AN205108

F²MC-16LX Family, Flash Programmer Yokogawa AF220/221

This application note describes the set up and using of the third party Flash-Programmer “Yokogawa AF220/AF221”.

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1 Introduction

This application note describes the set up and using of the third party Flash-Programmer “Yokogawa AF220/AF221”.

The programmer allows in-circuit programming of Cypress microcontrollers using the serial-synchronous interface.

The Yokogawa AF220/AF221 can be adapted to different target controller types by changing the control-module (PC-card). With the FF201 module near all Cypress microcontrollers of the 16LX-series can be programmed. The FF205 module supports the MB91F150-family (32-Bit), the FF206 module has to be used together with MB91F360-family (32-Bit).

It can be used as stand-alone system as well as a PC-controlled programmer using the RS-232C or the Ethernet interface.

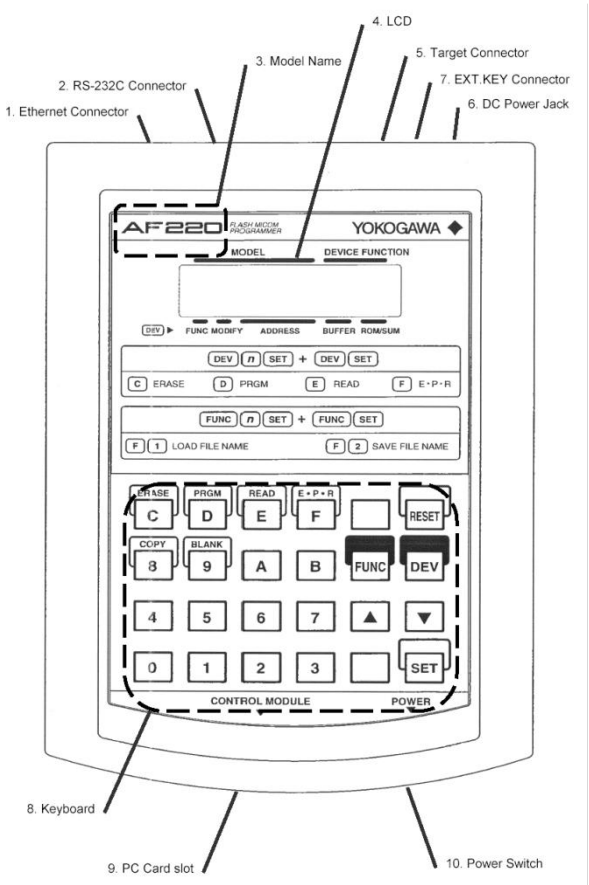
The optional software package AZ290 allows to program remotely control application software created at customers' sites.

User information and system settings can be stored on the PC-card.

1.1 Programmer overview

Figure 1 shows the YOKOGAWA Flash-Programmer AF220 and its most important operating elements.

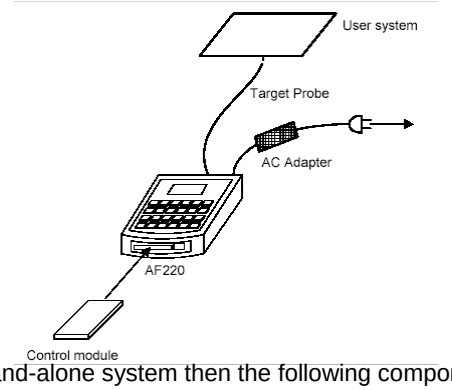
Figure 1. Aspect of the AF220 Flash-Programmer



1.2 System overview

A typical system environment is depicted in the Figure 2 to 4 . Depending on the operation mode, the programmer can be used as stand-alone programmer or it can be connected to a PC via RS-232C or Ethernet interface.

Figure 2. Stand-alone Programmer



When using the programmer as stand-alone system then the following components have to be ordered separately:

- Flash Programmer AF220/221
- Control Module FF201 for Cypress 16LX-series
- Interface cable AZ210 or AZ211 or AZ212 (see chapter “Target Probe” below)

In case that the programmer wants to be controlled by a PC then additionally the

- Remote Controller Software Package AZ290 (can be download from homepage) and
- RS-232C cable AZ221/AZ222 or twisted Pair Ethernet cable

have to be ordered, too

Figure 3. PC connection via RS-232C

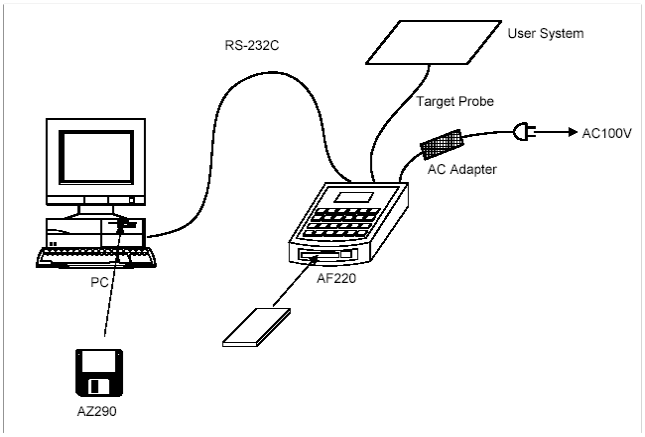
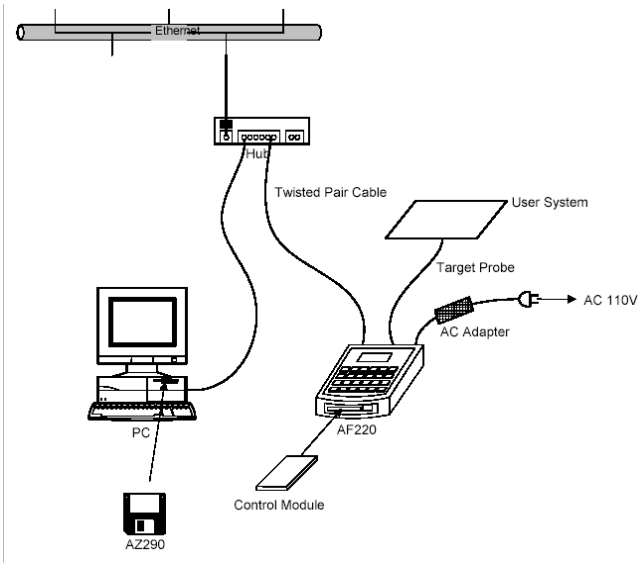


Figure 4. PC connection via Ethernet



If an own software front-end wants to be development then the library-package AZ291 has to be ordered additionally.

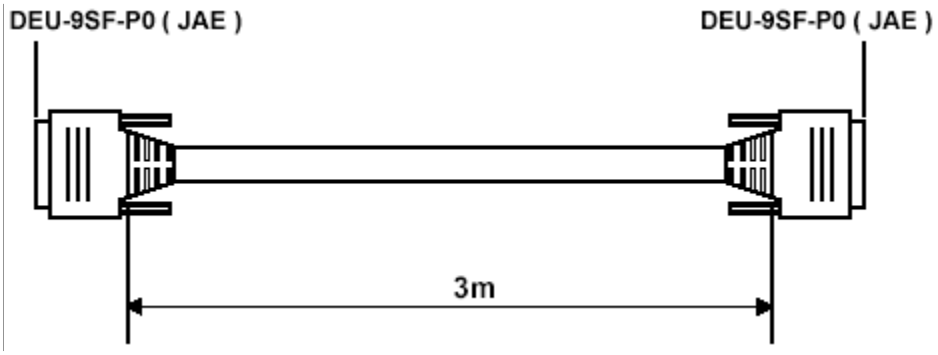
1.3 Serial Interface Cable

Two serial interface cables are available.

1.3.1 AZ221

If the COM-port of the host PC uses a 9-pin D-Sub connector then interface cable AZ221 has to be used.

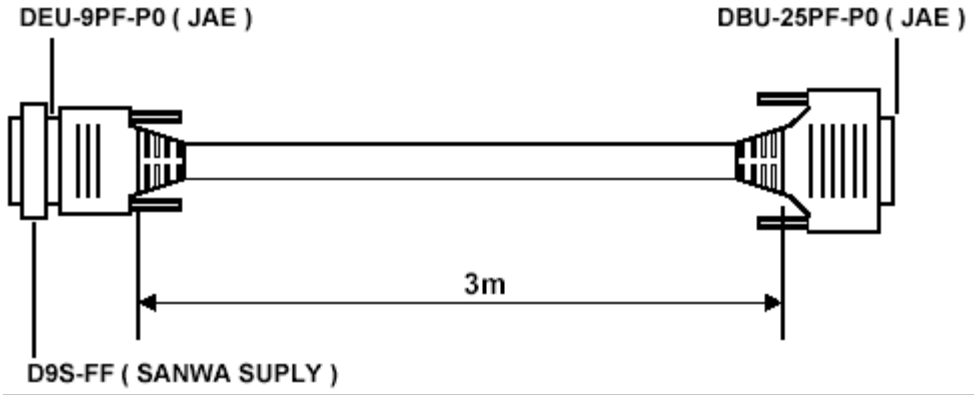
Figure 5. Serial interface cable AZ221



1.3.2 AZ222

In case, that the COM-port of the host PC uses a 25-pin D-Sub connector, the interface cable AZ222 has to be used.

Figure 6. Serial interface cable AZ222



1.4 Target Probe

The AF220/221 Flash Programmer uses a rare connector for connection to the target board:

DX31A-28P/DX-28-CV from Hirose Electric (www.hirose.com)

Figure 7. Pin Layout of Target Probe Connector

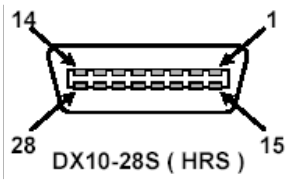
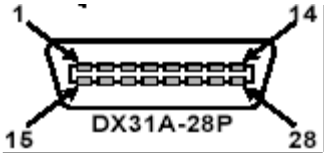


Figure 8. Pin Layout of Target Probe Connector viewed from cable side



Yokogawa offers optional three types of Probe Cables (Interface Cable). Depending on the target board a cable with connector on both sides, with test clip on one side or a simple cable has to be ordered:

Figure 9. Interface Cable AZ210 Figure 10. Interface Cable AZ211 Figure 11. Interface Cable AZ212

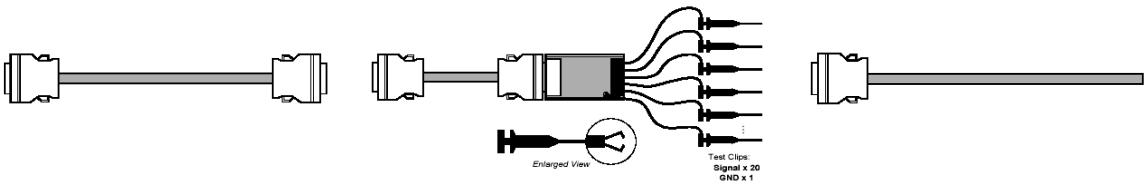


Table 1. Signal assignment of interface cable

AF220 - Signal Name	AZ210 / AZ212 Pin No.	AZ211		Cypress-Name
		Pin No.	color	
TRXD	27	1	brown	SOTx *1
TTXD	13	2	red	SINx *1
TCK	6	12	white & red	SCKx *1
TAUX	23	9	white	P00 *2
-	-	-	-	P01*2
TMODE	12	4	yellow	MD0
TAUX4	20	11	white & brown	MD1
TAUX3	19	13	white & orange	MD2
/TRES	5	14	white / yellow	/RST
/TICS	10	8	grey	optional *3
TVCC	2	20	light blue	Vcc
VCC	3	18	white & grey	Vcc
GND	1,7,8, 14, 15, 21, 22, 28	soldered on PCB	(black)	GND

*1 : The used serial interface depends on the microcontroller series.

*2 : Instead of P00, P01 other port-pins may be used (See to Application-Note AN-MCU-390031-E-xx)

*3 : The programmer signals (SINx, SOTx, SCKx, P00, P01, \RST) may conflict with the user-system while programming. The signal /TICS can be used to disconnect the user circuit but additional three-state drivers have to be used. Refer to the chapter “Examples of serial programming connection” of the MCU hardware manual

.

1.5 External Key Entry Interface Cable AZ223

Optional two buttons can be connected externally to EXT.KEY in order to start a command sequence (see chapter 6).

Figure 12. Pin Layout of Connector EXT.KEY

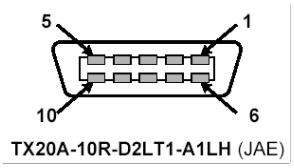


Figure 13. Connection of external key OAK1

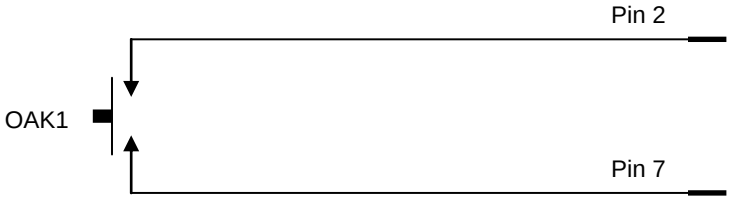


Figure 14. Connection of external key OAK2

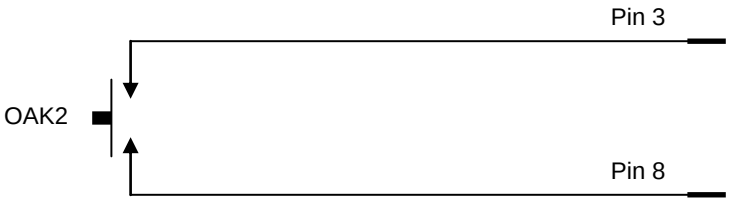
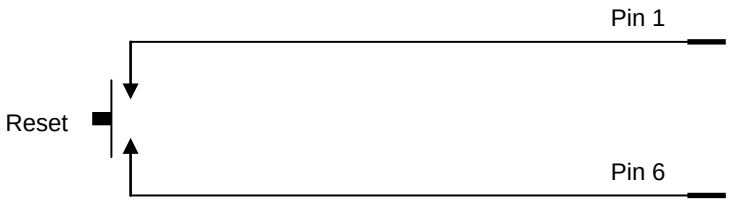


Figure 15. Connection of external reset key



1.6 Pass/Error Adapter AZ266

This optional adapter uses the signal output from EXT.KEY to give the result of programming (PASS / ERROR). It can be used to drive lamps or buzzer in e.g. a manufacture line.

Figure 16. Pass/Error Adapter AZ266

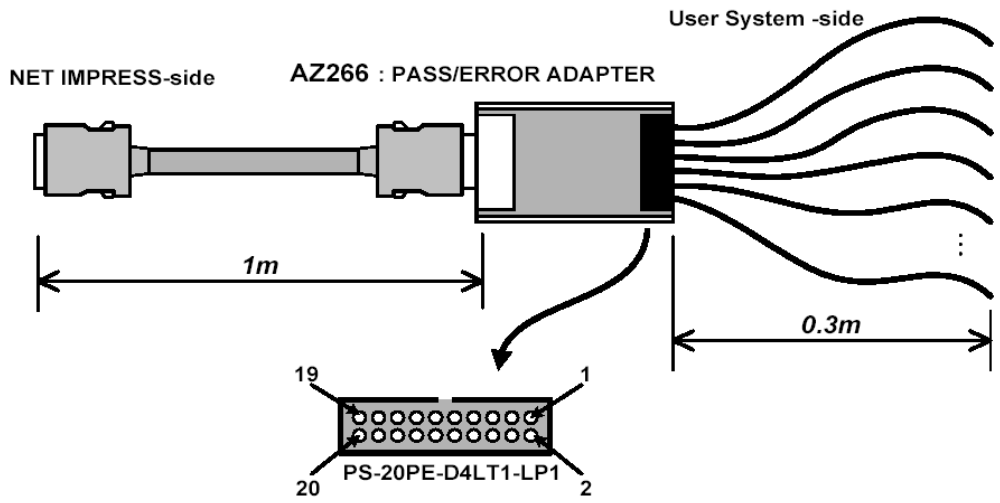


Table 2. Pin out of Pass/Error Adapter AZ266

Pin	Signal Name	Explanation
1	RES+	Reset Key
2	RES-	
5	OAK1+	One Action Key 1
6	OAK1-	
9	OAK2+	One Action Key 2
10	OAK2-	
13	VCC	5V, max. 100mA
14	VCC	
15	/User clear	User clear input (low active)
17	/PASS	Pass signal (low active, open collector: VOH=20V, IOL=40mA)
18	/ERROR	Error signal (low active, open collector: VOH=20V, IOL=40mA)
19	GND	GND
20	GND	

2 Hardware Set-up

This chapter describes how to set up the programmer

2.1 Hardware Configuration

The right PC-card (for Cypress 16LX-series: FF201) has to be inserted in the card slot of the programmer. Of course, the power connection with the external power-adapter and the connection to the target board via the interface cable have to be done, too.

After switching on the power supply, an internal system-check is done and the used control module name is displayed.

In case that another microcontroller wants to be used, another Micom Pack has to be used.

2.1.1 Changing the MCU series

In order to change the microcontroller type the latest Micom Pack including the module parameter file (*.prm) and write control program (*.BTP), means bootloader-kernel, has to be downloaded from

http://www.ydc.co.jp

The *.BTP file is like a bootloader-kernel and is always related to a special microcontroller series.

1. Download latest Micom Pack regarding to your microcontroller-series.
2. Remove PC-card from Yokogawa Programmer.
3. Insert PC-card to Personal Computer with an enabled PC-card slot.

Note:

In order to enable access to the PC-card the PC-card driver of Windows has to be installed on your PC. Add the following lines to the config.sys in order to find the PC-card as a drive within the Widows-Explorer:

```
device=c:\windows\system\csmapper.sys
device=c:\windows\system\carddrv.exe/slot=2
```

4. Copy the write control program (*.BTP) to PC-card.
5. Remove PC-card from Personal Computer.
6. Insert PC-card to Yokogawa Programmer.

If no PC with PC-card slot is available then the BTP-file can be exchanged using the Remote software package AZ290 (see chapter 4):

The old BTP-file has to be erased by the command File Purge[FUNC] + F 3 in the tab Basic-Operation. Afterwards the new BTP-file can be copied by using the function “Bundle-File: File Copy from HD to DOS area” from the tab File-Transfer.

Note:

Only one write control program (*.BTP) is allowed to be stored on the PC-card!

In case that more than one BTP-file is located on the PC-card the programming might fail!

2.1.2 Connection to the Target Board

All devices of the Cypress 16LX-series use at least eight signal lines for serial programming:

- SINx, SOTx and SCKx for serial communication [*1]
- MD0, MD2, P00, P01 for Mode-setting [*2]
- RST for Reset

[*1]: The used serial interface depends on the microcontroller series.

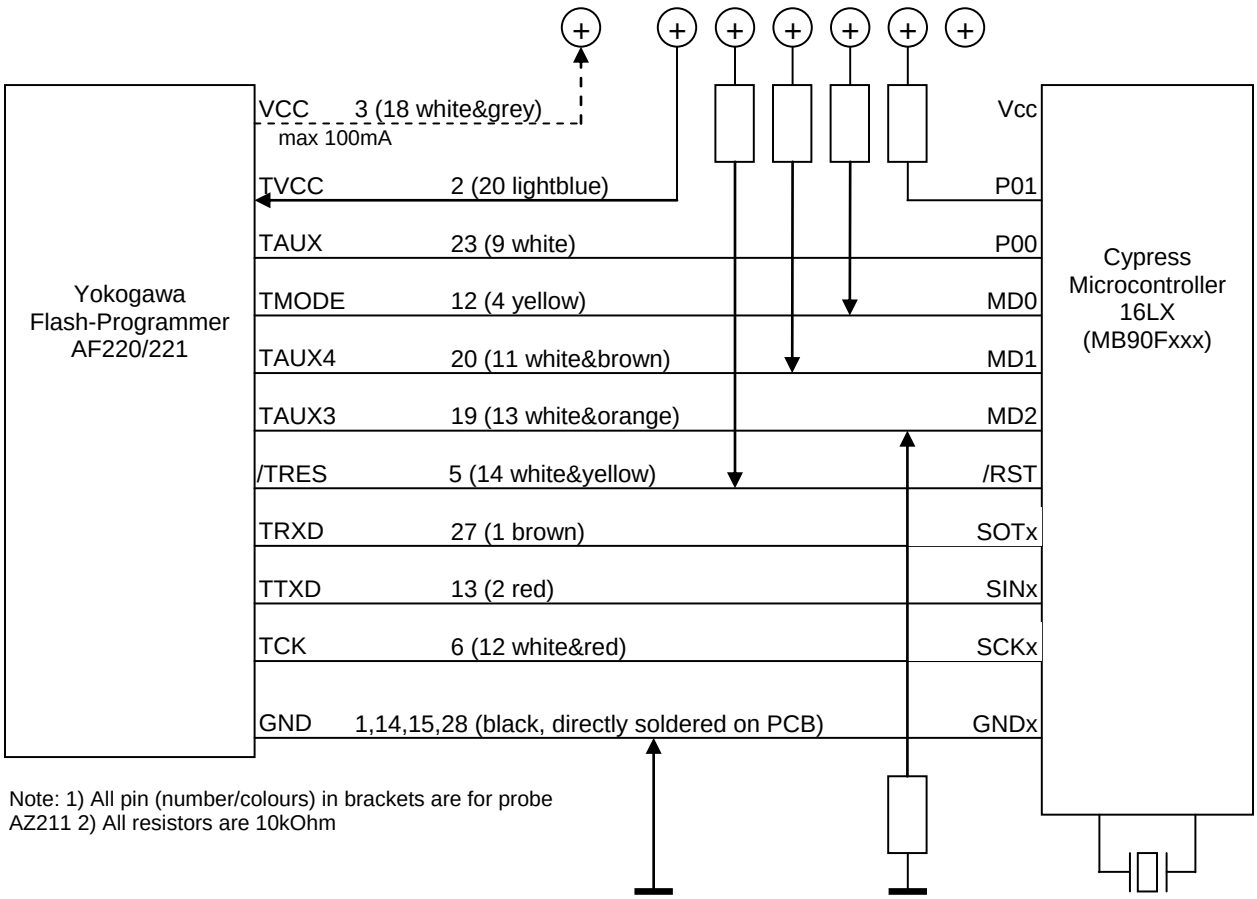
[*2]: Instead of P00, P01 other port-pins may be used
Please refer to the AN-MCU-390031-E-vxx Programming Flash MCUs.

Depending on the used interface cable the corresponding pin connection according to Table 1 has to be used.

Figure 17 shows a typical connection between the Yokogawa Flash-Programmer and the target system with a Cypress 16LX-microcontroller.

Please refer to the Flash-Programmer manual or the hardware manual of the related microcontroller (chapter “Examples of serial programming connection”) in order to get more detailed information.

Figure 17. Example of connecting with Cypress target system



Note:

For minimum configuration at least the signals GND(GND), TRXD(SOTx), TTXD(SINx), TCK(SCKx), /TRES(/RST) and TVCC(VCC) have to be connected. The other MCU signals can be set static to their levels: MD0=P00=GND, MD1=MD2=P01=Vcc while programming.

3 Stand-alone operation

This chapter describes the Yokogawa Flash-Programmer in stand-alone mode.

The Yokogawa Flash-programmer can be used as stand-alone programmer. In this case, the programmer can be controlled by the integrated keypad.

The basic functions are listed below.

Note that an explicit connect-command does not exist.

Table 3. Basic Functions in stand-alone mode

Function	Key-code
Load HEX-file	[FUNC] F 1 = / > [SET] [FUNC] [SET]
Blank Check	[DEV] 9 [SET] [DEV] [SET]
Erase (including blank-check)	[DEV] C [SET] [DEV] [SET]
Program	[DEV] D [SET] [DEV] [SET]
Read Check (Verify)	[DEV] E [SET] [DEV] [SET]
Automatic (Erase, Program, Verify)	[DEV] F [SET] [DEV] [SET]
Save HEX-file	[FUNC] F 2 = / > [SET] [FUNC] [SET]
Purge file	[FUNC] F 3 = / > [SET] [FUNC] [SET] [SET]

For further and more specific functions, please refer to the Instruction Manual of the Yokogawa Flash-programmer.

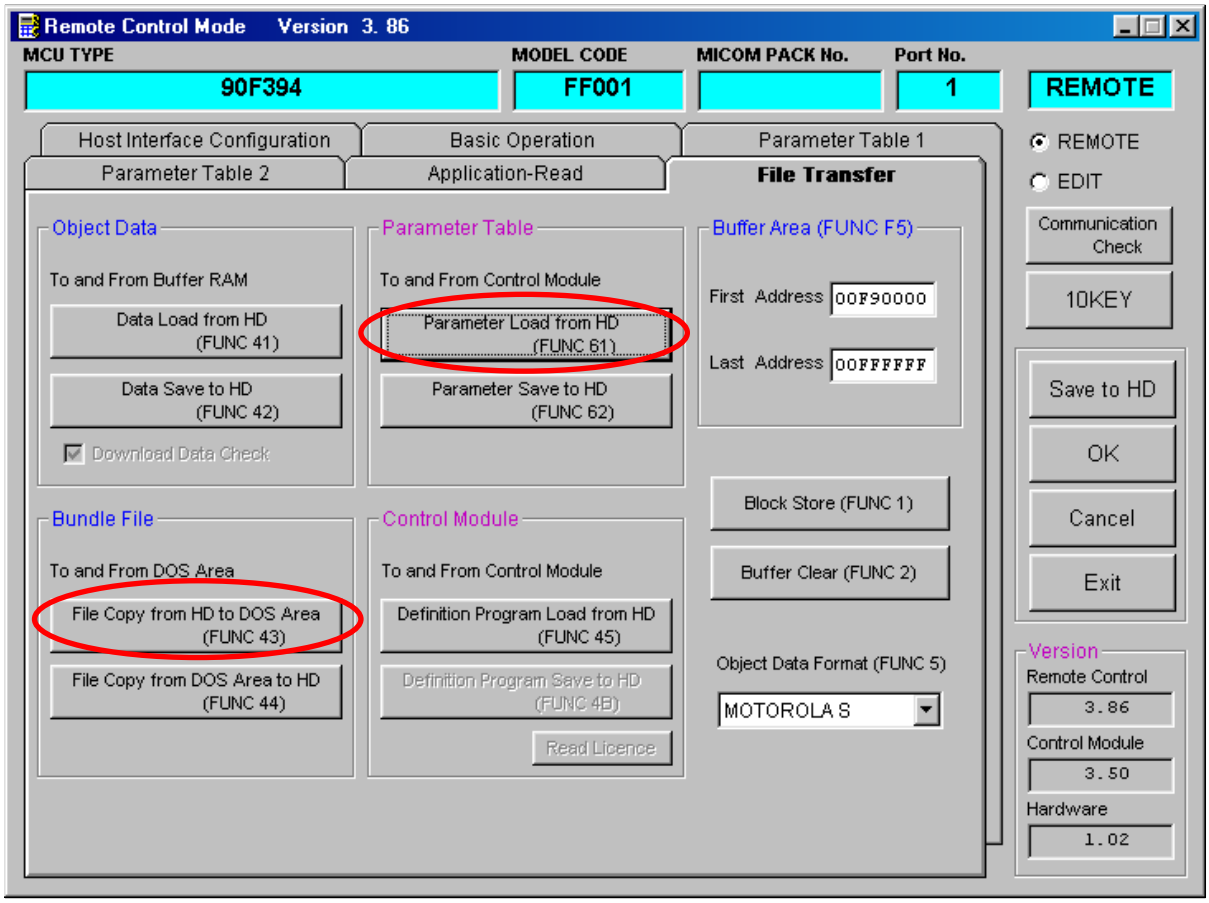
4 Software – Remote Controller AZ290

This chapter describes how to remote control the Yokogawa Flash-Programmer by a PC.

The Remote Software Package AZ290 allows to set-up and to control the Flash-Programmer by a PC.

Connect the Flash programmer AF220/221 via RS-232C or Ethernet to the PC. If the Ethernet wants to be used, refer to the user-manual how to set-up the IP-address.

Start the Remote-Software AZ290. The software should automatically find the programmer.



4.1 Parameter Load

The parameter file contents the microcontroller-related information like e.g. Flash-Memory size.

In order to load a new microcontroller series, open the tab “File Transfer” and select “Parameter Load from HD”.

After the file is successfully loaded, the MCU-type is shown on the programmers LC-display.

4.2 File transfer to PC-card

Keep in mind that the related bootloader-kernel (write control program, *.BTP) has to be copied manually to the PC-card. This can be done by the button “File copy from HD to DOS area” in the group “Bundle File”. See chapter 2.1.1 for more details.

4.3 Basic Operation

The basic functions for file handling (load, save, purge, etc.) on the PC-card and for programming a device are available in the tab “Basic Operations”.

4.3.1 File Operation

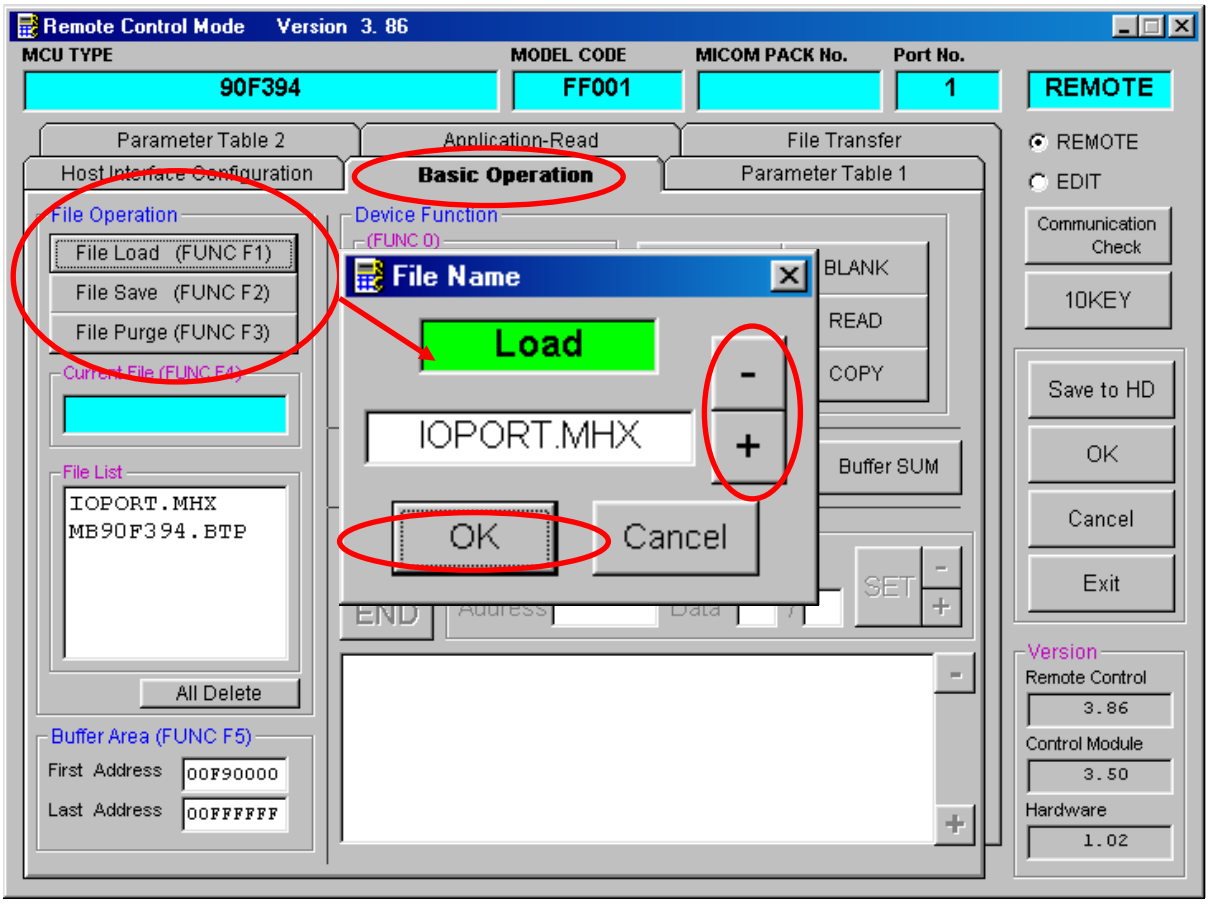
Within the Group “File Operation” basic functions for handling the data files on the PC-card can be found:

FILE LOAD copies data from PC-card into the buffer

FILE SAVE stores data from the buffer to the PC-card

FILE PURGE deletes a specific file

Figure 18. File operation on PC-card



Please take care that the file handling is a little bit windows unusual:

Whether files can be marked in the file list, this will not be kept after a file operation is selected. Within the file operation the filename has to be picked by the buttons **+** and **–**

.

4.3.2 Device Function

The basic functions for programming a device are available in the tab “Basic Operations”:

ERASE - erases the flash-memory and performs blank check

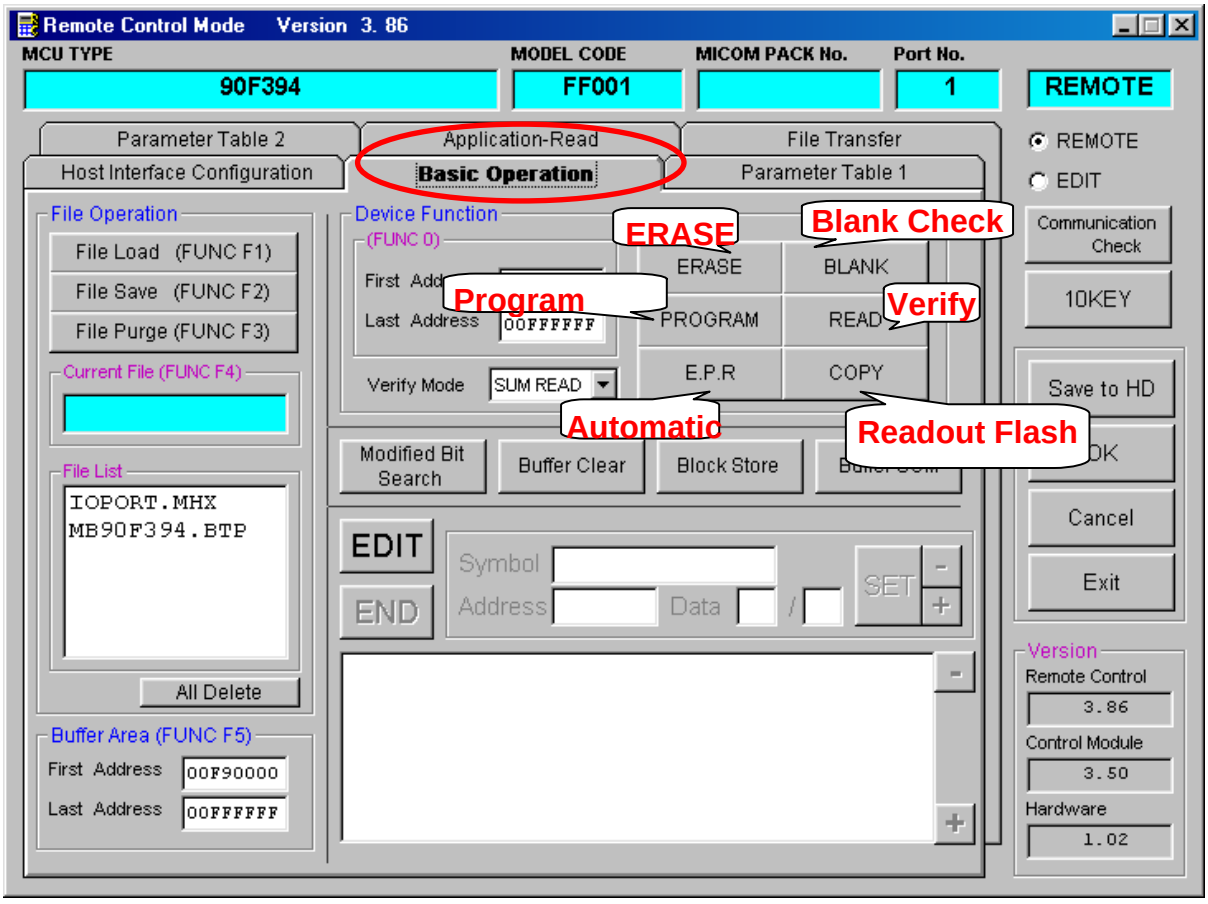
BLANK - checks whether the memory is cleared

PROGRAM - programs the flash-memory with the data of the buffer; after programming a verify (=read) is done

READ - means Read-check and verifies the flash-memory with the buffer

COPY - readouts the flash-memory into the buffer

E.P.R - performs automatically: ERASE – PROGRAM – READ (verify)



5 Software – Remote Controller Library AZ291

This chapter lists the software library functions for programming own applications

A software package AZ291 is available to program own front-end applications.

The library functions are based on Visual Basic 5.0.

Overview of Library Functions included in AZ291:

BUFFER_CLEAR ()
BLOCK_STORE ()
CHECK_YSM ()
REQUEST_SUM ()
FILE_LOAD ()
FILE_PURGE ()
FILE_ALL_PURGE ()
DOSFILE_DOWNLOAD ()
DOSFILE_UPLOAD ()
FILE_DOWNLOAD ()
FILE_UPLOAD ()
PARAMETER_DOWNLOAD ()
PARAMETER _UPLOAD ()
DEVICE_ERASE ()
PROGRAM ()
EPR ()
READ ()
COPY ()
BLANK ()
SET_RS232C_PARAMETER ()
COM_CHECK ()
DISPLAY_TYPE ()
STATUS ()
CONTROL_MODULE_DOWNLOAD ()

For more details, please refer to the User Manual of AZ291

6 External Key Entry Interface AZ233

This chapter describes how to use two external buttons to control the Flash-Programmer

In order to integrate the Yokogawa Flash-Programmer in an automatic assembly line, two external switch-buttons or relays connected to EXT.KEX can be used to start a command sequencer.

A command sequence file (*.CSB) is used to define the function.

In case that the signal lines OAK1+ and OAK1- respectively OAK2+ and OAK2- are shortcut the command sequence LK1 respectively LK2, stored in the CSB-file, is started.

Alternatively two buttons of the keypad can be used, see

This text file consists of two lines. It can be easily edited, e.g.:

my.csb:

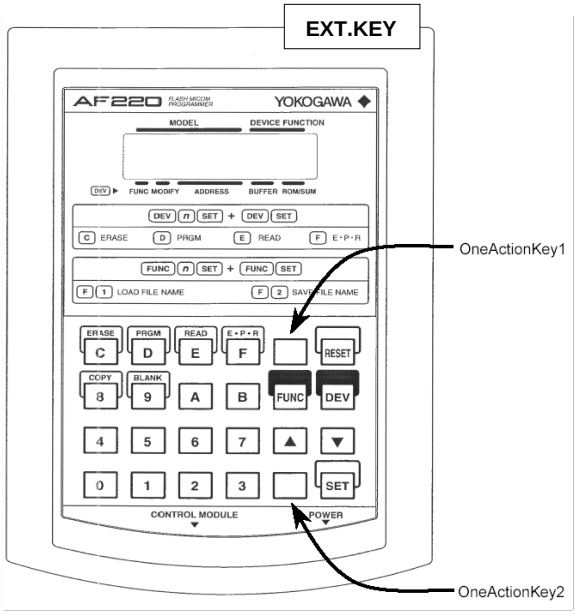
```
LK1,04,E,B,P,R;remark: Erase/BlankCheck/Program/Verify [CRLF]
LK2,01,P;remark: only Program without erasing the chip [CRLF]
```

Number of commands Command Sequence

E	ERASE	P	Program
B	Blank Check	R	Read Check (Verify)

Note: A maximum number of 16 commands can be executed within one sequence.

Figure 19. One Action key



7 Pass/Error Adapter AZ266

This chapter describes how to output the programming result

For extended functionality within an assembly line, the Pass/Error adapter AZ266 (see chapter 1.6) may be helpful to output the result of programming.

By this adapter, communication with a SPS-interface is possible.

Figure 20. Pass/Error adapter AZ266

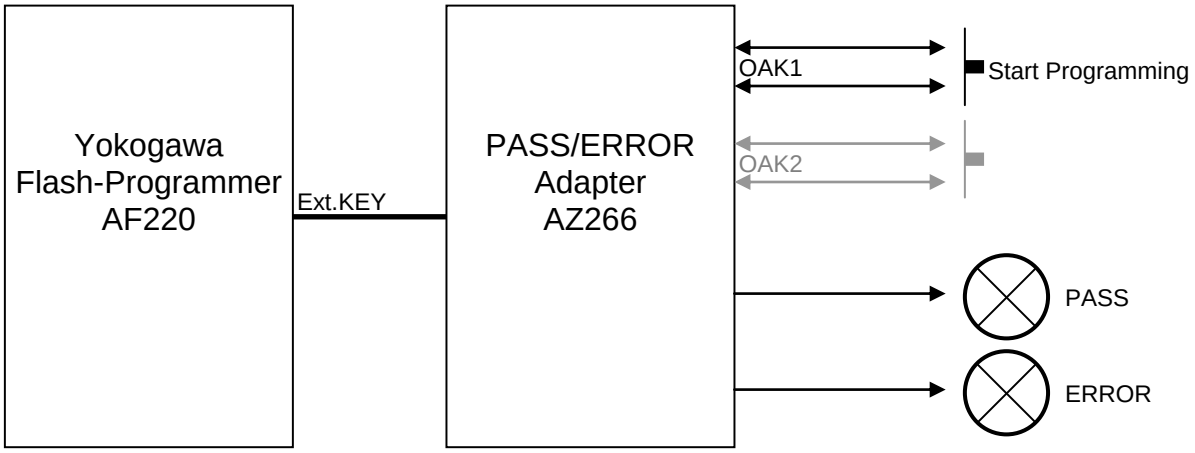


Table 4. Function results

Function	PASS	ERROR
ERASE	Chip was erased successfully	Chip erase failed
BLANK CHECK	Chip is empty	Chip is not empty
PROGRAM	Program ended successfully	Programming failed
READ	Verify okay	Verify failed
E.P.R.	Automatic programming ended successfully	Automatic programming failed

8 Part List

AF221 Main Unit of Flash microcomputer Programmer

FF201 Control Module for Cypress 16LX microcontroller
FF205 Control Module for Cypress microcontroller 91F154, 91F155
FF206 Control Module for Cypress microcontroller 91F362GA (asynchronous mode)

AZ221 PC cable (D-SUB 9pin – D-SUB 9pin)
AZ222 PC cable (D-SUB 9pin – D-SUB 25pin)

AZ210 Probe cable with 2x Hirose-connector
AZ211 Probe cable with Test-clips
AZ212 Probe cable with open end

AZ223 EXT.KEY interface cable
AZ266 PASS/ERROR Adapter

AZ290 Remote Control Software (can be downloaded from YDC homepage)
AZ291 Remote Control Software including Library functions to build own applications

9 Contact Addresses

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E-mail: ian.harry@ashling.com

http://www.ashling.com/

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FAX: +44-(0)1256-811761

E-mail : teruki_kawano@ydc.co.jp

10 Appendix

10.1 Time Measurement

Based on a MB90F394 with 384KByte Flash the following execution time was measured:

Command	Time	Remark
ERASE	9 sec	called by One Action key (CSB-file)
BLANK CHECK	4 sec	called by One Action key (CSB-file)
ERASE (incl. BlankCheck)	11 sec	[DEV] C [SET] [DEV] [SET]
PROGRAM (128K)*1	5 sec	called by One Action key (CSB-file)
PROGRAM (384K)	14 sec	called by One Action key (CSB-file)
PROGRAM (128K) (incl. Read-Check)	7 sec	[DEV] D [SET] [DEV] [SET]
PROGRAM (384K) (incl. Read-Check)	18 sec	[DEV] D [SET] [DEV] [SET]

Note *1

In case that not the total memory space is used the start-address and end-address have to be set manually:

[FUNC] 0 FE0000 > *wait some seconds* FFFFFF > *wait some seconds* [SET] [FUNC] [SET]

Start-address End-address

For further details see AF220 Instruction manual.

Document History

Document Title: AN205108 - F²MC-16LX Family, Flash Programmer Yokogawa AF220/221

Document Number: 002-05108

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	NOFL	04/23/2003	Initial release
*A	5230863	NOFL	04/20/2016	Migrated Spansion Application Note MCU-AN-390087-E-V10 to Cypress format
*B	5869231	AESATP12	08/31/2017	Updated logo and copyright.

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PSoC	cypress.com/psoc
Power Management ICs	cypress.com/pmic
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