FPIO_V1019 & V1041 Software Documentation V0.04

Valid for FPIO_V1019

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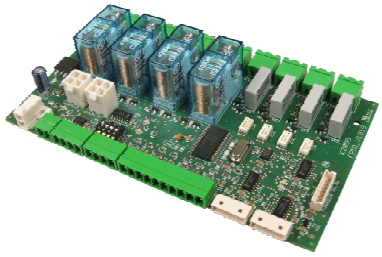

Content:

Basic Concept

The FPIO is a 4 relays board with power detection and analog and sensor inputs which can be controlled by a host over a RS485-bus and communicates over the DataServer Protocol.

In future software versions, it is possible to implement some simple autonomous functions like a delayed switch and timed turn off.

TG12_195.EVS provides some exemplary source code to handle the peripheral.
FPIO.INC provides the register-addresses as constants and some answer constants.

Hardware architecture

The FPIO needs to be powered with nominal 24VDC. There are several ways of powering the FPIO. On the outside a 2pole Molex MiniFit-Connector, a 2pole PTR 3.81 and two 4pole PTR 3.81 for BUS-Connection and power. On the board there are also two additional 4pole MiniFit-BUS-Connectors. The hardware has four relays to switch loads. In the reset state, the relays are not energized.

Firmware

For an application the FPIO is seen as a set of registers 16 and 32 Bit wide. For addressing a register in the system each Node has its own address. The lower part of the address can be set by DIP-switches. The firmware manages all functions on the FPIO-Board and gives the application as much flexibility as possible.

BUS-Registers

The bus registers are grouped into different functions:

- System management registers
- Function registers
- Peripheral registers

The system management registers provide information about the general state of the system.

The function registers can be read or sometimes written to change the functionality of the subsystem. (Attention: Do not write on R only registers! This could produce problems.)

The peripheral registers contain periodically updated readings or are input registers to the peripheral functions of the subsystem.

System management registers

The system management registers allow the master to communicate with module an to set commands. (Node-Address: Hex: 0x8801…0x880F, Decimal: 34817…34831)

FPIO_JustResetFlag	RW	INT16	0/1	boolean	88

After power up this register is set to 0x0001 (true). The master can see, if there was a power up and eventually set the values necessary for the application. This register can be written with 0x0000 (false) or another value to monitor the bus node.

FPIO_UpTimeSEC	RW	INT32	$0..2^{31}-1$	[s]	84

After a reset the UpTimeSEC is reset an begins to count up each second. After reaching a value of 0x7FFF'FFFF the counter starts again with 0.

FPIO_UpTimeMS	RW	INT16	$0..2^{15}-1$	[ms]	83

After a reset the UpTimeMS is reset an begins to count up each millisecond. After reaching a value of 0x3E8 = 1000 the counter starts again with 0 on the UpTimeSEC is 1 second added.

not yet implemented:

FPIO_SynchronizeFlag	RW	INT16	0/1	boolean	0x0???

Each update period the SynchronizeFlag is set to 0x0001 (true) by the firmware. This means, that an update can be read by the master. The SynchronizeFlag can be set to 0x0000 (false) after reading registers. With this mechanism the update rate is synchronized.

FPIO_Version	R	INT16	86

In this register the software version is written by the firmware. E.g. a value of 120 means firmware version 1.20 or 1 means firmware version 0.01

FPIO_Hardware	R	INT16	87

In this register the hardware version is written by the firmware. E.g. a value of 1019 means that the FPIO_V1019 is present.

Function registers

L_Max	RW	INT16	0..255	TICs	77

Filter settings DIN's: Value for setting the maximum level of the filter counter for the stabilized DIN's registers. The max value is calculated by 255-(L_HB+L_Hbi), which is automatically checked by firmware every second.

L_ON	RW	INT16	0..255	TICs	78

Filter setting DIN's: What counter level needs to be achieved to set the DIN to 1. Reasonable would be a value depending a bit on the other values of about 20 to 50.

L_Zero	RW	INT16	0..255	TICs	79

Filter setting DIN's: The zero level where DIN is switched to 0. Reasonable would be 2 or more depending on L_LM. The firmware checks this value every second and corrects it to a value that (L_Zero + L_LM) ≥ 0 holds.

L_HB	RW	INT16	0..127	TICs	80

Filter setting DIN's: On every LoHi transition on a DIN Port this value is added to the filter counter. (LoHi-Transition-Bonus)

L_HBi	RW	INT16	0..127	TICs	81

Filter setting DIN's: Each millisecond the RDIN is high this value is added to the filter counter. (Hi-Bonus immediate)

L_LM	RW	INT16	-128..0	TICs	82

Filter setting DIN's: Each millisecond the RDIN is low this value is added to the filter counter. Because it is negative it will be subtracted.

Peripheral registers

The peripheral registers hold settings for the peripheral hardware functions of the module such as relays states and additional sensor readings. A/D values read by the module are in read only registers.

AIN1	R	INT16	0..1023	TICs	53

The raw value of the 10-Bit A/D is updated in this register. The input is Pin 4 on Input CN4. In the delivery state it is set up for a connection of a 10kΩ-NTC. But it can be changed to accept a analog 0..10VDC input. This can be done with removing the 0Ω-resistor R38.

AIN2	R	INT16	0..1023	TICs	54

The raw value of the 10-Bit A/D is updated in this register. The input is Pin 6 on Input CN4. In the delivery state it is set up for a connection of a 10kΩ-NTC. But it can be changed to accept a analog 0..10VDC input. This can be done with removing the 0Ω-resistor R42.

AIN3	R	INT16	0..1023	TICs	55

The raw value of the 10-Bit A/D is updated in this register. The input is Pin 8 on Input CN4. In the delivery state it is set up for a connection of a 10kΩ-NTC. But it can be changed to accept a analog 0..10VDC input. This can be done with removing the 0Ω-resistor R54.

AIN4	R	INT16	0..1023	TICs	56

The raw value of the 10-Bit A/D is updated in this register. The input is Pin 8 on Input CN4. In the delivery state it is set up for a connection of a 10kΩ-NTC. But it can be changed to accept a analog 0..10VDC input. This can be done with removing the 0Ω-resistor R58.

SCON1	RW	INT16	0/1	boolean	57

Enables the connection and request routine to the SHTB-Sensor on CN5. Is initially 0 and so does not request and update the values.

TEMP1	R	INT16	-400..1000	[0.1°C]	58

This register is periodically updated by the FPIO-Firmware if SCON1 is set to 1 with the temperature of the optional SHTB-Sensor connected to CN5. Initial value is 0, if SCON1 is not 1. If SCON1 is 1 and no sensor is connected, the register holds a non correct value, see error handling below.

TRAW1	R	INT16	-1..16383	TICs	59

The raw temperature value of the SHTB-Sensor on CN5. The value -1 is set when the sensor didn't respond on temperature request.

HUMI1	R	INT16	0..1000	[0.1%]	60

This register is periodically updated by the FPIO-Firmware if SCON1 is set to 1 with the humidity of the optional SHTB-Sensor connected to CN5. Initial value is 0, if SCON1 is not 1. If SCON1 is 1 and no sensor is connected, the register holds a non correct value, see error handling below.

HRAW1	R	INT16	-1..16383	TICs	61

The raw humidity value of the SHTB-Sensor on CN5. The value -1 is set when the sensor didn't respond on temperature request.

not yet calculated:

DWPT1	R	INT16	-1000..1000	[0.01°C]	62

The dew point of the current ambient calculated from TEMP1 and HUMI1.

not yet calculated:

MXRA1	R	INT16	0..10000	[0.01g/kg]	63

The mixing ratio of air and water of the current ambient calculated from TEMP1 and HUMI1.

ERRS1	R	INT16	0/1	boolean	64

The register to check if the communication to the SHTB-Sensor on CN5 failed. On fail holds value 1 or greater, on correct communication it is set to 0.

SEMA1	R	INT16	0/1	boolean	65

The register to check if new values are available. On new values this register is set to 1. After reading the values one can set this to 0. Wait until the value is 1 again and grab then the next values.

SCON2	RW	INT16	0/1	boolean	66

Enables the connection and request routine to the SHTB-Sensor on CN6. Is initially 0 and so does not request and update the values.

TEMP2	R	INT16	-400..1000	[0.1°C]	67

This register is periodically updated by the FPIO-Firmware if SCON2 is set to 1 with the temperature of the optional SHTB-Sensor connected to CN6. Initial value is 0, if SCON2 is not 1. If SCON1 is 1 and no sensor is connected, the register holds a non correct value, see error handling below.

TRAW2	R	INT16	-1..16383	TICs	68

The raw temperature value of the SHTB-Sensor on CN6. The value -1 is set when the sensor didn't respond on temperature request.

HUMI2	R	INT16	0..1000	[0.1%]	69

This register is periodically updated by the FPIO-Firmware if SCON2 is set to 1 with the humidity of the optional SHTB-Sensor connected to CN6. Initial value is 0, if SCON2 is not 1. If SCON1 is 1 and no sensor is connected, the register holds a non correct value, see error handling below.

HRAW2	R	INT16	-1..16383	TICs	70

The raw humidity value of the SHTB-Sensor on CN6. The value -1 is set when the sensor didn't respond on temperature request.

not yet calculated:

DWPT2	R	INT16	-1000..1000	[0.01°C]	71

The dew point of the current ambient calculated from TEMP2 and HUMI2.

not yet calculated:

MXRA2	R	INT16	0..10000	[0.01g/kg]	72

The mixing ratio of air and water of the current ambient calculated from TEMP2 and HUMI2.

ERRS2	R	INT16	0/1	boolean	73

The register to check if the communication to the SHTB-Sensor on CN6 failed. On fail holds value 1 or greater, on correct communication it is set to 0.

SEMA2	R	INT16	0/1	boolean	74

The register to check if new values are available. On new values this register is set to 1. After reading the values one can set this to 0. Wait until the value is 1 again and grab then the next values.

DIN1	R	INT16	0/1	boolean	25

This register is written by the FPIO firmware and holds the filtered RDIN1 state. The filter settings are described above and start with "L_". If 230VAC is connected to CN11 then this value is all the time 1.

DIN2	R	INT16	0/1	boolean	26

This register is written by the FPIO firmware and holds the filtered RDIN2 state. The filter settings are described above and start with "L_". If 230VAC is connected to CN12 then this value is all the time 1.

DIN3	R	INT16	0/1	boolean	27

This register is written by the FPIO firmware and holds the filtered RDIN3 state. The filter settings are described above and start with "L_". If 230VAC is connected to CN13 then this value is all the time 1.

DIN4	R	INT16	0/1	boolean	28

This register is written by the FPIO firmware and holds the filtered RDIN4 state. The filter settings are described above and start with "L_". If 230VAC is connected to CN14 then this value is all the time 1.

RDIN1	R	INT16	0/1	boolean	29

This register is written by the FPIO firmware and holds the raw state from CN11. If 230VAC is connected then the value changes from 0 to 1 and back. This happens at the rate of the AC frequency.

RDIN2	R	INT16	0/1	boolean	30

This register is written by the FPIO firmware and holds the raw state from CN12. If 230VAC is connected then the value changes from 0 to 1 and back. This happens at the rate of the AC frequency.

RDIN3	R	INT16	0/1	boolean	31

This register is written by the FPIO firmware and holds the raw state from CN13. If 230VAC is connected then the value changes from 0 to 1 and back. This happens at the rate of the AC frequency.

RDIN4	R	INT16	0/1	boolean	32

This register is written by the FPIO firmware and holds the raw state from CN14. If 230VAC is connected then the value changes from 0 to 1 and back. This happens at the rate of the AC frequency.

FIN1	R	INT16	0..250	[Hz]	33

This register is written by the FPIO firmware and holds the frequency of the connected source. If 230VAC @50Hz is connected to CN11 then this value is 50 after a short initial delay.

FIN2	R	INT16	0..250	[Hz]	34

This register is written by the FPIO firmware and holds the frequency of the connected source. If 230VAC @50Hz is connected to CN12 then this value is 50 after a short initial delay.

FIN3	R	INT16	0..250	[Hz]	35

This register is written by the FPIO firmware and holds the frequency of the connected source. If 230VAC @50Hz is connected to CN13 then this value is 50 after a short initial delay.

FIN4	R	INT16	0..250	[Hz]	36

This register is written by the FPIO firmware and holds the frequency of the connected source. If 230VAC @50Hz is connected to CN14 then this value is 50 after a short initial delay.

PIN1	R	INT32	$0..2^{31}-1$	TICs	37

This register is written by the FPIO firmware and holds the number of 0 to 1 (LoHi) transitions of the RDIN1. After reset it is 0.

PIN2	R	INT32	$0..2^{31}-1$	TICs	39

This register is written by the FPIO firmware and holds the number of 0 to 1 (LoHi) transitions of the RDIN2. After reset it is 0.

PIN3	R	INT32	$0..2^{31}-1$	TICs	41

This register is written by the FPIO firmware and holds the number of 0 to 1 (LoHi) transitions of the RDIN3. After reset it is 0.

PIN4	R	INT32	$0..2^{31}-1$	TICs	43

This register is written by the FPIO firmware and holds the number of 0 to 1 (LoHi) transitions of the RDIN4. After reset it is 0.

UIN1	R	INT16	0..1000	[0.1%]	45

This register is written by the FPIO firmware and holds the high duty cycle of CN11. The precision is reverse proportional to the input frequency.

UIN2	R	INT16	0..1000	[0.1%]	46

This register is written by the FPIO firmware and holds the high duty cycle of CN12. The precision is reverse proportional to the input frequency.

UIN3	R	INT16	0..1000	[0.1%]	47

This register is written by the FPIO firmware and holds the high duty cycle of CN13. The precision is reverse proportional to the input frequency.

UIN4	R	INT16	0..1000	[0.1%]	48

This register is written by the FPIO firmware and holds the high duty cycle of CN14. The precision is reverse proportional to the input frequency.

PHASES	R	INT16	0..132	TICs	75

This register is written by the FPIO firmware and holds the phase order of CN11, CN12 and CN13. It updates at each new pulse put to CN11. It is also the raw value for the ROTDIR register.

ROTDIR	R	INT16	0/1/2	3-states	76

This register is written by the FPIO firmware and holds the rotation direction of the three phases connected to CN11, CN12 and CN13. 0=undefined, 1=left, 2=right.

REL1	RW	INT16	0/1	boolean	49

This register is written by the master and the firmware enables or disables the relays and output CN21.

REL2	RW	INT16	0/1	boolean	50

This register is written by the master and the firmware enables or disables the relays and output CN22.

REL3	RW	INT16	0/1	boolean	51

This register is written by the master and the firmware enables or disables the relays and output CN23.

REL4	RW	INT16	0/1	boolean	52

This register is written by the master and the firmware enables or disables the relays and output CN24.

Version History

V0.01	01.07.2010	1st	version of this document, but not finished yet.
	02.07.2010	2nd	version of this document.
	21.07.2010	3rd	version of this document, little changes, View-No, Node-Address.
	28.07.2010	4th	version new registers and change of register numbers.
	06.09.2010	5th	version some corrections
	11.10.2010	6th	version some corrections