TELEFRANG AB

SIOX Local Controller S12

General Description

S12 is an I/O module with both analogue and digital inputs and outputs to handle a variety of distributed tasks. Up to 8 analogue inputs, 3 outputs and 8 configurable digital in/out are supported. The basic remote I/O operation can be enhanced by an internal multitasking programmable controller, permitting mixed or full stand-alone operation. Operating modes and scaling factors are saved in an EEPROM. Data can be sent to and from the module over the SIOX bus using 1 to 5 addresses.

I/O Mix

Analogue Inputs:	4 differential or 8 single-end 12-bit inputs, each settable as ±10 V, ±2 V, 0-20 mA, 4-20 mA, 0-20 kΩ Pot, 10 kΩ NTC or Pt100 Temperature Transducers.
Analogue Outputs:	3 AO, each 0-10 V or 2-10 V, 10 bits
Digital In/Outputs:	Each of 8 I/O is independently configurable as DI 0-35 V or DO with short-circuit check at 300 mA.

Versions: S12, SIOX Local Controller

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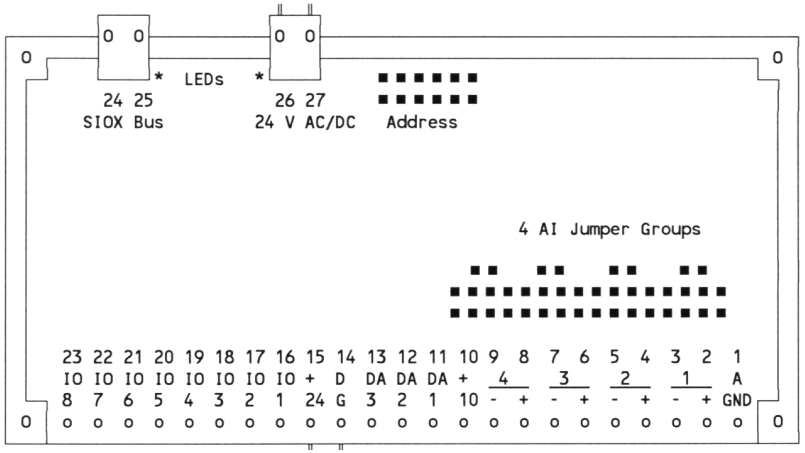
Installation and Start-Up

To get the module "up and running", all that has to be done is to connect a power supply to terminals 26 and 27 and, unless the module is preprogrammed as a stand-alone controller, connect the SIOX bus to terminals 24 and 25. Both the power and the SIOX connectors are unpolarized.



The power supply can be any AC or DC voltage of 12 - 35 VDC or 15 - 24 VAC. The module itself consumes less than 20 mA, but the digital outputs can output above 2 A together. For high-current loads it is therefore recommended to use a DC supply and connect it, correctly polarized, to terminals 14 and 15 of the 23-pole I/O-connector. This bypasses the 400 mA rectifier at terminals 26 and 27 and limits rectification ripple.

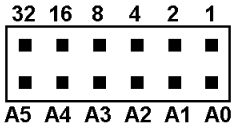
SIOX modules should be interconnected through a two-wire, low capacitance twisted pair. Shielded cables may be used but unless a correct strategy for shield grounding is adopted, it may prove to be of little benefit. The total resistance of the bus should not be higher than 2 * 50 Ω. The communication bus is opto-isolated from the rest of the module.

A variety of digital and analog I/O can be connected to terminals 1 - 23. In addition to the physical connections, the analogue inputs must be configured through hardware jumpers. Some parameters will probably have to be changed in the internal EEPROM to specify how the internal software should treat the I/O. These operation modes are described below for each type of I/O and summarized in the Parameter Setup section. Changes are brought about by Parameter Setup Strings communicated over the SIOX bus, described on page 14. Alternatively, the PC based SIOXUSER or Visual SIOX program packages permit easy access to all parameters.

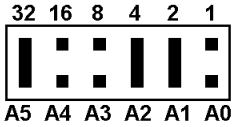
Unless otherwise requested, the module is set up at the factory to communicate at 4800 bits/s using address 01. General principles for the SIOX bus and communications are described in a separate manual, the "SIOX System Description".

Address Setup

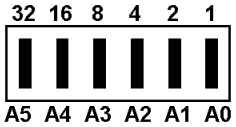
There are two ways of defining each of the 63 addresses for an S12 module, either through jumpers in the module or by the internal EEPROM in the module. The jumpers consist of six pairs of pins marked A0 - A5 and up to 6 jumper blocks. If any combination of jumper blocks except all six installed or all six removed is used at power-up, the module will choose this jumper combination as the correct address.



= 63 : Illegal, will use EEPROM definition



= 25 : Valid address (16 + 8 +1 = 25)



= 00 : Illegal, will use EEPROM definition. If the EEPROM address is 00 too, Central Mode will be selected at power-up, and the S12 acts as a bus master.

The jumper positions A0 - A5 contribute their values 1, 2, 4, 8, 16 and 32 when the corresponding jumper is removed.
All jumpers installed would generate the invalid slave address 0, and all jumpers removed would be equal to the "reserve" address 63. In this case, the module checks its internal parameter 01 for a valid address number. Should none be found, address 63 will be selected.

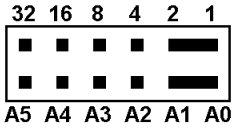
The selected address, either from the jumpers or the EEPROM, is finally saved in the RAM parameter 01 and used for all subsequent communications until this parameter is changed or a new power-up is performed.

Changing the RAM address can be done from the master or from the local PLC program in the module, but make absolutely certain to avoid collision with other modules on the bus.

A special feature is added to help recover "lost" modules, i.e. when an unknown bitrate and/or address is selected or the PLC runs a program that erroneously alters parameters affecting the communication. To recover such a module, carry out the following steps:

1. Disconnect power.

2. Remove all address jumpers except for A0 and A1 but **rotate** these two jumpers 90° from their normal position. Please refer to the figure below.



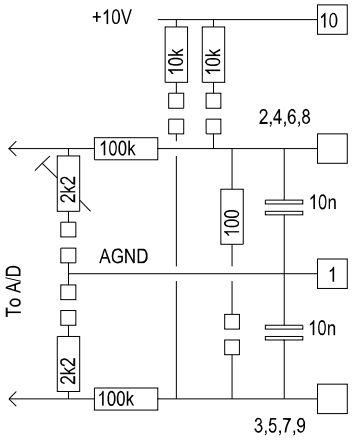
3. Apply power. The module will now communicate at 4800 bits/s using address 63 with the PLC and any options disabled.

4. Check and reconfigure the module for proper operation.

5. Restore correct jumper address.

Analogue Inputs

The analogue inputs can handle an arbitrary mix of input signals: ± 10 V, 2-10 V, ± 2 V, ± 20 mA, 4-20 mA, Pt100, NTC and potentiometer. Up to eight inputs can be connected using screw terminals 2 - 9. Terminal 1, Analogue Ground, is used in some measurements. It is connected internally to the Power GND terminal 14, but should not carry heavy currents in order to maintain accuracy.



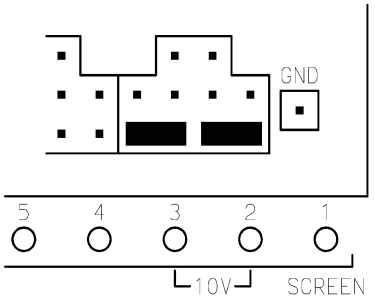
Setting up a specific mode includes selecting the right connection terminals, installing jumpers in one of four selection fields and setting the signal type in one of the parameters Ø4 - Ø7.

Below follows settings for various combinations. Terminals 1 (AGND) and 2 - 3, the first jumper selection field, and the corresponding setup parameter Ø4 are shown, but three further sections are handled identically.

Differential 10 V Mode

This mode measures positive and negative voltages between terminals 2 and 3 even when common-mode disturbances offset both terminals up to ± 80 V.

Installing the two jumpers shown divides the differential signal before measurement. In addition to the signal wires to terminals 2 and 3, any cable screen or signal grounding point for the input signal is best connected to terminal 1, Analogue Ground.



Parameter Ø4 (or Ø5-Ø7 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at ØØxx.

A -10 V signal will set the resulting data in parameter 38 to hex FØØØ and a +10 V signal will set the result hex 1ØØØ. 0 V corresponds to ØØØØ. Parameters 39, 3A and 3B contain the results for terminals 4-5, 6-7 and 8-9, respectively.

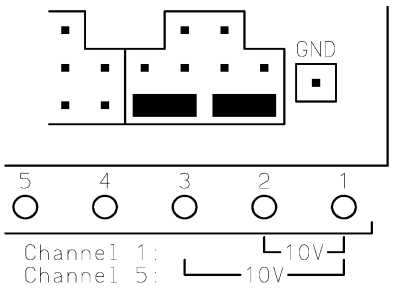
Signals in the range ±2 V can be specified by setting the parameter at 2Øxx. It is still possible to measure 10 V signals but the result will be 5 times larger.

In some applications, zero levels may be offset so that the effective measurement range is +2 V to +10 V. Such signals are measured using the parameter setting 6Øxx. 10 V will still produce the result hex 1ØØØ but the result ØØØØ is obtained at +2 V. Lower voltages produce negative results and are regarded as erroneous measurements.

Dual Single-End 10 V Mode

This mode permits two separate signal sources to be measured, one connected between terminals 2 and 1 and the other between 3 and 1. This, however, necessitates that the signal sources can share the same ground level as the S12 = Analogue Ground, terminal 1.

The same two jumpers as in differential 10 V mode shall be installed, one for either 10 V channel. Note that either channel may be jumpered and set up for an alternative single-end signal source described on the following pages.



Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at 8000.

The result will be stored in parameter 38 for channel 1 and in parameter 3C for channel 5. Results for the three other pairs are stored in parameters 39/3D, 3A/3E and 3B/3F.

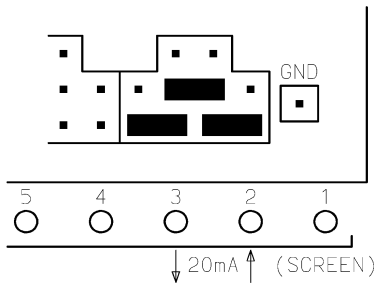
A -10 V signal will set the result data to hex F000 and a +10 V signal will set the result to hex 1000. 0 V corresponds to 0000.

Signals in the range ±2 V are specified by setting the parameter at A020.

Zero levels may be offset to create a +2 V to +10 V range by the parameter setting C040.

Differential 20 mA Mode

This mode measures bidirectional currents flowing between terminals 2 and 3 even when their voltage level differs from the S12 ground level with up to ± 80 V.



In addition to the jumpers that divide the differential inputs before measurement, another jumper connects a current measurement resistor between the input pins. In addition to the signal wires to terminals 2 and 3, any cable screen or signal grounding point for the input signal is best connected to terminal 1, Analogue Ground.

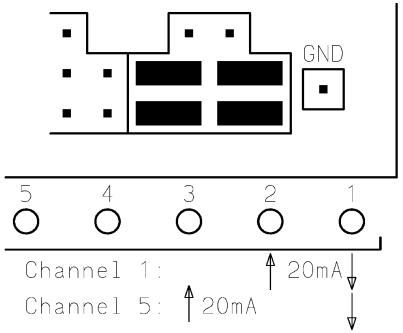
Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at 08xx.

A -20 mA signal (in at terminal 3 and out at terminal 2) will set parameter 38 result data to hex F000 and a +20 mA signal will set the result hex 1000. 0 mA corresponds to 0000.

In many applications, zero levels may be offset so that the effective measurement range is +4 mA to +20 mA. Such signals are measured using the parameter setting 48xx. 20 mA will still produce the result hex 1000 but the result 0000 is obtained at +4 mA. Lower currents produce negative results and are regarded as erroneous measurements.

Dual Single-End 20 mA Mode

This mode measures bidirectional currents flowing between terminals 2 or 3 and terminal 1 (AGND). This, however, necessitates that the signal sources can use the same ground level as the S12.



In addition to the jumpers that divide the differential signal before measurement, another two connect current measurement resistors from the input pins to ground. For maximum flexibility, either half of the terminal pair may be modified to suit another single-end input mode.

Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at 8808.

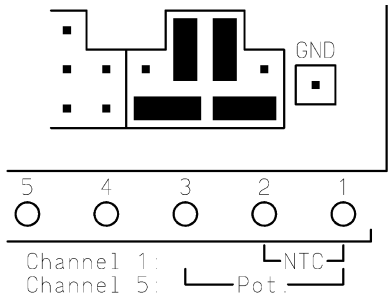
A -20 mA signal (out from terminal 2/3) will set the resulting data in parameter 38 or 3C to hex F000 and a +20 mA signal will set the result hex 1000. 0 mA corresponds to 0000.

Zero levels may be offset so that the effective measurement range is +4 mA to +20 mA by setting the parameter to C848. 20 mA will still produce the result hex 1000 but the result 0000 is obtained at +4 mA. Lower currents produce negative results and are regarded as erroneous measurements.

Dual Potentiometer/NTC Mode

This mode permits two separate resistive transducers to be measured, one connected between terminals 2 and 1 and the other between 3 and 1. An

internal 10 kΩ resistor supplied from +10 V provides the necessary measuring current for each signal. Software treats the measurement to get an output proportional to either the potentiometer value or to a NTC temperature. It is possible but of little advantage to connect one sensor in differential mode between terminals 2 and 3.



The same two jumpers as in 10 V modes are installed to decrease the input signal, one for either channel. In addition, an extra jumper for each channel connects the current source to the input pins. Connection is independent of the sensor type.

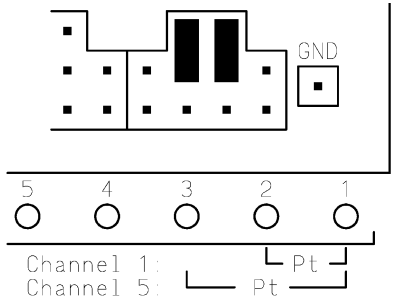
Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) is set at 9818 for two NTC transducers and at A828 for two potentiometers.

A potentiometer resistance of 0 Ω between terminals 3 and 1 will set the resulting data to hex 0000, 5 kΩ to 0400, 10 kΩ to 0800 and 20 kΩ to hex 1000. Up to 80 kΩ = 4000 can be handled but with less resolution.

A suitable NTC sensor should have a nominal resistance of 10 kΩ at 25 °C and a B value around 3900, indicating that its resistance at -25 °C is 130 kΩ and at 75 °C 1,48 kΩ. The resulting values at various temperatures is the temperature in tenths of degrees C: -25 °C = -250 = hex FF06; 25 °C = 250 = hex 00FA; 75 °C = 750 = hex 02EE. A temperature range of -50 °C to +150 °C can be read.

Dual Pt 100 (Two-Wire) Mode

This mode permits two separate resistive temperature transducers of the Pt 100 type to be measured, one connected between terminals 2 and 1 and the other between 3 and 1. An internal 10 kΩ resistor supplied from +10 V provides the necessary measuring current for each signal. Software treats the measurement to get an output proportional to the transducer temperature.



Two "vertical" jumpers are installed to supply the transducer current. In Pt100 Mode full amplification is needed and the jumpers in the bottom row shall be removed. Note that this makes the inputs more sensitive to overvoltages.

Although the inputs are well protected, adjacent channel measurements may be affected, so install these jumpers on all unused channels.

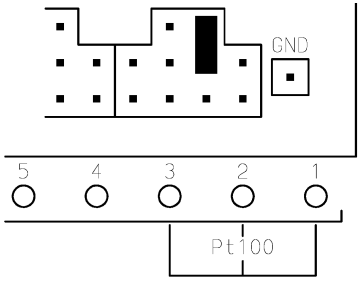
Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at 9010.

The results will be stored in parameters 38 and 3C.

The Pt 100 sensors are normalized e.g. through the DIN 43760 curve to exhibit 100 Ω at 0 °C with a change of 0,385 Ω / °C. Software linearizes the readings and present resulting values at various temperatures equal to the temperature in tenths of degrees C, e.g.: -25 °C = -250 = hex FF06; 25 °C = 250 = hex 00FA; 100 °C = 1000 = hex 03E8. A temperature range of -200 °C to +300 °C can be read.

Differential Pt 100 (Three-Wire) Mode

This mode permits one resistive temperature transducer of the Pt 100 type to be measured, connected via two wires to terminals 2 and 3. To compensate for long wires whose resistance may affect the readings, a third wire is connected to terminal 1, in effect parallel with the wire to terminal 3. An internal 10 kΩ resistor supplied from +10 V provides the necessary measuring current. Software assumes that the voltage drop in the wire to terminal 2 is identical to what it measures in wire 1 and compensates the error, in the same time linearizing the measurement to get an output proportional to the transducer temperature.



Only one jumper is installed between the top and middle rows to supply the transducer current. In Pt100 Mode full sensitivity is needed and both jumpers in the bottom row shall be removed. Note that full amplification makes the inputs more sensitive to overvoltages. Although the inputs are well protected, adjacent channel measurements may be affected, so install these jumpers on all unused channels.

Parameter 04 (or 05-07 for terminals 4-5, 6-7 and 8-9, respectively) shall be set at 10xx.

The result is stored in parameter 38 (39, 3A or 3B).

The Pt 100 sensor is normalized through the DIN 43760 curve to exhibit 100 Ω at 0 °C with a change of 0,385 Ω / °C. Software linearizes the readings and

present resulting values at various temperatures equal to the temperatures in tenths of degrees C, e.g.: -25 °C = -250 = hex FF06; 25 °C = 250 = hex 00FA; 100 °C = 1000 = hex 03E8. A temperature range of -200 °C to +300 °C can be read.

10 V Reference

The voltage used when reading resistive transducers is available on terminal 10. It can be used to supply external measuring bridges or to parallel an external resistor with the internal 10 kΩ. This simplifies using e.g. low resistance NTC sensors without affecting linearization.

Analogue Outputs

The three analogue outputs connect to terminals 11, 12 and 13, respectively, with terminal 1 or 14 as common ground. They output positive voltages between 0 V and 10 V at loads up to 5 mA. An individual control flag in the EEPROM changes this range to 2 - 10 V for either output to suit some types of proportional valves etc.

Analogue Outputs Range

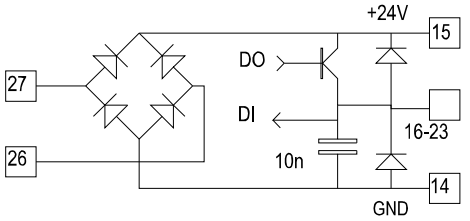
The analogue outputs reflect the current values in parameters 0C, 0D and 0E, respectively, as controlled either by SIOX communications or through the local PLC program.

Normal 12-bit AO control range, compatible with other SIOX modules, is hex 0000 to 1000 = 4097 values. However, S12 outputs accept only 1025 different values within 0 to 10 V (10-bit resolution). This means that 4 consecutive 12-bit values, e.g. 0004-0007, in one of the parameters will generate the same output voltage. (Single-byte Data Mode communications allow only 128 different voltages.)

Negative control values, hex 8000 - FFFF (or in Double Data Mode hex 2000 - 3FFF) will set the output to 0 V (or 2 V if the 2V offset is active).

Positive values hex 1000 - 7FFF will set the output to 10 V.

Digital I/O



S12 includes eight digital inputs/outputs where each signal can be individually selected as input or output. Inputs are activated when the corresponding terminal pin is pulled more than 7 V above ground. Those bits enabled as outputs use a transistor to pull the terminal pin up to the 24 V supply and can then source up to 300 mA. Note, that with a total output load above 400 mA, the rectifier from pins 26-27 can overheat. In those cases, connect a DC supply to pins 14-15 instead.

An output is enabled by setting bit number 0 - 7 in the first half of parameter 0A, after which it may be activated and cleared in register 08. Bits not enabled as outputs are not affected when setting and clearing the outputs.

An activated output is continually supervised for short-circuits, in which case this output starts pulsing until the short is removed. This avoids excessive heating of the output transistors. Note, that the check can only detect heavy shorts but not light overloads, still capable of overheating the transistor. Detected shorts are signalled as bits 15 - 8 together with activated outputs when reading parameter 08.

One register, the eight bits 7 - 0 in parameter 11 indicate which outputs that are controlled by the local PLC program, and thus shall not be affected by communications changing the outputs. These bits can be set in EEPROM when the application is defined. PLC output instructions (SET Qx, ST Qx and RES Qx) will automatically set these bits, but is readily possible that these instructions are not run immediately when starting the PLC program.

At start-up, outputs are set to the bits in the EEPROM parameter 08, until first communication or a local PLC output change is carried out.

In some applications it is necessary to turn off active outputs, should communication with the central fail. S12 uses the first half of parameter 03 to define a timeout period after last communication with the module before the outputs are to be turned off. A zero timeout period deactivates this "outputs watchdog".

All eight DIO bits, outputs and inputs alike, can be read at any time in parameter 09. Input bits can further be inverted by setting corresponding bits in parameter 0B. A software filter "debounces" all inputs, that is holds the old values until new 0/1s have been steady for a preset time. This time, from 4 ms to 1 s, is common to all inputs and is defined in the second half of parameter 03.

Inputs can also be set to maintain an active level until it has been read by either the central computer or the local PLC. This edge trigger is enabled for individual inputs in parameter 0B. One (invisible) register holds edges to be read by the central and auto-cleared after a valid parameter 09 read. A separate edge register is included in DI reads by the PLC. This flag register can be cleared by setting a flag in parameter 13 (see PLC manual).

Each DIO has a separate 16-bit pulse counter register, parameters 18 - 1F. A counter increments each time the I/O pin goes high, possibly after the preset debounce delay. The counters may at any time be preset or cleared by the PLC of through a communication from the central.

SIOX Message Transfer for S12

Data exchange with the module can be achieved using either String Mode giving read and write access to all information in the module, or Data Mode with 1 or 2 data characters from the central. In Data Mode output values may be set and inputs read using up to five different, consecutive addresses. For details about these communication types it is recommended to read the "SIOX System Description".

A Data Mode Communication transmits an output value from the central computer to the module. Parameter 00 defines the number of addresses from 1 to 5, starting with the address set in parameter 01.

If double-byte Data Mode is selected, communications to the first addresses set AO1 - AO3 and the module answers with AI1 - AI4. The values are 13-bit with sign, automatically limited to the range hex E000 - 0000 - 1FFF.
The fifth address, if permitted, communicates 14 bits to the module, the eight least significant of which are stored in parameter 08 to control DO. The answer contains parameter 09 data, the up to eight DI bits.

In single-byte Data Mode only 128 different analogue output values are possible and only 7 of the 8 digital outputs can be controlled.

A special case exists when single-byte Data Mode and only one address is available. The 128 values then select an answer from one of the 128 first parameters.

Example single data communication when S12's first address is 09:

From central (hex notation): **C9** **3F**
Address 9 AO1=4,92 V (unless scaled)

Answer from S12: **60** **0F**
AI1 value (07E0)

Double data communication:

From central: **CD** **00** **01**
Address 0D hex 80 = 8th DO

Answer from S12: **00** **01**
7 LS DIO DIO8

String Mode Communications use the same physical address as the first Data Mode address stored in parameter 01. It provides access to many other functions besides just setting and reading the I/O. The string from the central must therefore contain a parameter number from 00 -03 FF. A typical communication for setting the analogue value for channel 2, parameter 0D, in String Mode will be:

From central:

C0	**09**	**38**	**44**	**30**	**30**	**38**	**30**	**BE**	**74**
Address 9	write 0D			0	8	0	0	Sign-off/Checksum	
Set Output 2 to 0800=5 V									

Answer from S12:

31	**32**	**33**	**32**	**BE**	**79**
1	2	3	2	Sign-off/Checksum	
Value =1232 (hex)					

To permanently change the output range to 2-10 V for all three AO, a write data = 0700 to EEPROM parameter number 0F must be made:

From central:

C0	**09**	**43**	**46**	**30**	**37**	**30**	**30**	**BF**	**67**
Address 9		C	F	0	7	0	0	Sign-off/Chsm	
EEPROM write				Value 0700 (hex)					

Answer from S12:

30	**37**	**30**	**30**	**BF**	**79**
0	7	0	0	Sign-off/Checksum	
Value 0700 (hex)					

Parameter Setup

The S12 contains two types of memory: RAM for temporary storage for as long as the module is connected to a power supply, and EEPROM for long-term storage of working modes, parameters and initialization values after a power disconnect. At power-up, the EEPROM variables are automatically copied to the RAM, and the information is used to control the module.
By using String Mode commands, any variable may be read or modified at any time, either temporarily in RAM or permanently in EEPROM. In the latter case, the corresponding RAM cells are modified as well. Information in controlling parameters immediately affect the function of the module.

Below follows a description of each parameter position. All parameter values are shown in hexadecimal notation.

Pos. hex	Value hex	Function
00	8xxx	Permit New Trim Values in parameters 70 - 7F.
	4xxx	Inhibit String Text Mode, where the PLC can submit text answers, making it equal to String Setup Mode.
	2xxx	Inhibit Data Mode to prevent unwanted changes.
	1xxx	2 Data characters expected in Data Mode, permitting 14-bit output data.
	0xxx	1 Data character expected in Data Mode, with a maximum of 128 different values.
	x3xx- -x9xx	Transmission Speed 3 - 9 = 300 - 19200 bits/second. Other values are invalid and revert to 4800 bits/s. To change, a write to EEPROM must be made, followed by a power-down/power-up or a soft reset = FFFF sent to this parameter.
	xx01- -xx05	One to Five Addresses are accepted in Data Mode to handle 4 AO/AI and 1 DO/DI communications.

Pos. hex	Value hex	Function
01	8xxx	Master Flag starting communications defined in parameters 40 - 7F.
	01xx- -3Fxx	Module Slave Address 01 - 3F (1 - 63), current address jumpers, EEPROM or temporary value.
	xx8x	Spy Inhibit. The spy area will be free for general use.
	xxx2	Double Communication Safeguard When set, two identical Data Mode communications must be carried out on the fifth address before the digital outputs can change.
02	0000	Options reserved for customer specific functions.
03	TTxx	Timeout before clearing outputs if communication stops. TT = 00 = no timeout. TT = 01 to FF = timeout (250 ms - 65 s) in 250 ms steps.
	xxDD	Inputs debounce time. DD = 00 = no debounce, i.e. 1 ms. DD = 01 to FF is debounce time in 4 ms steps.
04-07	8xxx	Mode Control for AI 1-4 & 5-9. 8xxx enables two single-end inputs instead of one differential on AI 1/5, 2/6, 3/7 and 4/8, respectively.
	4xxx	2-10 V / 0,4-2 V / 4-20 mA Range for AI1-4.
	28xx	Potentiometer Linearization 0-20 kΩ for AI1-4.
	20xx	0-2 V Range for AI1-4.
	18xx	NTC Temperature Linearization -50 - +150 °C.
	10xx	Pt100 Temperature Linearization -200 - +300 °C.
	08xx	0-20 mA Range for AI1-4.
	00xx	0-10 V Range for AI1-4.

Pos. hex	Value hex	Function
	xx4x	2-10 V / 0,4-2 V / 4-20 mA Range for AI5-8.
	xx28	Potentiometer Linearization 0-20 kΩ for AI5-8.
	xx20	0-2 V Range for AI5-8.
	xx18	NTC Temperature Linearization -50 - +150 °C.
	xx10	Pt100 Temperature Linearization -200 - +300 °C.
	xx08	0-20 mA Range for AI5-8.
	xx00	0-10 V Range for AI5-8.
08	00xx- -FFxx	Short-Circuited DO. A bit set to 1 indicates that a short exists on the corresponding output bit.
	0000- -xxFF	Digital Outputs Activation of DO1-8 if permitted in parameter 0A.
09	xx00- -xxFF	Digital Inputs DI1-8; Bit value 1 = input active. The eight most significant bits are free for e.g. PLC.
0A	00xx- -FFxx	Digital Outputs Enable for DO1-8.
	xx00- -xxFF	Edge Trig Enable for DI1-8. DO bits are not affected.
0B	xx00- -xxFF	Digital Inputs Invert Enable for DI1-8, affects data in parameter 09.
0C-0E	0000- 1000	Analogue Output Control Values for AO1 - AO3. Negative values are limited to 0000, high positive values to 100.
0F	x0xx- -x7xx	Analogue Outputs Range 2 - 10 V for AO1 - 3.

Pos. hex	Value hex	Function
10		Not used in S12
11	00xx- -FFxx	PLC Controlled Outputs (also set automatically).
	xxPP	PLC Program Counter if PLC is permitted.
12	TTxx	PLC Timer Tick 1/1024-256/1024 if PLC is permitted.
	xxRR	PLC Run Flags if PLC is permitted.
13	XXXX	PLC Flag/Accumulator Bits if PLC is permitted.
14	VVVV	PLC 16-bit Accumulator if PLC is permitted.
15	TTTT	PLC 16-bit Timer if PLC is permitted.
16	E0xx- -1Fxx	Real Time Clock fine tuning.
	xx00- -xx63	Real Time Clock 10 ms counter, reset at 99*10 ms.
17	0000- -FFFF	Real Time Clock seconds counter. Setting a new value through communication also clears the 10 ms counter in parameter 16.
18-1F	0000- -FFFF	Pulse Counters for DIO 1 - 8.
20-37		Free Memory for PLC use.
38-3B	8000- -7FFF	Analogue Input Result Values for AI1-4, differential or single-end mode.
3C-3F	8000- -7FFF	Analogue Input Result Values for AI5-8, single-end mode.
40-6F		Communication Parameter Pairs for Spy or PLC use.

Pos. hex	Value hex	Function
70-77	00xx--FFxx	NTC / Potentiometer Trim Gain for AI1-8 increases the raw A/D value from 0 to 6 %.
	xx00--xxFF	Pt 100 Trim Gain for AI1-8, increases the raw A/D value from 0 to 6 %.
78/7F	00xx--FFxx	20 mA Range Trim Gain for AI1-8, increases the raw A/D value from 0 to 6 %.
78/7B	xx00--xxFF	10 V/2 V Range Trim Gain for AI1/5, 2/6, 3/7 and 4/8, increases the raw A/D value from 0 to 6 %.
7C/7E	xx00--xxFF	Trim Gain for AO1-3, increasing the output signal from 0 to 2 %.
80-FF		PLC program space (byte addresses 100 - 1FF).
100-3FF		PLC Program/Application Area, these parameters are not automatically copied from EEPROM to RAM at power-up. RAM values are protected from inadvertent changes, while EEPROM data is freely usable for PLC data logging, texts or program overlays (byte addresses 200 - 7FF).

For further information about the PLC, Spy and Master Modes, please refer to the "SIOX PROGRAMMABLE CONTROLLER" manual.

Parameter Specifics

Parameter 00, Double Data, Speed and Number of Addresses

The central computer can send messages in Data Mode using either 1 or 2 data characters. S12 can communicate in either mode as described on pages 13-14. The first hex digit in parameter 00 can be set either to 0 or 1 for 1 or 2 data characters to be sent in Data Mode. The Transmission Speed is normally 4800 bits/s. To change it, send a Setup String command setting the station's first EEPROM parameter to 9xx for 19200 bits/s; 8xx for 9600; 7xx for 4800; 6xx for 2400; 5xx for 1200; 4xx for 600 or 3xx for 300 bits/s. Note, that the speed will not change until after a power-down/power-up cycle has been carried out or a Soft Reset = FFFF in this parameter.

Parameter 00, Inhibit Data Mode

String Mode transfers are more reliable than Data Mode, and in some cases a Data Mode message could inadvertently change an output. Therefore, setting parameter 00 to 2xxx inhibits any changes by Data Mode, although a correct answer will still be returned. See also Double Comm below.

Parameter 00, Inhibit String Text

The PLC can generate String Text answers, e.g. event values. Older SIOX modules, however, accept String Text as equal to parameter accesses, so this flag permits installing S12 in older systems.

Parameter 00, Number of Addresses

In the same parameter, the number of communication addresses in Data Mode is defined. S12 can use one to five addresses, permitting access to AO/AI and DO/DI. String Mode can only make use of the first address of the two as defined in parameter 01, irrespective of the setting. Illegal values will revert to 1.

Parameter 01, Module Address

This parameter can be set to a value 01xx - 3Fxx, specifying the address to 1 - 63. At power-up the RAM parameter is preset to reflect either a valid jumper address (not 00 or 63), a valid EEPROM parameter value (not 00) or the address number 63 = 3Fxx (hex). See page 4.

Parameter 01, Double Communication

Data Mode uses only parity checking for maximum efficiency. To stop stray errors from changing an analogue or digital output, setting this flag requires new data to the outputs to be sent twice in sucession before the change is carried out.

Parameter 03, DI Debounce Time

Setting this parameter to a non-zero value eliminates noise from bouncing contacts or electrical interference which otherwise could lead to reading errors. The value set, from 0001 to 00FF, defines the decounce time from 4 ms to 1 s. A change in input level must be steady for the full time before the status bit in parameter 09 can change.

Parameters 16-17, Real Time Clock

The software controlled RTC depends on the internal CPU clock for accuracy. To optimise its speed, the first half of parameter 16 can be increased or decreased a few steps (in EEPROM for permanency). Alternatively the RTC parameter 17 may be rewritten (in RAM) at any time, which also restarts the 10ms counter (second half of parameter 16).

Any of the PLC instructions DATE (DATM...DATS) changes, when first run, parameter 16 from a 65536 seconds counter to a minutes + seconds register with a maximum value of hex 3B3B (59 minutes, 59 seconds).

Parameters 70-7F, AI/AO Trim Values

These parameters are preset from factory. To avoid inadvertent changes they can only be changed if 8xxx is set in parameter 00. Trimming can be done in RAM first and transferred to EEPROM only when improvements are achieved.

Parameters 80-FF contain a user programmable PLC program, refer to the SIOX PLC manual.

Parameters 100-3FF are not automatically copied from EEPROM to RAM at power-up.

RAM values are protected from inadvertent changes, while EEPROM data is freely usable for PLC data logging, texts or program overlays.

Assistance

on safety and technical matters is available from:

TELEFRANG AB
Victor Hasselblads Gata 9
S-421 31 V FRÖLUNDA
SWEDEN

Tel: **+46 31 40 30 60**
Fax: **+46 31 40 20 25**
E-mail: **info @telefrang.se**

Electrical Specifications (at 25°C)

	Min	Typ	Max	Unit
Supply Voltage	12	24	35	V DC
	18	20	24	V AC
Supply Current (No load)		18		mA
Analogue Input Voltage	-10		10	V
Differential Common Mode	-80		80	V
Resolution		2,5		mV
Accuracy 25 °C		¼	1	%
Analogue Voltage Output	0		10	V
Output Current			5	mA
Output Noise			60	mV_{pp}
Analogue Output Resolution		10		bits
Accuracy 25 °C		¼	1	%
Drift -20 °C to 75 °C			150	ppm/°C
Digital Input Voltage	0		35	V
Input Current		3		mA
Digital Input Activation Voltage	6	8	10	V
Digital Transistor Output Current			300	mA

Environmental Specifications

Operating Temperature	0		+55	°C
Storage Temperature	-40		+85	°C

Mechanical Specifications

Case Size	139 x 81 x 25			mm
Weight		220		g