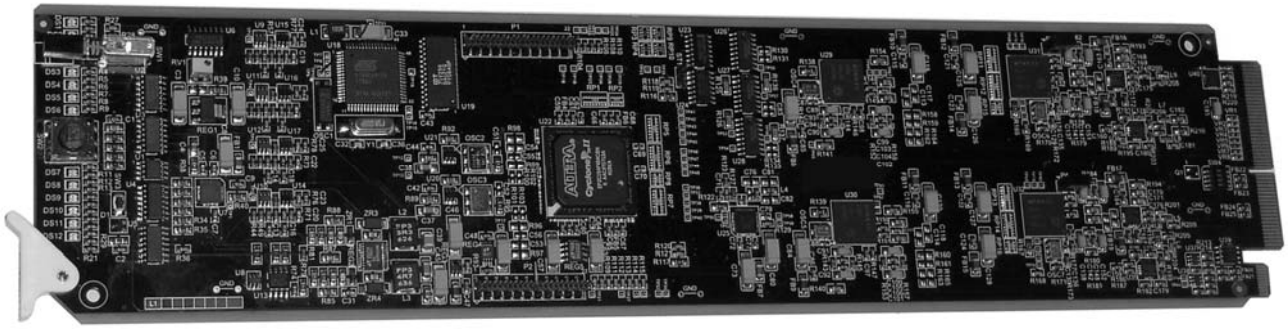
Ross Video Limited

TSM-100

Transport Stream Monitor

User Manual



Live Production Technology

Product Name: TSM-100

TSM-100 • Transport Stream Monitor User Manual

- Ross Part Number: **TSM100DR-004-02**
- Release Date: September 23, 2010. Printed in Canada.

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Important Regulatory and Safety Notices

Before using this product and any associated equipment, refer to the “Important Safety Instructions” listed below so as to avoid personnel injury and to prevent product damage.

Products may require specific equipment, and/or that installation procedures be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these Specific requirements.

Symbol Meanings

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

Warning

The symbol with the word “**Warning**” within the equipment manual indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

Caution

The symbol with the word “**Caution**” within the equipment manual indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Notice

The symbol with the word “**Notice**” within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.

ESD Susceptibility

This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from electrostatic discharge.

Important Safety Instructions

Caution

This product is intended to be a component product of the openGear 8000 series frame. Refer to the openGear 8000 series frame User Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.

Warning

Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing this area.

Warning

Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.

This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product’s power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair.

To reduce the risk of fire, replacement fuses must be the same type and rating.

Only use attachments/accessories specified by the manufacturer.

EMC Notices

US FCC Part 15

This equipment has 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 users will be required to correct the interference at their own expense.

Notice

Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.

CANADA

This Class "A" digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe "A" est conforme à la norme NMB-003 du Canada.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

INTERNATIONAL

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002** and found to comply with the limits for a Class A Digital device.

Notice

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

Maintenance/User Serviceable Parts

Routine maintenance to this openGear product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the "Contact Us" section on the last page of this manual.

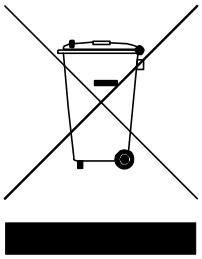
Environmental Information

The TSM-100 complies with the European Union's RoHS Directive. This stands for "the restriction of the use of certain hazardous substances in electrical and electronic equipment". This Directive bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants.

The equipment that you purchased required the extraction and use of natural resources for its production. Despite compliance with the RoHS directive, it may nevertheless contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, we encourage you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

Contents

Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- Functional Block Diagram
- Features
- Documentation Terms

A Word of Thanks

Congratulations on choosing the openGear TSM-100 Transport Stream Monitor. The TSM-100 is part of a full line of Digital Products within the openGear Terminal Equipment family of products.

You will be pleased at how easily your new TSM-100 fits into your overall working environment. Equally pleasing is the product quality, reliability and functionality. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your TSM-100, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is available for consultation or service.

Overview

The TSM-100 monitors several critical characteristics of an MPEG 2 Transport Stream (TS), and warn the user of any error conditions. The error conditions are categorized on the five-level scale defined by ATSC Recommended Practice A/78. These vary from relatively minor errors (Technically Non Compliant or TNC) to very serious ones (Transport stream Off Air or TOA).

The **TSM-100** accepts an ASI input signal, and is intended to monitor a DVB or ATSC TS with up to 16 programs, continuously and unobtrusively, until it becomes necessary to call the user's attention to a violation of one of the predefined limits. The TSM-100 then alarms the user visually through the DashBoard user interface and optionally through a contact closure connected to a warning device or plant monitoring system. If SNMP is enabled in the openGear frame, the TSM-100 can also issue an SNMP trap in response to the alarm condition.

Note — *Users who are unfamiliar with the terminology used in discussing MPEG 2 Transport Streams are advised to either read one of the reference documents listed below or ignore - for now - the many acronyms in the following discussion. Knowing these is not essential to understanding what the TSM-100 does.*

The TSM-100 constantly evaluates the following parameters against established limits:

- Integrity of PSI tables, such as the PAT, PMT, CAT, NIT, SDT, EIT, and TDT. It verifies the syntax, CRC (indicator of transmission errors), continuity (indicator of missed packets) and version (indicator of improperly signaled changes to PSI).
- PSI table intervals.
- PCR and PTS intervals.
- When operating in ATSC mode, PSIP table integrity and timing.

Features

The TSM-100 provides a number of innovative tools for Transport Stream monitoring, in order to simplify your workflow. For example:

- Selectable ATSC (A/78) or DVB (TR 101 290) mode.
- ASI output of selected input, for connection to other analysis equipment, for example.
- User-settable limits for each of the table types.
- Automatic categorization of errors by their severity, with color-coded indicators.
- "Set and forget" operation: once the operating parameters have been established, the TSM-100 requires no attention until there is a problem in the Transport Stream.
- Continuous simultaneous monitoring of up to 16 programs and 60 elementary streams.
- The openGear card format permits monitoring of up to either 10 or 20 Transport Streams in one 2RU frame, depending on the models of TSM-100 and frame, or a combination of the TSM-100 and other functions available from openGear partners.
- Counts of each type of error condition, to allow evaluation of their frequency of occurrence.
- Summary, in which the most serious error condition determines the state of the overall TS.

- GPIO Alarm output, which can be either a contact closure or logic level, depending on the choice of rear module.
- SNMP alarm output available, if enabled on the frame.
- Reclocked ASI output, allowing connection of other test and monitoring equipment.
- As a member of the openGear family, the TSM-100 shares a common control interface, known as DashBoard, with a broad array of other products.
- Allows definition of custom tables, to allow monitoring of infrequent events such as Splice Information sections (SCTE-35 triggers).

Reference documents

The following documents define the test limits for ATSC and DVB. These recommended practices refer the reader to standards that specify the MPEG 2 Transport Streams and define the terminology used in discussing them.

- "ATSC Recommended Practice: Transport Stream Verification", A/78, Advanced Television Systems Committee Inc, http://www.atsc.org/standards.html.
- "Digital Video Broadcasting (DVB): Measurement guidelines for DVB systems", TR 101 290, European Broadcasting Union and European Telecommunications Standards Institute, http://www.etsi.org.
- "Code Point Registry", TSG-575r42, Advanced Television Systems Committee Inc, http://www.atsc.org/standards.html.
- "Unidirectional Transport of Constant Bit Rate MPEG-2 Transport Streams on IP Networks", SMPTE 2022-2, http://www.smpte.org/standards.
- "Forward Error Correction for Real-time Video/Audio Transport over IP Networks", SMPTE 2022-1, http://www.smpte.org/standards.

Glossary

The following provides brief definitions of a few terms and acronyms used in this manual. Some of these may differ slightly from the official definitions, since our emphasis is on the usage of these words in this manual. These are presented in logical, rather than alphabetic, order. For more complete definitions, please see the recommended reference documents.

- ES: Elementary Stream. One of the components of a program, such as video, audio or data.
- Program: A group of Elementary Streams intended to be presented together. A television program typically contains one video, at least one audio, and possibly some data ES's.
- TS: MPEG-2 Transport Stream. A group of one or more Programs which are carried together, along with information that describes the contents of the TS and its Programs to allow receivers to select the appropriate components for presentation to the viewer.
- MPTS (Multi Program Transport Stream). A TS that contains more than one Program.
- ASI or DVB-ASI: Asynchronous Serial Interface. A standard interface for carriage of a TS in a 270 megabit/second serial digital signal.
- PSI: Program Specific Information, defined by ISO/IEC 13818-1. Metadata that describes the TS and its Programs to allow receivers to select and assemble the appropriate components for presentation to the viewer. PSI is required in every MPEG-2 TS, including the DVB and ATSC formats that the TSM-100 is designed to monitor. PSI consists of tables such as the PAT which are used in both DVB and ATSC formats, and others such as the SDT which are used only in DVB. The acronyms for the various tables are given below.

- PSIP: Program and System Information Protocol, defined by ATSC A/65. A specification that defines metadata that is required in an ATSC TS, in addition to essential PSI tables. The acronyms for the PSIP tables are given below.
- PID: Packet ID. A 13-bit address that identifies each component of a TS. For example, each ES and PSI table has its own PID. Some have fixed reserved values (e.g. 0 for the PAT) and others have values that are defined within the PSI.
- PCR: Program Clock Reference. A timing reference signal that must be carried in each Program. It is embedded in one or more ES's. The PMT specifies the PID of the ES that carries the main or only PCR for the Program.
- PTS: Presentation Time Stamp. A timestamp that is carried in an ES and marks the instants at which units of content are to be presented.

PSI tables monitored by the TSM-100 (for more detail, see ISO/IEC 13818-1 and ETSI EN 300 468):

- PAT: Program Association Table.
- PMT: Program Map Table.
- CAT: Conditional Access Table.
- NIT: Network Information Table.
- SDT: Service Description Table.
- BAT: Bouquet Association Table
- EIT: Event Information Table.
- TDT: Time and Date Table.
- TOT: Time Offset Table
- RST: Running Status Table

PSIP tables monitored by the TSM-100 (for more detail, see ATSC A/65):

- MGT: Master Guide Table.
- TVCT: Terrestrial Virtual Channel Table.
- CVCT: Cable Virtual Channel Table.
- RRT: Rating Region Table
- STT: System Time Table.
- EIT: Event Information Table.
- ETT: Extended Text Table.

Functional Block Diagrams

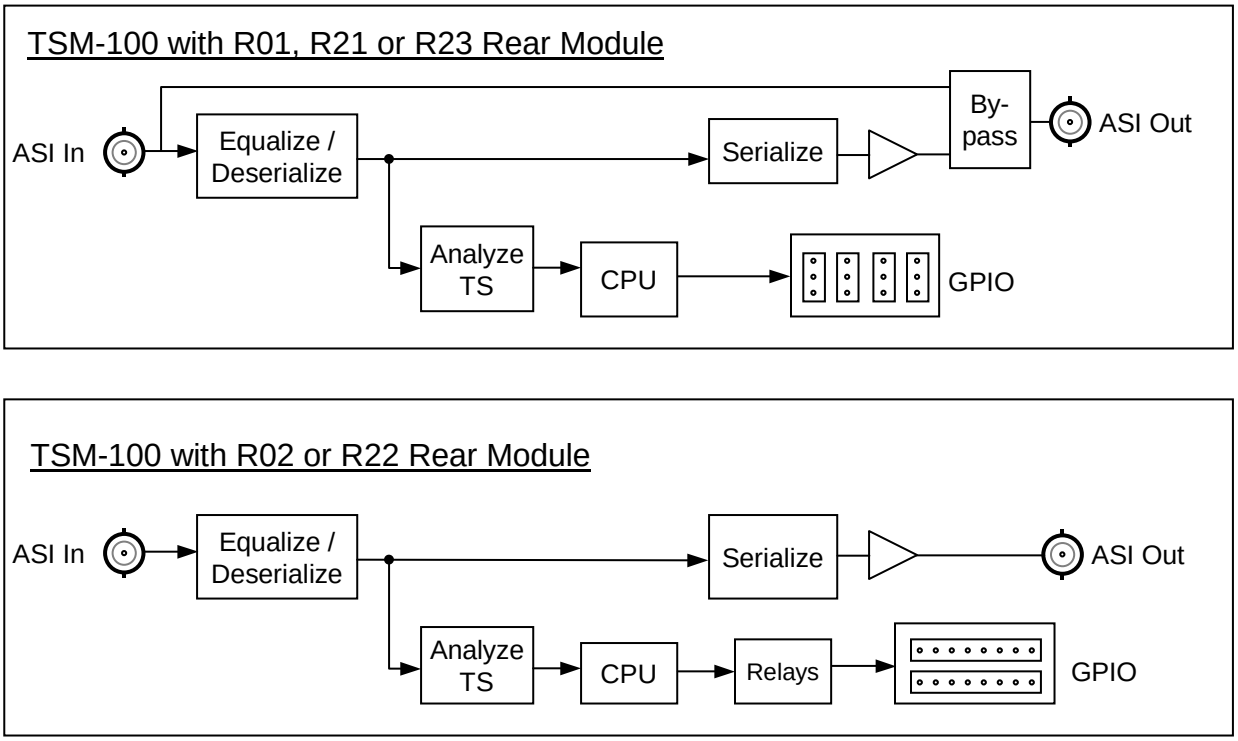


Figure 1. Simplified Block Diagrams of TSM-100 Functions

Documentation Terms

The following terms are used throughout this guide:

- "**Frame**" refers to the **DFR-8310** or **DFR-DFR-8321 series frame** that houses the TSM-100. Note that the frame must have the network option for use with the TSM-100.
- "**Operator**" and "**User**" refer to the person who uses the TSM-100.
- "**Board**" and "**Card**" refer to the TSM-100 itself, including all components and switches.
- "**System**" and "**Video system**" refer to the mix of interconnected production and terminal equipment in which the TSM-100 operates.
- "**Rear Module**" refers to the connector module at the rear of the frame that the TSM-100 is inserted.

Frame and Rear Module Compatibility

The following combinations of TSM-100, frame and rear modules are recommended.

Table 1. Combinations of TSM-100, Frame, and Rear Module models

Frame	Rear Module	Functions
DFR-8310-N	ONG-MDL-R01	ASI in/out, with ASI bypass relay, logic-level GPIO
DFR-8310-N	ONG-MDL-R02	ASI in/out, relay-isolated GPIO outputs
DFR-8321-C or –CN or -CNS	ONG-MDL-R21	ASI in/out, with ASI bypass relay, logic-level GPIO
DFR-8321-C or –CN or -CNS	ONG-MDL-R22	ASI in/out, relay-isolated GPIO outputs
DFR-8321-C or –CN or -CNS	ONG-MDL-R23	ASI in/out, with ASI bypass relay, logic-level GPIO, half-width rear module (20 cards/frame)

The TSM-100 can also operate in other types of rear modules, with some loss of functionality such as GPIO connections. For ordering information, see the inside back cover of this manual.

Quick Start

Assuming you have one of the combinations listed in the previous section, the following steps will get you started with Transport Stream monitoring:

1. Connect the frame to your LAN, using the instruction sheet "Connecting the openGear Frame to a Network", supplied with the frame.
2. Install DashBoard on a computer connected to the LAN. The DashBoard Control System software and manual are available on the Ross Video website.
3. Install the rear module in the frame, as described in the section "**Rear Module Installation**" of this manual.
4. Install the TSM-100 into the rear module, as described in the section "**Board Installation**" of this manual.
5. If using a TSM-100 with ASI input, connect the ASI signal to the ASI input jack on the rear module as described in the section "**Cable Connections**" of this manual, and turn the frame power on.
6. Start DashBoard on your computer. It should automatically find your frame within a minute or two. Click the "+" next to the frame name to show the cards in the frame, then double-click the TSM-100.
7. Click the **Settings** tab, select ASI or IP input and select DVB or ATSC, as appropriate for the input Transport Stream. Click **Reset Counters**, then **Refresh**.
8. Click the **Summary** tab. The display should be similar to the one in the section "**Summary**" of this manual. If all is well, the indicators will all be green.
9. If desired, connect wires from the GPIO jacks on the rear panel to your monitoring equipment, as described in the section "**GPIO Outputs**" of this manual.

Installation and Setup

In This Chapter

This chapter contains the following sections:

- Static Discharge
- Unpacking
- Rear Module Installation
- Board Installation
- Connector Labels
- Cable Connections

Static Discharge

Whenever handling the TSM-100 and other related equipment, please observe all static discharge precautions as described in the following note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each TSM-100 you received from the shipping container, and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video Limited directly.

Rear Module Installation

The openGear frame provides slots for ten individual rear modules. As discussed in the section "**Frame and Rear Module Compatibility**", the TSM-100 operate with a variety of rear modules. Figure 2 shows two rear modules mounted on an openGear frame. If you received a rear module with your TSM-100, you will need to install it in your frame before you can install the TSM-100 itself or connect cables to the slot you have chosen for it.

Use the following procedure to install the rear module in an openGear DFR-8300 series frame:

1. Refer to the ***DFR-8300 Series Frames User Manual*** to ensure that the frame is properly installed according to instructions.
2. On the rear of the frame, locate the card frame slot.
3. Remove the Blocker Plate (if any) from the rear of the slot you have chosen for the TSM-100 installation. Retain the plate for possible future use.
4. Seat the bottom of the rear module in the seating slot at the base of the frame's back plane.

Figure 2: Rear Module Installation, showing R1-10B (left) and ONG-MDL-R01 (right) modules

5. Align the top hole of the rear module with the screw hole on the top edge of the back plane.
6. Using a Phillips screwdriver and the supplied screw, fasten the rear module to the frame's back plane. Do not over-tighten.
7. Ensure proper frame cooling and ventilation by having all rear frame slots covered with rear I/O modules or blank metal plates. If you need blanks, contact your openGear sales representative.

This completes the procedure for installing the Rear I/O Module in an openGear frame.

Board Installation

Use the following procedure to install the TSM-100 in an openGear frame:

Notice — *It is recommended to use a frame with the cooling fan option in all cases, in order to allow all slots to be used without exceeding heat dissipation limits.*

1. Refer to the ***DFR-8300 Series Frames User Manual*** to ensure that the frame is properly installed according to instructions.
2. After selecting the desired frame installation slot, hold the card by the edges and carefully align the card edges with the slots in the frame.
3. Fully insert the card into the frame until the rear connection plugs are properly seated on the midplane and rear modules.

This completes the procedure for installing the TSM-100 in an openGear distribution frame.

BNC Labels

Affix a connector label (if supplied) to the rear of the rack frame at the position occupied by the TSM-100. Some rear modules do not require a label, as the connector names are silkscreened directly onto the rear module itself.

Cable Connections

This section provides information for connecting cables to the rear modules on the frame backplane. Connect the input and output cables according to the following diagram and the descriptions that follow. It is not necessary to terminate unused outputs. Figure 3 shows the rear modules that are most commonly used with the TSM-100; for information on using other modules, please contact our technical support group, using the contact information on the inside rear cover of this manual. In the following discussion, the five BNC jack positions in the left-hand column are numbered 1, 3, 5, 7 and 9, from top to bottom; the five in the right column are 2, 4, 6, 8 and 10.

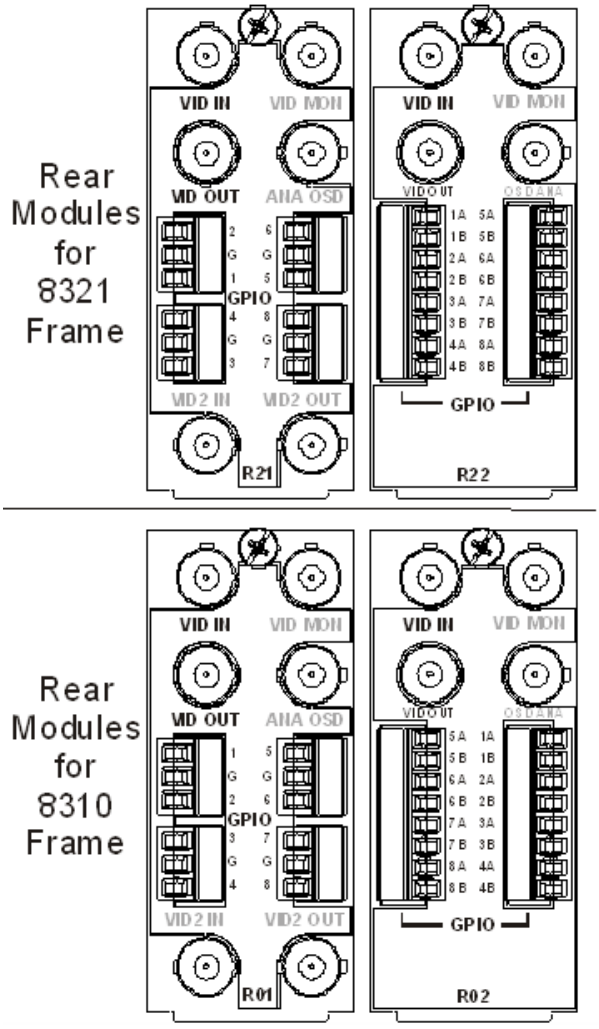


Figure 3. Top, left to right: ONG-MDL-R21, R22 and R23; Bottom, left to right: ONG-MDL-R01 and R02

BNC 1 ASI Input (may be labelled "VID In", "SDI In", or "ASI In")

This jack accepts an ASI video signal. The input signal is internally terminated in 75 ohms when the TSM-100 is installed. The TSM-100 requires this input in all cases.

BNC 3 ASI Output (may be labelled "VID Out", "SDI Out" or "ASI Mon")

When using ASI input, this jack carries a reclocked copy of the ASI signal applied to BNC1. When using IP input, this jack carries an ASI signal derived from the selected multicast stream. When the TSM-100 card is removed from its slot, the **ONG-MDL-R01**, **R21** or **R23** rear module bypasses BNC1 to BNC3 directly. The **ONG-MDL-R02,** and **R22** do not provide this bypass capability.

BNC 2 and 4-10 Not used

Although some of these may be labelled as shown in the illustration, they have no function on the TSM-100.

GPIO Outputs

These jacks carry the TSM-100's GPIO outputs that can be used to control external equipment. Note that the plugs are supplied with each module.

The GPIO signals are numbered 1 through 8.

On the ONG-MDL-R01, R21 and R23, there is one logic-level pin per GPIO. In the illustration, they are labelled 1-8. Ground connections are identified by the label “G”.

The ONG-MDL-R02, and R22 have on-board relays. Each GPIO output consists of two pins that are connected together when the GPIO is asserted, and isolated from all other signals when the GPIO is negated. The two signals in each pair are labelled A and B; for example, 1A and 1B are for GPIO 1.

The following table lists the conditions that are associated with each of the GPIOs.

Table 1: GPIO Conditions

GPIO	Condition
1	ASI Bypass
2	Loss of Video
3	No LAN
4	TOA
5	POA
6	CM
7	QOS
8	TNC

For the meanings of the codes in the **Condition** column, see the section “**Interpreting Error Severity Levels**”.

Rear Module Styles

In the DFR-8310 series frame, each rear module is connected to one circuit card and occupies one-tenth of the space on the rear of the frame.

The DFR-8321 series frame has twenty slots in the same space as the ten slots of the DFR-8310 series frame. Each rear module corresponds to two slots of the frame. Rear modules that can accommodate one card are called “full”; an DFR-8321 series frame with ten “full” rear modules can hold ten cards.

There are also “split” rear modules that can accommodate two cards. Each card is connected to half of the connectors on the rear module. An DFR-8321 series frame with ten “split” rear modules can hold twenty cards.

The ONG-MDL-R01 and R02 are full rear modules for the DFR-8310 series frame; each can accommodate one TSM-100 card.

The ONG-MDL-R21 and R22 are full rear modules for the DFR-8321 series frame with the same functionality as the R01 and R02; each can accommodate one TSM-100 card which must be in an even-numbered slot (2, 4, 6 etc).

The ONG-MDL-R23 is a split rear module for the DFR-8321 series frame that can accommodate two TSM-100 cards. Its two columns of jacks are labelled ODD and EVEN to indicate which slot they are connected to. For example, assume that an R23 rear module is installed in the position corresponding to slots 1 and 2 of the frame. The jacks labelled ODD will be connected to the card in slot 1, and those labelled EVEN will be connected to the card in slot 2. If it were installed at slots 7 and 8, ODD would connect to 7 and EVEN would connect to 8.

User Controls and Indicators

In This Chapter

This chapter contains a description of the TSM-100 user controls:

- Switches
- LEDs

User Controls

Figure 4 shows the front edge of the TSM-100. Following the illustration are descriptions of the controls and indicators identified here.

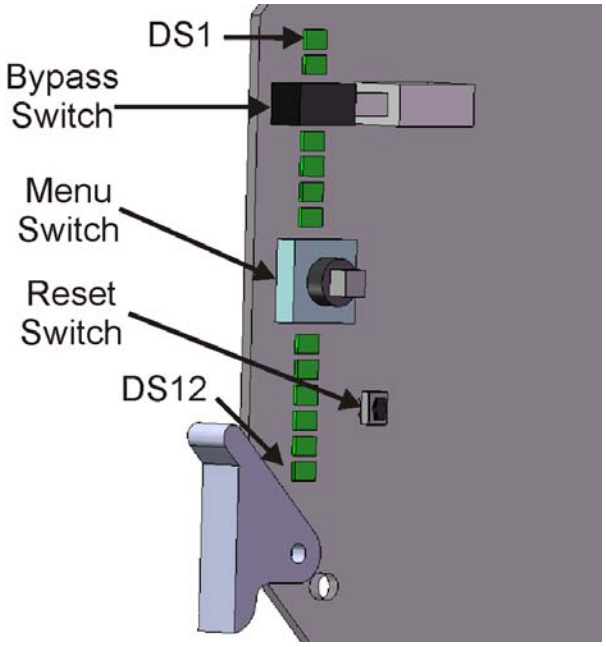


Figure 4. Card-edge User Controls

Bypass Switch

If the TSM-100 is installed in a rear module such as the ONG-MDL-R01 or R21 or R23 that has a bypass relay, this two-position pushbutton can be used to control the relay that routes ASI either through or around the TSM-100.

- When the pushbutton is in the "IN" position, the TSM-100 is in the ASI signal path.
- Pressing it once moves the switch to the "OUT" position and bypasses the TSM-100, with the ASI input signal routed directly to the ASI output. In this state, the input is disconnected from the card which therefore reports a loss of video. The front-edge Bypass LED turns on.
- Pressing the pushbutton again restores the TSM-100 to its active state.

When the TSM-100 is installed in a rear module that does not provide bypass capability, this switch turns on the Bypass LED but has no useful function. It should be left in the "IN" position at all times.

Menu Switch

This switch has no function on the TSM-100.

Reset Switch

This button can be used for rebooting the card.

LEDs

The front-edge of the card features LEDs that display the status of the input signals. Descriptions are provided in the following table:

Table 2. Status LED Descriptions

LED	Color	Location	Display and Description
Power	Red/ Green/ Orange	DS1	When off, there is no power. When lit and green the card is running with valid input. When flashing green, the boot loader is waiting for software upload. When lit orange, this is a warning about a signal or configuration error. When lit red, the card is not operational. This will occur if, for example, there is no video input.
Bypass	Red	DS2	When off, TSM-100 is in the ASI path. When lit red, the TSM-100's ASI is bypassed if the rear module provides this feature.
ASI In	Red/ Green	DS3	When lit green, the ASI input is present and valid. Red indicates that data errors are detected in the ASI input.
ASI Out	Green	DS4	When lit green, the ASI output serializer is locked to a valid input.
TOA	Red/ Green	DS7	Normally lit green. When lit red, this indicates that the Transport Stream is unusable. See the section "**Interpreting Error Severity Levels**".
POA	Red/ Green	DS8	Normally lit green. When lit red, this indicates that a Program in the Transport Stream is unusable. See the section "**Interpreting Error Severity Levels**".
CM	Red/ Green	DS9	Normally lit green. When lit red, this indicates that a component of the Transport Stream is missing. See the section "**Interpreting Error Severity Levels**".
QOS	Orange/ Green	DS10	Normally lit green. When orange, this indicates a major compliance failure of a component of the Transport Stream. See the section "**Interpreting Error Severity Levels**".
TNC	Orange/ Green	DS11	Normally lit green. When orange, this indicates a minor compliance failure of a component of the Transport Stream. See the section "**Interpreting Error Severity Levels**".
Not used		DS12	

Transport Stream Monitoring

In This Chapter

This chapter provides a detailed explanation of the functions available when using DashBoard to monitor the TSM-100. The DashBoard program and manual are available for download from the Ross Video website.

The following topics are discussed in this chapter:

- Selecting a TSM-100 Module
- Screen layout
- How to use the Status screens

This section focuses on the use of the DashBoard program to control and monitor a TSM-100. For a more complete description of DashBoard and its capabilities, refer to the ***DashBoard Control System User Manual***.

Selecting a TSM-100 Card

Figure 5 shows a typical DashBoard screen. After it has established its connection to the frame containing the TSM-100, a list of modules is displayed at the left side. Clicking on a frame and then double-clicking on a TSM-100 causes a window for that module to be opened, resulting in the display shown here. In this simple example, there is only one device, the TSM-100, open. DashBoard provides the ability to view multiple devices in this window. For details, see the ***DashBoard Control System User Manual***.

Screen layout

The TSM-100 window is divided into four sections as shown:

- The upper left side is the Product Status area, and displays a summary of the present module status.
- The lower left side is the Status area and provides three tabs to select more detailed status.
- The right side, the Settings area, provides controls to allow control of the various functions of the module.
- The bottom band contains buttons for general functions of the card:
  - **Refresh** is used to update the status display. It is especially useful after changing settings and/or clicking the **Reset Counters** button.
  - **Upload** is used to load new firmware into the card. It has no function in normal operations.
  - **Reboot** restarts the card software. It should not be used in normal operations.

Note — *The screen shots in this and the next chapter apply when an ONG-MDL-R01or R21 rear module is used. When other rear module types are used, the GPIO capabilities may not be available. Consequently, the GPIO and GPIO Status tabs are not displayed..*

Viewing the Status Information

Because of the complexity of the TSM-100 display, there are two special controls that should be used to increase the area available for Status information:

- Double-click the tab for the TSM-100 card at the top of the screen, to enlarge its window by hiding the module list. You can later restore the module list by double-clicking the tab again.
- Hover the mouse pointer over the vertical dividing line between the Status and Settings panes. When the pointer becomes a double arrow ↔, click and hold the line and drag it to the right to enlarge the Status pane.

Product Status

The left side of this figure shows product information that is useful in discussing the operation of the module with Ross Video's Technical Support staff.

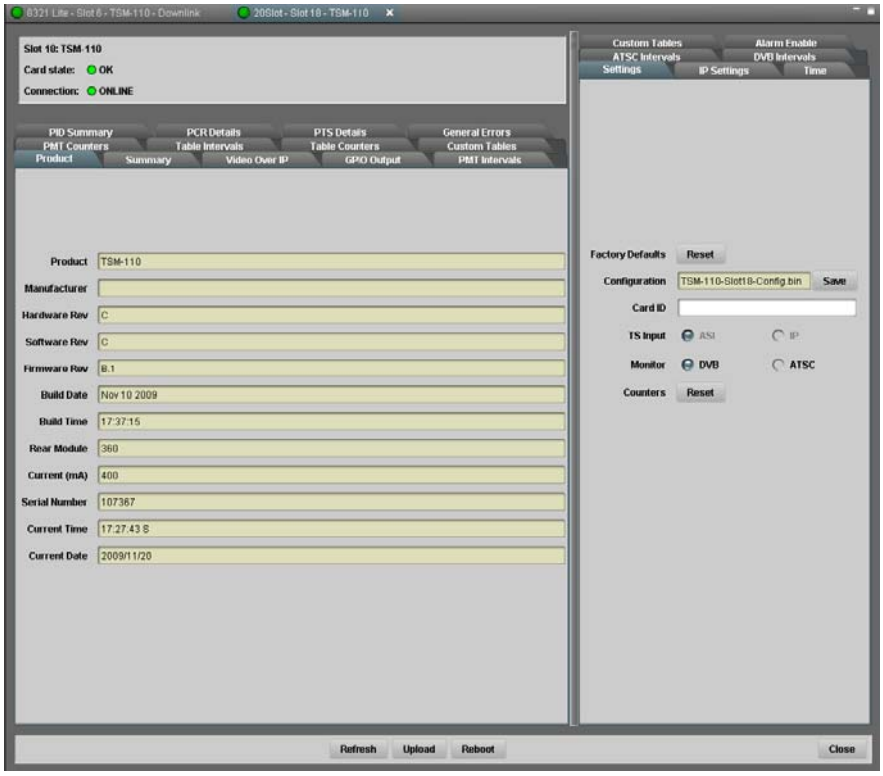


Figure 5: TSM-100 DashBoard Screen, showing Product Status and Settings

Interpreting Error Severity Levels

The Card Status and many other status fields in the TSM-100 follow the error severity levels defined by A/78. These apply to both DVB and ATSC modes of the card, even though the recommended practice for DVB, TR 101 290, does not define multiple severity levels. This provides extra information about the severity of errors, beyond the requirements of the DVB practice.

The error severity levels are listed, along with their names and the colors of the corresponding indicators on the TSM-100 screens, in Table 3.

Table 3: Error severity levels

Level	Meaning	Color
OK	No error conditions	Green
TNC	Technically Non-Conformant	Yellow
QOS	Quality of Service	Yellow
CM	Component Missing	Red
POA	Program Off Air	Red
TOA	Transport Stream Off Air	Red

For a detailed explanation of these error levels, please refer to ATSC A/78. The following is a point-form summary of some of the most important principles:

- Many components of a Transport Stream have a maximum allowable cycle time (interval) between repetitions, which we call T_C.
- As long as the interval is less than T_C, the component is considered to be **OK**.
- If the interval is greater than T_C but less than twice T_C, it is Technically Non-Conformant (**TNC**), which is considered to be a non-urgent condition.
- If the interval is greater than twice T_C but less than five times T_C, it is viewed as potentially having a negative effect on Quality of Service and is therefore categorized as **QOS**. Although this is more serious than **TNC**, the Transport Stream should still be usable by most receivers.
- If the interval is greater than five times T_C, the component is considered to be missing, which is indicated by **CM**. This might indicate that a component of a program - such as the audio for example – is missing or misidentified. This is a serious error condition.
- There are certain critical components whose absence has a more serious impact than others. For example, if a PMT (Program Map Table) or PCR (Program Clock Reference) is missing, the entire program to which it belongs is unusable. Therefore, a rating of **CM** on a PMT or PCR is automatically escalated to Program Off Air (**POA**).
- Similarly, if the PAT (Program Association Table) is missing, the entire Transport Stream - which may contain several programs - is unusable. Therefore, a rating of **CM** on the PAT is automatically escalated to Transport Stream Off Air (**TOA**), which is the most serious error level.
- In ATSC mode, if the MGT (Master Guide Table) is missing, the entire Transport Stream - which may contain several programs - is unusable. Therefore, a rating of **CM** on the MGT is automatically escalated to Transport Stream Off Air (**TOA**), which is the most serious error level.

Summary

Figure 6 shows the main status screen for the TSM-100. This is how you would normally leave your DashBoard display unless you are investigating a specific error condition.

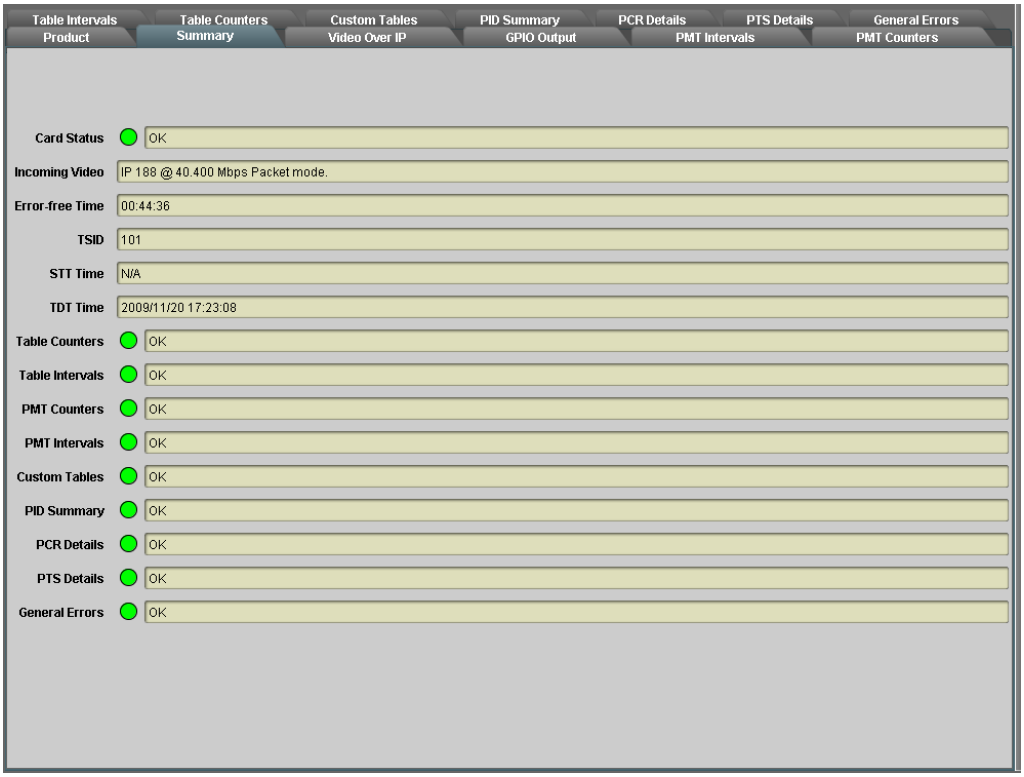


Figure 6. Summary status screen

Card Status is a summary of the other indicators below it. It indicates the most serious error level that has occurred. For example, if one indicator is yellow (warning) and all others are green (OK), the Card Status will be yellow. The two or three-letter code next to Card Status is the error severity level, coded as described in the previous section.

Note — *The TSM-100 status indicators are persistent; that is, the severity level of any error that occurs is retained until the user clicks Reset Counters on a settings menu. This allows transient error conditions to be detected, even though the user may not be watching the screen when they occur. Note that, after clicking Reset Counters, there may be a delay of several seconds before the monitoring state is fully reset*

This area also shows the Transport Stream bit-rate, whether the input is ASI input or IP, whether the input is in Packet or Byte mode, the Transport Stream Identifier (TSID), the time extracted from the STT if present, and the time extracted from the TDT if present. Both times are UTC (Universal Coordinated Time).

Error-free Time is a running count of the time since the most recent error was detected in the Transport Stream. The error can be any of the ones that the TSM-100 is capable of detecting. Inspection of the other status tabs enables you to identify the type(s) of error(s) that have occurred. This elapsed time field allows you to determine when the last (or only) one occurred.

Table Counters is a summary of other errors in the individual tables that the TSM-100 monitors. If this is not **OK** (green), more detailed error information can be found by examining the **Table Counters** tab.

Table Intervals is a summary of the timing of the individual tables that the TSM-100 monitors. If this is not **OK** (green), more detailed error information can be found by examining the **Table Intervals** tab.

PMT Counters is a summary of other errors in the PMTs that define the Transport Stream. If this is not **OK** (green), more detailed error information can be found by examining the **PMT Counters** tab.

PMT Intervals is a summary of the timing of the PMTs that define the Transport Stream. If this is not **OK** (green), more detailed error information can be found by examining the **PMT Intervals** tab.

Custom Tables is a summary of the timing and error status of the custom tables that the TSM-100 monitors. If this is not **OK** (green), more detailed error information can be found by examining the **Custom Tables** tab.

PID Summary is the status of the Elementary Streams such as video and audio, principally continuity errors. If this is not **OK** (green), more detailed error information can be found by examining the **PID Summary** tab.

PCR Details is a summary of the status of the Program Clock Reference (**PCR**) fields that are expected to be present in the Transport Stream. If this is not **OK** (green), more detailed error information can be found by examining the **PCR Details** tab.

PTS Details is a summary of the status of the Presentation Time Stamp (**PTS**) fields that are expected to be present in the Transport Stream. If this is not **OK** (green), more detailed error information can be found by examining the **PTS Details** tab.

General Errors is a summary of the status of miscellaneous errors that may occur in the stream, including Transport Errors and missing and unreferenced PIDs. If this is not **OK** (green), more detailed error information can be found by examining the **General Errors** tab.

The following sections describe each of the detailed status tabs discussed above.

PMT Intervals

The Program Map Table (PMT) is an essential component of every Transport Stream. There must be one PMT for each program. The PMT defines the components, such as audio and video, that are part of the program. Without the PMT, a receiver has no way of finding the program components and binding them together. Because of its importance, the PMT merits its own status reporting. The TSM-100 dedicates two screens to the PMT.

Figure 7 shows the PMT Intervals screen. The upper portion of the screen shows the PMT Intervals state which is also reflected in the Program State indication on the Summary screen. This is followed by a list of programs, with one row for each program detected in the Transport Stream. Each row shows: the program name (if available) and number; the program's Alarm Status; its PID; and the minimum and maximum measured intervals between repetitions of the program's PMT. Note that the PID values and all other numbers in this manual are expressed in decimal, unless otherwise indicated.

Clicking on the appropriate Interval tab in the Settings pane (**DVB Intervals** in this case) displays the limits for each of the monitored tables. We can see that the limit for PMTs is 500 milliseconds (ms). The maximum measured intervals for all the programs in this example are well below this limit, with the result that their status is listed as **OK**.

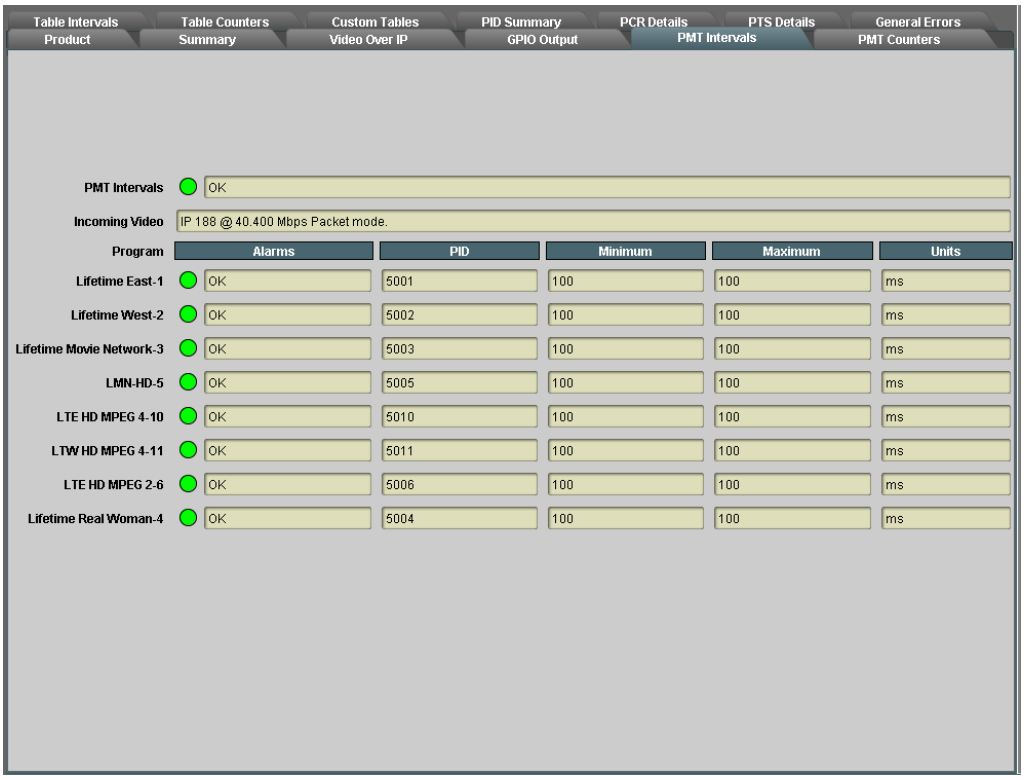


Figure 7. PMT Intervals status screen

Note — *The following scenario describes how one might make use of this status screen. You notice that the Card State of the TSM-100 is yellow (TNC). This indicator is visible in four places: in the Summary screen; in the Product Status area at the top of the TSM-100 status area; on the status indicator for the TSM-100 in the Device list; and on the status indicator for the openGear frame that houses the TSM-100, which is shown next to the frame name in the device list (tree view). Inspection of the Summary indicates that PMT intervals are the source of the problem. You click the PMT Intervals tab and inspect the list. If one of the programs is out of spec, you can infer which portion of the upstream equipment requires attention*

PMT Counters

As discussed in the preceding section, the Program Map Table (PMT) is an essential component of each program in a Transport Stream. The second screen dedicated to PMTs is shown in Figure 8. The upper portion of the status area shows the same information as the PMT Intervals screen.

This is followed by a list of programs, with one row for each program detected in the Transport Stream. Each row shows: the program name (if available); the program's Alarm Status; and a number of event counters for that program.

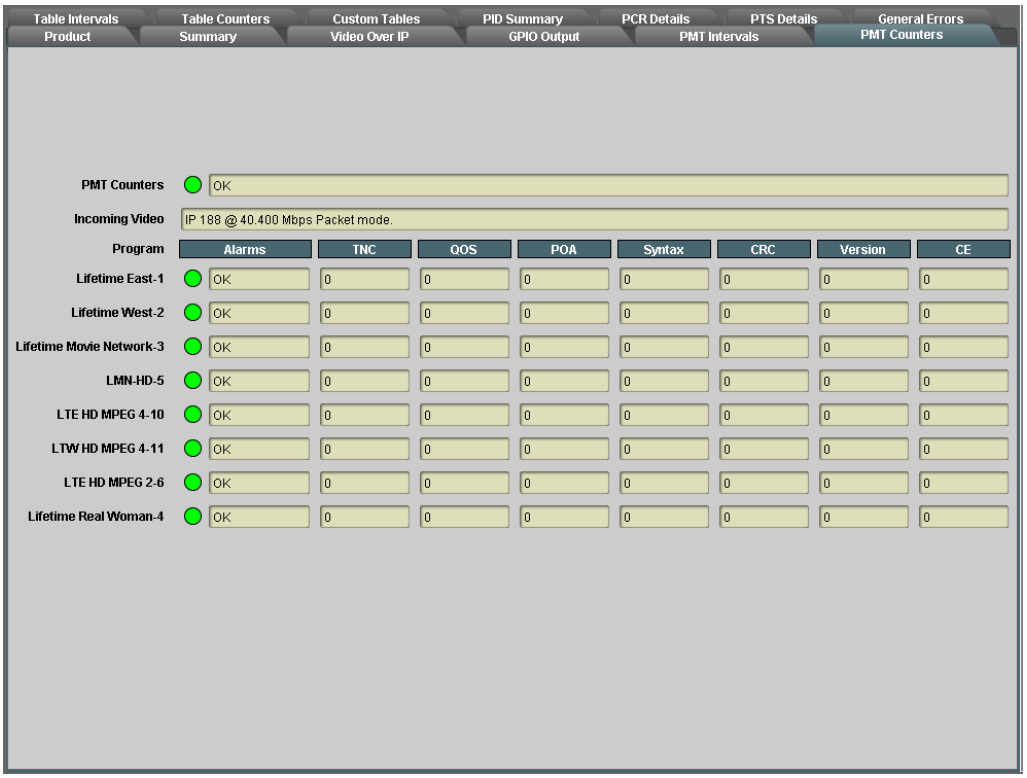


Figure 8. PMT Counters status screen

The counters for ***TNC***, ***QOS***, and ***POA*** represent the number of times the given level of error severity has been attained since the last time they were reset. These error severity levels are discussed in the section "**Interpreting Error Severity Levels**". Note that there is no counter for ***CM***, since a missing PMT is automatically escalated to ***POA***.

Syntax is a count of syntax errors occurring in the PMT. For example, this could be caused by an invalid "table_id" value in the PMT. Recurring errors of this type might indicate a fault in the equipment that constructs the PMT for the program.

CRC is a count of the number of CRC errors occurring in the PMT. The CRC (Cyclic Redundancy Check) is used to detect bit errors in tables. Relatively infrequent CRC errors have little consequence because the tables are repeated often enough that missing an occasional repetition normally has little impact. Constant CRC errors are equivalent to the table being missing, since it cannot be processed unless its CRC is valid. Moderate or even low levels of CRC errors may indicate that upstream equipment needs attention. The appropriate response may depend on the number of PMTs that show CRC errors: if only one has errors, this may direct you to a specific piece of equipment; if, on the other hand, all PMTs have errors, the problem may be in any of a number of pieces of transmission equipment.

Version is a count of the number of times that the PMT's version number has incremented inappropriately. Whenever the contents of the PMT change, indicating a change in the program structure, the PMT's Version number is required to increment. If it does not, or if it increments incorrectly, a Version error is counted.

CE is a count of the number of discontinuities in the packet continuity counter for the PMT. Every PID in a Transport Stream (TS) has a continuity count that increments by one with each new TS packet. If this does not increment correctly, a CE error is counted. CE errors are typically an indication that upstream equipment is losing TS packets. This can occur, for example, because of bit errors on a transmission link or because of inappropriate attempts to groom or compress the TS. Occasional CE errors in tables such as PMTs may not have much impact because of frequent repetitions; however they could indicate that you should check whether they are also occurring in the video and audio elementary streams, where the consequences of packet losses can be severe. Refer to the section "**PID Summary**".

Table Intervals

The preceding sections discussed the two screens used to monitor PMTs. This section discusses the Table Intervals screen, which summarizes the interval status for various types of important tables. The list of essential tables depends of the type of Transport Stream: ATSC or DVB. The following two screenshots show the Table Intervals screens: Figure 9 is DVB, and Figure 10 is ATSC.

The upper portion of the screen shows the Table Intervals state, which is a summary of all the state indicators in the lower portion of the screen. This is also reflected in the Table Intervals state indication on the Summary screen. This area also shows the Transport Stream bit-rate, and whether the ASI input is in Packet or Byte mode.

This is followed by a list of the table types monitored by the TSM-100, along with their status and their measured minimum and maximum intervals. The DVB tables monitored are the PAT, PMT, NIT, SDT, EIT, and TDT; the CAT is also monitored if its presence is signaled. Whereas there is only a single PAT per Transport Stream, there may be several PMTs. This screen summarizes all PMTs into a single indicator. The PMT Intervals screen can be used to obtain details about individual PMTs.

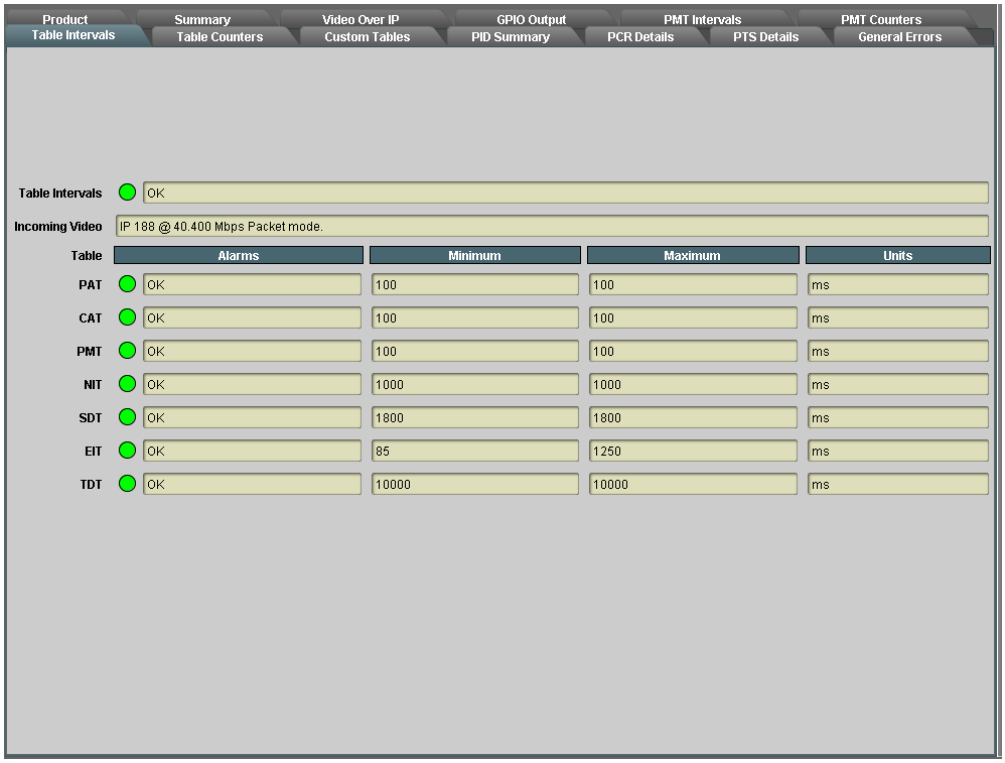


Figure 9. DVB Table Intervals status screen

Table State Example

The following scenario describes how you might make use of this status screen. You notice that the Card State of the TSM-100 is yellow (TNC). This indicator is visible in four places: in the Summary screen; in the Product Status area at the top of the TSM-100 status area; on the status indicator for the TSM-100 in the Device list; and on the status indicator for the openGear frame that houses the TSM-100.

Inspection of the Summary indicates that the Table Intervals state is the source of the alarm. You click the Table Intervals tab, and inspect the list of tables to locate the one that is out of spec. By clicking on the DVB Intervals tab in the Settings pane, you can view the limit for the affected table's interval.

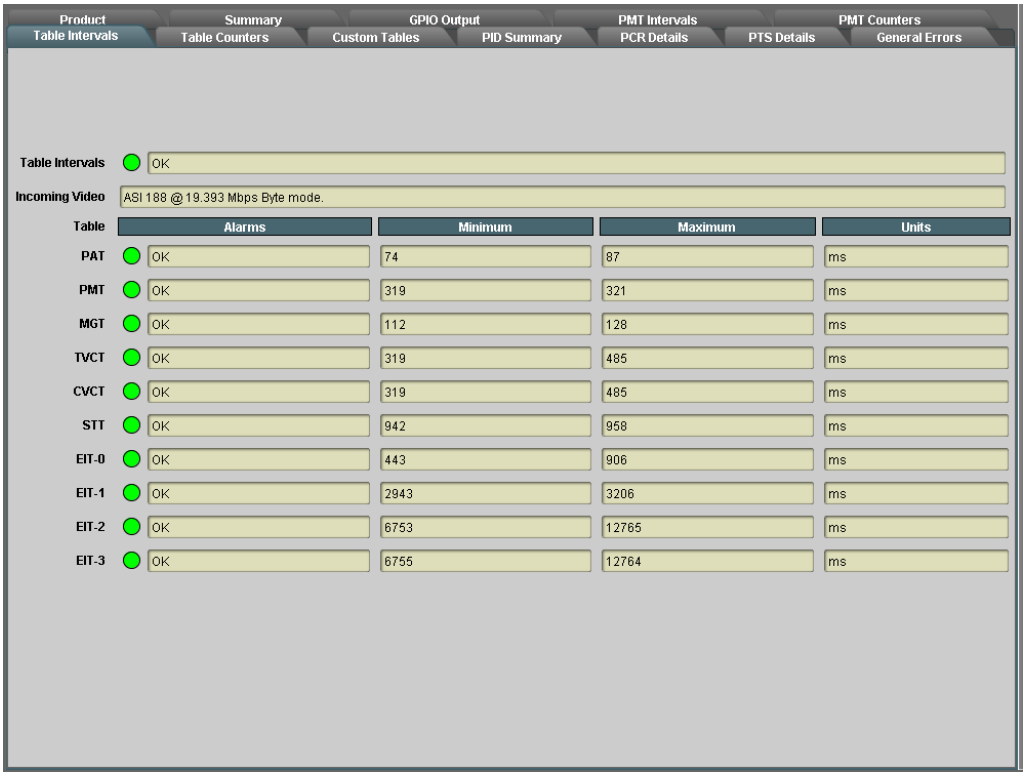


Figure 10. DVB Table Intervals

The format of the ATSC Table Intervals screen is the same as for the DVB Table Intervals screen discussed previously. The ATSC tables monitored are the PAT, PMT, MGT,TVCT, CVCT, RRT, STT, and EIT; the ETT and CAT are also monitored if their presence is signaled. Whereas there is only a single PAT per Transport Stream, there may be several PMTs.

An ATSC stream may carry a large number of EIT tables, but only the first four, EIT-0 through EIT-3, are required for conformance. For this reason, only these four are monitored on this screen.

This screen summarizes all PMTs into a single indicator. The PMT Intervals screen can be used to obtain details about individual PMTs.

For a suggested method of use of this screen, please see the example earlier in this section.

Table Counters

The preceding section described the interval timers for important DVB or ATSC tables. The second screen dedicated to tables is shown in Figures 12 (DVB) and 13 (ATSC). This upper portion of the status area shows general information about the Transport Stream, as on other status screens. This is followed by a list of the table types monitored by the TSM-100, along with their status, just as in the Table Intervals screen. Each row shows: the table name; the program's Alarm Status; and a number of event counters for that program.

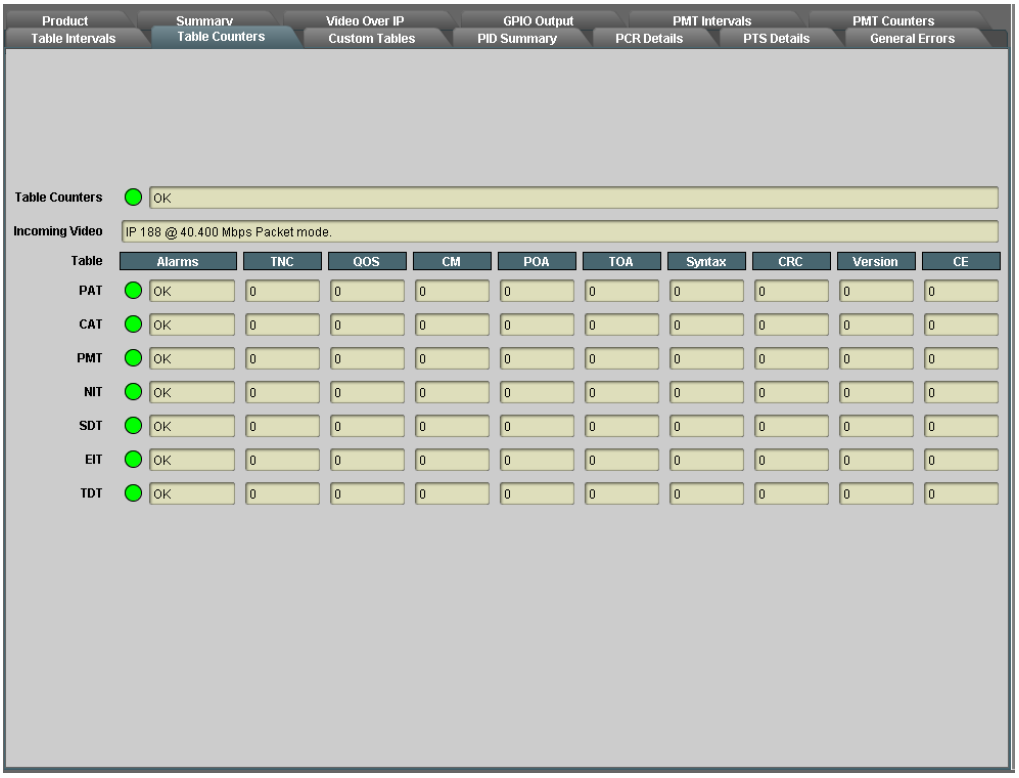


Figure 12. DVB Table Counters status screen

The counters for ***TNC***, ***QOS***, ***CM***, ***POA*** and ***TOA*** represent the number of times the given level of error severity has been attained for this table since the last time they were reset. These error severity levels are discussed in an earlier section entitled *Interpreting Error Severity Levels*.

Syntax is a count of syntax errors occurring in this table. For example, this could be caused by an invalid table_id value. Recurring errors of this type might indicate a fault in the equipment that constructs the tables.

CRC is a count of the number of CRC errors occurring in the table. The CRC (Cyclic Redundancy Check) is used to detect bit errors in tables. Relatively infrequent CRC errors have little consequence because the tables are repeated often enough that missing an occasional repetition normally has little impact. Constant CRC errors are equivalent to the table being missing, since it cannot be processed unless its CRC is valid. Moderate or even low levels of CRC errors may indicate that upstream equipment needs attention. The appropriate response may depend on the number of tables that show CRC errors: if only one has errors, this may direct you to a specific piece of equipment; if, on the other hand, all tables have errors, the problem may be in any of a number of pieces of transmission equipment .

Version is a count of the number of times that the table's version number has incremented inappropriately. Whenever the contents of the table change, its Version number is required to increment. If it does not, or if it increments incorrectly, a Version error is counted.

CE is a count of the number of discontinuities in the packet continuity counter for the table. Every PID in a Transport Stream (TS) has a continuity count that increments by one with each new TS packet. If this does not increment correctly, a CE error is counted. CE errors are typically an indication that upstream equipment is losing TS packets. This can occur, for example, because of bit errors on a transmission link or because of inappropriate attempts to groom or compress the TS. Occasional CE errors in some tables may not have much impact because of frequent repetitions; however they could indicate that you should check whether they are also occurring in the video and audio elementary streams, where the consequences of packet losses can be severe. Refer to the section "**PID Summary**".

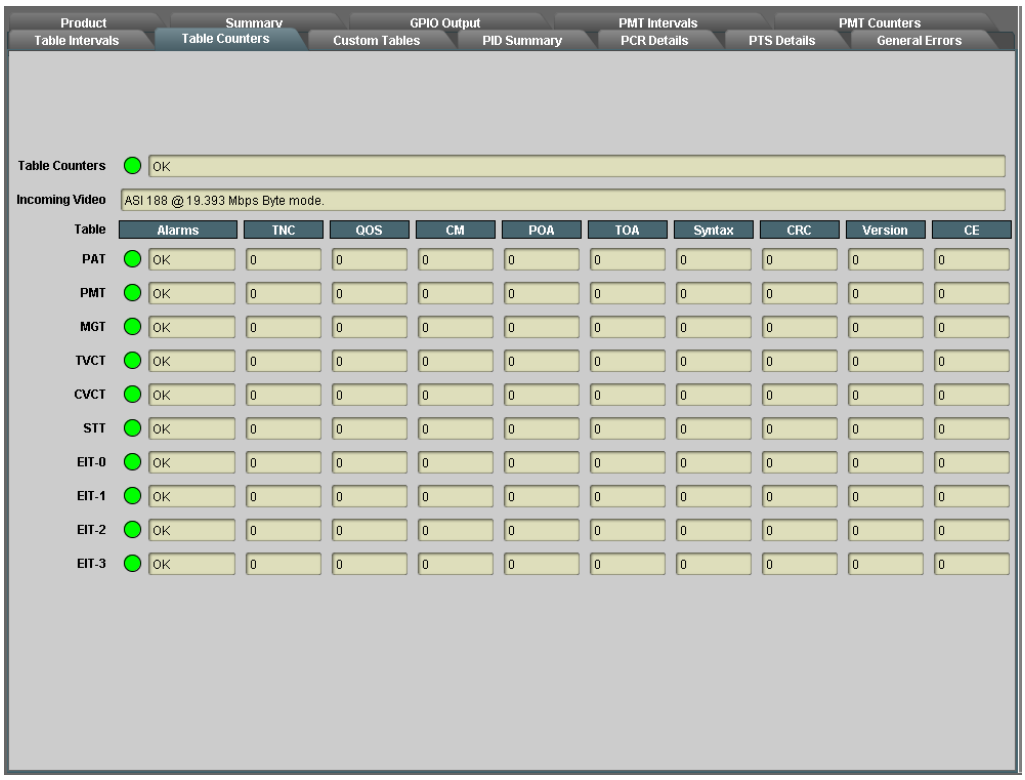


Figure 13. ATSC Table Counters status screen

PID Summary

The preceding sections have been concerned principally with the integrity of DVB and ATSC tables: that is, PSI and PSIP. This section describes monitoring of elementary streams such as video and audio. Figure 13 shows the **PID Summary** screen, which provides a list of the elementary streams that belong to the programs that are carried in the Transport Stream.

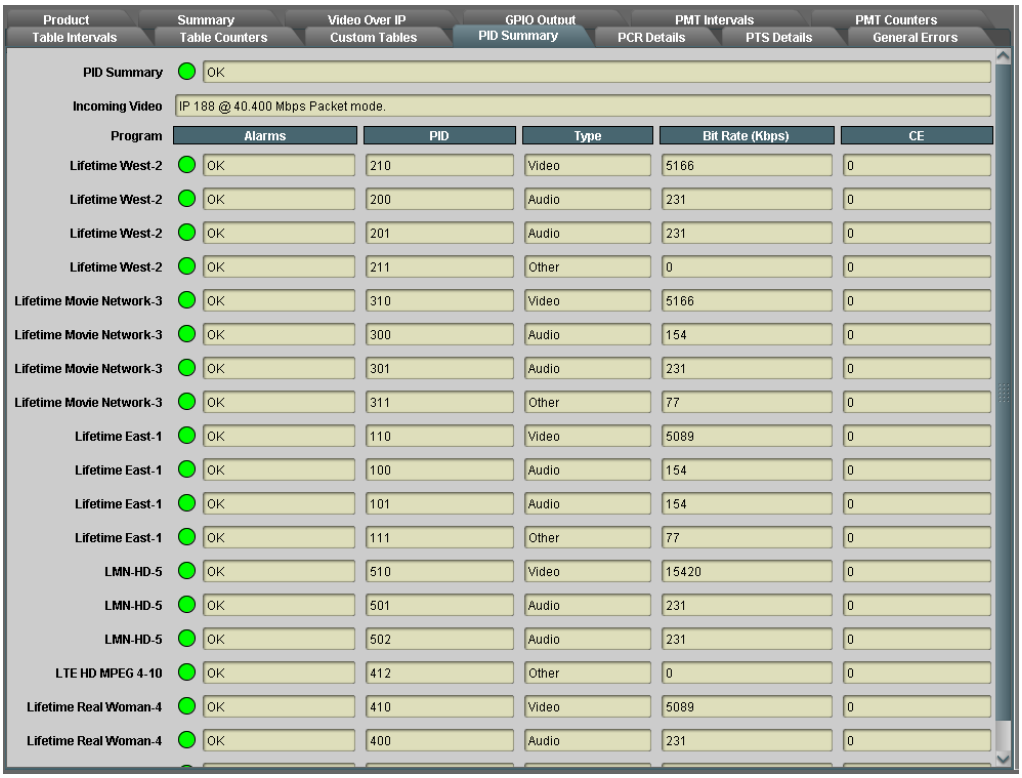


Figure 14. PID Summary Counters status screen

For each elementary stream, the following information is provided:

The name (if available) and number of the program to which it belongs; its Alarm Status; its PID; its type (Video, Audio or Other), its measured bit rate; and continuity errors (CE). All of these, with the exception of CE, are informational; however, a non-zero CE value indicates an error condition.

CE is a count of the number of discontinuities in the packet continuity counter for the stream. Every PID in a Transport Stream (TS) has a continuity count that increments by one with each new TS packet. If this does not increment correctly, a CE error is counted. CE errors are typically an indication that upstream equipment is losing TS packets. This can occur, for example, because of bit errors on a transmission link or because of inappropriate attempts to groom or compress the TS. CE errors in video or audio elementary streams will cause visible or audible disruptions in equipment that plays the affected program(s).

You would typically use this screen if the **Summary** screen shows an alarm for PID Summary. You might also have noticed continuity errors on the **Table Counters** or **PMT Counters** screen and want to check whether elementary streams are also losing TS packets.

PCR Details

Each program must contain a Program Clock Reference (PCR). This component provides the timing for all decoding operations at the receiver. It is embedded in TS packets belonging to an elementary stream, typically but not necessarily the video stream. The PMT specifies the PID of the stream that contains the PCR. Other streams in the program may also contain a PCR, but the one indicated by the PMT is the reference.

For both DVB and ATSC, the PCR has a maximum allowable interval time. The TSM-100 measures PCR intervals, and presents the results in much the same way as the tables discussed in previous sections. Figure 15 shows the **PCR Details** screen.

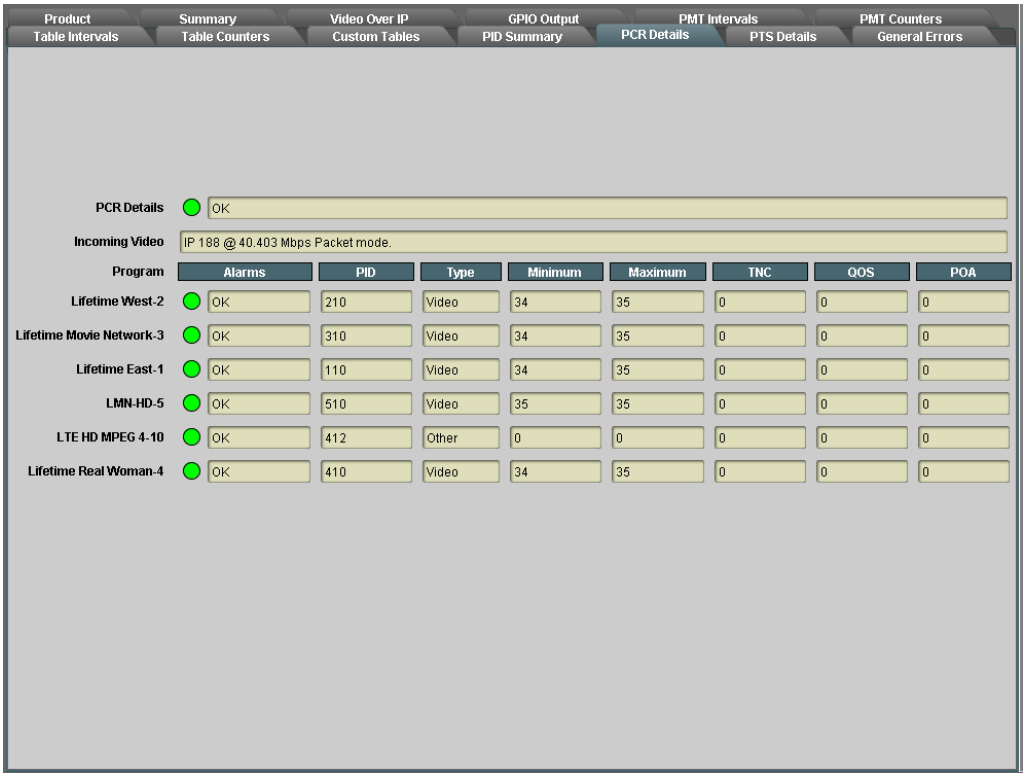


Figure 15. PCR Interval status screen

For each elementary stream that contains a PCR, the screen lists the following information:

The name (if available) and number of the program to which it belongs; its PID; its type (Video, Audio or Other), the measured minimum and maximum interval between PCRs; and the number of times the PCR interval has attained the value needed to count as a TNC, QOS or POA error. These error severity levels are discussed in an earlier section "**Interpreting Error Severity Levels**". Note that a CM (Component Missing) error in a PCR is automatically escalated to POA (Program Off Air), because the absence of the PCR makes the complete program unusable.

Clicking on the appropriate Interval tab in the Settings pane (**DVB Intervals** or **ATSC Intervals**) displays the limit for the PCR Interval, for comparison purposes. You may have to scroll down the list to find the PCR entry.

You would typically use this screen if the **Summary** screen shows an alarm for PCR State.

PTS Details

Elementary streams normally contain Presentation Time Stamps (PTS). These are used by the receiver to know when to present specific items of content to the user. They are embedded in TS packets belonging to individual elementary streams.

For both DVB and ATSC, the PTS has a maximum allowable interval time. The TSM-100 measures PTS intervals, and presents the results in much the same way as the PCR discussed in the preceding section. Figure 15 shows the **PTS Details** screen.

For each elementary stream, the screen lists the following information:

The name (if available) and number of the program to which it belongs; its PID; its type (Video, Audio or Other), the measured minimum and maximum interval between PTSs; and the number of times the PTS interval has attained the value needed to count as a TNC, QOS or CM error. These error severity levels are discussed in the section "**Interpreting Error Severity Levels**".

Clicking on the appropriate Interval tab in the Settings pane (**DVB Intervals** or **ATSC Intervals**) displays the limit for the PTS Interval, for comparison purposes. You may have to scroll down the list to find the PTS entry.

Note — *The numerous zero values for PTS interval in this example demonstrate an interesting phenomenon: this Transport Stream is scrambled. As a consequence, the PTSs (if present) are also scrambled, and it is therefore impossible to determine whether their intervals comply with the prescribed limits*

You would typically use this screen if the **Summary** screen shows an alarm for PTS State.

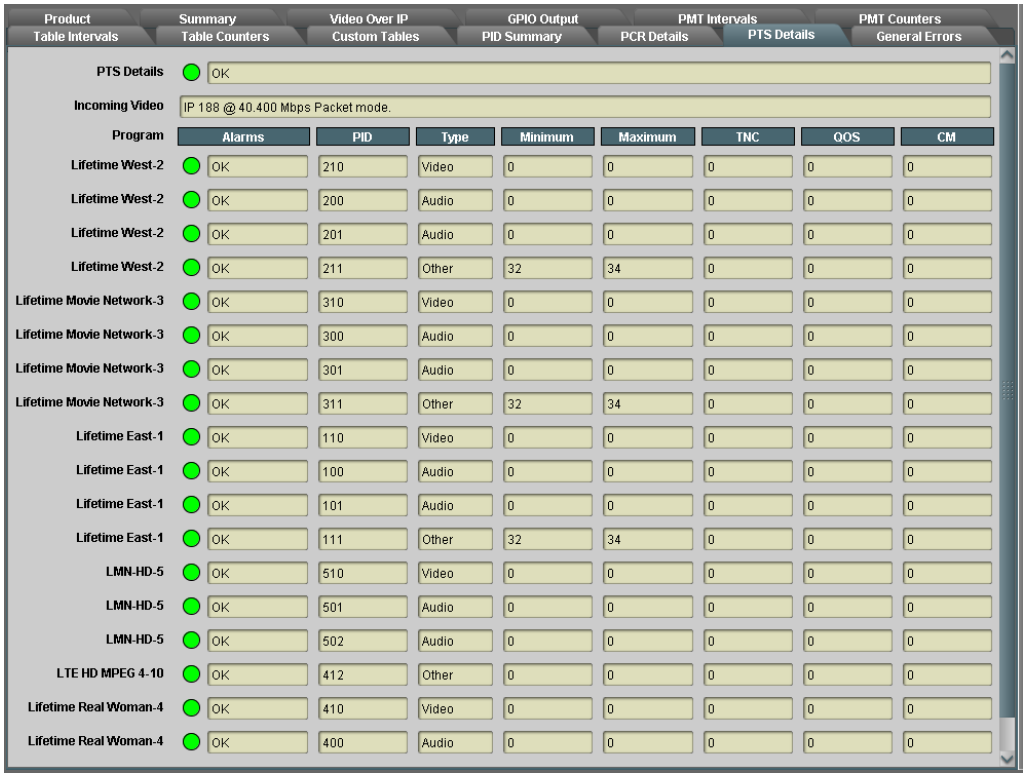


Figure 16. PTS Details status screen

General Errors

This screen , shown in Figure 17, summarizes some error types that pertain to the Transport Stream transmission layers and also shows inconsistencies in its overall logical structure.

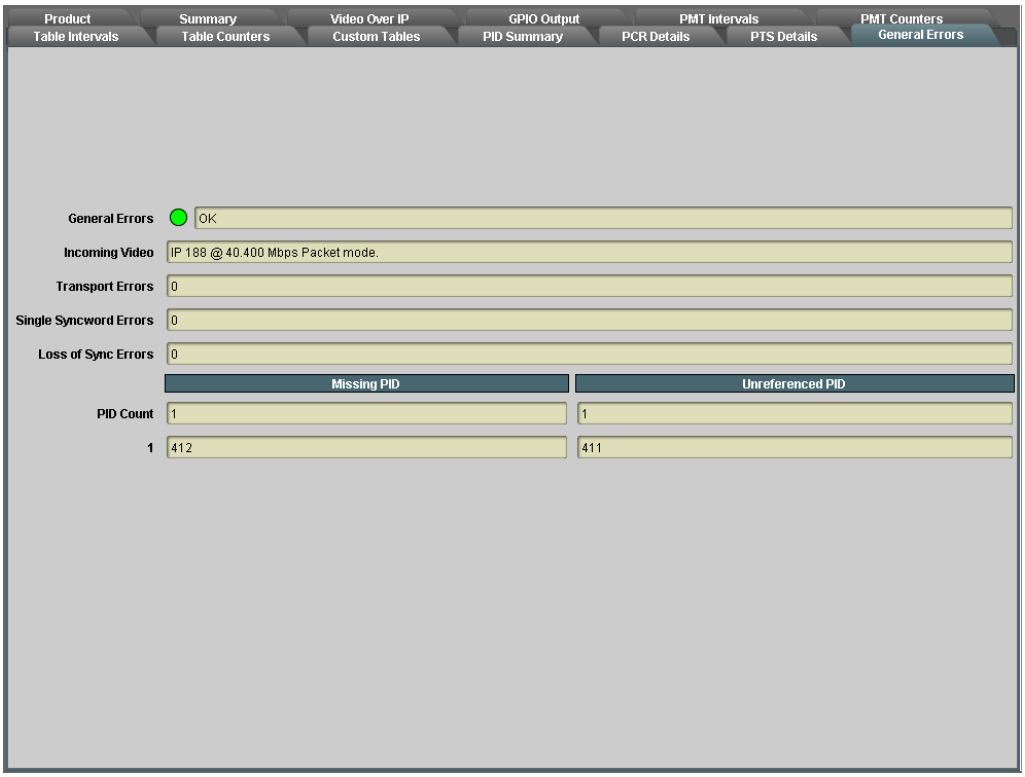


Figure 17. General Errors status screen

Transport Errors reports the number of TS packets received with the transport_error_indicator flag in the TS packet header set. This bit is set by upstream equipment (a demodulator, for example) to signal that it has detected data errors that it was not able to correct. This will frequently correspond to packet losses, which will appear as continuity errors in one or more of the other status screens.

Single Syncword Errors reports the number of single TS packets that have been received with the Syncword not equal to the specified value of 0x47. Small number of these errors may have minimal effect on the usability of a TS, however they are an indication that some upstream equipment may be marginal and about to fail in a more serious manner. This only counts isolated single Syncword errors. If two consecutive packets have Syncword errors, the TSM-100 instead declares a loss of sync and attempts to resync to the TS.

Loss of Sync Errors reports the number of times that two or more consecutive packets have Syncword errors. This is most commonly caused by asynchronous switching between two Transport Streams, or the disconnection or disruption of the ASI input.

Missing PID is a list of PIDs that are defined to be part of the Transport Stream (for example, they are referenced in a PMT), but have not been detected in the last 10 seconds. In many cases, missing components will be listed as CM (Component Missing) on one of the other detailed status screens. However, there are some components for which no maximum interval time is specified. For example, splice commands for Digital Program Insertion (e.g. SCTE-35 triggers) are referenced in the PMT but may occur as infrequently as every 60 minutes, depending on the service operator. Their PIDs would normally appear in this Missing PID list. To prevent them from appearing here, the TSM-100 provides the **Custom Tables** settings menu, which is the subject of a later section.

Unreferenced PID is a list of PIDs that have been detected in the Transport Stream, but are not defined to be part of its structure. They do not represent an error condition as such. However, downstream equipment may legally delete them. If references to these PIDs were erroneously omitted from the TS, it is important to recognize and correct this situation. Otherwise, they can simply be ignored.

Both the Missing and Unreferenced PID lists are preceded by a count of the number of entries in the list. If the number exceeds 10, they are displayed in successive groups of 10 at a time; each group is displayed for a period of 10 seconds, before proceeding to the next group.

Custom Tables

Transport Streams may carry a variety of tables in addition to those that are considered essential for ATSC or DVB systems. These tables may constitute an important element of a particular service, even though they are not required in all Transport Streams. Typically, there are no established limits on their transmission intervals. Because they are not among the tables specified by A/78 or TR 101 290, they do not appear in the list of tables monitored on the Table Intervals and Table Counters screens.

To allow you to add specific tables that you consider important for your service, the TSM-100 provides the Custom Tables capability. The setup of these tables is discussed in the next chapter. The Custom Tables status display screen is shown in Figure 17.

This screen shows basic Transport Stream status information at the top, followed by one line for each custom table present in the TS. In this example, there are five instances of a "Splice Info" table. "Splice Info" is the name that we have assigned to a particular table in the Custom Tables setup menu. Each line contains the Program Number that contains the table, the table's PID, the minimum and maximum measured interval times, and the number of times each of the specified error levels (TNC, QOS and CM) and error types (Syntax, CRC, Version and CE) has occurred. For definitions of these errors, see the section "**Table Counters**" earlier in this chapter.

The specification of custom tables is covered in detail in the section "**Custom Tables Settings**".

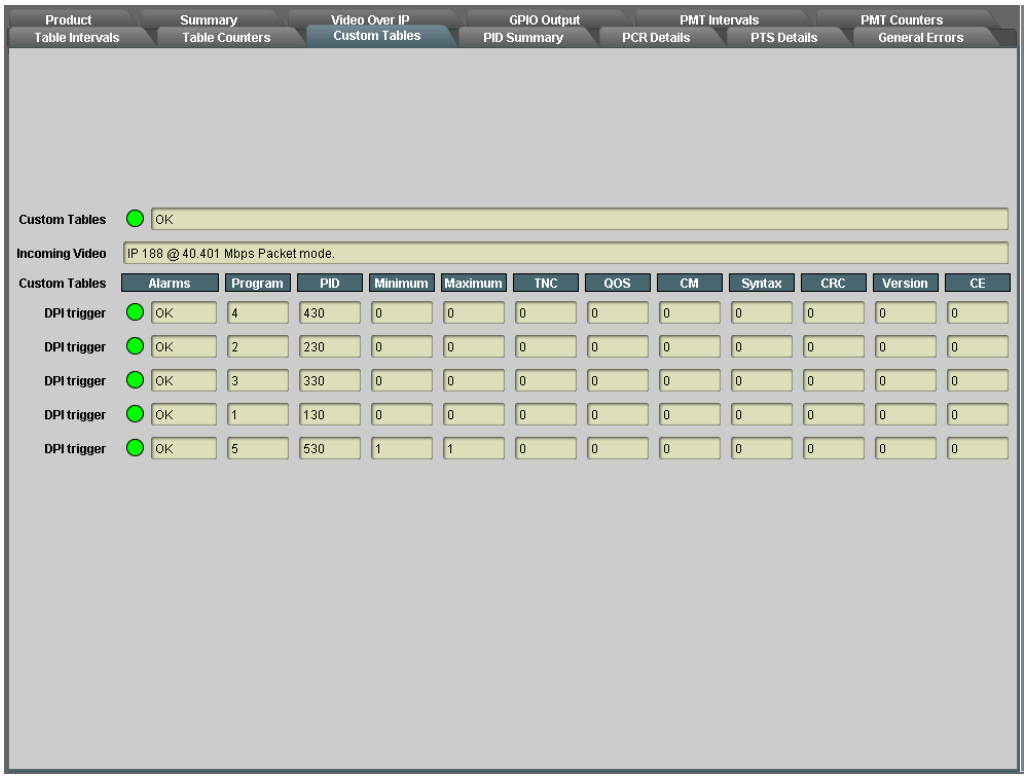


Figure 18. Custom Tables status screen

GPIO Output Status

The TSM-100 uses general-purpose outputs to signal error conditions to external equipment. The GPIO Output status screen displays the state of each of these outputs, as shown in Figure 19.

Only those that are relevant are displayed. GPIO 1 signals "ASI Bypass". In this example, the rear module does not provide a bypass capability; consequently, GPIO 1 is not used and not reported here. The levels of TS impairment TOA, POA, CM, QOS and TNC are defined in the section "**Interpreting Error Severity Levels**".

When the rear module provides a pair of relay contacts for each output, the display uses the words "Closed" and "Open" to designate the active and inactive states, respectively. When the rear module has logic-level outputs, the words "High" and "Low" are used instead.

The conditions that drive these GPIO outputs also generate SNMP traps if the SNMP option is enabled on the openGear frame.

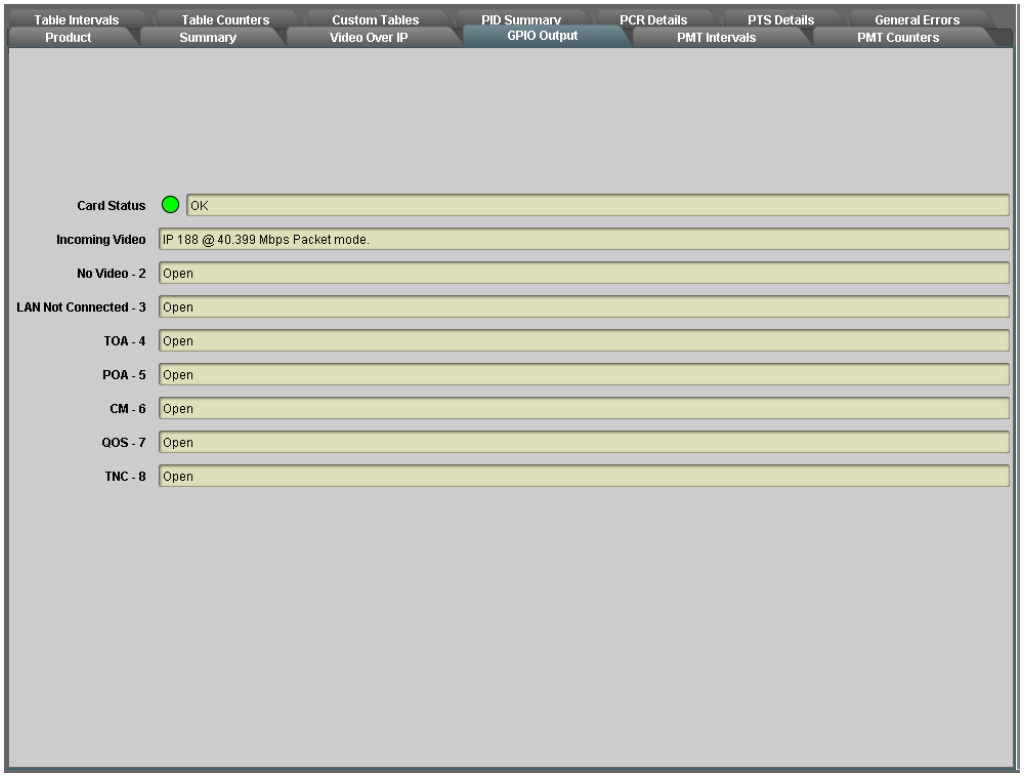


Figure 19: GPIO Output Status

Setting Up the TSM-100

In This Chapter

This chapter explains how to use the graphical user interface to set up the TSM-100, using DashBoard through a network connection.

The following topics are discussed:

- General Settings
- ATSC and DVB Intervals
- Custom Tables
- Setting Alarm sensitivity

General Settings

Figure 21 shows the **Settings** tab. Before proceeding to any of the other sections, please ensure that these settings are correct, as they will have an effect on the operation of the other functions.

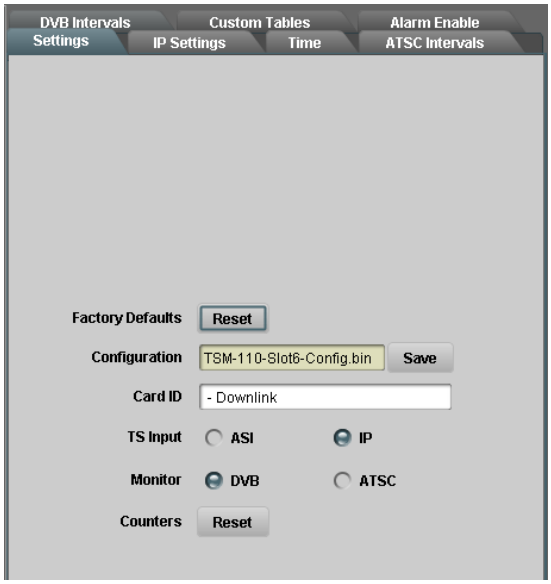


Figure 20. Settings menu

The first action you need to take on this page before using the TSM-100 for monitoring is to select the Transport Stream Input to be either **ASI** or **IP**. If your card is a TSM-100, this selection is not available, as ASI is its only input.

You also need to select either **ATSC** or **DVB**, to match the type of Transport Stream connected to the input. This action specifies which components of the TS will be monitored, as well as their allowable maximum intervals. After you change this selection, click **Counters - Reset**, then **Refresh**; the previous measured values for intervals and error counters are cleared and the TSM-100 reacquires the structure and status of the TS.

Clicking the **Counters - Reset** button allows you to clear the status of the TSM-100. As mentioned in the previous chapter, error conditions are persistent; that is, the most severe error level that has occurred is reflected in the Card Status, so that you can be made aware of problems that occurred at any time since you last looked at it. To clear the error indication (for example, so you can see whether the condition still exists), you can click this button. Note that the response will typically take several seconds before the various status indicators and counters are completely cleared. You should also click **Refresh** to ensure that the reset propagates to all sections of the display.

The **Configuration – Save** button opens a dialog box where you can specify a path and filename on your DashBoard computer to store a copy of your card settings. This allows you to later restore these settings into this card or copy them into another TSM-100, using the **Upload** button near the bottom of the DashBoard window. This should be used instead of the openGear Data Safe feature, which does not save and restore all of the TSM-100's settings.

The **Reset Factory Defaults** button restores all settings, including the ATSC and DVB intervals, to their default values. You will be asked to confirm this action, to prevent accidental loss of your settings

Time Settings

As a convenience, the TSM-100 can maintain the current time and date, and display them on the **Product** status screen. The **Time** settings menu allows you to either select an automatic source of the time and date or enter them manually. Automatic time setting is convenient, provided you have network access to an NTP (Network Time Protocol) server.

To enable this feature, you need to:

1. Select **Network Time** on this menu.
2. Specify your time offset from Universal Time (UTC), as a positive number of hours and minutes, and a direction (West or East). For example, the area of North America where Pacific time is observed is 8 hours west of longitude 0; the settings would be **UTC Offset** : **HH=8, MM = 0** and **Hemisphere** = **West**. Note that UTC is also known as GMT (Greenwich Mean Time).
3. Enable or disable **DST** (Daylight Savings Time) as appropriate, and click **Accept**.
4. In order to use network time, you also need to ensure that the network card in the openGear frame has been configured to acquire time from an NTP server. To do this, double-click the network card in slot 0 of the frame and then click the **Network** settings tab. Enter the IP address of the NTP server and then click **Apply**. If you click the **Product** status tab of the TSM-100, your current local time and date should now be displayed. If you do not have access to an NTP server, you can enter the time and date directly on the **Time** settings menu, select **Manual** and click **Accept**.

ATSC and DVB Intervals

Figure 22 shows the screens that are displayed by clicking the **DVB Intervals** and **ATSC Intervals** tabs. The two screens list different tables with different maximum interval limits. However, their structure is the same, and they will be discussed together in this section.

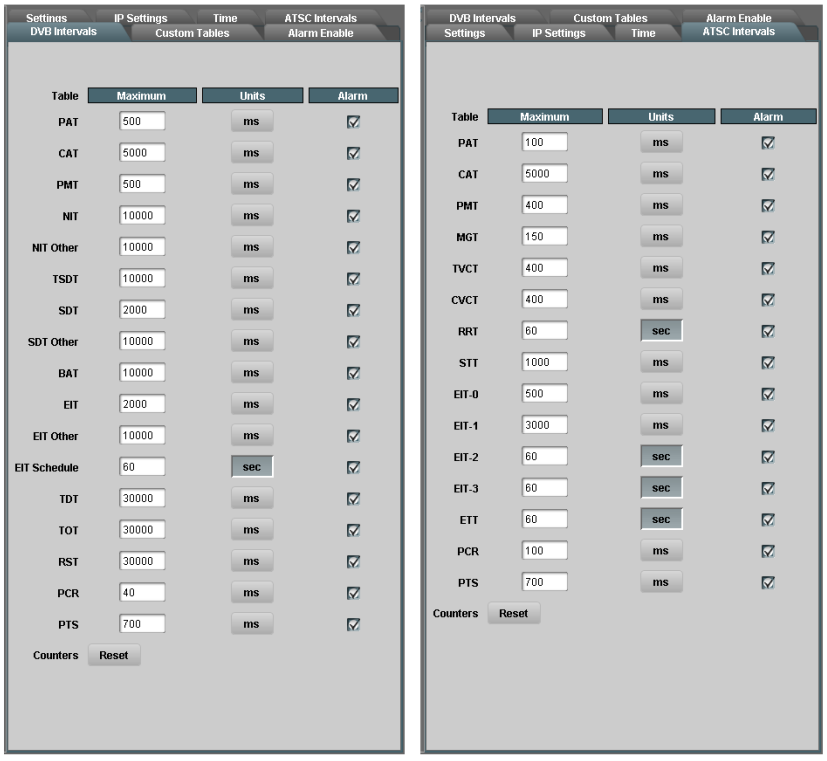


Figure 21. DVB Intervals (left) and ATSC Intervals (right) menus

Each entry in the list is for one TS component i.e. a table or a PCR or PTS timestamp. For each entry, the following items can be set: the maximum interval time and its units of measure (normally milliseconds, but seconds in a few cases), and a checkbox that specifies whether to include this component in the Alarm Status.

In most cases where the TS complies with the appropriate limits, the default values can be used for the intervals, and alarms can all be left enabled. However, you might want to adjust some of the intervals, for a number of reasons, including the following:

- You may wish to set tighter limits on some components, for example to allow margin for downstream equipment to lengthen some intervals.
- You might want to slightly relax the limit on some components that are not crucial to your service, in order to avoid having users develop the habit of ignoring warnings because they are usually not serious.
- You might have different system requirements than other users of an ATSC or DVB TS.

Note that relaxing an interval is normally preferable to removing its alarm check-mark, since the latter means that even a complete loss of this component will not be reported. This should normally only be used if the component is known to be absent from the TS, and its absence is acceptable.

The **Reset Factory Defaults** button restores all settings, including the ATSC and DVB intervals, to their default values. You will be asked to confirm this action, to prevent accidental loss of your settings. The values shown in Figure 24 are the factory default values.

Clicking the **Reset Counters** button allows you to clear the status of the TSM-100. As mentioned in the previous chapter, error conditions are persistent; that is, the most severe error level that has occurred is reflected in the Card Status, so that you can be made aware of problems that occurred at any time since you last looked at it. To clear the error indication (for example, so you can see whether the condition still exists), you can click this button. You should also click this button after changing any of the interval values or alarm settings, to cause them to take effect. After resetting the counters, it is advisable to click **Refresh** to ensure that the reset propagates to all sections of the display.

Custom Tables Settings

As mentioned in the previous chapter, Transport Streams may carry a variety of tables in addition to those that are considered essential for ATSC or DVB systems. These tables may constitute an important element of a particular service, even though they are not required in all Transport Streams. Typically, there are no established limits on their transmission intervals. Because they are not among the tables specified by A/78 or TR 101 290, they do not appear in the list of tables monitored on the Table Intervals and Table Counters screens.

To allow you to add specific tables that you consider important for your service, the TSM-100 provides the Custom Tables capability. The screen for specifying these tables is shown in Figure 23.

Important — *This is by far the most technical portion of this manual. It requires knowledge of the structure of your Transport Stream and familiarity with MPEG constructs such as Table ID and PMT Stream Type. As we'll see, the latter can normally be looked up in the ATSC Code Point Registry (Document #TSG-575r42), which is a valuable reference for this operation. Information about the Transport Stream will normally be available from its originator.*

This menu allows you to specify up to four custom tables that you want the TSM-100 to monitor.

- The **Custom Table Number** is the number in the range 1-4 of the table that you are working on.
- The **Description** is the name you want to give to this table. This will be appear in the Custom Tables status screen for each instance of the table that is found in the Transport Stream.

- The **PMT Stream Type** and **Table ID** can be looked up in the ATSC Code Point Registry or discovered by analysis of the Transport Stream. These will be described in more detail in the example below.
- **Maximum** is the maximum allowable interval time for this table, and **Units** can be either seconds or milliseconds.
- The **Alarm** check box specifies whether to include the status of instances of this table in the Card Status.
- Once these fields are filled in, clicking the **Apply** button saves these changes and causes the table to be monitored.

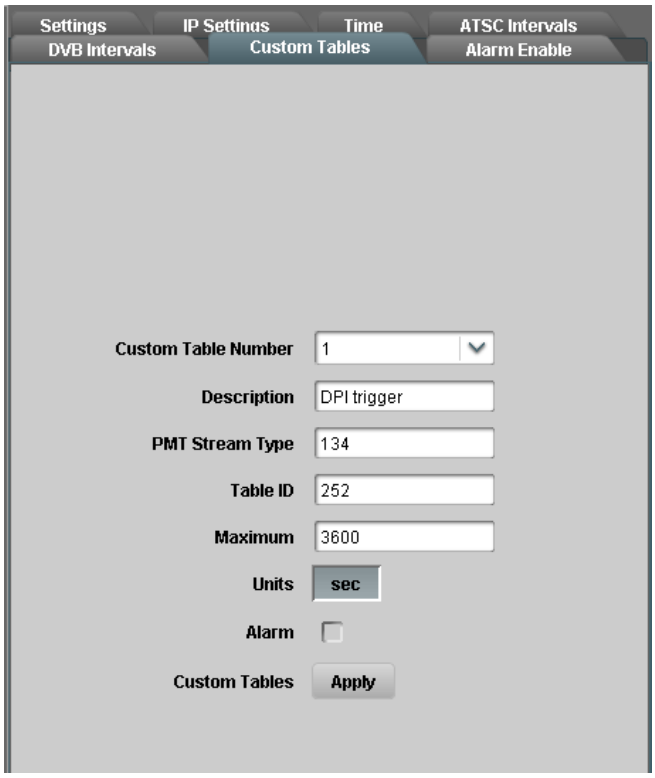


Figure 22. Custom Tables Settings menu

Example

This example will illustrate how the "Splice Info" custom table shown in Figure 25 might be defined.

After connecting your Transport Stream to the TSM-100, you notice that several PIDs (130, 230, 330, 430 and 530) appear in the Missing PIDs list on the General Errors screen. This reminds you that your TS contains SCTE-35 DPI triggers. These are referenced by the PMT for each program, but they may only occur once or twice per hour, so they appear to be missing from the TS.

You consult the ATSC Code Point Registry. In the ATSC Reserved portion of the section "Table ID", you find "SCTE splice_info_section" has a Table ID of 0xFC, which is 252 decimal. You enter 252 for the Table ID in the menu.

You also find in the PMT Stream Types section that the "SCTE-35 splice information table" has a Stream Type of 0x86, which is 134 decimal. You enter 134 for the PMT Stream Type in the menu.

After filling in the Description, Maximum and checking the Alarm box, you click Apply. The five PIDs disappear from the missing PIDs list on the General Errors status screen and appear on the Custom Tables status screen. Because there are five instances of the same table type defined in this TS, there are five "Splice Info" entries in the list.

If you didn't know about the presence of these triggers in the Transport Stream, you could proceed in one of two ways to look up their Table ID and PMT Stream Type, and their purpose: you could obtain this information from the originator of the service, or you could use a TS analyzer to inspect the stream.

Alarm Enable

The **Alarm Enable** menu allows you to specify the error conditions and severity levels that are included in status indications. The selections are shown in Figure 27. Normally, all error conditions should be enabled, with the possible exception of Unreferenced PIDs which are not normally a service-affecting condition.

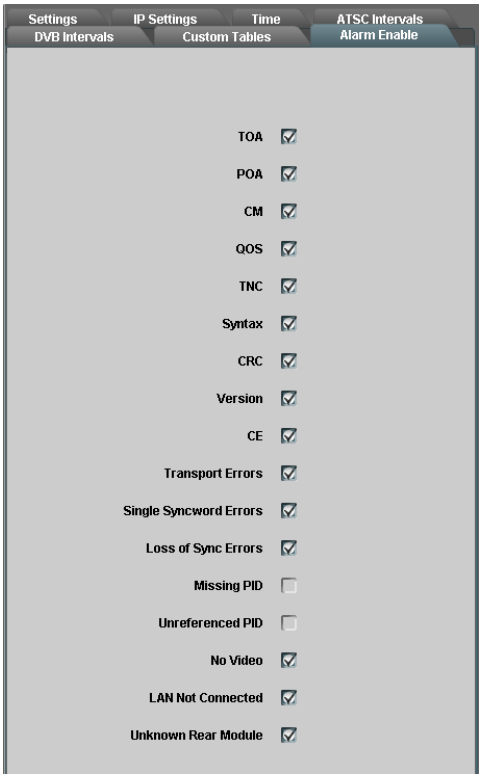


Figure 23. Alarm Enable menu

The severity levels **TOA**, **POA**, **CM**, **QOS** and **TNC** apply to all measurements. For example, individual tables pass their status to the **Table Intervals** and **Table Counters** screens; these pass their status to the **Table State** indicator on the **Summary** screen; this summarizes its status indicators in the **Card State** indicator. Disabling one of the severity levels inhibits transmission of the status across all these links, and also to the GPIO output for that level. For example, if you no longer want to be told about TNC conditions, you would remove the check mark next to TNC and then click **Reset Counters** on the **Settings** menu. Note that it can be misleading to disable a more serious error level while leaving a less serious one enabled. For example, if you disable QOS, you should also disable TNC in order to obtain meaningful results.

The **Syntax**, **CRC** and **Version** errors apply to errors reported on the **Table Counters** and **Custom Tables** screens. **CE** errors apply to errors reported on the **Table Counters**, **Custom Tables** and **PID Summary** screens. **Missing PIDs** and **Unreferenced PIDs** apply to the errors reported on the **General Errors** screen.

Changes to the Alarm Enables on this screen are immediate; as soon as you add or remove a check mark, the corresponding alarm is enabled or disabled.

Specifications

In This Chapter

This chapter contains the Technical Specifications table. Note that specifications are subject to change without notice.

Table 1. Norpak Corporation TSM-100 - Technical Specifications

Category	Parameter	Specification
Serial Digital Video Inputs	Number Of Inputs	1 input
	Input Signal Standard Accommodated	DVB-ASI (EN 50083-9)
	Impedance	With ONG-MDL-R02 or R22 rear module: 75Ω terminating.
		With ONG-MDL-R01 or R21 rear module: 75Ω terminating in Active mode Loop-through to SDI Output in Bypass mode.
	Equalization	Over 100 m of Belden 1694A cable
	Return Loss	>15dB to 270 MHz
Serial Digital Video Outputs	Number of Outputs	1 output of reclocked ASI input
	Impedance	75Ω
	Return Loss	>10dB to 270 MHz
	Signal Level	800mV ±10%
	DC Offset	0 Volts ±50 mV
	Rise & Fall Time (20-80%)	700ps. typical
	Overshoot	<8%
GPIO Outputs	Number and type of outputs	With ONG-MDL-R02 or R22 rear module: 8 pairs of isolated contacts, on 2 eight-pin connectors. (Max 0.1A)
		With ONG-MDL-R01 or R21 rear module: 8 logic outputs (3.3v) and 4 ground connections, on 4 three-pin connectors.
LAN	Jack type and interface standards	RJ45 jack, 10/100/1000-base-T Ethernet connection for IP Transport Stream input or output.
Other	Maximum Power Consumption	5W
	Warranty	1 year return to factory

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Power LED Conditions
- Bootload Sequence
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your TSM-100, the following basic troubleshooting checklist may help identify the source of the problem. If the module still does not appear to be working properly after checking all possible causes, please contact your openGear products distributor, or the openGear Technical Support department at the numbers listed under the "**Contact Us**" section at the end of this manual.

1. **Visual Review –** Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the module, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check –** Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Reseat the Card in the Frame** – Eject the card and reinsert it in the frame.
4. **Check Control Settings –** Refer to the Installation and Operation sections of the manual and verify all user-adjustable component settings.
5. **Input Signal Status –** Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path –** Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Module Exchange** – Exchanging a suspect module with a module that is known to be working correctly is an efficient method for localizing problems to individual modules.

Power LED Conditions

The top front edge of the module has a Power LED which indicates card status. The Power LED displays the following conditions:

- **Off** - there is no power.
- **Green** - the card is running with valid input.
- **Flashing green** - the boot loader is waiting for, or receiving, a software upload.
- **Orang**e – there is a signal or configuration error. Check the inputs and menus.
- **Red** - the card is not operational. This will occur if, for example, there is no video input. Check the inputs, reseat the card, press the Reset button, or call Technical Support.

Bootload Sequence

In the unlikely event of a complete card failure, you may be instructed by a Ross Video Technical Support specialist to perform a complete software reload on the TSM-100. To perform this task, follow these steps:

1. Press and hold the Menu Switch.
2. While holding the Menu Switch, press the Reset button in.
3. Release the Reset button and then the Menu Switch.

   The Power LED will flash GREEN while the card is waiting for a new software load. If a new software load is not received within 60 seconds, the card will attempt to restart with the last operational software load.

Software loads can be sent to the TSM-100 from DashBoard, using a MFC-8300 Series Network Controller card.

Warranty and Repair Policy

The TSM-100 is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your TSM-100 proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this TSM-100 has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This User Manual provides all pertinent information for the safe installation and operation of your TSM-100. Ross Video policy dictates that all repairs to the TSM-100 are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your TSM-100, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your TSM-100. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

PHONE	**General Business and Technical Support**	613 • 652 • 4886
	After-hours Emergency	613 • 349 • 0006
	Fax	613 • 652 • 4425
E-MAIL	**General Information**	solutions@rossvideo.com
	Technical Support	techsupport@rossvideo.com
POSTAL SERVICE	**Ross Video Limited**	8 John Street, Iroquois, Ontario, Canada K0E 1K0
	Ross Video Incorporated	P.O. Box 880, Ogdensburg, New York, USA 13669-0880

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