CIR - Chromadigm Integrated RFoG Transmitter

Installation and Operation Guide

InnoTrans Chromadigm CIR Transmitter
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Table of Contents

1 Important Safety Instructions 5

1.1 Electric Shock Hazard 5

1.2 Installation Site 5

1.3 Installation Requirements 5

1.4 Equipment Placement 5

1.5 Power Connections 6

1.6 Fuse Replacement 6

1.7 Laser Safety 7

1.8 Laser Power and Warning Labels 7

2 Product Introduction 8

3 Unpacking and Inspecting a New Unit 9

3.1 What to do about physical damage 9

3.2 What to do about concealed damage 9

3.3 How to return equipment 9

4 Specifications 10

5 Block Diagram and Operation 11

6 Front and Rear Panel 12

6.1 Front Panel 12

6.2 Rear Panel 12

6.3 Alarm Status Indicators 13

7 Chassis Installation 14

7.1 Site considerations 14

7.2 Airflow considerations: 14

7.3 Electrical / Network Connections: 14

8 RF and Optical Connections 15
8.1 RF Connections 16
8.2 Optical Connections 16
9 Module Setup 17
9.1 Setting RF input levels 17
9.2 Configuring the CIR transmitter 18
9.2.1 AGC Mode 19
9.2.2 MGC mode 20
10 Troubleshooting the CIR transmitter 23

1 Important Safety Instructions

- Carefully read all safety and operating instructions contained in this user guide before operating this equipment, and retain them for future reference.
- Follow all installation and operating instructions. Pay attention to all warnings and cautions in the user guide as well as those that are affixed to this equipment.

1.1 Electric Shock Hazard

This equipment meets applicable safety standards.

WARNING:
To reduce risk of electric shock, perform only the instructions that are included in the operating instructions. Refer all servicing to qualified service personnel only.

Adhere to the following safety warnings and guidelines:

- Dangerous Voltages
  - Only qualified service personnel are allowed to perform equipment installation or replacement.
  - Disconnect power before servicing the unit.
  - Only qualified service personnel are allowed to remove chassis covers and access field replaceable pluggable accessories.
- Grounding
  - Do not violate the protective grounding by using extension cables, power cables, or other devices on the mains power without a protective ground conductor.
  - If this equipment is equipped with an external grounding terminal, attach one end of an 18-gauge wire (or larger) to the grounding terminal; then, attach the other end of the wire to a ground, such as a grounded equipment rack.

1.2 Installation Site

When selecting the installation site, comply with the following:

- Maintain a Protective Ground - The protective ground lead of the building's electrical installation should comply with national and local electrical and safety requirements.
- Environmental Condition – The installation site should be dry, clean, and ventilated. Do not use this equipment where it could be at risk of contact with water. Ensure that this equipment is operated in an environment that meets the requirements as stated in this equipment's environmental specifications.

1.3 Installation Requirements

WARNING:
Allow only qualified service personnel to install this equipment. The installation must conform to all local codes and regulations.

1.4 Equipment Placement

WARNING:
Avoid personal injury and damage to this equipment. An unstable mounting surface may cause this equipment to fall.

- Install this equipment in a restricted access location.

- Place this equipment close enough to a mains AC outlet to accommodate the length of this equipment's power cord.
- Route all power cords so that people cannot walk on, place objects on, or lean objects against them.
- Make sure the mounting surface or rack is stable and can support the size and weight of this equipment.
- Make sure that the rack is placed on a stable surface. If the rack has stabilizing devices, install these stabilizing devices before mounting any equipment in the rack. The mounting surface or rack should be appropriately anchored according to the manufacturer's specifications.
- Ensure this equipment is securely fastened to the mounting surface or rack to protect against damage.
- This equipment has openings for ventilation to protect it from overheating. To ensure equipment reliability and safe operation, do not block or cover any of the ventilation openings.

WARNING:
Avoid personal injury and damage to this equipment. Mounting this equipment in the rack should be such that a hazardous condition is not caused due to uneven mechanical loading.

CAUTION:
Installation of this equipment in a rack should be such that the amount of airflow required for safe operation of this equipment is not compromised.

1.5 Power Connections

Connection to AC Power source

Important: If this equipment is Class I equipment, it must be grounded.

- Connect this equipment only to the power sources identified on the equipment-rating label.
- Overcurrent protection breakers or fuses must be sized appropriately for the total current rating of the chassis or multiple chassis that are connected to a common mains circuit.
- This equipment may have two power sources. Be sure to disconnect all power sources before working on this equipment.
- If this equipment **does not** have a main power switch, the power cord connector serves as the disconnect device.

Connection to -48 VDC Power Source

- Use at least #16 AWG wire for all DC power wiring.
- Overcurrent protection breakers or fuses must be sized appropriately for the total current rating of the chassis.
- Follow the recommended practices of the DC power system manufacturer.

CAUTION:
Consider the connection of this equipment to the supply circuit and the effect that overloading of circuits might have on overcurrent protection and supply wiring.

1.6 Fuse Replacement

To replace a fuse, comply with the following:

- Disconnect the power before changing fuses.
- Identify and clear the condition that caused the original fuse failure.
- Always use a fuse of the correct type and rating. The correct type and rating are indicated on this equipment.

1.7 Laser Safety

This equipment may contain or be connected to an infrared laser source that transmits intensity-modulated light and emits invisible radiation.

WARNING: Avoid Personal Injury
The laser light source on this equipment or the fiber cables connected to this equipment emit invisible laser radiation. Avoid direct exposure to the laser light source.

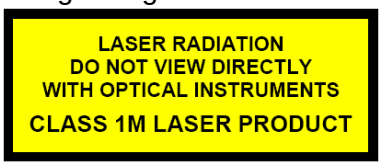
Viewing the laser output (if a transmitter) or fiber cable with optical instruments may pose an eye hazard.

This equipment may only be installed, operated and serviced by authorized personnel trained in the safe handling and operation of fiber optic cables and laser sources.

- Do not apply power to this equipment if the fiber is unmated or unterminated.
- Do not look into an activated fiber with optical instruments such as magnifiers, or microscopes.

1.8 Laser Power and Warning Labels

This equipment may contain or be connected to other equipment containing Class 1M laser sources. The following labels adhered to each product will indicate the type of laser source utilized along with general laser radiation labels.



2 Product Introduction

The CIR (Chromadigm Integrated RFoG) transmitter integrates a high power EDFA, high SBS suppression, optical splitter and optional filters to support bi-directional transmission of RFoG and xPON wavelengths in a single rack unit (1 RU) package. The CIR incorporates InnoTrans' Chromadigm CHIRP Cancellation and Clipping Mitigation technology to deliver exceptional MER and error-free, pre-FEC BER performance with low R-ONU optical input levels.

The CIR transmitter with its innovative technology sets the performance standard for RFoG and PON RF overlay application offering a unique set of benefits:

- CHIRP Cancellation for distance independent performance
- Adaptive Clipping Mitigation for error-free QAM performance
- 1 GHz RF passband
- High OMI produces higher RF output levels and improved MER performance at the R-ONU
- High SBS suppression supports +20 dBm over 20 km of fiber
- Improved dynamic range to support DOCSIS 3.1
- Integrated RFoG return and xPON filters eliminates external fiber connections, rack space and insertion loss.

The CIR is offered with either one, two, four or eight output ports with 9, 18 or 20 dBm of output power. The 1 RU chassis supports modular and redundant AC or DC power supplies.

3 Unpacking and Inspecting a New Unit

Before shipment, InnoTrans Communications inspects and packs all the essential items carefully. Nevertheless, damage may occur during shipment. The carrier assumes full responsibility for a safe delivery of the equipment.

1) Inspect the package for any physical damage.
2) Open the package.
3) Remove any packing material.
4) Inspect the unit for any physical damage.
5) Shake the unit with care, paying attention to any rattling loose parts that may suggest concealed damage (some noise due to moving cables is normal)
6) Check for any missing accessories.

When any damage is noticed to the merchandise, please notify the InnoTrans Customer Service representative (408-227-3400) and file a claim with the carrier as noted below.

3.1 What to do about physical damage

Record any evidence of physical damage or loss on the freight bill or receipt and have the carrier's agent sign it. If you fail to do so, the carrier may refuse to honor the damage claim. The carrier will supply you with any forms required to file such a claim.

3.2 What to do about concealed damage

Damage which is not apparent until the unit has been unpacked is considered concealed damage. The contents may have been damaged due to rough handling even if there is no external evidence. If you should notice damage upon unpacking the unit you should make a written request for inspection by the carrier's agent within 10 days of the delivery date. Afterwards file a claim with the carrier.

3.3 How to return equipment

Call InnoTrans Communications at 408-227-3400 or email support@inno-trans.com for a Return Materials Authorization (RMA) number. You will need the unit's serial number, description of the problem, and some shipping information. We must receive the unit within thirty (30) days from the date a RMA number is issued. If for any reason, you want to ship the unit 30 days after the RMA number has been issued, you must obtain a new RMA number by calling or emailing InnoTrans Communications. Units received without an RMA number or one with an expired RMA number will not be accepted by our receiving department.

4 Specifications

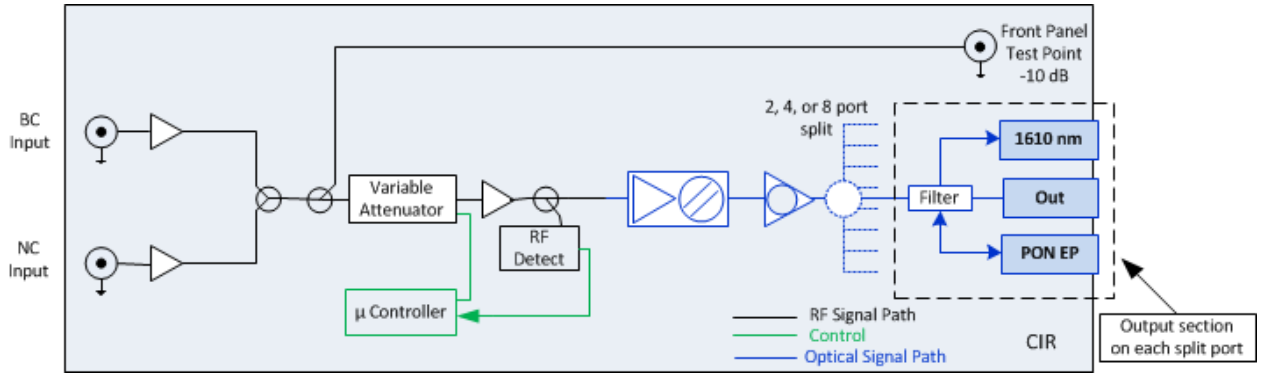
Optical Parameter	CIR		Notes
Wavelength	1540 nm to 1562 nm ITU Channels: 20 to 39		RFoG compliant range
Optical Power	9, 16, 18, 20 dBm		
Number of ports	1, 2, 4 or 8		
Optical connector	LC/APC		
RF Parameter			**Notes**
Frequency range	54 to 1002 MHz		
Flatness	±0.75 dB (54 to 1218 MHz)		
Return loss	16 dB		
RF Test Point	-20 dB		
Total composite RF input (Broadcast + Narrow cast)	38 dBmV		RF reads 0 in Tx status menu provides 3 to 4 dB gain reserve
Channel Loading per channel input level	**Analog**	**QAM**	**Reserve Gain**
30 NTSC analog (54-258 MHz), 125 ITU-T J.83 Annex B QAM 256 channels (258-1002 MHz)	20 dBmV	14 dBmV	Stated RF levels provide about 3 to 4 dB of reserve gain
60 NTSC analog (54-445 MHz), 95 ITU-T J.83 Annex B QAM 256 channels (451-1002 MHz)	19 dBmV	13 dBmV	
80 NTSC analog (54-555 MHz), 75 ITU-T J.83 Annex B QAM 256 channels (561-1002 MHz)	18 dBmV	12 dBmV	
All QAM, 155 ITU-T J.83 Annex B QAM 256 channels (54-1002 MHz)	N/A	16 dBmV	

Link Performance (excluding source)	CNR	CTB/CSO	MER	BER	
80 NTSC analog (54-555 MHz), 75 ITU-T J.83 Annex B QAM 256 channels (561-1002 MHz)	48 dB	-65/-62 dBc	41 dB	<1.0 E-9 pre FEC	20 km fiber, 17 dB passive loss -3.5 dBm receive optical level. R-ONU 5pA/√Hz
60 NTSC analog (54-445 MHz), 95 ITU-T J.83 Annex B QAM 256 channels (451-1002 MHz)	48 dB	-65/-62 dBc	41 dB	<1.0 E-9 pre FEC	
30 NTSC analog (54-258 MHz), 125 ITU-T J.83 Annex B QAM 256 channels (258-1002 MHz)	48 dB	-65/-62 dBc	41 dB	<1.0 E-9 pre FEC	
All QAM, 155 ITU-T J.83 Annex B QAM 256 channels (54-1002 MHz)	N/A	N/A	43 dB	<1.0 E-9 pre FEC	

Management		Notes
Local	Front panel display, CLI, GUI	15 PIN connector
Remote	SNMP Enterprise MIB, GUI, CLI Telnet	RJ45 Ethernet on Chassis
Electrical & Operational		**Notes**
Power Consumption	30 to 60 W	Output power dependent
AC Power Supply Range	85 to 240 VAC	
DC Power Supply Range	-42 to -56 VDC	
Operating Temperature	0 to 50 °C	
Storage Temperature	-40 to +65 °C	
Dimensions (W x H x D)	19" x 1.75" x 21" (1RU)	
Weight	18 lbs.	

5 Block Diagram and Operation

The following block diagram depicts the RF and optical signal flow through the CIR transmitter.



CIR Chromadigm Integrated RFoG Transmitter Block Diagram

The CIR (Chromadigm Integrated RFoG) transmitter is a single wavelength transmitter which integrates a high power EDFA, high SBS suppression, optical splitter and optional filters to support bi-directional transmission of RFoG and xPON wavelengths in a single rack unit (1 RU) package. There are two RF input ports, a Broadcast (BC) RF input and a Narrowcast (NC) input port. The NC channels are combined with the BC channels creating a full spectrum of channel loading from 54 MHz to 1002 MHz. The combined signal is coupled to a -10 dB front panel RF test point. The combined BC and NC signal first passes through a variable RF attenuator. The attenuator is either automatically set through the feedback loop when operated in the AGC mode or may be set in the manual mode via the chassis front panel menu display, LAN or Local RS232 connection. The signal is amplified and then passes through a directional coupler used to sample the RF signal for the AGC control loop which controls the variable attenuator. The RF signal is adjusted to the optimal total power level and then applied to the optical laser. The patented Clipping Mitigation circuit is also within the RF path to mitigate instantaneous peak bursts of the Analog or QAM modulated signals which normally would overdrive the laser, briefly resulting in bit errors of the QAM signals.

The laser modulates the RF signals onto an optical signal with an assigned wavelength between ITU C-Band channels 20 to 39. The optical signal is then CHIRP cancelled, amplified and split according to the number of output ports. Each output port has a filter to extract the RFoG 1610 nm upstream wavelength. An optional filter can also be added to support connecting to an xPON OLT supporting the bi-directional xPON wavelengths.

6 Front and Rear Panel

6.1 Front Panel

The following diagram and table depicts the interfaces of the CIR transmitter front panel.

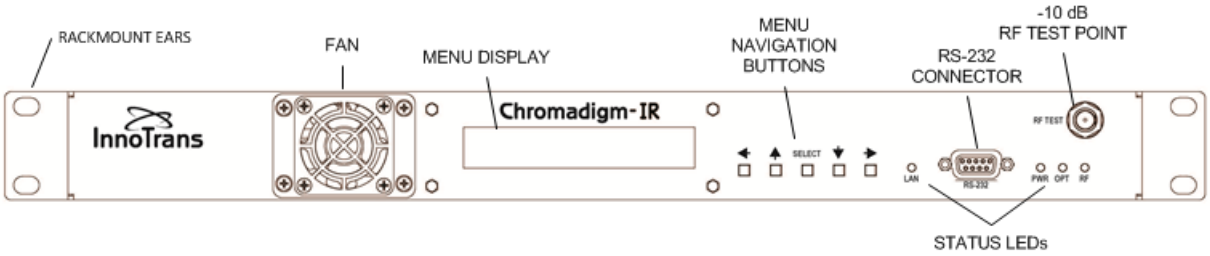


Table of Front Panel Interfaces

Rack Mount Ears	Rack mount ears come attached for standard 19” EIA relay racks or cabinets.
Fan	Front panel fan pulls air into the chassis.
Menu Display	Displays the CIR setup, alarm and status menus.
Menu Navigation Buttons	Used to navigate and configure the CIR setup, alarm and status menus.
RS-232 Connector	Local connection to a PC for the CLI interface.
RF test point	-10 dB sample of the RF input to the module.
Transmitter Status LEDs	Visual alarm status indicators.

6.2 Rear Panel

The following diagram and table depicts the features of the CIR transmitter rear panel with DC power supplies.

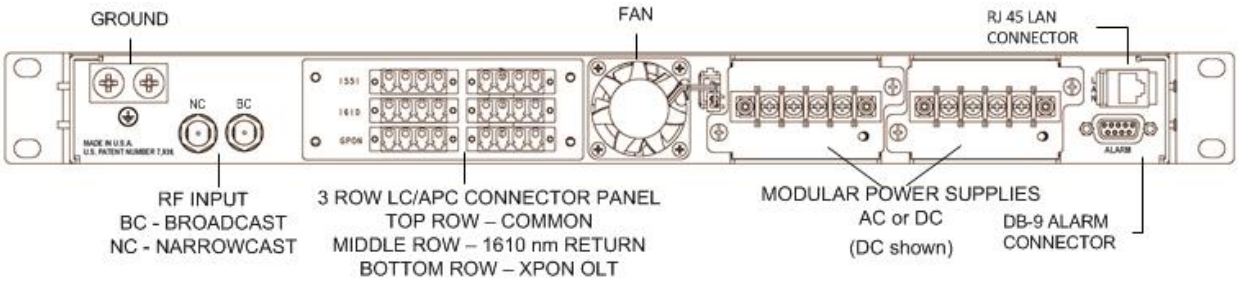


Table of Rear Panel Interfaces

RF Input	Separate broadcast and narrowcast RF input connectors.
Ground Terminal	Connection point to the rack bonding system.
Optical Connections	Three rows of optical interface connections: Top row is the common port Middle row is the RFoG 1610 nm return port Bottom row is the PON OLT interface port
Fan	Rear panel fan pulls air from the front of the chassis.
LAN	RJ 45 10/100BASE-T Ethernet LAN connector provides a network connection to the chassis and application modules.
Alarm	DB-9 connector for hard wired alarm connection.
Power Supply Slots	Two AC or DC power supply module slots.

6.3 Alarm Status Indicators

LED	Function	Value
LAN	Indication of LAN connection activity	Green – flashes with activity
PWR	Fan, Power Supply, Temperature	Green = Normal Amber = Minor Temperature alarm Red = Major Temperature or fan failure
OPT	Optical output power Laser temperature Module temperature	Green = Normal Amber = Minor Temp alarm or Opt power +/- 1dB Red = Major temp alarm or Opt power +/- 2 dB
RF	Monitors the RF drive level to each laser.	Green = Normal Amber = Minor alarm, RF out of range +/- 2 dB Red = Major alarm, RF out of range +/- 3 dB

7 Chassis Installation

The CIR chassis is designed to be mounted in standard EIA 19" relay racks or equipment cabinets and consumes one rack unit (1 U) of space.

7.1 Site considerations

Before beginning the installation, ensure the site meets the following requirements along with adhering to the safety considerations outlined in Section 1.

- Warning! Ensure that only authorized personnel have access to this equipment. Otherwise, personal injury or equipment damage may occur.
- Allow sufficient clearance around the rack for installation and maintenance of the equipment.
- Caution! Avoid damage to this product! Operating this product outside the specified operating temperature limits or voids the warranty.
- Ensure the racks and cabinets are properly installed, secure and stable in accordance with the equipment manufacturer's instructions.
- Ensure the rack space where the chassis is to be installed is clear of any obstructions.

7.2 Airflow considerations:

The CIR chassis is designed for front to back airflow. The chassis has a dual fan configuration with a front panel fan that pulls air into the chassis and a rear panel fan that exhausts the air from the chassis.

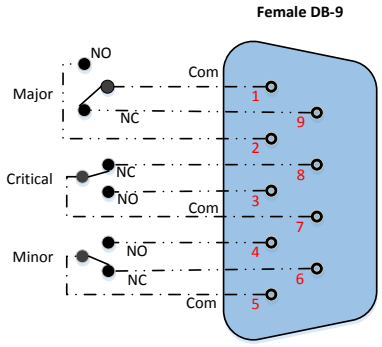
7.3 Electrical / Network Connections:

The CIR chassis supports two AC or DC power supply modules which work in a load share configuration.

Important note! *Connect the chassis to the rack bonding system prior to installing and activating the power supply modules.* Overcurrent protection breakers or fuses must be sized appropriately for the total current rating of the CIR chassis or multiple chassis that are connected to a common mains circuit.

1. Connect the chassis to the rack bonding system. The chassis provides a terminal for a standard Two Hole Barrel CU Ground Lug with .625 in (15.9 mm) hole spacing and ¼ in. (6.35 mm) screw size. Mount the ground lug to the terminal on the chassis and connect the chassis to the rack bonding system following local and industry codes.
2. (Optional) Connect the LAN cable to the 10/100BASE-T LAN port on the back panel to monitor the unit remotely utilizing a network connection and SNMP or the GUI. See Section 10 for further details about remote management of the unit. ***Important note!*** *An IP address must first be assigned to the CIR chassis via a CLI connected to the front panel RS-232 port.*

3. (Optional) Connect the DB-9 ALARM connector on the back panel for hard wired alarm alert of any minor, major or critical alarm condition. Three internal relays provide open / closed state for the alarms. The alarm state is as follows; Normal = closed, Alarm = open. The following diagram depicts the pin configuration for the DB-9 connector.



4. Insert each of the two AC or DC power supply modules into the rear panel slots.
   - **AC Unit:** Connect the female end of the supplied AC power cord into the module's power inlet. Connect the male end of the power cord to the main power source receptacle.

Important note! *A six foot, 3-pin plug NEMA 5-15P to IEC C13 18 AWG power cord is supplied with each power supply module. For connection to receptacles other than Type-B, replace the supplied cord with another IEC C13 18 AWG power cord with the desired plug. Note that the replacement requires connection to a 3-terminal mains supply outlet via a 3-terminal power cord for proper connection to the protective ground.*

   - **DC UNIT:** Attach Terminal Lugs with #16 AWG or greater gauge wire to the -48 DC Feeds, (A and B), ensuring proper color coding or polarity. Ideally, A and B feeds should be from independent power sources for redundancy. Connect the other end of the DC wires to the Fuse Panel after ensuring that the fuses are pulled. Reversing the polarity will not harm the unit over the short term, but is to be avoided if possible.

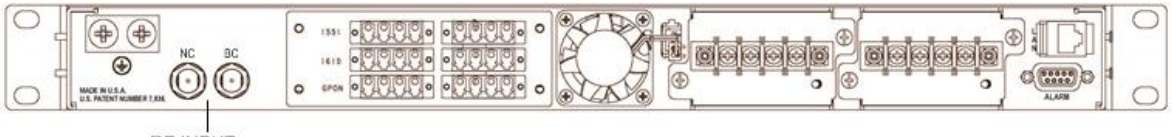
Important note! Mixing AC and DC power supplies is not recommended as load sharing will not perform properly. The dominant power supply, one with higher voltage (>10 mV), will consume 60 to 100% of the total chassis load. Consult with InnoTrans Technical Support for more information.

8 RF and Optical Connections

The following describes the initial RF and optical connections to the CIR chassis.

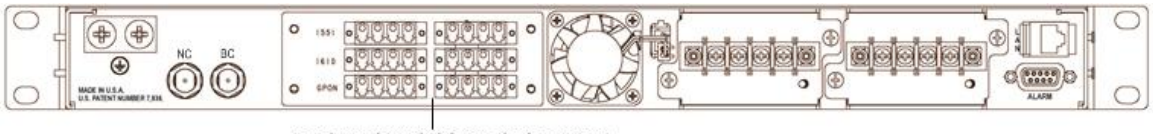
8.1 RF Connections

RF connections are made at the back of the CIR chassis. The CIR chassis has one Broadcast input and one Narrowcast input. See Section 9 for determining the proper RF input levels.



8.2 Optical Connections

The CIR chassis integrates optical filters to simplify the optical connections for RFoG and PON applications. The following figure shows the CIR configured with eight common ports, eight RFoG 1610 nm upstream ports and eight PON bi-directional OLT interface ports.



There are either two or three rows of optical interface connections depending on the CIR configuration:

- The top row is the common port facing the network with the downstream 155x nm wavelength, the upstream RFoG R-ONU 1610 nm wavelength and the bi-directional PON OLT wavelengths. Connect each port with a good quality clean LC/APC jumper to the network facing fibers.
- The middle row extracts the RFoG R-ONU 1610 nm upstream signal. Connect each port to a return path receiver with a good quality, clean LC/APC jumper.
- The bottom row is the optional bi-directional PON OLT 1260 nm to 1620 nm interface port. Connect each port to the PON OLT interface with a good quality clean LC/APC jumper.

Important Note: Always clean and inspect optical connectors prior to making a connection to the CIR optical ports. Never look into an optical connector when a signal is present.

9 Module Setup

9.1 Setting RF input levels

Two RF input ports are provided for convenience to support combining networks with separated Broadcast (BC) and Narrowcast (NC) combining.

Determining the proper rear panel RF input level is important to ensure optimal transmitter performance. The following will provide guidance in calculating the proper adjustment to the per channel RF level for your actual channel loading from the reference channel loading level to ensure the proper total RF input power requirement is achieved.

Each CIR transmitter is factory optimized for a rear panel total input power of +38 dBmV for the combined BC and NC signals. This level provides 3 to 4 dB of reserve gain for the AGC operation. The reserve gain is the amount of headroom above the +38 dBmV reference level.

All QAM channels

The all QAM reference channel loading and per channel input level is 155 ITU-T J.83 Annex B QAM 256 channels between 54-1002 MHz set to 16 dBmV. The RF per channel level of 16 dBmV is calculated from the total power as follows:

*Total Power - [10*log$_{10}$(channel load)]*
*38 dBmV - [10*log$_{10}$(155)] = 38 dBmV – 22 = 16 dBmV*

Using the same formula to adjust for a lower channel loading such as a 750 MHz system with 110 channels:

*38 dBmV - [10*log$_{10}$(110)] = 38 dBmV – 20.4 = 17.6 dBmV*

Therefore with 110 of all QAM channel loading the correct rear panel RF input level is 17.6 dBmV at the input of both the BC and NC ports.

Mix of Analog and QAM channels

The mix of Analog and QAM reference channel loading and per channel input level is 80 NTSC analog (54–550 MHz) set to 18 dBmV and 75 ITU-T J.83 Annex B QAM 256 channels (258- 1002 MHz) set to 12 dBmV. The RF level per channel for analog and QAM is calculated from the total power as follows:

Since there is a 6 dB power level difference between the QAM and analog channels it is easier if we convert the QAM channels to an equivalent analog power level in the formula below. The QAM RF level being 6 dB lower means the QAM channel power level is 1/4th the analog channel level. As a point of reference, -3 dB is 1/2 power and -6 dB is 1/4th power.

*Total Power - [10*log$_{10}$(Analog channel load)+(QAM channel load/4))]*
*38 dBmV - [10*log$_{10}$(80)+(75/4))] = 38 dBmV – 20 = 18 dBmV*

Therefore the analog channels are set to 18 dBmV and the QAM channels are 6 dB lower or 12 dBmV.

Using the same formula to adjust for a decrease in the number of analog channels to 30 and increase the number of QAM channels to 124 and calculate the correct input level for each:

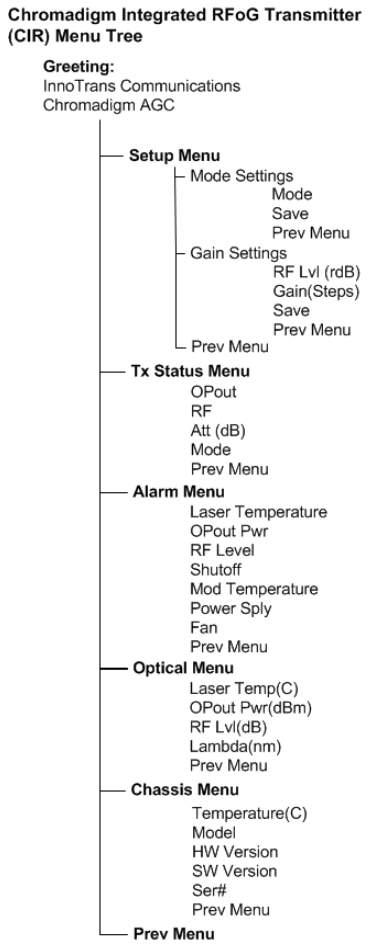
$$38 \text{ dBmV} - [10*\log_{10}(30)+(124/4))] = 38 \text{ dBmV} – 17.8 = 20.2 \text{ dBmV}$$

Therefore the analog channels are set to 20.2 dBmV and the QAM channels 6 dB lower or 14.2 dBmV.

9.2 Configuring the CIR transmitter

The setup, configuration and verification of the RF drive level for the CIR transmitter requires the operator to become familiar with the front panel configuration menus. Refer to the InnoTrans Document No: 2000010, Chromadigm Chassis – User Interface as a supplement to the following procedures which will reference the associated display parameters.

The following CIR menu tree will assist in navigating the Hand Held Display.



9.2.1 AGC Mode

Operating in the AGC mode provides for plug-and-play RF level setting as the transmitter automatically sets the internal attenuators for the optimal laser drive level and OMI. The following provides the procedures and associated menus for configuring the CIR transmitter with the front panel display in the AGC mode. The CIR transmitter will be in the AGC mode as a default.

1. Connect power to the chassis.
2. With a combined Broadcast/Narrowcast total RF power of 38 dBmV as determined in 9.1, plug the Broadcast cable into the BC port and the Narrowcast cable (if utilized) into the NC ports.
3. From the front panel RF Test Point confirm the Narrowcast QAM RF channels are set to the same level as the Broadcast QAM RF channels. If not, correct the level difference coming into the chassis between the BC & NC ports.
4. Using the front panel menu navigate to the Tx Status Menu as follows.

   Press center key to enter sub menus. Press the down key until the cursor is highlighted on the Tx Status Menu.

   Press center key to advance to the Tx Status Menu.

   This menu displays the output optical power (OPT:) in dBm which is displaying +18 dBm in the example. The “reference RF level” (RF:) is displaying the reference input level to the laser as 0 dB ±0.5 dB which is the expected reference level with a rear panel input level of +38 dBmV total composite RF power of the BC and NC combined signal.

5. Navigate to the RF menu to check for proper AGC reserve gain. Press the down key to move the cursor to the RF menu and then press the center key.

   The RF menu now displays the reference RF level input to the laser and the reserve gain “ATT (dB)”. In this case +3.2. The reserve gain should be between +3 to +4 with a rear panel RF input level of +38 dBmV total composite RF power of the BC and NC combined signal.

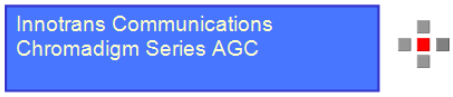
   The setup is now confirmed to be correct.

9.2.2 MGC mode

The following provides the procedures and associated menus for configuring the CIR with the front panel display in the MGC mode.

1. Connect power to the chassis.
2. With a combined Broadcast/Narrowcast total RF power of 38 dBmV as determined in Section 9.1, plug the Broadcast cable into the BC port and the Narrowcast cable (if utilized) into the NC ports.
3. From the front panel RF Test Point confirm the Narrowcast QAM RF channels are set to the same level as the Broadcast QAM RF channels. If not, correct the level difference coming into the chassis between the BC & NC ports.
4. Using the front panel menu navigate to the Setup/Mode Settings menu.

   Press the center key to enter the Sub Menus

   The cursor is on the Setup Menu, press the center key to enter the Setup Menu, and then press the center key again to enter Mode Setting.

5. Under the Mode Settings Menu place the unit in MGC mode and save the setting.

   The Mode default is AGC. Press the right or left key to toggle to MGC and press the center key. The Mode changes from AGC to MGC however the change is not initiated until the action is saved. The current mode is shown in the parenthesis in the Save line shaded below.

   Press the down key to move the cursor to the Save position.

   Press the right or left key to toggle between Save No and Yes.

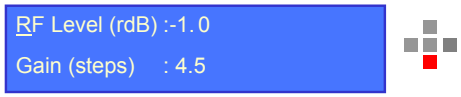
Press the center key to select yes. The mode status in the parenthesis will change from AGC to MGC.

6. Next navigate to the Setup/Gain Setting Menu to set the attenuators for the proper laser drive level.

   In the Mode/Gain Setting Menu press the down key to move the cursor to Gain Setting. Press the center key to select.

7. The Gain Setting Menu displays the RF reference level, R*F Level (rdB)*, and the attenuator gain step setting, Gain (steps). The gain setting is adjusted for a RF Level of 0.0 ±0.5 dB. In the example below the reference level is -1.0 so the attenuator needs to be adjusted.

   Press the down key to move the cursor to Gain (Steps)



8. Adjust the Gain (Steps) to add or remove the attenuation steps until the *RF Lvl* displays 0.0 dB ±0.5 dB in the TX Status/RF Menu.

   Press the select key and press the right or left key to change the Gain (Steps) setting to obtain a reference level of 0.0 ±0.5 dB.

   Press the center key to select the new value and press the down key to navigate to the Save Menu.

9. Save Gain (Steps) value.

   Press the down key to move the cursor to Save. Press the right or left arrow key to toggle between Save: No and Yes.

Press the select key to save. Note the value in the parenthesis has now changed to the new value.

10. Navigate to the TX Status Menu to check the RF value of each port.

The RF Menu now displays the reference RF level for the laser and the reserve gain “ATT” (dB). In this case +3.2. The reserve gain should be between +3 to +4 with a rear panel RF input level of +38 dBmV total composite RF power of the BC and NC combined signal.

The setup is now confirmed to be correct.

10 Troubleshooting the CIR transmitter

Condition	Steps to Check
Power LED OFF (AC)	1) Check if Power Cable is plugged in and Power Switch is in ON position. 2) Verify AC Outlet is functional and confirm fuse on the AC feed is fine, replacing it if necessary. 3) Look for other signs of life in unit like running fan, LCD display etc.
Power LED OFF (DC)	1) Verify DC Feed is active and fuse is intact on fuse panel. 2) Verify DC Feed is not reversed. 3) Look for other signs of life in unit like running fan, LCD display etc.
Optical LED is Amber or Red	1) Check output light level.
RF LED is Amber or Red	1) Check RF Input level. 2) If in MGC mode the RF Level may be too low or high and require adjusting the gain steps.
Communication Issue with Unit	1) Please confirm setup is as described in the User Interface Document. 2) If problem persists, please contact InnoTrans Support for further help.