

QUICK INSTALLATION AND SETUP MANUAL

WARSANIS MODULATION PROCESSOR

March 2001

MODEL 1401FM



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WARRANTY

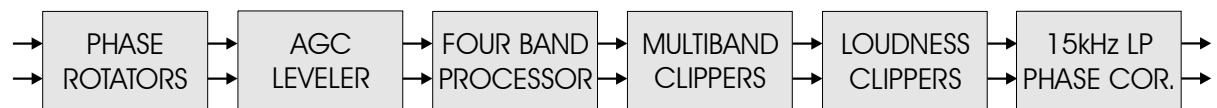
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Please fill in the Registration Card and fax it to Warsanis Productions in The Netherlands. You are then automatically entered in our product update en new product mailing list.

INTRODUCTION

The Warsanis 1401FM is an integrated multiband audio processing system for FM radio that replaces all others compressors, limiters, clippers, the stereo generator and filters. It can be installed either at the studio site using the analog stereo outputs or the transmitter site using the composite outputs. It can also be used for a composite baseband microwave link. It is possible with the Warsanis 1401FM to create your own sound with an absolute control of peak modulation. You can vary your sound between unprocessed and heavily processed. With the Warsanis 1401FM you can give your station the punch, loudness and clarity you always wanted. The Warsanis 1401FM does not only do a great job for CHR stations but also sounds perfectly for talk radio and AC music formats and even classical.

Simplified Block Diagram



Phase Rotators and AGC/Leveler are user selectable

SHORT DESCRIPTION OF THE 1401FM

The **phase scrambler** (rotator) makes peaks more symmetrical to fully benefit the symmetrical peak overload characteristics of the FM medium. Voice and some music can contain asymmetrical waveforms that can overload the processing circuit. By removing asymmetrical waveforms from the audio, larger amounts of gain reduction can be achieved with less distortion.

A **15kHz low pass filter** prevents the AGC for >out of the band= frequencies.

The AGC/Leveler acts more like a leveling device than as a compressor. The idea is to keep consistent dynamic levels working into the four band audio processors. By doing this, the limiter will operate within its >sweet spot= more often, and produce a more consistent on air sound. The release and attack times are very slow. Hence, the AGC/Leveler does not affect the dynamic range of the signal. When the signal is under the gate threshold, the system slows down the release times to prevent noise rush up. Program material below the gate threshold is considered as noise. The gate threshold can be adjusted from -45 up to 0 dB via a trimmer inside the unit.

25, 50 or 75us **pre-emphasis** (specify when placing the order).

The **four band processors** have independent program-controlled time constants according to the band frequency. In each band you can switch the density between fast, medium and slow. The density control affects release times, attack times, double sloop release times and more. You can also select the stereo tracking per band. For example, you can link band three and four individually to provide the stereo link. The Left and Right channel of Band one and two will work independently.

Multiband clipping is a soft clipping module that acts gently without adding audible distortion to the signal. Filtering after the soft clippers prevents interharmonic distortion.

Loudness clipping is a hard clipping module. This gives you excellent peak control. Too much loudness clipping results in distortion. Although the loudness clipper module is distortion controlled, it is possible that a certain amount of distortion is hearable when too much clipping is used.

A sharp **15 kHz low pass filter** prevents the stereo generator and transmitter from out of the band frequencies.

Phase and overshoot filters are used to compensate overshoots and phase difference created by the crossover networks and low pass filters. Without the phase correction filters you will not have a flat phase response. Without the overshoot filters it is not unusual to get overshoots as high as 3 to 4 dB.

The **safety clipper** is only active to eliminate overshoots caused by very unusual waveforms.

The **Stereo generator** (option) uses a digitally controlled circuit to produce a high quality composite signal. The Stereo generator has two outputs both with independent output amplifiers and level controls. A SCA (subcarrier) input is available for RDS and a 19kHz (TTL) output for synchronisation. This stereo generator replaces all low pass and high pass filters, overshoot filters, pre-emphasis and the stereo generator of the transmitter or STL link.

Selectable **de-emphasis** on the analog output gives you the possibility to connect the Warsanis 1401FM directly to a flat input of a external stereo generator if the integrated stereo generator is not being used.

INSTALLATION GENERAL

We suggest leaving one rack space vacant between the units. When several units are in a common rack, we recommend using one common power supply-strip to minimize hum and ground loop problems.

INSTALLATION IN THE STUDIO

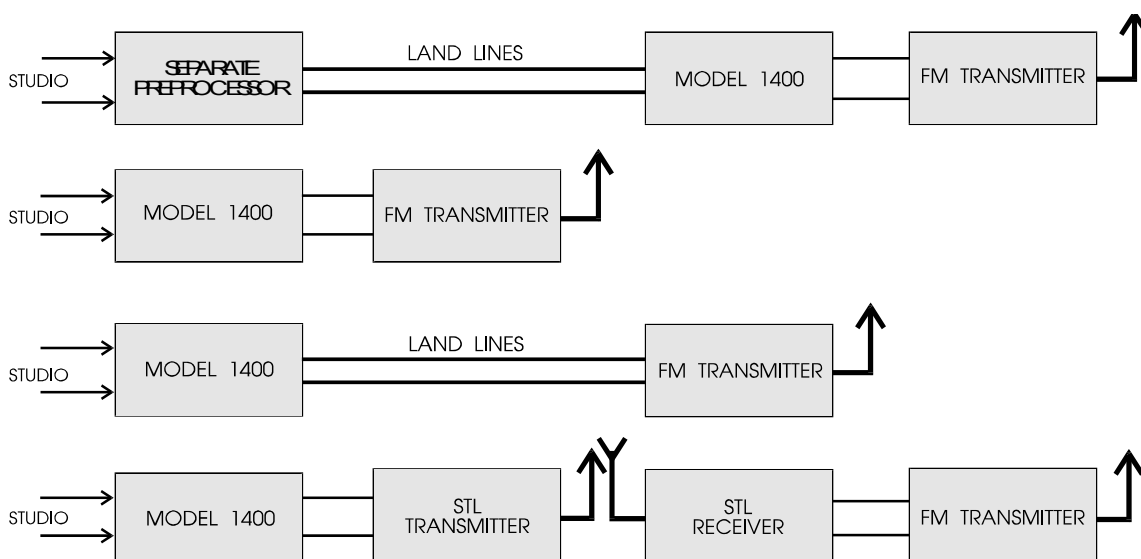
The Warsanis 1401FM should always be the last device in the audio processing chain!

- * Disable all low pass and high pass filters, input transformers and limiters/clippers placed after the Warsanis 1401FM.
- * The system group delay of the land lines, STL or satellite links must be constant between a frequency range of 30Hz to 15.000Hz.
- * The frequency response must be as flat as possible (<0,5dB recommended).

The Warsanis is shipped with a flat frequency response on the analog outputs. This means that the de-emphases are enabled. Defeating the de-emphasis is only necessary if you install the Warsanis 1401FM at the transmitter site without using the intergraded stereo generator (pre-emphasis at the transmitter/stereo generator must be disabled!!).

INSTALLATION AT THE TRANSMITTER SITE

- * Disable all low and high pass filters, input transformers, the stereo generator, pre-emphasis and limiters/clippers placed after the Warsanis 1401FM.



Typical system configurations

CHANGING THE INPUT SENSITIVITY

(Skip this step if you want an input sensitivity of -10 to +10dBu)

The Warsanis 1401FM is shipped with the input sensitivity set to -10 to +10dBu. This is the most common setting for professional broadcast equipment. Move the four jumpers (J4, J6, J7 and J8) on the output board of the processor to the right (See fig. Boards) in order to change the input sensitivity from -20 to -10dBu. This is only necessary if you connect consumer equipment to the input of the Warsanis 1401FM.

ANALOG INPUTS AND OUTPUTS

Symmetrical: PIN1 = GROUND

PIN2 = HOT

PIN3 = COLD

PHASE ROTATOR

Move the two jumpers J11 and J12 to the left to disable the Phase Rotator. The recommended and shipped setting is ENABLED.

ANALOG OUTPUT LEVEL

On the rear side of the Warsanis 1401FM you can adjust the output level (max. >18dBu). Use the supplied screwdriver to change the output level. For setting the maximum desired output use the installation setting as illustrated on fig. >Recommended settings=. The best way to set the output level is to use program material, not (sinus) tones! If available use a (pre-emphasised) modulation monitor or a good (pre-emphasised) PPM meter. If a STL is used you must have at least 3 dB headroom between the maximum output of the Warsanis 1401FM and the clipping point if you are using an (STL) analog audio link.

BASEBAND COMPOSITE OUTPUTS

The Warsanis 1401FM has two unbalanced composite outputs on two BNC connectors on the rear side of the unit. Jumpers are provided for 0ohm or 75ohm impedance.

BASEBAND COMPOSITE OUTPUT LEVELS

On the rear side of the Warsanis 1401FM you can adjust the output levels of the two stereo analog baseband composite outputs. Each of the two outputs can be separately adjusted.

CHANGING THE COMPOSITE OUTPUT IMPEDANCE

The Warsanis 1401FM is shipped with a composite output impedance of 0ohm. This is the common impedance for most situations. If a 75ohm output impedance is required you have to change two jumpers on the Stereo Generator PCB. Make sure you have disconnected the power before changing the jumpers. The two composite outputs can be independently switched for 0ohm or 75ohm operation. For more information see Fig. Stereo Generator at the end of this manual.

SCA INPUT

The stereo generator has an 600ohm unbalanced SCA input. The SCA will be mixed into each composite output. 1,5V peak at the subcarrier input BNC produces 10% subcarrier injection with reference of 100% modulation of the FM carrier independent of the level output control.

19kHz OUTPUT

A 19kHz output (TTL) is available at a RCA connector at the rear side for synchronizing an external subcarrier generator like RDS to the 19kHz pilot tone.

19kHz CRYSTAL OSCILLATOR

Although the 19kHz pilot tone of the stereo generator is very stable, it is possible to replace the standard crystal with a crystal oscillator which will give you a stability of 1ppm (part per million). The crystal must be carefully removed from the PCB and one jumper must be changed for operation with an crystal oscillator. Frequency: 2.432 Mhz

A factory kit with a crystal oscillator and installation instructions is available. Contact your local dealer for further information.

UNBALANCED ANALOG USAGE

INPUT: If you want to connect unbalanced equipment to the input of the Warsanis 1401FM connect PIN3 to ground.

OUTPUT: If you want a unbalanced output use PIN2 as >HOT= and leave PIN3 unused. **Do not connect PIN3 to Ground!!**

GROUNDING

Always use the supplied grounded power cord. Never defeat the earth ground. The earth ground prevents ground loops, hum and assured safety. Measure the resistance between the chassis and earth ground to verify that it is less than 0,5 ohm. A RFI suppression filter is installed in the unit. No ground lift switch is available. To lift the ground from the unit remove the connection between the RFI suppression filter and the chassis inside the unit.

FUSES

The value of chassis fuse for 230V usage: 250mA / Slow Blow

The value of chassis fuse for 115V usage: 350mA / Slow Blow

The value of the power PCB fuse: 1A / Fast Blow

Replace only with the same value!

SETUP & OPERATION

The Warsanis 1401FM is very easy to a setup. You will need 15 to 30 minutes to set up the entire system.

INSTALLING THE 1401FM

PREPARATION

Make sure your transmitter or STL link has a flat input and that all pre-emphasis, low and highpass filters and transformers are defeated or removed and that all jumpers are set to your requirements.

Connect one of the Composite outputs of the Warsanis 1401FM directly to the BNC connector of the baseband input of the transmitter using a short length of coaxial cable. The maximal length of the cable must not exceed 15 metres (50 feet). **At this stage do not connect your SCA generator to the stereo generator when setting up the Warsanis 1401FM.**

LINE UP

This is one of the most important steps of installing the Warsanis 1401FM. The Warsanis 1401 Stereo Generator has a build-in tone generator that produces a 400Hz sinus wave of 100% modulation including the 19kHz pilot tone (without SCA subcarrier).

Turn off the power and open the cover and switch on the sinus generator by using the switch on the Stereo Generator board and by moving one jumper (see Fig. Stereo Generator). Turn the power back on. If the sinus generator is switched on, the audio inputs of the stereo generator are connected to earth. This prevents any signal coming into the stereo generator influencing the 100% output generated by the sinus generator.

Connect a modulation monitor to the transmitter or receiver and adjust the composite output of the stereo generator to produce 100% modulation. This can be achieved by using the plastic screwdriver increasing or decreasing the multi turn cermet trimmers at the back labelled composite output (1 or 2, depending on which BNC output is being used).

The stereo generator is calibrated with a pilot injection of 9%. This injection is user adjustable between 7% and 10% by a R51 (See Fig. Stereo generator).

COMPOSITE STL LINK

If a composite STL link is being used, adjust the composite output of the stereo generator for 100% modulation on your composite STL transmitter. After that, adjust your composite STL receiver output or transmitter input for 100% modulation on your transmitter composite meter or modulation monitor.

USING SCA

Most countries will NOT require adjustment of the input level of the stereo generator. They allow you to generate SCA signals on top of the MPX signal. This results in a higher deviation than "75kHz reading on your modulation monitor.

If you have finished the LINE UP, switch off the internal sinus wave generator (don=t forget to change the jumper) and put the cover on the Warsanis 1401FM. If required, connect the SCA generator to the SCA BNC connector at the rear of the Warsanis 1401FM.

A 19kHz reference output is available on a RCA connector.

No further internal adjustments are necessary for normal operation.

OPERATION

Make sure the Warsanis 1401FM bypass switch is switched to OPERATE. The first stage of the setup is the AGC. Use normal program material. Adjust the DRIVE LEVELER to get approximately 4 to a maximum of 8 dB gain reduction on the led bar of the leveler. Watch the led bar for a longer period of time if possible on music and speech. This first step is very important for the rest of the processing unit.

Now you can set one of the recommended settings in the Warsanis 1401FM.

The Bypass switch has only effect on the analog XLR outputs. The signal coming into the stereo generator will still be processed to prevent overmodulation!

DENSITY SWITCHES

One of the functions is the possibility to change the density per band. The density switches are located on the >processing board= PCB (fig. Boards). There are four switches; one for each band. Each switch has three positions. Changing the switches can be done on air. Be careful when you change the density switches.

STEREO TRACKING JUMPERS

It's possible with the Warsanis 1401FM to link left and right channels per band individually. This means that for example you can link the left and right channel of band four (high) and leave the other three bands not linked! This special feature gives you more control over your sound. If you stereo link a channel it tracks the stereo definition resulting in better stereo but lower average loudness. The shipped setting is enabled.

LOUDNESS CLIPPING

The setting of the loudness clipping control mostly depends on how competitive your market is. More loudness clipping means a louder but also more distorted signal. Try to find a balance (trade off) between quality and distortion. Voices are mostly more affected by the loudness clippers than music. Setting of the loudness clipping drive should be done subjectively and over a period of time. Try a recommended setting and start working from there.

TRANSMITTER LIMITERS/CLIPPERS

If an external stereo generator is used and there is a limiter after the Warsanis 1401FM that you cannot defeat, set the Multiband Clipping to the maximum (+4) to prevent the transmission limiter from being operative. Be also very careful with the output gain, too much output gain causes the transmission limiter to react which decreases the performance of the Warsanis 1401FM and the on-air loudness.

If possible, use the internal stereo generator of the Warsanis 1401FM. This results in a louder on air sound and a better peak control.

RECOMMENDED SETTINGS

FORMAT	LEVELER G/R*	MULTI-BAND G/R*	LEVELER	DENSITY BAND 1	DENSITY BAND 2	DENSITY BAND 3	DENSITY BAND 4	DRIVE MULTI-BAND CLIPPING	DRIVE LOUDNESS CLIPPING
INSTALLATION	-	15	BYPASS	-	-	-	-	-4	+4
CLASSICAL	-	2 / 4	BYPASS	SLOW	SLOW	SLOW	SLOW	0	0
JAZZ	2 / 4	4 / 6	OPERATE	SLOW	SLOW	SLOW	SLOW	+1	+1
CHR	4 / 6	6 / 8	OPERATE	MEDIUM	MEDIUM	MEDIUM	MEDIUM	+3	+1
ROCK	4 / 6	6 / 8	OPERATE	SLOW	SLOW	MEDIUM	MEDIUM	+2	+2
ALBUM	2 / 4	4 / 6	OPERATE	SLOW	MEDIUM	MEDIUM	MEDIUM	+2	+1
AC	2 / 4	3 / 6	OPERATE	SLOW	SLOW	SLOW	SLOW	+1	0
MIX	2 / 6	3 / 8	OPERATE	SLOW	SLOW	SLOW	SLOW	+2	0
URBAN	4 / 6	6 / 8	OPERATE	SLOW	MEDIUM	MEDIUM	MEDIUM	+3	+2
SOFT HITS	2 / 4	2 / 4	OPERATE	SLOW	SLOW	SLOW	SLOW	+2	0
SUPERLOUD	6 / 8	8 / 15	OPERATE	FAST	FAST	FAST	FAST	+4	+3

* Peak level on the gain-reduction meters using program material.

THE WARSANIS 1401FM IN HARMONY WITH OTHER EQUIPMENT

MIC PROCESSING

Most stations use mic processing for its announcers. Be sure to tune the Warsanis 1401FM to your desired sound before tweaking the mic processors. Use only a few dB of gain reduction on your mic processor. This avoid heavy pumping and breading. If available use a de-esser. The de-esser prevents extensive high frequency limiting and the Warsanis 1401FM from overload. The gate/downward expander on your mic processor is very useful if more than 4 dB of multiband gain reduction on the Warsanis 1401FM is being used.

LEVELER

The leveler in the Warsanis 1401FM is perfectly adjusted to the rest of the unit. Some stations prefer to use their own leveling devices. Be sure that, when you use another leveler than the one in the Warsanis 1401FM, the internal leveler is switched **off**. Never use a leveler as a (pumping) compressor. This decreases the quality of the Warsanis 1401FM.

OTHER EFFECT EQUIPMENT

All devices must be placed before of the Warsanis 1401FM!!

STEREO ENHANCERS

Never use too much stereo enhancement. It can cause multipath distortion.

EQUALIZERS

Some stations want to have more frequency control. This can be achieved by placing an equalizer before of the Warsanis 1401FM. Any equalizer will do, parametric or graphic. Never use more than 2 to 3 dB of equalising to prevent the Warsanis 1401FM from overload.

AUDIO EXCITERS

Exciters create harmonics in the higher band. Be careful on how much >exiting= you apply. Too much exiting can causes overloads in the processing equipment.

BASS ENHANCERS.

Same as above; never overdrive the bass enhancers. It can cause pumping and distortion when too much bass enhancing is applied.

TEST AND ALIGNMENT PROCEDURES

Thanks to the design of the Warsanis 1401FM the unit does not have any user alignment points. These tests should be carried out off air.

POWER-UP TEST

- A. Apply power and immediately check for overheating of the regulators on the power board. Also, check other components for overheating.
- B. Check the power leds on the front panel.

INPUT STAGE TEST

Beginning settings.

- A. Switch the Leveler into bypass, be sure that the System switch is in Operate.
 - B. Leveler drive -
 - C. Multiband Drive 0
 - D. Multiband Clipping -4
 - E. Loudness Clipping -4
-
- A. Feed a 1kHz tone into both channels, increase the input till the >Multiband gain reduction meter= indicates -2.
 - B. Change the four input jumpers (J4, J6 ,J7 ,J8) to the right.
 - C. The output level should increase approximately 10 dB.

PHASE ROTATOR TEST

Cannot be tested separately. If you think the phase rotator has a problem simply change the jumpers J11 and J12 to the left. This disables the phase rotator. If this solves the problem IC U2 is probable broken. Replace the IC and test again.

LEVELER TEST

Beginning settings.

- A. Be sure that the Leveler and System switches are in Operate.
 - B. Leveler drive 10
 - C. Multiband Drive 0
 - D. Multiband Clipping -4
 - E. Loudness Clipping -4
-
- A. Feed a 1kHz tone into both channels, increase the input till the >leveler gain reduction meter= indicates -10.
 - B. Decrease the signal by 10dB in one step.
 - C. When listening to the output of the unit the 1kHz tone should be increasing slowly.

CROSSOVER TEST

Be very care full, do not touch any other pins than those shown below!!

- A. Leveler and System switch: operate.
- B. Feed program material or white noise to the unit.

Low band check (front PCB board2)

Check audio on pin 1 and 7 at U5

Mid Low band check (front PCB board2)

Check audio on pin 1 and 7 at U2

Mid High band check (front PCB board2)

Check audio on pin 1 and 7 at U3

High band check (front PCB board2)

Check audio on pin 1 and 7 at U8

MULTIBAND TEST

Settings:

- A. Switch the Leveler into bypass, be sure that the System switch is in Operate.
- B. Leveler drive -
- C. Multiband Drive 10
- D. Multiband Clipping -4
- E. Loudness Clipping -4

- A. Feed pink noise into both channels, increase the input till the >Multiband gain reduction meter= indicates -15.
- B. Check the led meter on the front panel.
- C. Decrease the signal by 10dB in one step.
- D. When listening to the output of the unit the pink noise should be increasing very fast almost unnoticeable. The time in which the audio increases depends on the setting of the density switches.

MULTIBAND CLIPPING TEST

No audio is necessary to preform this test.

- A. Locate the multiband clipper diodes on the output board. These diodes are located right of U5 on the PCB.
- B. Connect your DC meter to the right of Diode D1.
- C. Check the DC voltage at the anode (right side) of D1.
- D. Your meter should be reading negative 1.16 Volt/DC (" 0.2 Volt)
- E. Set the Multiband Clipping control to +4
- F. Your meter should be reading negative 0.65 Volt/DC (" 0.1 Volt)

- G. Repeat steps= C, D, E and F at the cathode (left side) of Diode D2. Your DC meter should be reading positive voltages.

LOUDNESS CLIPPING TEST

No audio is necessary to preform this test.

- A. Locate the loudness clipper diodes on the output board. These diodes are located above and below U9.
The Loudness clipping control does not have any affect on the DC voltage of the Diodes.
- B. Connect your DC meter to the anode (top side) of Diode D8.
- C. Check the DC voltage at the anode (top side) of D8.
- D. Your meter should be reading negative 4.25 Volt/DC (" 0.25 Volt).
- E. Check the DC voltage at the cathode (top side) of D7.
- F. Your meter should be reading positive 4.25 Volt/DC (" 0.25 Volt).
7. Repeat the steps for Diode D23 and D24.

OUTPUT STAGE TEST

- A. Feed program material into the Warsanis 1401.
- B. Check for audio at the left output XLR connectors at pin 2 & 3.
- C. Repeat set A and B for the right channel.

STEREO GENERATOR TEST

The stereo generator does not need any adjustment. A seperate service manual is available. To order the service manual please contact your dealer.

Do not try to adjust the trimmers on the Stereo Generator PCB. Improper adjustment can cause the Stereo Generator to fail.

TROUBLESHOOTING

Determine if the problem is caused by the Warsanis 1401FM and not by other equipment.

LOST OF MODULATION

- * Check the connection to and from the Warsanis 1401FM.
- * If this is not the problem disconnect the unit from your audio chain. Test the unit again.
- C Check the connections between the XLR connectors and output/input PCB.
- * If you cannot locate the problem contact your official Warsanis dealer.

BUZZ

- * Check the grounding of the Warsanis 1401FM.
- * Check the cables feeding the audio to the Warsanis 1401FM.
- * Check the power supply (see test and alignment procedures).

WHISTLE

- * Check the power supply (see test and alignment procedures).
- * If the whistle sounds more like stisteling it is likely to be an oscillating IC. In this case you should locate the IC and replace it by a new one of the same value and type.

GROSS DISTORTION OR LOST OF MODULATION

- * Check the clipper diodes of the multiband and loudness clippers (see test and alignment procedures).
- * Check the multiband processors.

IF ON-AIR BALANCE SEEMS INCORRECT

- * Check the crossover filters.
- * Check the de-emphasis (J9 and J10).
- * Check the multiband processors and clippers.

CHECK THE FOUR BAND PROCESSORS:

- * Locate the multiband clipper diodes on the output board.
- * Feed audio into the unit.
- * Check on audio at the left side of the left row of diodes (D1, 3, 9, 11, 13, 15 and 17).

For the other channel, check the right side of the right row of diodes (D2, 4, 10, 12, 14, 16, 18, 20).

You should listen to the output of the several bands separately. If no audio is found at one or two of the diodes, the problem is likely to be a processor failure. Contact your official Warsanis dealer on how to solve this problem.

VOCAL DISTORTION

- * Check the control of the loudness clipping. Reduce this control.
- * If the distortion does not decrease check the loudness clippers as described above.

GATE LIGHT PERMANENT ON OR OFF WITH NORMAL PROGRAM MATERIAL

- * This probably indicates a failure of the gating circuitry on board 2. Check U13.

IF YOU STILL HAVE A PROBLEM:

Contact your official Warsanis dealer or contact Warsanis customer service in The Netherlands.

TECHNICAL SPECIFICATIONS:

GENERAL:

Total harmonic distortion (THD):	< 0.12% (below processing threshold). < 0.3% (all signal processors active). > 60 dB (70 dB typical).
Signal to noise:	>20K Balanced.
Audio input:	-20 dBm or +10 dBm (jumper selectable).
Input sensitivity:	XLR.
Input connectors:	Balanced.
Audio output:	Adjustable up to >+18 dBm.
Output level:	XLR.
Output connectors:	
Size:	19" 2 rack units.
Weight:	Approximately 7 kilograms.
AC Power:	230 / 115 Volt AC.

PHASE ROTATOR:

This all-pass network makes peaks more symmetrical to fully benefit the symmetrical peak overload characteristics of the FM medium (jumper selectable).

AGC / LEVELER:

Program-controlled time constants provide " 20 dB of leveling. Selectable.

GATING:

Slows down the release time of the leveler as soon as the input falls under the gating threshold. Threshold user adjustable inside the unit.

PRE-EMPHASIS:

25, 50 or 75 μ s (sepecify when order).

CROSSOVER:

Phase linear:	6 dB/Okt.
Crossover points:	140, 850, 6000 Hz.

FOUR BAND PROCESSOR:

Program-controlled time constants provide 25 dB of multiband processing. Time constants adjusted according to band frequency. Employs delayed release for distortion reduction. Stereo Tracking per channel On/Off.

MULTIBAND CLIPPING:

Clipper threshold:	Adjustable over a range of 8 dB.
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LOUDNESS CLIPPING:

Clipper drive:	Adjustable over a range of 8 dB.
Clipper circuit:	Distortion controlled.

<u>PEAK MODULATION CONTROL:</u>	Within " 2% typical.
<u>LOW PASS FILTER:</u>	9th order elliptical phase linear.
<u>PILOT PROTECTION:</u>	>60 dB.
<u>UPPER COMPOSITE PROTECTION:</u>	>65 dB.
<u>PHASE / OVERSHOOT FILTERS:</u>	Compensate the overshoots and phase difference created by crossover networks and low pass filters.
<u>SAFETY CLIPPER:</u>	Only active to eliminate overshoots caused by very unusual waveforms.
<u>JUMPER CONTROLS PCB'S:</u>	Input -5 / +10 dBm or -20 / -5 dBm, Phase Rotator, de-emphasis, Stereo Tracking.
<u>SETUP CONTROLS:</u>	Drive Leveler, Drive Multiband, Drive Multiband Clipping, Drive Loudness Clipping Leveler Bypass and System Bypass. Density can be per band adjusted by a 3-position slide switch. Stereo tracking van be swiched per band by a Jumper.
<u>SYSTEM BYPASS:</u>	Relay controlled / hard bypass. In case of a power failure the system will automatically be switched in bypass mode.

STEREO GENERATOR

SPECIFICATIONS Stand-a-lone Performance

- Frequency Response: 0.5dB, 30Hz-15kHz.
- Separation: >55dB, 400Hz.
- Noise (50 microseconds de-emphasized, 100% modulation): >75dB.
- Total Harmonic Distortion: <0.07% THD, 0.065% SMPTE IMD, 20Hz-15kHz.
- Crosstalk-Linear (referenced to 100% modulation): -60dB.
- Crosstalk-Non-linear (referenced to 100% modulation): -60dB.
- 38kHz Subcarrier Suppression (referenced to 100% modulation): -60dB.
- 76kHz Subcarrier and Suppression Sideband (referenced to 100% modulation): -60dB.

INPUT

- Directly connected to the 1401FM output board.

SCA SUBCARRIER INPUT

- Configuration: One input that sums into composite baseband outputs.
- Sensitivity: 0.8Vp-p for 10% modulation, 1.0Vp-p for 12.5% modulation of main carrier.
- Maximum Input Level: +18dBu.
- Impedance: 600 ohms, unbalanced.
- Connector: BNC. EMI-suppressed.

COMPOSITE BASEBAND OUTPUTS

- Configuration: Two outputs, each with Output Level control, output amplifier and BNC connector.
- Source Impedance: 0 ohms or 75 ohms (jumper-selectable).
- Load Impedance: 40 ohms or greater.
- Level: Adjustable, 0Vp-p to 9Vp-p (100% modulation) with Output Level control.
- Connector: BNC. EMI-suppressed.

PHYSICAL

- Switches: Stereo/Mono (Stereo, Mono L, Mono R), Crosstalk Test (Operate, Main>Sub, Sub>Main), 400Hz Generator.
- Jumpers: Pilot On/Off, 400Hz Generator On/Off, Output Impedance.
- User Screwdriver-Adjustable Controls: Output Level (Pilot, Comp 1, Comp 2).
- Safety Standards: CE-marked.

PILOT Circuit Characteristics

- Frequency: 19kHz.
- Accuracy: +/-1Hz
- Injection: Adjustable, 7% to 10%.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE