SYS-File: 70089371v170.SYS
SYS-File Family: 70093603
Hardware: MC024_120_nl(11131280) MC024-122(11131281)

1 General

BIOS Functionality; The functionality is defined around the pin. If no *Variable Type* is specified the *Variable Name* contains elements, defined later. The pins are defined as C(ConnectorNumber)p(PinNumber).
Example:
The pin C1p02 has 2 variables; C1p02.AnIn, C1p02.Volt.

Etc.

Contents

2 BIOS Variables

2.1 Digital Inputs

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C1p06	-			
C1p07	-			
Elements				
DigIn	BOOL	Read	Digital Input True = Active	**Note2**
Bias	U8	Write	Bias Configuration 0 = No Pull-Down, No Pull-Up 1 = No Pull-Down, Pull-Up to internal +5V 2 = Pull-Down to internal GND, No Pull-Up	**Note2**
Status	U16	Read	Status 0 = OK Bit 1 (0x0002) = True : Config Error Bias	**Note2**

2.2 Simple Digital Analog Inputs

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C1p05	-			
Elements				
AnIn	U16	Read	Analog In 0-32767	AD Count
Voltage	U16	Read	Analog in scaled [mV]	0..5250mV
DigThresLow	U16	Write	Digital Input Threshold Low Configuration [mV] Default value 2000 **If activated with 5V Supply** This will define when DigIn goes from True to False.	**Note2**
DigThresHigh	U16	Write	Digital Input Threshold High Configuration [mV] Default value 3000 **If activated with 5V Supply** This will define when DigIn goes from False to True.	**Note2**
DigIn	BOOL	Read	Digital Input True = Active	**Note2**

2.3 Multifunction Inputs -Dig/Ana/Freq

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C1p10	-			
C1p11	-			
C1p12	-			
C2p01	-			
C2p02	-			
Elements				
Phase	S32	Read	Phase shift [0.1 μs], sign defines direction.	Only valid when InputMode = 4
Per	U32	Read	Period in scaled [0.1 μs]	
AnIn	U16	Read	Analog In 0-32767	AD Count
Voltage	U16	Read	Analog In Scaled [mV]	Depending on range selection
Freq	U16	Read	Frequency In Scaled [Hz]	0-10kHz
Count	U16	Read	Number of measured edges this loop.	
Duty	U16	Read	Positive duty cycle in scaled [0.01%]	
QuadCount	S16	Read	Number of measured counts this loop, sign defines direction.	Only valid when InputMode = 3
Bias	U8	Write	Bias Configuration 0 = No Pull-Down, No Pull-Up 1 = No Pull-Down, Pull-Up to internal +5V 2 = Pull-Down to internal GND, No Pull-Up 3 = Pull-Down to internal GND, Pull-Up to internal +5V	**Note2**
Range	U8	Write	Range Configuration 0 = 0-5.25V range (middle range) Thresholds when measuring frequency: Rising Min/Max 2.73V/3.99V Falling Min/Max 0.96V/2.68V 1 = 0-35.3V range (high range) Thresholds when measuring frequency: Rising Min/Max 11.84V/26.54V Falling Min/Max 5.61V/18.89V 2 = 0-0.3675V range (low range) Thresholds when measuring frequency: Rising Min/Max 0.111V/0.291V Falling Min/Max 0.047V/0.210V 3 = 0-2.465V range (lower resolution)	**Note2** Note: with some frequency measurements (elements: .QuadCount and .Phase) the maximum frequency is 4000 Hz

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
DigThresLow	U16	Write	Digital Input Threshold Low Configuration [mV] Default value 2000 **If activated with 5V Supply** This will define when DigIn goes from True to False. **If activated with GND** This will define when DigIn goes from False to True.	**Note2**
DigThresHigh	U16	Write	Digital Input Threshold High Configuration [mV] Default value 3000 **If activated with 5V Supply** This will define when DigIn goes from False to True. **If activated with GND** This will define when DigIn goes from True to False.	**Note2**
InputMode	U16	Write	Input Mode Configuration 0 = No additional measure mode 3 = Quad encoder enabled, result in .Quad-Count 4 = Phase shift enabled, result in .Phase	**Note2** Only on C1p10, C2p01
Status	U16	Read	Status 0 = OK Bit 1 (0x0002) = True : Config Error Bias Bit 2 (0x0004) = True : Config Error Range Bit 3 (0x0008) = True : Config Error Input-Mode	
DigIn	BOOL	Read	Digital In True = Active	

2.4 Multifunction Outputs

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C2p03	-			
C2p04	-			
C2p05	-			
C2p06	-			
C2p07	-			
C2p08	-			
C2p09	-			
C2p10	-			
Elements				
CurrentOut	S32	Write	0-30000 [0.1 mA]	Valid if .Output-Mode = 4,5,8

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
FeedBackCurrent	S32	Read	Actual Value Current [0.1 mA]	Feedbacks average values every 41uS. The quantity is dependent of the the PWM frequency. If OutputMode = 7, 8 the .FeedBackCurrent will be reported for the pin sourcing the current, the pin sinking the current will be reported as 0.
OutputMode	U16	Write	Output Mode Configuration 0 = Digital Output Output defined by variable .DigOut Push/Pull Output 1 = Digital Output Output defined by variable .DigOut Sourcing Output 2 = Digital Output Output defined by variable .DigOut Sinking Output 3 = PWM Output Output defined by variable .DutyOut Range 0-10000 [0.01% pos duty] 4 = PWM Output Output defined by variable .CurrentOut Range 0-30000 [0.1 mA] 5 = PWM Output Output defined by variable .CurrentOut Range 0-30000 [0.1 mA] Dither Enabled 6 = PVE Output Output defined by variable .DutyOut Range 0-10000 [0.01% of PVE Power] 7 = Hbridge Output Enabling C2p03 and the next output for hbridge, set C2p03.OutputMode to 7 Enabling C2p07 and the next output for hbridge, set C2p07.OutputMode to 7 Range 0-10000 [0.01% pos duty] Output defined by variable .DutyOut Dither Disabled 8 = PWM Output (current control bidirectional) Enabling C2p03 and the next output for bdir, set C2p03.OutputMode to 8 Enabling C2p07 and the next output for bdir, set C2p07.OutputMode to 8 Range 0-30000 [0.1 mA] Output defined by variable .CurrentOut Dither Enabled	

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
Status	U16	Read	Status 0 = OK Bit 4 (0x0010) = True : Overload Bit 5 (0x0020) = True : OutputMode Error	**Note3**
DutyOut	U16	Write	0-10000 [0.01% pos duty]	Valid if .Output-Mode = 3,6,7
AnIn	U16	Read	Averaged .AnIn value used to calculate .Feed-BackValue. 0-32767 (16384 typical = 0 cur-rent)	
ActDuty	U16	Read	Actual Value Duty 0-10000 [0.01% pos duty]	
DitherFreq	U16	Write	Set point Dither Frequency 40-250 [Hz]	
DitherAmp	U16	Write	Set point Dither Amplitude 0-5000 [0.1mA]	
ReqFreq	U16	Write	Set point Frequency Default 1000 33-4000, 4000 [Hz] Limited to 4000 Hz if dither is active.	Requests greater than 4000 will set .ReqFreq to 4000.
ActFreq	U16	Read	Actual Value Frequency [Hz]	
CurChgLim	U16	Write	Limit for current change if OutputMode = 4,5 or 8 22-333 [0.1 mA/ms], Default 111	
DigOut	BOOL	Write	Digital out True = Supply Voltage	Valid if .Output-Mode = 0,1,2

2.5 Supply Voltage

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C1p02	-		Range = 0-33V Battery Voltage averages 1024 samples every 109uS for an update rate of 112mS	
Elements				
AnIn	U16	Read	Analog In 0-32767	AD Count
Voltage	U16	Read	Analog In Scaled [mV]	

2.6 Sensor Power

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
C1p08	-		Fixed to 5V	
Elements				
AnIn	U16	Read	Analog In 0-32767	AD Count
Voltage	U16	Read	Analog in scaled [mV]	

2.7 OS

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
OS	-			
Elements				
ETime	U32	Read	Time since power on [10ms]	
LoopCnt	U32	Read	Counter that increment by 1 every processing time.	
ExecTime	U16	Read	processing time [ms]	
ExecTimeOut	U16	Write	Requested processing time 1-250[ms] Default: 10[ms]	**Note11**
ExecTimeWork	U16	Read	Actual work time during processing time [ms]	
CrcStatus	U16	Read	0 = CRC calculation matches 1 = CRC calculation is not implemented 2 = CRC calculation does not match 3 = CRC data missing; unable to perform test 4 = CRC calculation is in progress 5 = CRC is not present in the downloaded file	
CrcCalcTime	U16	Read	Calcuation time to for CRC [ms]	
ChecksumFailure	U16	Read	**Bit0** True = Flash checksum error False = Flash check OK **Bit1** True = RAM checksum error False = RAM check OK **Bit2** True = Bootloader checksum error False = Bootloader check OK	These elements are set during start-up of the device. Bit 0 will be true if OS.CrcFailed = 2.

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
ChecksumFailure-Treatment	U16	Write	**Bit0** True = All outputs will be turned off/set to tri-state automatically in case of a Flash checksum error. Application will not be executed. False = Application continues to run. Default: True **Bit1** True = All outputs will be turned off/set to tri-state automatically in case of a RAM checksum error. Application will not be executed. False = Application continues to run. Default: True **Bit2** True = All outputs will be turned off/set to tri-state automatically in case of a Bootloader checksum error. Application will not be executed. False = Application continues to run. Default: False	
ResetExecTime	BOOL	Write	Reset the execution time. Try to set OS.ExecTime to the requested value in OS.ExecTimeOut on change from TRUE to FALSE.	
Start	BOOL	Read	Set during the first processing time.	

2.8 Software Versions

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
UnitVersion	-			
Elements				
Ident_No	U32	Write	Unit identification number	
SW_Vers	U32	Write	Version number of the application	
Param_Vers	U32	Write	Version number of the parameter set	
Release	BOOL	Write	True = Application released	

2.9 LED

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
Led	-			
Elements				

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
Green	BOOL	Write	Green LED True = On	
Red	BOOL	Write	Red LED True = On	

2.10 NVMem

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
NVMem	-			
Elements				
Status	U16	Read	Status of Non-Volatile memory after reset. The status code is bit coded. **Bit 0** True = The NV Memory was restored to a previous state. This may happen when a store operation was aborted. For example due to power off. **Bit 1** True = The NV Memory checksums are not correct. This may, for instance, occur during the first boot up after a new application is downloaded, if the NV Memory usage is changed. **Bit 2** True = The reset routine could not access the NV memory. This may, for instance, occur due to a hardware problem. **Bit3-15** Reserved	

2.11 Service Tool Access

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
ServiceTool	-			
Elements				
MasterPassword	-			
Elements				
Write	U32	Read	True = This value can be read by the Service Tool even if .DisableRead is True.	

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
Read	U32	Write	this value can be written by the Service Tool even if .DisableWrite is True. It can also be read by the Service Tool even if .DisableRead is True.	
DisableRead	BOOL	Write	True = The Service Tool has no read access to the unit.	
DisableWrite	BOOL	Write	True = The Service Tool has no write access to the unit.	
DisableDownload	BOOL	Write	True = The Service Tool has no access to download any file to the unit.	
Connect	BOOL	Read	True = The unit has received a Service Tool Command during the last excecution loop.	

2.12 Packed Infoblock

The packed infoblock contains data about the controller, application and embedded operating system of a hardware unit. Each field consists of a number of bytes which are packed in arrays of U16 in little endian byte order.

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
ECUInfoPacked	-			
Elements				
AppCmplTime	ARRAY[4]U16	Read	Application compilation time stamp in the format yy yy mm dd hh mm ss cc, where each of the four elements is a hexadecimal number representing four digits. Consider the following example: If an application is compiled December 2nd 2009 at 16:54:49.22 this is presented as {0x0920, 0x0212, 0x5416, 0x2249}.	cc=1/100s
AppId	ARRAY[26]U16	Read	Application identity. It consists of a null terminated ASCII string. As an example, Untitled is presented as {0x6E55, 0x6974, 0x6C74, 0x6465, 0x0000}.	
AppType	ARRAY[16]U16	Read	Application type. It has the same format as AppId.	
AppVer	ARRAY[11]U16	Read	Application version. It has the same format as AppId.	

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
BDate	ARRAY[4]U16	Read	Production time stamp in the same format as AppCmplTime.	
BootVer0	U16	Read	Bootloader version. It is a 16 bit number.	
PNr0	ARRAY[6]U16	Read	Part number 0. It consists of a right justified ASCII string padded with space characters; e.g. a part number equal to 1002096 is presented as {0x2020, 0x2020, 0x3120, 0x3030, 0x3032, 0x3639}.	
PNr1	ARRAY[6]U16	Read	Part number 1. It has the same format as PNr0.	
PNr2	ARRAY[3]U16	Read	Part number 2. It is a numerical value. As an example, consider the part number 025125980137. Its hexadecimal representation is 0x05D9A007E9 and this number is presented as {0x07E9, 0xD9A0, 0xXX05}, where XX is undefined and should be masked away.	**Note4**
PRev0	ARRAY[2]U16	Read	The revision level of part number 0. It consists of four ASCII characters. For example, a revision level equal to RevA is presented as {0x6552, 0x4176}.	
PRev1	ARRAY[2]U16	Read	The revision level of part number 1. It has the same format as PRev0.	
SerNr0	ARRAY[3]U16	Read	40 bit serial number. It has the same format as PNr2.	

2.13 CAN

CAN-Controller internal in CPU is used for CAN[0] (C1p03-C1p04) bus.
In addition to the following Application Interface, CAN[0] can be used for diagnostics and for download.
Following CAN-signals are implemented.

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
CAN[n]	-		n = 0	
Elements				

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BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
Baudrate	U32	Write	Default 250000 baud Supported baud rates: 50000 100000 125000 250000 500000 1000000	**Note2**
BusOff	BOOL	Read	True = The CAN controller is in Bus Off mode.	
Reset	BOOL	Write	True = Resets the CAN controller and Bus off mode.	
DriverError	BOOL	Read	True = The CAN driver could not be initialized and the whole CAN functionality is shut down. This flag could be set if other CAN-Nodes already communicate during initialization phase.	
DriverReset	BOOL	Write	True = Reinitialize the CAN driver if DriverError is Set.	
Overflow	BOOL	Read	True = The internal CAN message queue was full during the last execution loop. A message may have been lost.	
ErrorPassive	BOOL	Read	True = The Can controller is in error passive state.	
Port	PORT	Read	A handler for the CAN port x, used as an input to a CAN symbol to select which CAN port to use.	

2.14 ID

BIOS-name	Variable Type	Variable Direction	Function, Scaling	Miscellaneous
ID	-			
Elements				
Node	-			
Elements				
ServerAddr	U8	Write	Server Address (Node ID) of the ECU	**Note1**
ClientAddr	U8	Read	The node number of the diagnostic tool	
Net[n]	-		n = 0	
Elements				
Addr	U8	Write		**Note1**

3 Notes

3.1 Note1

This signal must use the symbol "Intialize Hardware Output". "Initialize Hardware Output" means that this output will be updated before the application starts.

3.2 Note2

This signal can use both symbols Intialize Hardware Output and Hardware Output if Variable Direction is Write. Initialize Hardware Output means that this output will be updated before the application starts. Hardware Output means that this output will be updated every loop in the application.
This signal must use the symbol Hardware Input if Variable Direction is Read. In case of a Safety Controller the value is set from the primary processor.

3.3 Note3

After an Overload condition it is recommended to set the set point for the output with either .CurrentOut, .DigOut or .DutyOut (depending on .OutputMode) to False or 0 for 250 ms to reset the Overload condition properly.

3.4 Note4

.PNr2 may be either a part number or an EAN number. If the formula below matches it is a part number; if the high byte of .PN2[2] is a valid EAN checksum it is an EAN number.
PNr2[2]:HB = CRC8(PNr2[0]:LB ...PNr2[2]:LB)
where:
LB = low Byte
HB = high Byte
CRC8 =8 Bit CRC with polynomial is x8 + x2 + x + 1; startvalue to be 0xFF

3.5 Note11

If the processing time exceds the value Z then the processor will be reset and the application restarted.
Z is calculated as follows: If T < THEN Z = 30 ms ELSE Z = 5*T ms.
Where T = OS.ExcecTimeOut for the first loop and T = OS.ExcecTime after the first loop.

4 Miscellaneous

All scaling and ranges presented are nominal values. More technical details can be found in PLUS+1 Controller Family Technical Information. Maximum nested levels are 10
Maximum number of supported NV memory cells is 3500 .
PLUS+1 GUIDE 7.1.10 or higher is required.

4.1 Supported PLUS+1 GUIDE Components

The following PLUS+1 GUIDE components which need support from the SYS are allowed

- Get Time us
- Until
- Repeat
- Initialize Hardware Output
- Sin
- Cos
- Tan
- Square Root
- Arc Sin

- Arc Cos
- Arc Tan
- Hardware Input
- Read Output from Hardware
- Module Input
- Module Bus Input
- Module Bus Output
- Access App Log Enable
- Set Pulse
- Disable Raw Applog Data Readout
- Accessrights App Log Statistics
- Accessrights App Log Errors
- Accessrights App Log Others
- Accessrights History
- Accessrights Read
- Accessrights Write
- Create Externally Defined Class
- Call Method Of Externally Defined Class
- Transmit CAN
- Receive CAN Basic
- Receive CAN with ID Mask
- Receive CAN with Filter
- Close Parameter Set

4.2 Diagnostic Data (PLG) In Target

Diagnostic Data (PLG file) is dynamically allocated in target FLASH memory.

4.3 ToolKey

"LOGKEY" Supported.

4.4 TimeBase

The following time bases are supported

- T1M
- T10M
- T100M
- T1S
- T60S
- T1H
- TLOOP

4.5 Unit History

Unit History is supported. The 20 latest activities are logged.

4.6 Read-Only Parameters Support

This software supports Multiple Read Only Parameters. 16384 bytes are allocated and there is theoretically no limit on the number of files that can be used. However, the minimum size for each file is 230 bytes, so no more than 71 files can be used.
This SYS has a parameter named ReadOnlyParameters which enables or disables this function. The parameter can have the values ENABLE or DISABLE. DISABLE is the default value. This value can be set in the GUIDE. Select this SYS in the Project manager and Edit the Parameter in the Inspector. NOTE: The memory calculation will not be correct when the ReadOnlyParameters is in ENABLE mode. The total amount of ROM should be reduced by 8192 to get the correct calculation.
Needed information for csv file:

```
ADDRESSMODE:     LSBFIRST
DEFAULTTYPEDATA: 1
MIN_DATASIZE:    8
```

4.7 Compiled Code Package Support

This software supports compiled_code package (CCP) using IDL type .

4.8 HOST-settings

In General the PLUS+1 Setup program does this.
This setting use STM32FX0X Compiler v4.7.4, Key is; ARM-GCC 4.7 2013Q2-20130614