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USER MANUAL

STL10

FM STL TRANSMITTER / RECEIVER

INTRODUCTION

The STL10-xxT is a solid-state wideband FM Transmitter providing a continuously variable RF output form 0 to 25 watts into a 50 Ohm load at many frequency within the UHF/ VHF band in 10 kHz increments.

The STL10-xxR receiver uses the same synthesized oscillator as the transmitter. A comb line band pass filter ensures image-frequency rejection exceeding 60dB. The achieved sensitivity in mono is around 10mV per 60dB of SNR. low noise and distortion, and high interference rejection.

With full range universal power input and built-in active PFC function. Those STLs can operate on either 90 ~ 264VAC / 47~63Hz or 127 ~ 370VDC as mean power to suitable most of Countries in the world.

Digital & Microwave System (D&M) has designed and manufactured broadcast equipment since its incorporation in 2000. Our product line has consistently applied the best in current technology to the specific needs of broadcasters.

FEATURES

- Easy and direct programming of the frequency by LCD, Step 10 KHz.
- Soft-start from RF mute status.
- Adjustable power output from 0 to 25 W with automatic power control, maintaining the output at any fixed level.
- Available with External AUX/MPX input connectors.
- Meets or exceeds all FCC and CCIR requirements.
- High reliability provided by conservatively rated components.
- Modular layout with Plug-in, easy replaceable circuits and parts.
- Built-in stereo coder.

SAFETY FIRST!

IMPORTANT: In order to avoid risks to personnel in the installation, utilization and maintenance of units, the following safety procedures and guidelines will be followed.

Improper use or installation of this apparatus could cause serious damage to objects and people alike. Therefore it is essential to rely on an installer who has been previously authorized or approved by D&M or by our local representative and that both the user and the installer read the whole manual before carrying out any operation.

Failure to apply these guidelines can lead to situations in which legally applicable safety standards are not met. In these cases, D&M shall be exempt from any responsibility.

All units will be properly grounded, through the network wire or through a special ground wire for this purpose. The ground should meet guidelines applicable to low voltage systems.

Do not use units in areas containing an explosive atmosphere, or where inflammable gases or smoke may be present.

Fuses blown as a result of short-circuit must be replaced with new one of the same value and characteristics. Repaired fuses must never be used. Fuse sockets should be checked to ensure that they have not been damaged.

Do not make any modifications to units. Any modification can lead to additional dangers that cannot be controlled.

Do not use inflammable products, which can lead to a risk of fire. Do not use solvents that may damage the paint surface, markings or lettering.

Maintenance personnel must not remove unit covers without taking required protective measures. Any manipulation must always be carried out by qualified or maintenance personnel. Appropriate precautions must be taken even when the unit has been disconnected: the inside of the unit may still have a dangerous voltage level.

!!! MAINS VOLTAGE MAY KILL !!!

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TECHNICAL SPECIFICATIONS

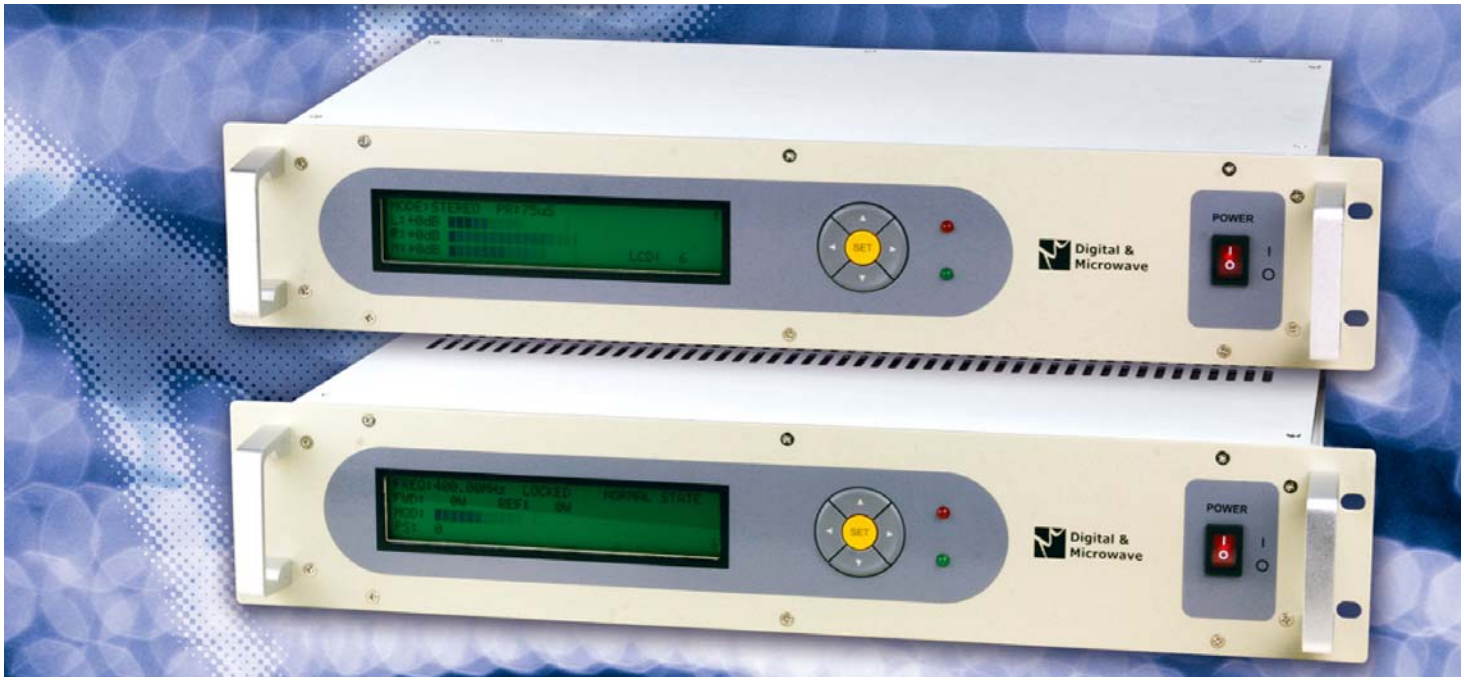
TECHNICAL CHARACTERISTICS for TRANSMITTER

- Frequency range..... 200.00 to 220 MHz /240 to 260 MHz / 300 to 320 MHz / 320 to 340 MHz / 400 to 420 MHz / 460 to 470 MHz / or other frequency on demand.
- Output Power..... 25W MAX /250W MAX
- Output Connector..... 50 ohm, Type N female
- Frequency Stability..... ± 0.0002%, 0°C to + 50°C
- Spurious Signal Emission..... 60 dB below maximum carrier power
- Base band Frequency Response..... ± 0.1 dB or better, 50 Hz to 53 kHz. ± 0.3 dB or better, 30 Hz to 100 kHz, the 3 dB roll off is approximately 220 kHz.
- Stereo Separation..... > 55 dB at 1 kHz modulating frequency
- Total Harmonic Distortion..... 0.02%, 75 µsec de-emphasis
- Signal-to-Noise Ratio..... 80 dB below ±75 kHz deviation, 75 µsec de-emphasis
- Nonlinear Crosstalk..... 50 dB or better
- Sub channel-to-Main..... 60 dB or better
- Modulation Capability..... Stereo channel and MUX input for RBDS, SCA, or MUX
- Modulation Input Levels..... Composite: 3 Vp-p into 2k ohms for ± 50 kHz deviation.
- Input Connectors..... BNC and XLR
- Mains power supply requirements.... 90~264VAC; 127~370VDC, Full range universal input
- Operating temperature range..... -10 to 45 ℃
- Dimensions..... 483 x 89 x 400 mm, rack std. 19" 2U (STL10-25W)
  483 x 132.5 x 400 mm, rack std. 19" 3U (STL10-250W)
- Weight..... 6.5 Kg (STL10-25W), 16.5 Kg (STL10-250W)

TECHNICAL CHARACTERISTICS for RECEIVER

- Frequency range..... The same with transmitter above
- RF Input Connector ..... Type N Female, 50 ohm
- Sensitivity..... 30 mV for 60 dB SNR, 400 mV for 80 dB
- Stereo Separation..... 50 dB at 1 kHz, 40 dB or better at other frequencies
- Total Harmonic Distortion..... 0.05% with 75 µsec de-emphasis
- Crosstalk (Mux-to-Main) ..... 50 dB or better
- Signal-to-Noise Ratio..... 75 dB with 75µ sec de-emphasis at maximum deviation.
- AC power..... 85~264VAC; 120~370VDC, Full range universal input
- Operating temperature range.... -10 to 45 ℃
- Dimensions..... 483 x 89 x 320 mm , rack std. 19" 2U
- Weight..... 5 Kg

FRONT PANEL



All FMT-Series digital front panels are pretty similar; they all carry the LCD display and function keys for operation control.

The power-on switch with internal mains signaling lamp is on the right.

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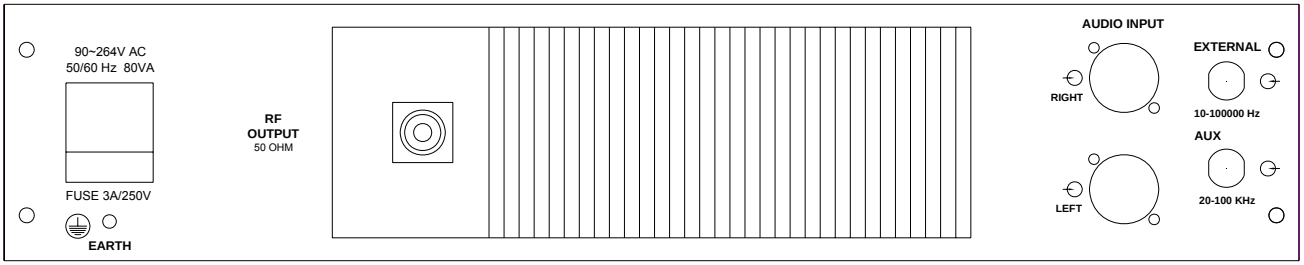
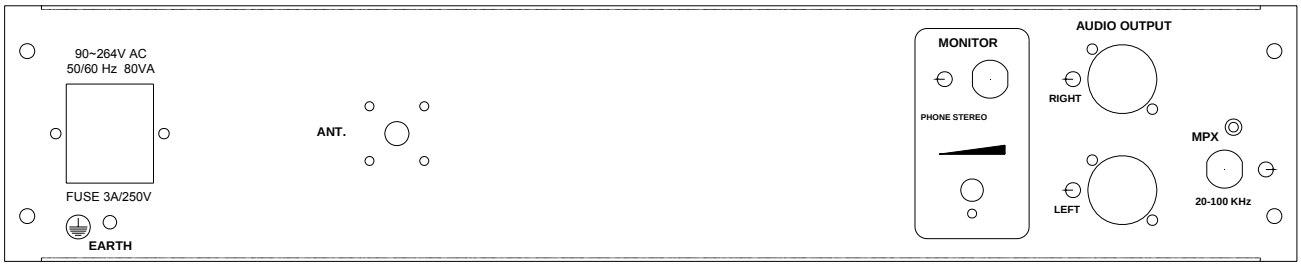
REAR PANEL CONNECTORS





All STL input and out put are allocated on the rear panel. They are:

- The audio channels sockets on balanced female XLR-type connectors.
- The wide-band external processed / stereo composite signal input/output on a grounded, unbalanced BNC connector.
- The low-frequency limited (20k~100kHz) auxiliary channel input on a grounded, unbalanced BNC connector for transmitter.
- The RF antenna connector, N-type.
- The hot center-pin on the “EXTERNAL” BNC input in physically in parallel with the signal + input (pin3) on the mono/right channel XLR socket. For this reason both connectors cannot be used at the same time.
- This panle also carries the IEC-type mains socket with fuse and an earth screw for system earthing, besides the ground ping on mains socket.

INSTALLATION AND USE

STL TRANSMITTERS

FOREWORD TO INSTALLATION

Install the transmitter in a dry, vented, dust-free environment, with a mean temperature of +10~+35 °C. Do not install on surfaces or racks subjected to vibrations, external vibrations can impair S/N ratio.

Connect your audio source using suitable cables and connectors.

The STL10 Series audio circuitry is similar to hi-fi equipment and should be installed and wired with the same attention; avoid earth loops as much as possible. When these conditions are met, the transmitter will deliver excellent audio characteristics.

The STL10 Series are fully RF shielded and can be installed close to the production studio, this type of installation allows constant monitoring of audio levels, deviation and power parameters. The transmitter can also be installed in other locations away from the studio and connected with several meters of LF co-axial cables with no adverse effect on modulation quality. Remote installation usually requires STL (Studio to Transmission Link equipment).

Final modulation performance is based upon the system installation, give careful consideration to where you will locate the transmitter. Additional advices are given in the appropriate paragraphs in this manual to assist you to achieve an optimum environment.

RF CONNECTION

Connect the N type output connector, marked "RF OUT" to the antenna system with top-grade 50-ohm shielded cable.

Note: Although most 50-ohm specified cable has enough power management capability, its power attenuation can be too high and may excessively lower the power available to the antenna. For this reason use only low-attenuation type cable; we suggest RG213 cable or in certain applications, where the power is over dimensioned or the cable length is small, RG58 cable can be used. Times Microwave, Cell Flex, Andrews all manufacture high quality low loss coax.

POWER UP

1) Connect transmitter to mains, check the ground, switch on.

Menu will display the model and firmware version. “Our ODM Series will display the customer’s information”

If this is the first boot or you need to change the systems configuration select “No” by pressing the ► button. If no changes are made the unit press the “set” button unit will perform a 10 second internal self test, once complete the LCD will look like this:

.

Initially, the PLL requires sometime to lock onto your frequency. During this phase the LCD will display “UNLOCK” and “**INH** PLL UNLOCK” alarm.

Once locked onto your frequency the display will show “LOCKED” and “NORMAL STATE”. At this point the transmitter will begin delivering power to your antenna.

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SETTING FREQUENCY AND TRANSMIT POWER

From the main menu, press “SET” for 3 seconds, the LCD will display the setup mode. You should see FREQ with the [***.**MHz] in blocks.

Use “▲” “▼” keys to change frequency, press and hold for fast forward, for fine tune press and release. You can select any frequency in 10 kHz steps.

Once you have set the frequency use the “◄” “►” keys to change to the next parameter. This will display the output power “PS” with the PS in [0] blocks use the “▲” “▼” keys to set the power from zero to maximum. Power output is displayed as “FWD:” reflected power is displayed as “REF”.

Correct operation will be within a range where the reflected power should be less than 10% of the forward power. In the event your reflected power exceeds 10% you should immediately inspect all connections, coax cable/feed line, antenna connection or antenna match/tune.

Check the transmitter's maximum output power does not harm the downstream amplifier stage (if any). If needed, set output power to the minimum.

Once you have finished setting the frequency and power press “SET” for 3 seconds again; this will save your new settings to the unit’s memory. All parameters will be saved even during a power outage or reboot.

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Use the “▲” “▼” keys to move to the next display parameter.

Next, we will repeat the setup mode in the audio display, press “SET” for 3 seconds or until you see the [ ] blocks.

The [ ] blocks will be in “MODE” area. Use the “▲” “▼” keys to change from Stereo to Mono, when you have selected stereo/mono press the “►” key, this will advance the selection to “PR” change the pre-emphasis by pressing either “▲” “▼” keys, now press the “►” key the blocks will advance to “LIM” the units on-board limiter, to make changes press the “▲” “▼” keys, press the “►” key once more and it will highlight the L/R: Audio input level, use the “▲” “▼” keys to select the audio level, now press the “►” key once more the blocks advance to the “A” section, “Auxiliary Channel” again use the “▲” “▼” keys, to make your selection. Once finished remember to press “SET” for 3 seconds for the new parameters to be saved to the units memory. The digital menu display system is very easy to understand and you will become familiar with its functions very quickly.

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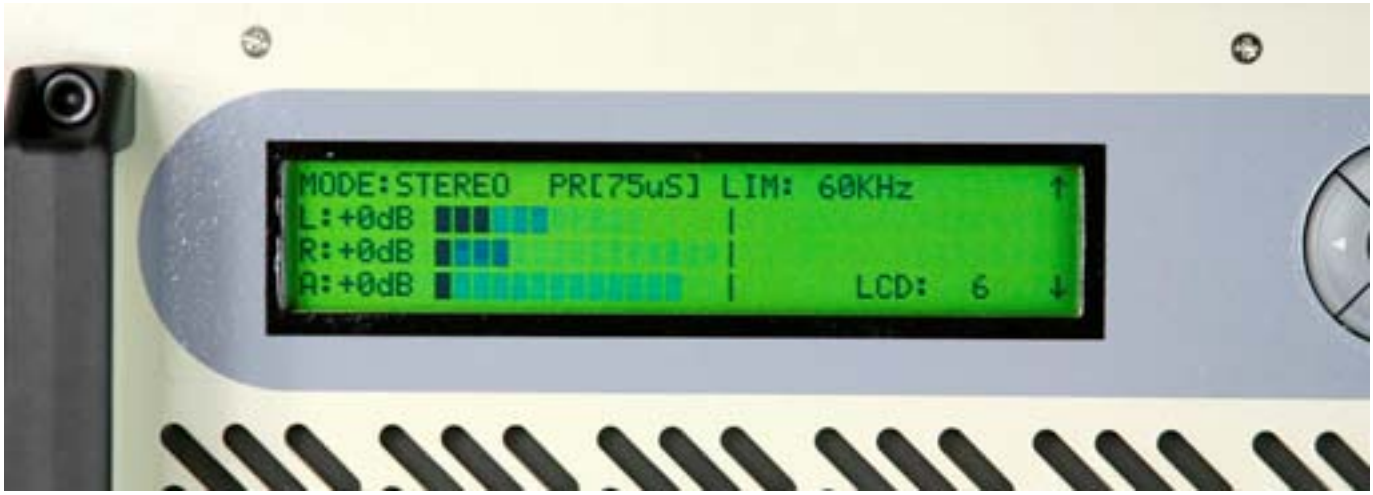
LF CONNECTION

Pre-emphasis setting “PR:”

Low frequency and stereo channel signals have to be adequately "pre-emphasized". For this purpose, select the setting “PR” and choose 0, 25, 50, and 75μs. Factory preset is 50μs. (Europe/Pacific/South America). USA requires 75μs. When using an external processor that employs pre-emphasis you must set the “PR” to 0.

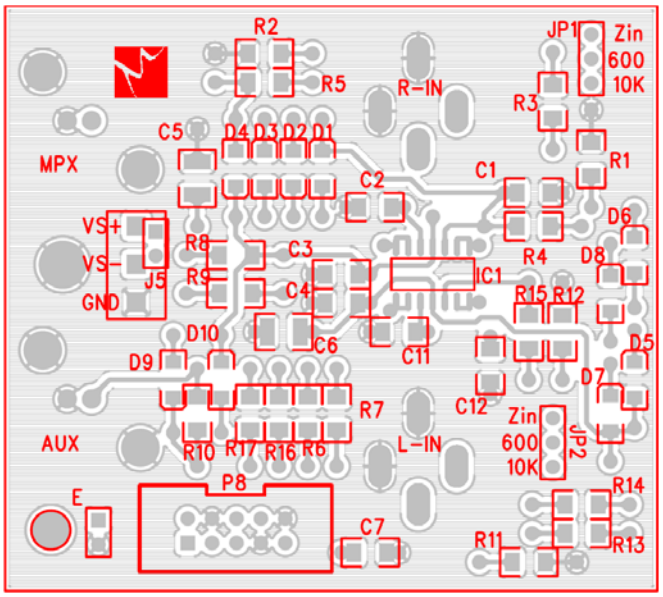
If you need to alter the setting, select and adjust the “PR” to the required parameter.



LF wiring and impedance selection

The STL10 Series supports balanced/unbalanced signals with selectable input impedance.

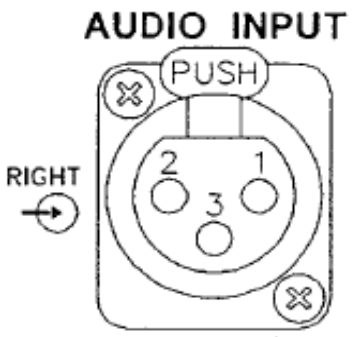
The audio inputs can be set to 600/10K ohm resistive impedance; factory preset is 10k ohm. They can be connected to the balanced output of a professional mixer or to the unbalanced output of a low cost unit without appreciable degradation.



Selection of the input impedance is done by jumpers JP1 and JP2 on the input board

shown to the right; Impedance selection is silkscreened on the component mask of the board.

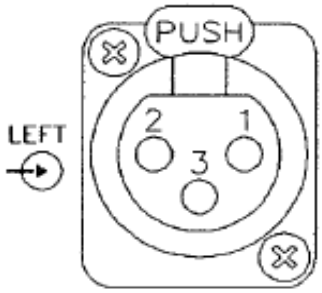
LF audio mono or stereo input employ " XLR" female connectors, use balanced coaxial cable connected to pin 3(+) and pin 2(-). Connect the ground of the driving equipment to pin 1.



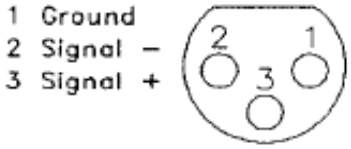
In case of unbalanced drive, input pin 2 shall be short-circuited with ground and shield on pin 1, while the signal shall be available on pin 3.

High impedance selection. 5K ohm instead of 10K ohm.

With a balanced audio signal, the audio cables can be run for 100 meters.



MPX or an externally processed signal, usually an unbalanced signal, can be supplied to the female BNC connector, marked "EXTERNAL", which is internally parallel wired with the mono /right channel connector: for this reason it is not possible to connect signals to these two connectors at the same time. Higher impedance position is 5K ohm in this case.



Connect this input with a 50-ohm (RG58) cable up to 3 meters' distance; if the distance exceeds several tens of meters, use 75-ohm (RG59) or 92-ohm (RG62) cables.

The auxiliary-channel connector, also of the BNC female type, is ground as usual. Use 50-ohm (RG58) or 75-ohm (RG59) cables to connect to the driver.

LF input level range, setting and requirements

In the following paragraph we will refer to 0 dBm as the audio signal which produce 1mW on 600 ohm, i.e. a 775mVrms / 2200 mVpp sine. Irrespective of the impedance we will continue to assume 0dBm as a LF signal whose peak is + (or-) 1100 mV.

In the same way, when discussing the modulation, we will assume a 0dB signal produces 100% maximum modulation, i.e. 75 kHz deviation.

There is no absolute world-wide standard regarding LF peak level as a modulation signal for a transmitter, nor for the mean deviation. Many Broadcasters use 0 or +6 dBm as LF peak level for 100% modulation, USA often uses +10 dBm.

Many European countries specify +6dBm for 40 kHz deviation (which is assumed to be a "mean" modulation). This allows for 5.5dB headroom to max 75 kHz deviation, i.e. +11.5 dBm.

Higher level audio inputs and ambient noise:
High levels will stress the input circuitry of the transmitter, reducing the dynamic distortion-free range over the nominal level (headroom). It will also reduce the quality of audio. For this reason we recommend, whenever possible, to adopt a +6 ~ +10 dBm as nominal peak level for audio modulation purposes.

The STl10 Series transmitters allows an input level range on the main channel of-9 ~ +6 dBm to be set for 100% modulation, with almost no difference in modulation performances, if a high quality signal is provided. Even at the higher level, +6 dB minimum headroom is allowed (i.e. up to 150 kHz deviation, with no distortion). Obviously this deviation is not currently allowed by the broadcast standards and the limiter threshold must be set at its maximum to permit undistorted performance.

The auxiliary channel's gain lies within -6 and -24 dB, with respect to 0 dBm and 100% modulation; this input's maximum applicable level is 0 dBm (775 mV rms).

Typical input levels for an SCA-type signal (10% max. admissible deviation) may lie in the –9 to 0 dBm range (245 - 775 mV rms / 696~2200 mV pp), when the gain is set between -9 dB. Typical-input levels for an RDS-type signal (max. admissible peak deviation 2 kHz) may lie in the -21.5 to -11.5 dBm (185 ~ 585 mV pp) ranges, when the gain is set between -9 dB as above.

The nominal input level to 0 dB modulation may be set with good precision on audio / stereo composite channels, by change the gain to reach the wanted level.

The auxiliary channel level is much more difficult to be precisely set, due to the wider range of the continuously variable control, 18 dB vs. 4 dB. Nevertheless dB control is easy to be set when applying the nominal signal from an external generator, whose level is known, and regulating it to display the wanted modulation on the modulation meter.

The transmitter's internal limiter is of the peak-clipping type; this means that as soon at it cuts in, modulation distortion increases sharply. For this reason, the modulation signal should be kept under control to prevent intervention of the limiter.

The cut-in limiter threshold is factory preset to +2.5 dB (100 kHz peak value). It may be set from 0 dB (75 kHz) and more than +6 dB (150 kHz). This threshold value is mostly specified in the various national standards, and tolerance to short over-modulating peaks varies from country to country.

In any case, the modulation peak value that is internationally admitted for FM is 75 kHz for peaks that are not extremely short. For this reason, the limiter's cut-in threshold should never be too high. It is highly recommended to use an external multi-band limiter to optimize modulation, with higher tolerance for any audio-signal peaks. Such devices momentarily reduce the amplifier circuits' gain if the threshold is exceeded and prevent severe, significant distortion.

Any external compressor, limiter or audio meter must be frequency compensated with the same time constant of the pre-emphasis to modulate or monitor deviation properly.

Therefore, the audio level shall be constantly and correctly monitored and adjusted, to prevent as much as possible, the internal limiter from cutting in. On the other hand, the audio level should be as high as possible, to achieve the best on-air sound.

The tendency to over process the audio signal is common with local broadcasting stations: some sort of processing is advisable and we recommend using a top grade multiband compressor but not as to compress the signal to a point that impairs the original dynamics.

The audio response of the STL10 Series is very flat, without perceivable loss on low and high audio frequency: for these reasons large frequency alterations of the audio signal supplied by using a so-called "frequency equalizer," are not advisable. An increase of the low and high frequency contents of the audio signal by more than a few dB can cause general degradation of modulation dynamics and improper functioning of the limiter.

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OPERATION

Stereo Broadcasting with 2 Input Audio Channels:

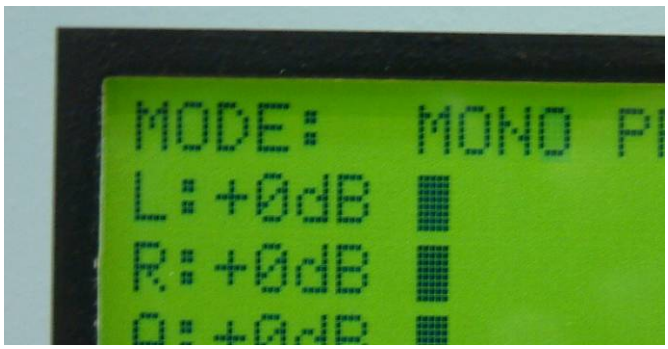
1) Wire the XLR-type modulation input connectors, marked "Left" (channel) and "Right" (channel), to the output of the two channels from the mixer or stereo source.

2) Change "MODE" to "Stereo".

Mono Broadcasting, from a monophonic audio source:

1) Wire the "right" (or mono) input connector to the corresponding audio source as above. Please note that in this case too, the signal runs through the channel(s) processors and is 15-kHz filtered and pre-emphasized.

The FMT-Series with internal stereo-encoder is usually factory preset to process the right channel input signal in the mono mode: it is however possible to use the left channel signal in a similar way by moving jumper "BD1" on the stereo encoder board from position "R" to "L". It is also possible to mix automatically the left and right channels for mono by inserting 2 jumpers in "L" and "R" on the encoder: the transmitter is thereby already preset for stereo operation if needed.



2) Move "MODE:" to "Mono" and set "L/R: " to "0dB".

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Mono or Stereo Broadcasting from Radio-Link Receiver or an External Encoder:

1) In this case, the signal is already multiplexed and pre-emphasized. Use the "External" or "Stereo" audio input.

The signal skips the coding and filtering stage and therefore is not pre-emphasized.

2) Move "MODE" switch to "External".

Operation with a RDS or SCA Encoder

1) Wire the BNC-type "Aux" connector to the output of the RDS or SCA Encoder, momentarily disconnecting any other signal, if present. Wire the pilot-tone synchronization output to the corresponding input of RDS encoder, if present.

2) Momentarily move "MODE:" switch to "Mono".

3) Adjust RDS or SCA encoder output level and /or transmitter aux level front trimmer, marked "aux gain", to achieve the right modulation level.

Modulation Adjustment with broadcast signal:

Check the modulation level for adequacy, as follow:

1) Send a sufficiently constant musical signal to modulator input, check that the meter needle hovers around 0 dBm and moves into the red range during signal peak only and by no more than 1 or2dB. For any other reading, adjust the mixer's "MASTER" volume until the above conditions are obtained.

The "Limiter" alarm should never or very rarely shows up as this would indicate distortion.

If the limiter is set just above 75 kHz, the ”LIM” will shows up above 0dB and the

meter will never show a much greater value. Factory preset is 100kHz (+2.5dB).

"MODE" Switch on "Mono " and “0dB”

In this position, the audio circuit gain of the transmitter is slightly below unity (90%) and corresponds to the sensitivity obtainable in the stereo position, with pilot tone which allows for the remaining 10%.

Use this setting exclusively to test briefly stereo-mono switch, when no volume variation is desired in the modulation. In this case, for two-channel mono operation, it is preferable to place two jumpers in "L" and "R" at the BDI position on the stereo encoder board, to use both channel mixed in transmission.

For protracted mono broadcasting, use the position "Mono” “0dB", which permits correct 100% modulation with 0dB level, as indicated by the internal meter.

Low power level transmission

The FMT-Series transmitters are not specified at power level less than 2 Watt, as with some power and frequency combinations (usually at less than 0.5 Watt, some sub-harmonic and/or spurious signals may be generated.

Were low power level transmission was imperative, verify with a spectrum analyzer that the transmitter is correctly functioning at and just below the operation power: lowering the exciter to final amplifier power, via the exciter board power regulator, may help and even completely fix the problem.

The installation of the transmitters is thereby completed. D&M wishes you success in your work and remind you that they are always available for further information or to tackle any specific problem.

STL RECIEVER

FOREWORD TO INSTALLATION

Install the RECIEVER in a dry, vented, dust-free environment, with a mean temperature of +10~+35 °C. Do not install on surfaces or racks subjected to vibrations, external vibrations can impair S/N ratio.

Connect your audio source using suitable cables and connectors.

The STL10 Series audio circuitry is similar to hi-fi equipment and should be installed and wired with the same attention; avoid earth loops as much as possible. When these conditions are met, the transmitter will deliver excellent audio characteristics.

The STL10 Series are fully RF shielded and can be installed close to the production studio, this type of installation allows constant monitoring of audio levels, deviation and power parameters. The transmitter can also be installed in other locations away from the studio and connected with several meters of LF co-axial cables with no adverse effect on modulation quality. Remote installation usually requires STL (Studio to Transmission Link equipment).

Final modulation performance is based upon the system installation, give careful consideration to where you will locate the transmitter. Additional advices are given in the appropriate paragraphs in this manual to assist you to achieve an optimum environment.

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RF CONNECTION

Connect the N type input connector, marked "ANT. in" from the antenna system with top-grade 50-ohm shielded cable.

We suggest RG213 cable or RG58 cable can be used. Times Microwave, Cell Flex, Andrews all manufacture high quality low loss coax.

POWER UP

1) Connect reciever to mains, check the ground.

Menu will display the model and firmware version.

“Our ODM Series will display the customer’s information”, then go to normal monitor page.

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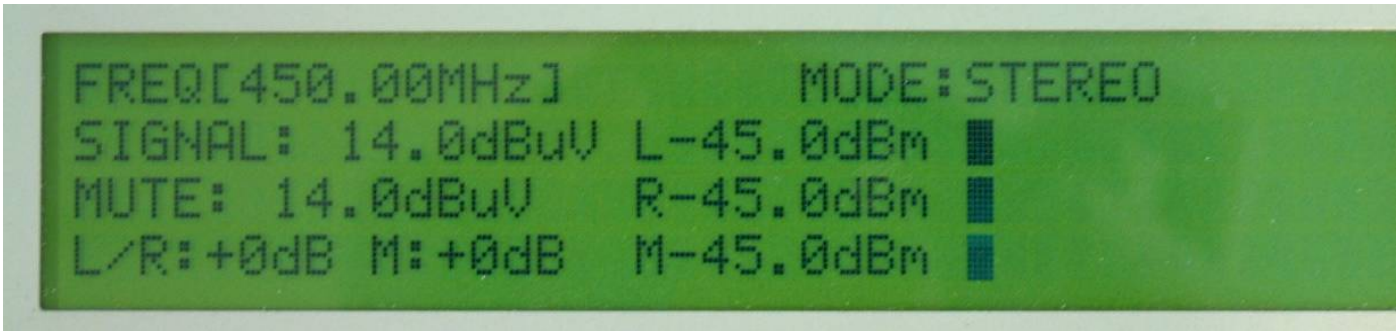
SETTING FREQUENCY AND OTHER PARAMETERS

If this is the first boot or you need to change the systems configuration, keeping press “◄” and ”►” button same time during power on. It will goes to service mode, once complete the LCD will look like this:



You should see FREQ with the [***.**MHz] in blocks.

Use “▲” “▼” keys to change frequency, press and hold for fast forward, for fine tune press and release. You can select any frequency in 10 kHz steps.

The frequency of STL receiver is pre-set and fix by factory due to narrow band pass filter inside. Only few MHz bandwidths allow adjusting. If you need to change your receive frequency, please info your local service or back to factory to get better receiving.

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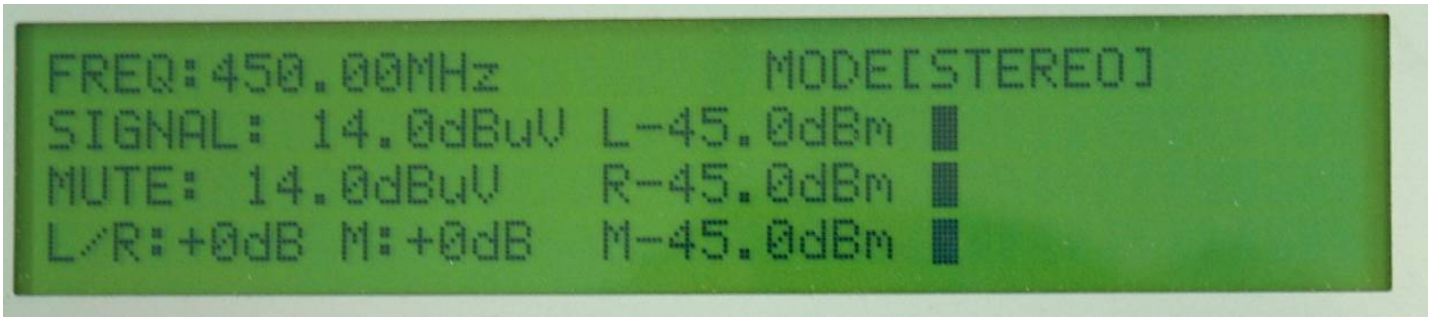
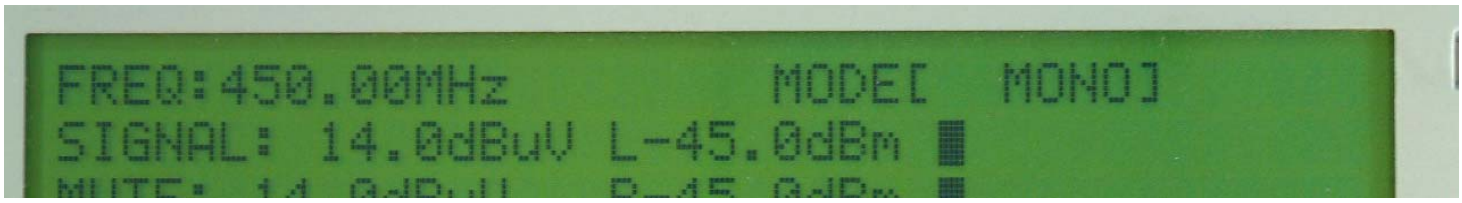
Once you have set the frequency use the “◄” “►” keys to change to the next parameter.



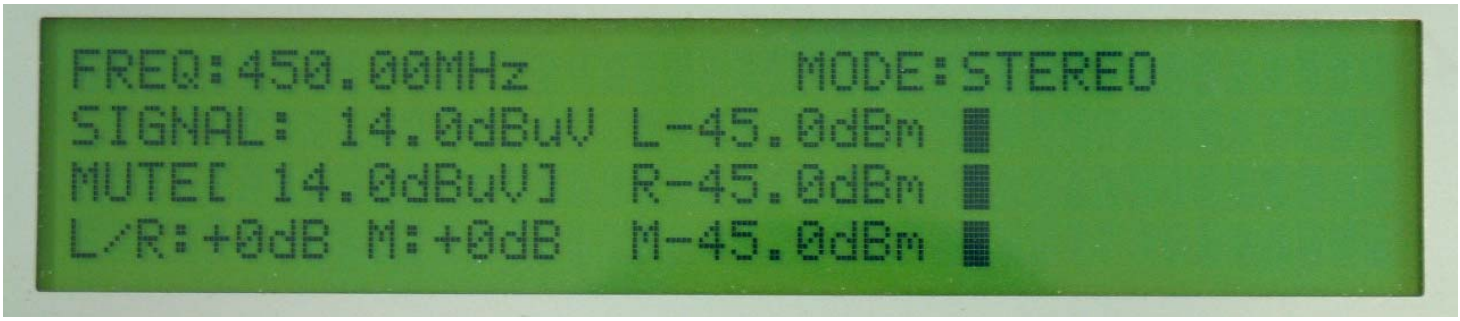
This will display the MODE with the STEREO in [STEREO] blocks, use the “▲” “▼” keys to set the receive mode with STEREO or MONO.



MUTE

Use the “◄” “►” keys to change to the next parameter.

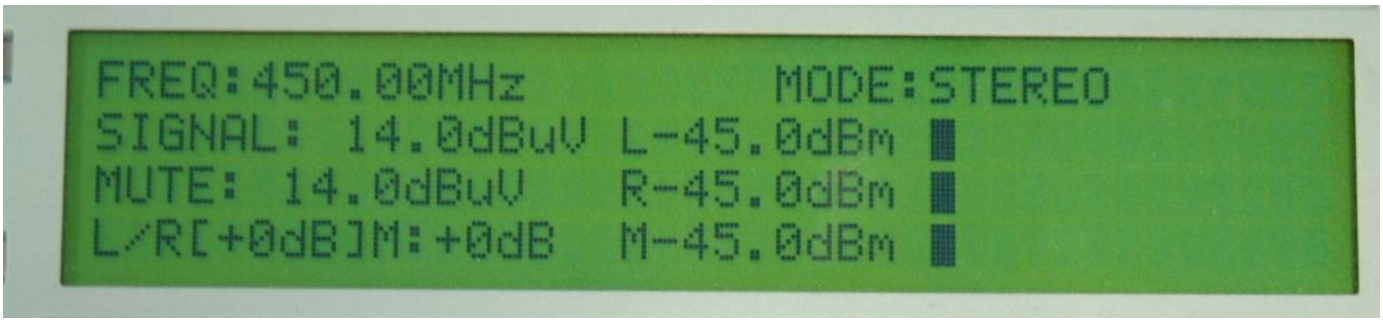
This will display the MUTE with the dBuV in [**.*dBuV] blocks, use the “▲” “▼” keys to set your minimum receiving level with dBuV. Lower this signal level will force the



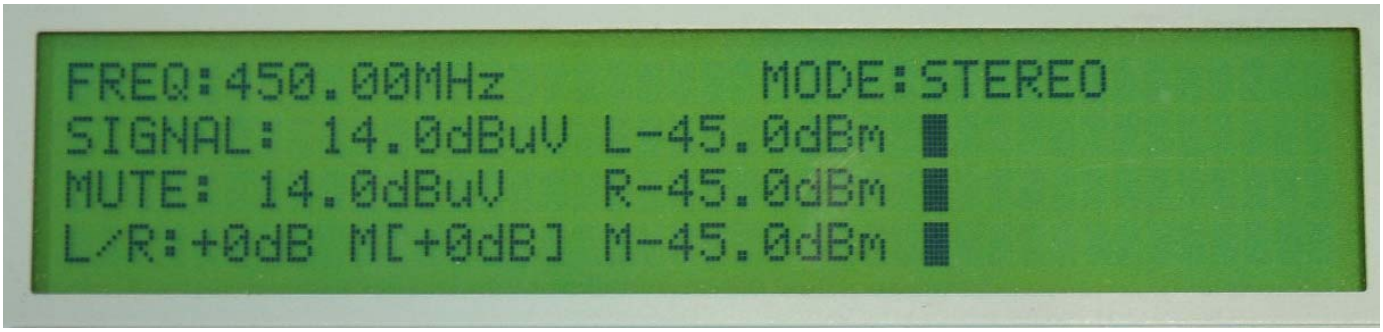
audio output cut off and goes to MUTE mode.

AUDIO AND MPX OUTPUT LEVEL

Use the "◄" "►" keys to change to the next parameter.



This will display the L/R with the dB in [**dB] blocks, use the "▲" "▼" keys to set your audio output level from -9 to +6 dB. Use the "◄" "►" keys to change MPX output level.



WARNING!

OPERATION WITHOUT ANTENNA, BADLY TUNED ANTENNA, FAULTY ANTENNA CONNECTION, POOR COAXIAL CABLE/CONNECTIONS OR OPERATOR ERROR CAN CAUSE DEGRADATION AND POSSIBLE DESTRUCTION TO THE TRANSMITTERS FINAL AMPLIFICATION STAGE. FAILURES OF THIS NATURE ARE NOT COVERED BY THE GUARANTEE.

www.fmuser.org

GENERAL CONDITIONS OF SALE

All orders shall imply acceptance of the general conditions laid out herein below. Where differences arise between the general conditions and the specific conditions stipulated in price quotations, the latter shall prevail. No amendments to the present conditions shall be valid without written approval from D&M.

1- ORDERS

1.1 Orders placed with D&M must be sent either in writing or by fax followed by written confirmation within eight days.

1.2 Like price quotations, any exchanges of information between D&M and the purchaser shall not constitute a contractual agreement. The sales agreement shall not be binding on both parties until receipt of the purchaser's order.

1.3 The cancellation or interruption of an order shall only be valid with the consent and written approval of D&M. Where cancellation is accepted, the purchaser shall be liable for payment of compensation which must cover the total amount of costs already incurred. In all cases, the said compensation shall amount to at least 30% of the total sale price.

2- PRICES

2.1 The prices indicated in all price lists or quotations shall be given in USD exclusive of V.A.T. and any other tax, except different specification in the quotation.

2.2 Prices are final and shall not be subject to revision, on condition that the order is placed before expiry of the period of validity indicated on the quotation. Except where otherwise stated, this period shall be 30 days.

3- CONDITIONS OF PAYMENT

3.1 Invoices are drawn up on the date of delivery. They should be paid in full within 30 calendar days of the invoice date. Payment may be made by bank draft (subject to our acceptance), transfer or change.

3.2 The order shall only be completed on a 100% advanced payment by a direct swift to D&M bank. Except specific term mentioned in the quotation.

3.3 Failure to make payment on the scheduled date shall result in a demand for payment of all other outstanding payments. Furthermore, all overdue payments shall automatically give rise, after formal notice, to the payment of interest for overdue payments, which shall be calculated at a rate equal to one and a half times the legal rate of interest. Failure to pay may result in D&M suspending or canceling the delivery of orders in progress and reclaiming any goods already supplied. In this case, D&M shall retain the deposit paid by the purchaser by way of contractual compensation. Furthermore, all costs incurred in recovering moneys owing, in addition to any legal expenses, shall be borne by the purchaser.

3.4 Advance payment does not give entitlement to discount.

4- PACKAGING AND TRANSPORT

4.1 Packaging costs are included in the price.

4.2 Carriage costs and any taxes in the country of final destination shall be borne by the purchaser.

4.3 All our goods are carried at the risk of the purchaser, who shall check the condition of the delivery before issuing a discharge to the final carrier.

5- DELIVERY

5.1 D&M shall not be liable to the Customer or be deemed to be in breach of contract by reason of any delay in performing, or any failure to perform, any of the obligations in relation to the goods and services, if the delay or failure was due to any cause beyond the reasonable control of D&M.

5.2 Without prejudice to the generality of the foregoing, the following shall be regarded, but not limited to, as causes beyond the reasonable control of D&M: act of God, explosion, flood, tempest, fire or accident; war or threat of war, sabotage, insurrection, civil disturbance or requisition; acts, restrictions, regulations, bye-laws, prohibitions or measures of any kind on the part of any governmental, parliamentary or local authority; import and customs regulations, charges or seizures; strikes, lock-outs or other industrial actions or trade disputes by employees of the postal system, carriers or other third parties; difficulties in obtaining raw materials, labor, or parts; power failure or breakdown in machinery.

6- TRANSFER OF RISKS AND OWNERSHIP

6.1 Risks shall be transferred to the purchaser as of dispatch of the goods, including goods sent carriage paid.

6.2 In accordance with Law, D&M shall reserve ownership of the goods sold until the purchaser has made full payment of all moneys due. In this respect, under the terms of the present provision, the remittance of bills or any instrument creating an obligation to pay shall not be deemed to constitute payment.

7- DRAWINGS AND PRELIMINARY DESIGNS

D&M retains full intellectual property of its designs, which may not be communicated to others or executed without its written authorization.

8- INDUSTRIAL AND INTELLECTUAL PROPERTY

8.1 Except where authorization is given, documentation and software shall not be copied or amended, translated or adapted into any other software language or foreign language by the purchaser. However, the purchaser may make 2 copies for filing purposes and for the replacement of a defective copy.

8.2 Should the purchaser be sued in relation to a product supplied by D&M on grounds of breach of an industrial or intellectual property right held by a third party, D&M shall assume responsibility for the defense case at its own cost, shall conduct the proceedings and shall pay any damages awarded to the said third party. This commitment is subject to the obligation upon the purchaser to inform D&M immediately in writing of any claims lodged, and to leave D&M free to reach a compromise.

8.3 Purchasing products from D&M does not imply the grant of rights under any patents of third parties, by license or otherwise. If the purchaser is not yet licensed, he shall approach administrator, as the case may be, in order to apply for a license, if it is necessary.

9- WARRANTY AND LIMITATION OF LIABILITY

9.1 The parts and any workmanship commissioned by D&M is guaranteed for a period of 12 months from the date of the sales invoice against defects, providing the goods: in the case of kits, are constructed and soldered properly; are not subject to use that is beyond normal/reasonable wear and tear; are not powered with an unsuitable power supply, power source or battery; in the case of transmitters are not operated with an unsuitable antennas or RF loads that cause damage to the output transistors; are not damaged from excessive over heating due to inadequate ventilation; any kinds of RF power transistor defect are not warranted.

9.2 Qualifying goods will be repaired or, at our option, replaced providing the goods are returned to us, carriage paid and suitably packaged within a 12 month period, together with a copy of the original sales invoice. To prevent import charges being made on returned goods from countries and territories outside the Taiwan, 4 photocopies of the original D&M sale invoice should be attached to the outside of the packaging, together with the relevant completed customs documentation stating that the goods originated from the Taiwan and are being returned for repair/replacement. Under no circumstances will any returned goods requiring payment of import charges be accepted by D&M.

9.3 Warranty against any manufacturer's defect. Damage due to improper installation, overdrive, over voltage, damaged I/O pads or traces, and over temperature invalidate warranty. RoHS related failures or performance reduction are not warranted. Proper installation procedures electrical and mechanical must be followed. Any evidence of solder tampering outside of connection areas also invalidates warranty. Shipping costs are not covered in warranty. Minor deviations from specifications which do not affect the performance are excluded from the warranty. All repairs warranty or otherwise, require a Return Material Authorization or RMA.

10- ATTRIBUTION OF COMPETENT JURISDICTION

Any disputes concerning the interpretation or execution of the present general conditions of sale shall be referred exclusively to the Commercial Court in Taipei, regardless of the place of delivery or the means of payment accepted.