



**INSTRUCTION MANUAL**

**HD-6Pack Series**

**SERIAL DIGITAL  
FIBER OPTIC TRANSPORT and DISTRIBUTION  
SYSTEM FOR SMPTE 259, 292, 424, DVB-ASI and  
other protocols**

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This product was designed and manufactured in the  
UNITED STATES of AMERICA

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## INTRODUCTION

The HD 6-Pack series of fiber optic transmitters and receivers makes possible the media conversion and combining of up to 6, 12, or 18 digital signals onto one fiber (HD6000-ONE, HD12000-ONE or HD18000-ONE, respectively) using CWDM techniques or onto 6,12, or 18 fibers (HD6000, HD12000 or HD18000) for transport up to 20km. The units accept and output 75 ohm digital signals with data rates ranging from 125MBPS up to 2970 MBPS. Although designed for SMPTE 424,292, or 259 SDI and DVB-ASI, the HDx000/x000-ONE can be used with other protocols within this range. Each of the 6,12 or 18 channels has a reclocker that is bypassable for non-SMPTE signals, and can support up to 120m of coax cable using its built in equalizer.

It is also possible, upon special order, to have a mixture of transmit and receive channels at each end to support bidirectionality. For example in a HD6000 you could have 3 transmit and 3 receive channels at each end, or any other combination.

Applications include transmission links for high definition or digital television studio to transmitter, studio-to-studio, or any other similar long-range situations. It can also combine and transport the outputs of other Multidyne products that fall within its 19 to 2970 MBPS operating range..

## FEATURES and OPERATION

The following discussion assumes that we have a HD6000 standard configuration consisting of 6 transmit channels at one end and 6 receive at the other end. The HD12000 and 18000 are just 2 or 3 HD6000s in one case with common power and common optical I/O for the 'ONE versions.

Each FTX channel consists of a cable receiver and a reclocker. The cable receiver can EQ up to 120m of cable at 3 GBPS. In the case of the HD6000-ONE, each channel has a CWDM SFP transmitter. In the HD6000, each has a standard 1310 nm SFP transmitter. The reclocking function can be bypassed. The HD6000-ONE also contains a CWDM cassette to combine the 6 CWDM channels onto a single fiber. The HD6000 does not have the cassette as it will use 6 individual fibers.

Each HD6000/6000-ONE FRX channel consists of a standard SFP receiver that can accept wavelengths of 1100 to 1600 nm, a bypassable reclocker, and a cable driver. In the case of the HD6000-ONE, a CWDM cassette is included to route the single fiber's 6 wavelengths to the SFP optical inputs of the 6 channels. The HD6000 has no cassette and its SFPs receive their inputs directly from 6 individual fibers.

It is possible to order the HD6000/6000-ONE with a mixture of transmit and receive channels at each end to support bidirectionality. For example on end could have 4 TX and 2 RX and the other 4 RX and 2 TX, or any other combination.

The following discussion of the front and rear panels assumes the 6 channel versions. The 12 or 18 channel versions would have the HD6000 panel features replicated into 2 or 3 groups of 6 channels each. In order to accommodate 12 or 18 channels instead of just 6.

## TRANSMITTER FRONT AND REAR PANELS

The front and rear panels of the 'ONE-FTX are shown below in Fig. 1. The HD6000-ONE rear panel has one BNC input for each channel, labelled **CH1** thru **CH6**, plus a **COMMON** ST/UPC output port for the resulting CWDM optical signal. The HD6000 rear panel differs in that, instead of a single **COMMON** fiber ST/UPC connector, it has 6 ST/UPC output connectors, one for each BNC input, also labelled **CH1** thru **CH6**. Besides a **POWER** LED, which is green when power is applied to the unit, the front panel has 6 **STATUS** LEDs, one for each of the 6 channels. Note that, upon special order, some of these channels can be TXs and some can be RXs as mentioned above. Thus, the BNCs and fiber ports could be either inputs or outputs. Assuming that the channel is a transmit channel, the **STATUS** LED functions for that channel are:

**Green** whenever there is a carrier detected at the channel's BNC input.

**Red** if no carrier is detected at the BNC input. This will cause the channel to be muted. But the LED for the corresponding channel at the other end of the link might still be green, as the laser for this channel is still providing light, even if unmodulated.

**Blinking Red** if the laser has failed for the channel, regardless of input status. This would result in no optical output for that channel onto the fiber. The corresponding LED for this channel at the other end of the link should be red under these conditions, as it will be dark.

**Off** if the channel is not populated.

Note that the status LEDs do NOT indicate quality or type of signal.

## RECEIVER FRONT AND REAR PANELS

The front and rear panels of the 'ONE-FRX are shown below in Fig.1. Note that the rear panels are identical to those of the FTX except that the directionality of the ports is reversed. The HDx000 FRX version will have separate optical inputs for each channel instead of a **COMMON** input. Besides a **POWER** LED, which is green when power is applied to the unit, the front panel has 6 **STATUS** LEDs, one for each of the 6 channels. As mentioned above, the channels could be either RXs or TXs. Assuming that the channel is a receive channel, the **STATUS** LEDs for that channel are:

**Green** whenever channel's optic is illuminated with at least -15 dbm of signal.

**Yellow** if this optical signal is between -18 and -15 dbm.

**Red** if this optical signal is less than -18 dbm. This will cause the channel to mute.

**Off** if the channel is not populated.

Note that the status LEDs do NOT indicate quality or type of signal.

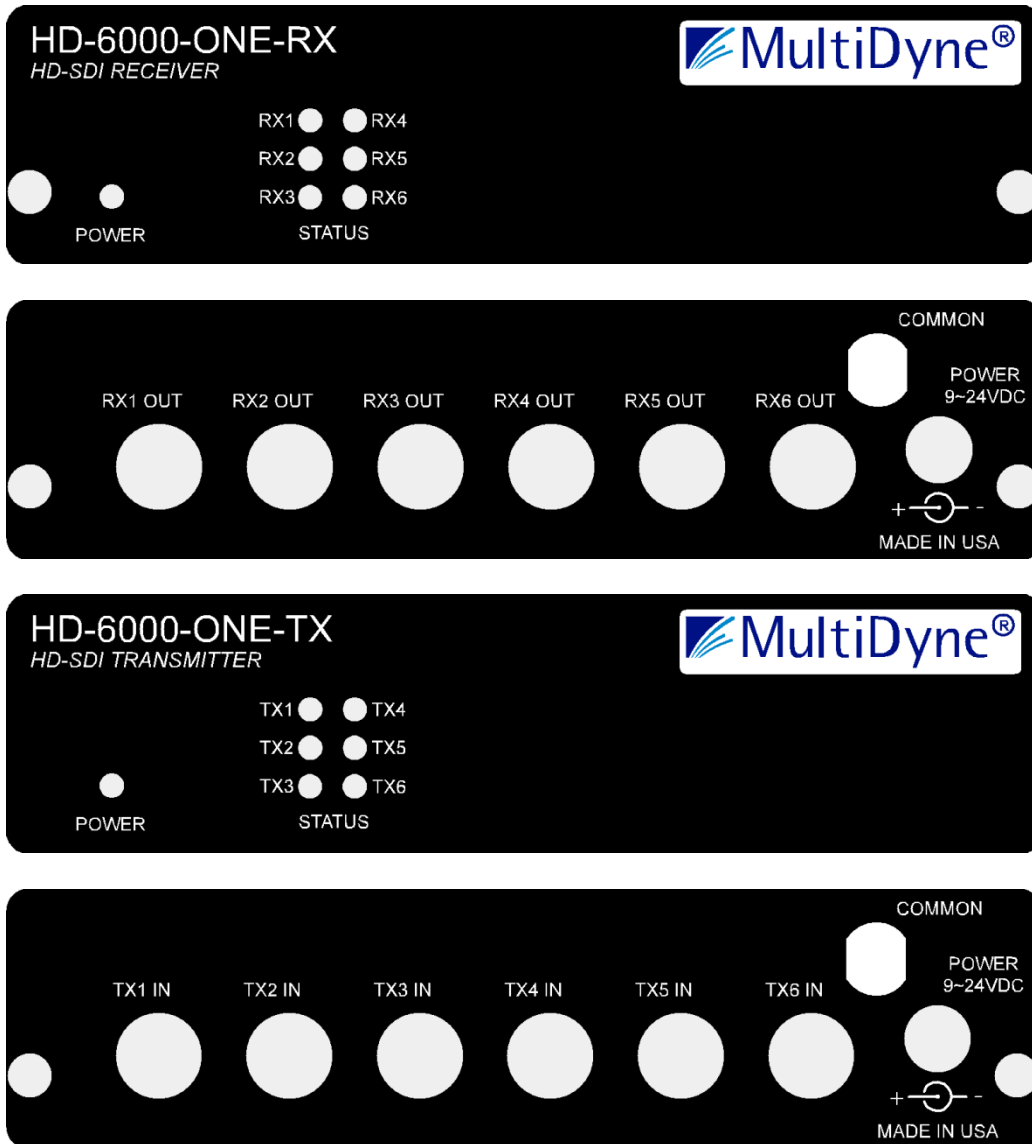


Fig. 1: Front and Rear Panels, HD6000-ONE FTX and FRX

**POWER REQUIREMENTS**

The HDx000/x000-ONE operates from 110 or 220 VAC with the included desktop universal input 12V power supply or other source from 9 to 24 VDC and at least 12, 24, or 36VA of power, depending on model. It uses a coaxial type connector (sleeve ground) on the rear panel labelled **POWER**. If desired, the units can be powered from a battery pack or automotive battery instead of the wall unit.

## INSTALLATION AND SETUP

The HD6000/6000-ONE is configured at the factory for SMPTE signals. Normally no user configuration is required except in cases where non-SMPTE signals are to be transported. Behind the front panel is a row of configuration dip switches. See Table 1 below. The first 6 switches are used to turn reclocking on or off for each channel. Normally you would leave these in the default up position to reclock SMPTE signals. But if use with non-SMPTE signals is anticipated, the reclockers should be turned off by setting the switches down, because otherwise the reclocker may falsely lock to a non-SMPTE signal and corrupt it. This could happen if the signal frequency, or a harmonic thereof, is close to 270, 1485 or 2970 MBPS. The HD6000/6000-ONE will automatically mute a signal if the reclocker is not locked to a SMPTE standard if the reclocker switch for that channel is on. But if reclocking is off, it will be unmuted as long as a signal is present, whether it is locked or not. See Table 2. Switch 7 and Switch 8 are reserved, leave up. Since the HD12000 and 18000 consist of 2 or 3 HD6000 PCBs in one enclosure, each serving a group of 6 channels, one must configure each PCB for the group of channels it serves.

Switch	Function	Setting	
1	Channel 1 reclock	up=reclock	down=bypass reclocker
2	Channel 2 reclock	up=reclock	down=bypass reclocker
3	Channel 3 reclock	up=reclock	down=bypass reclocker
4	Channel 4 reclock	up=reclock	down=bypass reclocker
5	Channel 5 reclock	up=reclock	down=bypass reclocker
6	Channel 6 reclock	up=reclock	down=bypass reclocker
7	Reserved		
8	Reserved		

Table 1: Settings for Configuration Switch in the HD6000/6000-ONE-FTX or FRX

Reclocker	Signal	Muted?
bypassed	Any	no
on	SMPTE	no
on	Non-SMPTE	yes
x	No carrier or no illum	yes

Table 2: Automute Functionality

No special sequence must be followed to connect and start up the unit. RG59 or other 75 ohm coaxial cable must be used for the BNC SDI inputs and outputs. Note that when the

BNCs are inputs they will only accept signals between 125 and 2970 MBPS. However when the BNCs are outputs, they can function down to 19 MBPS. This is useful only if the channel is receiving optical signals from devices other than the 6 PACK family.

The HDx000-ONE-FTX and FRX should be connected together by a SM optical fiber at the **COMMON** ST/UPC connectors on their rear panels. This fiber will contain 6, 12 or 18 CWDM signals representing the 6, 12 or 18 channels. As such, it cannot go thru an O/E/O switch.

The HDx000-FTX and FRX will require 6, 12 or 18 individual fibers to form a link. The default configuration of the HDx000 is to use single mode fiber. Multimode fiber can be used with the HDx000 only if it is ordered with MM optics. Unlike the HDx000-ONE, the HDx000's fibers each contain only one signal and thus only one wavelength so they can be routed thru a switch. For the HDx000, connect each fiber I/O on the FTX to its matching I/O on the FRX.

The HD6000/6000-ONE comes standard as a stand-alone unit. An optional rack-mounting kit is available to mount up to 3 units in a 1 Rack-unit or 1 3/4" by 19" rack space. The part number is -RMT. Note that doing this does not convert the 2 or 3 HD6000-ONEs into a HD12000-ONE or 18000-ONE. In order to place 12 or 18 wavelengths onto 1 fiber, you must order the HD12000-ONE or 18000-ONE specifically. The HDx000/x000-ONE requires room for adequate ventilation around it. Do not block the fan vent holes on the top of the case.

## APPENDIX: Technical Specifications

### General

Power: .....	9-24V / 12, 24 or 36VA
Impedance: .....	75 ohms
Return Loss, < 1.5 GHz: .....	> 15 db
Return Loss, < 3.0 GHz: .....	> 10 db
Max Cable Length, < 3.0 GHz: .....	> 120 m
Added Jitter: .....	< 0.06UI
Laser Safety .....	Class 1
Optical Power .....	- 8 dbm to 0 dbm
Optical Sensitivity .....	-18 dbm
Operating Temperature .....	0 to 50 deg C
Data Rates, Optical I/O or BNC Out .....	19 to 2970 MBPS
Data Rates, BNC Input: .....	125 to 2970 MBPS

### Transmitter (-FTX)

Output Wavelengths ..... CWDM or 1310

### Receiver (-FRX)

Input Wavelengths ..... CWDM or 1100 to 1600

Specifications are subject to change without notice.