MANUAL-SETUP
TRANSMITTER GUIDE

Economy / Manual-Setup Units | Fixed 22 dBmV Reference Models

Setup Guide for QFRF Manual-Setup Transmitters with Fixed-Input Reference for FT1504D and FT1510D

Factory-Marked Input Workflow • Channel Loading Charts • Installation Guide

RF Input Level Calculator • Digital vs. Analog Adjustments • Troubleshooting

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SECTION 1 QUICK START — 5 STEPS TO CORRECT SETUP

⚠ IMPORTANT: For manual-setup units, the RF input level printed above the rear F connector is for 80 ANALOG channels. FT1504D and FT1510D use fixed 22 dBmV input for 80 analog channels. If your system carries digital QAM channels, set them 6 dB lower than the analog recommendation.

1. Find the Factory-Marked Base RF Input — Printed directly above the rear F connector. For FT1504D and FT1510D, use fixed 22 dBmV for 80 analog channels.
2. Count Your RF Carriers — Determine the total number of discrete 6 MHz RF carriers in your system lineup, NOT the number of virtual QAM channels.
3. Look Up Your Input Level — Use the Channel Loading Chart (Section 4) that matches the base RF input printed on your unit.
4. Apply Digital Adjustment — Use the "Digital dBmV" column for all-digital QAM systems. For mixed systems, set analog channels to the recommended analog levels and the QAM channels 6 dB lower.
5. Connect and Verify Operation — After setting the RF drive, complete the connections in Section 3 and confirm normal status on the front panel.

RF Input Formula: `New Input Level (dBmV) = Base Level + 10 × Log(80 / N)`

Where N = total number of discrete 6 MHz RF carriers and Base Level is the value printed on the unit.

SECTION 2 MODEL IDENTIFICATION & REFERENCE SPECS

Find your model number on the front panel or rear label. The tables below are reference specifications only. FT13xx RF input level must be taken from the value printed above the rear F connector; do not set drive by model number alone. The number after "FT13" or "FT15" indicates the nominal optical output power in milliwatts (e.g., FT1310 = 10 mW).

FT13xx Series — 1310nm Manual-Setup Reference Models

Model	RF Input Setup	Optical Power	Link Loss	CNR (77ch)	BW (MHz)
FT1302EGI	Use printed unit label	≥2 mW	6 dB	51 dB	45-1000
FT1304EG	Use printed unit label	≥4 mW	7 dB	52 dB	45-1000
FT1306EG	Use printed unit label	≥6 mW	9 dB	51.9 dB	45-1000
FT1308EG	Use printed unit label	≥8 mW	10 dB	51.9 dB	45-1000
FT1310EG	Use printed unit label	≥10 mW	11 dB	52 dB	45-1000
FT1312EG	Use printed unit label	≥10.8 mW	12 dB	52 dB	45-1000
FT1316EG	Use printed unit label	≥16 mW	13 dB	52 dB	45-1000
FT1320EG	Use printed unit label	≥20 mW	14 dB	52.5 dB	45-1000
FT1322EG	Use printed unit label	≥22 mW	14 dB	52.5 dB	45-1000
FT1326EG	Use printed unit label	≥26 mW	15 dB	51.2 dB	45-1000
FT1331EG	Use printed unit label	≥31 mW	15.8 dB	51.2 dB	45-1000

Note: FT13xx input level varies by the factory-marked value printed above the rear F connector. Do not set RF drive by model number alone.

FT15xx Series — 1550nm Fixed-Input Reference Models

Model	Base RF Input	Optical Power (mW)	RF Mode	BW (MHz)
FT1504D	**22 dBmV**	4	AGC/MGC	47-1000
FT1510D	**22 dBmV**	6–10	AGC/MGC	47-1000

FT1504D and FT1510D use fixed 22 dBmV base RF input for 80 analog channels. These models feature AGC/MGC and are included here as fixed-input reference exceptions, not as part of the variable-input economy workflow.

SECTION 3 INSTALLATION & CONNECTIONS

3.1 Physical Installation

- Mount the transmitter in a standard 19-inch rack or cabinet. Leave at least 1.75 inches (4.5 cm) of clearance above and below the unit for proper ventilation.
- Operating environment: 0°C to 50°C (32°F to 122°F). Recommended: 25°C (77°F). Humidity must remain below 95% (non-condensing). Operate in a relatively dust-free environment.
- Ensure proper grounding with grounding resistance less than 4Ω. The rear IEC-320 power connector uses a three-wire configuration where the center wire is the ground.

3.2 Power Connection

All QFRF rack-mount transmitters include a UL-Listed switching power supply that accepts 85–254 VAC, 47–63 Hz for international use. Maximum power consumption is 50W. Connect the grounding screw on the bottom of the transmitter to a reliable earth ground using #20 AWG or heavier wire before connecting AC power.

⚡ **FT15xx DC Option:** FT15xx models may include an optional 36–60 VDC floating DC input. When both AC and DC are available, AC is the primary power source.

3.3 RF Connection

- The rear panel RF input is a standard 75Ω F-type connector.
- Set the RF input level according to the Channel Loading Charts in Section 4. Choose the chart that matches the value printed above the F connector on the unit. FT1504D and FT1510D use fixed 22 dBmV for 80 analog channels.
- For digital QAM channels, use input levels 6 dB below the analog recommendation. In mixed systems, set analog channels to the analog level and QAM channels 6 dB lower.
- If the RF input level is too high, the transmitter will alarm (Red LED blinking). Correct the input level, then cycle power to reboot.

3.4 Optical Connection

- All QFRF transmitters use SC/APC (angled physical contact) fiber connectors. Do NOT use flat/UPC connectors.
- Remove the protective dust cap only when ready to connect. Never touch the polished fiber end.
- Clean all fiber patch cords before connecting. Use a dry lint-free cloth on connectors and compressed air (ultra-filtered to <0.2 microns) on bulkheads.
- Ensure the laser key switch is OFF before connecting fiber. After connecting, turn the key switch ON. The laser activates after a 10-second safety delay.
- Verify optical output power using an optical power meter matches the specification for your model (see Section 2 reference specs).

⛔ **LASER SAFETY:** Never look into the optical output or energize the transmitter without a fiber or protective cap connected. Laser radiation can cause permanent eye damage.

SECTION 4 CHANNEL LOADING CHARTS

Find the chart that matches your transmitter's base RF input level as printed above the rear F connector. Then look up your channel count to find the correct input level.

Use the Analog column for analog NTSC/PAL carriers; use the Digital column for QAM/digital carriers. In mixed systems, set analog carriers to the Analog level and QAM carriers 6 dB lower.

Chart 4A — 18 dBmV Base Input

Formula: Input Level = 18 + 10 × Log(80/N) | Digital = Analog – 6 dB

# Channels	Analog (dBmV)	Digital (dBmV)
132	15.8	9.8
110	16.6	10.6
80	18.0	12.0
60	19.2	13.2
40	21.0	15.0
30	22.3	16.3
20	24.0	18.0
16	25.0	19.0
10	27.0	21.0
8	28.0	22.0
4	31.0	25.0

Applies to: Manual-setup units labeled 18 dBmV

Chart 4B — 19 dBmV Base Input

Formula: Input Level = 19 + 10 × Log(80/N) | Digital = Analog – 6 dB

# Channels	Analog (dBmV)	Digital (dBmV)
132	16.8	10.8
110	17.6	11.6
80	19.0	13.0
60	20.2	14.2
40	22.0	16.0
30	23.3	17.3
20	25.0	19.0
16	26.0	20.0
10	28.0	22.0
8	29.0	23.0
4	32.0	26.0

Applies to: Manual-setup units labeled 19 dBmV

Chart 4C — 20 dBmV Base Input

Formula: Input Level = 20 + 10 × Log(80/N) | Digital = Analog – 6 dB

# Channels	Analog (dBmV)	Digital (dBmV)
132	17.8	11.8
110	18.6	12.6
80	20.0	14.0
60	21.2	15.2
40	23.0	17.0
30	24.3	18.3
20	26.0	20.0
16	27.0	21.0
10	29.0	23.0
8	30.0	24.0
4	33.0	27.0
2	36.0	30.0
1	39.0	33.0

Applies to: Manual-setup units labeled 20 dBmV

Chart 4D — 21 dBmV Base Input

Formula: Input Level = 21 + 10 × Log(80/N) | Digital = Analog – 6 dB

# Channels	Analog (dBmV)	Digital (dBmV)
132	18.8	12.8
110	19.6	13.6
80	21.0	15.0
60	22.2	16.2
40	24.0	18.0
30	25.3	19.3
20	27.0	21.0
16	28.0	22.0
10	30.0	24.0
8	31.0	25.0
4	34.0	28.0
2	37.0	31.0
1	40.0	34.0

Applies to: Manual-setup units labeled 21 dBmV

Chart 4E — 22 dBmV Base Input

Formula: Input Level = 22 + 10 × Log(80/N) | Digital = Analog – 6 dB

# Channels	Analog (dBmV)	Digital (dBmV)
132	19.8	13.8
110	20.6	14.6
80	22.0	16.0
60	23.2	17.2
40	25.0	19.0
30	26.3	20.3
20	28.0	22.0
16	29.0	23.0
10	31.0	25.0
8	32.0	26.0
4	35.0	29.0
2	38.0	32.0
1	41.0	35.0

Applies to: Units labeled 22 dBmV. FT1504D and FT1510D use this fixed input.

SECTION 5 FRONT PANEL OPERATION

5.1 Power-Up Sequence

6. Connect AC power. The front panel displays "READY: KEY OFF" and the LED indicator is Red.
7. Turn the front panel laser key switch to ON. The display shows "KEY ON..." while the 10-second laser safety delay counts down.
8. After startup, the Laser LED turns Green (normal operation). The display shows the model number.
9. Use the STATUS / arrow buttons to scroll through diagnostic menus.

5.2 LED Indicators (All Models)

LED State	Meaning
Solid Green	Normal operation — transmitter is functioning properly
Solid Red	Laser output is disabled (key switch OFF or startup in progress)
Blinking Red	ALARM condition — see Section 6 Troubleshooting

5.3 Diagnostic Menus (Common to All Models)

Menu Item	Type	Description
Description / Model	Read-only	Displays the transmitter model number
LD S/N (FT15xx only)	Read-only	Laser diode serial number
OUTPUT / POWER	Read-only	Optical output power (dBm or mW)
LD CURRENT / BIAS	Read-only	Laser bias current (mA)
LD TEMP / TEMP	Read-only	Laser temperature (°C)
LD COOLING/HEATING	Read-only	Thermoelectric cooler current (mA)
RF MODE (FT15xx)	Adjustable	AGC or MGC mode selection
RF Level (FT15xx)	Read-only	Current RF input level
+5V / -5V / +24V	Read-only	Internal power supply voltages
IP / Sub / GW / TR1 / TR2	Adjustable	SNMP network configuration

SECTION 6 TROUBLESHOOTING

Symptom	Likely Cause	Action
Red LED blinking (Alarm)	Microprocessor detected a fault	Check the LCD display for the specific fault description. Correct the condition and cycle power (rear switch OFF then ON).
Display shows "INTERLOCK"	Bad connection to optional remote interface on rear panel	Check the remote interface cable connection. If not using remote monitoring, ensure the port is properly terminated.
RF input level too high alarm	Input level exceeds safe operating range	Reduce the RF input level to match the Channel Loading Chart for your channel count. Cycle power to clear the alarm.
Low optical output	Laser degradation or fiber connector contamination	Clean the SC/APC connector. Verify output with optical power meter. If below spec, contact QFRF for service.
No optical output after key ON	10-second startup delay or laser fault	Wait 10 seconds for normal startup. If LED remains Red after 30 seconds, cycle power. If persistent, contact QFRF.
High TEC current reading	Ambient temperature too high or TEC degradation	Verify environment is within 0–50°C. Ensure adequate ventilation. Contact QFRF if TEC current exceeds normal range.
Fuse blown	Internal power supply or circuitry problem	Do NOT replace the fuse. This indicates an internal fault. Return unit to QFRF for repair.

SECTION 7 WARRANTY & TECHNICAL SUPPORT

- Each transmitter includes a full one-year parts and labor warranty. QFRF will supply emergency spares whenever possible to prevent long-term outages.
- Do not open the top cover for repairs unless you have first spoken with QFRF technical support. Unauthorized repairs may void the warranty and incur additional charges.
- QFRF provides lifelong maintenance support, even after the warranty period has expired. Repair fees may apply for damage caused by human error.
- When returning a unit for service, always use the original packaging to prevent shipping damage. QFRF is not responsible for damage caused by improper packaging.

Technical Support Contact:

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SECTION 8 COMMON SPECIFICATIONS (ALL MODELS)

Parameter	Specification
RF Input Connector	75Ω F-type
Optical Connector	SC/APC (angled physical contact)
RF Bandwidth	47–1000 MHz
RF Input Flatness	±0.75 dB
CTB (77ch NTSC)	≥67 dBc
CSO (77ch NTSC)	≥63 dBc
Front Panel Test Point	-20 dB
Power Supply	85–254 VAC, 47–63 Hz, UL-Listed
Power Consumption	<50W
Chassis	19" rack mount, 1.75" (1RU) height
Dimensions	483 × 385 × 44 mm (19" × 15" × 1.75")
Operating Temperature	0°C to 50°C (32°F to 122°F)
Laser Startup Delay	10 seconds (safety feature)
Monitoring	Front panel LCD/VFD + optional RS-232/SNMP

SECTION 9 UNDERSTANDING DIGITAL VS. ANALOG LEVELS

Digital QAM channels contain approximately 4 times the power of an equivalent analog carrier. Also, digital channels are measured by their AVERAGE power, whereas analog channels are measured by their PEAK level. For this reason, the recommended RF input drive level for digital channels is 6 dB below the analog level. This ensures the transmitter operates within its linear range and prevents over-driving the laser.

System Type	RF Input Level Setting
All Analog (NTSC/PAL)	Use the Analog dBmV column directly
All Digital (QAM)	Use the Digital dBmV column (Analog – 6 dB)
Mixed Analog + Digital	Set analog channels to the Analog level; set QAM channels 6 dB lower.