

N5069 Optical Node

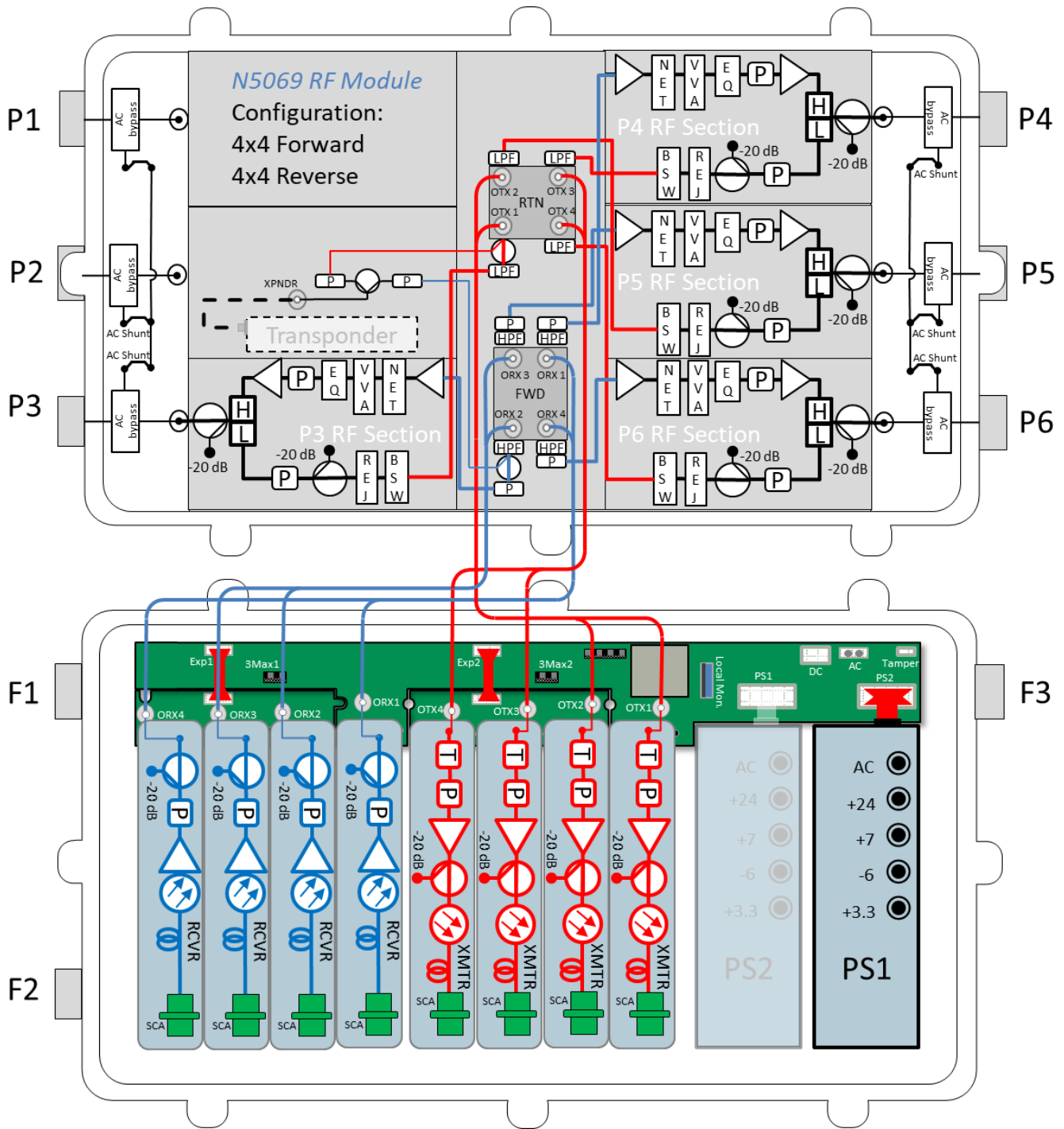
4x4 Fully Segmentable

The N5069 1.2 GHz is a 4-output 4x4 fully segmentable optical node that is capable of providing up to 59.1 dBmV output at 1218 MHz with an optical input range from -8 dBm to +2 dBm. The node can have up to four optical receivers and four optical transmitters. The N5069 is RPhy capable and is compatible with the Harmonic pebble module. The N5069 optical node is compatible with the legacy SA6940 platform so it can be directly dropped into the existing SA6940 footprint to upgrade the HFC network to 1.2GHz bandwidth without re-splicing the cable. If the existing housing must be replaced the port configuration is the same as the legacy SA6940.

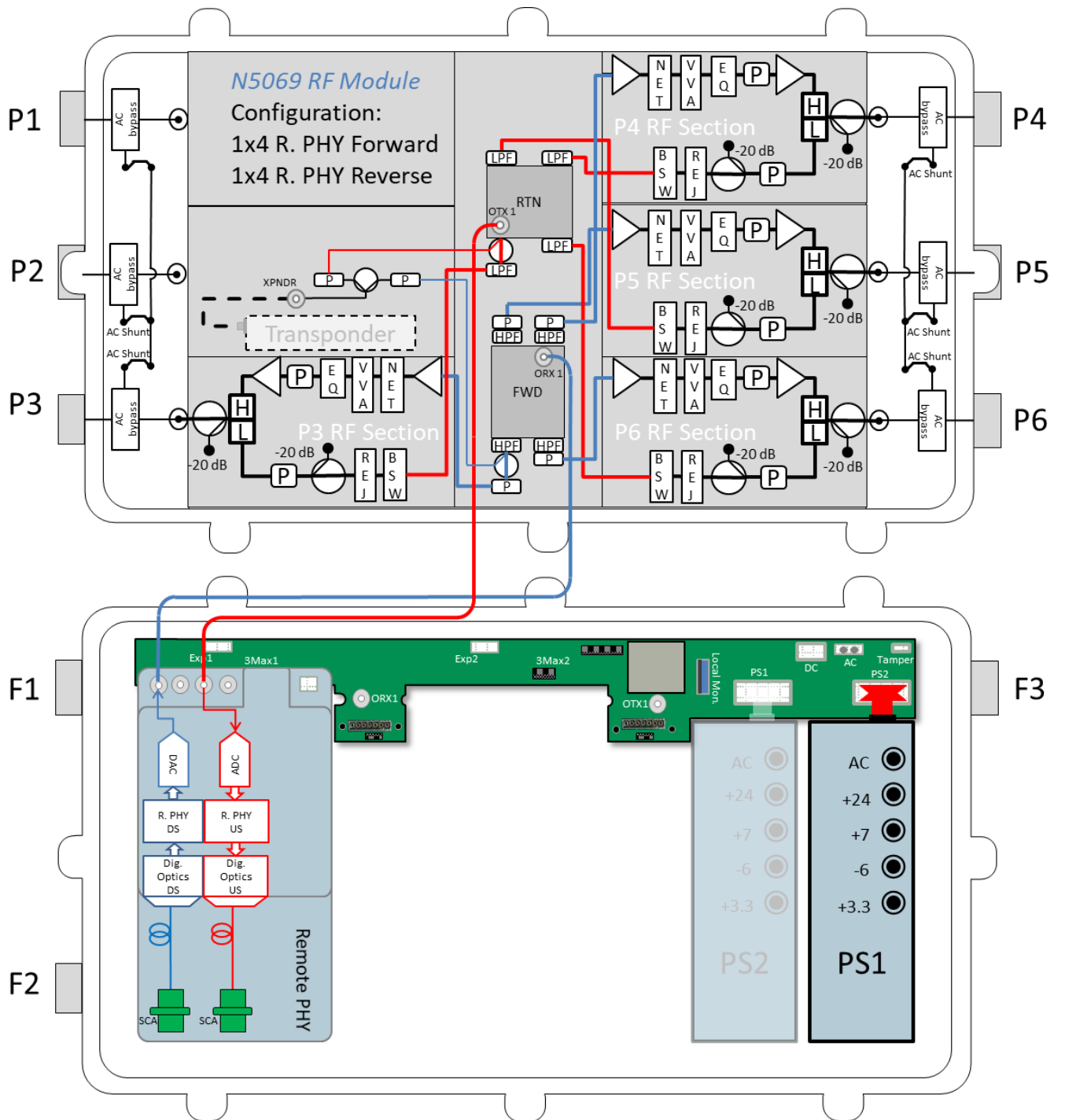
Features

- ◆ Four driven output ports
- ◆ Compact size for a 4x4 segmentable node (8.44" H x 20.22" W x 10.73" D)
- ◆ -20.0 dB directional coupler test points
- ◆ Built-in bridger switching for managing the reverse path @ 0, -3.0, -6.0, and -26.0 dB (open) with active status monitoring (optional)
- ◆ Standard push on "F" connectors can be used on all test points
- ◆ DFB, CWDM, & DWDM transmitters available
- ◆ Remote PHY module is available for digital fiber link (option)
- ◆ Plug-in forward and reverse configuration modules allows for easy field reconfiguration to add or remove segmentation as needed
- ◆ 85% efficient 40/90 VAC switch-mode power supply with built-in Triac surge protection

Block Diagrams



N5069 Block Diagram (4x4 Segmented Optical Node 1218 MHz)
Analog Transmitters



N5069 Block Diagram (1x4 Optical Node 1218 MHz)
Remote PHY Module

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| N5069 4-Output (Forward and Reverse Segmentable Optical Node 1218 MHz) | | | | | | |
|---|---|---------|----------------------------|------|------------------|--|
| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
| Downstream Station (including FWD Configure Board unless otherwise noted), Port 3, Port 4, Port 5, Port 6 | | | | | | |
| Downstream Passband | 42/53 Split | MHz | 54 | - | 1218 | |
| Input Current Capacity | 15 | A | - | - | 15 | |
| Hum Modulation | 5 to 1218 MHz | dBc | 65 | - | - | Time Doman @ 15A |
| RF Input Level | Analog Level into FWD Configure Board Input | dBmV/ch | 26 | - | - | |
| Gain (Ref @ 1218MHz) | With 1x4 FWD Config Board (Config Bd IL: -10dB) | dB | 32 | 33 | 34 | ±1dB stability over Node's Operating Temperature Range |
| | With 2x2 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| | With 4x4 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| Port to Port Isolation | 54 to 1218 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | with FWD Configure Board | dB | -1 | - | 1 | |
| Output Return Loss | 54 to 1218MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | - | dB | -20.5 | -20 | -19.5 | Note 6 |
| RF Output Level | 54/105/550/750/870/1002/1218 MHz | dBmV | 38/39/47/50.6/52.7/55.1/59 | | | Analog Reference, Note 4 |
| | | | 32/33/41/44.6/46.7/49.1/53 | | | Digital level, Note 4 |
| Operational Slope | 54/105/550/750/870/1002/1218 MHz | dB | 0/1/9/12.6/14.7/17.1/21 | | | |
| Slope Tolerance | - | dB | ±1 | | | |
| Slope Range | Min Slope = 10dB | dB | 11 | - | - | |
| CCN | 21dB Slope | dB | 54 | 56 | - | Note 1a |
| CSO | 30ch Analog (55.25-253.25MHz) + SCQAM (261-1215MHz) Digital is -6dB from Analog | dBc | - | -65 | -61 | |
| CTB | | dBc | - | -70 | -68 | |
| XMOD | 59dBmV Po @ Fc=1215MHz (analog ref level) | dBc | - | - | -64 | |
| MER | All Digital, 21dB Slope, 160ch SCQAM (75-1215MHz) | dB | 40 | - | - | Note 1b |
| BER | | - | - | - | 10 ⁻⁹ | |
| Spurious | - | dBc | - | - | -70 | |
| RF-Tray NF @ +21dB Slope | 54/550/1002/1218MHz | dB | 12 | | | Without FWD Configure Board |
| Station NF @ +21dB Slope | 54/550/1002/1218MHz | dB | 19/19/18.5/18 | | | Note 3 |
| Upstream Station (including the RTN Configure Board unless otherwise noted), Port 3, Port 4, Port 5, Port 6 | | | | | | |
| Upstream Passband | 42/53 Split | MHz | 5 | - | 42 | |
| Port to Port Isolation | 5 to 42 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | 5 to 42 MHz | dB | -0.75 | - | 0.75 | |
| Insertion Loss | Without the RTN configure board, REF @ 25MHz With Rejection Filter jumper, LPF and -1dB RF atten | dB | - | - | -8.5 | |
| Station Gain | RF Tray + All options of the RTN configure board REF @ 25MHz | dB | 6 | - | dB | ±1dB stability over Node's Operating Temperature Range |
| Station Tilt | - | dB | -1 | 0 | 0.5 | |
| Input Return Loss | 5 to 42MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | 5 to 42 MHz | dB | -20.5 | -20 | -19.5 | Note 6 |
| Bridge SW Attenuation Range | BSW Default Setting Stages: 0dB, -3dB, -6dB and Open | dB | 12 | - | - | ±0.5dB Atten Accuracy |
| RF Input Level | - | dBmV/ch | 17 | - | - | |
| Station Output to OTx | With all options of the RTN configure board | dBmV/ch | - | 23 | - | |
| RF-Tray NF | Meas @ 25MHz | dB | - | 7.5 | 8.5 | Without RTN Configure Board |
| Station NF | Option: 4x1/4x4/2x2 | dB | 23/22/19 | | | Note 3 |
| CSO | 6ch Loading for 5-42MHz: 7, 13, 19, 25, 31, 37MHz | dBc | - | - | -75 | Note 2 |
| CTB | | dBc | - | - | -80 | |
| XMOD | | dBc | - | - | -80 | |
| MER | | dB | 40 | - | - | |
| BER | | - | - | - | 10 ⁻⁹ | |
| Peak NPR | 5-42MHz | dB | 57 | - | - | |
| Dynamic Range | @ NPR40dB | dB | 30 | - | - | |

| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
|---|---|---------|-------|------|------------------|---|
| Optical Section: Forward Receiver Module | | | | | | |
| Optical Wavelength | - | MHz | 1260 | - | 1620 | |
| Optical Input Range | Optical AGC | dBm | 2 | - | -4 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Responsivity | 1310 nm | mA/mW | 0.8 | - | - | |
| | 1550 nm | | 0.95 | - | - | |
| RF Bandwidth | - | MHz | 54 | - | 1218 | |
| Frequency Response | - | dB | -0.5 | - | 0.5 | |
| Tilt | Reference from 54MHz | dB | 0 | - | 1 | |
| Optical Input DC Testpoint | 1310 nm | V/mW | 0.9 | 1 | 1.1 | |
| | 1550 nm | | 1 | 1.1 | 1.21 | |
| RF Output Test Point Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Output Level at 2 to -4dBm | Analog Reference | dBmV/ch | 26 | - | - | @ 3.4% OMI/ch |
| Optical Input Level | Digital | dBmV/ch | 20 | - | - | |
| MER | All Digital 42/54 Split, 21±1dB Slope 160ch SCQAM (75-1215MHz) | dB | 40 | - | - | Note 1b, 7 |
| BER | | - | - | - | 10 ⁻⁹ | |
| Optical Section: Analog Return Transmitter Module | | | | | | |
| Optical Wavelength | $\lambda_c \pm 20\text{nm}$, ITU-T, DFB | nm | 1271 | - | 1611 | |
| Optical Output Power | ±1dB Stability Over the Node's Operating Temperature Range | mW | 2 | - | 10 | See Ordering Matrix for Opt Power Model |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Optical DC Testpoint | - | V/mW | 0.9 | - | 1.1 | |
| RF Bandwidth | - | MHz | 5 | - | 210 | |
| Frequency Response | - | dB | -0.75 | - | 0.75 | |
| Tilt | Reference from 54MHz | dB | -0.5 | - | 1 | |
| Laser Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 21 | 22 | 23 | |
| CNR | 6ch Loading, 5-42MHz: 7, 13, 19, 25, 31, 37MHz | dB | 50 | - | - | Note 8 |
| CSO | | dBc | - | - | -55 | |
| CTB | | dBc | - | - | -60 | |
| XMOD | | dBc | - | - | -60 | |
| MER | 6ch Loading for 5-42MHz: 7, 13, 19, 25, 31, 37MHz | dB | 40 | - | - | Note 2, 8 |
| BER | | - | - | - | 10 ⁻⁹ | |
| NPR | 5 - 42MHz Noise Loading, Test with QRR/DRR300 | dB | 40/16 | - | - | Note 8 |
| Optical Section: Digital Return Transmitter Module | | | | | | |
| Optical Wavelength | 1310 | nm | 1290 | 1310 | 1330 | |
| | ITU-T CWDM | | 1271 | - | 1611 | |
| | ITU-T, DWDM, 100GHz Spacing | | 1577 | - | 1528.8 | |
| Optical Output Power | 1310 | dBm | -5 | - | 1 | |
| | CWDM | | 0 | - | 3 | |
| | DWDM | | 2 | - | 7 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| RF Bandwidth | - | MHz | 5 | - | 42 | |
| Frequency Response | Test with QDR/DDR | dB | -0.75 | - | 0.75 | |
| RF Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 16 | 22 | 28 | |
| MER | 6ch Loading for 5-42MHz: 7, 13, 19, 25, 31, 37MHz | dB | 38 | - | - | Note 2, 9 |
| BER | | - | - | - | 10 ⁻⁹ | |
| NPR | 5-42MHz Noise Loading, Test with QDR/DDR | dB | 40/18 | - | - | Note 9 |

Notes:

- (1a) Factory Digital Loading for testing: 256QAM (261 to 999MHz) + 1x192MHz OFDM, Source MER ≥ 43dB, MER/BER test frequencies: 261, 555, 747, 831, 999MHz
- (1b) Factory Digital Loading for testing: 256QAM (57 to 999MHz) + 1x192MHz OFDM, Source MER ≥ 43dB, MER/BER test frequencies: 57, 261, 555, 747, 831, 999MHz
- (2) 64QAM, Source MER ≥ 43dB
- (3) RF-Tray with Configure Board
- (4) ± 1dB accuracy
- (5) Production Return Loss test limit is -16.5dB
- (6) Production TP level test limit is -20 ± 0.5dB
- (7) Downstream Link: Optical Link + RF-Tray. Po @ Fc=1215MHz = 53±1dBmV (Digital Level), Test with STD FT3UD-1310 or EMTx, 20km of fiber, Rx optical power = 0dBm
- (8) Upstream Link: RF-Tray + Optical Link. -10dBm rec'd optical power, QRR/DRR300 RF atten 10dB (RF output = 30 to 35dBmV/ch)
- (9) Upstream Link: RF-Tray + Optical Link. QDR/DDR output = 30 to 42dBmV/ch. Fiber Length: 40km for 1310nm, 80km for CWDM, 100km for DWDM

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| N5069 4-Output (Forward and Reverse Segmentable Optical Node 1218 MHz) | | | | | | |
|---|---|---------|-------------------------|------|------------------|--|
| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
| Downstream Station (including FWD Configure Board unless otherwise noted), Port 1, Port 3, Port 4, Port 6 | | | | | | |
| Downstream Passband | 85/105 Split | MHz | 105 | - | 1218 | |
| Input Current Capacity | 15 | A | - | - | 15 | |
| Hum Modulation | 5 to 1218 MHz | dBc | 65 | - | - | Time Doman @ 15A |
| RF Input Level | Analog Level into FWD Configure Board Input | dBmV/ch | 26 | - | - | |
| Gain (Ref @ 1218MHz) | With 1x4 FWD Config Board (Config Bd IL: -10dB) | dB | 32 | 33 | 34 | ±1dB stability over Node's Operating Temperature Range |
| | With 2x2 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| | With 4x4 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| Port to Port Isolation | 105 to 1218 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | With FWD Configure Board | dB | -1 | - | 1 | |
| Output Return Loss | 105 to 1218MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | - | dB | -20.5 | -20 | -19.5 | Note 6 |
| RF Output Level | 105/550/750/870/1002/1218 MHz | dBmV | 39/47/50.6/52.7/55.1/59 | | | Analog Reference, Note 4 |
| | | | 33/41/44.6/46.7/49.1/53 | | | Digital level, Note 4 |
| Operational Slope | 105/550/750/870/1002/1218 MHz | dB | 0/8/11.6/13.7/16.1/20 | | | |
| Slope Tolerance | - | dB | ±1 | | | |
| Slope Range | Min Slope = 10dB | dB | 11 | - | - | |
| CCN | 20dB Slope | dB | 54 | 56 | - | Note 1a |
| CSO | 25ch Analog (109.25-253.25MHz) + SCQAM (261-1215MHz) | dBc | - | -65 | -61 | |
| CTB | Digital is -6dB from Analog | dBc | - | -70 | -68 | |
| XMOD | 59dBmV Po @ 1218MHz (analog ref level) | dBc | - | - | -64 | |
| MER | All Digital, 20dB Slope | dB | 40 | - | - | Note 1b |
| BER | 160ch SCQAM (105 to 1215MHz) | - | - | - | 10 ⁻⁹ | |
| Spurious | - | dBc | - | - | -70 | |
| RF-Tray NF @ +20dB Slope | @ 85/550/1002/1218MHz | dB | 12 | | | Without FWD Configure Board |
| Station NF @ +20dB Slope | @ 85/550/1002/1218MHz | dB | 19/19/18.5/18 | | | Note 3 |
| Upstream Station (including the RTN Configure Board unless otherwise noted), Port 3, Port 4, Port 5, Port 6 | | | | | | |
| Upstream Passband | 85/105 Split | MHz | 5 | - | 85 | |
| Port to Port Isolation | 5 to 85 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | 5 to 85 MHz | dB | -0.75 | - | 0.75 | |
| Insertion Loss | Without the RTN configure board, REF @ 25MHz With Rejection Filter jumper, LPF and -1dB RF atten | dB | - | - | -8.5 | |
| Station Gain | RF Tray + All options of the RTN configure board REF @ 25MHz | dB | 6 | - | dB | ±1dB stability over Node's Operating Temperature Range |
| Station Tilt | - | dB | -1 | 0 | 0.5 | |
| Input Return Loss | 5 to 85 MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | 5 to 85 MHz | dB | -20.5 | -20 | -19.5 | Note 6 |
| Bridge SW Attenuation Range | BSW Default Setting Stages: 0dB, -3dB, -6dB and Open | dB | 12 | - | - | ±0.5dB Atten Accuracy |
| RF Input Level | - | dBmV/ch | 17 | - | - | |
| Station Output to OTx | With all options of the RTN configure board | dBmV/ch | - | 23 | - | |
| RF-Tray NF | Meas @ 25MHz | dB | - | 7.5 | 8.5 | Without RTN Configure Board |
| Station NF | Option: 4x1/4x4/2x2 | dB | 23/22/19 | | | Note 3 |
| CSO | 8ch Loading for 5-85MHz: 7, 19, 31, 43, 55.25, 67.25, 77.25, 83.25 MHz | dBc | - | - | -75 | |
| CTB | | dBc | - | - | -80 | |
| XMOD | | dBc | - | - | -80 | |
| MER | 8ch Loading for 5-85MHz: 7, 19, 31, 43, 51, 63, 79, 85 MHz | dB | 40 | - | - | Note 2 |
| BER | | - | - | - | 10 ⁻⁹ | |
| Peak NPR | 5-85MHz | dB | 57 | - | - | |
| Dynamic Range | @ NPR40dB | dB | 30 | - | - | |

| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
|--|--|---------|-------|------|------------------|---|
| Optical Section: Forward Receiver Module | | | | | | |
| Optical Wavelength | - | MHz | 1260 | - | 1620 | |
| Optical Input Range | Optical AGC | dBm | 2 | - | -4 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Responsivity | 1310 nm | mA/mW | 0.8 | - | - | |
| | 1550 nm | | 0.95 | - | - | |
| RF Bandwidth | - | MHz | 54 | - | 1218 | |
| Frequency Response | - | dB | -0.5 | - | 0.5 | |
| Tilt | Reference from 105MHz | dB | 0 | - | 1 | |
| Optical Input DC Testpoint | 1310 nm | V/mW | 0.9 | 1 | 1.1 | |
| | 1550 nm | | 1 | 1.1 | 1.21 | |
| RF Output Test Point Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Output Level at 2 to -4dBm | Analog Reference | dBmV/ch | 26 | - | - | @ 3.4% OMI/ch |
| Optical Input Level | Digital | dBmV/ch | 20 | - | - | |
| MER | All Digital 85/105 Split, 20 ±1dB Slope | dB | 40 | - | - | Note 1b, 7 |
| BER | 160ch SCQAM (105 to 1215MHz) | - | - | - | 10 ⁻⁹ | |
| Optical Section: Analog Return Transmitter Module | | | | | | |
| Optical Wavelength | $\lambda_C \pm 20\text{nm}$, ITU-T, DFB | nm | 1271 | - | 1611 | |
| Optical Output Power | ±1dB Stability Over the Node's Operating Temperature Range | mW | 2 | - | 10 | See Ordering Matrix for Opt Power Model |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Optical DC Testpoint | - | V/mW | 0.9 | - | 1.1 | |
| RF Bandwidth | - | MHz | 5 | - | 210 | |
| Frequency Response | - | dB | -0.75 | - | 0.75 | |
| Tilt | Reference from 105MHz | dB | -0.5 | - | 1 | |
| Laser Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 21 | 22 | 23 | |
| CNR | 8ch Loading, 5-85MHz: 7, 19, 31, 43, 55.25, 67.25, 77.25, 83.25MHz | dB | 50 | - | - | Note 8 |
| CSO | | dBc | - | - | -55 | |
| CTB | | dBc | - | - | -60 | |
| XMOD | | dBc | - | - | -60 | |
| MER | 8ch Loading for 5-85MHz: 7, 19, 31, 43, 51, 63, 79, 85MHz | dB | 40 | - | - | Note 2, 8 |
| BER | - | - | - | - | 10 ⁻⁹ | |
| NPR | 5 - 85MHz Noise Loading, Test with QRR/DRR300 | dB | 40/11 | - | - | Note 8 |
| Optical Section: Digital Return Transmitter Module | | | | | | |
| Optical Wavelength | 1310 | nm | 1290 | 1310 | 1330 | |
| | ITU-T CWDM | | 1271 | - | 1611 | |
| | ITU-T, DWDM, 100GHz Spacing | | 1577 | - | 1528.8 | |
| Optical Output Power | 1310 | dBm | -5 | - | 1 | |
| | CWDM | | 0 | - | 3 | |
| | DWDM | | 2 | - | 7 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| RF Bandwidth | - | MHz | 5 | - | 85 | |
| Frequency Response | Test with QDR/DDR | dB | -0.75 | - | 0.75 | |
| RF Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 16 | 22 | 28 | |
| MER | 8ch Loading for 5-85MHz: 7, 19, 31, 43, 51, 63, 79, 85MHz | dB | 38 | - | - | Note 2, 9 |
| BER | - | - | - | - | 10 ⁻⁹ | |
| NPR | 5 - 85MHz Noise Loading, Test with QDR/DDR | dB | 40/18 | - | - | Note 9 |

Notes:

- (1a) Factory Digital Loading for testing: 256QAM (261 to 999MHz) + 1x192MHz OFDM, Source MER ≥ 43dB, MER/BER Test Frequencies: 261, 555, 747, 831, 999MHz
- (1b) Factory Digital Loading for testing: 256QAM (105 to 999MHz) + 1x192MHz OFDM, Source MER ≥ 43dB, MER/BER Test Frequencies: 105, 261, 555, 747, 831, 999MHz
- (2) 64QAM, Source MER ≥ 43dB
- (3) RF-Tray with Configure Board
- (4) ±1dB accuracy
- (5) Production Return Loss test limit is -16.5dB
- (6) Production TP level test limit is -20 ± 0.5dB
- (7) Downstream Link: Optical Link + RF-Tray. Po @ 1218MHz = 53 ± 1dBmV (Digital Level), Test with STD FT3UD-1310 or EMTx. 20km of fiber, Rx optical power = 0dBm
- (8) Upstream Link: RF-Tray + Optical Link. -10dBm rec'd optical power, QRR/DRR300 RF atten 10dB (RF output = 30 to 35dBmV/ch)
- (9) Upstream Link: RF-Tray + Optical Link. QDR/DDR output = 30 to 42dBmV/ch. Fiber Length: 40km for 1310nm, 80km for CWDM, 100km for DWDM

Specifications 204/258

| N5069 4-Output (Forward and Reverse Segmentable Optical Node 1218 MHz) | | | | | | |
|---|---|---------|---------------------------|------|------------------|--|
| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
| Downstream Station (including FWD Configure Board unless otherwise noted), Port 3, Port 4, Port 5, Port 6 | | | | | | |
| Downstream Passband | 204/258 Split | MHz | 258 | - | 1218 | |
| Input Current Capacity | 15 | A | - | - | 15 | |
| Hum Modulation | 5 to 1218 MHz | dBc | 65 | - | - | Time Domain @ 15A |
| RF Input Level | Analog Level into FWD Configure Board Input | dBmV/ch | 26 | - | - | |
| Gain (Ref @ 1218MHz) | With 1x4 FWD Config Board (Config Bd IL: -10dB) | dB | 32 | 33 | 34 | ±1dB stability over Node's Operating Temperature Range |
| | With 2x2 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| | With 4x4 FWD Config Board (Config Bd IL: -10dB) | dB | | | | |
| Port to Port Isolation | 258 to 1218 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | With FWD Configure Board | dB | -1 | - | 1 | |
| Output Return Loss | 258 to 1218 MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | - | dB | -20.6 | -20 | -19.4 | Note 6 |
| RF Output Level | 258/550/750/870/1002/1218 MHz | dBmV | 41.7/47/50.6/52.7/55.1/59 | | | Analog Reference, Note 4 |
| | | | 35.7/41/44.6/46.7/49.1/53 | | | Digital level, Note 4 |
| Operational Slope | 258/550/750/870/1002/1218 MHz | dB | 0/4/7.2/8.9/10.9/14 | | | |
| Slope Tolerance | - | dB | ±1 | | | |
| Slope Range | Min Slope = 10dB | dB | 11 | - | - | |
| MER | All Digital, 14dB Slope | dB | 40 | - | - | Note 1, 2, 7 |
| BER | 131ch SCQAM (258 to 1215 MHz) | - | - | - | 10 ⁻⁹ | |
| Spurious | - | dBc | - | - | -70 | |
| RF-Tray NF @ +20dB Slope | @ 258/550/1002/1218 MHz | dB | 12 | | | Without FWD Configure Board |
| Station NF @ +20dB Slope | @ 258/550/1002/1218 MHz | dB | 19/19/18.5/18 | | | Note 3 |
| Upstream Station (including the RTN Configure Board unless otherwise noted), Port 3, Port 4, Port 5, Port 6 | | | | | | |
| Upstream Passband | 204/258 Split | MHz | 5 | - | 204 | |
| Port to Port Isolation | 5 to 204 MHz | dB | - | - | -50 | Note 3 |
| Response Flatness | 5 to 204 MHz | dB | -0.75 | - | 0.75 | |
| Insertion Loss | Without the RTN configure board, REF @ 25MHz With Rejection Filter jumper, LPF and -1dB RF atten | dB | - | - | -8.5 | |
| Station Gain | RF Tray + All options of the RTN configure board REF @ 25MHz | dB | 6 | - | dB | ±1dB stability over Node's Operating Temperature Range |
| Station Tilt | - | dB | -1 | 0 | 0.5 | |
| Input Return Loss | 5 to 204 MHz | dB | - | - | -16 | Note 5 |
| RF Test Point Level | 5 to 204 MHz | dB | -20.6 | -20 | -19.4 | Note 6 |
| Bridge SW Attenuation Range | BSW Default Setting Stages: 0dB, -3dB, -6dB and Open | dB | 12 | - | - | ±0.5dB Atten Accuracy |
| RF Input Level | - | dBmV/ch | 17 | - | - | |
| Station Output to OTx | With all options of the RTN configure board | dBmV/ch | - | 23 | - | |
| RF-Tray NF | Meas @ 25MHz | dB | - | 7.5 | 8.5 | Without RTN Configure Board |
| Station NF | Option: 4x1/4x4/2x2 | dB | 23/22/19 | | | Note 3 |
| CSO | 8ch Loading for 5-85MHz: 7, 19, 31, 43, 55.25, 67.25, 77.25, 83.25 MHz | dBc | - | - | -75 | |
| CTB | | dBc | - | - | -80 | |
| XMOD | | dBc | - | - | -80 | |
| MER | 31ch SCQAM Loading (7 to 201 MHz) | dB | 40 | - | - | Note 2 |
| BER | | - | - | - | 10 ⁻⁹ | |
| Peak NPR | 5-204 MHz | dB | 45 | - | - | |
| Dynamic Range | @ NPR40dB | dB | 25 | - | - | |

(Forward and Reverse Segmentable Optical Node 1218 MHz)

| Parameter | Conditions | Units | Min | Typ. | Max | Notes |
|--|---|---------|-------|------|------------------|--|
| Optical Section: Forward Receiver Module | | | | | | |
| Optical Wavelength | - | MHz | 1260 | - | 1620 | |
| Optical Input Range | Optical AGC | dBm | 2 | - | -4 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Responsivity | 1310 nm | mA/mW | 0.8 | - | - | |
| | 1550 nm | | 0.95 | - | - | |
| RF Bandwidth | - | MHz | 54 | - | 1218 | |
| Frequency Response | - | dB | -0.5 | - | 0.5 | |
| Tilt | Reference from 258 MHz | dB | 0 | - | 1 | |
| Optical Input DC Testpoint | 1310 nm | V/mW | 0.9 | 1 | 1.1 | |
| | 1550 nm | | 1 | 1.1 | 1.21 | |
| RF Output Test Point Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Output Level at 2 to -4dBm | Analog Reference | dBmV/ch | 26 | - | - | @ 3.4% OMI/ch |
| Optical Input Level | Digital | dBmV/ch | 20 | - | - | |
| MER | All Digital 204/258 Split, 14 ±1dB Slope 131ch SCQAM (258 to 1215 MHz) | dB | 40 | - | - | Note 1, 2, 7 |
| BER | | - | - | - | 10 ⁻⁹ | |
| Optical Section: Analog Return Transmitter Module | | | | | | |
| Optical Wavelength | $\lambda_c \pm 20\text{nm}$, ITU-T, DFB | nm | 1271 | - | 1611 | |
| Optical Output Power | ±1dB Stability Over the Node's Operating Temperature Range | mW | 2 | - | 10 | See Ordering Matrix for Opt Power Model |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| Optical DC Testpoint | - | V/mW | 0.9 | - | 1.1 | |
| RF Bandwidth | - | MHz | 5 | - | 210 | |
| Frequency Response | - | dB | -0.75 | - | 0.75 | |
| Tilt | 5 to 204 MHz | dB | -0.5 | - | 1 | |
| Laser Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 21 | 22 | 23 | |
| CNR | 8ch Loading, 5-85MHz: 7, 19, 31, 43, 55.25, 67.25, 77.25, 83.25MHz | dB | 50 | - | - | Note 8 |
| CSO | | dBc | - | - | -55 | |
| CTB | | dBc | - | - | -60 | |
| XMOD | | dBc | - | - | -60 | |
| MER | 31ch SCQAM Loading (7 to 201 MHz) | dB | 40 | - | - | Note 2, 8 |
| BER | | - | - | - | 10 ⁻⁹ | |
| NPR | 5 - 204 MHz Noise Loading, Test with QRR/DRR300 | dB | 40/10 | - | - | Note 8 |
| Optical Section: Digital Return Transmitter Module | | | | | | |
| Optical Wavelength | 1310 | nm | 1290 | 1310 | 1330 | |
| | ITU-T CWDM | | 1271 | - | 1611 | |
| | ITU-T, DWDM, 100GHz Spacing | | 1577 | - | 1528.8 | |
| Optical Output Power | 1310 | dBm | -5 | - | 1 | |
| | CWDM | | 0 | - | 3 | |
| | DWDM | | 2 | - | 7 | |
| Optical Return Loss | SC/APC | dB | 40 | - | - | |
| RF Bandwidth | - | MHz | 5 | - | 204 | |
| Frequency Response | Test with QDR/DDR | dB | -0.75 | - | 0.75 | |
| RF Input Testpoint Level | - | dB | -20.5 | -20 | -19.5 | |
| RF Input Level | Upstream RF Level from RF-Tray Into OTx | dBmV/ch | 16 | 22 | 28 | |
| MER | 31ch SCQAM Loading (7 to 201 MHz) | dB | 38 | - | - | Note 2, 9 |
| BER | | - | - | - | 10 ⁻⁹ | |
| NPR | 5 - 204 MHz Noise Loading, Test with QDR/DDR | dB | 40/16 | - | - | Note 9 |

Notes:

- Factory Digital Loading for testing: 256QAM (261 to 999MHz) + 1x192MHz OFDM, Source MER ≥ 43dB, MER/BER Test Frequencies: 261, 555, 747, 831, 999MHz
- 64QAM. Source MER ≥ 43dB. Measured MER is Source corrected as defined in ANSI/SCTE 96 2020. Max correction is 4.3dB.
- RF-Tray with Configure Board
- ±1dB accuracy
- Production Return Loss test limit is -16.5dB
- Production TP level test limit is -20 ± 0.5dB
- Downstream Link: Optical Link + RF-Tray. Po @ 1218MHz = 53 ± 1dBmV (Digital Level), Test with STD FT3UD-1310 or EMTx. 20km of fiber, Rx optical power = 0dBm
- Upstream Link: RF-Tray + Optical Link. -10dBm rec'd optical power, QRR/DRR300 RF atten 10dB (RF output = 30 to 35dBmV/ch)
- Upstream Link: RF-Tray + Optical Link. QDR/DDR output = 30 to 42dBmV/ch. Fiber Length: 40km for 1310nm, 80km for CWDM, 100km for DWDM

Receiver, Transmitter and Spare Parts

| RECEIVER AND TRANSMITTERS | |
|---|--|
| XXX = Optical Connector Type (FC/UPC, FC/APC SC/APC & SC/UPC) | |
| Part Number | Description |
| 090816-01XXX | Receiver, N50 MIMIC 1218 MHz |
| 090817-01XXX | Transmitter N50 DFB Uncooled, Isolated 1310 nm 1.0 mW |
| 090817-02XXX | Transmitter N50 DFB Uncooled, Isolated 1310 nm 2.0 mW |
| 090817-03XXX | Transmitter N50 DFB Uncooled, Isolated 1310 nm 3.0 mW |
| 090818-02XXX | Transmitter N50 DFB Uncooled, Isolated 1550 nm 2.0 mW |
| 090818-04XXX | Transmitter N50 DFB Uncooled, Isolated 1550 nm 4.0 mW |
| 090819-01XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1471 nm 2.0 mW |
| 090819-02XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1491 nm 2.0 mW |
| 090819-03XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1511 nm 2.0 mW |
| 090819-04XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1531 nm 2.0 mW |
| 090819-05XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1551 nm 2.0 mW |
| 090819-06XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1571 nm 2.0 mW |
| 090819-07XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1591 nm 2.0 mW |
| 090819-08XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1611 nm 2.0 mW |
| 090820-01XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1471 nm 3.0 mW |
| 090820-02XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1491 nm 3.0 mW |
| 090820-03XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1511 nm 3.0 mW |
| 090820-04XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1531 nm 3.0 mW |
| 090820-05XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1551 nm 3.0 mW |
| 090820-06XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1571 nm 3.0 mW |
| 090820-07XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1591 nm 3.0 mW |
| 090820-08XXX | Transmitter N50 DFB CWDM Uncooled, Isolated 1611 nm 3.0 mW |
| 090824-XXXXX | Transmitter N50, DWDM ITU CHXX XXXX.XX nm 10.0 mW |
| FORWARD AND RETURN CONFIG MODULES | |
| 090850-01 | Return Config Module 1x4 42MHz |
| 090851-01 | Return Config Module 2x2 42MHz |
| 090852-01 | Return Config Module 4x4 42MHz |
| 090850-02 | Return Config Module 1x4 85MHz |
| 090851-02 | Return Config Module 2x2 85MHz |
| 090852-02 | Return Config Module 4x4 85MHz |
| 090850-03 | Return Config Module 1x4 204MHz |
| 090851-03 | Return Config Module 2x2 204MHz |
| 090852-03 | Return Config Module 4x4 204MHz |
| 090853-01 | Forward Config Module 1x4 42MHz |
| 090854-01 | Forward Config Module 2x2 42MHz |
| 090855-01 | Forward Config Module 4x4 42MHz |
| 090853-02 | Forward Config Module 1x4 85MHz |
| 090854-02 | Forward Config Module 2x2 85MHz |
| 090855-02 | Forward Config Module 4x4 85MHz |
| 090853-03 | Forward Config Module 1x4 204MHz |
| 090854-03 | Forward Config Module 2x2 204MHz |
| 090855-03 | Forward Config Module 4x4 204MHz |
| POWER SUPPLY | |
| N50-90VPS | N50 40-90 VAC Power Supply |
| REMOTE PHY Mounting Plate Kit | |
| 120631-01 | KIT, N50 Remote PHY Plate Installation Kit |
| AC ENTRY KITS | |
| 120634-01 | AC Entry Right Installation Kit |
| 120635-01 | AC Entry Left Installation Kit |

Part Number Ordering Matrix

N5069 4x4 Optical Node Configuration Sheet

Customer: _____

Created By: _____ Order Date: _____

ORDERING MATRIX

November 7, 2022

| | | | | | | | | | | | | | | | | | | |
|-------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| Position | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| PART NUMBER | 5 | S | | | | | | | | | | | | | | | | |

3 **BASE CONFIGURATION**

A = FWD 1x4 REV 4x1 Nonsegmented
1 Transmitter installed
1 Receiver installed

C = FWD 2X2 REV 2X2 Forward & Return segmented
2 Transmitters installed
2 Receivers installed

G = FWD 4X4 REV 4X4 Forward & Return segmented
4 Transmitters installed
4 Receivers installed

L = FWD 1X4 REV 4X1 Nonsegmented (See Note 2)
1 Remote PHY 1x1 module installed (1 DS + 1US) capable

M = FWD 2X2 REV 2X2 Forward & Return Segmented (See Notes 1 & 2)
2 Remote PHY 1x1 modules installed (2 DS + 2 US) capable

N = FWD 2X2 REV4X4 Forward & Return Segmented (See Notes 1 & 2)
2 Remote PHY(1x2) modules installed (2 DS + 4 US) capable

P = FWD 1X4 REV 2X2 Forward Nonsegmented & Return Segmented (See Note 2)
1 Remote PHY(1x2) module installed (1 DS + 2 US) capable

R = FWD 2X2 REV 2X2 Forward & Return segmented Digital RPD (See Note 2)
with FWD analog RF overlay
1 Remote PHY 1x2 module installed (1 DS + 2 US) & 1 Receiver installed capable

4 **DIPLEX FREQUENCY SPLIT & OPTICAL CONNECTOR TYPE**

| Connector Split | SC/APC | SC/UPC | FC/APC | FC/UPC |
|-----------------|------------|------------|------------|--------|
| 4 = 42/53 | A = 42/53 | E = 42/53 | J = 42/53 | |
| 5 = 55/70 | B = 55/70 | F = 55/70 | K = 55/70 | |
| 6 = 65/85 | C = 65/85 | G = 65/85 | L = 65/85 | |
| 8 = 85/105 | D = 85/105 | H = 85/105 | M = 85/105 | |

TYPE DWDM: ITU Grid: C-Band, 100 GHz Spacing (10.0 mW)

| | | |
|-----------------------------|-----------------------------|-----------------------------|
| 19 = Channel 19 - 1562.23nm | 35 = Channel 35 - 1549.32nm | 51 = Channel 51 - 1536.61nm |
| 20 = Channel 20 - 1561.42nm | 36 = Channel 36 - 1548.52nm | 52 = Channel 52 - 1535.82nm |
| 21 = Channel 21 - 1560.61nm | 37 = Channel 37 - 1547.72nm | 53 = Channel 53 - 1535.04nm |
| 22 = Channel 22 - 1559.79nm | 38 = Channel 38 - 1546.92nm | 54 = Channel 54 - 1534.25nm |
| 23 = Channel 23 - 1558.98nm | 39 = Channel 39 - 1546.12nm | 55 = Channel 55 - 1533.47nm |
| 24 = Channel 24 - 1558.17nm | 40 = Channel 40 - 1545.32nm | 56 = Channel 56 - 1532.68nm |
| 25 = Channel 25 - 1557.36nm | 41 = Channel 41 - 1544.53nm | 57 = Channel 57 - 1531.90nm |
| 26 = Channel 26 - 1556.56nm | 42 = Channel 42 - 1543.73nm | 58 = Channel 58 - 1531.12nm |
| 27 = Channel 27 - 1555.75nm | 43 = Channel 43 - 1542.94nm | 59 = Channel 59 - 1530.33nm |
| 28 = Channel 28 - 1554.94nm | 44 = Channel 44 - 1542.14nm | 60 = Channel 60 - 1529.55nm |
| 29 = Channel 29 - 1554.13nm | 45 = Channel 45 - 1541.35nm | 61 = Channel 61 - 1528.77nm |
| 30 = Channel 30 - 1553.33nm | 46 = Channel 46 - 1540.55nm | 62 = Channel 62 - 1527.99nm |
| 31 = Channel 31 - 1552.52nm | 47 = Channel 47 - 1539.77nm | 63 = Channel 63 - 1527.22nm |
| 32 = Channel 32 - 1551.72nm | 48 = Channel 48 - 1538.98nm | 64 = Channel 64 - 1526.44nm |
| 33 = Channel 33 - 1550.92nm | 49 = Channel 49 - 1538.19nm | |
| 34 = Channel 34 - 1550.12nm | 50 = Channel 50 - 1537.40nm | |

- 5 & 6 TRANSMITTER 1 - Primary 4X1, or Ports 3 & 4 for 2X2, Port 3 for 4X1
 - 7 & 8 TRANSMITTER 2 - Secondary 4X1 or Ports 5 & 6 for 2X2 or Port 5 for 4X1
 - 9 & 10 TRANSMITTER 3 - Secondary Ports 3 & 4 for 2X2 or Port 4 for 4X1
 - 11 & 12 TRANSMITTER 4 - Secondary Ports 5 & 6 for 2X2 or Port 6 for 4X1
- 00 = NO TRANSMITTERS INSTALLED

REMOTE PHY MODULE ENTER "RP" FOR POSITIONS 5&6, 9&10
REMOTE PHY MODULE CONFIGURATIONS:
 FILL IN POSITION 7&8 FOR RPD#1, 11&12 FOR RPD#2

ANALOG TRANSMITTER OPTIONS:
TYPE FP & DFB
 00 = None
 D0 = Uncooled 1310 nm 1.0 mW FP
 H0 = Uncooled 1310 nm 2.0 mW FP W/ISOLATOR
 J0 = Uncooled 1310 nm 1.0 mW DFB
 R0 = Uncooled 1310 nm 2.0 mW DFB
 B0 = Uncooled 1310 nm 3.0 mW DFB
 C0 = Uncooled 1550 nm 2.0 mW DFB
 Z0 = Uncooled 1550 nm 4.0 mW DFB

TYPE DFB CWDM 2.0 mW
 A2 = Uncooled 1471 nm DFB CWDM (2.0 mW)
 G2 = Uncooled 1491 nm DFB CWDM (2.0 mW)
 V2 = Uncooled 1511 nm DFB CWDM (2.0 mW)
 L2 = Uncooled 1531 nm DFB CWDM (2.0 mW)
 W2 = Uncooled 1551 nm DFB CWDM (2.0 mW)
 M2 = Uncooled 1571 nm DFB CWDM (2.0 mW)
 N2 = Uncooled 1591 nm DFB CWDM (2.0 mW)
 T2 = Uncooled 1611 nm DFB CWDM (2.0 mW)

TYPE DFB CWDM 3.0 mW
 A3 = Uncooled 1471 nm DFB CWDM (3.0 mW)
 G3 = Uncooled 1491 nm DFB CWDM (3.0 mW)
 W3 = Uncooled 1551 nm DFB CWDM (3.0 mW)
 N3 = Uncooled 1591 nm DFB CWDM (3.0 mW)
 T3 = Uncooled 1611 nm DFB CWDM (3.0 mW)

TYPE DFB CWDM 4.0, 5.0 & 6.0 mW
 W4 = Uncooled 1551 nm DFB CWDM (4.0 mW)
 W5 = Uncooled 1551 nm DFB CWDM (5.0 mW)
 N5 = Uncooled 1591 nm DFB CWDM (5.0 mW)
 T5 = Uncooled 1611 nm DFB CWDM (5.0 mW)
 A6 = Uncooled 1471 nm DFB CWDM (6.0 mW)
 G6 = Uncooled 1491 nm DFB CWDM (6.0 mW)

TYPE REMOTE PHY MODULE CONFIGURATIONS (See Notes 1 & 2)
 00= No Remote PHY Module
 MP= Remote PHY Module Mounting Plate Installed
 11= 1 Down Stream + 1 Up Stream (1x1 module) Base options L, M or Q
 12= 1 Down Stream + 2 Up Stream (1x2 module) Base option N, P or R

Mux/Demux Module for CWDM, DWDM or WDM
(For a 1X2 Mux or WDM use position 13)
MUX A -Use for 2X2, or ports 3 & 5 for 4X4
MUX B Ports 4 & 6 for 4X4 or 2X2, 2+2, With Optics Redundancy
 0 = None
 A = FWD path 1291, 1293; REV path 1471, 1491 nm & common
 B = FWD path 1290, 1295; REV path 1591, 1611 nm & common
 C = FWD Path 1310, 1431; REV path 1451, 1551 nm & common
 P = DWDM 1291/CWDM 1471 nm
 W = WDM 1310/1550 nm

Future = ____ A1 ____ A2 ____ A3 ____ A4

SLOPE

| MHz | 550 | 750 | 870 | 1002 | 1218 |
|-----|-----|------|------|------|------|
| E= | 8.3 | 12.2 | 14.5 | 17.0 | 21.0 |
| T= | 6.3 | 10.2 | 12.5 | 15.0 | 19.0 |

HOUSING OPTIONS & POWER SUPPLY QUANTITY (See Note 1)
 P = Complete Node - 1 Power Supply
 K = Upgrade kit - 1 Power Supply
 E = Complete Node - 2 Power Supplies
 F = Upgrade kit - 2 Power Supplies

STATUS MONITORING
 0 = None
 D = DOCSIS HMS Transponder

CUSTOM
 0 = None
 X = Determined by Product Management

NOTES:

- For Configurations with 2 Remote PHY modules 2 power supplies are required.
- For Configurations with remote PHY modules a 10GBASE SFP + single mode fiber optic transceiver submodule is needed for each RPD to establish the digital fiber link with the headend CCAP core.
- Example: 5NC4A2G20000A0EP00
 2X2 Forward & Reverse segmented node, 2 Receivers, TX1: CWDM 1471nm 2mW, TX2: CWDM 1491nm 2mW, 1 Mux/Demux module DWDM1291/1293/CWDM 1471/1491nm 1.2GHz/Slope 21dB, complete node with single power supply.

Power Consumption

| Node Option | With Xponder | W/O Xponder |
|----------------------|--------------|-------------|
| | Watts | Watts |
| 4x4 Analog OTx & ORx | 148 | 143 |
| 2x2 Analog OTx & ORx | 127 | 122 |
| 1x4 Analog OTx & ORx | 117 | 112 |
| Dual RPD Node | 154 | 154 |
| Single RPD Node | 128 | 128 |



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