Manual

ARC1 – USB Interface Access 2.0

P/N A1-2-USB-00

AFT microwave GmbH
Donaustr. 18
D-71522 Backnang – Waldrems
Germany
Phone: + 49 – (0)7191 / 9659 – 0
Fax : + 49 – (0)7191 / 9659 – 200

www.aft-microwave.com
info@aft-microwave.com

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1. Introduction

ARC1 - Single/ Dual Channel Arc Detector 2.0 is a standalone device that can be successfully operated with standard preset parameters. However, in order to take full advantage of all of its customization features, a serial terminal connection to a PC computer is required. Using a serial connection set up by any terminal/telnet client software of your choice, you will be able to:

- Read parameters
- Adjust light sensitivity by changing detector threshold voltage
- Adjust auto-reset time
- Choose between OR-Logic (default) and AND-Logic (coincidental arc detection) for the global arc output signal GLBARC, applicable for the dual channel version A1-2-DC-00 only.

The table below summarizes default factory settings of all adjustable parameters of the device.

Table 1.1: Default factory settings

Parameter	Default Setting
Signal Polarity	Inverted, for all digital outputs
Auto Reset	OFF
Auto Reset Time	1000 ms, if auto reset is activated
Sensitivity Threshold	20 mV
*Arc-Signal**	Open Collector, for ARC Out (BNC) and GLBARC
*GLBARC Logic**	OR

* ARC1 2.0 Dual Channel only!

This manual guides you step by step on how to set up your PC to properly connect to your ARC1 2.0 via USB. It also gives you a full list of available terminal commands and the syntax.

Scope of Supply:

AFT USB flash drive with password and manual.
1x USB cable type A to type B connector.

Software Downloads:

The following table shows appropriate terminal/telnet client software options (Windows) with links for free download; status *February 2019*:

Table 1.2: Terminal client software options

Name	Source, link	Note
HTerm	http://www.der-hammer.info/terminal/	Free
PuTTY	https://www.putty.org/	Free
HyperTerminal	https://www.hilgraeve.com/hyperterminal-trial/	License required (free trial available)

2. Connecting via USB (Windows)

The ARC1 2.0 device communicates with a PC using a serial connection. Certain interface parameters has to be set, in order to establish a serial connection via the USB port. The following steps present the procedure to follow under windows. *HTerm* for windows has been chosen by AFT for demonstration purpose.

1) Unbox the ARC1 device. Don't plug it into the mains just yet.
2) Use the ARC1's USB-port to connect to a PC using a USB Type A to B cable.
3) Turn on power by plugging in the mains cable and wait for the device to boot – "READY" LED should turn green.
4) Wait about 30 seconds until Windows recognizes the device. In the Device Manager it should be listed as "USB Serial Port (COMxx)"
5) Install and run the client software of your choice. *HTerm* for Windows is chosen by AFT for demonstration purpose.
6) Choose the appropriate COM-Port and set the connection parameters listed in **Tab. 2.1** (independent of software used). In *HTerm* you will find it in the drop-down list of the main window, see **Fig 2.1**.

Table 2.1: Connection Parameters

Connection Parameter	Value
Baud rate	38400
Data bits	8
Stop bits	1
Parity	None
Flow control	Hardware
New line at	CR+LF
Show new line characters	no / unchecked
Send on "ENTER"	CR+LF

7) Click "Connect" in the upper left corner. Your "Received Data" window should be blank. (Fig. 2.1)
8) To unlock access, type the following command in the command line of the "Input Control" window (lower left in Fig. 2.1) and press Enter.

```
password=123abc
```

The string "123abc" should be substituted by your individual password that can be found on the AFT USB flash drive in a text file named ***password_SN123456.txt.***

9) Once you have unlocked access, you can use commands listed in section 3.

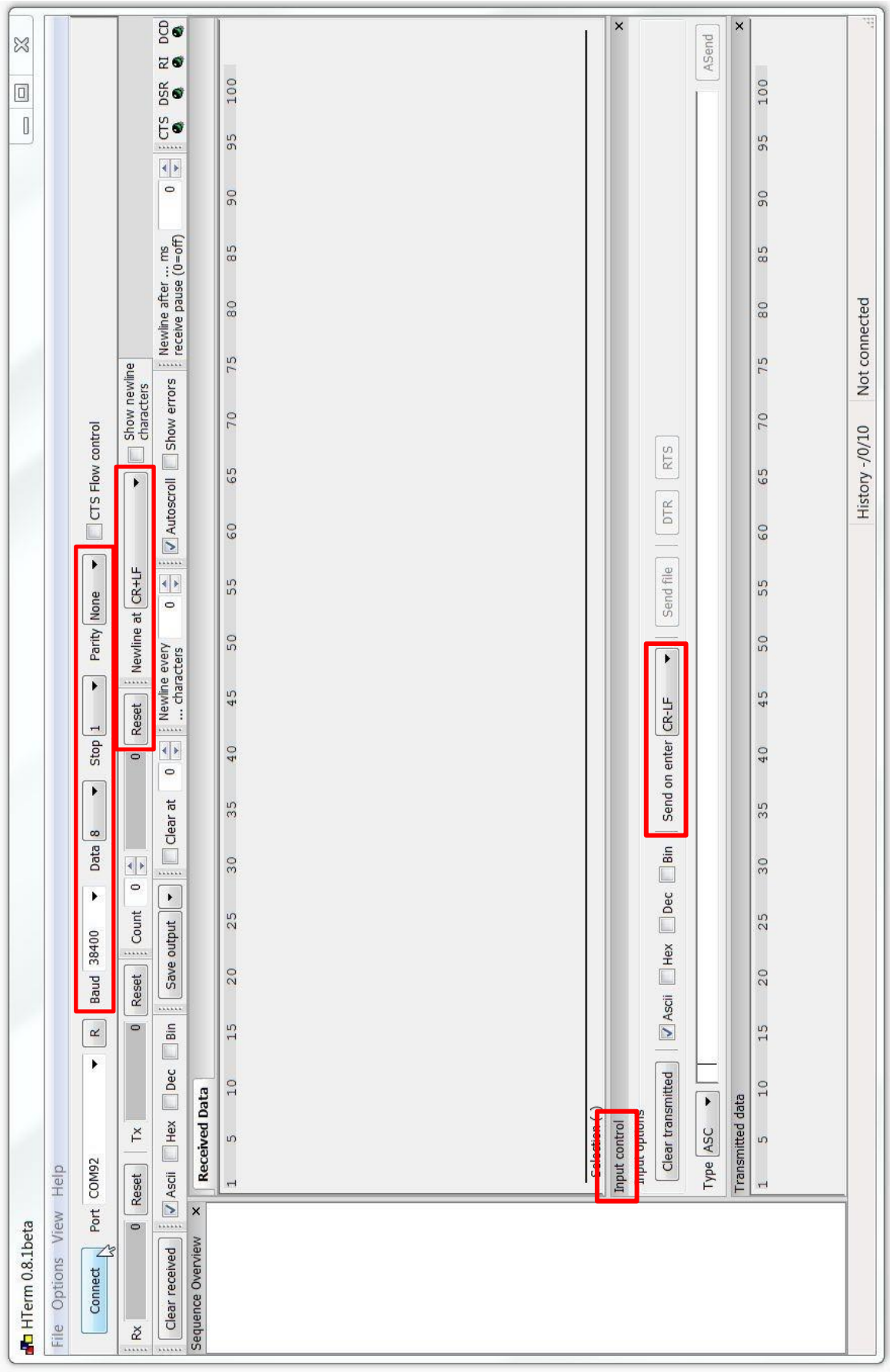

Fig. 2.1 Connection parameters for *HTerm* (Windows)

3. List of Commands

Presented below is a list of available terminal commands for reading and writing the device's parameters. Please note, that given the correct settings of terminal/telnet client software, the string <CR><LF> should be equal to "Enter" key input.

Table 3.1.: General syntax

Syntax	Description
<QUERY><CR><LF>	:command string
<ANSWER><CR><LF>	:answer to parameter read
<ok><CR><LF>	:confirmation of every successful command
<?><CR><LF>	:command unknown
<locked?><CR><LF>	:access locked

Table 3.2.: Basic Commands

Syntax	Description
VERSION<CR><LF>	Show software version
SERIALID<CR><LF>	Show device's SN
PASSWORD<CR><LF>	Show password
RESET<CR><LF>	Device reset
PARLIST<CR><LF>	Show parameter list
SAVE SET1<CR><LF>	Save data set 1-9
LOAD SET1<CR><LF>	Load data set 1-9
LOGOUT<CR><LF>	Log out

Table 3.3.: Read Parameters

Syntax	Description
NAME<CR><LF>	Show device identifier
THRESHOLD1<CR><LF>	Show CH1 sensitivity threshold [mV]
THRESHOLD2<CR><LF>	Show CH2 sensitivity threshold [mV]
LANGUAGE<CR><LF>	Show current language [D/E]
ARESET<CR><LF>	Show auto reset status [ON/OFF]
ARTIME<CR><LF>	Show auto reset time [msec]
POLARITY<CR><LF>	Show polarity for CH1 and CH2 [NORMAL/INVERTED]
GLOGIC<CR><LF>	Show logic for GLBARC [OR/AND]
GPOLARITY<CR><LF>	Show polarity for GLBARC [NORMAL/INVERTED]
GOUTPUT<CR><LF>	Show signal type for GLBARC (BNC) [OC/TTL]
CHANNEL<CR><LF>	Show whether device has 1 or 2 channels.  This parameter should NOT be changed by the USER!

Table 3.4.: Set Parameters

Syntax	Description	Value	Unit
NAME=[Value]<<CR><LF>	Change device identifier	max. 32 ASCII characters	
LANGUAGE=[Value]<<CR><LF>	Change language [D/E]	D = German E = English	
THRESHOLD1=[Value]<CR><LF>	Set CH1 sensitivity threshold voltage in steps of 1mV	5 - 500 *	mV
THRESHOLD2=[Value]<<CR><LF>	Set CH2 sensitivity threshold voltage in steps of 1mV (dual channel only)	5 - 500 *	mV
THRESHOLD=[Value]<<CR><LF>	Set CH1 and CH2 sensitivity threshold voltages simultaneously (dual channel only)	5 - 500 *	mV
ARESET=[Value]<<CR><LF>	Switch auto reset on/off	ON / OFF	
ARTIME=[Value]<<CR><LF>	Set auto reset time in steps of 0.1ms	0.1 – 3000	ms
POLARITY=[Value]<<CR><LF>	Change polarity for CH1 and CH2	NORMAL / INVERTED	
GPOLARITY=[Value]<<CR><LF>	Change polarity for GLBARC [NORMAL/INVERTED]	NORMAL / INVERTED	
GOUTPUT=[Value]<<CR><LF>	Change Arc-Signal type for ARC Out (BNC) and GLBARC	OC / TTL	
GLOGIC=[Value]<<CR><LF>	Change logic for ARC Out (BNC) and GLBARC (dual channel only)	OR / AND	

Note

*** Threshold values below 20mV (default) increase the optical sensitivity but may also increase sensitivity to EM noise and the risk for spurious trips. Therefore threshold values < 20mV are not recommended for reliable use of ARC1 2.0.**

Examples:

THRESHOLD1=50 - set threshold voltage for CH1 to 50 mV
THRESHOLD2=50 - set threshold voltage for CH2 to 50 mV (dual channel only)
THRESHOLD=100 - set threshold voltage for CH1 & CH2 to 100 mV (dual channel only)
ARESET=ON - turn auto reset ON
ARTIME=0.1 - set auto reset time to 0.1 ms

4. Basics of Combinational Logic

The ARC1 - Dual Channel Arc Detector 2.0 (A1-2-DC-00) is equipped with two independent input channels, as well as two digital arc output channels CH1 and CH2. The outputs can be read individually or as a logical combination of CH1 and CH2 at the GLBARC output.

4.1 OR Logic

The GLBARC logic is an OR function of channels CH1 and CH2.

GLBARC = (CH1) **OR** (CH2)

This is the default factory setting of ARC1 2.0. The most common practical use of the OR logic is (1) monitoring two different high-power components, e.g. circulator and load, or (2) improving the coverage of a single component, where both arc viewports oversee different and independent areas.

4.2 AND Logic

Using USB Interface Access you will be able to set an alternative AND logic of the GLBARC output.

GLBARC = (CH1) **AND** (CH2)

It is specifically used for "**coincidental arc detection"** and requires two adjacent viewports with overlapping fields of view, focused on the same event. This method finds application where high EM noise or gamma or X-ray radiation in vicinity of the detector is present, potentially leading to a statistical spurious trip of one of the channels. Experience has shown that it is very unlikely that both detectors give random false tripping at the same time.

Note

While using AND logic for coincidental arc detection, ensure that:

1) **Both viewports oversee the same area.**
2) **AUTO-RESET is ON and**
3) **Set the auto-reset time T_R to the minimum of 0.1ms.**

4.3 Signal Diagrams

The principle of the global output signal logic is shown in the below signal diagrams. **Fig. 4.3.1** depicts OR and AND logic with manual reset for a TTL signal in normal polarity. **Fig. 4.3.2** illustrates the OR and AND logic with auto-reset ON (auto-reset time T_R).

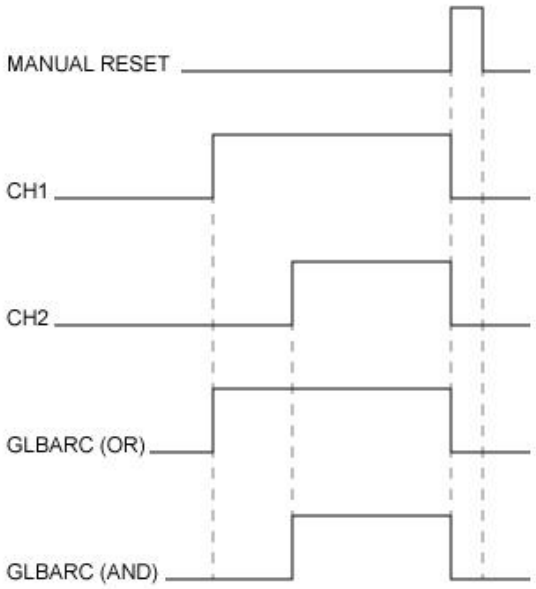

Fig. 4.3.1 Signal diagram for GLBARC OR and AND logic with auto-reset = OFF, polarity = normal (TTL).

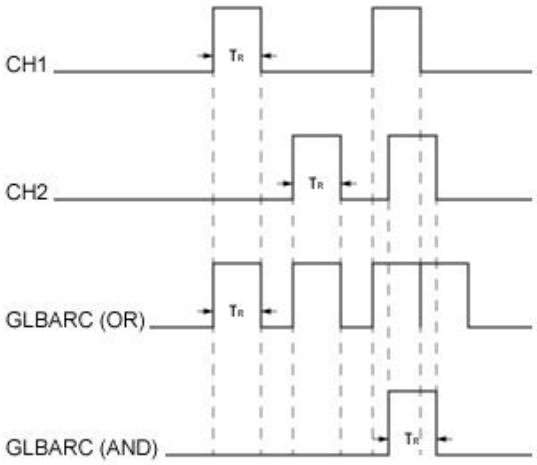

Fig. 4.3.2 Signal diagram for GLBARC OR and AND logic with auto-reset = ON, polarity = normal (TTL).

Revision History:

Revision	Date	Description
1.0	16.10.2018	initial
1.1	16.01.2019	recommended sensitivity threshold values
1.2	25.03.2019	terminal connection parameters, programming examples, default factory settings, text formatting
1.3	07.03.2022	Formal changes