MLE401-4

1 GHz Series

- **1GHz High Gain "Drop In" module upgrade increasing available bandwidth.**
- **Eliminate cost of replacing entire housings and LOWERS construction costs.**
- **Reduced power consumption.**
- **Field upgradeable plug-in diplex filter (various band splits available)**
- **Very low noise.**
- **"Green Solution" (recycled chassis and use of existing housing)**
- **Universal accessories equalizers, pads, diplex filters, AGCs etc.**
- **Best consistency/operating levels (state of the art diplex filter design) very low insertion loss less than < 1dB; very high isolation greater than > 35dB.**
- **Pad controlled slope with thermal option (patent pending) available for LEs without AGC module.**

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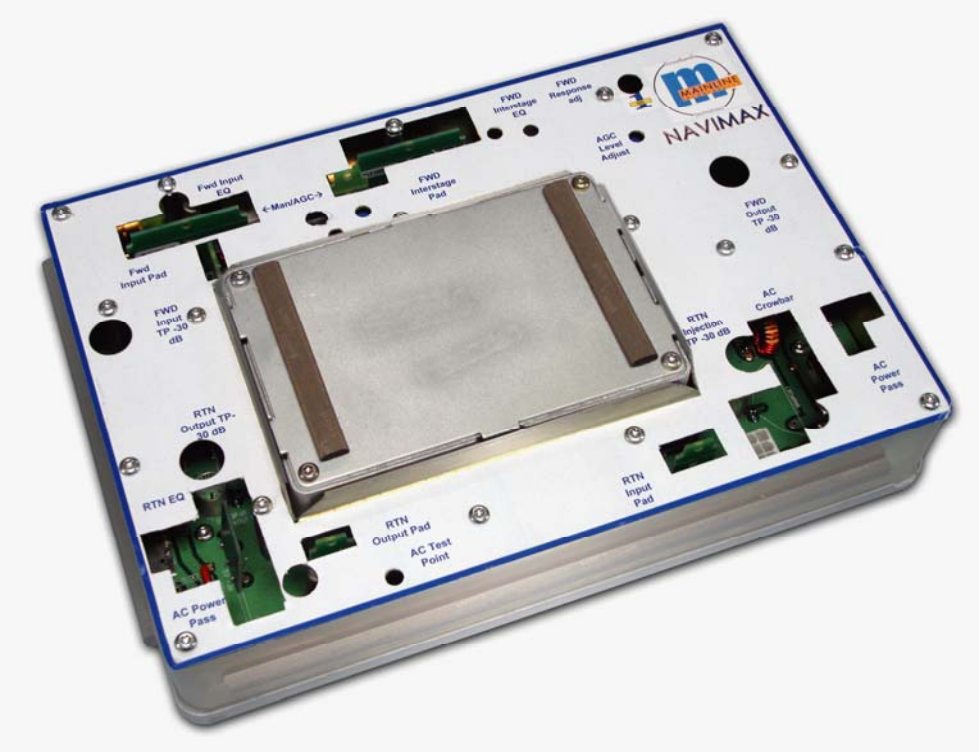
MLE401-4**.25 Line Extender

(Legacy "Navicor" style)

The 1 GHz Series broadband line extender is essentially a "drop-in-upgrade" module that allows the customer to perform system upgrades without suffering extensive construction costs. The revolutionary MLE401-4**.25 provides better performance and enhanced features at low cost.

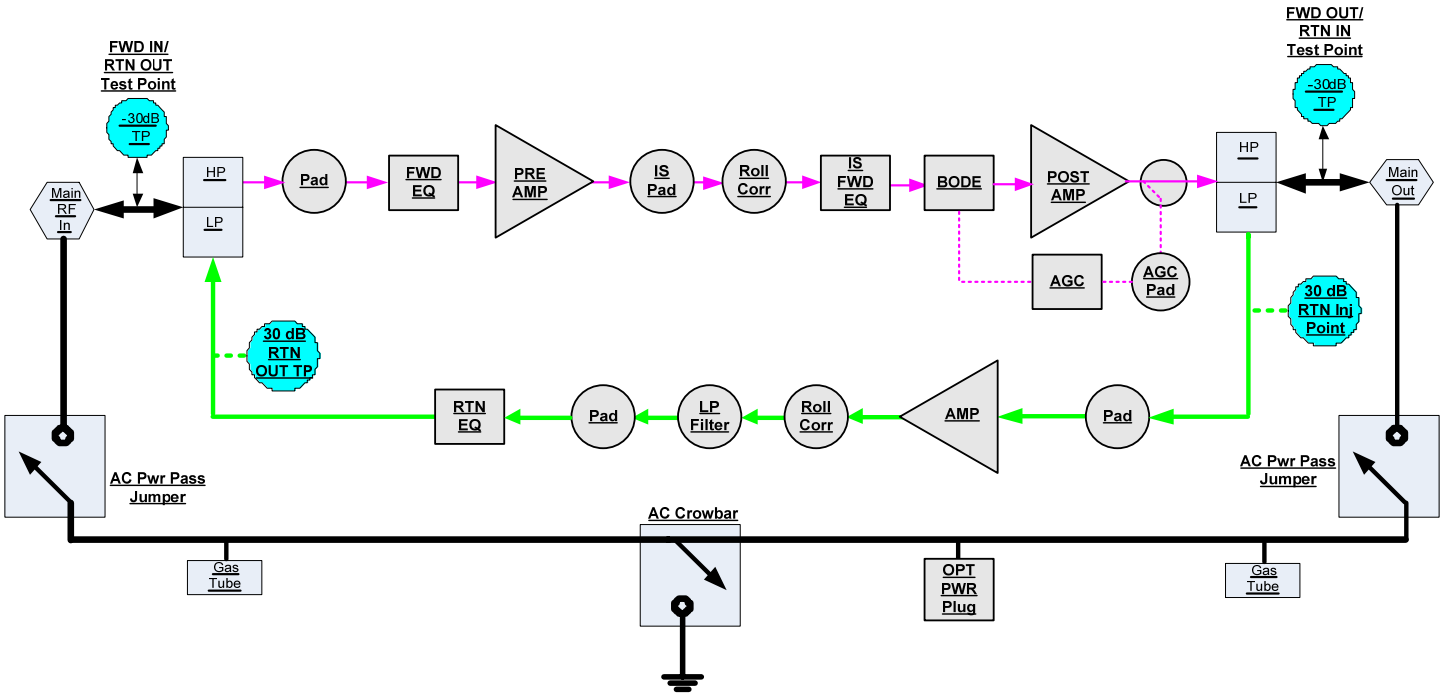
The MLE401-4**.25 is designed to re-use the existing power supply, the original amplifier chassis, and fit into the same Navicor LE series housing as before. The MLE401-4**.25 includes a newly manufactured state-of-the-art PCB assembly that is installed in the original chassis and fully tested as new. The original power supply is re-tested and refurbished to ensure years of reliable service.



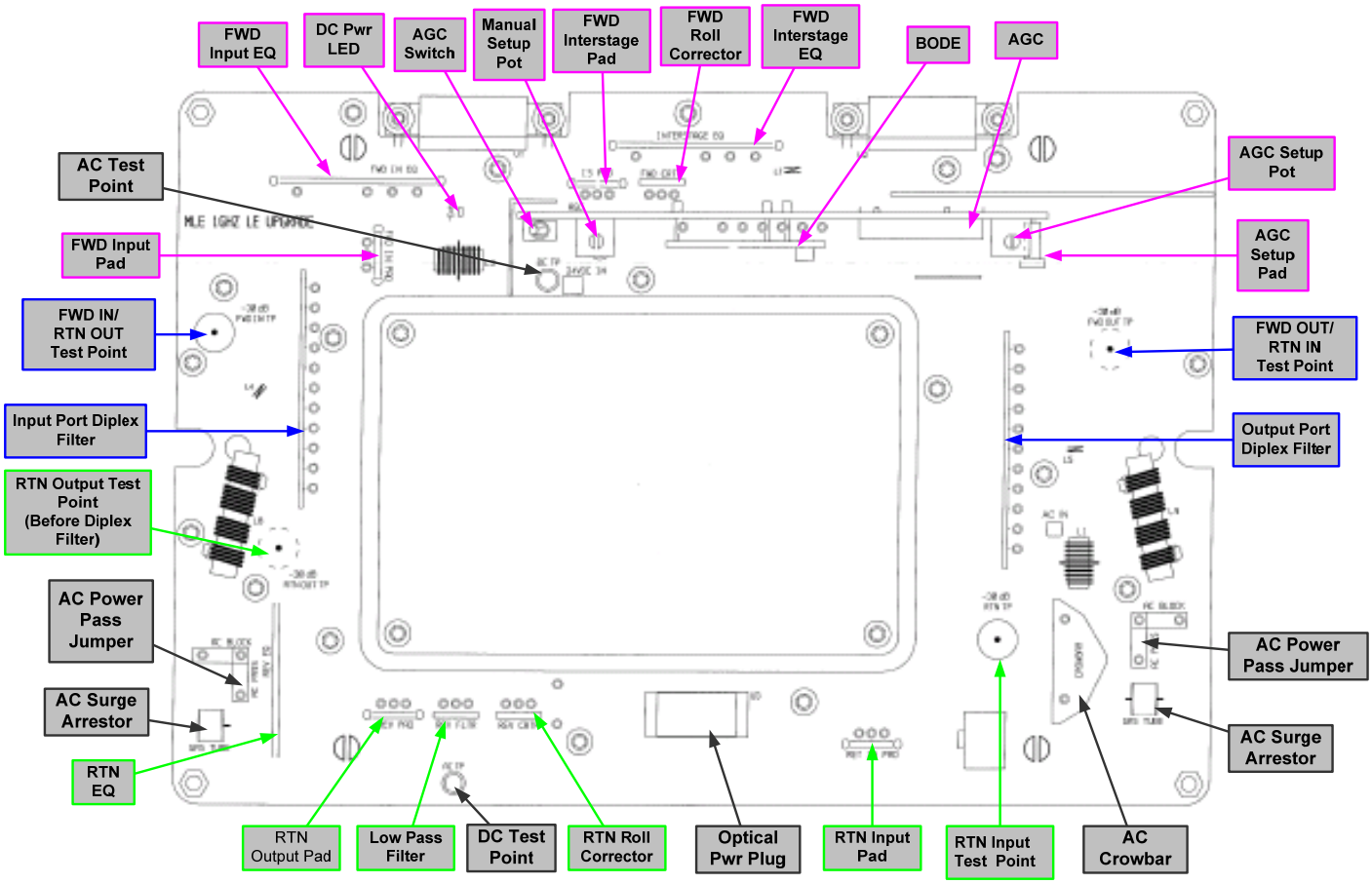
Features:

- The Industry's first 1GHz Navicor style line extender that is backwards compatible!
- Low-cost, easy-to-install, drop-in-upgrade unit that fits into existing housing offers increased gain to allow for existing spacing. Eliminates new construction altogether, or greatly reduces construction costs!
- High performance GaAsFET gain stages deliver Lowest 2^{nd} and 3^{rd} Order distortions, superior CNR, and low noise figure, while maintaining highest gain and excellent flatness in both forward & return bands.
- Computer designed, fixed component diplex filters exhibit the highest stop band isolation (>40 dB), the best return loss (>24 dB), and the lowest insertion loss available (< 0.75 dB).
- Plug and play diplex filters allow quick and low cost changes to both forward & return bands.
- The plug-in AGC module is designed to work with analog or QAM modulated carriers using a low loss SAW filter that provides accurate pilot channel selection.
- Dual port gas tubes and a plug-in Crowbar provide surge protection.
- Similar layout and look as the original Navicor line extender, is technician friendly, and will require minimal training.
- Increase your existing modules MTBF and reduce service outages by letting us completely disassemble and rebuild your existing amplifier. This is not a modification to your existing amplifier! We install newly manufactured electronic assemblies that upgrade your module in every way.
- Line Extender module includes a complete 2-year warranty on all installed electronic assemblies.

MLE401-4**.25 Functional Block Diagram



MLE401-4**.25 Accessory Locations



Amplifier Setup

The MLE401-4**.25 line extender is a 2-way capable single output amplifier that provides more Forward and Return path gain, higher output levels, lower noise figure, better distortion performance, and wider bandwidth than the original module. The extra bandwidth your system will achieve with this direct drop-in-upgrade module, assuming no additional amplifiers are cut in, will depend on several loss factors that the improved performance must compensate for. This includes increased dB losses due to system configuration, taps, the type and length of coax, that are encountered based upon the original amplifier dB spacing. Although the physical length of the coax cable span has not increased, the dB losses and the cable dB changes due to temperature at the highest frequency channels will increase. The amplifier's extra RF gain and plug-in AGC module will help compensate for the additional cable loss as the bandwidth increases and temperature changes, the lower noise figure improves the C/N, and the improved distortion performance increases the channel capacity.

The RF test points on the input and output ports are bi-directional and provide a -30 dB monitor. There is a return injection test point as well as an independent return output test point, which provide a -30 dB monitor. Also, the RF test points are in the same previous locations making them all accessible thru the cover. The AC power directors can be configured to provide AC power to the power supply itself and/or the output port as needed. There are AC and DC voltage test points accessible thru the cover as well as a power LED to ensure proper function of the power supply. Dual port gas tubes and a plug-in Crowbar provide surge protection. The MLE401-4**.25 line extender can be made backward compatible with the Navicor LE series housing.

Setting the MLE401-4**.25 in Manual Mode

The forward operational gain of the MLE401-4**.25 is 37.5 dB with an output "cable" tilt of 16 dB. The gain is controlled using a plug-in Input Pad as well as an Interstage Pad *(MP***-0)*. The tilt is controlled using a plug-in Input EQ as well as an Interstage EQ *(MFA***-0)*. In addition, the plug-in AGC module provides a manual gain control as well as an automatic gain control.

1. Ensure the AGC switch is in the Manual position.

2. Connect a signal-level meter to the forward input test point, measure and document the tilt and RF input level at the highest and lowest system carrier. *Note: Both carriers should be at standard analog levels, non-scrambled.*

3. Install the correct Input Pad and Input EQ to achieve the designed input level and tilt.

4. Connect the signal-level meter to the forward output test point and ensure there is at least 3.1 dB of reserved gain at the highest system carrier. Adjust the manual gain control if needed. *Note: The MLE401-4**.25 is factory set to have 3.1 dB of reserved gain at 1 GHz.*

5. Measure and document the tilt and RF output level at the highest and lowest system carrier as well as the pilot carrier.

6. If the RF output level at the highest frequency is too high and the input is padded correctly, install the correct Interstage Pad.

7. If the output tilt is less than required, install a higher value Interstage EQ.

8. If the output tilt is greater than required, install a lower value Interstage EQ.

Setting the MLE401-4**.25 in AGC Mode

1. Perform the complete procedure described in “Setting the MLE401-4**.25 in Manual Mode” if not already completed.

2. Ensure the AGC switch is in the AGC position.

3. Connect the signal-level meter to the forward output test point and measure the RF output level at the highest system carrier.

4. Adjust the automatic gain control until the RF output level matches the RF output level obtained in Manual Mode.

Note: The plug-in AGC pad is factory set for an amplifier output level range from +40 dBmV to +50 dBmV at the pilot frequency. You can change this pad (MGIP-) depending on the operational output of the MLE401-4**.25.*

Return Path Alignment

The return operational gain of the MLE401-4**.25 is 24.1 dB. The gain is controlled using a plug-in Return Input Pad as well as a Return Output Pad *(MP***-0)*. The tilt is controlled using a plug-in Return EQ *(MRN***-0)*.

1. Set up the return optical link using the design input reference levels for the return transmitter and the system design output levels of the return path receiver. This must be done before you balance any return amplifiers.

2. Document what the amplifier’s RF input reference levels are.

3. Use the -30 dB Forward Output/Return Input test point to inject the return carriers or sweep. *Note: There is an independent Return Injection test point if needed.*

4. Verify that the Return Input Pad is an *MP000-0* (0 dB).

5. Install the design value Return Output Pad.

6. Install the design value Return EQ.

7. Set the sweep output to the design reference level and set the sweep output for a -30 dB test point.

8. Change the Return Output Pad and/or Return EQ until the swept response matches, as close as possible, the stored reference sweep taken at the optical node.

9. Document sweep levels used as well as the Return Pads and Return EQ values.

Using Amplifiers In Lower Frequency Systems

When using the MLE401-4**.25 line extender in a 1 GHz distribution system, you must use an *MFA***-0* equalizer. For use in lower frequency systems, such as 870 MHz or 750 MHz, you must consider the best method for handling the reduced bandwidth and channel-loading requirement. If you use 1 GHz equalizers in lower frequency systems, you will need to take into account the reduced gain from 1 GHz. Due to the amplifier tilt, there will be some loss in gain from the published operational gain specification at 1 GHz. *Note: Please refer to the “MFA***-0 Triple Specification Sheet” listed below.*

To avoid any additional loss in gain, it is optimal to use the equalizers that match the system frequency. For an 870 MHz system, use 870 MHz equalizers. For a 750 MHz system, use 750 MHz equalizers.

MFA***-0 Triple Specification Sheet

Part Number	EQ Value @ Stated Frequency	Insertion Loss (dB)
MFA010-0	1.0 dB @ 1000 MHz 0.9 dB @ 862 MHz 0.8 dB @ 750 MHz	1.0 1.0 1.0
MFA020-0	2.0 dB @ 1000 MHz 1.9 dB @ 862 MHz 1.8 dB @ 750 MHz	1.0 1.0 1.0
MFA030-0	3.0 dB @ 1000 MHz 2.9 dB @ 862 MHz 2.8 dB @ 750 MHz	1.0 1.0 1.0
MFA040-0	4.0 dB @ 1000 MHz 3.9 dB @ 862 MHz 3.8 dB @ 750 MHz	1.0 1.0 1.1
MFA050-0	5.0 dB @ 1000 MHz 4.8 dB @ 862 MHz 4.6 dB @ 750 MHz	1.0 1.0 1.2
MFA060-0	6.0 dB @ 1000 MHz 5.5 dB @ 862 MHz 5.2 dB @ 750 MHz	1.0 1.0 1.3
MFA070-0	7.0 dB @ 1000 MHz 6.6 dB @ 862 MHz 6.3 dB @ 750 MHz	1.0 1.0 1.4
MFA080-0	8.0 dB @ 1000 MHz 7.5 dB @ 862 MHz 7.2 dB @ 750 MHz	1.0 1.0 1.4
MFA090-0	9.0 dB @ 1000 MHz 8.5 dB @ 862 MHz 8.0 dB @ 750 MHz	1.0 1.4 2.1
MFA100-0	10.0 dB @ 1000 MHz 9.2 dB @ 862 MHz 8.8 dB @ 750 MHz	1.0 1.3 2.0
MFA110-0	11.0 dB @ 1000 MHz 10.3 dB @ 862 MHz 9.6 dB @ 750 MHz	1.0 1.3 2.1
MFA120-0	12.0 dB @ 1000 MHz 11.2 dB @ 862 MHz 10.6 dB @ 750 MHz	1.0 1.4 2.2
MFA130-0	13.0 dB @ 1000 MHz 12.2 dB @ 862 MHz 11.4 dB @ 750 MHz	1.0 1.6 2.5
MFA140-0	14.0 dB @ 1000 MHz 13.0 dB @ 862 MHz 12.2 dB @ 750 MHz	1.0 1.6 2.6
MFA150-0	15.0 dB @ 1000 MHz 13.9 dB @ 862 MHz 13.0 dB @ 750 MHz	1.0 1.8 2.8
MFA160-0	16.0 dB @ 1000 MHz 14.8 dB @ 862 MHz 13.8 dB @ 750 MHz	1.0 2.4 3.4
MFA170-0	17.0 dB @ 1000 MHz 15.6 dB @ 862 MHz 14.4 dB @ 750 MHz	1.0 2.2 3.4
MFA180-0	18.0 dB @ 1000 MHz 16.6 dB @ 862 MHz 15.6 dB @ 750 MHz	1.0 2.6 3.7
MFA190-0	19.0 dB @ 1000 MHz 17.4 dB @ 862 MHz 16.4 dB @ 750 MHz	1.0 2.6 3.7
MFA200-0	20.0 dB @ 1000 MHz 18.5 dB @ 862 MHz 17.1 dB @ 750 MHz	1.0 2.5 3.9
MFA210-0	21.0 dB @ 1000 MHz 19.6 dB @ 862 MHz 18.4 dB @ 750 MHz	1.0 2.9 4.3

Line Extender Station (LE and Housing) Specifications

Standard RF Specifications				
Parameter	**Units**	**Forward**	**Reverse**	**Notes**
Pass Band	MHz	54-1002	5-40	
Amplifier Type	-	GaAsFET PD	Silicon	
Flatness	dB	+/-0.75	+/-0.5	1,2
Minimum Full Gain (AGC mode)	dB	41.6	25.1	2
Operational Gain (MGC mode)	dB	37.5	24.1	3,4
AGC Range @ 1002 MHz	dB	+3.1/-4.0	-	
Return Loss (typical)	dB	-16	-16	5
Noise Figure	dB	7	6.5	6
Test Points	dB	-30 (+/-1.2)	-30 (+/-1.0)	5
Loop Isolation (40-54 MHz)	dB	Better than -35		6
Hum Modulation @ 15 A	dBc	-60 (54-870 MHz) -58 (870-1002 MHz)	-60 (5-12 MHz) -65 (12-40 MHz)	
AC Bypass Current (continuous)	A	15		
DC Current Draw (maximum)	mA	880		
Distortion Measurements @ Rated Level				
Reference Frequencies	MHz	1002 / 870 / 750 / 550 / 54	T7-T12	
Output Levels	dBmV	49.5 / 48.2 / 46.9 / 45.2 / 36.2	35 (flat out)	
Channel Loading	NTSC	130	6	7
CTB	dBc	-64	-87	2
CSO (high side)	dBc	-69	-80	2
Cross Modulation	dBc	-60	-77	2,8

Notes:

1. Measured with 16 dB of simulated cable.
2. Measured using an Interstage EQ = MFA150-0 and 0 dB plug-ins for all remaining forward and return locations.
3. Includes a 1 dB loss from the Input EQ and a 1 dB loss from the Return EQ.
4. When in MGC mode ensure there is at least 3.1 dB of reserved gain.
5. Measured using an Input EQ = MFA110-0, Interstage EQ = MFA150-0, and 0 dB plug-ins for all remaining forward and return locations.
6. Measured using 0 dB plug-ins for all forward and return locations.
7. Distortions in MGC mode with 130 NTSC analog channels (no digital).
8. X-mod (@ 15.75 KHz) specified using 100% synchronous modulation.

Accessories	
Factory Installed Plug-ins	**Plug-in Series**
Diplex Filters (not accessible thru the cover, field upgradeable)	MLE300XDF-01
Interstage Pad = MP000-0	MP***-0
Interstage EQ = MFA150-0	MFA***-0
AGC/MGC Module (available pilot frequencies: 427.25 and 499.25 MHz)	MAA4**250
Return Input Pad = MP000-0	MP***-0
Return Roll Corrector (not accessible thru the cover, field upgradeable)	MLE1202RRC
Low Pass Filter (not accessible thru the cover, field upgradeable)	MLERF100104
AC Power Pass Jumpers (In/Out)	CJT002
230 V AC Crowbar Surge Protector	MLE300SATCB
Required Plug-ins	**Plug-in Series**
Input Pad	MP***-0
Input EQ	MFA***-0
Return Output Pad	MP***-0
Return EQ	MRN***-0
Optional Plug-ins	**Plug-in Series**
Forward Roll Corrector (not accessible thru the cover, field upgradeable)	MLE1202FRC
Plug-in Pads for the AGC/MGC Module	MGIP-*
Plug-in diplex filter options include 40/51, 42/54, 55/70, 65/86, and 85/105 MHz.	-

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