του βοηθήματος/εγχειριδίου
ΜΗΝ ΛΕΙΤΟΥΡΓΗΣΕΤΕ ΑΥΤΟΝ ΤΟΝ ΕΞΟΠΛΙΣΜΟ.

Επίσης, αυτό το εγχειρίδιο είναι διαθέσιμο σε μετάφραση σε αυτή τη γλώσσα και μπορείτε να το αγοράσετε.

ESPAÑOL

LEA ESTE AVISO PRIMERO!

Si no entiende el contenido de este manual
NO OPERE ESTE EQUIPO.

Podemos asimismo suministrarle una traducción de este manual al (idioma) previo pago de una cantidad adicional que deberá abonar usted mismo.

List of Contents

Chapter 1: Introduction

This chapter describes the purpose of the TT1220 in a typical system, provides a summary of its main features and identifies the controls.

Chapter 2: Installing the Equipment

This chapter provides a guide to installing the equipment, including the suitability of an installation, detailed procedures for the preparation, installation and configuration. This chapter also includes **important safety information.** It also lists the pin-outs for the various connectors, and details the power cycle procedure.

Chapter 3: Operating the Equipment Locally

This chapter provides a guide to using the LCD interface and keypad. It also details the setting up, configuration and operating procedures.

Chapter 4: Operating the Equipment Remotely

This chapter provides a guide to configuring the RS-232 remote control port, and preparing the unit for remote operation. This chapter does **not** detail the remote control procedure itself, as this is detailed in the instructions for the individual control system.

Chapter 5: Alarms

This chapter provides a guide to configuring the alarm interface and menus.

Chapter 6: Preventive Maintenance and Fault-Finding

This chapter details routine maintenance tasks to be performed, provides general service advice, and information regarding warranty.

Annex A: Glossary

Annex B: Technical Specification

Annex C: Menus

Annex D: Alarm Categories and Conditions

Annex E: Using the TT1220 with the NDS Director System

About this Manual

This manual provides instructions and information for the installation and operation of the TT1220 range of decoders.

This manual should be kept in a safe place for reference for the life of the equipment. It is not intended that this manual will be amended by the issue of individual pages. Any revision will be by a complete reissue. Further copies of this manual can be ordered from the address shown on *page vi*. If passing the equipment to a third party, also pass the relevant documentation.

Issues of this manual are listed below:

Issue	Date	Software Version	Comments
1	Dec 2000	1.0.0	Initial release.
2	Feb 2000	2.2.0	Phase 2 software updated release

Acknowledgements

General

All best endeavours have been made to acknowledge registered trademarks and trademarks used throughout this manual. Any notified omissions will be rectified in the next issue of this manual. Some trademarks may be registered in some countries but not in others.

Registered trademarks and trademarks used are acknowledged below and marked with their respective symbols. However, they are not marked within the text of this manual.

Registered Trademarks

VideoGuard® is a registered trademark of NDS Limited.

Dolby Digital® and AC-3® are registered trademarks of Dolby Laboratories Licensing Corporation.

Alteia *plus*® is a registered trademark of TANDBERG Television Limited.

Trademarks

Alteia™ is a trademark of TANDBERG Television Limited.

NDS Director™ is a trademark of NDS Limited.

Notice

This product incorporates copyright protection technology that is protected by U.S. patents and other intellectual property rights. Use of this copyright protection technology must be authorised by Macrovision, and is intended limited by pay-per-view uses only unless otherwise authorised by Macrovision. Reverse engineering or disassembly is prohibited.

Warnings, Cautions and Notes

Heed Warnings

All warnings on the product and in the operating instructions should be adhered to. The manufacturer can not be held responsible for injuries or damage where warnings and cautions have been ignored or taken lightly.

Read Instructions

All the safety and operating instructions should be read before this product is operated.

Follow Instructions

All operating and use instructions should be followed.

Retain Instructions

The safety and operating instructions should be retained for future reference.

> **WARNINGS....**
>
> **WARNINGS GIVE INFORMATION WHICH, IF STRICTLY OBSERVED, WILL PREVENT PERSONAL INJURY OR DEATH, OR DAMAGE TO PERSONAL PROPERTY OR THE ENVIRONMENT. THEY ARE BOXED AND SHADED FOR EMPHASIS, AS IN THIS EXAMPLE, AND ARE PLACED IMMEDIATELY PRECEDING THE POINT AT WHICH THE READER REQUIRES THEM.**

> **CAUTIONS...**
>
> Cautions give information which, if strictly followed, will prevent damage to equipment or other goods. They are boxed for emphasis, as in this example, and are placed immediately preceding the point at which the reader requires them.

> **NOTES...**
>
> Notes provide supplementary information. They are highlighted for emphasis, as in this example, and are placed immediately after the relevant text.

EMC Compliance

This equipment is certified to the EMC requirements detailed in *Annex B, Technical Specification*. To maintain this certification, only use the leads supplied or if in doubt contact Customer Services.

Contact Information

TANDBERG Television Customer Services

Support Services

Our primary objective is to provide first class customer care that is tailored to your specific business and operational requirements. All levels are supported by one or more service performance reviews to ensure the perfect partnership between TANDBERG Television and your business.

Levels of Support

We offer a number of support service levels so you can choose the one most appropriate to your business requirements.

- For the initial 12 months, Bronze Level Support is provided free on this product. An extended time period can be purchased for this level.
- Silver Level Support extends the coverage to include on-site support, preventive maintenance and discount on predesigned training.
- The Gold Level Support gives an enhanced support package. It builds on the Silver Level by including advanced repair exchange, an account focused engineer, version migration support and further discount on predesigned training.

Where to Find Us

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Australia/NZ Office:	+61 2 9356 8599 fieldservice-australia@tandbergtv.com
Internet Address:	http://www.tandbergtv.com

Technical Training

Training Courses

TANDBERG Television provides a wide range of training courses on the operation and maintenance of our products and on their supporting technologies. TANDBERG can provide both regularly scheduled courses and training tailored to individual needs. Courses can be run either at your premises or at one of our dedicated training facilities.

Where to Find Us

For further information on TANDBERG Television's training programme please contact us:

International Telephone: +44 23 8048 4229
International Facsimile   +44 23 8048 4467

E-mail Address: training@tandbergtv.com
Internet Address   http://www.tandbergtv.com

Customer Services and Technical Training Postal Address

Tandberg Television
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Technical Publications

If you need to contact TANDBERG Television Technical Publications regarding this publication, e-mail: techpubs@tandbergtv.com.

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Chapter 1
Introduction

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1.1 Scope of This Manual

1.1.1 Who Should Use This Manual

This manual is written for operators / users of the TANDBERG TT1220 range of professional receivers and decoders. It describes the unit's functions and operation. The manual is written to assist in the installation and day-to-day care and operation of the unit. Maintenance information requiring the covers to be removed is not included.

CAUTION...

Removing the covers of this equipment may invalidate the warranty.

1.1.2 What This Manual Describes

Identifying The Equipment

The receivers and decoders described in this manual are the base models. These are designated by the marketing numbers:

M2/TT1220CIF/*xxx* for the common interface version
M2/TT1220NDS/*xxx* for the NDS VideoGuard version

Figure 1.1: TT1220

The type of unit can be identified as follows:

- The TT1220 common interface version has a common interface slot at the rear, below and right of the QPSK or ASI input. The common interface module has to be inserted first, before a smart card may be inserted.
- The TT1220 NDS VideoGuard version has a smart card reader slot at the rear, below and right of the QPSK or ASI input. A NDS VideoGuard smart card may be inserted directly into the unit.

1.2 Summary of Features

1.2.1 Main Features

All Models

The receivers and decoders are fully compliant with the appropriate sections of the MPEG-2[1] and DVB-S[2] specifications.

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[1] Moving Pictures Expert Group: MPEG-2 specification ISO 13818.
[2] European Digital Video Broadcasting (DVB) Project. EN 300 421 Digital broadcasting systems for television, sound and data services: Framing structure, channel coding, and modulation for the 11/12 GHz satellite service.

The TT1220 range offers the following features:

- Single QPSK RF input:
    - ✧ L-Band input
- Or ASI input:
    - ✧ Factory selectable mounting of a DVB-ASI BNC input
- Front panel controls and indications:
    - ✧ A 2 row by 20 character back lit LCD display provides information and allows operator choice entry
    - ✧ Four pushbuttons provide the control interface in conjunction with the LCD display
    - ✧ Single LED provides status information
- Service selection:
    - ✧ Chosen from a menu list of available services carried in the currently received transport stream in PSI/SI enabled mode.
- Video decoding:
    - ✧ 4:2:0 MP@ML mode support video resolutions up to 720 pixels x 576 active lines (25 frame/s) or 720 pixels x 480 active lines (30 frame/s)
    - ✧ No 4:2:2 support
    - ✧ Support for PAL- (B, D, G, H, I, M and Combination N)
    - ✧ Support for SECAM- (B, G, H, D, K, K1, L) Line ID
    - ✧ Support for NTSC (M)
    - ✧ 2 x composite video outputs
- Audio decoding:
    - ✧ According to MPEG-1 Layer I and II (Musicam)
    - ✧ Sampling rates 32, 44.1 and 48 kHz
    - ✧ All MPEG-1 Layer I and II bit-rates
    - ✧ 1 x 9-pin D-sub output
- Data:
    - ✧ Low speed data: RS-232 asynchronous (up to 115.2 kbit/s)
- Conditional access:
    - ✧ In addition to product specific CA, all units offer BISS (mode 0 and 1) support
- Vertical blanking interval (VBI) signalling support:
    - ✧ In 625 lines: VITS test lines, WST (EBU) Teletext insertion, VPS and WSS is supported
    - ✧ In 525 lines: Closed captioning and V.Chip signalling are supported
- Remote control:
    - ✧ RS-232, TANDBERG proprietary control solution

Options[3]

- Transport stream output:

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[3] Not all options available on all models. Some options only available when ordering as part of a new product. For information about the different options and their availability, please contact your TANDBERG Television representative. Software upgradeable options may incur a nominal fee.

- ✧ One DVB-ASI BNC output, user configured to provide a semi-descrambled output stream (selected service descrambled)
- SDI video output:
  - ✧ Replaces one of the composite video outputs
- Audio output:
  - ✧ Two stereo pairs, that replace the single one in the base model. Both stereo connectors provide MPEG-1 layer I and II (Musicam) analogue decoded streams
  - ✧ S/PDIF output option – SW upgradeable (only on 2 channel version)
  - ✧ AC-3 passthrough option – SW upgradeable (only on 2 channel version)
  - ✧ AC-3 downmix option (only on 2 channel version)
  - ✧ 2 x 9-pin D-sub output
- Signal protection:
  - ✧ TANDBERG Television proprietary CA system

Unique Features, NDS VideoGuard Director Version

- Conditional access:
  - ✧ NDS Director CA support or
  - ✧ BSkyB CA support
- Over the air control:
  - ✧ NDS Director over the air control (only on NDS Director version)
- Control relays:
  - ✧ Four relays available

Unique Features, DVB Common Interface Version

- Conditional access:
  - ✧ DVB Common Interface CA support
- Control relays:
  - ✧ One relay is available

1.2.2 Inputs

Transport Stream Input

The main input of the TT1220 is the QPSK f-connector, located on the rear of the unit. This input interfaces directly to Low-Noise Block (LNB) and accepts an intermediate frequency (IF) input in the 950 – 2150 MHz (L-band) range. The unit can provide DC power, that may be used for polarisation switching on the LNB, as well as a 22 kHz control signal. The maximum input symbol rate is 44,5 Msym/s, while the maximum total bit-rate is 60 Mbit/s.

An optional (factory fitted) DVB-ASI BNC connector may be present, replacing the QPSK f-connector. This input accepts a DVB-ASI compliant signal (188 or 204 byte), at a maximum of 60 Mbit/s.

1.2.3   Outputs

Transport Stream Output

One DVB-ASI BNC connector may be available. This provides the current incoming transport stream, including the current descrambled service, to be output at a maximum of 60 Mbit/s.

Video Outputs

Two BNC composite analogue video outputs are present on the rear of the unit. If the factory fitted option of a SDI video output is present, it replaces one of the composite outputs.

Audio Outputs

One analogue stereo audio pair carried on a 9-pin D-SUB connector, is available. Depending on the input, it is menu configurable to allow one stereo, a dual-mono or two independent mono channels. The channels can carry different languages.

The primary audio output might be replaced by the extended audio output option, which allows for two stereo audio pairs carried on two 9-pin D-SUB connectors.

Depending on the configured options, the extended audio output may be able to either provide analogue balanced audio, AES/EBU digital audio, AC-3 digital passthrough, or AC-3 to analogue Dolby Pro-Logic downmix.

Data Output

RS-232 asynchronous low speed data output carried on a 9-way D-sub connector, available on all models. The data output rate is configurable from 1200 bit/s to 115200 bit/s.

Alarm Output

Failure, alarm and warning monitoring is user configurable from the menu system, and performed within the equipment. When the equipment is in an erred state, the alarm is signalled both via the front panel alarm LED, and via the 9-way D-sub alarm relay connector, located on the rear of the unit. For instructions on configuring the alarms, see *Chapter 5, Alarms*. For a description of the alarm relay, see *Chapter 2, Installing the Equipment*.

1.2.4   Conditional Access

The following conditional access systems are standard on the TT1220 range of decoders.

- No conditional access
- Signal protection (if fitted)
- EBU BISS (mode 0 and mode 1)

Further CA systems are available on the specific models:

> **NDS Videoguard Director Version**

- NDS Director CA

> **NDS Videoguard BSkyB Version**

- NDS Videoguard BSkyB CA

> **DVB CI Version**

- Any DVB compliant CA system, utilising a DVB compliant common interface CA module

1.3   TT1220 Control Modes

1.3.1   Introduction

The TT1220 is designed for unattended operation. Once set up, it requires no further attention except to ensure that the fan is working. There are three control modes associated with the receiver, local (keypad), remote (RS-232), and over the air control (OAC)[4].

1.3.2   Remote Control

This state is entered when the **Ctrl. Mode** setting in the **Adv:System Options** menu is set to **remote**. When the decoder is remotely controlled, local control is disabled until the decoder is configured for the local mode.

1.3.3   Over the Air Control

This state is entered when the **Ctrl. Mode** setting in the **Adv:System Options** menu is set to **OAC**. When the decoder is remotely controlled, local control is disabled until the decoder is configured for the local mode.

1.3.4   Local Control

Local control allows parameters to be entered and chosen using the four keypad buttons.

The buttons roles and functions change, depending on what kind of menu or screen is available at the moment.

The up / down buttons are used for previous / next item in a menu, previous / next option in an option select menu (for instance, on or off) or the higher / lower digit in a numerical entry menu.

The right / left buttons are used to enter / leave a menu or submenu, and to select the next or previous digit in a numerical entry menu.

---

[4] OAC is a feature for NDS Videoguard Director only

1.4 Guided Tour

1.4.1 Construction

The receiver is constructed using a screened fan-ventilated chassis. All operational inputs and outputs are via the rear panel connectors. The unit may be operated free-standing on a horizontal flat surface, or mounted in a 19″ rack. 1RU rack height is required. It is important that horizontal airflow is not obstructed, to maintain the airflow required to cool the unit.

1.4.2 Front Panel Controls

Overview

The front panel is fitted with a keypad that is used to set up and monitor the unit. Information on the use of these controls is given in *Chapter 3*, *Operating the Equipment Locally*. *Figure 1.2* gives an overview on how to navigate the menus. *Figure 1.3* explains how to edit these values once a menu item is selected.
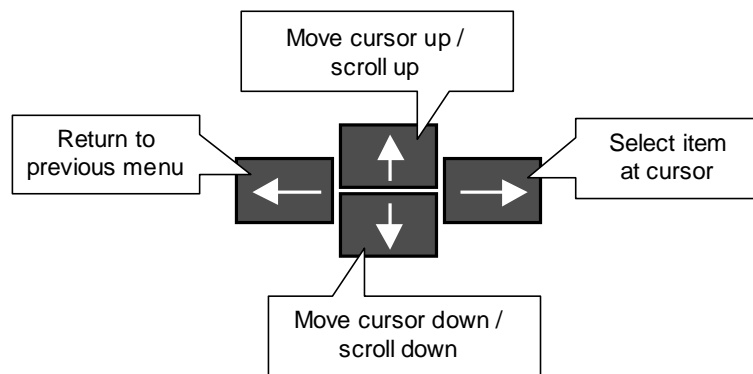

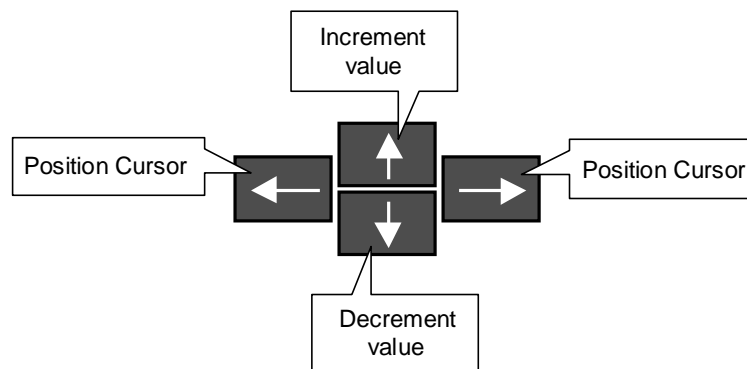*Figure 1.2: Navigating the Menus.*

Figure 1.3: Editing Values in a Menu.

Edit and Save

In the edit mode, when the correct value is in place, exit and save by pressing multiple times to the right, to move the cursor outside the edit area. When the cursor leaves the edit area, the new setting will be saved, and the keypad will revert to the navigation mode.

Cancel an Edit

In the edit mode, if you have incorrectly entered a value, cancel and exit by pressing multiple times to the left, to move the cursor outside the edit area. When the cursor leaves the edit area, the previous setting will reappear, and the keypad will revert to the navigation mode.

> **NOTE...**
>
> Keypad access may be locked, easily recognised by the small lock in the top left corner of the display. To navigate the menus, escape the locked mode by pressing left, right, 3 x left and then 3 x right in sequence. This will take you from the default status screen, to the main menu.

1.4.3   Front Panel LED

The unit is fitted with one LED, showing the status of the unit. When the LED lights up red, an alarm condition has been met, according to the alarm set-up described in *Annex D, Alarm Categories and Conditions*.

1.4.4   Conditional Access[5]

NDS Videoguard Director Version

There is one slot on the rear of the unit, to allow the insertion of a Conditional Access (CA) card for the NDS Director VideoGuard system.

NDS Videoguard BSkyB Version

There is one slot on the rear of the unit, to allow the insertion of a Conditional Access (CA) card for the NDS VideoGuard BSkyB system.

DVB CI Version

There is one slot on the rear of the unit, to allow the insertion of a DVB common interface (CI) conditional access module. The DVB CI unit will host the Conditional Access (CA) card for the CA system that matches the DVB CI module.

1.4.5   Rear Panel

All input and output connectors are located on the rear panel. Connector descriptions are given in *Chapter 2, Installing the Equipment*.

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[5] Note: All CA systems are mutually exclusive.

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Chapter 2

Installing the Equipment

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2.1 Read this First!

2.1.1 Handling

The TT1220 must be handled and installed carefully and thoughtfully to prevent safety hazards and damage.

2.1.2 Installing the Equipment

Ensure that personnel designated to install the unit have the appropriate skill and knowledge. If in any doubt, please contact Customer Services (see *Preliminary pages* for contact details).

Installation of the TT1220 should follow these instructions, and should only be using installation accessories recommended by the manufacturer. When rack-mounted, this unit must have shelf supports as well as being fixed at the front panel.

Do not use this product as a support for any other equipment.

2.1.3 Lifting

Although this is a light product, in some circumstances it might be awkward to lift, especially when packed. In which case, do not attempt to lift or move it without proper assistance or equipment. If in doubt, get help.

2.2 Preliminary Checks

2.2.1 Mechanical Inspection

Inspect the equipment for damage-in-transit. If in doubt, please contact TANDBERG Television Customer Services (see *Preliminary pages).*

> **WARNING...**
>
> **REMOVING THE COVERS OF THIS EQUIPMENT MAY INVALIDATE ANY WARRANTIES, CAUSE A SAFETY HAZARD AND / OR AFFECT THE EMC PERFORMANCE. CHECK WITH TANDBERG TELEVISION CUSTOMER SERVICES.**

2.2.2 Moving the Equipment Safely

Do not place this product on an unstable cart, stand, bracket or table. The product may fall and cause serious injury and serious damage to the product. Use only with cart, stand, bracket or table recommended by TANDBERG Television.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn. Do not move or carry the equipment whilst it is still connected to the supply or other leads, is live, or is in operation.

2.3 Installing the Equipment

2.3.1 Fixing

The TT1220 is designed for fixed use only and has been shipped with fixing brackets suitable for a standard 19 inch rack. When installed in a rack, it should be secured by using the fixing brackets. In addition, support shelves must be used to reduce the weight on the brackets. Ensure it is firmly and safely located and it has an adequate free-flow of air.

A free-standing unit should be installed on a secure horizontal surface where it is unlikely to be knocked or its connectors and leads disturbed.

2.3.2 Ventilation

Openings in the Covers

Openings in the cabinet are provided for ventilation. These ensure reliable operation of the unit and protect it from overheating. These openings must not be blocked or covered.
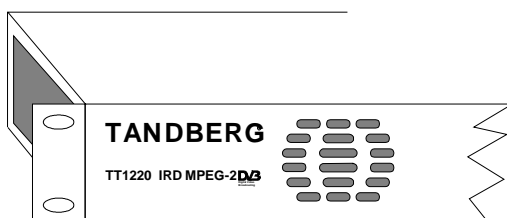
Figure 2.1: Openings in the Cabinet

Care in Positioning

> **CAUTIONS...**
>
> 1. The fan and openings contained within this unit are not fitted with a dust / insect filter. Pay attention to the environment in which it is to be used.
>
> 2. Do not install units so that the air intake for one unit aligns with the outlet of another. Provide baffles and adequate spacing.

The TT1220 should never be placed near or over a radiator or other source of heat. It should not be placed in a built-in installation such as a rack unless proper ventilation is provided and the instructions have been adhered to.

Allow at least 40 mm free air space at each side of the equipment to ensure adequate cooling. Unit in racks can be stacked with no space in between. Racks containing stacked equipment may need to be forced-air cooled to reduce the ambient temperature within the rack.

Protection From Moisture

Do not install this unit in areas of high humidity or where there is a danger of water or moisture entering the equipment.

2.3.3 Installing Cables – Safety

Power supply cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cables at plugs, convenience receptacles, and the point where they exit from the appliance.

Do not run ac power cables in the same duct as signal leads. Do not move or install equipment whilst it is still attached to the mains supply. Ensure that safety and ESD precautions are observed whilst interconnecting equipment.

WARNING…

WHEN CONNECTING THE F-CONNECTOR CABLE FROM THE ANTENNA TO THE QPSK F-CONNECTOR INPUT, IT IS IMPORTANT TO MAKE SURE THAT:
- THE UNIT IS PROPERLY GROUNDED.
– THE CABLE SCREEN IS THE FIRST POINT OF CONTACT BETWEEN THE F-CONNECTOR AND THE CABLE.
THIS IS TO MAKE SURE THAT THE CABLE AND UNIT ARE AT THE SAME ELECTRICAL POTENTIAL WHEN THE CONNECTION IS MADE, AND TO AVOID DAMAGE TO THE EQUIPMENT.

2.3.4 Outdoor Antenna

Lightning Protection

WARNING…

IF THE RECEIVER HAS BEEN SUBJECT TO A LIGHTNING STRIKE OR POWER SURGE WHICH HAS STOPPED IT WORKING, DISCONNECT THE POWER IMMEDIATELY. DO NOT REAPPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

Where appropriate, ensure this product has an adequate level of lightning protection. Alternatively, during a lightning storm or when it is left unattended unused for long periods of time, unplug it from the supply outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power line surges.

Power Lines

An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuitry. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.

2.4 EMC Compliance Statements[1]

2.4.1 EMC Compliance Approval

The following label, showing EMC compliance approval, is attached to the device.
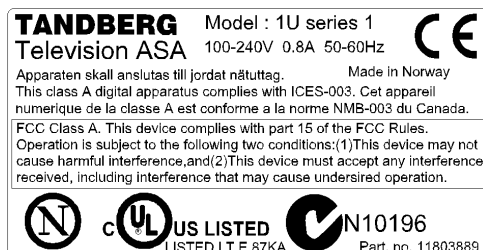
Figure 2.2: EMC Compliance Label

2.4.2 EN 55022, EN 55024, EN 61000-3-2, EN 61000-3-3 FCC part 15B class A, ICES-003 and AS/NZS 3548

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2.4.3 FCC

This equipment have been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.4.4 Connecting to a Public Telecommunication System

> **CAUTION...**
>
> TT1220 is not constructed for electrical connection directly to any public telecommunication system. None of the output signals shall be distributed directly from TT1220 to a public telecommunication system leaving the building without using some kind of interface in between such as a telecom terminal, switch or similar unit. Such kind of buffer is required to achieve a protective electrical barrier between the public telecommunication system and TT1220. This electrical barrier is required to achieve protection against lightning or faults in nearby electrical installations.

---

[1] The EMC information was correct at the time of manufacture. The EMC tests were performed with the technical earth attached.

2.5   AC Supply Voltage and Fusing – Safety Information

2.5.1   AC Power Supply

The TT1220 operates from a full range auto-sense power supply. The power supply is set to operate from 100 to 240 Vac 50 to 60 Hz nominal, and is designed for use in ambient temperature in the range of 0°C to + 50°C.

> **WARNING...**
>
> REMOVING THE COVERS OF THIS EQUIPMENT MAY INVALIDATE ANY WARRANTIES, CAUSE A SAFETY HAZARD AND / OR AFFECT THE EMC PERFORMANCE. CHECK WITH TANDBERG TELEVISION CUSTOMER SERVICES.

The full technical specification is given in *Annex B, Technical Specification*.

> **WARNING...**
>
> THE TT1220 SHOULD ONLY BE OPERATED FROM THE TYPE OF POWER SOURCE INDICATED ON THE MARKING LABEL. IF YOU ARE NOT SURE OF THE TYPE TO YOUR BUSINESS, CONSULT YOUR APPLIANCE DEALER OR LOCAL POWER COMPANY. DO NOT OVERLOAD WALL OUTLETS AND EXTENSION CORDS AS THIS CAN RESULT IN A RISK OF FIRE OR ELECTRICAL SHOCK.

Table 2.1: Fuse information

Item	Specification
Fuse	PCB fixed fuse, on the power supply board
Fuse type	T4A
Fuse rated voltage	250 Vac

> **WARNING...**
>
> THE FUSE IS ONLY TO REPLACED BY APPROVED TANDBERG TELEVISION ENGINEERS. THE POWER SUPPLY AND FUSE ARRANGEMENT IS NOT USER SERVICEABLE.

2.5.2   Technical Earth

A unmarked terminal at the rear panel (left of the power socket) is a technical earth. It is provided to:

1. Ensure all equipment chassis fixed within a rack are at the same technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.

2. Eliminate the migration of stray charges when connecting between equipment.

> **NOTE...**
>
> The technical earth shall be fitted with a bolt of M4 x 6 dimensions, 4 millimetres in diameter, and no longer than 6 millimetres.

2.5.3   AC Power Supply Cord

General

A mains cord is normally supplied with this product. It is fitted with a moulded plug suitable either for mainland Europe, the UK or USA as advised when ordered.

> **NOTE...**
> The TT1220 is not fitted with an ac power supply ON/OFF switch. Ensure the socket-outlet supplying the equipment is installed near the equipment, so that it is easily accessible.

When replacing the power cord in the USA, make sure to always replace it with a cord of the same type. The cord should be of type: Feller type SVT cord rated 3x18 AWG with plug 498 G and appliance coupler C13.

Disposal of Moulded Plugs

If the moulded plug fitted to the mains cable supplied with this equipment is not required, use another cable. If the supplied plug is to be changed, cut it off and dispose of it safely.

> **WARNING...**
> **IF THE MOULDED PLUG FITTED TO THE MAINS CABLE SUPPLIED WITH THIS EQUIPMENT IS NOT REQUIRED; PLEASE CUT IT OFF AND DISPOSE OF IT SAFELY. FAILURE TO DO THIS MAY ENDANGER LIVES AS LIVE ENDS MAY BE EXPOSED IF THE REMOVED PLUG IS INSERTED INTO A MAINS OUTLET.**

Wire Colours

The wires in the supply cord are coloured as shown in *Table 2.2*.

Table 2.2: Supply Cord Wiring Colours

	UK (BS1363)	Europe (CEE 7/7)	USA (NEMA 5-15P)
Earth	Green-and-yellow	Green-and-yellow	Green
Neutral	Blue	Blue	White
Live	Brown	Brown	Black

2.5.4   Connecting the Equipment to the AC Power Supply

As there is no power switch fitted to this unit, ensure the local ac power supply is switched OFF before connecting the supply cord.

Connect the mains lead to the TT1220 and then to the local supply.

2.6   Signal Connections

2.6.1   General

> **CAUTION...**
>
> It is strongly recommended that the Technical Earth terminal at the rear panel of the equipment be connected to a site Technical Earth before any external connections are made and the equipment is powered. This limits the migration of stray charges.

All signal connections are made via the rear panel. The two standard rear panels are shown in *Figure 2.3* for DVB CI and *Figure 2.4* for NDS VideoGuard Director.
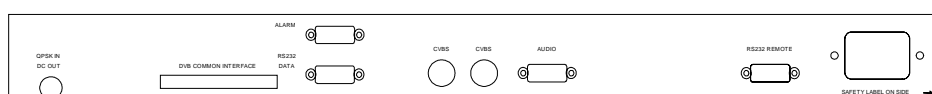
Figure 2.3: Common Interface Version
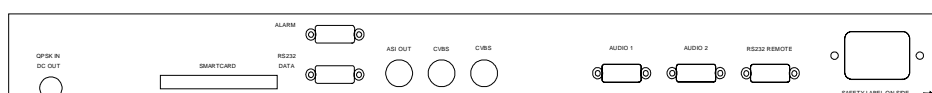
Figure 2.4: NDS VideoGuard Version

2.6.2   Input Connectors

Overview

Refer to *Section 2.5, AC Supply Voltage and Fusing – Safety Information* for ac power supply information.

> **WARNING...**
>
> **THE TT1220 IS NOT FITTED WITH AN AC POWER ON/OFF SWITCH. ENSURE THE SUPPLY SOCKET OUTLET IS INSTALLED OR LOCATED NEAR THE EQUIPMENT SO THAT IT IS ACCESSIBLE.**

Technical Earth

The Technical Earth provides a suitable connection between the TT1220 and the installation to give a low impedance path at normal operating frequencies.
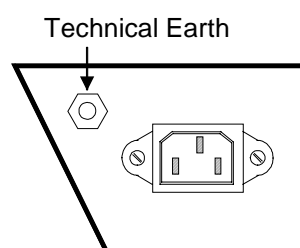
Figure 2.5: Technical Earth Connector

Remote Connector

The RS-232 connector labelled remote on the back of the equipment allows for connection to a PC for remote control, software upload or debug purposes. The **SETUP   ADVANCED   RS232 SETUP   REMOTE** menu is used to configure the parameters for communicating with the unit. For more information about remote control, see Chapter 4: Operating the Equipment Remotely.

Table 2.3: RS-232 Connector

Item	Specification		
Connector type	9-way D-type, Female		
Connector designation	REMOTE		
Pin-outs	**Pin**	**Function**	**Direction**
	1	Reserved	-
	2	Data receive (Rx)	Input
	3	Data transmit (Tx)	Output
	4	Reserved	-
	5	Ground	-
	6	Reserved	-
	7	Reserved	-
	8	Reserved	-
	9	Reserved	-

L-band Input (on QPSK Input Models)

The L-band input is to be connected to a suitable LNB either directly, or via a suitable attenuator giving adequate consideration to lightning and surge protection – see *Section 2.3.4, Outdoor Antenna*.

In most cases an attenuator will not be required. The following list summarises the circumstances in which one should be used.

1. If the wanted input level is greater than the specified maximum permissible (-25 dBm)
2. If the downlead is a short length of low-loss cable and the LNB in use has a poor return loss (7 dB min)
3. If the receiver is receiving one of many carriers in a multi-carrier FDM system and the level of the wanted signal is close to the specified maximum permissible

Table 2.4: QPSK Satellite Receiver (L-band) Connector

Item		Specification
Connector type		F- type, Female
Connector designation		QPSK IN, DC OUT
Pin:	Centre	RF Input
	Shield	Ground / Chassis
LNB Supply		0, 13 or 18 Volts dc max 450 mA
Impedance		75 Ω

ASI Input (on ASI Input Models)

The ASI connector is capable of receiving an ASI copper stream at a maximum sustained bit-rate of 60 Mbit/s.

Table 2.5: DVB-ASI Connector

Item	Specification
Connector type	BNC, Female 75 Ω
Connector designation	ASI IN
Pin: Centre Shield	Signal Ground / Chassis
Maximum burst time	370 μs at 216 Mbit/s

2.6.3 Output Connectors

Analogue Composite Video Output

This is a pair[2] of BNC sockets, which provides an analogue composite video output. The default output standard is configured using the **Setup**   **Video Format** menu.

Table 2.6: Analogue Video Connector

Item	Specification
Connector type	2 x BNC, Female
Output format*	PAL (B, D, G, H, I, Combination N, M) SECAM (B, G, H, D, K, K1, L) NTSC (M) *Output format varies with menu settings and incoming MPEG data.
Connector designation	CVBS
Pin: Centre Shield	Video output Ground / Chassis
Impedance	75 Ω

---

[2] If the SDI output option is fitted, one of the Composite video output connectors is replaced with the SDI output connector.

Digital Video Output (SDI, Option)

This is a BNC socket that provides a digital video output, optionally with embedded audio. The SDI output is a factory fitted option. When fitted, it replaces the second Analogue Composite Video output connector.

Table 2.7: Digital Video Connector

Item	Specification
Connector type	BNC, Female (the SDI output replaces the second CVBS output)
Video output format	ANSI/SMPTE 259M
Audio output format	ANSI/SMPTE 272M, level AEF (option)
Connector designation	SDI
Pin: Centre Shield	Signal Ground / Chassis
Output level	800 mV peak to peak, +/- 10%
Impedance	75 Ω

Audio Output

The decoder is fitted with either one or two 9-pin D-type connectors each carrying one stereo audio pair. If two connectors are fitted, an additional feature might be available, allowing them to carry S/PDIF or Dolby AC-3 audio.

Table 2.8: Analogue Audio Connectors

Item	Specification	
Connector type	9-way D-type, Male	
Connector designation	Bal aud. out *n*	
Output format	Balanced	
Nominal output level	0 dBm in 600 Ω (0 dBu) adjustable from –6 dB to +6 dB in 0.1 dB steps.	
Output impedance	< 20 Ω	
Idle channel noise	< -74 dB	
Pin-outs:	**Pin**	**Function**
	1	Reserved
	2	Reserved
	3	Left +
	4	Right +
	5	Ground
	6	Reserved
	7	Ground
	8	Left -
	9	Right -

Table 2.9: AC-3 Downmix / Passthrough Connector

Item	Specification	
Connector type	9-way D-type, Male	
Connector designation	Bal aud. out 2 Dolby AC-3	
Output format	Balanced analogue Dolby 2- channel Pro Logic downmix Unbalanced digital Dolby AC-3; ref. IEC-60958	
Pin-outs	**Pin**	**Function**
	1	AC-3 bit-stream
	2	Ground
	3	Left +
	4	Right +
	5	Ground
	6	Reserved
	7	Ground
	8	Left -
	9	Right -

Table 2.10: Serial Digital Audio (S/PDIF) Connectors

Item	Specification	
Connector type:	9-way D-type, Male	
Connector designation:	"Bal aud. out 2" or "Bal aud. out 3"	
Output format	According to IEC-60958	
Output levels	According to ANSI/SMPTE 276M-1995	
Pin-outs:	**Pin**	**Function**
	1	S/PDIF bit-stream
	2	Ground
	3	Left +
	4	Right +
	5	Ground
	6	Reserved
	7	Ground
	8	Left -
	9	Right -

RS-232 Low-speed Asynchronous Data Output

A 9-way D-type female connector is provided as the connection for low-speed data output.

Table 2.11: RS-232 Low-speed Data Connector

Item	Specification	
Connector type	9-way D-type, Female	
Connector designation	Data	
Output rate	1200, 2400, 4800, 9600, 19200 or 38400 baud selectable	
Pin-outs	**Pin**	**Function**
	1	Reserved
	2	Receive (Rx)
	3	Reserved
	4	Reserved
	5	Ground
	6	Reserved
	7	Reserved
	8	Reserved
	9	Reserved

Alarm Relay

A 9-way D-type female connector is provided as an alarm / controlled relay mechanism. In the DVB CI or NDS VideoGuard BSkyB mounting, only relay one is active, indicating if the unit is in an alarm state or not. In the NDS VideoGuard Director mounting, relays one through four are active, 2 through 4 controllable from the NDS Director software platform.

Table 2.12: Alarm Connector

Item	Specification	
Connector type	9-way D-type, Female	
Connector designation	Alarm[3]	
Relay method	Closed contact relay	
Pin-outs	**Pin**	**Function**
	1	Relay 4, common pin
	2	Relay 3, common pin
	3	Relay 2, normally closed
	4	Relay 1, common pin
	5	Relay 2, common pin
	6	Relay 4, normally open
	7	Relay 3, normally open
	8	Relay 1, closed on alarm, open on OK
	9	Relay 1, open on alarm, closed on OK

---

[3] Relay 1 is compatible with the TT1200 Alarm relay, where pin 8 is closed and pin 9 is open at power off (indicating alarm).

Chapter 3

Operating the Equipment Locally

Contents

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3.1 Powering the Equipment

3.1.1 Switching On

Connect the TT1220 to the signal inputs and the AC power supply and turn it on. There is a short boot period, while the display will be as follows:

```
Initialising
```

Figure 3.1: Boot Display

After the boot period, the unit will display the default status view, showing the current condition. It will generally look something like this:

```
🔒MPEG-2 DECODER
QPSK: NO SIGNAL
```
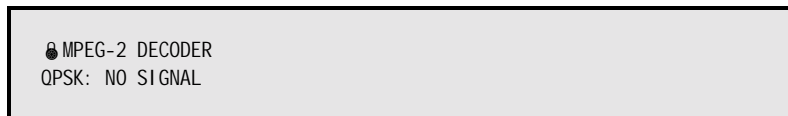
Figure 3.2: Status Display

This indicates that the keypad is locked, and no QPSK signal is available.

3.1.2 Front Panel Keypad

The front panel keypad functionally is explained in *Chapter 1, Section 1.4, Guided Tour*.

If the front panel keypad is not used for about a minute, the display reverts to the default status view.

3.2 Using the Local Controls

3.2.1 LCD Menu Overview - Unlocking the Menu

A detailed LCD menu overview is given in *Annex C, Menus*. This chapter concentrates on describing the menus for local operation.

> **NOTE...**
> Keypad access may be locked, easily recognised by the small lock in the top left corner of the display. To navigate the menus, escape the locked mode by pressing left, right, 3 x left and then 3 x right in sequence. This will take you from the default status screen, to the main menu.

3.2.2 Selecting a (Sub)menu Item

Selecting the Menu Item

To select a menu item, navigate using the *up* and *down* button until the desired menu is displayed in front of the cursor. Press the *right* arrow to select / enter this menu item.

Leaving the Menu Item

To leave the current menu tree, press the *left* arrow button.

3.2.3 Editing a Menu Value

Accessing the Edit Mode

To edit a menu item, first select the item using the *right* arrow button. This will bring you from the select mode to the edit mode.

Editing a Selectable Option

Once in edit mode, use the *up* or *down* button until the desired value is displayed. Exit and save the selection by pressing the *right* button.

Editing an Alphanumerical Value

When editing an alphanumerical value, the cursor starts flashing underneath the rightmost digit, once entering the edit mode. Use the *up* and *down* arrow to increase or decrease the value of this digit. Press the *left* button to select the next digit. You will see the cursor move to underneath the neighbouring digit. Again, use the *up* and *down* arrow to increase or decrease the value of this digit. Once satisfied with the result, move the cursor outside the selectable digits, by using the *right* button several times. Once the cursor moves outside the selectable area, the buttons return to navigation mode, and the new value is saved.

3.3 Setting Up the Input

Setting Up the QPSK Input

Setting up the QPSK input is done entirely from the **demod** menu. *Table* 3.1 steps through all the necessary settings to achieve signal lock.

Table 3.1: Tuning the Satellite Receiver.

Step	Action	Result
1.	Go to the **demod menu**, located under the **setup** menu.	The display will read "SET: DEMOD" on the top line.
2.	Repeat pressing the up arrow, until you are on the top line	The display will read "LNC Freq.:" on the bottom line.
3.	Press right once, and then by using the buttons as explained in *Section 3.2.3, Editing a Menu Value*, enter the desired LNC frequency.	The LNC frequency should be set to match your external LNC.

Step	Action	Result
4.	Go down one line, and edit the satellite channel frequency[1].	This sets up the tuning frequency in the receiver.
5.	Go down to the next line, and enter the Symbol rate.	This sets up the incoming symbol rate of the demodulator.
6.	Continue on line down to the Inner Code rate, select the correct inner code.	This sets up the Forward error correction (FEC) rate of the demodulator.
7.	For the final three items, select the correct LNC voltage, and turn 22 kHz control signal and spectrum inversion on or off.	This finalises the set-up of the satellite demodulator. Right to SET:DEMOD, status information about the signal lock is being displayed. (Signal strength.)

Setting Up the ASI Input

TT1220 units delivered with an ASI input are not input configurable. The ASI input is autosensing 188/204 byte mode, and accept both byte and burst mode[2] packets. The maximum sustained input rate is 60 Mbit/s.

3.4 Service Configuration

3.4.1 Selecting a Service

Setting Up a Service

Each transport stream may contain a multitude of services and types. The **TV service** and **Audio *n*** service menus, located in the **setup** menu, allows the user to select the current service to be decoded.

Setting Up a TV Service

Table 3.2: Selecting a TV Service

Step	Action	Result
1.	Go to the **TV service** menu, located under the **setup** menu.	The display will read "SET: TV SERVICE" on the top line.
2.	Repeat pressing the up and down arrows, until the selected service is displayed. If Service names do not exist for the chosen TS, continue to item 4.	The second line will scroll between all the services available in the transport stream.
3.	Pressing right will select the displayed service.	A small check mark is displayed in front of the service, indicating that it is selected.
4.	It is also possible to select service based on service id. Keep on scrolling until the display read "Service in. *nn*".	This enables you to select services that are not named in the SDT.
5.	By pressing right once, the keypad enters edit mode, and keying in the SID is now possible.	After entering the SID and leaving edit mode, the correct service is chosen and saved.

---

[1] The satellite frequency should be within the area of the LNC frequency (±950 to 2150 MHz). If your frequency is outside this range, replace your LNB with a higher or lower ranging unit.
[2] Maximum burst period is 370 µs at 216 Mbit/s.

Setting Up a TV Language

Some services may contain several audio, Teletext and subtitling components, being sent in different languages. To enable the decoder to identify which one of these components to use, it is important to edit the information in the **TV components** menu.

Table 3.3: Selecting a TV Language

Step	Action	Result
1.	Go to the **TV comp**. menu, located under the **setup** menu.	The display will read "SET: TV COMP." on the top line.
2.	Repeat pressing the up arrow, until you are on the top line	The second line will display "aud lang.: *xxx*"
3.	Press right to enter edit mode, and key in the desired ISO 639 language code.	Upon leaving the menu, the decoder will choose the audio stream in the service with the associated language (if available).
4.	Continue in the same fashion for the Teletext and subtitling components.	Upon leaving the individual menus, the decoder will choose the Teletext and subtitling stream in the service with the associated language (if available).

If the decoder is not able to find the language described in the **TV components** menu, the first component for each type in the PMT is selected for decoding.

3.4.2 Setting Up Additional Audio Channels

Depending on the configuration, the unit might be fitted with additional audio outputs. Configuring these outputs is very similar to configuring the TV output.

> **NOTE...**
>
> The first additional audio is dubbed "Audio 2", as "Audio 1" is the name of the output belonging to the TV service selection menu.

To set up an additional audio service, select the service and language according to *Table 3.4*.

Table 3.4: Setting Up Additional Audio Services

Step	Action	Result
1.	Go to the **Audio *n* service** menu, located under the **setup** menu.	The display will read "SET: AUDIO *N* SERVICE" on the top line.
2.	Repeat pressing the up and down arrows, until the selected service is displayed. If Service names do not exist for the chosen TS, continue to item 4.	The second line will scroll between all the services available in the transport stream.
3.	Pressing right will select the displayed service.	A small check mark is displayed in front of the service, indicating that it is selected. Note that if a TV service is selected, only the audio of this service is decoded.
4.	It is also possible to select service based on service id. Keep on scrolling until the display read "Service in. *nnnn*".	This enables you to select services that are not named in the SDT.
5.	By pressing right once, the keypad enters edit mode, and keying in the SID is now possible.	After entering the SID and leaving edit mode, the correct service is chosen and saved.

Step	Action	Result
6.	Exit the **Audio *n* service** menu once you have selected the correct service.	This will take you back to the set-up menu.
7.	Enter the **Audio n comp** menu.	The menu items here will enable you to select the correct audio language component from the service.

3.4.3   Selecting a Data Component

The low-speed data output on the TT1220 is intended for, but not limited to, outputting data in the transport stream as RS-232 data information. In fact, any one PID content can be selected[3] for data output.

Table 3.5: Configuring the Low-speed Data Output.

Step	Action	Result
1.	Go to the **LS data** menu, located under the **RS-232 setup** submenu in the **advanced** menu.	The display will read "SET: LS DATA" on the top line.
2.	Set the mode either to "manual" or "Mode # 2", depending on what kind of data you are extracting.	This will set the output mode, manual is the default. Mode #2 is a NDS specific format, only for use with NDS equipment.
3.	Set the aux PID to the PID number that is to be extracted.	The PID (if it exists) is now being output from the decoder.
4.	Enter the communication submenu, allowing you to select the communication parameters.	The display will read "LS: COMMUNICATION" on the top line.
5.	Set the data rate, data bits, parity bit, stop bit and flow control options to suit your communications application.	The changes take effect immediately when you leave a submenu. Make sure you don't select a lower data rate than the actual bandwidth of the selected pid.
6.	Leave the communication submenu, and select the Output submenu	The display will read "LS: OUTPUT" on the top line.
7.	Set the TS parse format, the output format and the buffer model.	Defines the way the data in the PID is output from the decoder, as defined in *Table 3.6*.

Table 3.6: Low-speed Data; Output Options

Selection	Option	Result
TS parse	All: Payload: PES payload:	Transport stream output "as is". TS packet payload is output, TS packet header is stripped off. Only PES payload is output.
O/P Format	BIN: HEX:	Binary output Hexadecimal output, most significant nibble first.
Buffering	Flow: Burst:	PID data is transmitted directly Used for analysing the input sequence of a PID with higher transfer rate than the UART can handle (max 115200 bit/s). The buffer will fill up and dump the contents. The buffer size is 16 kilobytes.

---

[3] Although any PID can be selected, the success of the data output relies on less data existing in the PID, than the current selected data output rate, which has a maximum of 115200 bit/s.

3.4.4   Setting Up the Transport Stream Output

Overview

The TT1220 unit might be fitted with an optional ASI output. This output can be configured to either output the incoming transport stream 'as-is', or, depending on configuration, output the transport stream with the selected service descrambled.

Either way, the entire transport stream is output. Null packets are not removed, and PIDs can not be filtered or remapped. The effective bit-rate is the same as on the input.

The output is configured for descrambling according to *Table 3.7*.

Table 3.7: Configuring Descrambled Transport Stream Output

Step	Action	Result
1.	Go to the **System Options** menu, located under the **Advanced** submenu in the **Setup** menu.	The display will read "ADV: SYSTEM OPTIONS" on the top line.
2.	Set the "ASI out" option to "Descr".	The ASI output will now contain the currently selected service components in clear.

Output Packet Format

Regardless of the input format, the ASI output of the TT1220 is always byte spread 188 byte packets. Any RS information present on the input is removed, and bursted data is buffered to a spread byte mode before being output.

Chapter 4

Operating the Equipment Remotely

Contents

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4.1   Remote Control

4.1.1   Introduction

The TT1220 can be remotely controlled in a variety of ways. The basic control methods are:

- RS-232 control methods:
    - TDC (TANDBERG Device Controller)
    - TSM (TANDBERG System Manager)
    - 3rd party application (using TANDBERG RS-232 control protocol)
- Over the air control methods:
    - NDS Director

Common for all control methods is that the TT1220 needs to be set up to accept the remote control handling. Once in remote control mode, it cannot be locally controlled unless the remote control is deactivated.

4.1.2   Remote Protocol Control Documentation

The protocols used for remote control are the TANDBERG RS-232 control protocol and the NDS Director Over-the-Air control protocol. Neither of these protocols are described, or intended to be in the scope of this manual.

For information about these protocols, please refer to the remote control documentation, or contact TANDBERG to obtain this information.

> **NOTE...**
> The remote control protocols are not contained as a part of the product. An additional license fee, NDA or other agreement with TANDBERG and/or NDS may be necessary to obtain the information required to control the product remotely.

4.1.3   Configuring the Unit for Remote Control Via RS-232

For the unit to be controlled via RS-232, the RS-232 port has to be configured to the same settings as the host controller system. The control mode of the TT1220 also needs to be set to remote.

Table 4.1: Configuring the Communication Parameters

Step	Action	Result
1.	Go to the **remote** menu, located under the **Advanced**, **RS-232 Setup** submenu in the **setup** menu.	The display will read "SET: REMOTE" on the top line.
2.	Repeat pressing the up arrow, until you are on the top line	The display will read "Baud rate:" on the bottom line.
3.	Press right once, and then by using the up and down arrows, key in the desired baud rate.	The baud rate should be set to the same value as the external control host.
4.	Repeat for data bits, stop bits, parity and flow control.	All settings should be set to match the external control host.
5.	Once completed, the changes take effect immediately.	

Once the communication parameters are entered correctly, set the system into remote mode for the external computer to gain control of the unit.

Table 4.2: Activating RS-232 Remote Control

Step	Action	Result
1.	Go to the **system options** menu, located under the **Advanced** submenu in the **setup** menu.	The display will read "ADV: SYSTEM OPTIONS" on the top line.
2.	Scroll until halfway down the menu, where the item "Ctrl. Mode" is shown.	
3.	Press right once, and then by using the up and down arrows, key in the desired control mode, in this case: "remote".	The unit is now ready to accept remote control via the RS-232 port.

4.1.4 Configuring the Unit for Remote Control Over the Air (OAC)

For the unit to be controlled via OAC, the control mode of the TT1220 needs to be set to OAC.

Table 4.3: Activating OAC Remote Control

Step	Action	Result
1.	Go to the **system options** menu, located under the **Advanced** submenu in the **setup** menu.	The display will read "ADV: SYSTEM OPTIONS" on the top line.
2.	Scroll until halfway down the menu, where the item "Ctrl. Mode" is shown.	
3.	Press right once, and then by using the up and down arrows, key in the desired control mode, in this case: "OAC".	The unit is now ready to accept remote control via the OAC protocol.

4.1.5   OAC Lockout

Overview

Once the unit is in OAC control mode, it is possible for the remote control operator to issue a local lockout command to the decoder. This will effectively deny the local user access to configuring the unit.

However, if a situation occurs whereby the local user needs to regain control over the unit, without a local lockout relinquish command being sent from the OAC control PC, a four digit PIN may be entered through the keypad.

The PIN is created at lockout time by the user. To obtain the PIN, please consult the person responsible for the administration of the unit.

> **NOTE...**
> TANDBERG Help Desk will not be able to provide you with the Local lockout pin, as it is uniquely created at the time of the lockout.

Entering the OAC Lockout PIN

Table 4.4: Entering the OAC Lockout PIN

Step	Action	Result
1.	Go to the **system options** menu, located under the **Advanced** submenu in the **setup** menu.	The display will read "ADV: SYSTEM OPTIONS" on the top line.
2.	Scroll until LL Pin is displayed	
3.	Press right once, and edit the four digit PIN until the lockout PIN is displayed.	
4.	Exit the menu by moving the cursor to the right outside the edit area.	The menu returns to the "ADV:SYSTEMS OPTIONS" menu. The unit is now in local control mode.

4.2   Returning the Unit to Local Control Mode

Once the unit is in remote control mode, no local controls are available. To reacquire local control, it is necessary to set the remote control parameter back to "local".

Table 4.5: Configuring the Unit for Local Control

Step	Action	Result
1.	Go to the **system options** menu, located under the **Advanced** submenu in the **setup** menu.	The display will read "ADV: SYSTEM OPTIONS" on the top line.
2.	Scroll until halfway down the menu, where the item "Ctrl. Mode" is shown.	
3.	Press right once, and then by using the up and down arrows, key in the desired control mode, in this case: "local".	The unit is now controlled via the front keypad.

If the unit is controlled via NDS Director, a local lockout may be imposed. In this case, it is necessary to relinquish the lockout from the remote system, or to enter the local lockout pin, described in *Table 4.4*.

4.3   Control Mode Flowchart

The following flowchart illustrates the different control modes, and how they affect one another.
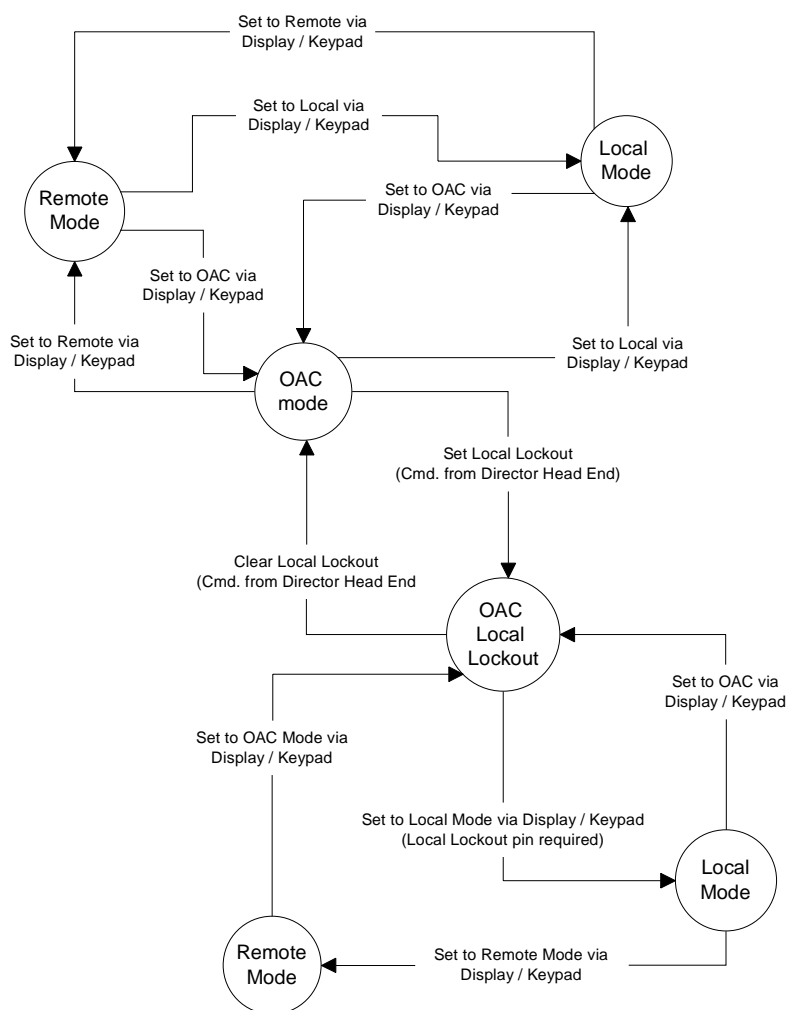
Figure 4.1: Control Mode Flowchart

Chapter 5

Alarms

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5.1 Alarm Configuration

5.1.1 Alarm Configuration of the TT1220

The TT1220 has a multitude of possible error conditions. All of these error conditions generate error messages, which are user configurable, and each message may be given three different states of severity. They are Ignore, Warning, and Alarm.

> **NOTE...**
>
> By sorting these alarm messages into these three different categories, you can avoid unnecessary alarm situations, for example missing Teletext in a service with only video and audio.

5.1.2 Changing the Alarm Configuration

The alarm messages are sorted into eight different categories, described in *Table 5.1*. The alarm messages associated with each category are described in *Annex D, Alarm Categories and Conditions*.

Table 5.1: Alarm Categories

Category	Description
Input	Alarms relating to the input signal strength, sync etc.
PSI	Alarms relating to errors in the PSI, missing PSI etc.
CA	Alarms relating to the CA system, the smart card reader, and the descrambling.
Video	Alarms relating to the video PID and the Video Decoding.
VBI	Alarms relating to the VBI PIDs and the display of Teletext, subtitling and testlines.
Audio	Alarms relating to the audio PIDs and the Audio Decoding.
Data	Alarms relating to the data decoding and output.
Config	Alarms relating to the general hardware and software configuration of the unit.

The option of user defining the severity of the alarms is located under the **Alarm Setup** menu, located under the **advanced** submenu of the **setup** menu.

> **NOTE...**
>
> The alarm message severity level is indicated by a single character, where **–** is for ignore when the condition is met, **W** is for raising a warning when the condition is met, and **A** is for raising an alarm when the condition is met.

Table 5.2: Navigating the Alarm Configuration Menus

Step	Action	Result
1.	Go to the **alarm setup** menu, located under the **advanced** submenu in the **setup** menu.	The display will read "ADV: ALARM SETUP" on the top line.
2.	Using the up and down arrows, select an alarm category for modification, right click to enter the category.	Scrolling up and down will now reveal all alarm messages associated with this alarm category.
3.	Right click to select an individual alarm state, and use the up and down arrows to select the severity of the corresponding alarm message.	This will allow you to select between A, W or – for the current alarm situation.
4.	Right click to save and exit the severity level of the current alarm message.	

5.2   Front Panel Alarm Indicators

5.2.1   Introduction

The status of the TT1220 may be read locally, either by observing the main error LED, or in more detail by going through the status menu.

5.2.2   Location of Front Panel LED and LCD Indicators

The front panel led is located between the display and the keypad. It has one condition indicator only, which is **On** (red light). This indicates that the unit is in an alarmed state.
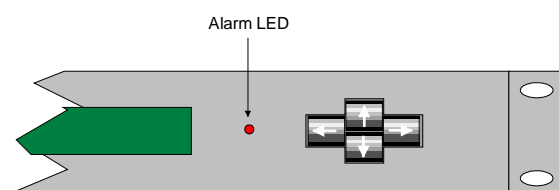
Figure 5.1: Location of Front Panel LED

The unit also indicates its alarm state by the use of the front display. When in status view, the current alarm state is shown in the top right hand side of the display. If several conditions exist, the most severe (alarm) is displayed, i.e. "Video: Err in stream". If no alarms are present in the system, the top most warning will be displayed.

If no alarms or warnings are active, the status display (if the LCD is in its default mode) will display "STATUS: OK" on the topmost line of the LCD.

5.3   Menu Driven Alarm Indications

Once the TT1220 is in a warned or alarmed state, the easiest way for the user to diagnose the alarm condition is via the status menu.

Table 5.3: Navigating the Alarm Status Menus

Step	Action	Result
1.	Go to the **alarm** menu, located under the **status** menu.	The display will read "STATUS: ALARM" on the top line.
2.	Scroll up and down through the alarm categories.	Each category will show its status; OK, WARNING or ALARM.
3.	To check the alarm state of an individual alarm, right click on a category showing a warning or alarm state.	This will show a list of all current alarms generating a warning or alarm message within the currently selected alarm category.

For description of all the alarm messages, refer to *Annex D, Alarm Categories and Conditions.*

5.4 Rear Panel Alarm Indicator

The rear panel is fitted with an alarm relay. This relay is a charge over contacts relay, which indicates both the Alarm and the OK state of the unit.

The description of the relay is located in *Chapter 2, Installing the Equipment.*
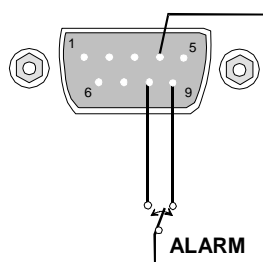
Figure 5.2: Alarm Relay

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Preventive Maintenance and Fault-finding

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6.1 Routine Checks

6.1.1 Cooling Fan

There are no routine checks associated with this equipment other than to ensure that the unit is adequately cooled. This equipment must never be operated unless the cooling fan is working; this should be checked periodically.

CAUTION...

The fan contained within this unit is not fitted with an insect / dust filter. Pay particular attention to the environment in which it is going to be used.

6.1.2 Cleaning

Unplug the equipment from the power supply before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning the exterior of the receiver.

6.2 Servicing

6.2.1 Conditions Requiring Servicing

WARNING...

DO NOT ATTEMPT TO SERVICE THIS PRODUCT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

The following is a list of conditions which may indicate a need for servicing of the product:

1. When the power supply cord or plug is damaged
2. If liquid has been spilled, or objects have fallen into the product
3. If the product has been exposed to rain or water
4. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions or as told by a TANDBERG Television engineer. Failure to do so may render the product in an unstable state; and may require extensive work by a qualified technician to restore the product to normal operation
5. If the product has been dropped or the case has been damaged
6. When the product exhibits a distinct change in performance
7. If the equipment has been exposed to a lightning strike or power surge

6.2.2 Replacement Parts

When replacement parts are required, be sure only parts specified by TANDBERG Television (or having the same characteristics as the original part) have been used. Unauthorised substitution may result in fire, electric shock or other hazards.

6.2.3 Check on Completion of Servicing

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in a safe operating condition. Also, performance and EMC checks may be required.

6.3 Maintenance

6.3.1 Warranty

The equipment is covered by a standard TANDBERG Television warranty service for a period of 12 months, from delivery from TANDBERG Television.

The warranty covers the following:

- All material defects in the equipment for a period of 12 months
- All parts and labour charges
- All returned items will be repaired within 30 working days from receipt at the TANDBERG customer services facilities
- Return of the repaired item to the customer, postage paid
- Provide assistance to the customer through the Customer Help Desk number, operated 24 hours a day, 7 days a week. See the customer help desk information in the Preliminary pages in this manual

The warranty does not cover any engineering visit(s) to the customer's premises.

6.3.2 Extended Warranty

NOTE...

The above warranty is the basic warranty on TANDBERG Television products. This warranty might be extended through a separate deal or purchase made with TANDBERG Television. Refer to the service contract (if any) that came with your equipment or system for further information.

6.4 Factory Default Settings

The TT1220 is dispatched with the following factory defaults, unless otherwise specified by the customer. These can be restored at any time using the **restore defaults?** option found in the **advanced** submenu of the **setup** menu.

Table 6.1: Factory Defaults

Menu	Item	Default
Setup	Video Format	PAL
	Teletext	OFF
TV Components	Aud Lang.	Eng
	Ttx Lang.	Eng
Audio 2 Component	Aud2 Lang.	Eng
System options	ASI Out	Transp.
	Ctrl. Mode	Local
	Menu lock	OFF
Vid. Setup 625	Teletext	OFF
	VPS	OFF
	WSS	MPEG-video
	Testlines	OFF
	Sin (x) / x	OFF
Vid. Setup 525	Testlines	OFF
TV Audio Setup	Output level (dB)	0.0
	Modulator	Stereo
2nd Audio Setup	Output level (dB)	0.0
	Modulator	Stereo
PTS setup	Audio Delay ms	0
	Audio2 Delay ms	0
Remote	Baud rate	115200
	Data bits	8
	Stop bits	1.0
	Parity	None
	Flow control	None
LS data	Mode	Manual
	Aux PID	0000
	Buff Use %	0.0
LS Communication	Baud rate	115200
	Data bits	8
	Stop bits	1.0
	Parity	None
	Flow control	None
LS Output	TS parse	Payload
	O/P format	Bin
	Buffering	Flow

6.5   Fault-finding

6.5.1   General

The information contained in this chapter is intended to isolate the unit *as* the faulty equipment if a system failure occurs. If the following information fails to clear the abnormal condition, please contact Customer Services using the information given in the Preliminary pages of this manual.

6.5.2   Preliminary Investigation

1. Ensure that all leads and connectors are in place and serviceable.
2. Ensure the unit is powered.
3. Ensure that the front panel LED is not lit. If it is lit, investigate the cause of the alarm in the **alarm status** menu as explained in *Chapter 5, Alarms*. If the LED is not lit, verify that alarm conditions that could be met have not been masked as explained in *Chapter 5*.
4. Verify signal lock, and that the BER is within the acceptable range (QPSK input only).

6.5.3   Testing

The TT1220 runs a self-initialisation and test at start-up. Verify that the display reads "initialising" when the unit is powering up, and that the hardware is working properly, by looking for alarms in the alarm status view.

If any configuration alarm messages exist, write them down before contacting the TANDBERG Television Customer Services

The following list covers most of the abbreviations, acronyms and terms used in TANDBERG Television Limited Manuals. All terms may not be included in this manual.

μm	Micro metres (10^{-6} metres).
3:2 pulldown	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled at half the luminance rate.
5B6B	Block code (5 binary bits encoded to 6 binary bits).
ac	Alternating Current.
ADPCM (Adaptive Differential Pulse Code Modulation)	A reduced bit-rate variant of PCM audio encoding (see also PCM). This algorithm encodes the difference between an actual audio sample amplitude and a predicted amplitude and adapts the resolution based on recent differential values.
ACC	Authorisation Control Computer.
ADT	Audio, Data And Teletext.
AFC	Automatic Frequency Control.
AFS	Automation File Server.
AGC	Automatic Gain Control.
AMOL I and II (Automatic Measure of Lineups I and II)	Used by automated equipment to measure programme viewing ratings.
ASI	Asynchronous Serial Interface.
ASIC (Application-Specific Integrated Circuit)	A customised chip designed to perform a specific function.
Async	Asynchronous.
ATM (Asynchronous Transfer Mode)	A source independent transport mechanism, supporting variable bit-rate transmission, which uses fixed length packets (called cells) to transfer user data.
ATSC	Advanced Television Standards Committee.
B3ZS	Interface code (bipolar with three successive zeros substituted). Similar coding scheme to HDB3.
Backward Compatibility	A newer coding standard is backward compatible with an older standard if decoders designed to operate with the older coding standard are able to continue to operate by decoding all or part of a bit-stream produced according to the newer coding standard.
BAT (Bouquet Association Table)	Part of the service information data. The BAT provides information about bouquets. It gives the name of the bouquet and a list of associated services.

Baud Rate	This is typically used to denote the bit rate of the payload plus channel coding overhead. In a binary transmission (low and hi only) the baud rate is equivivalent to the highest possible transition frequency (hi-low-hi-low) in the transmission.. Measured in Baud.
BCC	Broadcast Control Computer.
BER	Bit Error Rate: A measure of transmission quality. It is generally shown as a negative exponent, (e.g., 10^{-7} which means 1 out of 10^7 bits are in error or 1 out of 10,000,000 bits are in error).
	Also:
	Bit Error Ratio: The ratio of error bits to total error bits in a transport stream.
Bit-Rate	In a binary transmission (low and hi only) the bit rate is equivivalent to the highest possible transition frequency (hi-low-hi-low) in the transmission. This does not necessarily specify the bit rate of the payload. See baud rate.
Block; Pixel Block	An 8 row by 8 column matrix of luminance sample values, or 64 DCT coefficients (source, quantised, or dequantised).
Bouquet	A collection of services (TV, radio, and data, or any combination of the three) grouped and sold together, and identified in the SI as a group. A single service may be in several bouquets.
B-Picture; B-Frame (Bidirectionally Predictive Coded Picture/Frame)	A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backwards prediction). B frames are not used in any prediction.
BPSK (Binary Phase Shift Keying)	A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.
BW	Bandwidth.
CA (Conditional Access)	The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
CAT (Conditional Access Table)	Part of the Service Information data. The CAT identifies the PID in which conditional access management data (EMMs) is being carried, per CA provider.
C-Band	The portion of the electromagnetic spectrum which spans the frequency range of approximately 4 GHz to 6 GHz. Used by communications satellites. Preferred in tropical climates because it is less susceptible to fading compared to e.g. Ku band transmissions
CCIR	*See:* ITU-R.
CCITT	*See:* ITU-T.
Channel	A particular bandwidth on which an individual viewing service is broadcast.
Channel Coding	A form of coding for the conversion of a digital signal into a signal that is matched to the characteristics of the transmission channel.
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
Codec	The combination of a coder followed by a complementary decoder located respectively at the input and output of a transmission path.
COFDM (Coded Orthogonal Frequency Division Multiplex)	A modulation system used particularly for terrestrial digital broadcasting.
Compression	Reduction in the number of bits used to represent an item of data. For the purposes of a broadcast system, it is the process of reducing digital information by discarding redundant portions of information that are not required upon reconstitution to produce viewing clarity.
Compression System	Responsible for compressing and multiplexing the video/audio/data bit-streams, together with the authorisation stream. The multiplexed data stream is then transmitted to the satellite or cable head-end.
Cr/Cb	Chrominance difference signals. These signals, in combination with the luminance signal (Y), define the colour of a particular point on a TV line.
CRC (Cyclic Redundancy Check)	A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to insure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.
CVBS (Composite Video Blanking and Synchronisation)	Analogue TV signals, e.g. PAL, NTSC.

dB (Decibels)	A ratio of one quantity (usually signal power) to another. Common variants are suffixed by an additional letter signifying that a single power measurement is referenced to a standard value: dBm - decibels relative to 1 mW dBW - decibels relative to 1 W.
DCE	Data Communications Equipment.
DCT (Discrete Cosine Transform)	An invertible, discrete orthogonal transformation. The values associated with blocks of pixel samples are transformed from the spatial domain into the frequency domain, producing coefficients in which spatially redundant information can be removed. Can be forward DCT or inverse DCT.
DDS	Direct Digital Synthesiser.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some decoders are separate from the receiver but, in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). (The term IRD, or IRD/Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes/Converters.)
Decoding Time-stamp	A field that may be present in a PES packet header that indicates the time that an access unit is to be decoded in the system target decoder.
Differential Coding	Method of source coding using the difference between the value of a sample and a predicted value.
DIL	Dual In Line.
DIN	Deutsches Institut für Normung.
Downlink	The part of the communications satellite circuit that extends from the satellite to the Earth.
DPCM (Differential Pulse Code Modulation)	A process in which a signal is sampled and the difference between each sample of a signal and its predicted value is derived from the succession of quantised values is converted by coding into a digital signal.
DSNG	Digital Satellite News-Gathering.
DSP	Digital Signal Processor.
DTE/DCE (Data Terminal Equipment/Data Communication Equipment)	Components in a packet switching network.
DTH (Direct To Home)	The term used to describe uninterrupted transmission from the satellite directly to the subscriber - that is, no intermediary cable or terrestrial network utilised.
DVB (Digital Video Broadcasting)	A European project which has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) media, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421). DVB-PI refers to DVB Professional Interfaces.
DVB SI	Digital Video Broadcasting Service Information.
Earth	Technical Earth: Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth. Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.
EBU	European Broadcast Union.
ECM	Entitlement Control Message.
EIA	Electronics Industries Association (USA).
EIT (Event Information Table)	A component of the Service Information (SI) stream which contains information about events or programmes such as event name, start time, duration, etc.
Elementary Stream	A generic term for a coded video, coded audio or coded other bit-stream.
EMC	Electromagnetic Compatibility.
EMM	Entitlement Management Message.
Ethernet	A means by which machines are connected and communicate over a network.
ETS	European Telecommunications Standard.
ETSI	European Telecommunications Standards Institute.
FCC	Federal Communications Commission.
FDM (Frequency Division Multiplex)	A common communication channel for a number of signals, each with its own allotted frequency.

FEC	Forward Error Correction. The amount of redundancy available in the Input Signal. This redundancy is used by the Forward Error Correction routine to detect and correct channel errors. *Also:* Future ECM Computer: responsible for preparation of FECMs from Programme Information.
FFT (Fast Fourier Transformation)	A fast algorithm for performing a discrete Fourier transform.
FIFO (First In, First Out)	A type of buffer.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	File Transfer Protocol.
G.703	The ITU-T standard which defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP (Group of Pictures)	MPEG video compression works more effectively by processing a number of video frames as a block. The NDS System Encoder normally uses a 12 frame GOP, every twelfth frame is an I frame.
GUI	Graphical User Interface.
HDTV	High Definition Television.
HPA (High Power Amplifier)	Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
Hub	A device in a multipoint network at which branch nodes interconnect.
ICAM (Integrated Conditional Access Module)	Embedded in the IRD and responsible for descrambling and packet filtering and reception. It also contains the physical interface to the subscriber's viewing card.
IEC	International Electrotechnical Committee.
IF (Intermediate Frequency)	Usually refers to the 70 MHz or 140 MHz output of the modulator in satellite and cable transmission applications.
Interframe Coding	Predictive coding where values for prediction are taken from the previous and the current frame. That is, coding exploits temporal redundancy by using forward or backward prediction to produce P or B Frames.
Intraframe Coding	Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I Frames.
IP	Internet Protocol.
I-picture; I-frame (Intracoded Picture/Frame)	A picture/frame which is coded using purely intra coding, with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IPPV (Impulse Pay Per View)	One-time events that the subscriber purchases 'on impulse' using pre-arranged credit from the SMS, not as part of a subscription.
IRD (Integrated Receiver Decoder)	The receiver with an internal decoder which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and decodes it when provided with a control word by the viewing card. (Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.)
IRE (Institute of Radio Engineers)	IRE Unit: An arbitrary unit used to describe the amplitude characteristics of a video signal. Pure white is defined to be 100 IRE and the blanking level is defined to be 0 IRE.
ISDN (Integrated Services Digital Network)	An ISDN line usually refers to a 64 kbit/s data line.
ISO	International Standards Organisation.
ITS (Insertion Test Signal)	A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	Invitation To Tender.
ITU-R	International Telecommunications Union - Radiocommunications Study Groups (was CCIR).
ITU-T	International Telecommunications Union - Telecommunications Standardisation Sector (was CCITT).
JPEG (Joint Photographic Experts Group)	An ISO/IEC international standards group developing an image compression algorithm for continuous tone still colour pictures.
Kbps / kbps	1024 bits per second / 1000 bits per second.
Ku-band	The portion of the electromagnetic spectrum which spans the frequency range of approximately 12 GHz to 14 GHz. Used by communications satellites. Preferred for DTH applications because this range of frequency is less susceptible to interference.
LAN (Local Area Network)	A network which provides facilities for communications within a defined building or group of buildings in close proximity.
L-band	The frequency band from 950 MHz to 2150 MHz which is the normal input frequency range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.

LED	Light Emitting Diode.
LNB (Low Noise Block Down-Converter)	The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
LO	Local Oscillator.
LSB	Least significant bit.
LVDS	Low Voltage Differential Signal.

Also:

Low Voltage Differential Serial interface. |
Macroblock	The four 8 x 8 blocks of luminance data and the two (for 4:2:0 chrominance format), four (for 4:2:2) or eight (for 4:4:4) corresponding 8 x 8 blocks of chrominance data coming from a 16 x 16 section of the luminance component of the picture. Macroblock can be used to refer to the sample data and to the coded representation of the sample values and other data elements.
Mbps	Mega (million) bits per second.
MCC (Multiplex Control Computer)	A component of the compression system. Using information from the AFS, the MCC sets up the configuration for the multiplexers under its control. An MCC controls the main and backup multiplexer for each transport stream.
MCPC	Multiple Channels Per Carrier.
MEM	One of the range of Tandberg Television compression system control element products. The MEM holds a model of the system hardware. Using this model, it controls the individual system elements to configure the output multiplexes from the incoming elementary streams. The MEM monitors the equipment status and controls any redundancy switching.
MMDS (Multichannel Microwave Distribution System)	A terrestrial microwave direct-to-home broadcast transmission system.
Motion Compensation	The use of motion vectors to improve the efficiency of the prediction of sample values. The prediction uses motion vectors to provide offsets into the past and/or future reference frames or fields containing previously decoded sample values that are used to form the prediction error signal.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML (Main Profile Main Level)	A subset of the MPEG-2 standard which supports digital video transmissions from around 2 to 15 Mbit/s over both satellite and cable channels.
MPEG (Moving Pictures Experts Group)	The name of the ISO/IEC working group which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Also known as ISO/IEC 13818 [1]. Supersedes the MPEG-1 standard. The standard is split into layers and profiles defining bit-rates and picture resolutions.
MSB	Most significant bit.
MSymbol/s	Mega Symbols per second (10^6 Symbols per second)
Multiplex	A number of discrete data streams (typically 8 to 12) from encoders that are compressed together in a single DVB compliant transport stream for delivery to a modulator.
MUSICAM (Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing)	An audio bit-rate reduction system relying on sub-band coding and psychoacoustic masking.
Mux (Multiplexer)	Transmission multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation.

The multiplexer also contains the cypher card which scrambles the services according to the control words supplied by the BCC. |
| Network | In the context of broadcasting: a collection of MPEG-2 transport stream multiplexes transmitted on a single delivery system, for example, all digital channels on a specific cable system. |
| NICAM (Near Instantaneously Companded Audio Multiplex) | |

NIT (Network Information Table)	Part of the service information data. The NIT provides information about the physical organisation of each transport stream multiplex, and the characteristics of the network itself (such as the actual frequencies and modulation being used).
nm	Nano metres (10^{-9} metres).
NTSC (National Television Systems Committee)	The group which develops standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 60 Hz field frequency.
NVOD (Near Video On Demand)	A method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
NVRAM (Non-volatile Random Access Memory)	Memory devices which, although permitting random read/write access, will not lose their information when power is removed. Stores the default configuration parameters set by the user.
OFDM	Orthogonal Frequency Division Multiplexing.
OSD (On-screen display)	Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.
PAL (Phase Alternation by Line)	A colour television broadcasting system developed in Europe that uses 625 picture lines and a 50 Hz field frequency.
PAT (Program Association Table)	Part of the service information data. For each service in the multiplex, the PAT carries the basic mapping of all the data in the transport stream, associating each programme with a Program Map Table.
PCM (Pulse Code Modulation)	A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR (Program Clock Reference)	A time-stamp in the transport stream from which the decoder timing is derived.
Pel (Picture Element)	Also known as a pixel.
PES (Packetised Elementary Stream)	A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 kBytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the decoder.
PID	Packet Identifier: the header on a packet in an elementary data stream which identifies that data stream. An MPEG-2/DVB standard.
	Also: Project Initiation Document, Programme ID.
PIN (Personal Identification Number)	A password used to control access to programming and to set purchase limits. Each subscriber household can activate several PINs and may use them to set individual parental rating or spending limits for each family member.
Pixel; Picture Element	The digital representation of the smallest area of a television picture capable of being delineated by the bit-stream.
pk-pk	Peak to peak.
PLL	Phase-Locked Loop.
PMT (Program Map Table)	Part of the Service Information data. Each programme has a PMT which lists the component parts (the elementary streams of video, audio, etc.) for the various programmes being transmitted.
P-picture/P-frame	A picture/frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
ppm	Parts per million.
PPV (Pay Per View)	A system of payment for viewing services based on a usage/event basis rather than on on-going subscription. Subscribers must purchase viewing rights for each PPV event that they wish to view. PPV events may be purchased as IPPV or OPPV (q.v.).
Program	A sequence of instructions for a computer.
	A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the time base is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news show, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme have a common start and end time. A series of programmes are referred to as events.
PROM (Programmable Read-Only Memory)	A device which may be written once with data for permanent storage, and then read whenever required. Special types of PROM permit the erasure of all data by Ultra Violet light (EPROM) or by application of an electronic signal (EEPROM).
PS (Program Stream)	A combination of one or more PESs with a common timebase.

PSI (Program Specific Information)	Consists of normative data which is necessary for the demultiplexing of transport streams and the successful regeneration of programs. (*See also:* service information).
PSIP (Program System Information Protocol)	The ATSC equivalent of SI for DVB.
PSK (Phase Shift Keying)	A method of modulating digital signals particularly suited to satellite transmission.
PSR (Professional Satellite Receiver)	*See also:* IRD.
PSU	Power Supply Unit.
QAM (Quadrature Amplitude Modulation)	A method of modulating digital signals which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK (Quadrature Phase Shift Keying)	A form of phase shift keying modulation using four states.
Quantising: Quantisation	A process in which the continuous range of values that a quantity may assume is divided into a number of predetermined adjacent intervals and in which any value within a given interval is represented by a single predetermined value within the interval.
	Also:
	A restriction of the number of DCT coefficient values, resulting in a limiting of the luminance and chrominance information.
RAM (Random Access Memory)	A volatile storage device for digital data. Data may be written to, or read from, the device as often as required. When power is removed, the data it contains is lost.
RF	Radio Frequency.
ROM (Read-Only Memory)	A non-volatile storage device for digital data. Data has been stored permanently in this device. No further information may be stored (written) there and the data it holds cannot be erased. Data may be read as often as required.
RS (Reed Solomon coding)	FEC algorithm optimised to correct errors in the transmission caused by transient noise (burst errors.
RLC (Run Length Coding)	Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character *x y* times'.
SCPC	Single Channel Per Carrier.
Scrambling	Alteration of the characteristics of a television signal in order to prevent unauthorised reception of the information in clear form.
	Also:
	A process (in digital transmission) used to combine a digital signal with a pseudo-random sequence, producing a randomised digital signal, conveying the same information, in order to facilitate transmission.
SDT (Service Description Table)	Provides information in the SI stream about the services in the system; for example, the name of the service, the service provider, etc.
SELV	Safety Extra Low Voltage (EN 60950).
Set-Top Box (STB)	The cable equivalent of the IRD (q.v.).
SFN	Single Frequency Network.
SI (Service Information)	Digital data describing the delivery system, content and scheduling/timing of broadcast data streams. SI data provides information to enable the IRD to automatically demultiplex and decode the various streams of programmes within the multiplex. Specified in ISO/IEC 13818[1].
Smart Card	*See:* Viewing Card.
SMATV (Satellite Mast Antenna Television)	A distribution system which provides sound and television signals to the households of a building or group of buildings, typically used to refer to an apartment block.
SMPTE	Society of Motion Picture and Television Engineers.
SMS (Subscriber Management System)	A system which handles the maintenance, billing, control and general supervision of subscribers to conditional access technology viewing services provided through cable and satellite broadcasting. The SMS system provided by NDS links a number of Users on a LAN with Batch Processors and a File Server providing access to a Database and a separate dedicated Conditional Access Interface Server which communicates with an Authorisation Control Centre (ACC).
	An SMS can be an automatic (e.g. Syntellect) system where subscribers order entitlements by entering information via a telephone. Alternatively, an SMS can be a manual system which requires subscribers to speak with an operator who manually enters their entitlement requests. Some systems support multiple SMSs.
SNG	Satellite News-Gathering.

SNMP	Simple Network Management Protocol.
Spatial Redundancy	Information repetition due to areas of similar luminance and/or chrominance characteristics within a single frame. Removed using DCT and Quantisation (Intra-Frame Coding).
SPI	Synchronous Parallel Interface.
Statistical Redundancy	Data tables are used to assign fewer bits to the most commonly occurring events, thereby reducing the overall bit-rate. Removed using Run Length Coding and Variable Length Coding.
STB (Set-Top Box)	*See*: IRD.
TAXI (Transparent Asynchronous Tx/Rx Interface)	A proprietary multiplexer interface.
TCP/IP (Transmission Control Protocol/Internet Protocol)	A set of communications protocols that may be used to connect different types of computers over networks.
TDM (Time Division Multiplex)	One common, physical communications channel for a number of signals, each with its own allotted time slot.
TDT (Time and Date Table)	Part of the Service Information. The TDT gives information relating to the present time and date.
Temporal Redundancy	Information repetition due to areas of little or no movement between successive frames. Removed using motion estimation and compensation (Inter-Frame Coding).
Time-stamp	A term that indicates the time of a specific action such as the arrival of a byte or the presentation of a presentation unit.
Transport Stream	A set of packetised elementary data streams and SI streams which may comprise more than one programme, but with common synchronisation and error protection.
	The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Transport Stream Packet Header	A data structure used to convey information about the transport stream payload.
TS	Transport stream. A combination of one or more fixed length PESs with independent timebases into a single stream.
TSP	Transport Stream Processor.
U	44.45 mm (rack height standard).
UART (Universal Asynchronous Receiver Transmitter)	A device providing a serial interface for transmitting and receiving data.
Upconvert/ Downconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher (lower) frequency range.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS (Uninterruptable Power Supply)	A device that conditions the power supply to equipment to ensure continuous power and the avoidance of power surges. It also provides power from batteries, for a short time, in case of mains failure.
UTC	Universal Time, Co-ordinated (previously Greenwich Mean Time or GMT).
	Also
	Unique Title Code.
Vitterbi	A filter optimized to correct errors caused by evenly distributed noise. (Band limited White Noise)
VITS	Vertical Interval Test Signal. *See:* ITS.
VPS	Video Programming System.
WSS (Wide Screen Switching)	Data used in wide-screen analogue services which enables a receiver to select the appropriate display mode.
WST	World System Teletext.
XILINX	A type of programmable Integrated Circuit.
Y (Luminance)	Defines the brightness of a particular point on a TV line.

Annex B

Technical Specification

Contents

List of Tables

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B.1   General

The TT1220 is a 1RU single channel MPEG-2 decoder, designed to decode DVB compliant MP@ML MPEG-2 transport streams.

B.2   Key Features

- QPSK or ASI input
- NDS or DVB-CI CA
- MP@ML Decoding up to 15 Mbit/s
- Remote controllable via RS-232
- Optional descrambled ASI output
- Optional additional audio
- Supports NDS Director remote control

B.3   Technical Details, TS input

B.3.1   Satellite QPSK Input

Table B.1: QPSK Input

Parameter	Performance
Connector type:	F-type (female)
Impedance:	75 Ω
Symbol range:	1 – 44.5 Msymb/s
Max transport stream rate:	60 Mbit/s
FEC rate:	$^1/_2$, $^2/_3$, $^3/_4$, $^5/_6$, $^7/_8$
Frequency range:	950 – 2150 MHz
Tuning steps:	100 kHz
Input level:	-65 dBm to –25 dBm, for SymbolR. > 20Msymbols/sec -65 dBm to (–35 Rate [Msybols/sec] – 10) dBm, for 10 Msymbols/sec < SymbolR. < 20Msymbols/sec -65 dBm to –35 dBm, for SymbolR. < 10Msymbols/sec
Return loss:	>8 dB at i/p
LNB power feed V:	0V, 13.5V, 18V
LNB power feed I:	max 450 mA
LNB power supply tolerance:	+/- 5%
LNB 22 kHz:	On / Off selectable
LNB 22 kHz frequency tolerance:	+/- 2 kHz
LNB 22 kHz amplitude:	650 mV +/- 250 mV
Spectral inversion:	On / Off selectable

B.3.2 ASI Input

Table B.2: ASI Input

Parameter	Performance
Connector type:	BNC (female)
Impedance:	75 Ω
Sustained transport stream rate:	60 Mbit/s
Max burst time:	370 μs at 216 Mbit/s

B.4 Technical Details, TS Output

B.4.1 Optional ASI Output

Table B.3: ASI Output

Parameter	Performance
Connector type:	BNC (female)
Impedance:	75 Ω
Sustained transport stream rate:	60 Mbit/s
TS output mode:	Byte spread mode

B.5 Technical Details, Decoder

B.5.1 Video Decoder

Table B.4: Video Decoder

Parameter	Performance	
Profile:	MP@ML	
Max bit-rate:	15 Mbit/s	
Resolutions supported:	625 lines:	525 lines:
	720 x 576	720 x 480
	704 x 576	704 x 480
	544 x 576	544 x 480
	480 x 576	480 x 480
	352 x 576	352 x 480
	352 x 288	352 x 240

B.6 Technical Details, Audio and Video Output

B.6.1 Analogue Video Output

Table B.5: Analogue Video Output

Parameter	Performance
Connector type:	2 x BNC (female)[1]
Impedance:	75 Ω
Luminance non-linearity (measured on ramp):	< 2%
Chroma / Luminance gain error:	< 3%
Chroma / Luminance delay error:	< 37.5 ns
Chroma subcarriers (SECAM):	+/- 2 kHz
Differential gain:	< 2%
Differential phase:	< 1 deg
Identification (SECAM):	Line ID
2T K factor:	< 1%
S/N Shallow-ramp measured according to ITU-R J.64:	> 54 dB weighted
Group delay (0.0 - 5.0 MHz):	+/- 40 ns

B.6.2 Composite 625 Lines Output

Table B.6: 625 Line Analogue Video Parameters

Parameter	Performance	
Frequency response:	0.0 – 5.0 MHz:	+/- 0.5 dB
	5.0 – 5.5 MHz:	+0.5 dB / –1.5 dB
	5.5 – 5.8 MHz:	+0.5 dB / -3 dB
Video output level:	+/- 3% (700 mV)	
Synch level:	+/- 3% (300 mV)	
Output encoding PAL:	B, D, G, H, I, Combination N, M	
Output encoding SECAM w Line ID:	B, G, H, D, K, K1, L	
Output encoding SECAM w Field ID:	D, K	

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[1] 1 connector may be factory replaced with an SDI output.

B.6.3 Composite 525 Lines Output

Table B.7: 525 Line Analogue Video Parameters

Parameter	Performance
Frequency response:	0.0 – 4.2 MHz: +/- 0.5 dB
	4.2 – 4.5 MHz: +0.5 dB / –1.5 dB
Video output level:	+/- 3 IRE
Synch level:	+/- 1.5 IRE
Output encoding NTSC:	M
Output encoding PAL:	M

B.6.4 VBI 625 Lines Output

Table B.8: 625 Line VBI Output

Parameter	Performance
VITS lines specification:	ITU-R J.63
VITS PAL (lines)	17, 18, 330, 331
VITS SECAM (lines):	17, 18
Other testlines PAL / SECAM:	Sin(x)/x
Other testlines SECAM:	Sweep
WST (EBU) Teletext Source system:	ETS 300 472 (DVB), SI-DAT 477 rev. 2
WST (EBU) Teletext Output system:	ITU-R BT.653-3, system B
WST (EBU) Teletext Level:	462 mV +/- 6%
WST (EBU) Teletext Eye height:	> 90%
WST (EBU) Teletext Delay rel. to video:	+/- 1 frame
VPS Source system:	SI-DAT 477 rev.2
VPS Output system:	ETS 300 231, ARD/ZDF Nr. 8R2
WSS Source system:	SI-DAT 477 rev.2
WSS Output system:	ETS 300 294

B.6.5 VBI 525 Lines Output

Table B.9: 525 Line VBI Output

Parameter	Performance
VITS lines Output system:	ITU-R J.63
VITS (lines):	Line 17, field 1 and 2
GCR:	ref. ATSC Doc A/49

B.6.6 SDI Video Output Option

Table B.10: SDI Video Output

Parameter	Performance
Output connector:	BNC (female)[2]
Impedance:	75 Ω
Output standard:	ANSI/SMPTE 259M
EDH:	SMPTE RP165
Audio embedding:	ANSI/SMPTE 272M level AEF
Output level:	800 mV pk-pk nominal +/-10%
Return loss (5-270 MHz):	> 15 dB

B.6.7 Audio Decoder Availability[3]

Table B.11: Audio Decoder Availability

Parameter	Performance
Standard version, # of decoders:	1 stereo channel decoded (2 mono)
Standard version, output format options:	Analogue balanced only
Extended version, # of decoders:	2 stereo channels decoded(4 mono)
Extended version, output format options:	Analogue balanced, S/PDIF, AC-3 passthrough or AC-3 downmix

B.6.8 Audio Decoder (Standard)

Table B.12: Audio Decoder Capacity, Standard Version

Parameter	Performance
Decompression:	MPEG-1 layer 1, MPEG-1 layer 2 (MUSICAM)
Standard version, output format options:	Analogue balanced.

B.6.9 Audio Decoder (Extended)

Table B.13: Audio Decoder Capacity, Extended Version

Parameter	Performance
Decompression:	MPEG-1 layer 1, MPEG-1 layer 2 (MUSICAM) Dolby AC-3
Extended version, output format options:	Analogue balanced, S/PDIF, AC-3 passthrough or AC-3 downmix

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[2] Replaces one of the analogue composite outputs.
[3] Some audio configurations may require licensee fees, and/or are only available as factory options. Type of audio supported depends on ordered configuration.

B.6.10 Analogue Audio Output

Table B.14: Analogue Video Output Specification

Parameter	Performance
Output connector:	9 pin D-sub (male)
Output format:	Balanced
Minimum bit-rate:	32 kbit/s
Maximum bit-rate:	384 kbit/s
Sampling rates:	32, 44.1, 48 kHz
Nominal output level:	
18 dB below clipping:	0 dBm in 600 Ω
Adjustable:	+/- 6 dB
Step size:	0.1 dB
Output impedance:	< 20Ω
Freq response:	
Fs 44.1 / Fs 48 kHz:	+/- 0.5 dB (20 Hz – 20 kHz)
Fs 32 kHz:	+/- 0.5 dB (20 Hz – 14.5 kHz), +0.5 dB / -1.5 dB
THD+N @ +9 dB:	< 63 dB (20 Hz – 20 kHz)
IMD @ 9.95-10.05 kHz, 0 dB:	< -50 dB
Inter channel phase:	< 3°
Idle channel noise:	< -74 dB

B.6.11 S/PDIF Audio Output

Table B.15: S/PDIF Audio Output Specification

Parameter	Performance
Output connector:	9 pin D-sub (male)
Sampling rates:	44.1, 48 kHz
Output format:	IEC 60958
Levels:	ANSI/SMPTE 276M-1995

B.7 Technical Details, Conditional Access

B.7.1 Conditional Access (CA)[4]

Table B.16: Conditional Access

Parameter	Performance
DVB version:	Common interface and BISS mode 0/1
Interface:	1 DVB-CIF slot
Format:	EN50221
Option:	Signal protection[5]
NDS version:	NDS Videoguard Director or NDS Videoguard BskyB
Interface:	1 smartcard slot
Type:	Double density

B.8 Technical Details, Data Communication

B.8.1 Low Speed Data

Table B.17: LS Data Configuration

Parameter	Performance		
Output connector:	9 pin D-sub (male)		
Electrical format:	RS-232		
Data rates:	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200		
Tollerance:	2.5 %		
Pin-outs:	Pin	Function	Direction
	1	Reserved	-
	2	Data receive (Rx)	Input
	3	Data transmit (Tx)	Output
	4	Reserved	-
	5	Ground	-
	6	Reserved	-
	7	Reserved	-
	8	Reserved	-
	9	Reserved	-

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[4] Contact TANDBERG Television for the latest list of available CA systems.
[5] Signal Protection is a proprietary TANDBERG CA system, previously available on the TT 1100 and TT 1200. It is not compatible with RAS.

B.8.2   Remote Control Port

Table B.18: Remote Control Port Configuration

Parameter	Performance		
Output connector:	9 pin D-sub (male)		
Electrical format:	RS-232		
Data rates:	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200		
Baud rate tolerance:	+/- 2.5%		
Protocol:	Proprietary TTV remote control protocol		
Pin-outs:	Pin	Function	Direction
	1	Reserved	-
	2	Data receive (Rx)	Input
	3	Data transmit (Tx)	Output
	4	Reserved	-
	5	Ground	-
	6	Reserved	-
	7	Reserved	-
	8	Reserved	-
	9	Reserved	-

B.9   Technical Details, Relays

B.9.1   Relays

Table B.19: Relays

Parameter	Performance	
Output connector:	9 pin D-sub (female)	
Electrical format:	Mechanical relay, contact closure	
Number of relays:		
DVB-CI version:	1 relay	
NDS version:	4 relays	
Pin-outs:	Pin	Function
	1	Relay 4, common pin
	2	Relay 3, common pin
	3	Relay 2, normally closed
	4	Relay 1, common pin
	5	Relay 2, common pin
	6	Relay 4, normally open
	7	Relay 3, normally open
	8	Relay 1, closed on alarm, open on OK
	9	Relay 1, open on alarm, closed on OK

B.10 Technical Details, Electrical, Physical and Operational

B.10.1 Power Supply

Table B.20: Power Supply

Parameter	Performance
Voltage range:	100V to 240V
Voltage tolerance:	-10%, +6%
Frequency range:	50 Hz to 60 Hz
Consumption:	Less than 45W

B.10.2 Physical[6] and Environment

Table B.21: Physical and Environment

Parameter	Performance
Height:	44 mm (1RU)
Width:	19″ rack size
Depth:	320 mm chassis
	20 mm plugs
	10 mm clearing
Operating humidity:	0% - 95%
	(non condensing)
Operating temp:	0°C - 50°C
Storage temp:	-20°C + 60°C

B.11 Other

B.11.1 Configuration Notes

The TT1220 is a product family, which can be configured in several different fashions. Some options are available on all models, while others are mutually exclusive.

For a list of available configurations, contact TANDBERG Television.

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[6] The physical environment specification of the unit may be limited to the specifications of the DVB-CIF CAM module in use.

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Annex C
Menus

Contents

C.1 LCD Menus

C.1.1 Using the Menus

Detailed description of the use of menus is given in *Chapter 3, Operating the Equipment Locally.*

C.1.2 Menu Descriptions

This annex describes the front panel LCD menus.

When the unit is first powered up, it progresses through a series of start-up pages on the LCD display.

The menu is created in a tree structure, where each branch may contain items, new branches, or both.

An item is viewed as an information string on the left side of the LCD, with an editable or selectable item on the right side, or an information string.

A path to a new sub branch is viewed as an information string on the left side of the LCD, where the string ends with a "`>`" character. The "`>`" symbolises the arrow key you have to press, to enter the submenu.

C.2 Menu Pages - Main Menu

The main menu is a pure branching menu. No items are selectable in this menu, it only allows access to other, lower level menus, which are described in individual sections.

Table C.1: Main Menu Items

Display title: Main Menu	Description	Section
Setup>	Enters the setup submenu	C.3
Status>	Enters the status submenu	C.4
Properties>	Enters the properties submenu	C.5

C.3   Setup Menu

C.3.1   Setup Menu Items

The **setup** menu contains all the submenus and items, required to set the configuration and control the daily use of the unit.

Table C.2: Setup Menu Items

Display title: Setup	Description	Section
Demod>	Enters the demod submenu	C.3.2
TV Service>	Enters the TV Service submenu	C.3.3
TV Components>	Enters the TV components submenu	C.3.4
Video Format	Changes the default Video format: "PAL", "SECAM" or "NTSC" selectable[1]	
Subtitling	Activates EBU Teletext Subtitling, if available: "EBU" or "Off" selectable.	
Teletext	Activates Teletext insertion into the outgoing VBI, if available: "On" or "Off" selectable.	
Audio2 Service>	Enters the Audio2 service submenu	C.3.5
Audio2 Comp.>	Enters the Audio 2 Components submenu	C.3.6
Advanced>	Enters the Advanced submenu	C.3.7

C.3.2   Demod Menu

The demod menu contains all the items that need to be set, to achieve a signal lock on an incoming QPSK transport stream.

Table C.3: Demod Menu

Display title: SET: DEMOD	Description	Section
LNC freq	Changes the LNC frequency in gigahertz.	
Sat freq	Changes the satellite frequency in gigahertz. For a frequency to be valid, the (Sat. Freq. – LNC Freq) should be a number between 950 MHz and 2150 MHz.	
Sym rate	Changes the Symbol Rate in megasymbols. Valid range is 1.000 to 44.500 Msym/s.	
Inner code	Changes the FEC rate: "Auto", "1/2", "2/3", "3/4", "5/6" and "7/8" selectable.	
LNC volt	Defines the voltage output by the F-connector located on the TT1220. "Off", "13V" and "18V" selectable.	
LNC 22kHz	If unit should provide LNC 22 kHz control signal to the LNB: "On" or "Off" selectable.	
Spec inv	Enables or disables spectrum inversion on the incoming signal: "On" or "Off" selectable.	

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[1] The Videoformat selection is not a format converter. The video format of the incoming MPEG stream will override this setting.

C.3.3   TV Service Menu

The TV Service menu contains the service list for the currently tuned transport stream. In other words, it lists the contents of the current PMT table. The list also contains a "ServiceID" item, which allows you to select the service, simply by typing in the correct SID. By selecting a service in the service list, the decoder will configure itself to decode the selected service, on the video and primary audio output, if possible.

Table C.4: TV Service Menu

Display title: SET: TV SERVICE	Description	Section
ServiceID	Display or change the service ID for the decoded service.	
Program Name	Allows selection of the displayed programme name.	

C.3.4   TV Components Menu

The TV Components menu allows the user to select which part of components are to be decoded. This is relevant for services with multiple audio streams associated with the video, for instance.

Table C.5: TV Components Menu

Display title: SET: TV COMP	Description	Section
Aud Lang:	Allows the entry of the three character ISO language code, for selection of the correct audio PID for the video service. If the selected code is not present in the audio stream, the first audio stream in the PMT table will be decoded.	
Ttx Lang:	Allows the entry of the three character ISO language code, for selection of the correct teletext PID for the video service. If the selected code is not present in the teletext streams, the first teletext stream in the PMT table will be decoded.	
Sub Lang:	Allows the entry of the three character ISO language code, for selection of the correct subtitle language for the video service. If the selected code is not present in the subtitle stream, the first subtitle stream in the PMT table will be decoded.	

C.3.5   Audio2 Service Menu

The Audio2 Service menu contains the service list for the currently tuned transport stream. The list also contains a **ServiceID** item, which allows you to select the service, simply by typing in the correct SID. By selecting a service in the service list, the decoder will configure itself to decode the selected service on the secondary audio output, if possible.

Table C.6: Audio2 Service Menu

Display title: SET: AUD2 SERVICE	Description	Section
ServiceID	Display or change the service ID for the decoded service.	
Program Name	Allows selection of the displayed programme name.	

C.3.6   Audio2 Components Menu

The TV Components menu allows the user to select which part of components are to be decoded. This is relevant for services with multiple audio streams associated with the video, for instance.

Table C.7: Audio2 Components Menu

Display title: SET: AUD2 COMP	Description	Section
Aud2 Lang:	Allows the entry of the three character ISO language code, for selection of the correct audio PID for the Audio2 service. If the selected code is not present in the audio stream, the first audio stream in the PMT table will be decoded.	

C.3.7   Advanced Menu

The advanced menu is a menu hub, containing submenus that allow the user to configure various system, output, alarm and remote options.

Table C.8: Advanced Menu

Display title: SET: ADVANCED	Description	Section
System options>	Enters the system options submenu	C.3.8
Output setup>	Enters the output setup submenu	C.3.9
Alarm Setup>	Enters the alarm setup submenu	C.3.16
RS-232 setup>	Enters the RS-232 setup submenu	C.3.17
Reset	Resets the entire decoder. The user is presented with a yes/no selection, before the decoder is reset.	

C.3.8   System Options Menu

The system options menu, contains the parameters necessary to configure the software of the unit. These parameters affect how the CA system and remote control operates.

Table C.9: System Options Menu

Display title: ADV: SYSTEM OPTIONS	Description	Section
ASI out	"Transparent" or "Descramble" selectable. If descramble is selected, the currently selected components of the service that is running, will be descrambled in the outgoing stream.	
Ctrl. Mode	Allows the selection of the control mode. "Local", "Remote", or "OAC" selectable. In remote or OAC, no other parameters on the unit can be changed locally, until the Ctrl. Mode is set back to local.	
LL Pin	The local lockout pin. If the decoder is set in Local lockout mode, inhibiting anything but remote control, the correct LL pin has to be entered here, to allow manual control of the unit. The PIN is a four digit number, determined by the software that initiated the Local Lockout.	
RLP	RemoteLockout Pin. This is a master PIN key, that can override local lockout, even if the LL PIN cannot be obtained.	
Menu lock	"On" or "Off" selectable. If set to On, an 8 key combination has to be entered, to allow access to the menus.	

C.3.9 Output Setup Menu

The output setup menu, contains the parameters necessary to configure the output of the unit. These parameters affect how the video, audio, and VBI information is decoded, and also controls the timing between the various components. The menu functions as a hub, containing submenus for the various groups of editable items.

Table C.10: Output Setup Menu

Display title: ADV: OUTPUT SETUP	Description	Section
Vid. Setup 625>	Enters the 625 line video setup submenu	C.3.10
Vid. Setup 525>	Enters the 525 line video setup submenu	C.3.11
TV audio setup>	Enters the TV audio setup submenu	C.3.12
Audio2 setup>	Enters the 2nd audio setup submenu	C.3.13
PTS setup>	Enters the PTS (timing) setup submenu	C.3.14
Factory adj.>	Enters the factory adjustment setup submenu (password protected)	C.3.15

C.3.10 Vid. Setup 625 Menu

The Video setup 625 menu contains all the parameters that affect the Video, other than the basic selection of Video service and language, when displaying 625 line video (PAL, SECAM). These parameters mainly affect Teletext / subtitling and VBI information.

Table C.11: Video Setup 625 Menu

Display title: OUT: VID. SETUP 625	Description	Section
Teletext	"On" or "Off" selectable. Enables or disables the output of Teletext, if present in the stream.	
Subtitling	"EBU" or "Off" selectable. Enables or disables decoding of EBU Teletext Subtitling.	
VPS	Video programme system. Enables or disables decoding of the VPS information into the VBI area. "On" or "Off" selectable.	
WSS	Wide screen signalling. Enables or disables decoding of the WSS information into the VBI area. "Off", "On (DVB)" or "MPEG-video" selectable. When set to On, WSS will be signalled as sent in the WSS PID. When set to MPEG-video, WSS will be signalled as sent in the Video Packet header of the video stream.	
Sin(x)/x	Enables Sin(x)/x testlines. "Off", line "335" or line "319" selectable.	
Testlines	Enables testlines. "Off", "17, 18" or "19,20" selectable. The numbers indicate on which VBI lines the testlines are displayed.	
Frame format	Off: No format conversion is done on the video output. 4/3: Generates a 4/3 picture in the method described in the Frame conv. Menu item below.	
Frame Conv.	14/9: Generates a 4/3 image using the 14/9 combination method. (Cutoff + Letterbox) 16/9LB: Generates a 4/3 image using the 16:9 letterbox method. 4/3PS: Generates a 4/3 image using the 4:3 Pan & Scan method. (DVB specified).	

C.3.11   Vid. Setup 525 Menu

The Video setup 525 menu contains all the parameters that affect the Video, other than the basic selection of Video service and language, when displaying 525 line video (NTSC). These parameters mainly affect closed caption and VBI information.

Table C.12: Video Setup 525 Menu

Display title: OUT: VID. SETUP 525	Description	Section
Closed Caption	Activates closed caption transmission on line 21.	
	Auto: Detects and decodes, if present, ATSC or NDS formatted closed captioning.	
	Off: Closed caption VBI insertion is turned off.	
	C-Cube: Decoding of C-Cube formatted closed captioning is turned on.	
	DiviC: Decoding of Divicom formatted closed captioning is turned on.	
Testlines	Activates testlines (VITS) on line 17.	
Frame format	Off: No format conversion is done on the video output.	
	4/3: Generates a 4/3 picture in the method described in the Frame conv. Menu item below.	
Frame Conv.	14/9: Generates a 4/3 image using the 14/9 combination method. (Cutoff + Letterbox)	
	16/9LB: Generates a 4/3 image using the 16:9 letterbox method.	
	4/3PS: Generates a 4/3 image using the 4:3 Pan & Scan method. (DVB specified).	

C.3.12   TV Audio Setup Menu

The TV audio setup menu allows the user to configure the output level and modulation of the first audio channel.

Table C.13: TV Audio Setup

Display title: OUT: TV AUDIO SETUP	Description	Section
Outp.Lev[dB]	+/- 6 dBu selectable, in 0.1 dBu steps	
Modulator	Stereo, mono or transparent selectable.	

The modulation of the audio depends both on the modulation used on the encoder side, and on the decoder side. *Table C.14* lists what is output on the decoder, in correlation to the modulator setting, and what is sent from the encoder.

Table C.14: Audio Modulation Results

Audio source		Modulator					
		Stereo		Mono		Transparent	
		Left output	Right output	Left output	Right output	Left output	Right output
Stereo (or joint stereo)		L	R	L+R	L+R	L	R
Dual Channel	No.1 (L)	1	1	1	1	1	2
	No. 2 (R)	2	2	2	2	2	1
Single Channel (mono)		1	1	1	1	1	1

The Left output and Right output columns refer to the output at the left and right audio connector, respectively. "L" and "R" refer to the content of the left and right audio signal present in a stereo transport stream. "1" and "2" refers to the audio signals in channel 1 and 2 respectively (the two mono signals present in the Dual Channel audio PID), or 1 for a mono PID.

As seen from the table, Dual Channel PIDs will only provide both channels to the user if modulation is set to "transparent". This could for instance be very useful for a two language service, where each language is sent as a mono component in a dual channel PID. In both the stereo and mono configurations, a dual channel PID will only provide one of the audio channels to the users.

This channel is selected to match the "Aud Lang" setting set up in the TV Components Menu (see *Table C.5*). If the language setting does not match any of the two audio components in the dual channel stream, the first one will be selected and decoded.

C.3.13 Audio2 Setup Menu

The Audio2 setup menu is virtually the same menu as the TV audio setup menu, only that it affects the secondary audio output of the decoder, not the primary.

Table C.15: Audio 2 Setup Menu

Display title: OUT: AUDIO2 SETUP	Description	Section
Outp.Lev[dB]	+/- 6 dBu selectable, in 0.1 dBu steps.	
Modulator	Stereo, mono or transparent selectable.	

For information on how the parameters affect the output, refer to *Section C.3.12, TV Audio Setup Menu*.

C.3.14 PTS Setup Menu

The PTS setup menu, allows the user to configure a offset for the audio, in relation to the PTS (Presentation Time-stamp). This is useful for correcting lipsync generated on the encoder (or earlier) stage in the transmission process.

Table C.16: PTS Setup Menu

Display title: OUT: PTS SETUP	Description	Section
Aud delay ms	+/- 999 ms selectable, in 1 ms steps	

C.3.15 Factory Adjustment Menu

The factory adjustment menu contains parameters (video gain, chroma gain, audio level fine tuning), that is preset to the correct level when shipped from TANDBERG Television.

However, should there be a need to change these values, you may call TANDBERG Television support, at the number shown in the Preliminary pages of this manual, to obtain the necessary PIN to access these menus.

Table C.17: Factory Adjustment Menu

Display title: OUT: FACTORY ADJ.	Description	Section
Password	A 8 digit number has to be entered, to access the factory settings submenu.	

C.3.16 Alarm Setup Menu

The alarm setup menu, is a hub-menu, where the submenus contain all the configurable alarm parameters, sorted into groups. The alarm parameters may be configured into three levels of severity; alarm (A), warning (W), or ignore (-).

Table C.18: Alarm Setup Menu

Display title: ADV: ALARM SETUP	Description	Section
Input	Input alarms submenu	
PSI/SI	PSI/SI related alarms submenu	
CA	CA related alarms submenu	
Video	Video related alarms submenu	
VBI	VBI related alarms submenu	
Audio	Audio related alarms submenu	
Audio2	Audio2 related alarms submenu	
Data	Data output related alarms submenu	
Config	Errors related to the configuration of the unit	

For further information on what the different alarms mean, refer to the alarm chapter, *Annex D, Alarm Categories and Conditions*.

C.3.17 RS232 Setup Menu

The RS232 setup menu allows the user to enter the configuration of the two RS-232 ports on the TT1220, the remote port and the LS data port.

Table C.19: RS232 Setup Menu

Display title: ADV: RS232 SETUP	Description	Section
Remote>	Enters the remote setup submenu	C.3.18
LS Data>	Enters the LS data setup submenu	C.3.19

C.3.18 Remote Menu

The remote menu contains the parameters that has to be configured for a remote control computer / device to work correctly.

> **NOTE...**
>
> TANDBERG Television's remote control or software upgrade software requires the use of a null-modem (crossed) RS-232 cable, not a straight cable.

Table C.20: Remote Menu

Display title: SET: REMOTE	Description	Section
Baud rate	Sets the baud-rate for the communication with the external device. 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 baud selectable.	
Data bits	Sets the number of data bits. 7 or 8 selectable.	
Stop bits	Sets the number of stop bits. 0.5, 1.0, 1.5, and 2.0 selectable.	
Parity	Sets the parity. The TT1220 only accepts "none"	
Flow control	Sets the flow control. None or s/w selectable.	

> **CAUTION...**
>
> When software upgrading the TT1220 via RS-232 and the TANDBERG Television software upgrader (UPGRADE.EXE), it is important that the baud rate is set to 38400, the data bits to 8, the stop bits to 1, the parity to none, and the flow control to none. If this is not the case, the UPGRADE software might fail to work.

C.3.19   LS Data Menu

The LS data menu configures the parameters for the output of RS-232 data, fetched from the transport stream.

Table C.21: LS Data Menu

Display title: RS232: LS DATA	Description	Section
Mode	Off, manual or diagnostic selectable. In off mode, no data is output on the port. In manual, the selected PID is output on the port. In diagnostic, the diagnostic information from the TT1220 is output on the port.	
AUX pid	Selects the PID that is output on the port if "mode" is set to manual.	
Buff Use %	Shows the filling of the RS-232 buffer. If this buffer cycles up to 100% constantly, it is likely that you are not getting all the data on the output, due to buffer overruns.	
Port Settings>	Enters the port settings submenu	C.3.20
Profile:	Selects the encoding format used by encoder/transmitter. Streamed, Piped, Format #2	
Output>	Enters the output submenu	C.3.21

The RS-232 data output cannot exceed the data rate configured in the communication menu. If the outgoing data rate is higher, information will be dropped in an unpredictable fashion.

The transmitted PID's contents should have a lower rate than 115200 bit/s, since this is the maximum output rate. If the rate is higher, burst mode can be used, as explained in *Section C.3.21, Output Menu.*

C.3.20   Port Settings Menu

The port settings menu contains the controls for the physical output of the LS data, including baud-rate etc.

The settings configured here, need to match the settings on the device set up to receive the LS data.

Table C.22: The LS Data Communication Menu

Display title: LS: PORT SETTINGS	Description	Section
Baud rate	Sets the baud-rate for the communication with the external device. 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 baud selectable.	
Data bits	Sets the number of data bits. 7 or 8 selectable.	
Stop bits	Sets the number of stop bits. 0.5, 1.0, 1.5, and 2.0 selectable.	
Parity	Sets the parity. The TT1220 only accepts "none".	
Flow control	Sets the flow control. None or s/w selectable.	

C.3.21 Output Menu

The LS data output menu configures what part of the PID data should be output on the LS data port.

Table C.23: LS Data Output Menu

Display title: LS: OUTPUT	Description	Section
O/P format	"BIN" and "HEX" selectable. BIN provides a binary output. HEX provides a hexadecimal output with the most significant nibble first, then the least significant nibble.	
Buffering	"Flow" and "Burst" selectable. Flow mode transmits the selected PID directly. Burst mode can be used for analysing the input sequence of a PID which has higher transfer rate than the UART can handle (max 115.2k). The buffer will fill up and dump the contents out on the serial line. The buffer size is in both cases 16 kBytes.	

C.4 Status Menu

C.4.1 Status Menu Items

The status menu contains all the submenus and items, required to check the condition of the unit, and the currently decoded service.

Table C.24: Status Menu

Display title: STATUS	Description	Section
Alarm >	Enters the alarm status submenu	C.4.2
Input >	Enters the input status submenu	C.4.3
Signal >	Enters the signal status submenu	C.4.4
CA module >	Enters the CA module status submenu	C.4.10
PID info >	Enters the currently decoded service's PID status submenu	C.4.14
Download info >	Enters the download info submenu	C.4.17

C.4.2 Alarm Menu

The alarm status menu contains a list of all the alarm groups, and the associated status of that group. If the group status is in an alarm or warning state, you may enter the group to see the individual alarms or warnings for that group.

Table C.25: Alarm Status Menu

Display title: STATUS: ALARM	Description	Section
Status:OK	The most urgent alarm is presented here.	
Input	Enters the input alarm status submenu	
PSI/SI	Enters the PSI/SI alarm status submenu	
CA	Enters the CA related alarm status submenu	
Video	Enters the Video alarm status submenu	

Display title: STATUS: ALARM	Description	Section
VBI	Enters the VBI alarm status submenu	
Audio	Enters the Audio alarm status submenu	
Audio2	Enters the Audio2 alarm status submenu	
Data	Enters the data alarm status submenu	
Config	Enters the config alarm status submenu	

For information regarding the alarms and their individual interpretations, refer to *Annex D, Alarm Categories and Conditions*.

C.4.3 Input Menu

The input status menu provides information regarding the quality of the input signal.

Table C.26: Input Status Menu, QPSK Input

Display title: STATUS: INPUT	Description	Section
BER(PostV)	Provides the post Viterbi BER measurement, in logarithmic annotation.	
Eb/No margin	Provides the margin to an unacceptable Eb/No. (Single bit energy to normalised noise level ratio.)	
Lock freq	Provides the frequency at which the demodulator has locked.	

Table C.27: Input Status Menu, ASI Input

Display title: STATUS: INPUT	Description	Section
Packet length	Reports No sync, 188 or 204 bytes incoming ASI TS	

C.4.4 Signal Menu

The signal status menu provides information on the incoming transport stream.

Table C.28: Input Signal Status Menu

Display title: STATUS: SIGNAL	Description	Section
Pkt OK (sec)	Counts the number of seconds since the last sync break.	
Bit rate	Reports the current total bit-rate of the incoming transport stream	
Video >	Enters the video signal status submenu	C.4.5
Audio >	Enters the audio signal status submenu	C.4.6
Audio2 >	Enters the Audio2 signal status submenu	C.4.7
PTS >	Enters the PTS status submenu	C.4.8
VBI >	Enters the VBI signal status submenu	C.4.9
Data >	Enters the Data signal status submenu	

C.4.5   Video Menu

The video signal status submenu contains information about the currently decoded MPEG-2 video.

Table C.29: Video Signal Status Menu

Display title: SIG: VIDEO	Description	Section
HSize	Display the horizontal resolution of the video	
VSize	Display the Vertical resolution of the video	
Eff. Rate	Shows the effective bit-rate of the video component in 188 byte packet size	
Format	Shows the aspect ratio (4:3 or 16:9) of the video.	
Pict. Rate	Displays the number of pictures per second being displayed, usually 25 Hz or 30 Hz.	

C.4.6   Audio Menu

The audio signal status submenu contains information about the audio format and quality, of the currently decoded audio stream on the primary output.

Table C.30: Audio Signal Status Menu

Display title: SIG: AUDIO	Description	Section
Coding	Display the audio coding model, as layer I, layer II or AC-3.	
Mode	Shows the modulation mode reported used in the encoder. Mono, Dual mono, Stereo or Joint Stereo is displayed depending on the input.	
Rate (kbit/s)	Shows the bit-rate, in kilobits per second, that the audio was coded.	
Smpl	Shows the sampling rate, usually 32, 44.1 or 48 kHz	
Prot	Informs if protection bits are present for the currently decoded audio stream.	

C.4.7   Audio2 Menu

The audio2 signal status submenu contains information about the audio format and quality, of the currently decoded audio stream on the secondary audio output.

Table C.31: Audio2 Signal Status Menu

Display title: SIG: AUDIO2	Description	Section
Coding	Display the audio coding model, as layer I, layer II or AC-3.	
Mode	Shows the modulation mode reported used in the encoder. Mono, Dual mono, Stereo or Joint Stereo is displayed depending on the input.	
Rate (kbit/s)	Shows the bit-rate, in kilobits per second, that the audio was coded.	
Smpl	Shows the sampling rate, usually 32, 44.1 or 48 kHz	
Prot	Informs if protection bits are present for the currently decoded audio stream.	

C.4.8 PTS Menu

The PTS status menu display the current status of the utilisation of video and audio buffers, as well as the offset between the actual presentation of the components, compared to the ideal presentation time.

Table C.32: PTS Status Menu

Display title: SIG: PTS	Description	Section
VPS use %	Shows the usage, in percent, of the video decoding buffer.	
VPS Err ms	Shows the difference (in ms) between the actual decoding of the component, and the ideal decoding time according to PTS.	
APTS Use %	Shows the usage, in percent, of the audio decoding buffer.	
APTS Err ms	Shows the difference (in ms) between the actual decoding of the audio component, and the ideal decoding time according to PTS.	

C.4.9 VBI Menu

The VBI status menu displays the current status of the VBI components.

Table C.33: VBI Status Menu

Display title: SIG: VBI	Description	Section
Teletext	Show the current status of the Teletext. Off: Teletext is switched off in the Video setup menu. Not sent: Teletext transmission is turned on, but there is no Teletext for the service in the transport stream. Active: Teletext is being transmitted. Overflow: Teletext is switched on, but some lines are being suppressed by higher priority VBI data.	
VPS	Off: VPS is switched off in the Video setup menu. Not present: VPS is switched on, but there is no VPS information for the selected service in the transport stream. Active: VPS is switched on, and is present in the transport stream. Overridden: VPS is switched on and present in the transport stream, but is suppressed by higher priority VBI-data on the same line (line 16).	
WSS	Off: WSS is switched off in the Video setup menu. Active: WSS is present in the transport stream, and is transcoded into the PAL signal. MPEG video: WSS is included in the video stream and transcoded transparently as video in line 23.	
Closed Cap.	Show the current status of the Closed Caption. Off: Closed Caption is switched off in the VBI setup menu. Not sent: Closed Caption transmission is turned on, but there is no Closed Caption for the selected service in the transport stream. Active: Closed Caption is being transmitted.	
Testlines	Shows the currently displayed testlines.	
Sin(x)/x	Off: Sin(x)/x is switched off in the Video setup menu. On: Sin(x)/x is switched on in the Video setup menu, and transmitted in the video signal.	
TTX Subt.	Show the current status of the EBU Teletext Subtitling. Off: EBU Teletext Subtitling is switched off in the Video setup menu. Not sent: EBU Teletext Subtitling transmission is turned on, but there is no EBU Teletext Subtitling for the service in the transport stream. Active: EBU Teletext Subtitling is being transmitted.	

C.4.10 CA Module Menu

The CA module menu shows the currently active CA system, and allows access to the lower lever CA menus.

Table C.34: CA System Menu

Display title: STATUS: CA MODULE	Description	Section
Active:	Shows the active CA component. "DVB-CI", "NDS" or "Fixed key" may be displayed.	
CA Info>	Enters the CA info submenu	C.4.11
NDS Message>	Enters the NDS message submenu.	C.4.12

C.4.11 CA Info Menu

The CA info menu shows the current status of the smart card, and also lists the effect the smart card has for the currently selected components.

Table C.35: CA Info Menu

Display title: CAM: CA INFO	Description	Section
Card	Shows the smart card is "OK", "Not present" or "Not responding"	
Video	"Clear", "Descram", "No access", "Clear & CA", "Incom SC/CA", "Searching"	
Audio	"Clear", "Descram", "No access", "Clear & CA", "Incom SC/CA", "Searching"	
VBI	"Clear", "Descram", "No access", "Clear & CA", "Incom SC/CA", "Searching"	
Audio2	"Clear", "Descram", "No access", "Clear & CA", "Incom SC/CA", "Searching"	

The interpretation of the components status message is described in *Table C.36*.

Table C.36: CA Info Menu Interpretation

Properties	Interpretation
Clear	The component is clear and no smart card is required
Descram	The component is scrambled and the smart card has access
No access	The component is scrambled and the smart card has no access
Clear & CA	The component is clear but is signalled as scrambled. No smart card is required
Incom SC/CA	The component is signalled as scrambled and either the smart card fails to accept the CA descriptors, or the CA type in the stream is not compatible with the smart card
Searching	The decoder has not yet decided the status of the component
Fixed Key	Fixed Key CA is enabled (Setup System Options CA Mode = Fixed Key)

C.4.12   Data Menu

The Data menu shows the current status of the data component.

Table C.37: Data Menu

Display title: SIG: DATA	Description	Section
Buff Use %	Shows the usage, in percent, of the data decoding buffer.	
Type	"Piped", "Format #1", "Format #2", "Asynchronous"	
Rate	Shows the rate of the data component in kbit/s.	

C.4.13   NDS Message Menu

The NDS message menu displays the last message received from the NDS Director CA system.

Table C.38: NDS Message Menu

Display title: CAM: NDS MESSAGE	Description	Section
Information	Whatever text sent from the NDS Director CA system.	

C.4.14   PID Info Menu

Table C.39: PID Info Menu

Display title: STATUS: PID INFO	Description	Section
TV Comp.>	Enters the TV components submenu	C.4.15
A2 Comp.>	Enters the Audio2 components submenu	C.4.16

C.4.15   TV Components Menu

The TV components submenu lists the PIDs associated with the individual components belonging to a service.

Table C.40: TV Components Menu

Display title: PID INFO: TV COMP	Description	Section
Video	Lists the video PID, if present.	
Audio	Lists the audio PID, if present.	
WSS	Lists the WSS PID, if present.	
VPS	Lists the VPS PID, if present.	
TTX	Lists the Teletext PID, if present.	
TtxSubt	Lists the subtitling PID, if present.	
Subt.Page	Displays the Teletext page used for Subtitling	

C.4.16 A2 Components Menu

Shows the Audio PID associated with the currently selected Audio2 service, if present.

Table C.41: Audio2 Components Menu

Display title: PID INFO: A2 COMP	Description	Section
Audio:	List the audio PID, if present.	

C.4.17 Download Info Menu

The download info menu displays information about the current download status of new code or information to the unit.

Table C.42: Download Information Menu

Display title: STATUS: DWNLD INFO	Description	Section
#	"Not Available" if no other information is present.	

C.5   Properties Menu

C.5.1   Properties Menu Items

Shows the hardware and software properties of the TT1220.

Table C.43: Properties Menu

Display title: PID INFO: TV COMP	Description	Section
SW version	Shows the software version of the TT1220	
SerNo	Shows the serial number of the TT1220	
HW Config.>	Enters the HW config submenu	C.5.2

C.5.2   HW Config Menu

Lists the available features and hardware of the TT1220. A "+" in front of the component, signifies that the component is present. A "-" in front of the component, signifies that the component is not available.

Table C.44: HW Config Menu

Display title: PRO: HW CONFIG	Description	Section
RS232.Remote	RS-232 remote control is available	
Ethernet.Remote	Ethernet (SNMP) remote control is available	
QPSK.Input	QPSK input is available	
ASI.Input	ASI input is available	
ASI.Output	ASI output is available	
Video.PAL	Video decoder can decode in PAL format	
Video.NTSC	Video decoder can decode in NTSC format	
Video.SECAM	Video decoder can decode in SECAM format	
Video.SDI	SDI video output is available	
Video.dec.MP@ML	MP@ML 4:2:0 video decoder is available	
Audio.Musicam	Audio channel 1 can decode Musicam	
Audio.Dolby	Audio channel 1 can downmix AC-3 to Dolby Pro-Logic	
Audio.Out.Analog	Audio channel 1 can output audio in analogue balanced form	
Audio.Out.Digital	Audio channel 1 can output audio in digital S/PDIF form, or AC-3 passthrough	
Audio2.Musicam	Audio channel 2 can decode Musicam	
Audio2.Dolby	Audio channel 2 can downmix AC-3 to Dolby Pro-Logic	
Audio2.Out.Analog	Audio channel 2 can output audio in analogue balanced form	
Audio2.Out.Digital	Audio channel 2 can output audio in digital S/PDIF form, or AC-3 passthrough	
CommonIF	DVB Common interface hardware and software available	
SmartcardReader	NDS VideoGuard hardware and software available	

C.6 The Menu Tree

SETUP
Demod > *
TV Service > **
TV Components >
Video Format : PAL
Teletext : On
Subtitling : On
Audio2 Service > *
Audio2 Comp. > *
Advanced >

MAIN MENU
Setup >
Status >
Properties >

SET: DEMOD
LNC freq: 10.000
Sat freq: 11.2780
Sym rate: 24.500
Inner code: 7/8
LNC volt: Off
LNC 22kHz: Off
Spec inv.: Off

SET: TV SERVICE
ServiceID: 601
√ CNN
Hallmark

SET: TV COMP.
Aud Lang: eng
Ttx Lang: eng
Sub Lang: nor

SET: AUDIO2 SERVICE
ServiceID: 610
√ CNBC
CNN

SET: AUDIO2 COMP.
Aud2 Lang: eng

SET: ADVANCED
System opt. >
Output setup >
Alarm setup >
RS232 setup >
Reset No
Restore def. No

ADV: SYSTEM OPT.
CA mode: Standard
BISS/Fixed key > **
Sig. prot.: Off
ASI out: Descr
Ctrl. mode: Local
LL PIN: ****
RLP: ***************
Menu lock: Off

ADV: OUTPUT SETUP
Vid. setup 625 >
Vid. setup 525 >
Audio2 setup > *
PTS setup >
Factory menu >

ADV: ALARM SETUP
Input >
PSI/SI >
CA >
Video >
VBI >
Audio >
Audio2 >
Data >
Config >

ADV: RS232 SETUP
Remote >
LS Data >

SYS: BISS/FIXED KEY
TV CWs >
Audio2 CWs >

OUT: VID SETUP 625
Teletext : On
VPS : Off
WSS : On (DVB)
Testlines : Off
Frame format: 4/3
Frame conv: 4/3 PS
Sin(x)/x : Off
Subtitling : Off

OUT: VID SETUP 525
Closed Capt: Auto
Testlines: Off
Frame format: 4/3
Frame conv: 4/3 PS
GCR: Off

OUT: TV AUDIO SETUP
Outp.Lev[dB]: -0.1
Modulator: Stereo

OUT: PTS SETUP
Aud. Delay ms: -3
Aud2 Delay ms: 0

OUT: FACTORY MENU
Password: ********

AL. SET: -----
Please refer to alarm settigs it the alarm appendix.

SET: REMOTE
Baud rate: 38400
Data bits: 8
Stop bits: 1
Parity: None
Flow control: None

SET: LS DATA
Mode: Manual
Aux PID: 0000
Buff. use %: 0.0
Port settings >
Profile: Streamed

BISS: TW CWS
Even: 000000000000
Odd: 000000000000

BISS: AUDIO2 CWS
Even: 000000000000
Odd: 000000000000

LS: PORT SETTINGS
Baud rate: 38400
Data bits: 8
Stop bits: 1
Parity: None
Flow control: None

LS: OUTPUT
O/P format: Bin
Buffering: Flow

STATUS: ALARM
CA: SC not present
Input OK >
PSI/SI OK >
CA ALARM >
Video OK >
VBI OK >
Audio OK >
Audio2 OK >
Data OK >
Config OK >

STATUS
Alarm >
Input >
Signal >
CA module >
PID info >
Downld Info >

STATUS: INPUT *
BER (PostV): < 10e-9
Eb/No margin: 7.84
Lock freq: 11.278

STATUS: INPUT *
Packet length: 188

STATUS: SIGNAL
Pkt OK (sec) 5
Bit rate: 38.014
Video >
Audio >
Audio2 >
PTS >
VBI >
Data >

PROPERTIES:
SW Version: 2.0.0
SerNo: 101001
HW config >

ALARM: INPUT
BER < 10e-4

ALARM: PSI/SI
OK

ALARM: CA
SC not present

ALARM: CONFIG
OK

SIG: VIDEO
HSize: 528
VSize: 576
Eff.Rate: 03823874
Format: 4:3
Pict.rate: 25Hz

SIG: AUDIO
Coding: Layer 1
Mode: Stereo
Rate (kbps): 192
Smpl: 32kHz
Prot.: Present

SIG: PTS
VPTS use % : 70.2
VPTS err ms : 0
APTS use % : 18.4
APTS err ms : 3
APTS2 use % : 19.7
APTS2 err ms : -1

SIG: VBI
Teletext: Not sent
VPS: Off
WSS: Local
Closed Cap: Off
Textlines: Off
Sin(x)/x:: Off

SIG: DATA
Buff use: 0.0
Type: N/A
Rate: N/A

STATUS: CA MODULE
Active : DVB-CI
CA info >
NDS Message > *

STATUS: PID INFO
TV Comp >
A2 Comp > *

STATUS: DOWNLD INFO
#: No code downld

CAM: CA INFO
Card : Not present
Video: Clear
Audio: Clear
Audio2: Clear
VBI: Clear

CAM: NDS MESSAGE
: OK

PID INFO: TV COMP
Video: 0101
Audio: 0102
TTX: Not used
VPS: Not used
WSS: 0108
Closed Cap.: 0105

PID INFO: A2 COMP
Audio: 0103

PRO: HW CONFIG
+ RS232.Remote
- Ethernet.Remote
+ QPSK.Input
- ASI.Input
+ ASI.Ouput
+ Video.PAL
+ Video.NTSC
+ Video.SECAM
- Video.SDI
+ Video.dec.MP@ML
+ Audio.Musicam
- Audio.Dolby
+ Audio.Out.Analog
- Audio.Out.Digital
+ Audio2.Musicam
- Audio2.Dolby
+ Audio2.Out.Analog
- Audio2.Out.Digital
+ CA.BSkyB
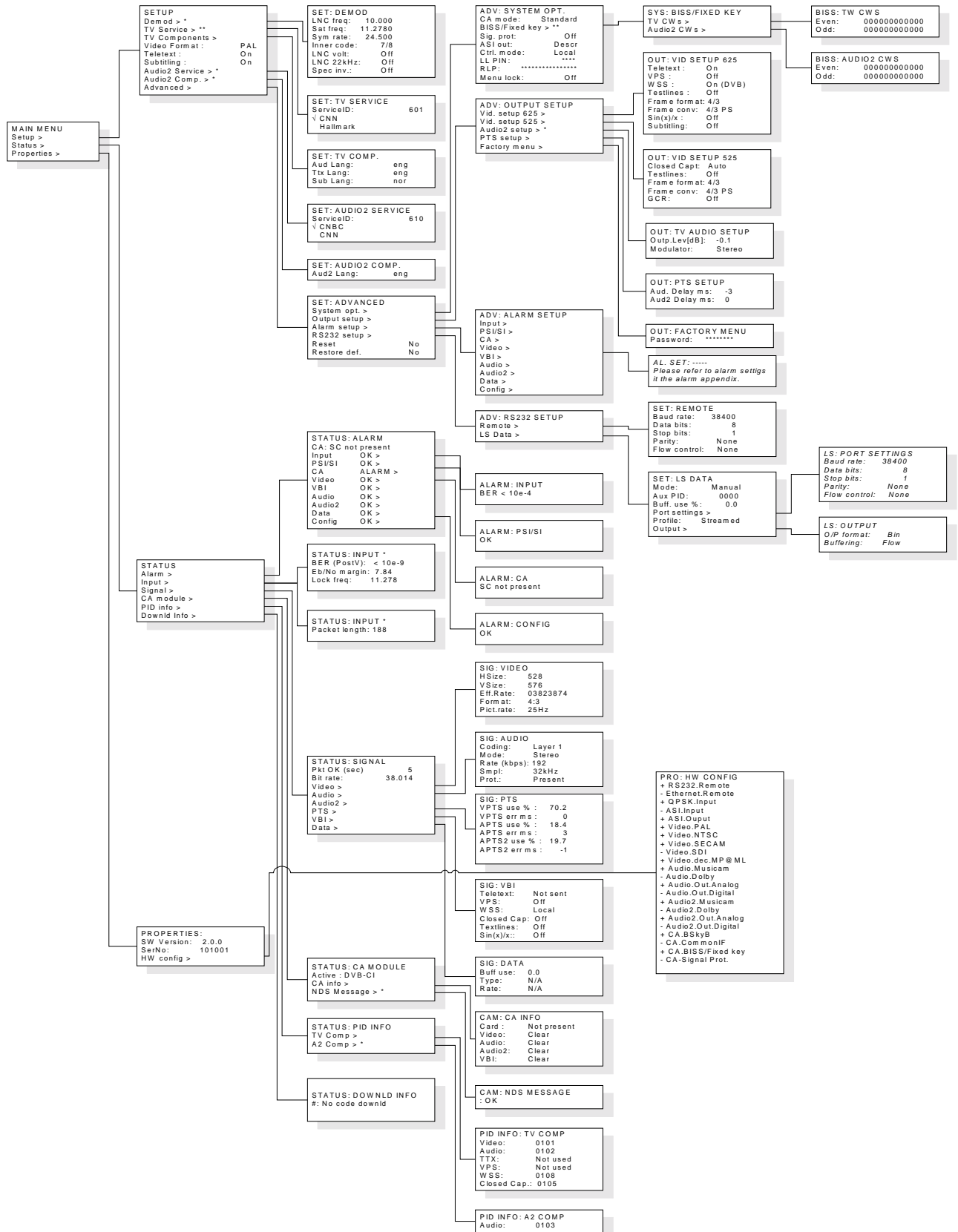- CA.CommonIF
+ CA.BISS/Fixed key
- CA-Signal Prot.

Figure C.1: Menu Tree

*) Menu entry depends on hardware configuration.

**) Menu entry depends on SW configuration. (See configurable menus)

***) Menu entry depends on hardware configuration and software configuration. (See configurable menus)

Enter: Type or select required information by exiting the editing menu with the RIGHT button.

Cancel: If the selection is not required, and you want to exit without doing anything, exit the menu with the LEFT button.

Menu modes: Some menus are editable some menus are information only. Editable menus are present in the Setup menus (Setup, Favorites) and the info menus are present.

Configurable menus: The menus that are marked ** will be present if the PSI system is running on the decoder. (PSI engine ON) makes different menus. The menu will be rebuilt.

Persistent information: Some information will appear in the top right corner of the menu window depending on where you are in the menu tree. This information is related to the input signal.

Locking: If you want to lock the display for unwanted access press LEFT, LEFT, LEFT, LEFT when you are located in the root menu. You will need to unlock the menu again to be able to use the buttons.

Unlocking: The unlocking sequence is required if the locked indicator is present on the top left line. The sequence is LEFT, RIGHT, LEFT, LEFT, LEFT, RIGHT, RIGHT, RIGHT.

Protected menus: Setup menus inside the menu tree may be protected for unauthorised access. The code for unlocking such menus are UP, DOWN, UP, UP, UP, DOWN, DOWN, DOWN.

Pins: Two pins can be prompted. One has to do with overriding the NCP over the air control, and the other has to do with the access to private menus in the decoder such as calibration settings etc.

Alarm Categories and Conditions

Contents

List of Tables

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D.1 Alarm Conditions

This chapter lists the alarm conditions detected by the unit. It also lists a description for the alarm, a possible remedy, and the default state of the alarm in the alarm configuration menu.

D.2 Input Stage Alarms

D.2.1 QPSK Input Alarms

The QPSK input alarms relate to alarms received form the DVB-S QPSK demodulator, or the lack of communication with this component.

Table D.1: QPSK Alarm Categories and Conditions

Alarm Category	Contents			
QPSK Input:	**Alarm**	**Description**	**Remedy**	**Default**
	Tuner fail	This alarm is set if the communication with the tuner is lost.		A
	No signal	Alarm only if the RF level has been zero for more than 2 consecutive times	Check signal source	A
	No lock	Demod will not be deemed to be locked until full lock status has occurred for 3 consecutive polls	Check input settings (frequency, FEC, symbol rate etc.)	A
	BER exceeded	BER TOO HIGH is declared when BER estimate exceeds # defined value for FEC rate.	The input signal strength or quality is not adequate.	W

D.2.2 ASI Input Alarms

The ASI input alarms relate to the condition of the ASI input.

Table D.2: ASI Alarm Categories and Conditions

Alarm Category	Contents			
ASI Input:	**Alarm**	**Description**	**Remedy**	**Default**
	No sync	The input stage is not able to lock on to the incoming signal.	Check input connections. Verify that the signal format is ASI, compliant with the specification given in *Annex B*.	A
	Imp. Overflow	The input rate is too high.	Use a transport stream with a lower bit-rate, usually by reducing the # of 0-packets	A

D.3 Output Stage Alarms

D.3.1 Video Output Alarms

The video output alarms relate to errors occurring in the video stream decoder.

Table D.3: Video Alarm Categories and Conditions

Alarm Category	Contents			
Video output:	**Alarm**	**Description**	**Remedy**	**Default**
	No stream input	No stream is detected in the current TS.	Check input source.	A
	Error in stream	There is an error in the video stream.	Verify correct CA system and smart card.	A
	Video resync	There has been a transition from "no frame sync" to "frame sync OK".		A
	Video not used	No video component exist for the currently selected service.		W

D.3.2 Audio Output Alarms

The audio output alarms relate to errors occurring in either the basic or extended audio decoders.

Table D.4: Audio Alarm Categories and Conditions

Alarm Category	Contents			
Audio output:	**Alarm**	**Description**	**Remedy**	**Default**
	No stream input	No stream is detected in the current TS.	Check input source.	A
	Unknown format	The incoming stream is impossible to decode.		A
	PES resync	There has been a transition from "no PES Sync" to "PES Sync OK".		W
	Frame resync	There has been a transition from "no frame sync" to "frame sync OK".		W
	Same PID	Attempt to set the same PID in one of the additional channels as in the main channel OR attempt to set the same PID in the main channel as in one of the additional channels.	Same PID in both additional channels is allowed. Same PID cannot be selected for the base and extended audio at the same time.	A
	FW restart	Audio artefacts due to hardware re-initialisation.		A

Alarm Category	Contents		
	PTS info starvation	Cannot obtain LipSync according to PCR/PTS due to compressed bit buffer underflow.	A
	PTS info overflow	Cannot obtain LipSync according to PCR/PTS due to compressed bit buffer overflow.	A
	PTS resync	Audio artefacts due to presentation adjustments.	W

D.3.3 VBI Output Alarms

The VBI output alarms relate to errors occurring in the decoding and embedding of VBI information into the outgoing video.

Table D.5: VBI Alarm Categories and Conditions

Alarm Category	Contents			
VBI output:	**Alarm**	**Description**	**Remedy**	**Default**
	TTX Err	Error in Teletext data.	Improve signal quality.	W
	TTX overflw.	Teletext buffer overflow.	The decoder cannot handle the rate of incoming Teletext data.	A
	TTX no data	No Teletext data available	Change the source, or ignore.	A
	SUBT err	Error in subtitling data	Improve signal quality.	W
	SUBT no data	No subtitling data available	Change the source.	A
	WSS no data	No WSS data available.	Make sure WSS is sent, or ignore.	A
	WSS err	Error in WSS data	Improve signal quality.	W
	VPS no data	No VPS data available	Make sure VPS is sent, or ignore.	A
	VPS err	Error in VPS data	Improve signal quality.	W

D.3.4 Data Output Alarms

The data output alarms reflect the status of the LS data (RS-232) output port, and its associated functions.

Table D.6: Data Output Alarm Categories and Conditions

Alarm Category	Contents			
Data output:	**Alarm**	**Description**	**Remedy**	**Default**
	Error in stream	Cannot decode the component stream.	Make sure the correct component is selected	A
	CC failure	TS has missing packets on the incoming transport stream.	Improve input signals, or check source	W
	Buffer overflow	Output port rate is lower than incoming data rate.	Increase output rate or select new component	A
	Not used	No PID selected to decode.	Select PID or turn of data output	A
	Same PID	The selected PID is in use by another part of the decoder.	Choose a different PID.	W

D.4 CA and PSI/SI Related Errors

D.4.1 CA Related Alarms

The CA status alarms indicate the current condition of the CA system

Table D.7: CA Related Alarm Categories and Conditions

Alarm Category	Contents			
CA system:	**Alarm**	**Description**	**Remedy**	**Default**
	No access	The DVB common interface module has no access to the currently selected component.	Check conditional access entitlements with service provider.	W
	No smart card	There is no smart card present in the card reader.	Insert the card.	W
	Bad SC	The smart card present is not valid.	Insert a valid smart card.	W

D.4.2 PSI/SI Related Alarms

Contains information about the currently processed PSI/SI arriving at the decoder.

Table D.8: PSI/SI Related Alarm Categories and Conditions

Alarm Category	Contents			
CA system:	**Alarm**	**Description**	**Remedy**	**Default**
	No stream input	No stream is detected.	Check input signal and verify source.	A
	PAT not present	No data is received on the PAT PID.	Check input signal and verify source.	A
	CAT not present	No data is received on the CAT PID.	Check input signal and verify source.	A
	PMT not present	No data is received on the PMT PID.	Check input signal and verify source.	A
	NIT not present	No data is received on the NIT PID.	Check input signal and verify source.	A
	SDT/BAT not present	No data is received on the SDT or BAT PID.	Check input signal and verify source.	A
	TDT not present	No data is received on the TDT PID.	Check input signal and verify source.	A

D.5 Hardware Related Alarms

D.5.1 Config Alarms

The config alarms contains alarms regarding the mismatches between present hardware, software and license keys, and the overall health of the hardware.

Table D.9: Hardware Configuration Related Alarm Categories and Conditions

Alarm Category	Contents			
Config alarms:	**Alarm**	**Description**	**Remedy**	**Default**
	Init fail	General initialisation failure.	Contact TANDBERG Television Customer Help Desk	A
	Cfg. Not supp	The configuration defined by the configuration word could not be supported.		A
	HW err.	The hardware check during initialisation failed.		A

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Using the TT1220 with the NDS Director System

Contents

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E.1 Configuring the TT1220 for Use With NDS Director

E.1.1 Getting Started

You must have the NDS VideoGuard Director CA option installed[1], a Director Smart Card and be tuned to a Director stream.

1. Insert the Director Smart Card before tuning to the service.

2. Check that the unit has VideoGuard installed (see *Annex C, Section C.5.2, HW Config Menu*).

3. Check that the unit is authorized for de-scrambling the selected service

> **NOTE...**
>
> In over-the-air control mode, menu items cannot be edited. The receiver should be set to local control mode for editing.

E.1.2 Do Not...

Repeatedly insert and remove the Director smart card, as this may reduce the lifetime of the card, and the card-reader.

E.1.3 Using the TT1220 in Over the Air Control Mode

- This section describes the behaviour of the TT1220 when it is controlled *OVER-AIR, with the NCP protocol* using the *Receiver Control* part of the Director PC GUI. It is assumed that the Receiver is set to OAC mode, and is entitled to receive Director commands. Consult the Director Control PC GUI manual for more information. The following commands are supported:

- Set Power-up Channel

- Set Emergency Channel

- Force-tune Carrier

- Force-tune Service

- Set Default Audio Language

- Store carrier data

- Front panel display

- Local Lockout

- Finger-printing

- Set relays

E.2 Response to Over the Air Commands

E.2.1 General

This section describes how the decoder responds to over-the-air commands from the NDS VideoGuard Director System.

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[1] If NDS VideoGuard Director CA is installed, a "+" sign will be in front of the "CA.Director" option in the Properties, HW-Config submenu.

E.2.2   Set Power-up Channel

Sets the Receiver power-up service. If the *Emergency Channel* has not been set, it is set to this service.

If neither the *Emergency* nor *Power-up Channel* have been set, the TT 1220 will be in an indeterminate state at power-up.

E.2.3   Set Emergency Channel

Sets the service to use in the event of a selection failure. It is activated after a specified time has elapsed. If not set, the Power-up Channel is assumed.

Setting the Emergency Channel allows a failure situation to be recovered.

E.2.4   Force Tune Carrier

Forces the Receiver to retune to a different frequency and/or service. This could be a service on a different feed (e.g. LNB input 2) or a service previously set up using the *Store Carrier Data* command. Timeouts allow the Receiver to revert to the original service after the time has expired. If the command fails, the *Emergency* channel is used. Enter a timeout of not less than 15 seconds (except 0 to permanently switch to the new service) to give the Receiver time to retune.

This command fails if the LNBs are not set up realistically (which may happen if the source is changed).

Take care when retuning to services on different LNB inputs. Force Service Selection is more efficient if the required service is on the same frequency and LNB input.

E.2.5   Force Tune Service

Forces the Receiver to decode a different service or stored channel (which may require a retune). The command is generally used to hop between services. The Director system has to be informed of the frequency, FEC-rate and symbol-rate for each stream. This is set up using the MEM/MCC.

The Director User Interface and the Director core require restarting to register changes that have been set in the MEM/MCC.

E.2.6   Set Default Audio Language

Sets an audio decoding preference for Audio and Audio2 when selecting a service.

E.2.7   Store Carrier Data

Stores a particular service as a preset channel. Subsequently, the head-end can force a service selection from this preset – see *Section E.2.5, Force Tune Service*.

E.2.8   Front Panel Display

Displays a text string on the LCD front panel. The message is displayed for a set time, until cleared from the Head End or the keypad is activated.

E.2.9   Local Lockout

Locks out the LOCAL CONTROL mode but status information can still be viewed. All Director commands are functional. The Receiver can be unlocked locally using a PIN number or over-air using Allow Local Access.

E.2.10   Finger Printing

The Receiver fully supports this function.

E.2.11   Set Relays

Switches the general-purpose relays. This command does not affect the summary alarm relay. The default values of the relays are described in Annex B, Technical Description.

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