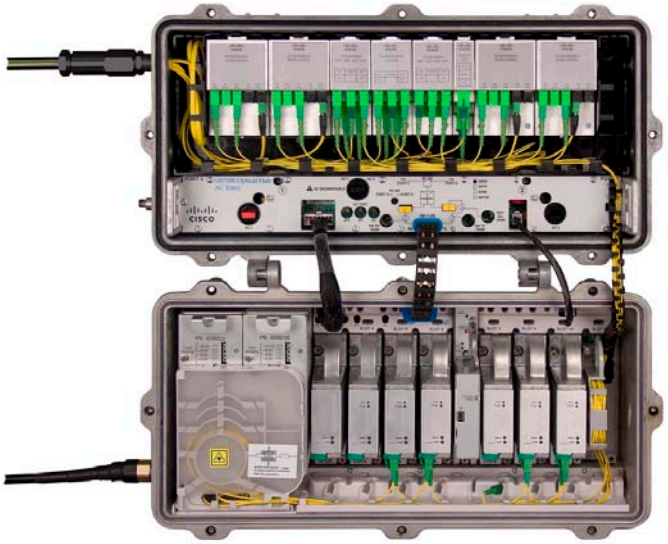
Model GS7000 Optical Hub

As operators migrate to architectures with deeper fiber reach, there is an increased need for flexible design options and efficient fiber utilization in the optical network. The Model GS7000 Optical Hub addresses those needs by providing multiple options for optical amplification, filtering, splitting, and combining, all in a field-proven Model GS7000 station.

Figure 1. Model GS7000 Optical Hub



The Model GS7000 Optical Hub employs a modular approach, allowing full configuration flexibility combined with simple component installation and removal. The Model GS7000 active optical modules include a variety of low-noise EDFA optical amplifiers for both broadcast and narrowcast applications, as well as optical switches that enable redundancy.

The Model GS7000 passive optical modules include single-function modules such as CWDM and DWDM 1x8 mux/demux's, two and four band mux/demux's, and a variety of optical splitters. Multi-function passive modules are also available, including combiners with integrated multiplexers and demultiplexers for narrowcast/broadcast overlays. The passive optical modules with higher input/output fiber counts make use of a multi-fiber ribbon cable which simplifies internal fiber routing and connectivity.

A fully configured Model GS7000 Optical Hub can combine narrowcast/ broadcast using up to 64 wavelengths, providing forward and reverse optical paths for a total of 32 nodes. The station utilizes the same field-proven housing and dual internal power supplies as the widely deployed Model GS7000 4-Port Node.

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Features

- EDFA modules for optical amplification
- Optical switch modules for redundancy
- Flexible and scalable optical passive modules
- Fiber management tray and tracks provide easy fiber routing and access to fiber connections
- Status monitor/Local control module for remote monitoring and control (Transmission Network Control System [TNCS] or other compatible element management system required)
- Fiber entry ports on both ends of housing lid
- AC power entry ports on both ends of the housing base
- Primary and redundant power supplies with passive load sharing
- Dual/Split AC powering

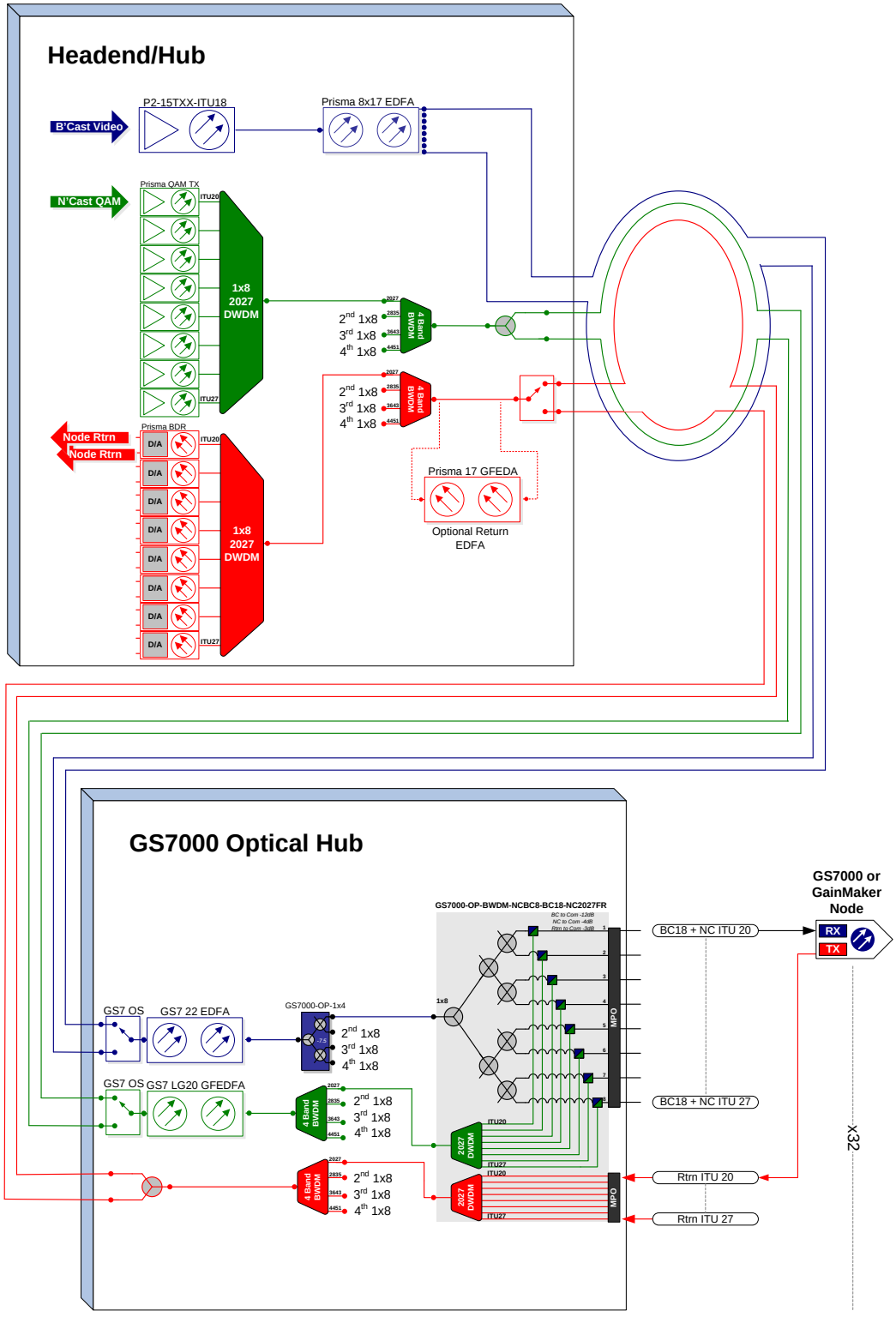
Benefits

- Eliminates building costs and permitting issues for new "brick and mortar" hub locations.
- Reduces the need for new fiber installation.
- Fiber management and fiber coupling (mux/demux, etc.) are typically done at the headend or hub, or within strand-mounted splice enclosures. This can now be done with the Model GS7000 Optical Hub.
- All passive devices are enclosed within the housing. No need for external splice enclosures.
- Optical amplification is typically done at the headend or hub, or with strand-mounted optical amplifiers. This can now be done with the Model GS7000 Optical Hub.
- The ability to add redundancy, or enable network switching for survivability is typically done at the headend or hub. This can now be done with the Model GS7000 Optical Hub.

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Application Examples

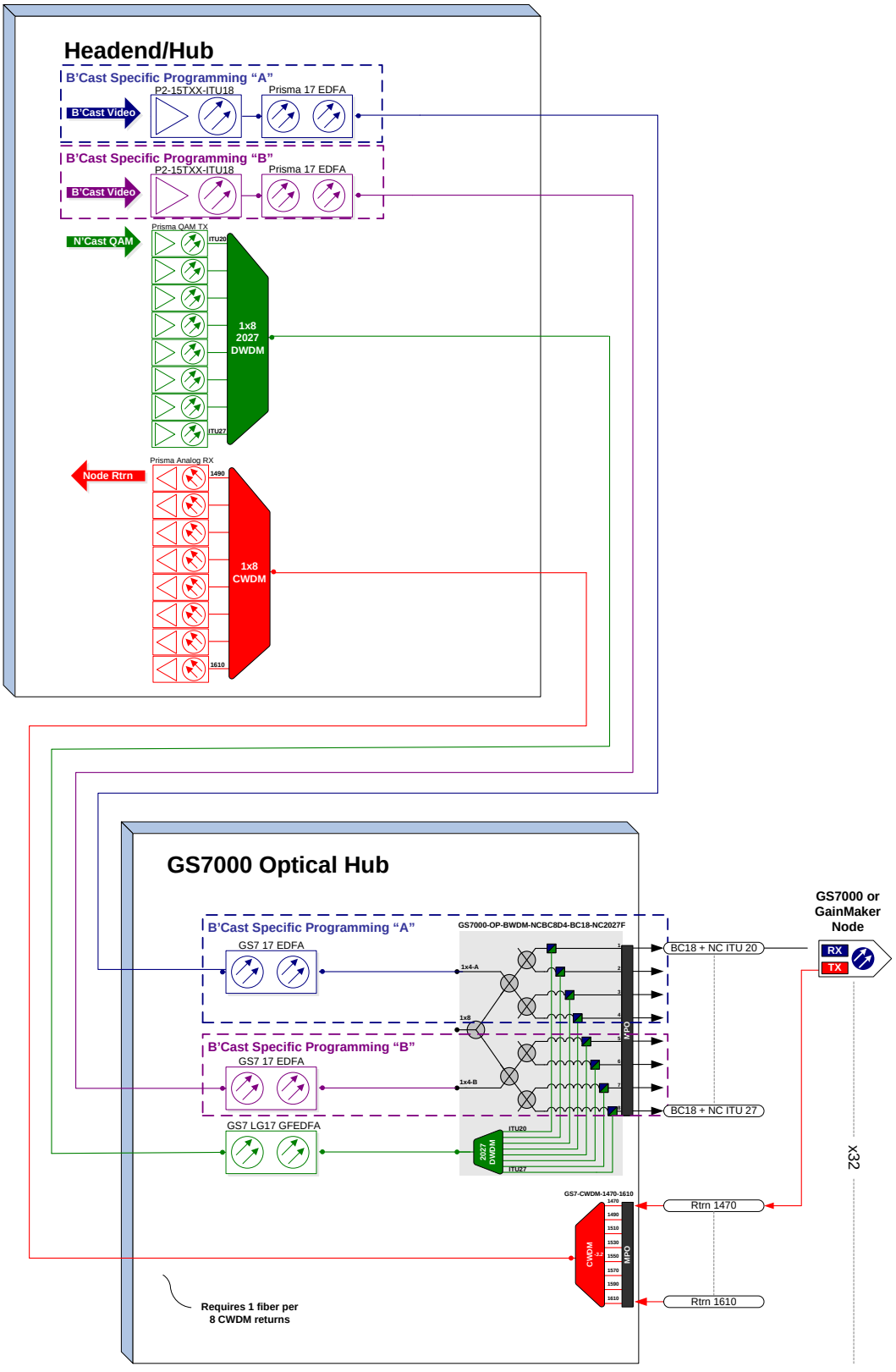
Figure 2. Broadcast/Narrowcast Overlay with Redundancy



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Application Examples (Cont'd)

Figure 3. Broadcast/Narrowcast Overlay with Two Broadcast Zones



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Model GS7000 Optical Hub Station

Table 1. General Station Specifications

Environmental	Units	Value
Temperature Range	°C °F	-40 to + 60 -40 to + 140
Humidity Range (4)	%	5 to 95
Mechanical		
Dimensions (Length x Height x Width)	in. cm	21.3 x 11.6 x 11.1 54.1 x 29.5 x 28.2
Weight (fully loaded)	lb kg	50 22.7

Model GS7000 Active Optical Modules

Table 2. EDFA Optical Amplifier Specifications

Optical	Units	Broadcast EDFA			Narrowcast Gain Flattened EDFA			
		17 dBm	20 dBm	22 dBm	17 dBm		20 dBm	
Output Power (note 1) (maximum)	dBm	17	20	22	17		20	
		12	15	17	Low	High	Low	High
Gain	dB				7	12	10	15
Input Power	dBm	0 to +10			-5 to +10	-10 to +5	-5 to +10	-10 to +5
Input Wavelength	nm	1530 - 1565			1536 - 1562			
Output Power Stability	dB	± 0.3			± 0.4			
Return Loss	dB	≥ 50			≥ 50			
Polarization Sensitivity	dB	± 0.15			± 0.15			
Noise Figure (note 2)	dB	5.5			6.5			
Output Power Variation with Wavelength	dB	±0.2			N/A			
Gain Flatness (note 3)	dB	N/A			± 0.75			
Optical Interfaces	-	SC/APC (2)			SC/APC (2)			
Electrical	Unit	EDFA			Gain Flattened EDFA			
Power Consumption @ 24 VDC (maximum)	W	4.5	7	9	4.5		7	
Mechanical								
Length x Height x Width	in. cm	5.8 x 3.8 x 1.5 14.7 x 9.7 x 3.8						

Notes:
1. The output power is measured after a typical jumper loss of 0.2 dB is accounted.
2. Noise figure measured at 0 dBm input.
3. Gain flatness for the default gain conditions.
4. Non-condensing external to the Node enclosure.

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Model GS7000 Active Optical Modules

Table 3. Optical Switch Specifications

Optical	Units	Value	Notes
Nominal Optical Wavelength	nm	1550 (±20)	
Input Optical Power Range	dBm	-10 to +14	1
Insertion Loss	dB	≤ 2.0	2
Inputs (1 each)	-	Primary Secondary Common	
Output	-	Common	
Cross Talk	dB	≥ 55	
Return Loss	dB	≥ 50	3
Optical Interfaces		SC/APC (3)	
Electrical			
Sense and Switch Time (from Primary to Redundant state)	ms	< 50	
Power Consumption @ 24 VDC (maximum)	W	3	
Switching Threshold	dB	-10 to +14 (user changeable)	
Restore Threshold	dB	0.5 to 9.5	
Wait Time before Restoration	minutes	0 to 10 in 1 second steps	
Mechanical			
Length	in. cm	5.8 14.7	
Width	in. cm	1.5 3.8	
Height	in. cm	3.8 9.7	
Weight	lb kg	.72 .33	

Notes:
1. Optical input power of -3.0 dBm or greater is required to maintain the full user-settable threshold range. When the optical input power is less than -3.0 dBm there is a 1-for-1 reduction in threshold range.
2. Insertion loss of module with 0.25 dB loss per mated connector pair for a total connector loss of 0.5 dB. Actual connection loss may be less or more depending on mating connector compatibility.
3. With APC connectors.

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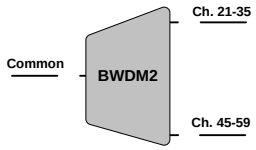
Model GS7000 Passive Optical Modules

Table 4. BWDM2 Two Band (Red/Blue) Filter Specifications

Parameter		Units	Value	Part Number
Passband Wavelengths	Port 2135	nm	1548.5 - 1561.5 Red	4030111
	Port 4559		1529.5 - 1542.5 Blue	
ITU Channels	Port 2135	ITU Channels	21-35	
	Port 4559		45-59	
Insertion Loss (see note)	Port 2135	dB	≤ 0.8	
	Port 4559		≤ 1.1	
Isolation	Port 2135	dB	≥ 12	
	Port 4559		≥ 15	
Directivity		dB	≥ 50	
Optical Return Loss			≥ 45	
Optical Interfaces			SC/APC (3)	
Package			1 Wide Module	

Note: Insertion loss includes input and output connector loss.

Figure 4. BWDM2 Filter



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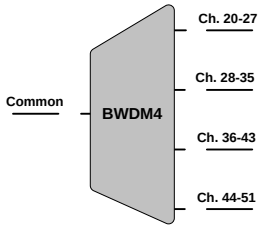
Model GS7000 Passive Optical Modules

Table 5. BWDM4 Four Band Filter Specifications

Parameter		Units	Value	Part Number
Passband Wavelengths	Port 2027	nm	1555.63 - 1561.54	4030110
	Port 2835		1549.20 - 1555.06	
	Port 3643		1542.82 - 1548.63	
	Port 4451		1536.49 - 1542.26	
ITU Ch's	Port 2027	-	20 - 27	
	Port 2835		28 - 35	
	Port 3643		36 - 43	
	Port 4451		44 - 51	
Insertion Loss (see note)	All Ports	dB	≤ 2.3	
Isolation	Port 4451	dB	≥ 12	
	Ports 2027, 2835, 3643		≥ 15	
Directivity		dB	≥ 50	
Optical Return Loss			≥ 45	
Optical Interfaces			SC/APC (5)	
Package			2 Wide Modules	

Note: Insertion loss includes input and output connector loss.

Figure 5. BWDM4 Filter



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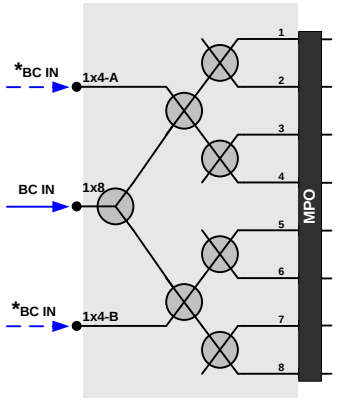
Model GS7000 Passive Optical Modules

Table 6. Coupler Specifications

Configuration	Parameter	Units	Value	Part Number
Common Specifications	Wavelength	nm	1550 ± 40	
	Split Ratio	-	Even	
	Optical Return Loss	dB	≥ 55	
1x2	Insertion Loss (note 1)	dB	≤ 4.2	4030112
	Uniformity	dB	0.7	
	Optical Interfaces		SC/APC (3)	
	Package		1 Wide Module	
1x3	Insertion Loss (note 1)	dB	≤ 6.3	4030113
	Uniformity	dB	1.0	
	Optical Interfaces		SC/APC (4)	
	Package		2 Wide Modules	
1x4	Insertion Loss (note 1)	dB	≤ 7.6	4030114
	Uniformity	dB	1.2	
	Optical Interfaces		SC/APC (5)	
	Package		2 Wide Modules	
1x8	Insertion Loss (note 1)	dB	≤ 11.2	4030115
	Uniformity	dB	1.5	
	Optical Interfaces		SC/APC (3), 8 Fiber MPO with male guide pins APC (1)	
	Package		3 Wide Modules	
1x8 when used as Dual 1x4	Split ratio		Even (two 1x4s)	
	Insertion Loss (note 1)	dB	≤ 7.6	
	Uniformity	dB	1.2	

Note 1: Insertion loss includes input and output connector loss.

Figure 6. 1x8 Coupler



* Can be used as dual 4-way split

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Model GS7000 Passive Optical Modules

Table 7. DWDM or CWDM 8 Channel Mux/Demux Specifications

Configuration	Parameter	Units	Value	Part Number
DWDM 1x8 200G	ITU Channels	-	200 GHz spacing, Ch 21 - 35, ODD	4030093
			200 GHz spacing, Ch 45 - 59, ODD	4030094
	Channel Bandwidth @ 0.5 dB	nm	± 0.25	
	Insertion Loss (see note)	dB	≤ 3.0	
DWDM 1x8 100G	ITU Ch's	-	100 GHz spacing, Ch 20 - 27	4030096
			100 GHz spacing, Ch 28 - 35	4030097
			100 GHz spacing, Ch 36 - 43	4030098
			100 GHz spacing, Ch 44 - 51	4030099
	Channel Bandwidth @ 0.5 dB	nm	± 0.12	
	Insertion Loss (note 1)	dB	≤ 3.2	
CWDM 1x8	Nominal Center Wavelengths	nm	20 nm spacing, 1470 - 1610 nm	4030095
	Channel Bandwidth @ 0.5 dB	nm	± 7.5	
	Insertion Loss (note 1)	dB	≤ 3.0	
Common Specifications	Insertion Loss Uniformity	dB	1.0	
	Polarization Dependent Loss (PDL)	dB	≤ 0.2	
	Polarization Mode Dispersion (PMD)	ps	≤ 0.15	
	Directivity	dB	≥ 55	
	Optical Return Loss – All ports	dB	≥ 50	
	Isolation	dB	≥ 30 Adjacent Channels	
			≥ 40 Non-Adjacent Channels	
	Optical Interfaces		8 Fiber MPO with male guide pins APC (1)	
			SC/APC (1)	
	Package		2 Wide Modules	

Note: Insertion loss includes input and output connector loss.

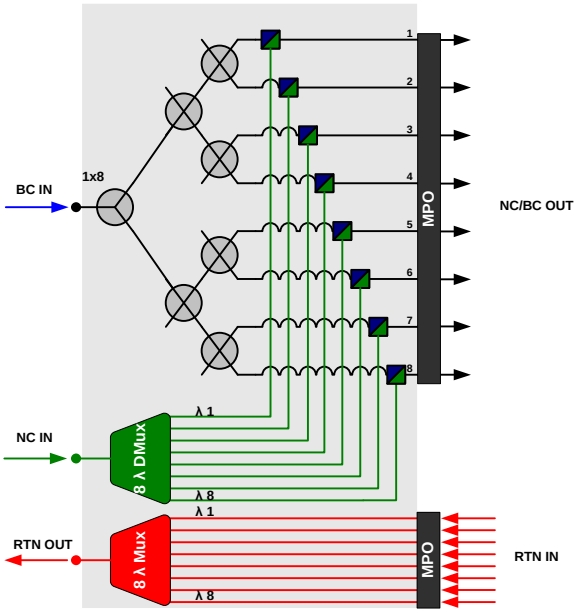
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Model GS7000 Multi-Function Passive Optical Modules

Table 8. BWDM Narrowcast Broadcast with Narrowcast DeMux and Return Mux Specifications

Model	BC 8-Way Split	Optional use as Dual BC 4-Way Split	BC ITU Ch	NC Demux ITU Ch	Return Mux Ch	Part Number
GS7000-OP-BWDM-NCBC8-BC18-NC2027FR-SAMPO	Yes	No	18	20 - 27	20 - 27	4030102
GS7000-OP-BWDM-NCBC8-BC18-NC2835FR-SAMPO	Yes	No	18	28 - 35	28 - 35	4030103
GS7000-OP-BWDM-NCBC8-BC18-NC3643FR-SAMPO	Yes	No	18	36 - 43	36 - 43	4030104
GS7000-OP-BWDM-NCBC8-BC18-NC4451FR-SAMPO	Yes	No	18	44 - 51	44 - 51	4030105

Figure 7. GS7000-OP-BWDM-NCBC8-BC18-NCXXXXFR-SAMPO (shown with 2 MPO fan-out cables)



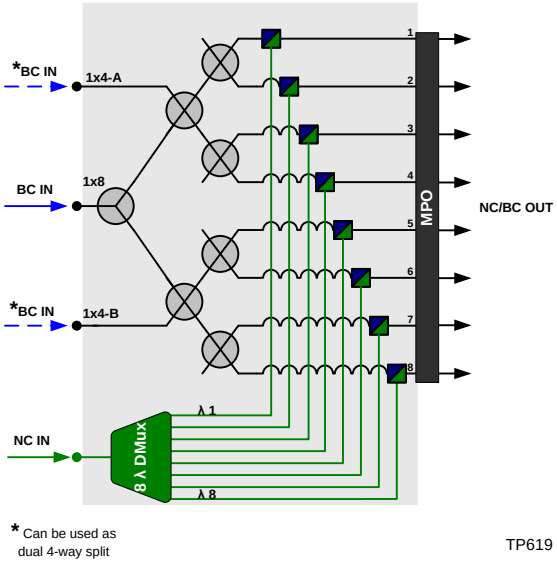
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Model GS7000 Multi-Function Passive Optical Modules

Table 9. BWDM Narrowcast Broadcast without Return Mux

Model	BC 8-Way Split	Optional use as Dual BC 4-Way Split	BC ITU Ch	NC Demux ITU Ch	Return Mux	Part Number
GS7000-OP-BWDM-NCBC8D4-BC18-NC2027F-SAMPO	Yes	Yes	18	20 - 27	No Mux	4030106
GS7000-OP-BWDM-NCBC8D4-BC18-NC2835F-SAMPO	Yes	Yes	18	28 - 35	No Mux	4030107
GS7000-OP-BWDM-NCBC8D4-BC18-NC3643F-SAMPO	Yes	Yes	18	36 - 43	No Mux	4030108
GS7000-OP-BWDM-NCBC8D4-BC18-NC4451F-SAMPO	Yes	Yes	18	44 - 51	No Mux	4030109

Figure 8. GS7000-OP-BWDM-NCBC8D4-BC18-NCXXXXF-SAMPO



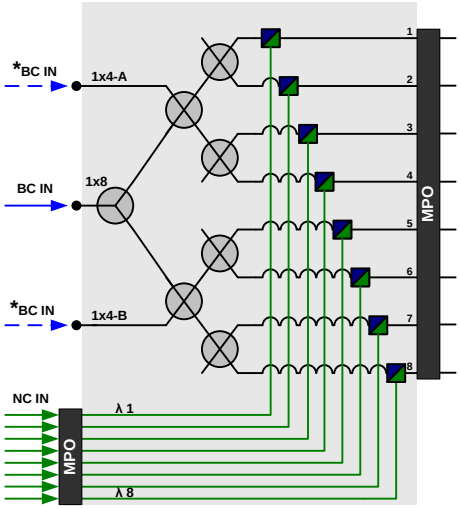
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Model GS7000 Multi-Function Passive Optical Modules

Table 10. BWDM Narrowcast Broadcast without Narrowcast DeMux or Return Mux

Model	BC 8-Way Split	Optional use as Dual BC 4-Way Split	BC ITU Ch	NC ITU Ch	Return Mux	Part Number
GS7000-OP-BWDM-NCBC8D4-BC3941-NC2095-SAMPO	Yes	Yes	39 - 41	20 - 95 No Demux	No Mux	4030100
GS7000-OP-BWDM-NCBC8D4-BC18-NC2095-SAMPO	Yes	Yes	18	20 - 95 No Demux	No Mux	4030101

Figure 9. GS7000-OP-BWDM-NCBC8D4-BCXXXXF-SAMPO



* Can be used as dual 4-way split

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Model GS7000 Multi-Function Passive Optical Modules

Table 11. BWDM Narrowcast Broadcast Module Specifications

Optical Performance Characteristics			
Broadcast Path (Pass Channel) Wavelength Range (nm)		ITU Ch 18 or 1543.5~1546.4nm for PN 4030100	
Narrowcast Path (Reflect Channel) Wavelength Range (nm)		ITU Ch's 20-59 1528.50~1541.7 or 1549.0~1561.9nm for PN 4030100	
Parameter		**Value**	**Units**
Narrowcast or return DWDM 100 GHz Channels	ITU Channels 20 - 27 ITU Channels 28 - 35 ITU Channels 36 - 43 ITU Channels 44 - 51		
Narrowcast 100G Channel Bandwidth		ITU +/-0.12	nm
Broadcast Path Insertion Loss (note 1)	Broadcast to Common Output 1 - 8	≤ 12.0	dB
	Broadcast to Common output 1 - 4 or 5 - 8 (only in BCNC8D4 module)	≤ 9.0	
Narrowcast Fwd Path Insertion Loss (note 1)	Narrowcast to Common Output	≤ 4.0	dB
	Narrowcast to Common Output (only in part 4030100 and 4030101)	≤ 1.0	
Return Path Insertion Loss (see note)	Return port 1 - 8 to Common Output (only in NCBC8-FR module)	≤ 3.0	dB
Passband Ripple		≤ 0.8	dB
Uniformity Across Common Outputs		2.5	dB
Uniformity Across Outputs for Return Mux		1.0	dB
Narrowcast or Return 100G Channel Isolation	Narrowcast to Broadcast	≥ 15	dB
	Broadcast to Narrowcast	≥ 15	dB
Return Loss		≥ 45	dB
Directivity	Narrowcast to Broadcast	≥ 55	dB
Optical Interfaces		8 Fiber MPO with male guide pins APC	
		SC/APC	
Package		3 Wide Package	

Note: Insertion loss includes input and output connector loss.

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Status Monitor Transponder/ Local Control Modules

Overview

A Local Control Module must be installed to allow local monitoring and control of the active modules in the Model GS7000 Optical Hub. For remote monitoring and control, a Status Monitor Transponder must also be installed. The Status Monitor (SM) Transponder connects directly to the Local Control Module (LCM).

Local Control Module

The LCM provides local monitoring and control capability at the Model GS7000 Optical Hub station. The LCM is equipped with a USB port to enable connection to a local PC/laptop. The Model GS7000 ViewPort software must be installed on the PC/laptop to allow all parameters monitored by the LCM to be displayed and to allow local control of the optical switches and optical amplifiers.

Status Monitor Transponder

The SM Transponder is HMS compliant and provides remote monitoring and control capability at the cable plant's headend. The Model GS7000 Optical Hub must be connected to an active two-way RF network for status monitoring communications. Configuration parameters for the transponder module, such as IP address, can be changed using the PC-based ViewPort software.

Table 12. Monitorable Parameters (via LCM and SM Transponder)

Description
Station – AC power presence and peak voltage (for split AC powering cases, AC power from both sides of node housing is monitored)
Power Supply – DC voltages from both primary and redundant power supplies
EDFA Optical Amplifier – Input & Output Optical Power, Module Temperature
Optical Switch – Switch Position, Optical Power, Module Temperature

Table 13. Configurable Parameters (via LCM and SM Transponder)

Description
EDFA Optical Amplifier – Set Mode, Set Power, Set Gain, Enable
Optical Switch – Set Mode, Set Threshold, Set Switch Position

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Model GS7000 Optical Hub Powering Information

Table 14. Station Powering Data

Electrical	Units	Value					
	Units						
Max AC Through Current (continuous)	Amps	15					
Max AC Through Current (surge)	Amps	25					
Under-voltage Lockout	Volts	33 VAC (no current draw below lockout voltage)					
		Component DC Current Draw (maximum)					
		@ +24 VDC	@ +8 VDC	@ +5 VDC	@ -6 VDC		
BC EDFA +17 dBm	Amps	0.19	-	-	-		
BC EDFA +20 dBm	Amps	0.29	-	-	-		
BC EDFA +22 dBm	Amps	0.38	-	-	-		
NC Gain-Flattened EDFA +17 dBm	Amps	0.19	-	-	-		
NC Gain-Flattened EDFA +20 dBm	Amps	0.29	-	-	-		
Optical Switch	Amps	0.08	-	-	-		
LCM/Status Monitoring	Amps	-	-	0.5	-		
Power Supply DC Current Rating	Amps	6.2	1.0	1.3	0.8		
Optical Hub with: (1) 20 dBm BC EDFA, (1) 17 dBm NC Gain-Flattened EDFA, (2) Optical Switches, (1) LCM							
DC Current	0.6 Amps @ 24 VDC and 0.5 Amps @ 5 VDC						
AC Voltage	90	80	70	60	50	40	
AC Current (A)	0.49	0.49	0.48	0.50	0.54	0.59	
AC Power (W)	25.4	25.1	24.9	24.5	24.6	24.5	
Optical Hub with: (2) 22 dBm BC EDFAs, (2) 20 dBm NC Gain-Flattened EDFAs, (2) Optical Switches, (1) LCM							
DC Current	1.5 Amps @ 24 VDC and 0.5 Amps @ 5 VDC						
AC Voltage	90	80	70	60	50	40	
AC Current (A)	0.83	0.80	0.83	0.90	1.06	1.17	
AC Power (W)	50.5	50.2	50.0	49.8	50.1	50.2	
Optical Hub with: (7) 22 dBm BC EDFAs, (1) LCM							
DC Current	2.6 Amps @ 24 VDC and 0.5 Amps @ 5 VDC						
AC Voltage	90	80	70	60	50	40	
AC Current (A)	1.19	1.18	1.26	1.43	1.64	1.83	
AC Power (W)	81.5	80.9	80.9	80.8	78.1	78.2	

Note: AC currents specified are based on measurements made with typical CATV type ferro-resonant AC power supply (quasi-square wave).

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Ordering Information

The Model GS7000 Optical Hub is available in a wide variety of configurations. The Model GS7000 Optical Hub ordering matrix provides ordering information for configured node stations. This page contains ordering information for required and optional accessories. Please consult with your Account Representative, Customer Service Representative, or Systems Engineer to determine the best configuration for your particular application.

Table 15. Active Optical Modules

Description	Part Number for Ordering
+17 dBm EDFA Broadcast	4027007
+20 dBm EDFA Broadcast	4027008
+22 dBm EDFA Broadcast	4027009
+17 dBm EDFA Gain Flattened, Low Gain	4027010
+17 dBm EDFA Gain Flattened, High Gain	4027011
+20 dBm EDFA Gain Flattened, Low Gain	4027012
+20 dBm EDFA Gain Flattened, High Gain	4027013
GS7000 Optical Switch	4027014

Table 16. Model GS7000 Passive Optical Modules – Single Function

Description	Part Number for Ordering
BWDM2 Two Band (Red/Blue) Filter	4030111
BWDM4 Four Band Filter	4030110
1x2 Coupler	4030112
1x3 Coupler	4030113
1x4 Coupler	4030114
1x8 Coupler (can also be used as Dual 1x4)	4030115
DWDM 8 channel Mux/Demux 200G, Ch 21 - 35 Odd	4030093
DWDM 8 channel Mux/Demux 200G, Ch 45 - 59 Odd	4030094
DWDM 8 channel Mux/Demux 100G, Ch 20 - 27	4030096
DWDM 8 channel Mux/Demux 100G, Ch 28 - 35	4030097
DWDM 8 channel Mux/Demux 100G, Ch 36 - 43	4030098
DWDM 8 channel Mux/Demux 100G, Ch 44 - 51	4030099
CWDM 8 channel Mux/Demux	4030095

Table 17. Model GS7000 Passive Optical Modules - Multi-Function

Description	Part Number for Ordering
BWDM Narrowcast Broadcast with Narrowcast DeMux and Return Mux	Refer to Table 8 on page 11
BWDM Narrowcast Broadcast without Return Mux	Refer to Table 9 on page 12
BWDM Narrowcast Broadcast without Narrowcast DeMux or Return Mux	Refer to Table 10 on page 13

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Table 18. Fiber Optic Cable Assemblies

Description	Model	Part Number for Ordering
Service Cable with four 12 fiber ribbon cables with four MPO fiber connectors and a Model GS7000 Optical Hub housing entry connector on one end, 48 bare fibers on other end, 100 ft	SERVICE CABLE, 4 MPO CONN, 4 RBN, 48 FBR	4029427
Service Cable with two 12 fiber ribbon cables with two MPO fiber connectors and a Model GS7000 Optical Hub housing entry connector on one end, 24 bare fibers on other end, 100 ft	SERVICE CABLE, 2 MPO CONN, 2 RBN, 24 FBR	4029426
Service Cable with four 12 fiber ribbon cables with four MPO fiber connectors and a Model GS7000 Optical Hub housing entry connector on one end, 48 SC/APC connectors on other end, 100 ft	SERVICE CABLE, 4 MPO CONN, 4 RBN, 48 SC/APC	4032472
Service Cable with four 8 fiber ribbon cables with four MPO fiber connectors and a Model GS7000 Optical Hub housing entry connector on one end, 32 SC/APC connectors on other end, 25 ft	SERVICE CABLE, 4 MPO CONN, 4 RBN, 32 SC/APC	4040682
Service Cable with four 12 fiber ribbon cables with four MPO fiber connectors and a Model GS7000 Optical Hub housing entry connector on one end, 48 LC/APC connectors on other end, 100 ft	SERVICE CABLE, 4 MPO CONN, 4 RBN, 48 LC/APC	4032473
MPO to MPO Ribbon Jumper Cable, 1 meter	JMPR-12S-3-P-MA-MA-NA-001	4030667
MPO to SC/APC Fan-out Jumper Cable, 1 meter	JMPR-12S-3-P-MA-SA-F9-001	4030668
SCA-SCA Jumper Cable, bend-insensitive, 1 meter	JMPR-SSB-1.6-S-SA-SA-001	4030479
SCA-SCA Jumper Cable, bend-insensitive, 0.5 meter	JMPR-SSB-1.6-S-SA-SA-0.5	4030476
MPO-SCA Fan-out Jumper Cable, 5 meters	JMPR-8S-3-MA-SA-F2-005	4040681

Table 19. Other Model GS7000 Optical Hub Components

Description	Part Number on Module	Part Number for Ordering
Optical Hub OIB	4025876	4025874
AC Entry Module 42/54 MHz	4025886	4025885
Optical Hub Housing Assembly (with 2 Power Supplies)		4025879
Power Supply	4009226	4011930
Local Control Module (LCM) with SM Transponder	4025872	4025871
Local Control Module (LCM) no SM Transponder	4027113	4027114
Status Monitor Transponder (HMS)	4025882	4025881
Status Monitor Transponder (DOCSIS®)		4036793

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Cisco Systems, Inc.
800 722-2009 or 678 277-1120
www.cisco.com

Part Number 7017707 Rev B
March 2011