METAMP_U.DOC
Author : MJF/WD
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# MET - AMP

# TRANSTEL TRAIN P.A.SYSTEM

# USER MANUAL

VERSION 4.0

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# USERS MANUAL

# 1 PRODUCT DESCRIPTION

The system provides public announcement facility and entertainment facility to be installed in the 5M2A type passenger train sets.

A typical train set consists of 14 coaches of which 3 are Motor coaches and 11 are Trailer coaches. The metro amplifier will be fitted into all the motor coaches.

The system share the same pair of output wires and can feed audio from either end of the train. Simultaneous operation is prevented by a guard signal which is transmitted on a separate pair. Another pair of wires serves as a means to provide communication from the driver to the guard via a private intercom system. Two output lines are available. One for PA + Music and the other for PA only.

The Met-Amp works in conjunction with an onboard UHF Mobile PA Trunking Radio system.
The units are sturdy, self contained with their own power supply operating from 110 VDC supplied.
The driver remotely switches the system on and off via a potential free key switch.

The units are to be mounted into a 19 inch rack type cabinet to be supplied by user. The height of the units are 6U. Cable entries are from the back of the box. The systems PCB's (pre-amp, intercom, power supply) are located inside the unit on a 4U rack. The power amplifier is attached to the rear of the heatsink. The complete power amplifier and heatsink is removable as a module for easy maintenance. The internal radio and 100V Audio line transformer are securely mounted behind the heatsink.
The front panel consists of the driver and monitor volume controls, driver speaker, LED fuse status indicators, chime test button, VU meter, power switch and remote connection. The relays, overvoltage and reverse polarity protection circuitry as well as the power input filter all sit on the relay tray just behind the front panel. The equipment is of a modular type design, fitted with durable plugs and sockets for easy maintenance.

## *1.2. Met-Amp features:*

### 1.2.1 General features:

- A Secure anti-theft RDS Radio Receiver capable of being tuned to any FM channel in the frequency band 87,5 to 108 MHz. It has a output signal of ( 0 dBm). The radio retains the correct and last channel tuned to if the supply to the radio is interrupted and re-applied.
- Announcements from driver or guards to passengers. First one (Driver or Guards) to make an announcement, has priority. A pre-announcement chime is sounded before each announcement is made. This is provided for by an input facility for the PA Trunking Radio system (0 dBm, 600 ohm balanced).
- An input facility for an external portable Radio/CD/Tape (0 dBm, balanced).
- Announcements are 6dB's higher and take priority over internal radio or external music system.
- An input facility for an auxiliary advert and announcement system ( 0 dBm, 600 ohm balanced).
- A chime test switch facility.
- Intercom communication between driver and guard without interrupting the public address system.
- Automatic sound level adjustment, relative to the speed of the train, to compensate for the varying ambient noise conditions.
- Ability to adjust the overall output level of the amplifier.

- The system incorporates a VU meter, measuring pre-amplifier output.
- Interactive remote control to adjust all fixed settings of the amplifier.

### 1.2.2 Pre-amplifier features:

- The pre-amplifier is the heart of the system and incorporates the intelligence of the metro amplifier.
- It incorporates the ability to select the different and various inputs as mentioned above.
- 5 band graphic equaliser to compensate for the coach and loudspeakers acoustics.
- Separate tone controls are also provided.
- Automatic speed level adjustment. A change in speed from 0 to 100 km/h will typically change the output of the amplifier by 10 dB depending on the pre-set adjustments.
- The pre-announcement chime. The chime melody can be customised to the clients individual requirements.
- Control circuitry which only allows one amplifier to be active at any one time.
- Remote control input able to change all settings of the pre-amp.

### 1.2.3 Power Amplifier

- The amplifier can deliver a continuous 200 Watts RMS. output power on the 100 volt audio line output.
- The amplifier can deliver peak output power of 400 Watts.
- The overall frequency response falls within the window of 100Hz to 10KHz , ± 3dB's from the level obtained at 1KHz.
- The total harmonic distortion does not exceed 2% at the rated output power.

## 2. SYSTEM CONFIGURATION

| UNIT | REV | DATE | COMMENT |
|---|---|---|---|
| au620c | 4.0 | 1996-11-05 | Overall wiring diagram |
| au621b | 4.0 | 1996-11-05 | Power Amp |
| au622b | 4.0 | 1996-11-05 | Intercom |
| au623b | 4.0 | 1996-11-05 | Pre-Amp |
| au624 | 3.0 | 1996-12-13 | Remote |
| au625 | 3.0 | 1996-12-13 | Enclosure front panel |
| au626b | 4.0 | 1996-11-05 | Relay Board |
| au627 | 3.0 | 1996-12-13 | System Mechanical layout |
| au628 | 3.0 | 1996-12-13 | Radio Front Panel |
| au629 | 3.0 | 1996-12-13 | Radio Case |
| au630b | 4.0 | 1997-11-05 | Backplane |
| au631 | 3.0 | 1996-12-13 | Remote Keypad |
| au632c | 4.0 | 1998-11-05 | Fuse status on front panel |
| au633b | 4.0 | 1998-11-05 | Power Supply Board |
| au830 | 1.0 | 1998-11-05 | Aux Input Board |
| au831 | 1.0 | 1998-11-05 | Under and Over Voltage Protection |

# 3. OPERATORS INSTRUCTIONS

No operator intervention is required.

# 4. PREPARATION FOR USE

### *4.1 Unpacking*

After unpacking, the system should be checked against the packing list. Each item should be inspected for damage during transit.

### *4.2 Installation*

Once satisfied that the system is complete and not damaged, it can be installed at the top position in the lockable 19" rack cabinet provided for. The height of the system is 6U. Cable entries are from the back of the box.

### *4.3 Connection*

Please refer to diagram AU620c for correct connections to the Met-Amp system.
It is important to connect the 110 Volt positive (U to Wire No 2) and 110 Volt negative (N to wire No1) correctly to ensure no damage is done to the system and for correct operation.
**Note:** The system has internal protection in case of incorrect connection.

#### 4.3.1 Power Amplifier Output Connections

- Music + PA (37) connected to wire No 5.
- PA only (31) connected to wire No 6.
- Common (32) connected to wire No 7.

#### 4.3.2 Intercom Connections

- Intercom (35) connected to wire No 1.
- Intercom (36) connected to wire No 2.

#### 4.3.3 Control Connections

- Control (33) connected to wire No 3.
- Control (34) connected to wire No 4.

#### 4.3.4 Trunk Radio System

- This connects via a DB25 male connection to the rear of the Met-Amp system. A metre extension cable is supplied with each unit.
- Includes connection to the PA system, Intercom, External Music Source, Advert and Announcement system, Driver control switch and Guard control switch.

### 4.3.5 External Music Source

- Connection is also possible via the same DB25 connector at the rear of the system. There are 5 wires to connect.
    - 12VDC, GND - this is a power source available to the external system. The unit must not draw more than 1.5 Amps continuously and 2.5 Amps peak.

    - ExtRadioA, ExtRadioB - this is the audio source being a 600 ohm 0dBm balanced signal.
    - RadioSelect - The external music source is selected when a potential free switch is pulled to GND(closed). The internal radio is selected when the switch is open.

## *4.4 Commissioning*

Switch off the unit before connecting. Power should only be applied once all connections are correct.
The driver of the train-set is the only person who is able to power up the system. He must insert the driver key before the system will power up. By inserting the driver key, the REL signal on pin 23 of the DB25 connector is pulled to GND, which then enables the power relay on the Relay Tray. This provides power to the whole system The following green led indicators should light up on the front panel. 'MAIN', 'RADIO', 'AMP'. The 'AUDIO' led indicator will only light if an audio signal is applied to the system.
The system will only output an audio signal if the radio select signal is activated. The driver volume can be adjusted by turning the volume control knob on the front panel until a comfortable volume level is reached.
The side tone is set by adjusting the pot (VR1) on the preamplifier board AU623.

### 4.4.1 Remote control

Use the remote control to set up the graphic equaliser, vary the volume, adjust the tone.

The remote control is a hand held unit which connects to the preamplifier of the system via the front panel. Once connected it will establish communication with the preamplifier. When this is done the remote will display its logo 'Met_amp' for a short period and then it will display 'Download Settings YES/NO '.

The operator can now choose to download the settings stored in the remote into the pre-amplifier by pressing the 'YES' key to download. Pressing the 'NO' key, the operator can then scan through the settings by using the right arrow key '→'.

Should you wish to change any of the settings the up '↑' or down '↓' keys can be used. These keys take effect within one second of pressing them. Please allow this time before the next adjustment is initiated.

The remote has the following menus available:

- Download settings (YES/NO) - Allows the operator to download the settings from the remote to the Met-Amp system.
- Save Settings (YES/NO) - Allows the operator to save the new settings in the amp and the remote.
- Min Volume - This is the lowest volume that the Met-Amp should be allowed to operate at and is expressed in a dB value. The minimum

value being -20 dB's and the maximum value being + 20 dB's.

Max. Volume - This is the highest volume the Met-Amp should be allowed to operate at. i.e. This setting is the upper limit of the system when the train reaches maximum speed. The minimum value being -20 dB's and the maximum value being + 20 dB's

- Treble Setting
- Graphic Equaliser Filter Settings - 90Hz, 200Hz, 800Hz, 2,5K Hz and 9,5K Hz

Once the operator has finished downloading the new settings, the remote can be unplugged from the Met-Amplifier. The system is now ready to be tested.

The radio is located behind the heatsink. Refer to the radio users manual supplied with this manual for correct setup and operation.

### *4.5 Testing*

#### 4.5.1 A Quick Test

A quick test is to push the yellow chime switch. A chime should sound for no longer than 3 seconds.

#### 4.5.2 PA System

To test the PA, push the Press to Talk button on the Trunk Radio System. A chime should sound for no longer than 3 seconds. There after the speaker may make an announcement.

#### 4.5.3 Testing the Internal Radio

To test the Internal Radio, the guard must first insert the guard key. The internal radio will play a pre-selected FM radio channel. Refer to the radio users manual for radio features.

#### 4.5.4 Testing the External Music System

An external music system can be connected to the Met-Amp system via the DB25 connector.
i.e. (12V, GND, External Radio A & B, RadioSelect)
The guard must first insert his key switch and then switch the RadioSelect switch to select external radio.

#### 4.5.5 Testing the Intercom

By pushing the intercom push to talk, the driver and the guard are able to communicate privately with each other.

## 5. MAINTENANCE

Maintenance of this equipment is divided into two categories. First line maintenance and PCB repair. Only qualified persons should be allowed to do any repairs to the equipment at board level. First line maintenance consists of isolating the faulty printed circuit board and replacing it.

### *5.1 Instruments and tools required.*

Multi-meter.
110V DC 10 Amp Power Supply
Frequency Generator 0 - 100 KHz
Wiring Diagram - au620b

### *5.2 Fault diagnostics*

The following steps should be taken to evaluate the situation when a system is reported faulty.

NOTE: No cards must be replaced with the power switched on as this could cause damage to the system.

Check if the 'MAIN' green led indicator lights up. If the red led is lit, then replace the 'MAIN' fuse on the front panel. Check all the other green led indicators on the front panel. If any red led indicator is lit then
replace the relevant fuse until the green indicator lights up. The value of all the front panel fuses are 10 amps 250VAC. **Note.** A music signal needs to be applied for a correct response from the 'AUDIO' indicator. Should the fuses persist in blowing then a closer inspection of the relevant area is needed.

<u>First line maintenance</u>

- On switch on, if none of the fuses are blown, and the driver key is inserted but the system does not power up, then the fault lies either with the switch on the front panel, or the Relay's, Mains Filter and Rectifying diode on the Relay board should be checked.
- If the 'RADIO' fuse persists in blowing, then the problem lies with the External Music System.
- If the 'MAIN' or 'AMP' fuse persists in blowing then the problem lies with the Power Supply or the Power Amplifier respectively.

Power Supply - Replace the fuses on the Power Supply Module. If the problem persists then replace the Power Supply Module. Remove the 2 screws on the angle bracket which secures the heatsink to the BOX. Swing open the heatsink.Remove the retaining plate which ensures the secure placment of all the PCB cards. Remove and replace the power supply.

Power Amplifier - Disconnect and replace the Power Amplifier Module. Remove the 2 screws on the angle bracket which secures the heatsink to the BOX. The heatsink should easily swing open. Push down on the pin in the top hinge and carefully remove the heatsink. Replace with a new heatsink/power amplifier. Installation procedure is the reverse of the removal procedure.

- If the 'AUDIO' fuse persists in blowing then the fault lies with either of the 110 Volt Audio line transformers or the actual load connected to the amplifier.
- If the system powers up correctly but the user gets no response when pushing the chime test switch, the problem lies with either the power supply or the pre-amplifier module.

- The preamplifier has the following indication LED's:
  - MONITOR - Indicates whether the monitor speaker is on or off.
  - AUX_PTT - Indicates an auxillary request.
  - PA_PTT - Indicates that a PA announcement is being made.
  - RADIO - Indicates that the radio is playing
  - AMP2 - Indicates that both the PA and Music relay has been activated.
  - AMP1 - Indicates that only the PA Relay has been activated.
  - PLAYCHIME - Indicates that a chime message will be played.
  - 5V - Indicates that there is 5V available to the PCB
  - 8.5V - Indicates that there is 8.5V available to the PCB

# 6. SPECIFICATIONS

## *6.1 Electrical characteristics*

| | |
|---|---|
| Supply voltage | 110VDC ± 25 % |
| Supply current | 10 Amps |

## *6.2 Audio Input Characteristics*

Analog inputs

| | |
|---|---|
| PA Input | (0dbm, 600 ohm balanced) |
| Auxiliary Input | (0dbm, 600 ohm balanced) |
| Chime Input | (0dbm, 600 ohm balanced) |
| Internal Radio Input | (0dbm, 600 ohm balanced) Blaupunkt ACR 3251 |
| External Music Source Input | (0dbm, 600 ohm balanced) |
| Control Signal Inputs | |
| Intercom Inputs | |
| Speed Current Loop Input | 0 - 4.7mA for 0 - maximum speed as preset by the remote. |

Voltage free contact inputs

Radio Select, PA PTT, AUX PTT
Driver Relay Input, Guard Control Key.

## *6.3 Amplifier Output Characteristics*

Load Characteristics: The Power Amplifier drives 100 Volt Audio Line Transformer into a isolating step down transformer and then into a 6 ohm speaker load in each coach. Heat is dissipated through a heat sink.

| | |
|---|---|
| Peak Output Power | 400 Watts. into 20 ohms at 100VDC |
| Continuous Output Power | 200 Watts RMS. |
| Total Harmonic Distortion | 2% at rated output power,depending on ventilation. |
| Frequency response | 100 Hz to 10 KHz ± 3db from level at 1KHz |

## *6.4 Mechanical Characteristics*

| | |
|---|---|
| Dimensions (H*W*D) | 6U * 19" * 300mm |
| Colour | Siemens Grey box + black front |
| Antenna Connection | BNC bayonet at rear of unit |

## *6.5 Environmental conditions*

| | |
|---|---|
| Ambient temperature | 0°C - 50°C |
| Relative humidity | 95% @ 25°C max. |
| Altitude | 0 to 1800 m |
| Air pollution | Saline laden industrial and locomotive fumes and dust. |

| | |
|---|---|
| Electromagnetic Interference | Caused by traction circuit. |