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Document Revision

Version	Date	Description of changes
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1. Introduction

The ALM-04-MRTU controller have RS-485 connection with Modbus RTU protocol support. The controller makes an easy way to incorporate RS-485 connectivity into monitoring and control systems. Which makes perfect integration to monitoring in SCADA software, HMI Modbus & Utility.



Figure 1-1: Application architecture for the ALM-04-MRTU

1.1 Features

- RS-485 Interface
- Modbus RTU protocol
- Photo couple input, Relay output
- Wide operating temperature range
- Wide power supply range
- MP3 Audio, external Line Out
- Digital Volume control
- Support up to 64 audio files
- 8 Alarm mode support
- 4 Single channel or 15 Binary channel support



1.1.1 Features Description

Modbus RTU protocols

The Modbus RTU function on the ALM-04-MRTU can be used to provide data monitoring from HMI/SCADA software built with Modbus RTU driver. All the RS-485 & Modbus RTU configuration are store in MicroSD(T-Flash), it can be created by PC Utility.

Built-in MP3 Audio decoder & Audio Output

The Alarm sound using MP3(MPEG1-Audio Layer III) audio, it support most of MP3 format(Sample Rate 24/44.1(prefer)/48 KHz, Bitrate 32 64 96 128(prefer) 160 192 Kbit/s), include an 3W audio power amplifier & $1K\Omega$ Impedance Line Out can send the alarm sound to external PA(Power Amplifier) system.

Support 4 channel trigger input with 8 alarm mode & Output

Include 4 channel Photo couple input & 8 kinds of alarm trigger mode, it also can be triggering an extend device using external Relay Output. All modes & MP3 audio files can be created or config by PC Editor.



1.2 Specifications

Table 1-1: System Specifications

Communication				
Interface	RS-485			
Parity, Data bit, Stop bit	None/Odd/Even, 8, 1/2			
Baud Rate	300 ~ 115200 bps			
Protocol	Modbus RTU			
Watchdog	Yes, 1.8s			
LED Indicators				
D (2)	One 2 colors LED, Blue for System status,			
Power/Status	Red for Alarm status.			
Protection				
ESD (IEC 61000-4-2)	±8 kV Air for Random Point			
EFT (IEC 61000-4-4) ±2 kV for Power				
Waterproof(IEC 60529)	(0529) IP54 (Panel Mount Upright Position)			
Power Requirements				
Input Voltage Range	$9 \sim 28$ VDC with Reverse Protection (Vin to GND)			
Power Consumption	0.48 W Standby.			
Mechanism				
Dimensions(WxLxH)	72 mm x 72mm x 22 mm			
Installation Panel Mount/Wall Mount/DIN-Rail Mounting				
Environment				
Operating Temperature	$-20^{\circ}\mathrm{C} \sim +75^{\circ}\mathrm{C}$			
Storage Temperature	$-30^{\circ}\mathrm{C} \sim +85^{\circ}\mathrm{C}$			
Humidity	$10\% \sim 85\%$ RH, Non-condensing			



Table 1-2: I/O Specification

Digital Input				
Channels	4			
Input Type	Dry Contact: Sink			
	Off Voltage Level: Open			
Dry Contact Level	On Voltage Level: Close to GND			
Photo-Isolation	3750 VDC			
Input Condition	Pulse Width must > 150mSec or more			
Digital Output				
Channels	1			
Output Type	Form A			
Contact Rating (Resistive Load)	DC50V/100mA			

Table 1-3: Audio Specification

Audio	
Sound Pressure Level	99dB@1KHz/1meter
Volume Control	Digital Volume Control
Number of Playback	64(Max)
Audio File Format	MPEG1-Audio Layer III (MP3)
Sample Rate	24/44.1(prefer)/48 KHz
Bit Rate	32 64 96 128(prefer) 160 192 kbit/s
Audio Startup Time	< 150ms
Audio Output	3W(Max)
Line Out Impedance	1ΚΩ

Table 1-4: Storage Specification

Storage				
Audio Files Locate	Micro SD(T-Flash) up to 32GB, bundle 4GB			
File System	Fat16/32			
File Transfer	PC Editor Utility, Copy to Micro SD			



2. Hardware

2.1 Outward Appearance

ALM-04-MRTU contains I/O connectors, Micro SD, Reset to Default and LEDs.



Figure 2-1: Front Panel



Figure 2-2: Back Panel



2.1.1 LED Indicator

Table 2-1: System Status Indicator

System Status Indicator				
LED	Controller Status	LED Status		
DWD	Power On	Blue LED		
PWK	Alarm Status	Red LED		

2.1.2 Connector Pin Define

Terminal NO		Pin Name	Wire Color	
	1	DI1	Brown	
	2	DI2	Red	
	3	DI3	Orange	
	4	DI4	Yellow	
	5	D+	Green	
	6	D-	Blue	
	7	DI.GND	Gray	
	8	Vin	Red	
	9	Vin	Red	
	10	GND	Black	
	11	GND	Black	
	12	Line Out	Purple	
	13	RL	White	
	14	RL	White	

Figure 2-3: I/O Connector of ALM-04-MRTU



2.2 Reset to default

Press & hold the reset button on the bottom side over 6 Sec until the Red LED quick flash and release, the ALM-04-MRTU will restore to default setting, default Device ID is "1", RS-485 setting is "115200,N,8,1", Volume is "5".



Bottom View

Figure 2-4: Reset button locate in the bottom side of ALM-04-MRTU

2.3 Dimensions

The diagrams below provide the dimensions of the ALM-04-MRTU to use in defining your enclosure specifications. All dimensions are in millimeters.





2.4 Wire Connection

2.4.1 Wire connection define

The following describe the wire color & function



Figure 2-6: Wire color & function

2.4.2 Digital Input (DI) wiring

Digital Input wiring				
Digital Input/ Counter	ON State	OFF State		
	Close to GND	OPEN		
Dry Contact	← □⊖ DIx □⊖ (B)GND	× DIx (B)GND		

Figure 2-7: DI Dry contact wiring



2.4.3 Relay Output wiring



Figure 2-8: Relay Output wiring

2.4.4 Line Out wiring



Figure 2-9: Line Out wiring

2.4.5 Power Input



Figure 2-10: Power Input

2.4.6 RS-485 Wiring





3. Software

The ALM04_Editor Utility provides the simple way to create or modify the MP3 Audio files & RS-485 Modbus RTU configuration. It is available on Windows application to configure the ALM-04-MRTU.

Utility Support Windows 7 (or later versions).

3.1 ALM04 Editor Utility

The following is the main screens provided by ALM Utility, these utility tools can be thought as a useful tool for configuration and monitoring on the ALM-04-MRTU. It supplies several functions, such as Monitoring, Configuration, Connection, Wi-Fi setting and F/W upgrade, etc...

3.1.1 Main Screen

35 ALM04 Editor V0.9 (20191204) -						
Project Dir: work/work3/						
(1)Set	Modbus RTU Config & Volume		(3)Alarm Config (Add audio before use) Mode			
Volun	ne 8 Device ID: 12 Data bit: 8	•	Mode 0-3, Digital Pin Input(DI1~DI4)			
	BaudRate: 115200 Stop bit: 1	•	DI1 #1 001 • #2 048 • #3 • #4 • Repeat 1	🔽 Alarm Output		
	Parity: None		DI2 #1 002 • #2 049 • #3 • #4 • Repeat 1	Alarm Output		
(2)Add	Audio		DI3 #1 003 • #2 052 • #3 • #4 • Repeat 1	Alarm Output		
		<u> </u>	DI4 #1 004 • #2 001 • #3 • #4 • Repeat 1	Alarm Output		
File No.	Real File Name	_^				
001	001	-1				
-002	002					
003	003					
004	004					
005	005					
006	006					
007	007					
008	008					
009	009					
010	010					
011	011					
012	012					
013	EN13	~				

Figure 3-1: ALM04_Editor Utility main screen



3.1.2 Alarm Mode & Audio Editor

ALM-04-MRTU contain 8 kinds of alarm mode, **Mode 0** ~ **3** are DI1~DI4 in single independence channel trigger, in DIx channel priority, the priority of DI channel is DI4 > DI3 > DI2 > DI1.

Mode 4 ~ 7 are DI1~DI4 in Binary trigger, the priority of DI channel (DI4,DI3,DI2,DI1) in this mode is 1111b(0x0F)>...> 0001b(0x01).

Alarm Mode					
Mode	Channel Trigger Function	Mode	Binary Trigger Function		
0	General Playback	4	General Playback		
1	Trigger Input priority Playback	5	Trigger Input priority Playback		
2	Hold Repeat Playback	6	Hold Repeat Playback		
3	Memory Once Playback	7	Memory Once Playback		

Max 4 MP3 files can be added for each Channel or Binary trigger alarm, it will playback from #1 to #4 for the trigger depend on the setting.

Relay output can set an extend alarm output to trigger another device. All those setting can be done in PC Utility, show as below.

🍜 ALM04	4 Editor V0.9 (20191204)		- 🗆 ×
🕑 Lo	ad Project Dir:,	(work)work3\	Cpen Folder
(1)Set	Modbus RTU Config & Volume	(3)Alarm Config (Add audio before use) Mode	
Volur	me 8 Device ID: 12 Data bit: 8 💌	Mode 4-7, Binary Input(bI1~bI6))	
	BaudRate: 115200 • Stop bit: 1 •	bl1 (0001b) #1 001 • #2 048 • #3 • #4 • Repeat 1	Alarm Output
	Parity: None 💌	bI2 (0010b) #1 002 ▼ #2 049 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output
(2)Ada		bI3 (0011b) #1 003 ▼ #2 052 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output
		bI4 (0100b) #1 004 v #2 001 v #3 v #4 v Repeat 1	Alarm Output
File No.	Real File Name	bI5 (0101b) #1 005 v #2 002 v #3 v #4 v Repeat 1	Alarm Output
001	001	bI6 (0110b) #1 006 ▼ #2 003 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output
002	002	Mode 4-7, Binary Input(bI7~bI15)	
003	003	, , , , ,	
004	004	bI7 (0111b) #1 007 • #2 004 • #3 • #4 • Repeat 1	Alarm Output
005	005	bI8 (1000b) #1 008 • #2 • #3 • #4 • Repeat 1	Alarm Output
006	006	b19 (1001b) #1 009 • #2 • #3 • #4 • Repeat 1	Alarm Output
007	007	b110 (1010b) #1 010 v #2 v #3 v #4 v Repeat 1	Alarm Output
008	008	bI11 (1011b) #1 011 ¥ #2 ¥ #3 ¥ #4 ¥ Repeat 1	Alarm Output
009	009		E Alarm Output
010	010		T Marin Output
011	011	DI13 (1101b) #1 013 • #2 • #3 • #4 • Repeat 1	I✓ Alarm Output
012	012	bI14 (1110b) #1 014 • #2 • #3 • #4 • Repeat 1	Alarm Output
013	EN13	bI15 (1111b) #1 015 • #2 • #3 • #4 • Repeat 1	Alarm Output
		1.1	

Figure 3-2: ALM-04-MRTU PC Utility Audio Editor page.



3.2 Start your Edit

First, load your project if the "*Project Dir:*" is not your target work job, or you need to start with a new project.

To Create a new project, use **Load Project** button, select the directory where you want to put and add the new directory name "newwork1", etc. show as below.

P Loa	d Project Dir:	e/work/work3\	Open Folder
(1)Set Volun	Modbus RTU Config & Volume e 8 Device ID: 12 Data bit: 0 Baudeate: 15500 - Stee bit: 0	(3)Alarm Config (Add audio before use) Mode 4 • • Mode 4-7, Binary Input(bI1~bI6))	
	Parity: None V	Select Directory	Alarm Output
		V #4 V Repeat 1	Alarm Output
(2)Add	Audio	v #4 v Repeat 1	Alarm Output
		v ≠4 v Repeat 1	Alarm Output
File No.	Real File Name	Repeat 1	Alarm Output
001	001	RAD 10_BC files	Alarm Output
002	002	ALMOGWF The specified directory does not exist. Create it?	
003	003	🕞 work	70
004	005	Prest Yes No Repeat 1	Alarm Output
005	005	Repeat 1	Alarm Output
007	007	▼ #4 ▼ Repeat 1	Alarm Output
008	008	OK Cancel Help #4 Repeat 1	Alarm Output
009	009	bI11 (1011b) #1 011 ¥ #2 ¥ #3 ¥ #4 ¥ Repeat 1	Alarm Output
010	010	bI12 (1100b) #1 012 • #2 • #3 • #4 • Repeat 1	Alarm Output
011	011	bI13 (1101b) #1 013 ¥ #2 ¥ #3 ¥ #4 ¥ Repeat 1	Alarm Output
012	012	bI14 (1110b) #1 014 • #2 • #3 • #4 • Repeat 1	Alarm Output
013	EN13		Alarm Output

Figure 3-3: New a Project in Editor.

Then, Follow the step number,

(1) Set Modbus RTU Config & Volume:

For default, Volume level is **6**, range from 0(Mute)~10(Max). For Modbus RTU Device ID is **1**. For RS-485 (115200,N,8,1) Baud Rate: **115200** Parity: **None** Data bit always be **8** Stop bit: **1** Modify those item for your system request.



(2) Add Audio: Double Click on which File No. you are going to add the audio file, max 64 files can be assigned.

File No. play back, select **Play Source** (Audio file original location) or **Play Project** (Audio file in project), click **File No.** and press **Play** button to play, and **Stop** button to break playback.

Click File No. and press the Delete button to remove file name in list, show as below.

(2)Add Audio	Play Source	C Play Project	00	0	Delete File
File No.	Rea	al File Name		1	
001		001			Pre-Listen
002		002			Play/Stop
003		003			
004		004			
005		005			
006		006			
007		007			
008		008			
009		009			
010		010			
011		011			
012		012			
013		EN13			

Figure 3-4: Play Back & Delete File.



(3) Alarm Config: Frist you need to select Alarm Mode, then you can assign audio File No. for each alarm channel from combo box, playback Repeat count & Alarm Output Relay.

🍜 ALM04	Editor V0.9 (20191204)									-		×	
🕑 Loa	d Project Dir:				····· \work\wor	k3\				2	Open Fol	der	
(1)Set	Modbus RTU Config & Volume		(3)Alarm Confi	(3)Alarm Config (Add audio before use) Mode 🛛 🔪 Alarm Mode									
Volun	ne 8 Device ID: 12 Data bit: 8 💌	I r	-Mode 0-3, Digita										
<u></u>	BaudRate: 115200 V Stop bit: 1 V		DI1	#1 001 ¥	#2 048 👻	#3	▼ #4	¥	Repeat 1	V	Alarm Out	put	
	Parity: None 💌		D12	#1 002 -	#2 049 -	#3	- #4	•	Repeat 1	Г	Alarm Out	put	
(2)Add	Audio	1	DI3	#1 003 •	#2 052 💌	#3	▼ #4	-	Repeat 1	~	Alarm Out	put	
	(• Play Source (Play Project)		DI4	#1 004 💌	#2 001 💌	#3	▼ #4	•	Repeat 1	Г	Alarm Out	put	
File No.	Real File Name	^											
001	001												
002	002												
003	003												
004	004												
005	005												
006	006												
007	007												
008	008												
009	009												
010	010												
011	011												
012	012												
013	EN13	~											
												1	



5 ALM04 Editor V0.9 (20191204)										
🖹 Loa	d Project Dir:	work\work3\	产 Open Folder							
(1)Set	Modbus RTU Config & Volume	(3)Alarm Config (Add audio before use) Mode T Alarm Mode								
Volun	ne 8 Device ID: 12 Data bit: 8 -	Mode 4-7, Binary Input(bI1~bI6))								
<u></u>	BaudRate: 115200 Stop bit: 1	bI1 (0001b) #1 001 • #2 048 • #3 • #4 • Repeat 1	Alarm Output							
	Parity: None	b12 (0010b) #1 002 ▼ #2 049 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output							
(2)Add	Audio	bI3 (0011b) #1 003 ▼ #2 052 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output							
	(• Play Source (* Play Project	bI4 (0100b) #1 004 • #2 001 • #3 • #4 • Repeat 1	Alarm Output							
File No.	Real File Name	bI5 (0101b) #1 005 • #2 002 • #3 • #4 • Repeat 1	Alarm Output							
001	001	bI6 (0110b) #1 006 • #2 003 • #3 • #4 • Repeat 1	Alarm Output							
002	002	Mode 4-7, Binary Input(bI7~bI15)								
003	003									
004	004	bI7 (0111b) #1 007 • #2 004 • #3 • #4 • Repeat 1	Alarm Output							
005	005	bI8 (1000b) #1 008 • #2 • #3 • #4 • Repeat 1	Alarm Output							
006	006	bI9 (1001b) #1 009 v #2 v #3 v #4 v Repeat 1	Alarm Output							
007	007	b110 (1010b) #1 010 x #2 x #3 x #4 x Beneat 1	Alarm Output							
008	008		Alarm Output							
009	009		je Albrin Golgar							
010	010	DI12 (1100b) #1 012 • #2 • #3 • #4 • Repeat 1	Alarm Output							
011	011	bI13 (1101b) #1 013 • #2 • #3 • #4 • Repeat 1	Alarm Output							
012	012	bl14 (1110b) #1 014 ¥ #2 ¥ #3 ¥ #4 ¥ Repeat 1	Alarm Output							
013	EN13	b115 (1111b) #1 015 ▼ #2 ▼ #3 ▼ #4 ▼ Repeat 1	Alarm Output							

Figure 3-6: Alarm Config Mode4~7



3.2.1 Make a Micro SD from project

Open project folder uses the **Open Folder** button, copy all the files inside this folder to the MicroSD root directory.

🍜 ALM04	Editor V0.91 (20191206)		- 0 ×
🔊 Loi	ad Project Project Dir:	(Release\MP\ Open project folder	Dpen Folder
(1)Set	Modbus RTU Config & Volume	(3)Alarm Config (Add audio before use) Mode 0 -	
Volur	ne 6 Device ID: 1 Data bit: 8	Mode 0-3, Digital Pin Input(DI1~DI4)	
	BaudRate: 115200 V Stop bit: 1	DI1 #1 001 • #2 • #3 • #4 • Repeat 1	Alarm Output
	Parity: None	DI2 #1 002 • #2 • #3 • #4 • Repeat 1	Alarm Output
(2)Add	Audio	DI3 #1 003 • #2 005 • #3 • #4 • Repeat 1	Alarm Output
	(* Play Source C Play Project 🚺 🔮	DI4 #1 004 • #2 006 • #3 • #4 • Repeat 1	Alarm Output
File No.	Real File Name		- 0 ×
001	beep_Fixed10s	烧 索 愛用 林田 檜湖	^ 0
002	bell_alarm_Fix 12s		
003	fire engine siren_Fix7.5s	🖈 🐚 🗋 📥 😽 🗸 -	🗸 🥵 - 🖽
004	warning_msg_Fix8.5s	釘握到[複製 貼上 😭 📭 新	内容 🦉 選
005	xiaofangjinglingsheng_Fix15s	快速存取]	💊 取-
006	door_chime0_Fix6.0s	剪贴簿 组合管理	開啟
007		← → ∨ ↑ 🖡 « Release > MP	> ひ 投募 MP ♪
008		▶ ▲ ヘ 名稱 ヘ 大小	類型
009		📕 / 💿 001 mp3	102 KB MP3 標案
010		F @ 002mp3	203 KB MP3 檔案
011		L © 003.mp3	139 KB MP3 檔案
012		桌 ⑥ 004.mp3	148 KB MP3 檔案
013	×	lo (005.mp3	166 KB MP3 檔案
		😻 [💿 006.mp3	166 KB MP3 檔案
		🔷 🤇 💿 Err1.mp3	17 KB MP3 檔案
		👌 T 😽 m3fn.txt	1 KB TXT 檔案
		🧏 🦉 🥵 plist.cfg	1 KB CFG 檔案
		🐂 🕴 🛛 🚱 rtu.cfg	1 KB CFG 檔案
		💷 1 🤫 vol.cfg	1 KB CFG 檔案

Figure 3-7: Open Project folder to copy

3.2.2 File content in SD Card

0xx.mp3 : File name start from 001.mp3~064.mp3 is MP3 audio file user can assign in editor.

m3fn.txt : Content MP3 file's long file name.

plist.cfg : Content the alarm index play rules, alarm mode, relay output enable, repeat count.

rtu.cfg : Content the Modbus RTU & RS-485 setting e.g. "1,115200,N,8,1",

The first "1" is for Modbus RTU Device ID.

"115200,N,8,1" is for RS-485,

Baud Rate: 115200

Parity: None

Data bit always be 8

Stop bit: 1

vol.cfg : Content the volume setting e.g. "5", the volume level from $0(Mute) \sim 10(Max)$, this file will be delete after the device boot up & been read.



3.3 Alarm Mode Description

Mode 0: Channel Trigger-General Playback

- DI1 to DI4 playback in single independence trigger of 4 channels.
- A pulse input triggered the Playback. Playback repeat when the input is not release.
- When alarm in playback process, any input trigger will ignore.
- The highest DIx channel priority input will take place after the previous playback complete.

DI1			1									
DI2		Л										
DI3												
DI4												
MP3 Playback	02	02	01	04	03	04	03	01	02	04	04	01

Figure 3-8: ALM-04-MRTU Mode 0

Mode 1: Channel Trigger-Trigger Input priority Playback

- DI1 to DI4 playback in single independence trigger of 4 channels.
- When alarm in playback process, any trigger input will break & take place the previous playback.
- In this mode, it only playback once, even the input is not release.
- Only when multi trigger in same time the highest DIx channel priority will take place



Figure 3-9: ALM-04-MRTU Mode 1



Mode 2: Channel Trigger- Hold Repeat Playback

- DI1 to DI4 playback in single independence trigger of 4 channels.
- When alarm in playback process, only higher DIx channel priority can break & take place the previous playback.
- Playback will repeat when input are not release & will stop immediately when input released.
- When multi trigger in same time the highest DIx channel priority will take place

DI1		
DI2		
DI3		
DI4		
MP3 Playback	02 02 01 03 01 04 04 04 03 03 02 02 01 02 03	

Figure 3-10: ALM-04-MRTU Mode 2

Mode 3: Channel Trigger- Memory Once Playback

- DI1 to DI4 playback in single independence trigger of 4 channels.
- When alarm in playback process, any trigger input will memory once for next playback.
- In this mode, it only playback once, even the input is not release.
- When multi trigger in same time the highest DIx channel priority will take place



Figure 3-11: ALM-04-MRTU Mode 3

Mode 4: Binary Trigger-General Playback

- DI1 to DI4 are used as binary input, max 15 channels.
- A pulse input triggered the Playback. Playback repeat when the input is not release.
- When alarm in playback process, any input trigger will ignore.
- The highest binary channel priority input will take place after the previous playback complete, DI4 is the most highest channel.

DI1										_			
DI2	_	<u>Π</u>	Γ										
DI3	_										Γ		
DI4	_												
MP3 Playback	_	02	03	01	08	15	15	07	01	08	09	13	01

Figure 3-12: ALM-04-MRTU Mode 4

Mode 5: Binary Trigger-Trigger Input priority Playback

- DI1 to DI4 are used as binary input, max 15 channels.
- When alarm in playback process, any trigger input will break & take place the previous playback.
- In this mode, it only playback once, even the input is not release.
- The priority depend on trigger input, only when multi trigger in same time the highest binary channel priority will take place, DI4 is the most highest channel.



Figure 3-13: ALM-04-MRTU Mode 5



Mode 6: Binary Trigger- Hold Repeat Playback

- DI1 to DI4 are used as binary input, max 15 channels.
- When alarm in playback process, only highest binary channel priority can break & take place the previous playback.
- Playback will repeat when input are not release & will stop immediately when input released.
- When multi trigger in same time the highest binary channel priority will take place, DI4 is the most highest channel.

DI1																			
DI2																			
DI3	_																		
DI4																			
MP3 Playback		02	02		01	05	01	09		15	15	07	07	05	05	01	05	08	
			Fig	ure	3-1-	4: /	٩L	M-()4-M]	RTU	JM	ode	6						

Mode 7: Binary Trigger- Memory Once Playback

- DI1 to DI4 are used as binary input, max 15 channels.
- When alarm in playback process, any trigger input will memory once for next playback.
- In this mode, it only playback once, even the input is not release.
- The highest binary channel priority input will take place after the previous playback complete, DI4 is the most highest channel.



Figure 3-15: ALM-04-MRTU Mode 7



4. Modbus RTU Protocol

The Modbus protocol is developed by Modicon Inc., originally developed for Modicon controllers. Detailed information can be found at <u>http://www.modicon.com/techpubs/toc7.html</u>. You can also visit <u>http://www.modbus.org</u> to find more valuable information. ALM-04-MRTU modules support the Modbus RTU protocol. The communication Baud Rates range from 300bps to 115200bps. The following Modbus functions are supported.

4.1 Function Code

Function Code	Descriptions
01 (0x01)	Read Coils
02 (0x02)	Read discrete Inputs
03 (0x03)	Read multiple Output registers
05 (0x05)	Write Single Coil
06 (0x06)	Write single Output register
	-

Table 4-1: Supports Function Codes of ALM-04-MRTU

If the function specified in the message is not supported, then the module responds as follows.

4.2 Error Response

Byte Index	Field Name	Byte count	Description
00	Address	1 Byte	1 to 247
01	Function code	1 Byte	Function code $+ 0x80$
02	Exception code	1 Byte	01

Table 4-2: Error response of ALM-04-MRTU

If a CRC mismatch occurs, the module will not respond.



4.3 Data Encoding

Modbus uses a "big-endian" representation for address and data items. This means that when a numerical quantity larger than single byte is transmitted, the most significant byte (MSB, also called the high-order byte) is send first. The following subtopics describe the different byte of encoding and show how the data is encoded as it is within the Modbus RTU packet.

4.3.1 Binary

A binary item is represented as a single bit within a data word. All binary is packed into 16-bits data words, which are accessed using function code 01 and 02. Therefore, a single register contains 16 bits of binary data, each having a specific meaning.

Value	1st	2nd
0xAA55	0xAA	0x55
(1010101001010101)	(10101010)	(01010101)

Table 4-3: A single register contains 16 bits of binary data

4.3.2 16-bits Word(INT16)

A 16-bits word item is transmitted with the most significant byte first. Function code 03 and 04 read 16-bits items at a time; therefore, each of these data items will fit within one register that is read.

Value	1st	2nd
0x1234	0x12	0x34

Table 4-4: A 16-bits word item



4.4 ALM-04-MRTU Address Mapping

00001 0	1	Digital Output	0=OFF, 1=ON	R

* Length must always be 1.

Table 4-5: FC01 Read Coil address (0xxxx)

Address	MB Addr	СН	Descriptions	Range(Byte)	Туре
10001~	0~3	1~4	Digital Input	0=OFF, 1=ON	R
10004					

Table 4-6: FC02 Read Discrete Inputs address (1xxxx)

Address	MB Addr	СН	Descriptions	Range(INT16)	Туре
40001	0	-	Volume Level	0~10	R

* Length must always be 1.

Table 4-7: FC03 Read multiple Output registers address (4xxxx)

Address	MB Addr	СН	Descriptions	Range(Byte)	Туре
00001	0	1	Relay Output	0x00=OFF, 0xFF=ON	W

* Length must always be 1.

Table 4-8: FC05 Write single Coil address (0xxxx)

Address	MB Addr	СН	Descriptions	Range(INT16)	Туре
40001	0	-	Volume Level	0~10	W
40002	1	-	Play Back Alarm Index	0: Stop Playback 1~15: Alarm Index	W

Table 4-9: FC06 Write single Output registers address (4xxxx)



D Technical Support

If you have problems about using the ALM-04-MRTU controller, please contact ICP DAS Product Support. Email: <u>service@icpdas.com</u>