ARMFLY

1.8-inch RS485 Digital Tube Display

Instruction Manual

Version: V2.3

Model	Brief Specification
LED-485-184-R	Red, 4-digit 1.8-inch digital tube, RS485 interface, Passive & Active display
LED-485-184-G	Green, 4-digit 1.8-inch digital tube, RS485 interface, Passive & Active display

Notes:

1. Active display means the display screen proactively sends query commands to read meter register values and display them. This is the most distinctive feature of this product.
2. Passive and active display modes can be configured via button or PC software.

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1 Product Overview

This product is designed and manufactured by Wuhan ARMFLY Electronics Co., Ltd. A host device (microcontroller, PLC, HMI touch screen) can send commands via the RS485 bus to control the display content. It supports the commonly used ASCII protocol and Modbus RTU protocol.

The display can also act as a Modbus master and send 03H/04H query commands, displaying the returned values from the meter.

The display can be used as a standalone counter with increment (+1), decrement (-1), and clear (0) functions.

Main application areas: production lines, industrial control equipment, automotive instruments, warehouse electronic labels, etc.

Product Features:

- RS485 communication; supports Modbus RTU protocol and simple ASCII protocol with automatic protocol detection.
- Can display integers, negative signs, decimal points, and various ASCII characters (A B C D E F P L, etc.). This is one of the most comprehensive ASCII-character-supporting digital tube displays on the market.
- Supports electronic label function; power-on display content is configurable. Widely used for warehouse location labels (e.g., 'A001', 'B002').
- Supports stroke brightness adjustment with 7 brightness levels.
- Supports baud rate modification (1200–115200 bps), covering commonly used baud rates.
- Supports parity mode modification (None / Odd / Even).
- Selectable power-on display content: show 0, show RS485 address, blank, or show specified content.
- Up to 128 digital tube displays can be connected on a single bus.
- Companion PC software provided for easy testing and parameter modification.
- Can act as a Modbus master and proactively send query commands to display meter values.
- Supports counter display function with +1, -1, and clear-to-zero operations.

Product Characteristics:

- Easy installation — only requires a square cutout in the panel; no mounting screws needed.
- Built-in switching power supply circuit with high conversion efficiency for long-term continuous operation.
- Wide input voltage range; can operate continuously at up to 36 V.
- Reverse polarity protection on the power input.
- High-quality, high-brightness digital tubes with uniform stroke width, high luminosity, and long lifespan.
- All chips are genuine original industrial-grade components; operating temperature range: -40 to +85 °C.
- Industrial-grade imported RS485 chip with ±15 kV ESD protection, TVS protection, over-voltage and current-limiting protection.
- High-quality lift-type terminal connectors for secure, non-slip wire clamping.

2 Product Specifications

Parameter	LED-485-184-R	LED-485-184-G
Display digits	4 digits	4 digits
Digit tube size	1.8 inch	
Stroke color	Red (standard)	
Enclosure dimensions	W 171.5 mm × H 93.6 mm × D 30 mm	
Panel cutout size	Actual: 162.8 × 84.1 mm Recommended cutout: W 163.5 mm × H 84.5 mm	
Connector	Model: KF2EDG3.81-10P (fully pluggable) Pins: VCC, GND, 485A, 485B, 232-RX, COM, INC, DEC, CLR, SET	
Power supply	DC 7–36 V; 24 V recommended Full display (8.8.8.8.): 280 mA@12V / 150 mA@24V Minimal display (1): 30 mA@12V / 18 mA@24V	
Serial parameters	Baud rate: [Default 9600] 1200/2400/4800/9600/19200/38400/57600/115200 Start bits: 1 | Stop bits: 1 | Data bits: 8 Parity: [Default None] None / Odd / Even	
Protocol	Simple ASCII text protocol (display cmd: no ACK; control cmd: ACK) Standard Modbus RTU protocol (every command has ACK)	

Pin Definitions:

- **VCC**: Power positive
- **GND**: Power negative
- **485A**: RS485 bus A (RS485 bus and GND terminal share common ground)
- **485B**: RS485 bus B
- **232-RX**: RS232 bus RX
- **COM**: Input common pin
- **INC**: Count increment (+1)
- **DEC**: Count decrement (-1)
- **CLR**: Count clear (0)
- **SET**: Reserved function

3 Wiring Diagrams

3.1 Counter Wiring Method

Two wiring methods are supported: direct switch connection or PLC output control. Both P-type (sourcing) and N-type (sinking) PLC outputs are supported.

Connect the COM terminal to the common reference point. Connect INC, DEC, and CLR terminals to the respective switch or PLC output contacts.

3.2 Passive Display Mode (Host Sends Display Content)

Register 0x0027 = 0

In this mode the display acts as an RS485 slave. The host (PC, PLC, or microcontroller) sends display commands over the RS485 bus and the screen shows the received content.

Up to 128 displays can be connected on a single bus. For more than 128 units, use a 485-HUB to expand to 255 devices.

Recommended wiring:

- Use twisted-pair cable for the RS485 bus.
- For long cable runs, connect 120 Ω impedance-matching resistors at both ends of the bus.
- Recommended power supply: 24 V DC switching power supply.
- Estimate power at 1.2 W per display. Keep load below 85 % of rated capacity (e.g., a 50 W supply supports ~30 displays; a 100 W supply ~70 displays).
- If the cable run is very long, consider reducing the baud rate or distributing power with multiple supplies.

3.3 Acting as Host — Reading and Displaying Meter Data

Register 0x0027 = 1

Example: A current meter has RS485 address 2, current register at address 7, 1 decimal place, 16-bit integer format. The display sends a 03H query to register 0x0007 every 250 ms and shows the returned value.

Register	Value	Description
0x0027	1	Set to instrument mode — read data using 03H command
0x0028	250	Scan interval in ms (adjustable)
0x0029	2	RS485 address of the monitored meter
0x002A	7	Register address of the monitored meter
0x002B	0	Data type of the monitored meter register
0x002C	1	Number of decimal places to display
0x002D	1	Number of meters
0x002E	= 0x0201	High byte: meter RS485 address; Low byte: number of registers
0x002F	= 0x0007	Starting register address of the meter

PC Software notes: Before configuring parameters, switch to page 1 and open the serial port. After changing any parameter, click the *Modify* button. Parameters in the right panel (master role) require clicking *Write*.

3.4 Monitoring Communication Data Between PLC and Meter

Register 0x0027 = 1 | Register 0x0028 = 0 (listen mode)

In this mode the display passively listens to traffic on the RS485 bus between a PLC and a meter, then displays the relevant register value. The scan period register (0x0028) must be set to 0 to activate listen mode.

Register	Value	Description
0x0027	1	Set to instrument mode — 03H command
0x0028	0	Scan interval = 0 → display is in listen (monitoring) mode
0x0029	2	RS485 address of the monitored meter
0x002A	7	Register address of the monitored meter
0x002B	0	Data type of the monitored meter register
0x002C	1	Number of decimal places in instrument mode

3.5 Multi-Meter Multi-Display Engineering Example

Application scenario: A test fixture has 3 meters measuring voltage, current, and power. The built-in meter displays are too small and can only show one value at a time. This solution simultaneously displays 9 measured values on 4-digit 1.8-inch screens.

Network topology:

- One RS485 bus connects 3 meters and 9 display screens.
- The 3 meters are assigned RS485 addresses 1, 2, and 3.
- Each meter provides 3 measured values (registers 0–5: current, voltage, power).
- One display acts as the Modbus master and cyclically sends 03H query commands. The other 8 displays operate in listen mode and each shows the value it is configured to monitor.

Master display configuration:

1. Select instrument mode, query 03H command.
2. Scan period must be > 0. A value of 250 means: after scanning all 3 meters, pause 250 ms then repeat.
3. Set monitored meter address, register address, data type, and decimal places per installation position.
4. In the 'Act as Master' parameter block: set meter count to 3; configure meters 1–3 (register count = 6 because each 32-bit parameter occupies 2 registers).

Listener display configuration:

1. Select instrument mode, query 03H command.
2. Scan period must be set to 0.
3. Set monitored meter address, register address, data type, and decimal places as needed. Example: to display meter 1's voltage (32-bit register at 0x0002), monitor register 3 (not 2) for the low 16-bit word; set decimal places to 1 (unit = 0.1 V).
4. The 'Act as Master' parameter block is irrelevant for listener displays.

4 Communication Protocol (ASCII)

Command	Function
Display Commands (no acknowledgement from display)	
$001,1234#	Display 1234. '001' is the screen address.
$001,8.8.8.8.#	Display all 8s with all decimal points lit.
$001,12.34#	Display 12.34
$001,#	Blank display (show nothing)
$001,002@	Change screen address from 1 to 2 (non-volatile).
$001,5%	
Control Commands (display returns acknowledgement)	
$001,01&	RS485 response test. Display returns: 'OK' | Display shows: ---
$001,02&	Query display model. Returns: 'LED-485-184' | Shows: '184'
$001,03&	Query firmware version. Returns/shows: 'u1.0', 'u1.3', etc.
$001,04&	Query brightness parameter. Returns: 'B-0'–'B-7' | Shows: 'b-5', etc.
$001,05&	Query power-on display mode. Returns: 'D-0'–'D-3' | Shows: 'd-0', etc.

5 Communication Protocol (Modbus RTU)

Frame format:

RS485 Address	Function CodeData	CRC Che
1 Byte (1–255; 0=broadcast)	1 Byte	N Bytes (format per function code)	2 Bytes (Modbus CRC)

Function Code 06H — Write Single Register

Display decimal integer

```
PLC sends: 01 06 00 88 04 57 4A DE
```

Byte(s)	Meaning
01	Station number (RS485 address)
06	Function code
00 88	Display register (integer) — also supports 00 26
01 44	Display data (signed 16-bit, big-endian). 0x0144 = decimal 324. Negatives use two's complement: FF FF = -1, FF FE = -2
4A DE	2-byte CRC

Display returns: 05 06 00 88 04 57 4A DE Note: Use together with the 'Set decimal places' command below. Default is no decimal point.

Set decimal places

```
PLC sends: 01 06 00 25 00 01 59 C1
```

Byte(s)	Meaning
01	Station number
06	Function code
00 25	Decimal point register
00 01	Number of decimal places (1 = one digit after decimal, e.g., 32.4). 00 00 = no decimal point
59 C1	2-byte CRC

Display returns: 01 06 00 25 00 01 59 C1 Note: Send once after power-on. This setting is lost on power-off.

Set power-on display mode

```
PLC sends: 01 06 00 21 00 00 D9 C0
```

Byte(s)	Meaning
01	Station number
06	Function code
00 21	Power-on display mode register
Value	00 00 = Show 0 | 00 01 = Blank | 00 02 = Show RS485 address | 00 03 = Show saved content (reg 0x0050–0x0055)
D9 C0	2-byte CRC

This parameter is permanently saved and survives power-off.

Modify baud rate

```
PLC sends: 01 06 00 22 00 03 69 C1
```

Byte(s)	Meaning
01	Station number

06	Function code
00 22	Baud rate register
Code	00 00=1200 | 00 01=2400 | 00 02=4800 | 00 03=9600 (default) | 00 04=11920 | 00 05=38400 | 00 06=57600 | 00 07=115200
69 C1	2-byte CRC

Permanently saved.

Modify RS485 address

```
PLC sends: 01 06 00 23 00 10 31 11
```

Byte(s)	Meaning
01	Current station number
06	Function code
00 23	RS485 address register
00 10	New address (0x0001–0x00FF)
31 11	2-byte CRC

Permanently saved.

Adjust brightness

```
PLC sends: 01 06 00 24 00 05 09 C2
```

Byte(s)	Meaning
01	Station number
06	Function code
00 24	Brightness register
00 05	Brightness value (0x0000–0x0007); 0=dimmest, 7=brightest
09 C2	2-byte CRC

Permanently saved.

Function Code 10H — Write Multiple Registers

Display decimal number (with sign and decimal point)

```
PLC sends: 01 10 00 90 00 02 04 00 02 01 EA DB 1C
```

Byte(s)	Meaning
01	Station number
10	Function code (write multiple registers)
00 90	Display register (signed decimal with decimal point)
00 02	Number of registers
04	Number of data bytes
00 02	Register 1: High byte = sign (00=positive, 01=negative, shows '-') Low byte = decimal places (0=none, 2=two decimal places)
01 EA	Register 2: integer value (big-endian). 0x01EA = 490
DB 1C	2-byte CRC

This command displays '4.90' Return: 01 10 00 90 00 02 41 E5 Example 1: ...04 01 01 00 0A... → shows '-1.0' Example 2: ...04 00 01 00 02... → shows ' 0.2'

Display ASCII string

```
PLC sends: 01 10 00 70 00 06 0C 50 32 2E 33 00 00 00 00 00 00 00 3B 25
```

Byte(s)	Meaning
01	Station number
10	Function code
00 70	ASCII display register
00 06	Number of registers
0C	Number of data bytes (12 fixed)
50 32 2E 33 00...	ASCII string, fixed 12-byte length. Pad right with 0x00. This example = 'P2.3'
3B 25	2-byte CRC

Displays 'P2.3' | Return: 01 10 00 70 00 06 41 D0 Example: ...0C 2D 2D 2D 00... → shows '---' (0x2D = '-') Example: ...0C 38 2E 38 2E 38 2E 00... → shows '8.8.8.'

Set power-on display content

```
PLC sends: 01 10 00 50 00 06 0C 50 32 2E 33 00 00 00 00 00 00 00 22 FD
```

Byte(s)	Meaning
00 50	Power-on display content register (0x0050–0x0055)
0C bytes	Fixed 12-byte ASCII string padded with 0x00

Return: 01 10 00 50 00 06 40 1A

6 Modbus Register List

Note: The RS485 digital tube product only supports function codes 06H and 10H. All other function codes are not supported.

Function Code 06H — Modify Single Parameter

Register	Description
0x0020	Serial parity: 0=None, 1=Odd, 2=Even (Permanently saved)
0x0021	Power-on display mode: 0x0000=Show 0 | 0x0001=Blank | 0x0002=Show RS485 address 0x0003=Show saved content in registers 0x0050–0x0055 (ASCII) (Permanently saved)
0x0022	Baud rate code: 0=1200, 1=2400, 2=4800, 3=9600(default), 4=11920, 5=38400, 6=57600, 7=115200 (Permanently saved)
0x0023	RS485 address 1–255 (0 is broadcast address, do not use) (Permanently saved)
0x0024	Brightness: 0x0000–0x0007 (0=dimmest, 7=brightest) (Permanently saved)
0x0025	Decimal point count: 1=1 digit after point (e.g., 32.4), default=0 (Lost on power-off; send once after each power-on)
0x0026 / 0x0088	Write-only register, signed integer. Can display negatives (FFFF=-1) Must be used together with the decimal point register (0x0025)
0x0027	Working mode: 0 = Normal (passive display) 1 = Instrument mode 1 — process 03H function code 2 = Instrument mode 2 — process 04H function code When 0x0028 = 0: listen mode — receives and displays responses without sending When 0x0028 > 0: master mode — actively sends 03H/04H queries and displays results Query count and order determined by 0x002D and 0x002E–0x003D (up to 8 meters)
0x0028	Scan period (instrument mode only), unit = ms, default = 250 0 = listen mode (monitor PLC–meter traffic) >0 = actively query meters at this interval
0x0029	RS485 address of the monitored meter (1–254)
0x002A	Register address of the monitored meter (0–65535)
0x002B	Data type of the monitored register: 0=16-bit unsigned int (2 bytes) 1=32-bit unsigned int (4 bytes) 2=16-bit signed int (2 bytes) 3=32-bit signed int (4 bytes) 4=IEEE 754 float (4 bytes) 5=Packed BCD (2 bytes) 6=Packed BCD (4 bytes)
0x002C	Decimal places in instrument mode 0=none, 1=1 digit, 2=2 digits Set to 0 when data type is float (0x002B=4) since float carries its own decimal info
0x002D	Number of meters in instrument mode (1–8) Only used when 0x0028 > 0

0x002E–0x002F	Meter 1 config: Reg 0x002E high byte=meter address, low byte=register count; Reg 0x002F=starting register addres
0x0030–0x0031	Meter 2 configuration parameters
0x0032–0x0033	Meter 3 configuration parameters
0x0034–0x0035	Meter 4 configuration parameters
0x0036–0x0037	Meter 5 configuration parameters
0x0038–0x0039	Meter 6 configuration parameters
0x003A–0x003B	Meter 7 configuration parameters
0x003C–0x003D	Meter 8 configuration parameters

Function Code 10H — Write Multiple Registers

Register	Description
0x0050–0x0055	Power-on display content. Write 6 registers via 10H. Fixed 12-byte ASCII string padded with 0x00 on the right.
0x0070–0x0075	Display ASCII string. Write 6 registers via 10H. Fixed 12-byte ASCII string padded with 0x00 on the right.
0x0090–0x0091	Display decimal (with sign and decimal point). Write 2 registers via 10H. Reg 0x0090: high byte = sign (0=positive, 1=negative), low byte = decimal places Reg 0x0091: integer value (big-endian, 16-bit)

7 PC Test Software

ARMFLY provides a dedicated PC software tool to conveniently configure all parameters of the RS485 digital tube display. The configuration file 'app.ini' stores the serial port settings so they are restored automatically on the next launch.

Software files:

- 1.8-inch Digital Tube Configuration Software.exe
- app.ini (parameter configuration file)

Usage:

- On first run, click **Set Serial Port** to select the COM port and baud rate. The display default baud rate is 9600 bps.
- The **Search** button automatically scans addresses 1–255; any responding device is shown in the status bar.
- The TX and RX buffers display raw communication data in hexadecimal format.
- On the parameter settings page you can modify: baud rate, RS485 address, power-on display mode, and power-on display content.
- To configure instrument/master mode parameters, switch to the **Instrument Mode** tab:

– Set Mode, Scan Period, Meter Address, Register Address, Data Type, Decimal Places, then click **Modify**.

– Set the 'Act as Master' parameters (meter count and per-meter address/register/count), then click **Write**.

- When scan period = 0: the display is in listen mode (monitors existing PLC–meter traffic).
- When scan period > 0: the display acts as master and actively polls meters.
- **Only one display per RS485 network may act as master.**

8 ASCII Code and HEX Reference Table

Computers represent information in binary. ASCII (American Standard Code for Information Interchange) provides a unified code for human-readable text exchange between humans, devices, and computers.

In computers, ASCII strings are generally terminated with 0x00. In C, 0x12 represents a hexadecimal value. A single character is enclosed in single quotes (e.g., '1'); multiple characters form a string enclosed in double quotes (e.g., "123").

Values 0x00–0x1F are non-printable control characters. 0x20 is a space. Values 0x20–0x7E are printable ASCII characters.

Hex	Dec	Char	Hex	Dec	Char
00H	0	N/P	40H	64	@
01H	1	N/P	41H	65	A
02H	2	N/P	42H	66	B
03H	3	N/P	43H	67	C
04H	4	N/P	44H	68	D
05H	5	N/P	45H	69	E
06H	6	N/P	46H	70	F
07H	7	N/P	47H	71	G
08H	8	N/P	48H	72	H
09H	9	N/P	49H	73	I
0AH	10	N/P	4AH	74	J
0BH	11	N/P	4BH	75	K
0CH	12	N/P	4CH	76	L
0DH	13	N/P	4DH	77	M
0EH	14	N/P	4EH	78	N
0FH	15	N/P	4FH	79	O
10H	16	N/P	50H	80	P
11H	17	N/P	51H	81	Q
12H	18	N/P	52H	82	R
13H	19	N/P	53H	83	S
14H	20	N/P	54H	84	T
15H	21	N/P	55H	85	U
16H	22	N/P	56H	86	V
17H	23	N/P	57H	87	W
18H	24	N/P	58H	88	X
19H	25	N/P	59H	89	Y
1AH	26	N/P	5AH	90	Z
1BH	27	N/P	5BH	91	[
1CH	28	N/P	5CH	92	\
1DH	29	N/P	5DH	93	]

Hex	Dec	Char	Hex	Dec	Char
1EH	30	N/P	5EH	94	^
1FH	31	N/P	5FH	95	_
20H	32	SPC	60H	96	`
21H	33	!	61H	97	a
22H	34	"	62H	98	b
23H	35	#	63H	99	c
24H	36	$	64H	100	d
25H	37	%	65H	101	e
26H	38	&	66H	102	f
27H	39	'	67H	103	g
28H	40	(	68H	104	h
29H	41	)	69H	105	i
2AH	42	*	6AH	106	j
2BH	43	+	6BH	107	k
2CH	44	,	6CH	108	l
2DH	45	-	6DH	109	m
2EH	46	.	6EH	110	n
2FH	47	/	6FH	111	o
30H	48	0	70H	112	p
31H	49	1	71H	113	q
32H	50	2	72H	114	r
33H	51	3	73H	115	s
34H	52	4	74H	116	t
35H	53	5	75H	117	u
36H	54	6	76H	118	v
37H	55	7	77H	119	w
38H	56	8	78H	120	x
39H	57	9	79H	121	y
3AH	58	:	7AH	122	z
3BH	59	;	7BH	123	{
3CH	60	<	7CH	124	|
3DH	61	=	7DH	125	}
3EH	62	>	7EH	126	~
3FH	63	?	7FH	127	N/P

9 Manual Parameter Configuration via Buttons

There are two buttons, S1 and S2, on the back of the display.

- **Short press S1**: the display cycles through the firmware version and common parameters.
- **Long press S2**: the display enters the parameter settings menu. Automatically exits after 3 seconds of inactivity.

Operating procedure:

1. Power on the display module.
2. Hold S2 until the display shows '1.Add', then release. You are now in the parameter settings menu.
3. Short-press S2 to cycle through menu items. Short-press S1 to enter the highlighted setting.
4. Inside a setting: press S1 to decrease the value, S2 to increase. Hold for fast change.
5. After 5 seconds the setting is automatically saved and you return to the menu.
6. In the main menu, wait 5 seconds to return to normal operating mode.

Menu items:

Display	Description
1.Add (addr)	Set RS485 address (register 0x0023)
2.bAU (baud)	Set RS485 baud rate (register 0x0022)
3.diN (display)	Set power-on display state (register 0x0021)
4.Nod (mode)	Set working mode (register 0x0027)
5.Per (period)	Set instrument scan period (register 0x0028)
6.-Ad (addr)	Set meter RS485 address (register 0x0029)
7.rEG (register)	Set meter data register address (register 0x002A)
8.tYP (type)	Set meter register data type (register 0x002B)
9.dot (dot)	Set decimal places for meter data (register 0x002C)
0.Par (parity)	Set serial parity bit (register 0x0020)

Important: When the display is acting as a Modbus master, all master-role parameters must be configured using the PC software — they cannot be set via the buttons.

10 Document Revision History

Version	Change Notes	Author	Date
1.0	Initial release (firmware V1.3)	Wei Chao	2014-07-03
1.4	Firmware V1.4: (1) Corrected 10H protocol to standard Modbus (2) Added examples (3) Added ASCII/HEX table	Zhang Hanguang	2014-07-10
1.5	Added LED-485-043 and LED-485-034 models	Liu Wenjie	2014-07-31
2.0	Firmware V2.0 — Major update: 1. Added baud rate modification 2. Revised menu structure 3. Auto-detect ASCII/Modbus protocol 4. New power-on display modes, added electronic label function 5. Added power-on display registers 6. Added broadcast address 0 7. Added PC software 8. Added wiring diagrams	Dong Ao Zhang Hanguang	2015-09-29
2.1	Added 4-digit 1.8-inch digital tube description	Zhang Hanguang	2016-07-27
2.2	Added multi-meter multi-parameter mode; active polling of multiple meters. Firmware version V3.2.	Zhang Hanguang	2016-10-11
2.3	Corrected installation dimension data. Added counter function description.	Zhang Hanguang	2016-11-20