

# **SOFTTEL**

## **MLE-02 Bidirectional Amplifier**

### **User Manual**

## **Notice**

This user manual is only for professionals.

To avoid electric shock, non-professionals should not operate any maintenance including installation and troubleshooting. All installation and maintenance should be carried out after professionals read the user manual and in strict accordance with the instructions.

If replacing the components or circuit without our permission, we will not take any responsibility.

To keep the best specification of the amplifier, do fasten all the screws on the panel when you remove and install it again.

## MENU

Notice.....	1
<b>1. Foreword.....</b>	<b>3</b>
<b>1.1 Introduction.....</b>	<b>3</b>
<b>1.2 Feature.....</b>	<b>3</b>
<b>1.3 Technical Support.....</b>	<b>错误! 未定义书签。</b>
<b>2. Description.....</b>	<b>3</b>
<b>2.1 Power Supply.....</b>	<b>3</b>
<b>2.2 Forward Path.....</b>	<b>4</b>
<b>2.3 Reversed Path.....</b>	<b>4</b>
<b>2.4 Control Forward Output Level.....</b>	<b>5</b>
<b>2.5 Accessories.....</b>	<b>6</b>
<b>3. Installation.....</b>	<b>6</b>
<b>3.1 Preparation.....</b>	<b>6</b>
<b>3.2 Installation.....</b>	<b>7</b>
<b>3.3 Check Forward System.....</b>	<b>7</b>
<b>3.4 Check Reversed System.....</b>	<b>8</b>
<b>3.5 Finish installation.....</b>	<b>8</b>
<b>Appendix A Specification.....</b>	<b>9</b>

## 1. Foreword

### 1.1 Introduction

MLE-02 is kind of bidirectional amplifier with one input port and one output port, which forward gain range from 28dB to 41dB and the max gain of reversed path can reach 23dB. It can be used as a trunk amplifier in the traditional coaxial network, also it can be used as an line extender amplifier in the HFC network. Its tank-type construction is convenient for maintenance.

### 1.2 Feature

- 5-1002MHz, bidirectional
- Output slope and reversed equalizer can be debugged by fixed attenuator, 1dB stepping
- Frequency of the diplexer can be specified
- GaAs module
- 35V-90V power supply
- Max overcurrent capability 15A
- MTBF>50000hours

## 2. Description

MLE-02 adopts two-stage GaAs module in forward path, which gain ranges from 28dB to 38/41dB, so it can be applied widely. The working voltage ~60V is fed by cable, and the working AC voltage is 35V~90V, so both of the input and output port can feed the next amplifier. MLE-02 can be set as unidirectional mode, and upgrade to bidirectional mode in the future.

MLE-02 contains RF amplifier hybrid and power supply. The water-proof aluminum casting housing is suitable for outdoor operation. Various components and options can meet many different requirements.

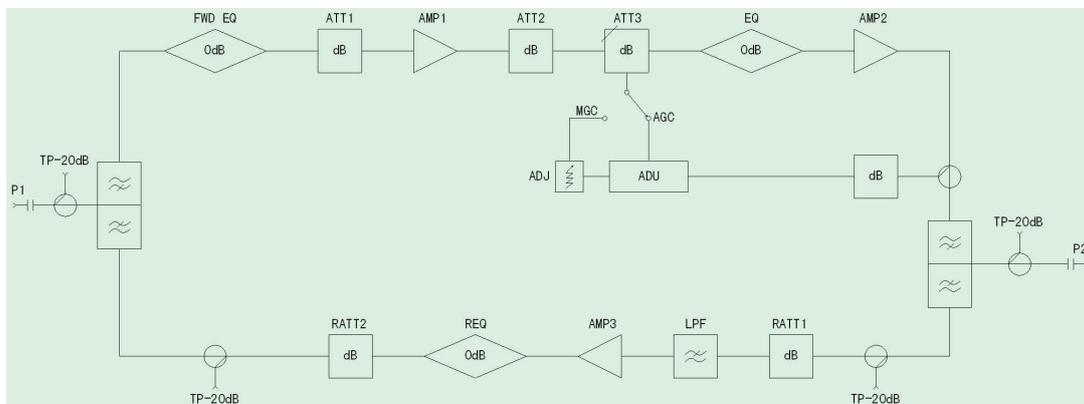
### 2.1 Power Supply

The power supply of MLE-02 is SMPS (Switching Mode Power Supply), which is fixed in the

bottom half of the tank. The input voltage is  $\sim 35\sim 90V$ , and the working bandwidth is  $47\sim 63MHz$ . The output voltage is  $+24V$ . The DC output current can reach  $1.5A$ .

## 2.2 Forward Path

MLE-02 can be divided into forward path and reversed path. The forward input contains cable equalizer (simulator) and fixed attenuator. The EQ range of the cable equalizer (simulator) is  $3\sim 21dB/0\sim 12dB$ ,  $1.5dB/step$ . Equalizer (simulator) is used to compensate the attenuation of different frequency in transmission and correct the forward input level. Attenuator is used to adjust the forward input level to suitable value.



**Figure 1 Block Diagram**

In forward path, it adopts two-stage amplify hybrid and provide  $28\sim 41Bm$  gain. The bandwidth is  $54/87/105/258 \sim 1002MHz$ . It adopts low-noise push-pull or GaAs module in first stage to pre-amplify the input signal and double-power GaAs module in latter stage to ensure the minimum non-linear distortion when output high level. Between two-stage amplify modules, there are attenuators, frequency correction circuit and equalizers. The installation of equalizers is same as fixed attenuators, and it can be changed according to the requirement. The circuit between two-stage modules is to adjust the forward output gain and RF output slope.

The forward equalizer contains build-in  $6dB$  fixed equalizer circuit and changeable equalizer circuit made up of fixed attenuator and peripheral circuit, ensuring the amplifier gaining certain equalization output.

There are  $-20dB$  test port for both input and output port. It adopts directional coupling mode and operate without external  $75\Omega$  load.

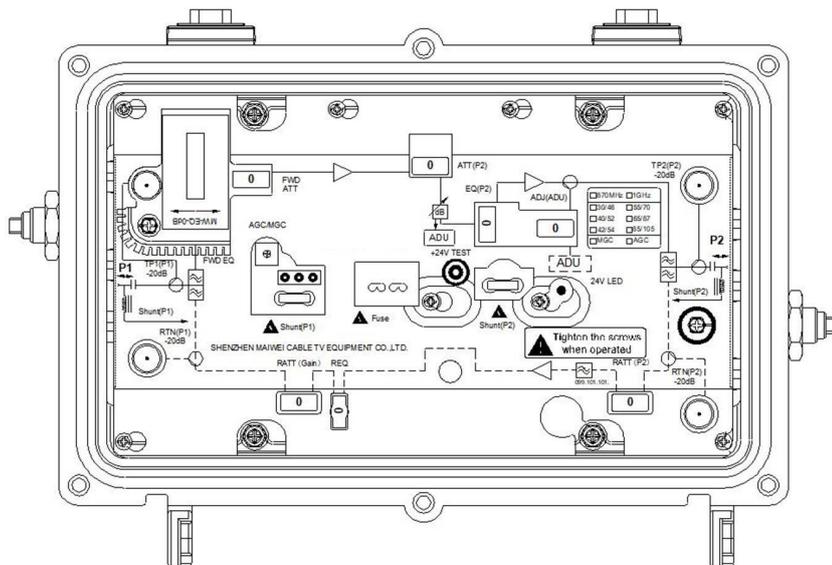
## 2.3 Reversed Path

The reversed bandwidth of MBC-02 begins from 5MHz, and various ended frequency (42/65/85/204MHz) are available for choice. The input attenuators, low-pass filters, reversed amplifier module and equalizers are pluggable, which is convenient to change. There are fixed attenuators at output port and reversed amplify gain is adjusted by output attenuator RATT (Gain). If the reversed signal does not require amplify, user can choose pass-through mode.

Reversed equalizer circuit is made up of fixed attenuator and external circuit to realize 0-16dB equalization. The reversed equalizer is used to compensate the cable loss among the reversed output, reversed input of next amplifier and the duplexer. To meet the equalization requirement, user can plug fixed attenuators in REQ position:

**Note: Reversed equalizer circuit adopts pedestal design, classify the specification by reversed end frequency. REQ pedestal with different frequency can be changed to change the splitting frequency of the amplifier.**

There is a -20dB test point at both of input and output port of the reversed path. The test point works in directional coupler mode, without external 75Ω load.



## 2.4 Control Forward Output Level

In CATV cable network, the cable loss will change with the temperature, and some passive components and amplifier module in the amplifier also will be affected by the temperature, so the level will change accordingly. If the numbers of cascade increase, the fluctuation of the output level will increase. To adjust the output level to meet the requirement, user can use the AGC plug-in ADU-W and enable AGC to ensure the reliability of the forward output level.

## 2.5 Accessories

If without any special requirement, we will attach the defaulted directional accessories, set the fixed attenuation as 0dB and set the forward equalization between stages as 14dB.

To ensure the basic function, user must plug suitable fixed attenuators to adjust the signal equalization and attenuation.

**Table 1 Accessories**

Model	Name	Description	Remark
GSJ-A-30-**	Fixed Attenuator	To adjust the RF level or signal slope, 1dB step	Options
DF(C)-**	Diplexer	To change the splitting frequency for the device	Parts
ADU-W	AGC Plug-in	To keep the forward level stable	Options
EQ(C)- 1G/**	Forward Equalizer	To Equalizing the forward RF level	Options
MB-RLP-**MHz	Reverse Filter	To filter out the reversed RF signal which is above the end frequency	Options
BLE-REQPAD- **MHz	Reverse Equalizer	To work with the fixed attenuator to equalizing the reverse RF level	Options

## 3. Installation

This chapter describes how to install and debug the amplifier. It requires power, several TV signal, TV carrier and test equipment for debugging. Below are the steps:

### 3.1 Preparation

Steps:

1. To ensure the circuit and personal safety, before installation do cut off the power or remove the short circuit plug-in at Shunt (P1) or Shunt (P2) position to cut off external feedback from relative port.
2. The amplifier connects with the cable by standard needle-type RF connector, which diameter of the central conductor is 1.5mm. Connect the cable with the amplifier well.
3. To prevent water coming into the amplifier, do tighten the cable connector.
4. Use cross screwdriver to tighten the screw in the central conductor of the RF connector.
5. Power on and check whether the power LED indicator is on. After power properly, please preheat the amplifier for a few minutes.
6. Check the AC voltage, which should be in proper working range.
7. Check the DC voltage, which should be in 23.5~24.5V range.

**Note: DO NOT remove the 20A plug-in at Fuse position in any case. It is used for over-current protection.**

### **3.2 Installation**

The amplifier can be placed on horizontally or hanged. For horizontal installation, generally it can be placed in the cabinet. For outdoor installation, it can be hanged on something like telephone pole. It just requires one steel wire to pass through two claws of the amplifier. If both amplifier and cable are hanged outdoor, they will be in the environment with same temperature. If the amplifier is in outdoor, while the cable is buried underground, they will be in the environment with different temperature. In these two cases, the output level will change with the temperature, just the range different. Generally, the attenuator can be adjusted to change the level.

### **3.3 Check Forward System**

The adjustment of the amplifier includes input level setting, output level setting and output slope setting, and attenuator adjustment or equalizer replacement if necessary. All test ports are -20dB without 75Ω load. The steps are as below:

1. Open the upper cover, check whether the AC and DC voltage are normal. Connect the input test port with field-intensity meter, and measure the input level and flatness of the pre-stage amplifier module. It should meet the specification requirement. If the level is too high or too low, the attenuation of the attenuator should be adjusted. Meanwhile, measure whether the difference between the high-end and low-end level is less than 1.5dB, otherwise the attenuator at the cable equalizer position should be changed. (The input level should be around 72dBuV, which is not too high or too low). For example, the high-end input level which the system record is +17dBmV, while the actual level is +23dBmV. Then the attenuator must be adjusted to decay 6dB.
2. To test output slope, measure the difference between high-end and low-end gain. Choose the fixed attenuator accordingly and plug in EQ (P2) position. If the measured value is small than the actual one, then user should replace the slope plug-in with bigger tilt. (e.g. the actual value is 10dB, then 4dB fixed attenuator can be used to work with the built-in fixed attenuator which the tilt is 6dB.)
3. Measure the level at the high-end, which should be meet the specification requirement. (The difference between the recorded value and measured value should be less than 1dB).

4. Adjust output level: the forward fixed attenuator ATT (P2) can be adjusted
5. Adjust AGC
  - 5.1 Before setting AGC, user should change ATT (P2) attenuator to adjust the output level of P2 port in MGC mode. ATT (P2) must be more than 3dB so that it can work properly in AGC mode.
  - 5.2 Set the AGC/MGC as AGC, and reduce 3dB for the forward attenuation ATT (P2)
  - 5.3 After finishing step 5.1 and 5.2, adjust the fixed attenuator at ADJ (ADU) position to restore the output level of P2 port in MGC mode.

### **3.4 Check Reversed System**

The reversed output port equips fixed attenuator and reversed equalizer. Adjust the attenuator RATT (Gain) after reversed amplifier module to adjust the reversed output level, so that it can output the proper input level for the next amplifier.

In the reversed path, the cable equalizer REQ is used to compensate the attenuation of reversed output cable at different frequency. Select the fixed attenuator according to the cable transmission to correct the level of forward and reversed path.

### **3.5 Finish installation**

Record all the information in a table. It will be useful for future maintenance. At last, cover the amplifier and fasten all the bolts.

## Appendix A Specification

No	Item	Forward	Reversed	Remark
1	Frequency (MHz)	54/105/258~1002	5~42/87/204	According to the split frequency
2	Flatness (dB)	±0.6	±0.5	
3	Return Loss	≥16(FH~750MHz) ≥14(751~1002MHz)	≥16	
4	Nominal Gain	28~38/41	0/20	
5	Min Full Gain	≥42	≥22	
6	Equalization/Analog	3~21/0~12	0~16	Forward 1.5dB step, reversed 1dB step
7	Forward Slope Output	14dB(54M-1002M)	null	
8	Noise Figure (dB)	<8		
9	AGC Range	±3dB (Broadband mode, output level change 0.3dB)		Forward
10	Forward Level	38dBmV~50dBmV		
11	Test Port Level (dB)	-20±1		
12	Test Port Frequency Respond (dB)	±1		
13	Working Voltage (V/DC)	+24		
14	HUM (dB)	≥66		
15	AC Input (V/AC)	~35-90V		
16	AC (A/AC)	15		Max continuous over current
17	Level Adjustment (dB)	0~20		1dB step
18	Connector	5/8 inch 24-tooth Connector		
19	Input/Output Resistance (Ω)	75		
20	C/CSO (dB)	63	-	110 NTSC channels + 22 10dB low QAM signal, 48 dBmV (750MHz), 14dB slope output, 10dB (54M~750M)
21	C/CTB (dB)	65	-	
22	Working Temperature (%)	-25°C~+55°C		
23	Power Consumption	25W		
24	Storage Temperature	-40°C~+70°C non-condensation		
25	Dimension (mm)	320L×200W×100H		
26	Weight (kg)	Max 2kg		
27	Shell Waterproof	IP67		

