GME3F31

FM Broadcasting Exciter(Modulator)

1 Overview

1.1 Product Introduction

GME3F31 FM broadcasting exciter meets the standards of monophonic broadcasting, stereophonic broadcasting, stereophonic additional program (SCA) broadcasting and FM data (RDS) broadcasting stipulated in *GB/T 4311-2000 Technical Specifications for FM Sound Broadcasting at VHF*, and all indicators meet the requirements of *GY/T 169-2001 Technical Specifications and Methods of Measurement for FM Broadcasting Transmitters at VHF*.

The product is characterized by simple structure, excellent performance, stable operation and convenient maintenance, and has the following outstanding features:

1) The main board adopts a new direct radio frequency output architecture, which has excellent performance, simple and fast frequency hopping, and good frequency consistency in the whole FM band.

2) The actuator adopts a brand new all-broadband loop scheme and has the characteristics of accurate power detection (power detection error is ±10% and typical value is ±5%) and loop control function in the whole FM band.

1.2 Functional Description

1) Maximum output power of actuator is 30W;

2) Support the following FM broadcasting mode:

a) Monophonic broadcasting;

b) Stereophonic broadcasting;

c) Stereophonic additional program broadcasting;

d) FM data broadcasting.

3) Support operating frequency range of 87MHz~108MHz;

4) Support FM synchronous network function;

5) Support manual and automatic switching of internal reference clock and external 10M reference clock;

6) Support analog L/R input, 2-way AES/EBU input, and manual and automatic switching;

7) Support AES/EBU monitoring output;

8) Support SCA/RDS input and 19 kHz pilot output;

9) Support three power control modes: manual, small-loop and large-loop;

10) The functions of monitoring, alarming and automatic protection are as follows:

Table 1 Monitoring and Alarm Functions

Monitoring Contents	**Alarm Conditions**	**Automatic Protection Treatment**
AES/EBU input	Interruption	--
Reference clock	Lose efficacy	Turn off RF
Temperature	Over heat	Turn off RF
Small-loop	Overload or other abnormalities during small-loop operation	Reduce power
Large-loop	Overload, exceeding manual threshold setting or other abnormalities during the operation of the large-loop	Reduce power

11) Support front panel touch screen control and RS232/485 control;

12) Support automatic/manual switching of main and standby actuators.

1.3 System Frame Diagram

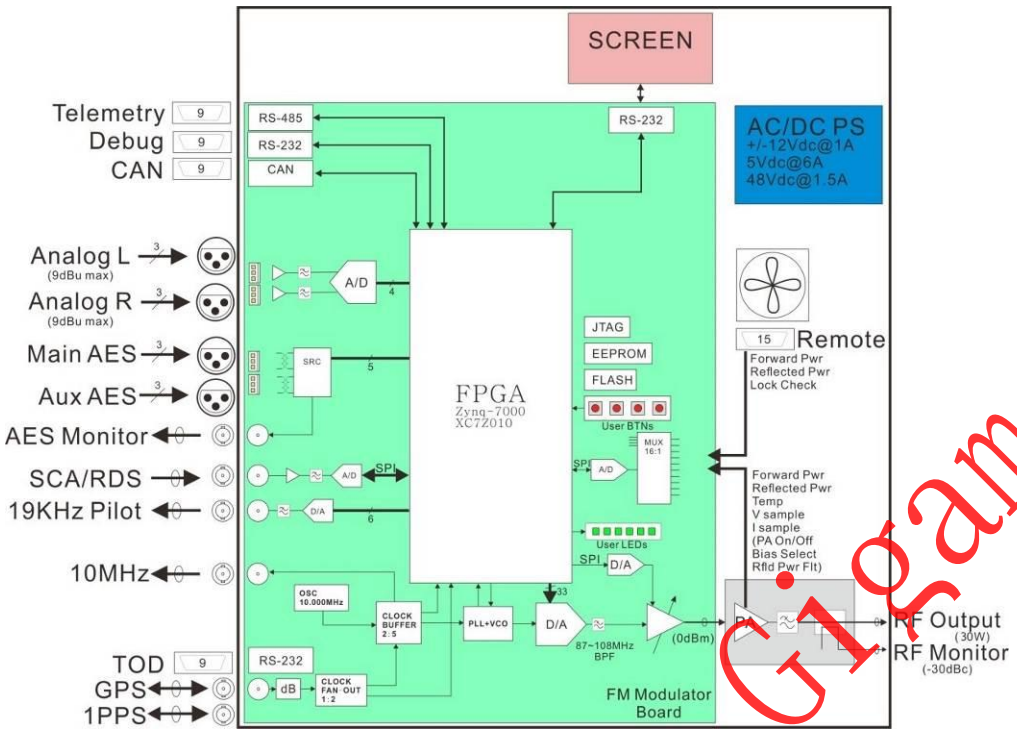


Figure 1 GME3F31 Broadcasting Actuator System Frame Diagram

2 Structure and Interface

2.1 Internal Structure

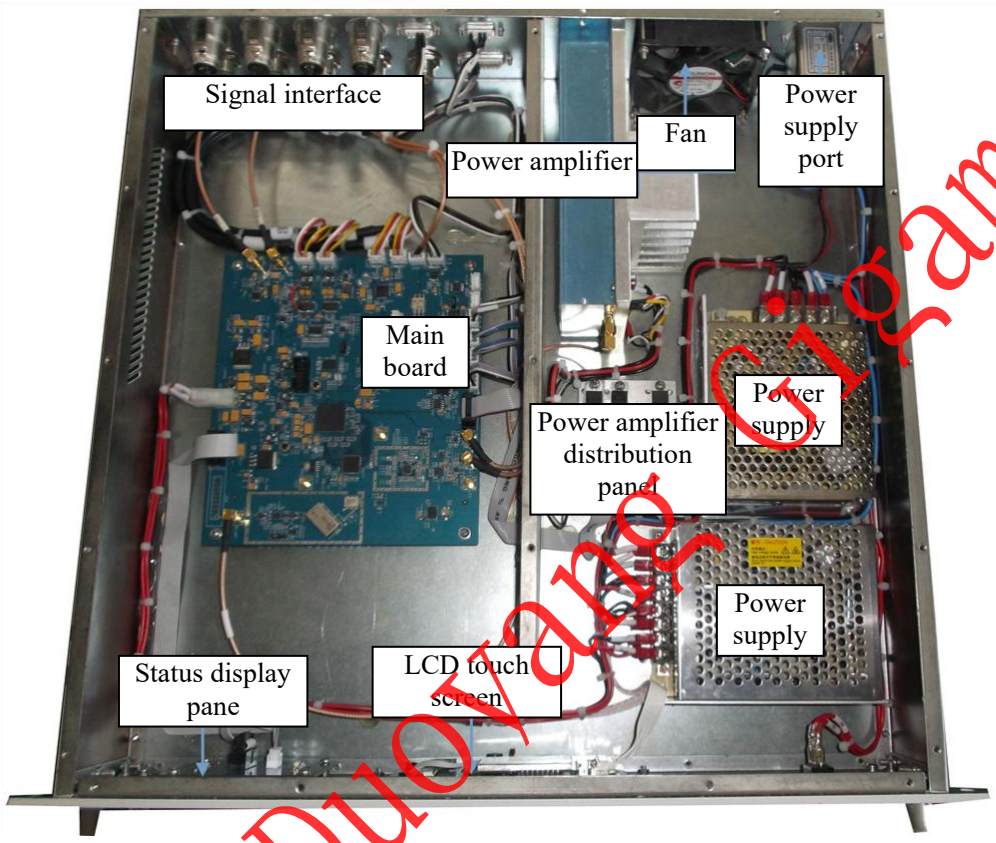


Figure 2 GME3F31 Structure Diagram

2.2 Interface Instruction

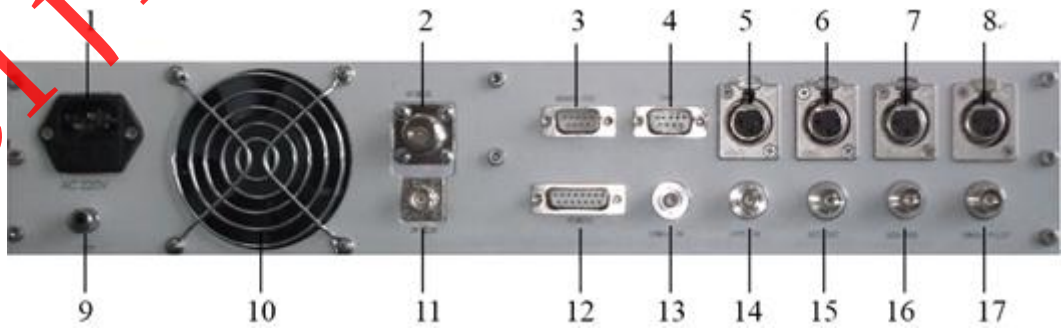


Figure 4 GME3F31 Panel Diagram

Table 3 Rear Panel Interface Instruction

Serial No.	Rear panel interface annotation	Function instruction
1	Power supply	Power supply 170~240Vac, 50~60Hz
2	RF output	RF output interface, N-base negative type, and output impedance 50Ω
3	RS485/232	Management, configuration, remote control, monitoring, RS485/232, DB9 positive type (DB9_2: RS485_A/RS232_RXD; DB9_3: RS485_B/ RS232_TXD; DB9_5: ground)
4	CAN	CAN data interface, DB9 positive type (DB9_2: CAN_L; DB9_3: ground; DB9_7: CAN_H)
5	AES/EBU1	Digital audio signal input interface 1, XLR negative type, 110Ω balance
6	AES/EBU2	Digital audio signal input interface 2, XLR negative type, 110Ω balance
7	LEFT	Analog left audio signal input interface, XLR negative type, 600Ω balance
8	RIGHT	Analog right audio signal input interface, XLR negative type, 600Ω balance
9	Grounding terminal	Grounding terminal
10	Fan	Fan
11	RF monitor	RF monitoring output interface, BNC negative type and output impedance 50Ω
12	REMOTE	Management, configuration, remote control and monitoring of loop signals, negative type (DB15_1: interlocking input, high level normal operation, and low level locking; DB15_2: reflex detection input of the whole machine; DB15_3: ground; DB15_10: power detection input of the whole machine)
13	10MHz	10MHz clock input interface, BNC negative type, and input impedance 650Ω
14	1PPS	1PPS input interface, BNC negative type, input TTLelectrical level
15	AES OUT	Digital audio signal monitoring output interface, BNC negative type
16	SCA/RDS	SCA/RDS input interface, BNC negative type, input impedance 600Ω
17	19KHz PILOT	19KHz PILOT output interface, BNC negative type

3 Technical Indicators and Parameters

Table 4 Physical Parameters

Outline dimension	482.6mm(L)*480mm(W)*88.2mm(H)(2U)
Whole machine weight	8.5kg
Ambient temperature	0℃~45℃
Relative humidity	≤95%
Atmospheric pressure	86kPa~106kPa

Table 5 Electrical Parameters

Power Supply Parameter	
Power supply	170~240Vac, 50~60Hz
RF Output Interface	
RF output	Output impedance 50Ω, output power 0~30W
RF monitoring	Output impedance 50Ω, <RF output-30dBc
Audio Interface	
Analog L/R audio input	Input impedance 600Ω balance, maximum input level 8dBu
Digital audio input	Input impedance 110Ω balance, AES/EBU standard
SCA/RDS input	Input impedance 10kΩ imbalance maximum input level 4Vpp

Table 6 Technical Indicators

General Indicators	
Output power	0~30W adjustable
Frequency range	87~108MHz, 1Hzstepping
Frequency accuracy	±1Hz
Frequency stability	10^{-6} (internal reference) 10^{-10} (external reference)
Residual wave radiation	< -65dB

Parasitic AM noise	< -60dB
Pilot frequency deviation	± 0.05Hz
38 kHz residual component in S signal	< -60dB
Modulation frequency offset	0~100kHz can be set; (maximum modulation frequency offset is150kHz)
Pre-emphasis	50us
Mono Broadcasting	
FM signal-to-noise ratio	> 80dB (RMS, 50us weighting and deweighting, 75kHz frequency offset)
Frequency response	±0.05dB (without weighting, and without deweighting) ±0.1dB (50us weighting, 50us deweighting)
Distortion (THD+N)	<0.05%
Stereophonic Broadcasting	
FM signal-to-noise ratio	>80dB (RMS, 50us weighting and deweighting, 75kHz frequency offset)
Frequency response	±0.05dB (without weighting, and without deweighting) ±0.1dB (50us weighting, 50us deweighting)
Distortion (THD+N)	<0.05%
Separation of left and right vocal tracts	>65dB

4.3 Operation Menu

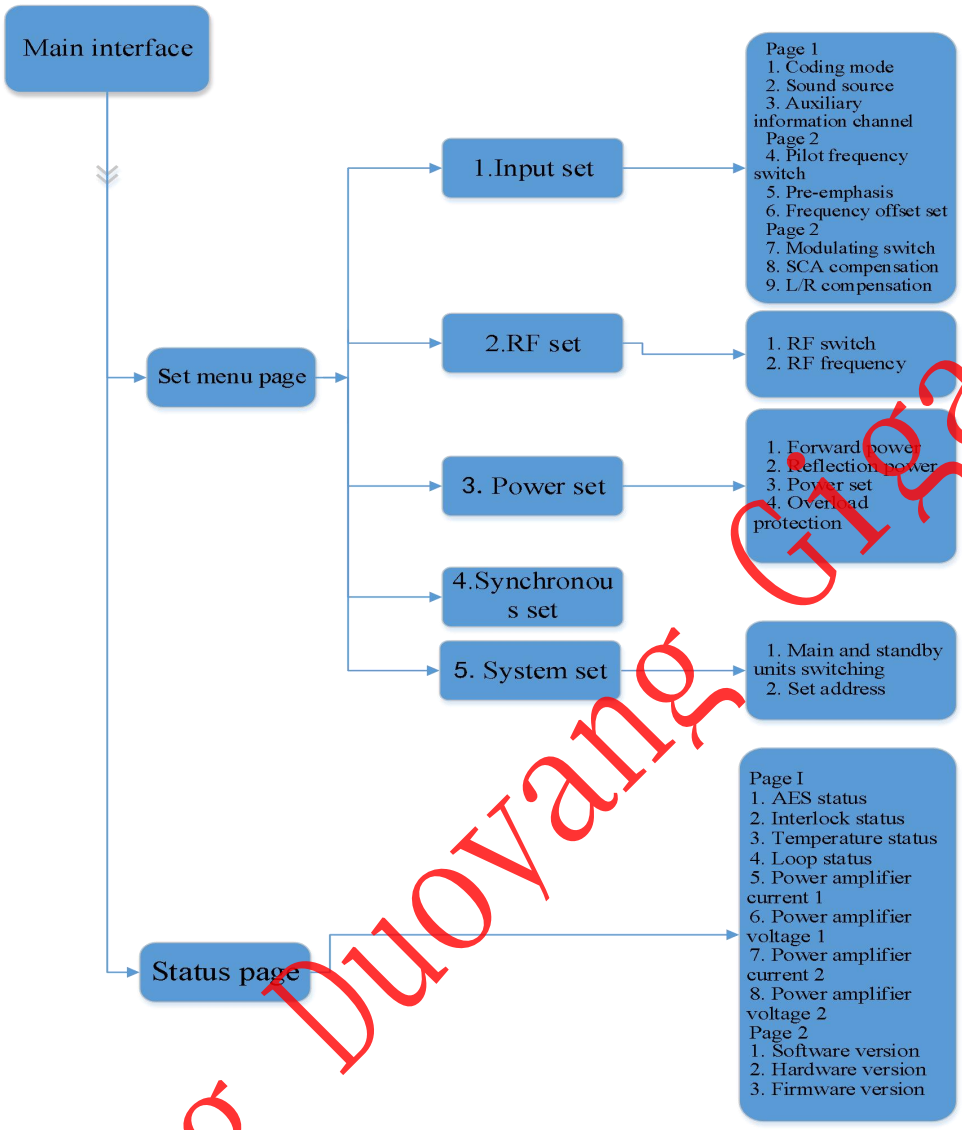


Figure 5 Operation Menu Structure Diagram

Main interface: displays the basic working information of the actuator and provides an entry for setting up the menu page and status page.

1) Menu page: enter the lower 5 categories of settings page.

a) Input settings: input signal and setting of FM coding;

b) Radio frequency setting: radio frequency switch, frequency setting and selection of reference clock;

c) Power settings: setting control mode, loop related parameters and part of

factory settings;

d) Synchronization settings: working mode and audio and radio frequency delay settings;

e) System settings: main and standby actuators and device address selection.

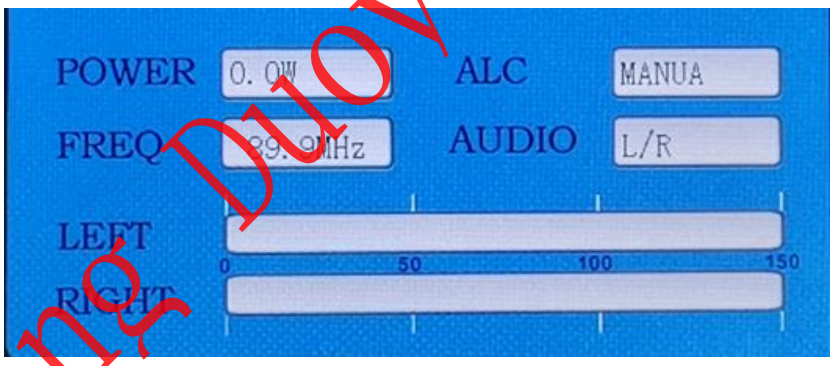
2) Status page: display actuator hardware status and version information.

4.3.1 Main Interface

1) Function button: jump to corresponding menu interface and status interface respectively;

2) Display the basic information of the actuator: input power (W), loop control method (manual, small-loop and large-loop), radio frequency (MHz) and sound source selection (L/R, AES1 and AES2);

3) Current volume display, the sound column will be displayed in yellow-green according to different volume sound (0-150).



4.3.2 Status Interface

The first page of status inerface：

1) AES (digital audio signal) input: when the current sound source is selected as AES1 (digital audio signal 1) or AES2 (digital audio signal 2), feedback AES status is displayed as "normal" or "abnormal". If AES status cannot detect the status of AES, it displays "--"；

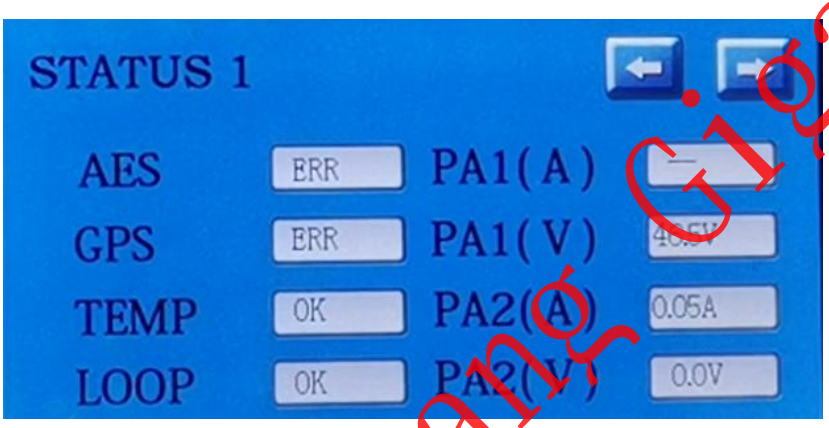
2) External 10M: feedback the status of external 10M signal source and and

display "normal" or "abnormal";

3) Temperature status: feedback whether or not the temperature is overheated and display "normal" or "abnormal";

4) Loop status: feedback current loop state, it displays "abnormal" when olverloading or in protection status, and the rest status displays "normal";

5) Display the current and voltage of power amplifier, current unit A, voltage unit V and power amplifier current 1 out-of-connection, so it displays "--".

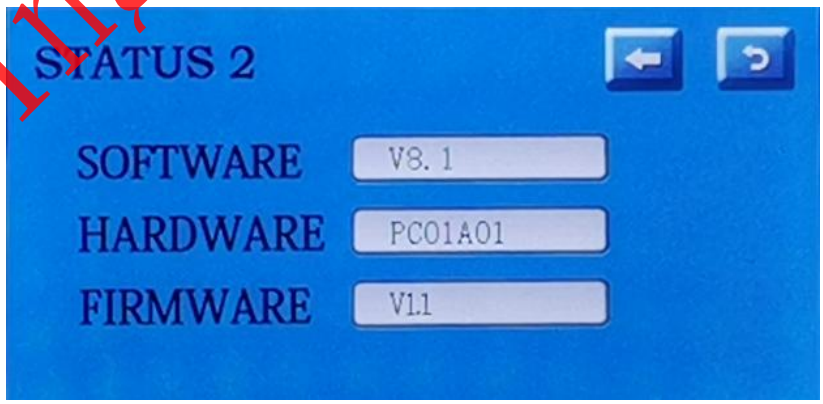


The second page of status interface:

1) Software version;

2) Hardware version;

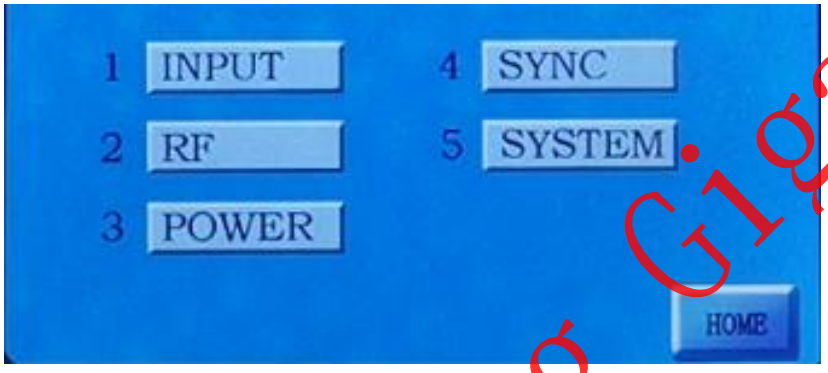
3) Firmware version.



4.3.3 Setting Menu

1) Button 1-5 is page jump button, it jumps to the corresponding settings interface, such as: press "radio frequency settings", it will jump to the radio frequency settings interface.

2) Press return button, it returns to home page.



4.3.3.1 Input Settings

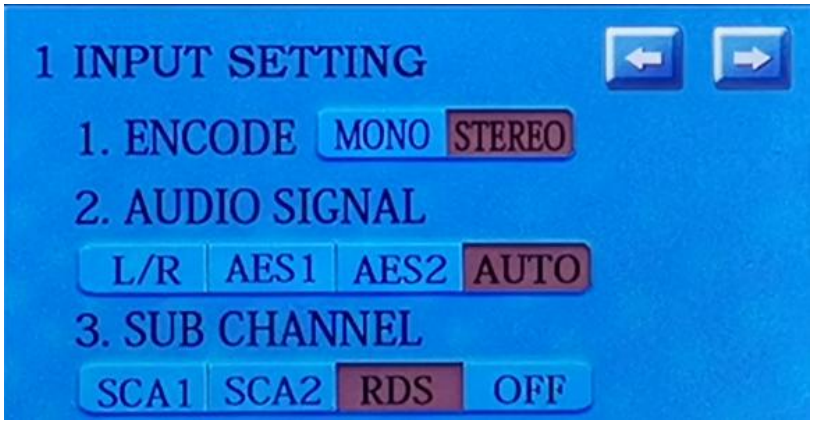
The first page of input settings:

1) Interface jump, return to the previous page (menu), or jump to the next page (the second page of input settings);

2) Coding mode selection, press the button to switch to the corresponding “mono track" or “stereophony";

3) Source selection, conduct manual switching between AES1, AES2 and L/R, in AUTO mode, one of the sound sources between AES1 and L/R will be automatically selected for input according to the hardware status, and AES1 takes precedence;

4) Supplementary channel, switch between SCA and RDS, and OFF is to close the supplementary channel.



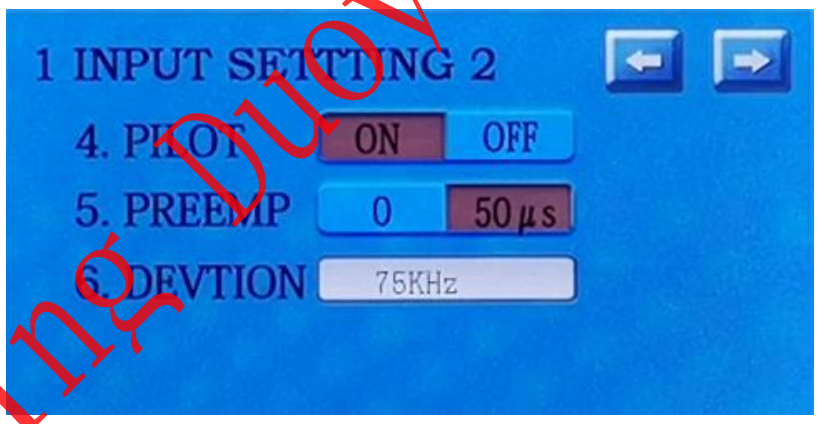
The second page of input settings:

1) Page jump, return to the previous page (the first page of input settings), or jump to the next page (the third page of input settings);

2) Pilot switch button is for switching on or switching off the pilot frequency;

3) Preemphasis selection: 0, 50, and unit is microsecond (us);

4) Frequency offset setting input box, click and the keyboard page for input value is popped up for inputing values, input range is 0-00KHz. The factory frequency offset is set to 75KHz by default.

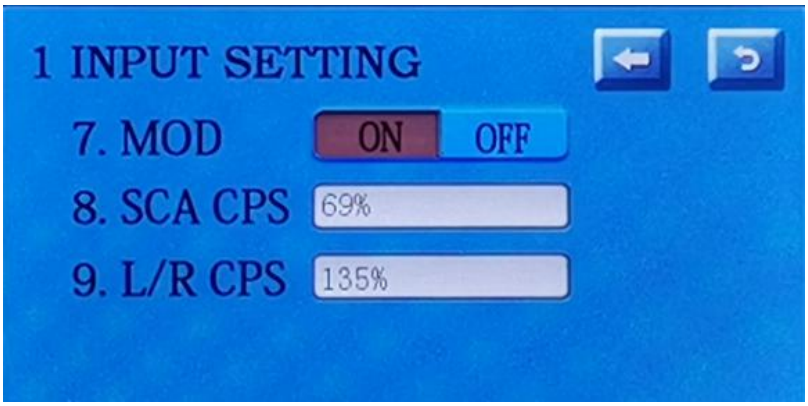


The third page of input settings:

1) Page jump, return to the previous page (the second page of input settings), or return to the menu.

2) SCA compensation is adopted to compensate the input electrical level of RDS.

3) L/R compensation input box to compensate analog L/R input electrical level.



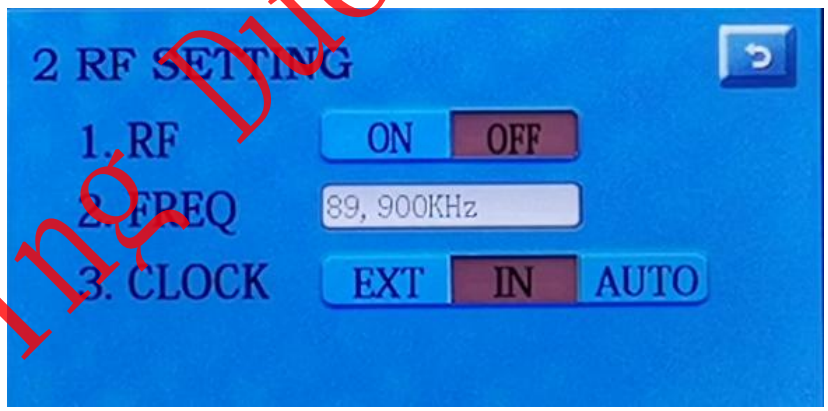
4.3.3.2 RF Settings

1) Return button is adopted to return menu interface;

2) The RF switch button corresponds to the RF of the switch.

3) RF input box, press it and the keyboard for inputing radio frequency is popped up;

4) Reference clock switching, external (GPS), internal (OSC), automatic (external 10M clock shall be given preference). If the device is not connected to the external clock, the internal clock is selected to ensure that the device works accurately.



4.3.3.3 Power Settings

The first page of power settings:

1) Jump button: return to the previous page (menu), or jump to the next page (the second page of power settings);

2) Forward power display box displays forward power value (actuator output

power value), and the unit is W;

3) Reflecting power display box displays the value of reflecting power, and the unit is mW;

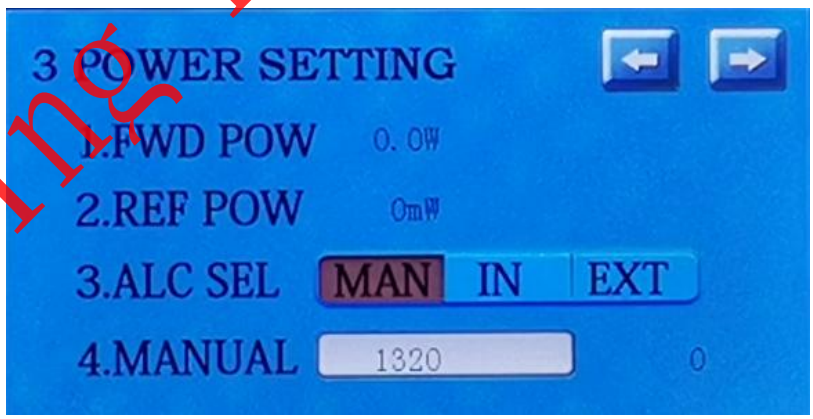
4) Selection of control mode has the modes of manual, small-loop and large-loop;

a) Manual mode: manually adjust the DA value to change the output power. The DA value is input by means of "4. Manual Settings"; and manually set the black number on the right to display the real-time output DA value.

Manual settings is valid when "Manual" is selected in "Control Mode", and manually set D/A value with range from 0 to 4095 (it is recommended not to exceed 3000).

b) Small-loop mode: percentage of rated power is modified through "5. Small-loop settings", and the actuator will automatically rise/decrease to the power to work. The formula is: percentage * rated power (30000mW) = actual power;

c) Large-loop mode: when the target voltage is set, the actuator will automatically adjust the DA value until the detection voltage of the whole power amplifier rises or decreases to that value, and the voltage value is input by means of "7. Large-loop settings".



The second page of power settings:

1) Jump button: return to the previous page (the first page of power settings), or jump to the next page (the third page of power settings);

2) Small-loop settings (0-100%): in the small-loop working mode, the percentage

of rated power is set from 0 to100%; and the number on the right side of the data box is the current small-loop forward detection voltage (mV);

3) Small-loop overload (0-4095 mV): in the small-loop working mode, set the voltage value (mV). If the small-loop reflecting detection voltage exceeds that value, the small-loop will be in the "overload" status. At this time, the alarm light will be turned on, and the "small-loop settings" power value will be reduced to half, if it still exceeds, then it will be reduced by half, iterating in turn until the reflecting detection voltage value is lower than that value on the right side of the data box; and the word is the current small-loop reflecting detection voltage value;

4) Large-loop settings (0-4095 mV): the expected value of the forward detection voltage of the large-loop is set in the mode of large-loop operation, and the actuator may adjust the output power to stabilize the forward detection voltage of the large-loop; and the number on the right side of the data box is the current large-loop forward detection voltage (mV);

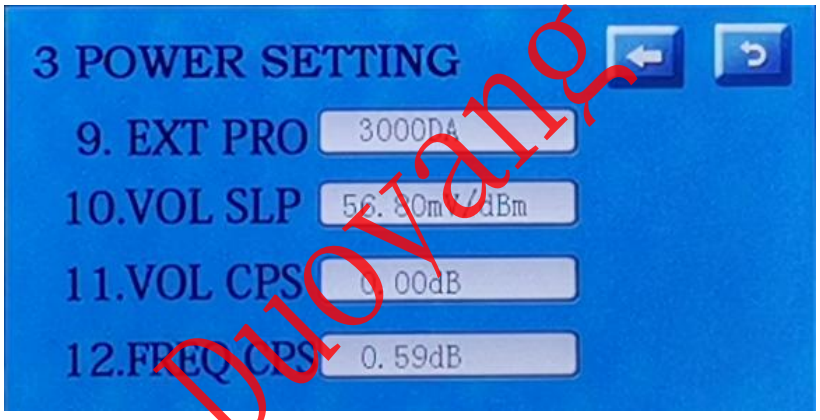
5) Large-loop overload (0-4095mV): in the large-loop working mode, when the reflecting voltage of the large-loop is greater than or equal to the overload value, the loop is in the "overload" status, at this time, the alarm light will be turned on, and the forward detection voltage of the "Large-loop Settings" will be reduced to half, reducing 50% at a time, until the reflecting voltage is lower than that value. Note: the alarm will be cancelled only after restarting or switching to other loop modes. The number on the right side of the data box is the current large-loop reflecting detection voltage (mV).

The third page of power settings:

1) Jump button: return to the previous page (the second page of power settings), or jump to the menu;

2) Great-loop protection (0-4095DA): in the working mode of the great-loop, when the current DA value exceeds this value, the great-loop is in the "protection" status, and at this time, the alarm light is on and current DA value is set as the protection value, until the DA value is lower than the protection value, the alarm is cancelled.

3) Set the detection slope, detection compensation, frequency compensation and actuator at the time it leaves the factory to adapt the linear relationship between different frequencies of the power amplifier block.



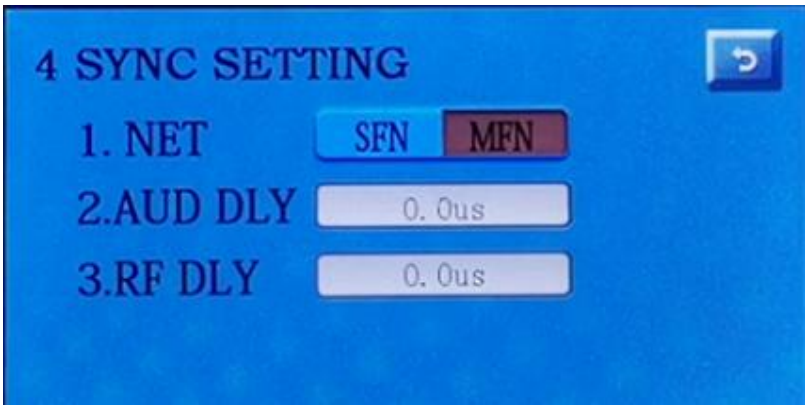
4.3.3.4 Synchronization Settings

1) Jump button: jump to menu;

2) Operating mode selection: switch to single-frequency network and multi-frequency network;

3) Audio delay: set the audio delay with the setting range of (0-3,000,000)*0.1, and unit is us;

4) Radio frequency delay: set the radio frequency delay with the setting range of (0-100,000)*0.1, and unit is us.



4.3.3.5 System Settings

1) Jump button: jump to menu;

2) Switching between main and standby: switch to main and standby actuators as the identification of the current machine;

3) Device address: set the device address of the current actuator from 0-127.