RF Transmission Equipment for Community Radio

स्वच्छ भारत
एक कदम स्वच्छता की ओर

BECIL
बेसिल

Keeping in view of the requirement of Community Radio Broadcasters a low cost, indigenously developed, robust RF transmission equipment with credible support after sales, BECIL has designed and developed complete RF transmission equipment. This consist of 50 Watt, Stereo FM Transmitter, type CRS-FM ST50, Two bay FM antenna and self supported transmission tower with in-house efforts. This stereo transmitter will enable Community Radio Broadcasters to Broadcast Stereo sound, so that listeners can receive and feel dual channel sound reproduction with channel separation of over 45dB that creates an illusion of multi-directional audibility..

Salient features of 50 Watt FM Stereo Transmitter:

- **Power**: 50W Nominal.
- **RF Output Impedance**: 50 ohms unbalanced.
- **Antenna VSWR**: Less than 1.5:1.
- **Frequency of operation**: 88 to 108MHz in 10kHz/steps. Frequency of operation to be set internally.
- **RF Signal generation**: Processor Based, Analog PLL.
- **Frequency Deviation**: ± 75kHz=100% (± 150kHz capability) ± 1 ppm from -5 to +45 °C.
- **RF Harmonics**: Exceeds EBU/CCIR/FCC requirements > -70dBc <-100dBc @ ± 1MHz min. out of carrier.
- **Supervision and Control**: Micro controller based control system with backup hardware control for fool proof protection of transmitter unit against faults (Over Temperature, Antenna Mismatch, Over Voltage & Current etc.) to safeguard the RF components of Transmitter Unit.
- **Remote control**: VGA based GUI for logging of events and analog metering parameters (Optional).
- **Monitoring:** LED Dual Bargraph to display the Actual Audio Level/ Frequency Deviation for Left and Right channels separately.

  LCD panel: Display status and functional information of transmitter unit.

  Programmed Software: Keil

  Stereo Encoder: State of the art SMD technique, with a signal separation of above 40 db and Pilot tone of 19KHz

  Dual Channel Audio peak Detector: Generates the peak value of the left and right channel audio signals.

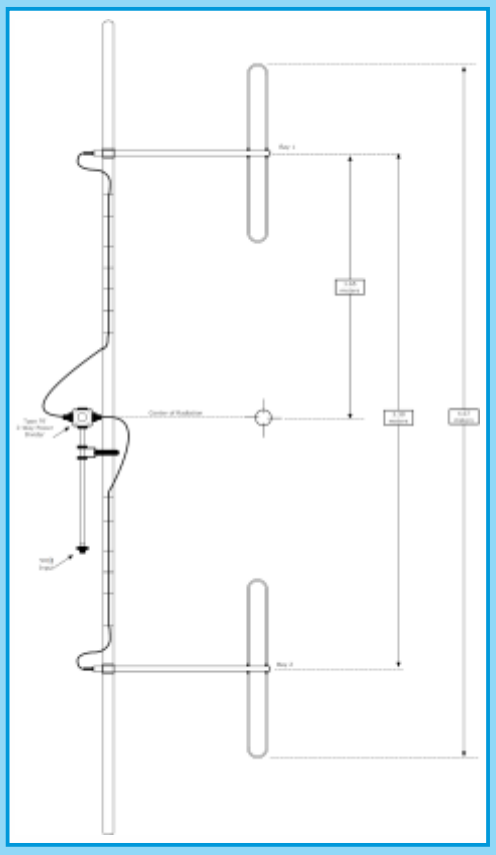
Technical Specifications: Stereo FM Transmitter

Audio Input: Left	XLR connector, balanced/unbalanced, differential, nominal input impedance of 10k, +4 dBm@75kHz deviation
Audio Input: Right	XLR connector, balanced/unbalanced, differential, nominal input impedance of 10k, +4 dBm@75kHz deviation
Pilot Tone	19 KHz +/-3Hz
Stereo Channel separation	Over 40dB - Typical 45dB
Distortion	THD: <0.03%, 30Hz-15kHz,IMD: <0.03% measured with 1 kHz and 1.3 kHz tones, 1:1 ratio @75kHz deviation
Transient IM	<0.03% (square/sinus)
Audio Response	±0.15dB 20Hz to 15 kHz
S N R	Weighted (CCIR 468/2-Peak CCIR detector) - 75 dB/50µs-69dB/flat; Weighted (CCIR 468/2-RMS detector)-
AM Synchronous	(AM=400 Hz, FM=400 Hz±75 kHz Ref.=100% AM, RMS detector, measured (20Hz-23kHz)<-69dB
AM Asynchronous	FM=no modulation, Ref.=100% AM, Unweighted, RMS detector, meas. (20Hz-23kHz), - 70dB (typ.-85dB)
Audio Filter	> 55 dB @ 19 kHz;>45dB 19 to 50 kHz; > 50dB to 100kHz (typ.)
CMRR	> 45 dB typical, 25 Hz to 15kHz

Metering display/ LCD Display	PA Drain Voltage, Current, Temperature, Gate Voltage, Forward Power, Final O/P PWR & Reflection (VSWR) Large LCD display. Alphanumeric 2 lines X 20 characters, size: 180mm (L) *40mm (W)* 14mm (H)
FM Dev.	20 Segment LED Bar Graph display to
Monitoring	visually indicate the Frequency Deviation of the Transmitter
LED alarm Indication	Reflected Power, Forward Power, PA Status, Heatsink Temperature, LEDs will be on when these parameter values exceeds the specified limits
Electricals	AC Input: 85 to 264 V, 47Hz to 63 Hz, average 120 Watts, provided with RFI/ EMI protection on the input
Acoustic Noise	<56 dBA, 3 min @ 1 m
Cooling	Forced air, with two numbers of internal long life DC brush-less ball bearing fan
Environmental	Guarantee performance temp. 0"C TO + 40 C and relative humidity (non condensing) 90%
Cabinet	Standard 2U height cabinet with 19" rack mounting fixture. Stainless steel cabinet.

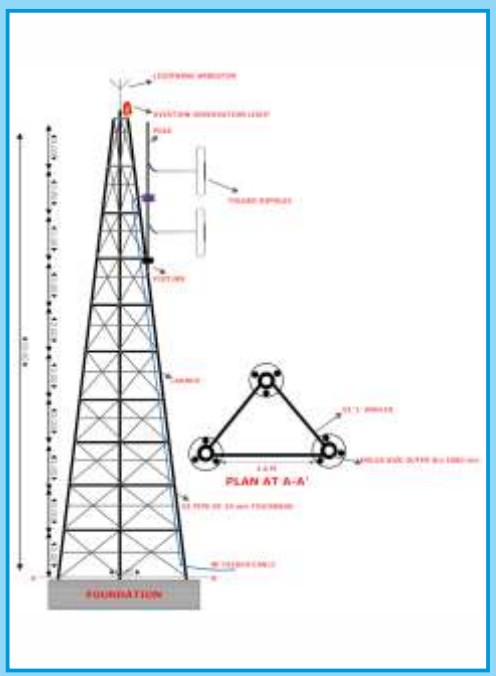
2. Two Bay VHF FM Radio Broadcast Antenna:

The BECIL make, VHF commercial band, vertically polarized, 2 bay FM broadcast antenna, type CRS-FDP-2 is a rugged and reliable antenna. Considering the challenging tropical conditions of India, the antenna construction has been ruggedized for trouble free working over a long period of time. The antenna assembly consists of two numbers of folded dipoles with λ spacing between the elements. The power to both the dipoles is divided by the quarter wave transmission line based transformer. Entire assembly of power divider and the folded dipoles is mounted on a 4 meter length pipe of 3" diameter so that, the complete antenna assembly can be suitably fastened as a side mount on the self supported transmission tower or guyed mast.



Brief Specifications	
Frequency	88 MHz to 108 MHz
Tuned band width	20 MHz
Beam width V	80°
Beam width H	220°
Pattern	Offset circular
Gain	3.1 dB (4.9dBd)
Operating VSWR	<1.5:1.0
Weight	25 KG
Array length	5000 mm
Aperture	3100mm
Spacing	1.0 l
Boom length	1200 mm
Boom diameter	40 mm
Impedance	50 Ω, on N, female
Power rating	1 KW continuous
Lightning protection	DC grounded
Material	Made of Industrial grade Copper material for best conductivity & efficient radiation pattern.

Salient Features
Vertical Polarization
Quarter - Wave Transformer Power Divider
Two Bay Array/Folded dipole
Water Proof Design
Easy to install
No need to optimize the SWR at field
Rugged fully welded copper material



Self Supported Transmission Tower for CRS:

BECIL has designed and developed low cost, light weight, durable and all weather, self supporting tower for community radio station. The Tower employs galvanized MS members, conforming to IS: 2629. The tower is provided with a suitably designed system of lightening protection in accordance with the provision of IS:2309/1969. Braided copper wire of 30 square mm diameter will be provided for Lightening Arrestor from top of the tower to the nearest earth pit. Suitable RCC foundation based on the site condition, local terrain, soil conditions, nature of sub soil, water table and its seasonal variations etc is also part of the work. For antenna hoisting arrangement provision for fixing 100 mm dia N.B. supporting seamless GI pipe of 8 meter length for side mounting VHF FM Pole type Antenna shall be made on three faces of the tower. This supporting pole will be fixed in VHF FM Band -II aperture on one of the three faces, to be intimated at the time of erection of tower based on the coverage requirements. The fixtures of the antenna shall not foul with the cable routing from the power divider to the antenna. The tower shall be provided with a suitably designed complete system of lightening protection in accordance with the provision of IS:2309/1969 including necessary earthing based on the specific resistivity of the soil and sub-soil water level.

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FM TRANSMITTER, BECIL MAKE, 50 WATT, TYPE CRS-FM50

Keeping in view of the requirement of Community radio station operators for indigenously developed, robust and simple FM transmitter with credible support after sales, BECIL has designed and developed 50 Watt, FM transmitter, type CRS-FM50 with in-house efforts. Considering that, CRS is being operated and maintained by NGOs belonging to Civil Society and Educational institutions, the transmitter is simple in design, easy to operate and maintain resulting in practically plug and broadcast type of equipment. However, the transmitter meets the audio and RF specification of a professional grade broadcast transmitter and complies with the ITU norms on RF emission standards. The transmitter employs in-house developed robust micro-controller based Control, monitoring and supervision system to safeguard the transmitter against abnormal operating conditions arising due to problems in abnormal ambient conditions, power supply, antenna etc. In addition to software control, hardware control also has been provided as a backup for automatic power control with fold back operation against the load variations.

Another notable feature is that, the transmitter has a built-in FM demodulator and its output is available on the back panel for monitoring and also as visual bargraph display for indicating the frequency deviation (depth of modulation). Important parameters of the transmitter can be remotely logged with time stamping on a system for monitoring the health of the transmitter. This data will be useful not only to keep a check on the performance of the transmitter, but also useful for fault diagnostics. In-house developed Windows based GUI is provided along with the transmitter for this purpose. The transmitter is completely modular in construction and hence can be easily field serviceable with ease by qualified technicians.

Salient features

1. **Power:** 50W with automatic fold back depending on the load conditions.
2. **RF output impedance:** 50 ohms unbalanced, VSWR less than 1.5:1
3. **Frequency of operation:** 88 to 108MHz in 10kHz/steps. Frequency of operation to be set internally.
4. **Signal generation:** Processor based analog PLL
5. **Lock in Time From power on to any programmed frequency:** typically 4sec.
6. **Off lock attenuation:** >75 dBc (typical - 80dB)
7. **Type of modulation:** F3E/F8E, direct FM on the carrier frequency.
8. **Modulation mode:** Mono
9. **Frequency deviation:** ± 75kHz=100% (± 150kHz capability) ± 1 ppm from -5 to +45 °C
10. **RF harmonics:** Exceeds EBU/CCIR/FCC requirements > -70dBc <-100dBc @ ± 1MHz min. out of carrier
11. **RF spurious:** typical -110dB
12. **Pre-emphasis:** 50/75µs selectable
13. **Pre-emphasis precision:** Nominal 1% (typical 0.4%)
14. **RF Power control:** Automatic power control with fold back feature depending on the load condition.
15. **Supervision and control:** Micro controller based in-built control system with backup hardware control for fool proof protection against faults to safeguard the transmitter RF components.
16. **Remote control:** USB based GUI for logging of events and analog metering parameters. For time and date stamping, on-board RTC is provided.
17. **Monitoring:** On board, built-in RF demodulator providing audio line level output for aural monitoring and bargraph display of the actual frequency deviation for visual monitoring of the modulation. Large sized LCD display for status information of the transmitter.

FM TRANSMITTER, BECIL MAKE, 50 WATT, TYPE CRS-FM50

Detailed Technical specification

Audio input	XLR connector, balanced or unbalanced, true differential, nominal input impedance of 10 kΩ, +4 dBm @ 75kHz Deviation
THD	< 0.03%, 30Hz-15 kHz
IMD	< 0.03% measured with 1 kHz and 1.3 kHz tones, 1:1 ratio@75kHz deviation
Transient IM	< 0.03 % (square/sinus)
Audio response	± 0.15 dB 20 Hz to 15 kHz
Signal to noise ratio	1. Weighted (CCIR 468/2 - Peak CCIR detector)- 75 dB / 50µs - 69 dB / flat; 2. Weighted (CCIR 468/2 - RMS detector) - 79dB / 50µs -72dB / flat; 3. Unweighted (RMS detector, meas. 20Hz-23 kHz) - 92 dB / 50µs - 88 dB / flat
AM Synchronous	(AM = 400 Hz, FM = 400 Hz±75 kHz Ref. = 100 % AM , RMS detector, measured (20Hz-23kHz) < -69 dB
AM Asynchronous	FM = no modulation, Ref. = 100 % AM, Unweighted, RMS detector, meas. 20Hz-23kHz) < -70dB (typ. -85dB)
Audio Filter	> 55 dB @ 19 kHz;>45dB 19 to 50 kHz; > 50dB to 100kHz (typ.)
CMRR	> 45 dB typical, 25 Hz to 15kHz
Analog metering display	PA DC Voltage and current, RF forward power at PA and Filter output, reflected power at PA and Filter output, heat sink temperature of the PA and gate voltage
LED Indication	Integrated fault, VSWR fault, controller health monitoring
Monitoring	Provided with built in on-board FM demodulator. Standard audio line output on XLR is available for monitoring. 30 segment LED bargraph display to indicate the frequency deviation of the transmitter.
LCD display	Alphanumeric 2 lines x 20 characters, size : 180mm(L) * 40mm (W) * 14 mm(H)
Electricals	AC input: 85 to 264 V, 47 to 63 Hz, consumption approximately 120 Watts
Acoustic Noise	<56 dBA, 3 min @ 1 m
Cooling	Forced air, with internal long life brush-less ball bearing fan
Environmental	i. Storage temperature -20°C TO + 60°C ii. Guaranteed performance temp. 0°C TO + 40°C iii. Relative humidity (non condensing) 90%
Cabinet	Anodized aluminum frame. Standard 2U height cabinet with 19" rack mounting fixture. Overall dimension: 483 mm (19") W x 44 mm (1¾") H x 350 mm depth, approximate weight 4.5 KG.

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