

PT3150 ISDB-T/Tb OEM Modulator



The PT3150 ISDB-T/Tb OEM ProTelevision Technologies' Software defined modulator, provides maximum integration flexibility for transmitter manufacturers.

The remarkable performance and robustness of the PT3150, makes it the perfect choice for your VHF and UHF ISDB-T/Tb transmitters.

- ◆ Future proof technology based on the fully reconfigurable, **software defined** modulator platform, that allows upgrading of the board to other DTT standards (DVB-T/T2 or ATSC).
- ◆ Supports operation based on input of a complete preprocessed BTS stream that carries all layer, mode and timing information required by the modulator.
- ◆ **ISDB-T/Tb REMUX** input mode for operation based on standard MPEG-2 TS input with local PID to layer mapping and local control of transmission mode. (Option PT3785)
- ◆ High performance **digital adaptive linear and nonlinear precorrection** for maximum transmitter performance (Option PT3754).
- ◆ **OPTIPOWER®** – market leading enhanced adaptive precorrection and PAPR clipping technology for maximum optimization of transmitter power efficiency and/or transmitter MER performance (Option PT3756).
- ◆ User friendly intuitive **WEB GUI** control for use with standard Web Browser (Internet Explorer, Mozilla Firefox, Google Chrome and Opera compatible).
- ◆ SCPI control over RS232/RS485 and over IP.
- ◆ 4x Ethernet Gigabit interfaces for control and data transport. Two of them optimized for **TSoIP** (Option PT3720/00).
- ◆ Integrated Multi Standard Global Navigation Satellite System (GNSS) receiver for time and frequency reference based on **GPS and GLONASS** systems (Option PT3711).
- ◆ **VHF and UHF** (selectable frequency from 30MHz to 860 MHz in steps of 1Hz).
- ◆ Power Supply acceptance range: from **5V to 52V**. That allows the usage of existing power supply mounted in the system.
- ◆ Three choices of internal precision (Local Oscillator) according to network requirements 2ppm, 0.25ppm or 0.01ppm.
- ◆ Power Output selectable from **-10dBm to +10dBm** in steps of 0.1dB.
- ◆ Available SW based **Automatic Level Control** to regulate any third party power amplifier output. (Option PT3770/00).
- ◆ SNMP client Get/Set/Trap.

ISDB-T

OPTIPOWER®

PT3150 ISDB-T/Tb OEM board:

220 x 100 mm open PCB for seamless integration into an exciter/transmitter solution.

For a 19" Rack Solution, please check the product PT3050 on ProTelevision's Website.

Application

The **PT3150 ISDB-T/Tb modulator** is characterized by a high RF and MER performance and by its unique ability to optimize the performance of any third party power amplifier being utilized together with the modulator.

The PT3150 OEM ISDB-T/Tb modulator provides a versatile, robust and unsurpassed performance solution for integration and manufacturing of high quality ISDB-T/Tb transmitters.

The integration of the OEM PT3150 into any transmitter system, is an easy process. ProTelevision Technologies will provide full support during this process which will only be necessary to do once in life, since ProTelevision's OEM hardware platforms are always backwards compatible with previous versions.

In addition, only one electrical and mechanical integration will automatically multiply the range of products, due to the feasibility of reconfiguring the modulation standard of the board to another terrestrial broadcasting format (for example ATSC or DVB-T/T2), by simply loading an alternative firmware image and licensing key.

The board is prepared for implementation of any future OFDM based solution.

The PT3150 ISDB-T/Tb modulators accept input in ASI format and in TSolP format subject to the particular configuration. The PT3150 ISDB-T/Tb modulator have four Ethernet **Gigabit** ports with different MAC addresses. Either one or two of these ports are available for **TSolP** (Option PT3720/00).

The standard input format supported by the PT3150 ISDB-T/Tb is 204 byte BTS (Broadcast Transport Stream) packets meaning a preprocessed ISDB-t/tb compliant stream carrying the payload complete with layer mapping as well as the mode control and timing information needed by the modulator for automatically setting the operational mode.

By adding the **REMUX** feature (SW Option PT3785), the PT3150 will allow ISDB-t/tb transmission based on input of a standard 188 byte MPEG-2 TS feed.

The ISDB-T/Tb **REMUX** will allow the modulator operator to construct the BTS for transmission based on the payload carried in the standard 188 byte MPEG-2 TS feed. The modulator operator may be assisted by the PT3785 option:

- Set-up the explicit mapping between the individual PIDs carried in the incoming TS feed and the up to three hierarchical layers supported by ISDB-T/Tb.
- Select transmission parameters like for example modulation system, guard interval and coderates.

The PT3785 **REMUX** will furthermore automatically add stuffing and other required signal grooming in order to deliver a proper BTS stream as input to the modulator for transmission.

The generated BTS will be available through TS monitoring output for distribution to another ISDB-T/Tb compliant modulator if so desired.

ISDB-T



Optipower is a ProTelevision Technologies' proprietary solution developed to provide an increase of quality (MER) and efficiency to new or existing TV transmitters.

Optipower consists of:

- 1) Enhanced Nonlinear Precorrection algorithm with **DEEP MEMORY EFFECTS** based on the Volterra polynomial series.
- 2) **Adaptive PAPR clipper**.

These two adaptive mechanisms, allow achieving the maximum MER value on any transmitter system (VHF, UHF, Class AB, Doherty, etc...) compared with other precorrection solutions on the market.

This MER extra increase, can be used to **enhance the overall efficiency of the transmitter system**.

In addition, ProTelevision Optipower (Option PT3756) will provide **live measurements** on the WEB Graphical User Interface: Shoulders, MER, PAPR, MER vs Carrier and a Spectrum graphic on the channel transmitted (see picture).

Main specifications for (Optipower) precorrection and feedback signals: Connectors: SMA 50 ohm // Level: -10dBm to +10dBm // Return Loss > 20dB // Frequency: 30MHz to 860MHz.



SIGNAL PROCESSING

Supported Input modes:

BTS:	Operation based on standard BTS feed
MPEG-2 TS:	Operaton based on a locally generated BTS through remuxing of a standard MPEG-2 TS input (requires Option PT3785)

SYSTEM MAIN CHARACTERISTICS

Main systems supported:	ISDB-T and ISDB-TB
System bandwidth:	6MHz, 7MHz and 8MHz (effective bandwidth in the 6MHz, 7MHz and 8MHz system subject to the selected ISDB-t/tb mode)
ISDB-T TRX modes:	Mode 1, Mode 2, Mode 3
Modulation system:	QPSK, 16QAM, 64QAM
Guard Interval:	1/4, 1/8, 1/16, 1/32
Time interleaving:	Supported
Frequency interleaving:	Intersegment / Intra segment
Selectable inner code rates:	1/2, 2/3, 3/4, 5/6, 7/8
Hierarchical transmission:	up to 3 levels
Network modes:	MFN and SFN (IIP packet)
Test modes:	Single carrier, PRBS

OUTPUT

RF-output

Connector:	SMA female, 50 ohm
Center frequency:	Adjustable 30-860 MHz in steps of 1 Hz
Frequency stability:	Intern ref from 2 ppm to 0.01 ppm or in accordance with external ref. accuracy
Spectrum polarity:	Inverted and non-inverted, user selectable
Level:	Adjustable [-10, +10] dBm
Stability:	± 0.5 dB
Return loss:	> 16 dB

Spectrum outside band (for RF Output 0 dBm @ 6 MHz)

+/-2.85 MHz:	0 dB
+/-3.18 MHz:	< -48 dB (typically -55 dB)
+/-3.94 MHz:	< -56 dB
Harmonics and spurious:	< -55 dBc
MER:	> 45 dB (typ. >50 dB)

Internal frequency reference

Selectable Local Oscillator for customer's specific requests.	
PT3710/00	TCXO 2 ppm (default)
PT3710/10	OCVXO 0.25 ppm (optional)
PT3710/20	OCVXO 0.01 ppm (optional)

CONTROL INTERFACE

Ethernet interface

Connector:	RJ 45 Quadruple PCB connector
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RS232/RS485 interface

Connector:	Routed via DIN41612M_60_4 main PCB connector
Alarm output:	Two user programmable open collector alarm lines
Input:	Separate Reset control and Output muting control, user programmable activation: ground closure or open

POWER SUPPLY

Voltage:	Accepts all the AC range from 5V to 52V
Power consumption:	Max. 18 W (Typical 16 W)

ELECTRICAL SPECIFICATIONS

Inputs

ASI inputs	
No. of ASI inputs:	2
Connector:	Coax contact in DIN41612M_60_4 main PCB con.
Input impedance:	75 ohm
Return loss:	> 13 dB
Redundancy:	User selectable switching policy between "Primary" and "Secondary" ASI source

Ethernet ports (1Gbit/sec)

No. of ethernet ports:	4 (2 of them optimized for PT3720/00 TSolP)
Connector:	RJ45 Quadruple PCB connector

GNSS Receiver Input (Option PT3711)

Connector:	Coax contact in DIN41612M_60_4 main PCB con.
Frequency:	1.575 GHz (GPS) / 1.598-1.606 (GLONASS)
Antenna net gain range:	0 to +32 dB
Antenna:	Passive or active antenna (not included)
Antenna DC supply:	OFF, 3 Vdc or 5 Vdc (±0.5 V), user selectable
Antenna DC current:	max 50 mA

External Clock reference

Connector:	Routed via DIN41612M_60_4 main PCB con.
Frequency:	10 MHz
Level:	100 mV-3 Vpp
Impedance:	50 ohm/ > 1 k ohm, user selectable

Time reference

Connector:	Routed via DIN41612M_60_4 main PCB con.
Frequency:	1 PPS
Level:	0-5 V, user selectable trigger point 1V or 1.6V
Trigger:	Rising or falling edge, user selectable
Impedance:	50 ohm/ > 1 k ohm, user selectable
Trigger:	Rising or falling edge, user selectable
Impedance:	50 ohm/ > 1 k ohm, user selectable

ENVIRONMENTAL SPECIFICATION

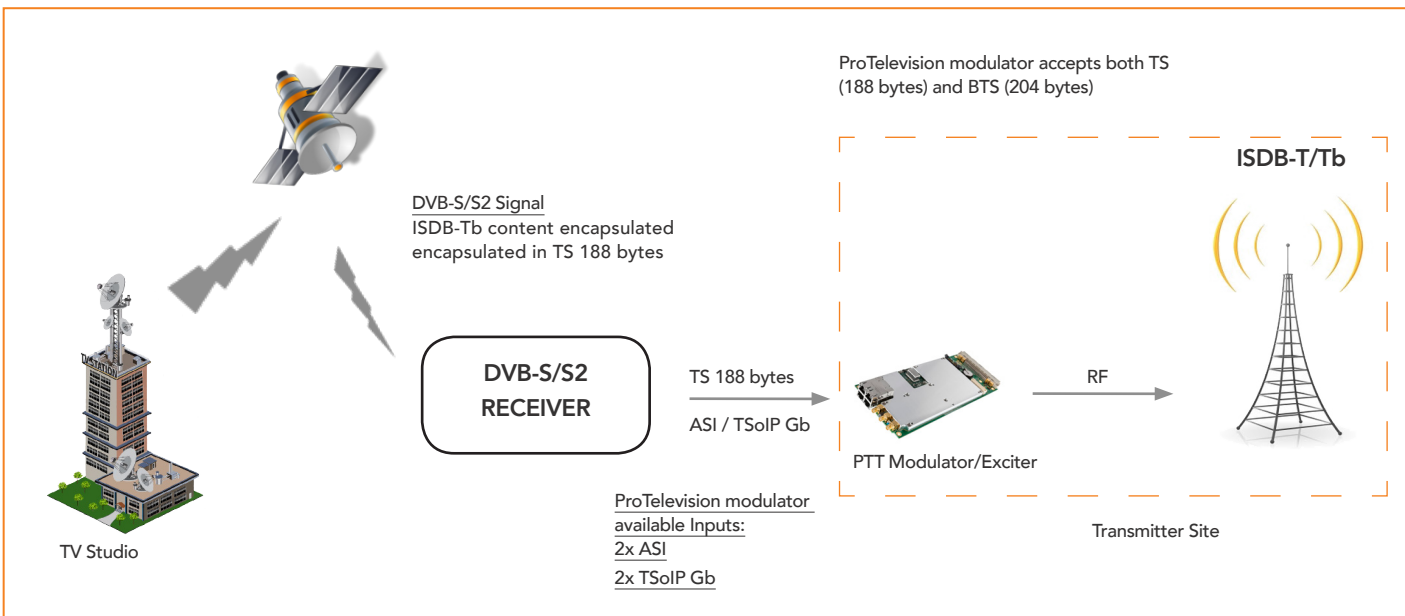
Note: The environmental specifications for a solution based on the PT3150 OEM card will depend on the specific chassis solution chosen in each individual case. The values shown are for ProTelevision own rack integration solution (PT3050).

Climatic Temperature range operating:	-5°C to +50°C (+23 F to +122 F)
Temperature range within specs:	+5°C to +45°C (+41 F to +113 F)
Temperature range storage:	-30°C to +70°C (-22 F to +158 F)
Humidity operating:	max 90% RH
Humidity storage:	max 90% RH
EMC	Compliant to EN55022 (emission) and EN55024 (immunity)
Safety	Compliant to EN60950-1
RoHs	Compliant with directive 2011/65/EU

MECHANICAL SPECIFICATION

Open PCB:	EURO module size
Width:	100mm
Depth:	220 mm (PCB footprint excluding connectors), 240 mm end-to-end including SMA and DIN connector
Build height:	Approximately 30 mm including allowance for recommended clearance of 7 mm between PCB underside and chassis. 3D step file available.
Weight:	0.5 kg
Cooling:	Designed for air-cooling. Recommended airflow along the PT3150 card is 250 l/minute.

By using PROTELEVISION modulator/exciter at the transmitter site, the broadcaster saves equipment, money and simplifies the architecture of the network since the **REMUX** is included as **software feature** inside the modulator/exciter.



TYPICAL BLOCK DIAGRAM FOR THE USE OF THE INTERNAL REMUX SOFTWARE

Ordering codes:

OEM Modulator

PT3150 ISDB-T/Tb OEM modulator card

Options, software

PT3720/00 2x TSolP interface (Gigabit)
 PT3754 Adaptive digital Pre-corrector
 PT3756 OPTIPOWER®: Enhanced precorrection
 and adaptive PAPR clipper
 PT3785 ISDB-T/Tb Re-Multiplexer option(REMUX)
 PT3770/00 Automatic Level Control

Options, hardware

PT3711 GNSS module (GPS and GLONASS support)
 PT3710/10 Medium Precision Oscillator OCVCXO 0.25 ppm
 PT3710/20 High Precision Oscillator OCVCXO 0.01 ppm

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