ABELL INDUSTRIES CO., LTD.

R-80

Digital Repeater Instruction Manual

Dear Users,

Thanks for buying our digital repeater.

This Digital repeater (is briefly referred to repeater as below) is a 50W professional repeater, adopting the high performance radio frequency module, Control panel, Power supply module and Built-in duplexer (Optional).

The repeater uses a modular, high performance design that is easy to maintain, convenient to update, and simple to interface. The main function of this repeater is the extended the range of two-way communications both local and networked.

Thanks for choosing our repeater, hope it will bring a lot of conveniences for your work and life.

Contents

User instructions

◆Please carefully read this manual before attempting to use this product. These instructions will explain the various features and operations of this repeater.

◆Please retain the instructions for future reference.

◆Please complete and return your user's warranty card. Complete all the items noted on the card.

◆AWC reserves the right to make changes, additions and modifications without prior notice. This manual is for reference only.

◆AWC retains final interpretation.

Safety Instruction

For safe and effective operation of this product, please read and note the information below carefully.

◆There are high voltages and high temperature components within the repeater enclosure. Exercise caution to prevent electric shock and burns.

◆The repeater shall be maintained by professionals. Do not attempt to open enclosure and self-service unless qualified.

◆Repeater must be set-up and deployed per appropriate regulatory bodies in the area.

◆Repeater should be grounded via the attached ground terminal for safety and performance.

◆The repeater antenna shall have the appropriate lightning protection and grounding to insure safe operation.

◆Installation of the repeater system including repeater, lightning protection, feed lines, combining, and power shall be completed by qualified professionals.

Open-package Inspection

Please exercise care when opening the shipping box. Confirm that all items noted in the table have been included and are in good condition. If not then please contact your dealer.

Item	No.
Repeater	1
AC power supply line	1
USB data line	1
User manual	1
Warranty Card	1

Product Introduction

Front panel introduction

Front view

Large view for front panel

Indicators Introductions

Indicator	Color	Functional description
TX	green	Always on, the repeater is transmitting signals
RX	green	Always on, the repeater is receiving signals
LNK	green	Always on, the link is successful
ERROR	red	On or flashes, error occured
DC	green	Always on, DC power supply equipment
POWER	green	TS B transmit
A、B	green	Digital time slot one receive signal, A light on. Digital time slot two, B light on. Analog doesn't light.

Repeater Display Instruction

The display consists of a two-digit numeric display that provides the following information:
a. Selected channel number
b. Display of current menu option or function parameters related to key operation.
c. Error code display

Front Panel Mic Connector

The front panel microphone connector consists of a RJ-45. It provides the interface for a local handheld microphone with PTT to be connected directly to the repeater for local operation.

Key function detailed description

| Button	Name	Menu guide function	Parameter editor function
C	C	1.short press back to last or root menu 2.long press back to standby mode and lock the keyboard	Clear or cancel current parameter value
◄	Left	1.Up level menu 2.Shortcut menu: decrease channel	Value decrease
►	Right	1. Next level menu 2. Shortcut menu, increase channel	Value increase
OK	OK	Enter next level menu	Confirm and save current parameter value
F1	F1	Function key 1 (software defines)	Figure 1
F2	F2	Function key 2 (software defines)	Figure 2
F3	F3/V_	1.Function key 3 (software defines) 2.Shortcuts menu: volume down	Figure 3
F4	F4/V+	1.Function key 4 (software defines) 2.Shortcuts menu: volume up	Figure 4

Back panel introduction



Rear view

Outside interface picture
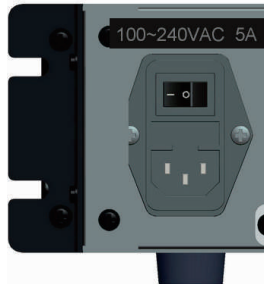
Power supply interface and switch picture

Rear panel port introduction

Port name	Function Declaration
USB	Connects to PC, used for programming and software update.
EXT-I/O	External interface, including the signal connected with outside and control the Pin, use as specific expanding function. Outside look structure define the interface.
RJ11	Connection to PSTN or analog PBX for inbound and outbound phone calls.
ANT/RX	Connect with antenna when duplexer installed, connect with transmit antenna when duplexer uninstalled.
AUX/TX	connect with transmit antenna when duplexer is uninstalled.

Rear panel EXT-I/O port definition
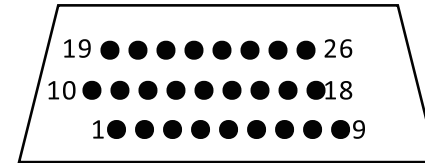
Pin No.	Definition	Function Declaration
Pin1	-13v	Power
Pin2	O_CLKX	CLKR output signal, opt coupler, LVTTL_3.3V
Pin3	UART3_RX	UART3_RX serial port
Pin4	IO_PTTI	PTTR input signal, opt coupler, LVTTL_3.3V
Pin5	SEL0_IN/SEL0_OUT	Expanding IO-0 LVTTL_3.3V
Pin6	DG	Digital
Pin7	AG	Analog
Pin8	EXT__IO_UF_OUT	Extend AF output
Pin9	EXT__IO_UF_IN	Extend MIC input
Pin10	+13v	12V_OUT 500mA_max
Pin11	IO_DX	DATAR peripheral equipment audio date (output)
Pin12	IO_FSX	FSR sync output
Pin13	IO_CLKR	CLKR input signal opt coupler, LVTTL_3.3V
Pin14	SEL1_IN/SEL1_OUT	Expending IO-1 LVTTL_3.3V
Pin15	DG	Digital
Pin16	AG	Analog
Pin17	NDET_OUT	Expanding port noise level (0-3V) (output)
Pin18	NDECT_IN	Expanding port noise level (0-3V) (input)
Pin19	UART3_TX	UART3_TX serial port transmit
Pin20	O_PTTO	PTT output signal opt coupler, LVTTL_3.3V
Pin21	IO_DR	DATAR peripheral equipment voice data

Pin No.	Definition	Function Declaration
Pin22	IO_FSR	FSR Signal Frame sync input
Pin23	DG	Digital
Pin24	AG	Analog
Pin25	RSSI_OUT	Extended port field intensity electrical level(0~3V)(input)
Pin26	RSSI_IN	Extended port field intensity electrical level(output)

Introduction of Functions

1).DMR digital audio transmit
When the RX port of the repeater receives an uplink signal from a device, the repeater will transmit it via its TX port if it meets the programmed signaling parameter of color code (CC) in DMR.

2). Analog Audio Transmit
TX and RX CTCSS or CDCSS may be set on an analog per channel basis.

3).DTMF modulation and demodulation
The hardware support DTMF and FSK modulation and demodulation channel.

4).Digital / Analog Channel Support
The repeater may be programmed to support both analog and digital operation. If a digital signal is received on the mixed mode channel, the repeater will transmit digital. If an analog signal is received, the repeater will transmit in analog. Programming establishes the signaling for both modes.

5). PSTN support
Support for external phone calls and DTMF dialing.

6).Channel Reserve Function
When no traffic is seen on the receiver, the repeater will continue to transmit for the duration of the channel reserve time. This minimizes communications turn-around time. The reserve time may be set between one to 50 seconds in intervals of one second. Default is six seconds.

7).IP Network
The IP network connection via the optional network card allows for the networking of R80 repeaters via the TCP/IP protocol. Networking supports both voice and data communications allowing them to occur over a larger footprint available from a single repeater site.

8). Operational Mode Switch
Allows the switching the repeater between repeater and test mode via software.

Repeater operation

1. Turn on/ off repeater

Toggle the power switch on the repeaters back panel to turn on. The speaker will provide an audible indication and the two-digit front panel display will light.

2. Audio / Data Transmit

When the RX port of the repeater receives an uplink signal from a device, the repeater will transmit it via its TX port if it meets the programmed signaling parameter of color code (CC) in DMR.

3. RX / TX Indicators

1). When the repeater is operational, the TX / RX indicators and A / B slot indicators will light. If "A" is illuminated then slot #1 is in use. "B" indicates that slot #2 is being used.

2). If neither A or B light then operation is analog.

4. Panel key board and display

Key and Display

5. Key warning tone

1). Key warning tones indicate modifications of working parameters or optional menu keys. A single beep will be heard.

2). Tones indicate error or invalid operation. Two beeps will be heard.

6. Programming software operation

1). Connect the repeater to the PC using a USB cable.

2). Open the previously install repeater programming software; power on the repeater.

3). Select the channel parameters; you will see the following window.
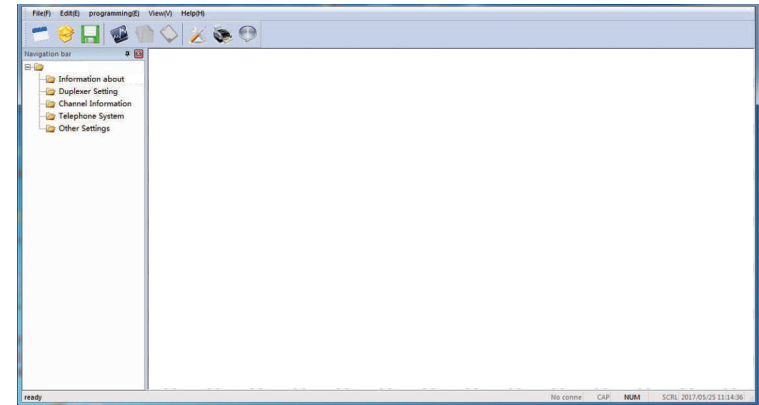
Please refer to "R-80 digital repeater software operation instruction manual" to set up channels in receiving and transmitting frequency, power, colour code and monitor, PTT and so on.

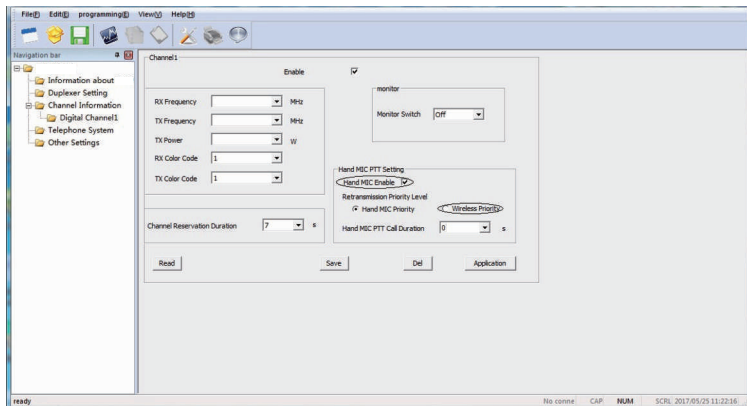**7. Two way radio calling**

1).Repeater Telephone System Configuration

①Find "telephone system" in R-80 programme software, configuration as below:
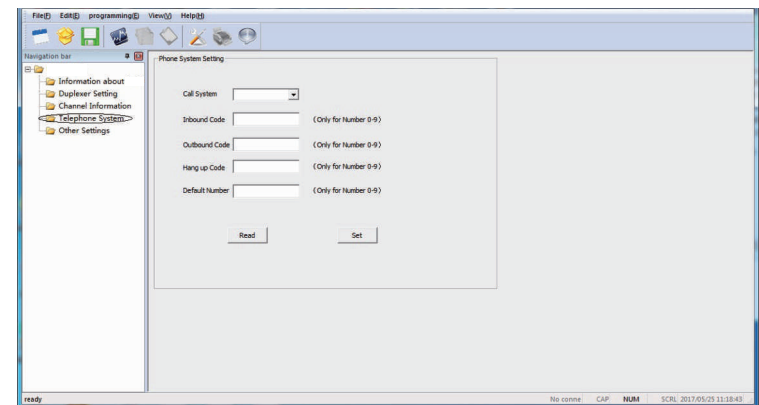
a).Call System: Per the required telephone use case, define the parameters necessary for telephone operation. Settings are available for off, inbound only, outbound only, or inbound / outbound.

b).Inbound Code: defines the numeric values (0 to 9) used to access the
   repeater via phone line from the outside.
c).Outbound Code: defines the numeric values (0 to 9) used to access the
   external phone line from the repeater.
d).Hang up Code: the numeric values (0 to 9) used to terminate the phone
   line after a call
e).Default Number: This is the default numeric value (0 to 9) for the repeater

②Note: The Telephone System only functions on a digital channel. Inbound
   calls use the ALL CALL group.

2).Two-way Radio Configuration - Telephone System
The repeater is compatible with most DMR radios on the market.
3). Answer and make a phone call
① handset makes a phone call (for example: call out password is: 222)
a).Dial any number: press the PTT button, input: call out password+ * +
   phone number + #.
   For example, call 26000000, press the PTT button, input 222+
   26000000 on keyboard at the same time, then release PTT button, you
   can see the radios send the phone call from the display, you have a call
   if other side answers.
b).Dial embedded number: press PTT buttons on two way radios, input
   call out password+ #, for example, the embedded number is

075526000000, firstly, press the PTT button, input 222# on keyboard,
then release PTT, after a few seconds you can have a call with
075526000000.
② A handsets answer an incoming phone call via the repeater using the
   call in password (111).
   If the other side uses the phone to call the handsets (repeater) after
   answering, you will need to input the call password +#(111#) then you
   can proceed with the call.
③ Handsets (repeater) hang up the phone, (the hang up password is 333
   etc):
   When the call is over, if the other side does not hang up, the repeater will
   hang up itself, the operation is: press the PTT, then input: hang up
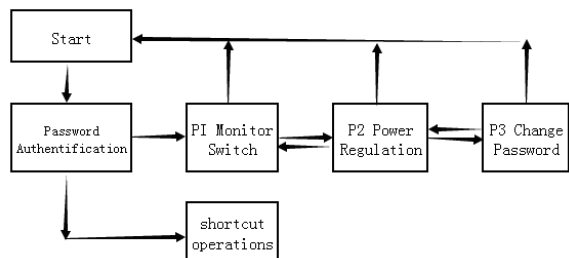   password +# (333#).

Panel basic operation

1.Power-on State
When the repeater is powered on and is idle, the display will show the current selected channel number.

2.Menu function
Panel function operation include: channel switching, monitor volume adjustment, monitor switch (P1), transmit power regulation (P2), password (P3), channel switching and volume adjustment are in shortcut menu, others are general function, operation mode is different, the operation process is below:


If the repeater does not open for password entry, press "OK" to bypass authentication.

3.Password authentication
1).If the current state is menu lock, press "OK" or shortcuts function button enter password authentication, the display will show ‑‑ to enter password. The password consist of "1" "2" "3" "4" in any random order, six figures, corresponding button is F1 F2 F3◄ F4◄ .
2).After input of the password, press OK , if the password is correct it will enter the menu "P1" or performs shortcuts, or warning will occur. .

(Password authentication)

3).Press C before OK will remove the password number you input.
4).In any menu press C , the device will enter password lock state and go idle.
5).If there are no button presses for 30 seconds or more, the repeater will enter the password lock and idle state.

4.Channel switching
Channel switching function is in the shortcuts menu function, directly press ◄ or ► to change the current channel, if the menu has a password lock, you need the password authentication, the channel number will display "01‑99", when you press ◄ or ►, digital display illuminates, when changing to target channel, then press OK to confirm, repeater will change to target channel, press C to return to the idle state, and display the current work channel number.

5.Volume adjustment
Volume adjustment function, press F3◄ or F4◄ , changing speaker volume, the volume can be U1 to U8 level, U1 is the lowest, U8 is the highest, when you press F3◄ or F4◄ , the digital display will illuminate, when you adjust to target volume level, and press OK to confirm, the device monitor volume will be set to this new target volume level. The following picture shows a volume setting of U8. It becomes effective when C is pressed. Once pressed, the repeater returns to its idle state.

(Volume adjustment)

6.Monitor switch
1).In the idle state, press OK to enter monitor switch menu, digital
   display "P1", and then press ▶ " to enter menu option, press OK ,
   then enter monitor switch set up.
2).Digital display "ON" or "OF", respectively represent on or turn off
   monitor switch.
3).Press OK to confirm, the value will be saved and become effective,
   press C to cancel the operation.

(Monitor open)

4).Press C again back to P1 menu interface.

7.Power regulation
In the P1 interface, press ◀ to enter power regulation menu option,
digital display "P2", press ▶ back to P1 interface, press OK to enter
power regulation set up operation interface, the process like below:

(P2 interface)

1).The digital display shows the current RF power level from L1 to L9. The
   levels correspond as L1 = 5W and L9 = 45 W. The figure shows a setting
   of L6 or 30 Watts.
2).Press ◀ or ▶ to decrease or increase the power level,
   alternately displays new level "L1 to L9" and responding power value.
3).Press OK to confirm, the value will be
   saved , and becomes effective, press C to cancel the operation.
4).Press C to cancel the operation.

(Power Level 6)

8.Password Change
In the P2 interface, press ▶ to enter password changing menu interface,
the display shows P3, you need verify old password before you change
password, after the verification of the password, you can change the
password, and the default factory password is "1 1 1 1 1 1":

(P3 Interface)

1).Press OK ,password authentication, the display shows ▪-▪ , for the
   detailed process please refer to the "Password Authentication"
2).After the password authentication a tone will mean you are correct, and
   then you can start to set your new password.
3)Press any combination of F1 F2 F3 F4 , set new six figures password,
   and then press to confirm.

4).Repeat the process, when the two passwords are the same, the
   repeater will emit a tone to indicate the entry is correct. The display will
   revert back to P3 indicating that the new password is in effect. If a
   warning tone is heard then the entry has failed in setting up the new
   password. Please input the new password again.
5).Press C to cancel the operation and press C again to return to the
   idle state.

(Be prompted for the password)

Troubleshooting guide

Description	Reason	Solution
Boot problem	1.The power cord is in poor contact. 2.The power cord is broken. 3.The fuse of power supply loose or break. 4.Switching power supply failure	1.Re-plug the power cord 2.Replace the power cord 3.Replace the fuse 4.Replace the switching power supply
Programming software fails to connect	Control line is broken	Replace the control line.
Failed to set up a call	1.Frequency of transmission and reception, color code of transmission and reception, retuned code, are different from the handsets. 2.Channel parameter beyond the diplexer working bandwidth, equipment trouble light will be light, the speaker will warning alarm, the fault code is 12; 3.Receive module failed, the fault code is 30, 31,32. 4.Stimulus module failed, the fault code is 20,21,22. 5.Control panel failed, the fault code is 40,41,42.	1.Inspect channel parameter: the repeater high frequency transmits, low frequency receives: repeater transmits frequency is corresponding to the handsets' receive parts, repeater's receive frequency is corresponding to the handsets' transmit frequency, the colour code and retuned code is the same with handsets. 2.Change the channel parameter in the frequency of diplexer work range or change the channel parameter frequency of the diplexer. 3.Replace the receive module 4.Replace the stimulus module 5.Replace the control panel.
Communication Distance become shorter	1.Antenna is damaged or feeder has water in it. 2.Antenna is in poor connection 3.Frequency disruption 4.Repeater transmit power decrease 5.Receive module sensitivity decrease	1.Examine the antenna. 2.Replace the antenna. 3.Find out the frequency disrupted or change. 4.Replace the power amplifier module. 5.Replace the receive module.
Indicator light no display, speaker no sound.	1.Flat cable broken. 2.The display board broken	1.Replace the flat cable. 2.Replace the display board.

When the repeater have some error, the error light will light up, the speaker will emit a warning alarm, the display tube will show the fault code. After the warning, check if the communication is OK, if not, restart the repeater, if still work, please contact the dealer.

The fault code as below:

Alarm class	Alarm item	Fault condition	LED display code	sound
RF power amplifier	0.not detected RF power amplifier	I2C is blocked	10	
	1.E2PROM fault	I2C is blocked	11	
	2.RF power amplifier fault	PA_ERRLED=1	12	
	3.RFpower amplifier overheat	PA_TEMPDECT>PA_CAP_TEMP	13	
	4.RF power amplifier overflowing	PA_CURRENT>PA_CAP_CURRENT	14	
	5.RF power amplifier overvoltage	PA_VO LTAGE>PA_CAP_V_MAX	15	
	6.RF power amplifier under voltage	PA_VO LTAGE<PA_CAP_V_MIN	16	
Stimulus module	0.not detected stimulus module	I2C is blocked, EX_PLLLD=0	20	
	1.E2PROM fault	I2C is blocked	21	
	2.Transmit frequency losing lock	EX_PLLLD=0	22	
Receive module	0.not detected receive module	I2C is blocked, EX_PLLLD=0	30	
	1.E2PROM have problems	I2C is blocked	31	
	2.receive frequency is locked.	RX-PLLLD=0	32	
Control panel	0.Control panel have some problems		40	
	1.E2PROM have problems		41	
	2.Ditital module fault	HR500_RESET_INT=0,SPI can not read	42	
Channel parameter fault	1.Transmit frequency is over range	Stimulus module parameter, power amplifier module, duplexer parameter	01	
	2.Receive frequency is over range	Receive module parameter	02	
	3.Board-band, narrow-band	Stimulus module parameter, receive module parameter	03	
	4.Transmit power is over range	Power module, duplexer parameter	04	

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Verification of harmful interference by this equipment to radio or television reception can be determined by turning it off and then on. The user is encouraged to try to correct the interference by one or more of the following measures:

● Reorient or relocate the receiving antenna. Increase the separation between the equipment and receiver.

● Connect the equipment into an outlet on a different circuit to that of the receiver's outlet.

● Consult the dealer or an experienced radio/TV technician for help.

Operation is subject to the following two conditions:

● This device may not cause harmful interference.

● This device must accept any interference received, including interference that may cause undesired operation.

Note: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Operational Instructions and Training Guidelines

To ensure optimal performance and compliance with the occupational/controlled environment RF energy exposure limits in the above standards and guidelines, users should transmit not more than 50% of the time and always adhere to the following procedures:

● Antenna gain must not exceed 0dBi.
● The antenna must be installed complying with the requirements of manufacturer or supplier, and it must be at least 70cm away from human body.

ISEDC Statement

This device complies with Innovation, Science and Economic Development Canada Compliance license-exempt RSS standard(s). Operation is subject to the following two conditions:

- This device may not cause harmful interference.

- This device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

ISEDC Radiation Exposure Statement:

This device must be restricted to work related operations in an Occupational/Controlled RF exposure Environment.

This equipment should be installed and operated with minimum distance 70cm between the radiator & your body.

ISEDC exposition aux radiations:

Ce dispositif doit être limité aux opérations liées au travail dans un environnement d'exposition RF professionnel/contrôlé.

Cet équipement doit être installé et utilisé avec un minimum de 70cm de distance entre le radiateur et votre corps.