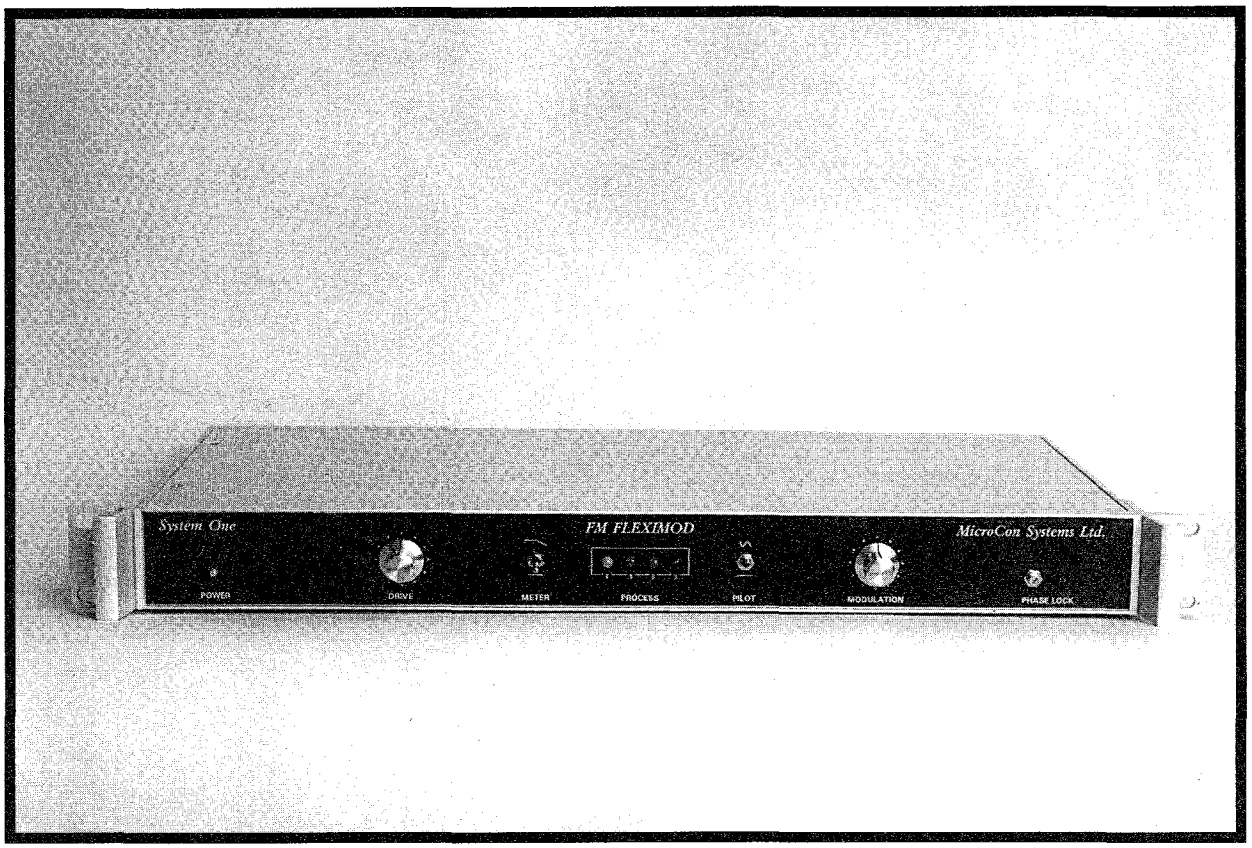


The FM FlexiMod composite processor will improve your sound, extend your coverage, and keep you legal. Improved sound and coverage can translate directly into higher ratings. Top quality processing will increase your TSLs by encouraging people to listen longer. The FM FlexiMod represents a new generation of computer-designed composite processors. It will improve the sound and coverage of any FM station that uses it ...regardless of format! MicroCon guarantees it, or your money back in 30 days.

Based on the DBE-1000 FM composite processor, the MicroCon FM FlexiMod continues the tradition of *gentle* processors that get results. The original DBE-1000 was developed by Jim Somich at Z-100 and WMMS in 1988. Its gentle action, yet powerful sound, gave these #1 stations a unique on-air *presence* that dominates the dial: clean, yet powerful. The processing module of the new FM FlexiMod has been re-designed using computer models of human hearing perception and fine-tuned under actual on-air conditions. It is the closest thing to a totally transparent composite processor we have yet achieved. Beta testers in markets of all sizes, with every format, have acclaimed the FM FlexiMod as indispensable in today's highly competitive broadcast business.

It will deliver for *you* ...regardless of whether your format is country, rock, or even classical.

The heart of the FM FlexiMod processor is our proprietary *c-limiter* module. The c-limiter emulates the best attributes of a super-fast, very clean limiter combined with an effective, low-distortion clipper. It is neither all limiter nor all clipper, but rather combines the best features of both. The limiter function provides positive, almost instantaneous peak control, while the super-clean clipper creates an absolute maximum modulation level to improve coverage and keep you legal. The c-limiter module is much more than just another gain controller. It produces a subtle aural enhancement by creating a low-frequency *time alignment* to improve bass. It also adds subtle, but

noticeable, high-frequency harmonics to the stereo baseband to replace those lost through multi-generation audio dubs and less than forgiving audio processing. This results in a high frequency *sparkle* and low frequency *power* than cannot be created by EQ alone. You no longer need to be dull sounding to be dominant.

The c-limiter is a major breakthrough for MicroCon Systems. For the first time you can be loud and punchy without being squashed and distorted.

We call this unique effect *aural extension*, the winning combination of psychoacoustic research and state-of-the-art engineering.

The final design parameters of the FM FlexiMod were calibrated by computer *and* ear, using a wide variety of music recordings. Source material included super-clean Cds and older music tape carts. From the latest rock sounds to oldies from the 50s and 60s.

The FM FlexiMod is more than just another composite processor. True to it's name, it is a flexible *FM Signal Management System.* You can configure your FM FlexiMod for several different and distinct modes of operation, depending on the on-air results you desire. As a high frequency controller, it is unchallenged in its uncanny ability to bring out the *sparkle* in program material. Simply process your audio *flat* and let the FM FlexiMod control high frequency overshoots.

If your needs are more aggressive, use any standard FM audio processor and adjust the FM FlexiMod for optimum program density. The low second-harmonic distortion c-limiter will permit you to tailor the impact of your station without adding grunge. In either mode you can operate with an internally generated, phase-locked stereo pilot that is free from all processing artifacts. If you desire, you can configure the FM FlexiMod to accept a direct clean pilot from your stereo generator. In either mode, the quality is superb.

In the *phase-locked mode,* the FlexiMod locks to incoming pilot and regenerates a new, clean pilot that is locked in phase to your composite signal. Rather than filter and reuse the original pilot, this approach guarantees the cleanest possible stereo.

If you are seeking every last bit of quality possible, you can feed clean pilot into the FM FlexiMod direct from your stereo generator and bypass the pilot stripper. A simple modification to your stereo generator takes less than 20 minutes.

Personalized processing consultation is an integral part of every FM FlexiMod purchase. Tell us what you are trying to achieve and we will guide you every step of the way. You are more than a customer number at MicroCon! Most problems can be solved over the phone, but field consultation is also available in special cases.

Installation and setup of the FM FlexiMod is a breeze: it takes less than 15 minutes. You can be experiencing the great new sound of your station almost immediately. If you have any questions, we are just a phone call away.

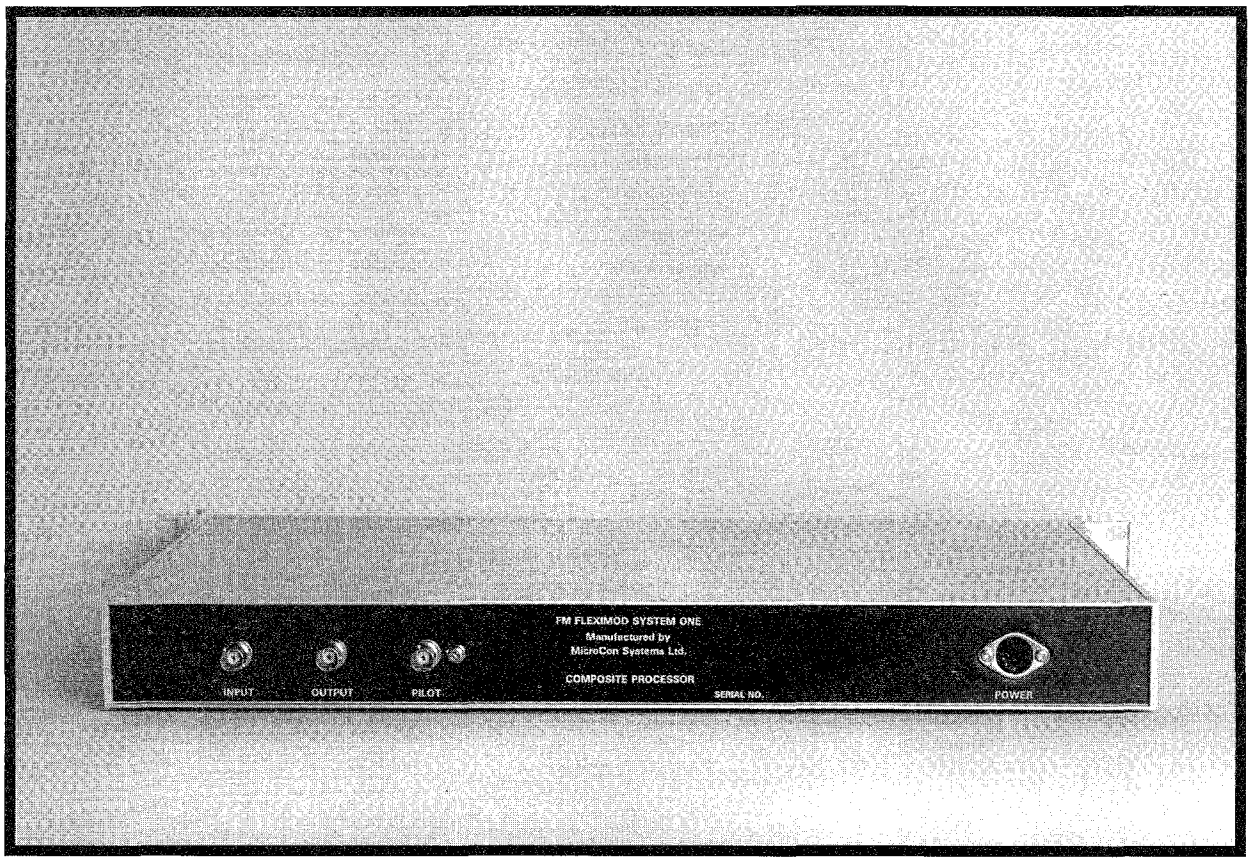
The MicroCon FM FlexiMod is the *Swiss Army Knife* of FM processors. Broadband or high frequency processing, phase-locked internal pilot or external pilot direct from your stereo generator: you set it up to suit your individual competitive needs. And at its low list price of only $1395, it will pay you back many times over with an improved *on air presence.*

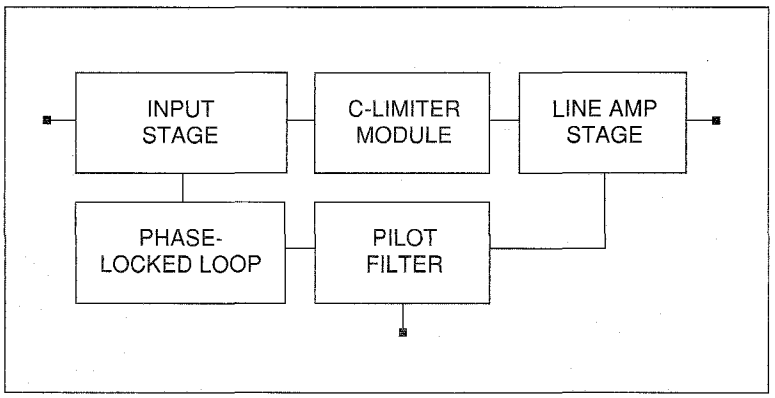
Rarely does a new processor come to the marketplace with such high expectations. The original DBE-1000, upon which the FM FlexiMod is based, became a legend among more than 500 savvy FM Broadcasters. Out of production for more than two years, DBE-1000s on the used equipment market often command a premium price. From this lineage comes the MicroCon FM FlexiMod ...also destined to become a classic.

The theory of audio processing has changed radically in the past few years. No longer content with *loudness at all cost,* broadcasters today demand CD-like quality, but with the punch and power to cut through and become the dominant signal in a market. The FM FlexiMod was designed to achieve just this: the exact tailoring of all program sources for maximum dial presence and impact. When you hear the FM FlexiMod on your own station, you will realize instantly that it has fully achieved its design objective. It is rare when a device costing as little as the FM FlexiMod can contribute so much to the success of a broadcast station.

The concept of *direct pilot operation* was introduced by Jim Somich in 1988. Through a simple modification to the stereo generator, the pilot signal is bypassed from the output. No filtering of the stereo composite is required. The phase and gain relationships in the stereo composite signal are very critical and even very small changes from ideal will affect separation and distortion to some degree. The FM FlexiMod gives *you* the choice: direct or regenerated pilot operation.

The FM FlexiMod was originally produced, in limited quantities, as a *secret weapon* for our processing clients. It is now available to you for $1395.





THEORY OF OPERATION

The input stage provides buffering and gain control, then removes the pilot from the composite signal. The stripper can be bypassed when configured for direct pilot operation. Composite signal, minus pilot is fed to the *c-limiter module,* which is the heart of the processor. The *c-limiter* processes the composite to a degree determined by the setting of the drive control. The phase-locked loop locks to incoming pilot to maintain phase integrity between the composite and pilot. The pilot filter accepts either the output of the phase-locked loop or external direct pilot from the stereo generator and outputs a 19 kHz sine wave. A phase trim circuit is part of the pilot filter and permits exact adjustment of pilot phase for maximum separation. The line amp stage combines the direct or regenerated pilot with the processed composite, provides amplification, and feeds the output via the modulation control.

The stereo pilot is never clipped in either mode.

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SPECIFICATIONS

FM FlexiMod Composite Processor

Size:	19" wide x 1 rack unit high x 8" deep for standard EIA rack mounting
Weight:	3 pounds
Input Power:	120 volts AC / 60hz / 10 watts (other configurations available)
Approvals:	UL and CSA listed
RFI Protection:	Fully enclosed plated and shielded chassis box. RFI filtering on all lines entering or exiting unit.
Input Impedance:	100 kilohms
Output Impedance:	30 ohms

Designed to be fed by any stereo generator or composite STL receiver and feed any FM exciter.

Nominal Input and Output Levels:	+4dbv
Maximum Output Level:	+20dbv clip
Frequency Response:	+-1db 10hz-100kHz (ac coupled)
Total Harmonic Distortion:	<0.01% at +4dbv input and output level
Intermodulation Distortion:	<0.02% (SMPTE method)
Differential Phase:	<0.1 degree
Wideband Noise:	(unweighted) >70db below +4dbv output (A weighting) >80db below +4dbv output
Stereo Separation:	>60db at 400hz / >50db at 15 kHz (including stereo generator).
Group Delay:	<260ns L-R to main / <500ns 1k-100kHz

All measurements made in the direct pilot mode

For more information or a demo, contact Jim Somich at:

1208 Stoney Run Trail
Broadview Hts., Ohio 44147
Tel. (216) 546-0967

FM FLEXIMOD QUICK START

1. Connect the FM FlexiMod between your stereo generator or composite receiver and your exciter.

2. Connect the power pack cable to the DIN socket on the rear panel of the FlexiMod and plug the power pack into a source of standard 120V-60hZ power.

3. The power LED on the FlexiMod should light.

4. The phase lock LED should be lit. If it is out, advance the 15-turn phase lock level pot until it comes on. Be sure your pilot is ON and at normal injection. If the phase lock LED (red) flickers during normal programming, back down the phase lock level until it stops.

5. Be sure the pilot toggle switch on the FlexiMod front panel is in the UP position (pilot on)

6. Set your pilot injection to 9% using the 15-turn trim pot on the front panel of the FlexiMod.

7. With normal program input, adjust the drive control so that the red LED lights only on the highest program peaks. (typical operation)

8. Adjust the modulation control for normal modulation (15-turn)

This latest version of the FM FlexiMod does not have a "de-emphasis switch" on the front panel. Disregard any references to it in the manual. The phase lock level has now been moved to the front panel.

These instructions were written to get you up and running as quickly as possible. Once you have your FM FlexiMod on-line, be sure to read the tech manual thoroughly and optimize your air chain. The secret of a great sounding station is the right equipment and complete system optimization.

If you need anyhelp, you can always give us a call at (216) 546-0967.

Jim Somich

v.p. engineering
Processing Solutions Inc.

TABLE OF CONTENTS

LIMITED WARRANTY

MicroCon Systems Ltd. warrants its products to be free of defects in materials and/or workmanship. This warranty shall extend for a period of one year from the date the product was originally shipped.

The **MicroCon Systems Ltd.** warranty does not apply to products that have been damaged due to and/or subjected to improper handling by shipping companies, negligence, accidents, improper use, or alterations not authorized by **MicroCon Systems Ltd.**

This warranty is in lieu of and excludes all other warranties, expressed or implied. **MicroCon Systems Ltd.** will not be liable for any incidental or consequential loss or damage whatsoever, whether based upon allegations or negligence, breach of warranty, or otherwise. This disclaimer of incidental or consequential damages includes, but is not limited to, property damage, loss of profits, loss of time and other losses or inconvenience resulting from any other defect in the material or workmanship of this product or any other connection with the purchase, operation or use of this product. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

PROPRIETARY NOTICE

The drawings and information disclosed in this manual contain proprietary information to **MicroCon Systems Ltd.** The user of this manual agrees to make no disclosure, reproduction, or use of any part of these drawings or information except by prior written permission from **MicroCon Systems Ltd.**

PRODUCT CHANGES

MicroCon Systems Ltd. reserves the right to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications. While many previously sold products are later upgraded by field bulletins, MicroCon Systems Ltd. reserves the right to do so without incurring any liability or obligations to modify or update any equipment previously sold.

SPECIFICATIONS

Size: 19" wide x 1 rack unit high x 8" deep
for standard EIA rack mounting

Weight: 3 pounds

Input Power: 120 volts AC / 60hz / 10watts
(other configurations available)

Approvals: **UL** and **CSA** listed

RFI Protection: Fully enclosed plated and shielded chassis box. RFI filters on all lines entering or exiting unit.

Input Impedance: 100 kilohms
Output Impedance: 30 ohms

Designed to be fed by any stereo generator or composite STL receiver and feed any FM exciter.

Nominal Input and Output Level: +4dbm

Maximum Output Level: +20dbm clip

Frequency Response: +-1db 10hz-100kHz (ac coupled)

Total Harmonic Distortion: <0.01% at +4dbm in/out
Intermodulation Distortion: <0.02% at +4dbm in/out
(SMPTE Method)

Differential Phase: <0.1 degree

Wideband Noise: (unweighted) >70db below +4dbm output
A weighted >80db below +4dbm output

Stereo Separation: >60db at 400hz / >50db at 15 kHz
(including stereo generator)

Group Delay: <260ns L-R to main <500ns 1k-100kHz

All measurements made in the direct pilot mode.

DESCRIPTION

The MicroCon Systems Ltd. FM FlexiMod is an FM Composite signal processor. It's purpose is to truncate system overshoots, enhance bass and treble, and increase loudness without excessive distortion or listener fatigue. It can be used to enhance your modulation, or to produce absolute maximum dial impact, depending on the front panel settings.

The processor is packaged in a totally shielded box, one rack unit high and 19 inches wide. It is designed to be mounted in a standard cabinet rack close to your stereo generator.

FRONT PANEL

The front panel display consists of a four LED meter, calibrated to show processing activity at the THRESHOLD of processing and at 1, 2 and 3DB of total peak processing. A power LED indicates that bi-polar DC is present in the unit.
Two 10-turn pots control DRIVE, or processing activity, and MODULATION. There are two toggle switches. One permits you to turn the internally generated pilot on or off for testing **(up/pilot on)**, the other permits you to view the LED meter in the flat or de-emphasized mode. **(flat/down)** A red LED indicates phase lock when operating in the regenerated pilot mode. A 10-turn trimpot adjacent to the LED is used to set the injection level of the regenerated stereo pilot.

REAR PANEL

Standard BNC female connectors are located on the rear panel for the FM FlexiMod to be inserted in the composite signal path between your stereo generator and exciter or composite STL transmitter. A 36" coaxial cable is provided to facilitate this connection. A BNC connector is provided for external pilot operation. In the regenerated pilot mode, this BNC can be used as an auxiliary output for monitoring or an auxiliary transmitter feed.

Power is applied from the external power pack (supplied) viaa 5-pin DIN connector. The power pack is internally protected and is UL and CSA listed.

IMPORTANT

If you have any questions after reading this manual, please call us at **(216) 546-0967.**

CONFIGURATION

The FM FlexiMod is normally configured for internally generated, phase locked pilot. Should you wish to convert the unit to direct pilot operation, follow the instructions in the Appendix.

INSTALLATION

The FM FlexiMod must be installed between your stereo generator composite output and your exciter or composite STL transmitter through a low capacitance coaxial cable with standard male BNC connectors on each end. A suitable cable is supplied with your unit.

Avoid installing the FM FlexiMod directly over any heat producing equipment and be sure the unit is securely grounded through the rack frame.

After mounting the FlexiMod and connecting the coax cables, plug the external power pack DIN plug into the rear receptacle on the FlexiMod and connect the power pack to standard AC power.

The Front panel power LED should illuminate, indicating that bipolar DC is reaching the circuit board. The phase lock LED should light indicating that the unit is seeing pilot from your stereo generator, is locking to it and re-generating a new pilot. If the phase lock LED does not light, advance trimpot #5 (see board diagram) phase lock level, slightly until the phase lock LED lights. If your unit was factory configured for direct pilot operation, the phase lock LED will NOT light

PROCESSING PHILOSOPHY

The FM FlexiMod can be utilized primarily to increase loudness and dial dominance, or primarily to improve sound quality. The key to this flexibility is in the way that your processing chain is setup to handle high frequency program content.

You can control high frequency content before the FM FlexiMod by using a processor designed to limit and/or clip along the 75us pre-emphasis curve, and use the FM FlexiMod to control build program density, or you can "process flat" and let the FM FlexiMod control primarily high frequencies.

Maximum dominance will be achieved by using a FM processor prior to the FM FlexiMod. However, if you are satisfied with your loudness/quality tradeoff, try the FM FlexiMod as a high frequency controller, after a "flat" processor. In this mode, you will notice improved high frequency "sparkle" and enhanced bass definition.

In either mode, you will experience some of the benefits of the alternate mode, so some experimentation can produce results tailored to your specific competitive situation. Advice is always just a phone call away at (216) 546-0967. We can also help you modify your stereo generator for direct pilot operation.

Let's outline how to set up the FM FlexiMod for each philosophy:

USING THE FLEXIMOD WITH AN FM PROCESSOR THAT CONTROLS HIGH FREQUENCIES

(Maximum Dominance/Some Quality Improvement)

1) Select **flat response** for the LED meter on the FM FlexiMod. Leave the switch in this position.

2) Advance the drive control until the third LED consistently lights on program peaks, with an occasional peak lighting the red LED. (This indicates about 2.5db of processor activity)

3) Adjust the Modulation control for normal modulation.

4) Check your pilot injection and adjust, if necessary. (front panel 10-turn trimpot)

If your FM processor lets you select between "soft" and "hard" high frequency processing, experiment with this. Generally, the "hard" processing will give you more brightness, with a little more distortion.

USING THE FLEXIMOD WITH AN "FLAT" PROCESSOR
(No pre-emphasized limiting)

(Substantial quality improvement/some increased loudness)

1) Select **de-emphasized response** for the LED meter on the FM FlexiMod.

2) Advance the drive control until the first LED occasionally lights on program peaks, with an occasional peak beyond the first LED. (This indicates about 0.5 db of processor activity on low and mid frequencies.

3) If sibilance becomes a problem, back off on the Drive just a bit.

4) Check your pilot injection and adjust, if necessary.

5) You can now monitor total processor activity, including high frequencies by selecting flat response, and processor activity on the low and mid frequencies by selecting de-emphasized response. In the flat response position, it will not be unusual to see the red LED light on extreme high frequency peaks.

Remember that the LED meter is just an aid to setting your processing where you need it. Your ear is the final judge. After you find the "sweet spot" for your station and format, you can adjust the LED Meter threshold internally to match your settings.

I suggest you start a little on the "low side" and gradually increase processor activity by using the Drive control. This is a ten-turn pot, permitting very accurate setting. When **sibilance** becomes a problem you have gone too far!

Remember, high frequency limiting will enhance your on air quality, but it won't make you the loudest station on the dial.

In closing, let me remind you that you are more than a customer number at MicroCon. We are always available for free consultation on your processing challenges.

Call (216)546-0967 9am-5pm Mon-Fri. You can leave a message at other times and often get a quick callback.

Thank You for purchasing the FM FlexiMod

Jim Somich
President
MicroCon Systems Ltd.

APPENDIX 1 - User Internal Jumpers & Adjustments

The FM FlexiMod is very stable and should not require internal adjustment unless a major component is changed. The diagram indicates the **adjustment points** and the location of the **configuration jumpers.**

Direct Pilot or Regenerated Pilot Mode

Jumper 1A. In the rear position the output of the pilot stripper is fed to the processor for regenerated pilot mode operation. In the front position the stripper is bypassed for direct pilot mode.

Jumper 1B. In the right position composite is directed to the pilot stripper for regenerated pilot mode operation. In the left position, the stripper is bypassed for direct pilot mode.

The FM FlexiMod is shipped configured for regenerated pilot operation unless otherwise noted.

Jumper 2. In regenerated pilot mode, the 3 pin jumper plug should be connected. This directs the output of the phase lock loop to the pilot filter. In direct pilot mode, disconnect this plug and connect the cable from the rear panel pilot in BNC to **the 3-pin header.** The plug on the BNC cable should be connected to the **rear** two pins of the header with the white lead toward the rear of the box.

If you are operating in the regenerated pilot mode, you can connect the cable from the rear panel BNC connector to **position A,** which is the test output. This will give you a test output on the rear panel of the FlexiMod. The white lead should connect to the left terminal of the test output.

Trim Pots

Trimpot 1 fine tunes the pilot stripper. It should be adjusted for minimum pilot feedthrough. Turn off the pilot switch on the front panel. Feed a composite signal with pilot into the FM FlexiMod and monitor at the output. The jumpers must be in the regenerated pilot position. (see appendix 1)

Trimpot 2 sets the "free running" frequency of the phase lock loop. With no input to the box, monitor pin 10 of U-3 with a frequency counter. Adjust trimpot 3 for 19.000 kHz.

Trimpot 3 is the display calibration. It is normally adjusted so that the first LED just lights at the threshold of processing.

Trimpot 4 adjusts pilot phase in either the regenerated pilot mode or the direct pilot mode.

Trimpot 5 adjusts the phase lock level in the regenerated pilot mode. It is set so the front panel phase lock LED just comes on when the unit is connected to your stereo generator.

APPENDIX 2 - STEREO GENERATOR MODIFICATION

The modification of your stereo generator for Direct Pilot Operation is a simple task. I recommend that, eventually, you operate in the direct mode. Bypassing the pilot stripper will improve your high frequency separation to it's theoretical maximum.

The drawing indicates a generic modification. Here are step by step instructions...

1) Dig out the schematic for your stereo generator.

2) Find the pilot injection pot

3) Break the connection from the arm of the pot and wire to the swinger of a SPDT toggle switch. (switch optional)

4) Connect one side of the toggle switch back to the point where you disconnected the wire from the injection pot, completing the circuit.

5) Connect the other side of the toggle switch to a BNC chassis mount connector, bypassed by a 200pf capacitor.

Note: It doesn't matter if your pilot is a square or sine wave at the injection pot. The internal pilot filter in the FM FlexiMod will output a sine wave.

You now have the capability of connecting direct pilot to the FM FlexiMod via the the BNC (pilot) connector on the rear panel of the box. (see appendix 1)

In the direct pilot mode, there will be no pilot present at the normal output of your stereo generator.

APPENDIX 3 - FINAL ADJUSTMENTS

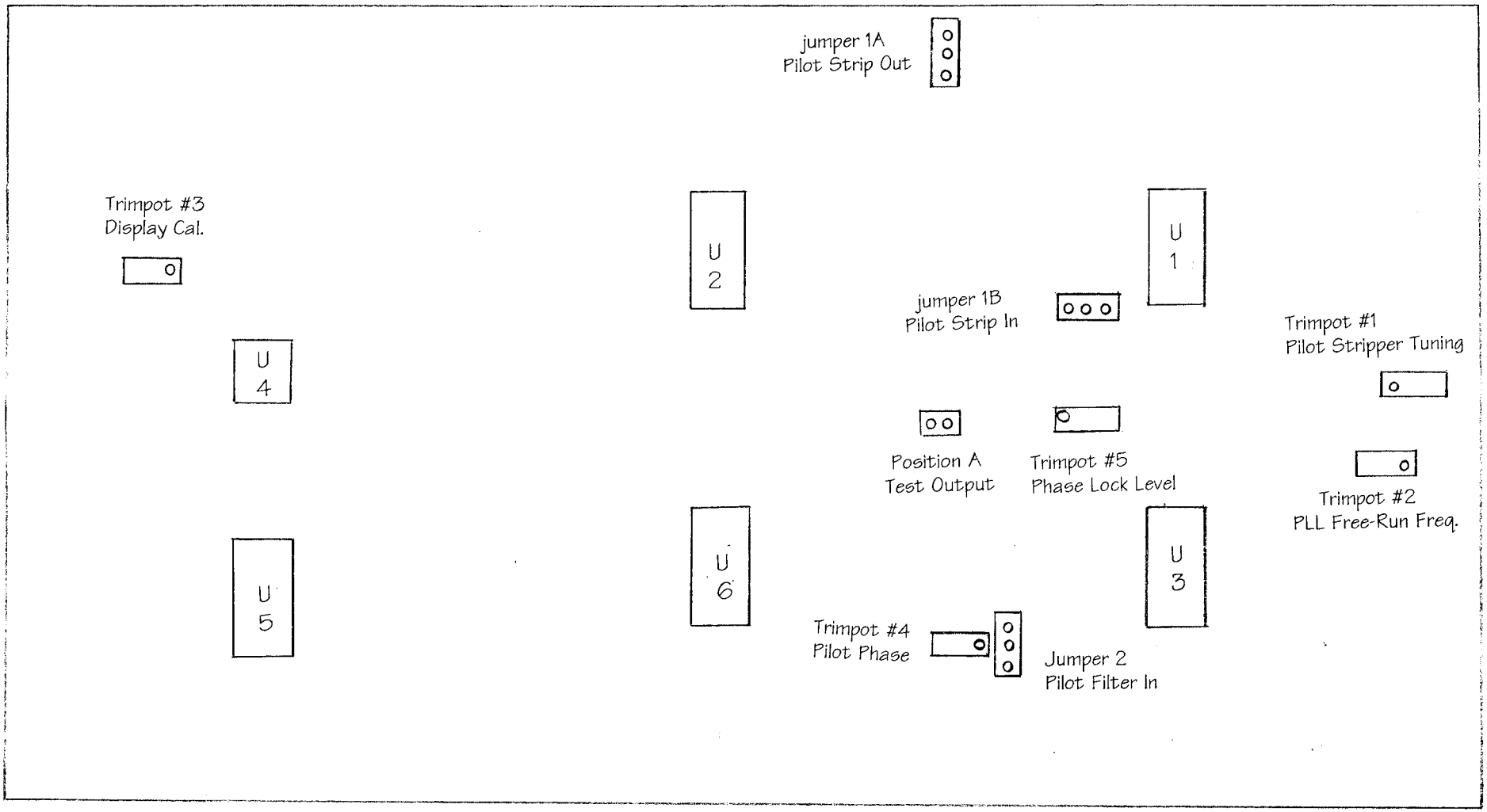
Unless otherwise noted, the FM FlexiMod is delivered for internally regenerated pilot. Pilot phase has been factory adjusted for optimum. If you convert the FM FlexiMod to Direct Pilot operation, you should reset pilot phase.

To reset pilot phase:

1. Feed 400hz into your stereo generator and monitor the output of the FM FlexiMod. Feed the right channel out-of-phase with the left channel. Be sure your **pilot is on** and that the pilot switch on the front panel of the FM FlexiMod is on.

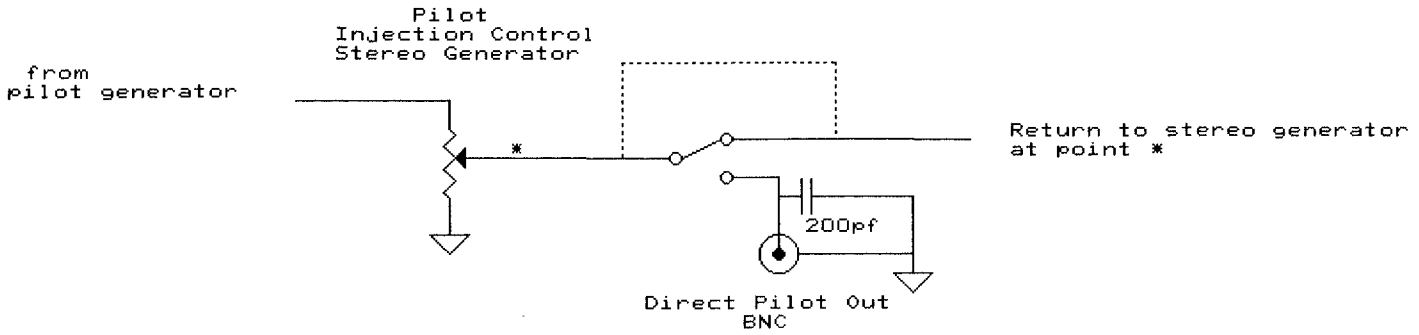
2. Connect your oscilloscope to the output of the FM FlexiMod and trigger it off of your audio oscillator. Set the input of the 'scope for dc coupling and use a short coaxial cable,such as the one supplied with the FlexiMod. Expand the trace vertically and horizontally until you see the diamond pattern. Adjust the pilot phase control on your stereo generator or **trimpot 4** on the FM FlexiMod board for horizontal alignment of the diamond pattern.

(REAR)



FM FlexiMod jumper locations and user adjustments
See Appendix 1 for instructions

Note: Dashed line indicates
original circuit before mod

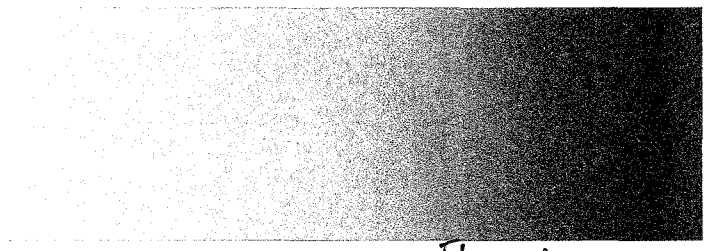


Note: Toggle Switch is optional
but permits return to normal operation

Generic Stereo Generator Mod for direct pilot		
Size A	Document Number	REV
Date: April 8, 1995	Sheet of	

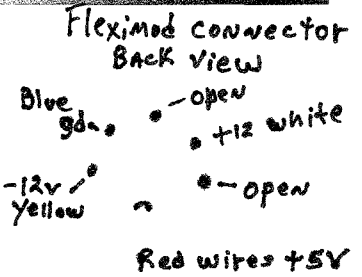
WM Series

2.5-14.4 WATT AC ADAPTERS



Features

- Two/three pin input plug (see chart)
- Output connector: 5 pin DIN or barrel type (5.5 x 2.5 x 9.5mm)
- Fully enclosed plastic case
- Fully regulated output



Elpac Model	Size	Voltage			Current			Watts	# of AC
		V1	V2	V3	I1	I2	I3	(max)	pins
WM050-1950-760	1	5			1.2			6	2
WM075-1950-760	2	5			1.5			7.5	3
WM060-1950-760	4	12			0.5			6	3
WM144-1950-D5	3	12			1.2			14.4	3
WM080-1950-760	4	24			0.33			8	3
WM100-D5*	3	5	-5		1	1		10	3
WM072-1950-D5	2	12	-12		0.3	0.3		7.2	3
WM071-1950-D5	2	15	-15		0.24	0.24		7.5	3
WM063-1950-D5	2	5	12	-12	0.6	0.16	0.16	6.3	3
→ WM113-D5	3	5	12	-12	0.86	0.3	0.3	11.3	3

Specifications

Input

- Voltage: 120VAC (108 -132)
- Frequency: 60 Hz

Output

- Combined regulation: ±5%
- Set point: ±3% at 60% load
- Ripple/ noise (V_{p-p}) :±0.5%

Mechanical (inches)

Size	L	W	H
1	2.2	1.9	3.3
2	4.7	2.6	1.9
3	4.7	3.1	2.3
4	3.2	2.2	1.9

Polarity

Pin-outs	1	2	3	4	5
Single o/p	com	N/C	V1	com	V1
Dual o/p	com	N/C	V1	com	V2
Triple o/p	com	N/C	V1	V3	V2
*WM100-D5	V2	N/C	V1	com	com

(barrel type – positive center)

Environmental

- Operating temperature: 0 C to 40 C
- Storage temperature: -55 C to 85 C

EMI

- Meets FCC class B, CISPR 22 class B

Safety

- UL1012, CSA 22.2 #223 (WMXXX)
- UL1950, CSA 22.2 #223 (WMXXX -1950-XX)
- * CSA only

ELPAC POWER SYSTEMS
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IC's

U1 TL084CN

U2 TL084CN

U3 HA1156N

U4 TL072CN

U5 LM324N

U6 TL084CN