

SIR-C

Feeder Protection and Recloser Control



DNP3.0 PROTOCOL MANUAL

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1. DNP3.0 PROTOCOL

As communication parameters are common for all the protocols, they can be adjusted on General Gettings of the relay, on the following menus:

- Rear Serial COM menu (for DNP 3.0 Serial):
 - o Protocol -
 - o Baudrate (19200 by default)
 - o Serial Setting – Parity (8-N-1 by default)
- Rear TCP COM menu (for DNP 3.0 TCP/IP)
 - o Protocol -
 - o IP: 192.168.200.100 (by default)
 - o Subnet: 255.255.255.0 (by default)
 - o Gateway: 192.168.200.1 (by default)

Inside each protocol:

- DNP3 Serial:
 - o Slave Address (3 by default)
 - o Master Address (1 by default)
- DNP3 TCP:
 - o Slave Address (3 by default)
 - o Master Address (1 by default)
 - o Port number: 20000 (by default)

In addition, the not configurable communication parameters are:

- o Unsolicited responses, number of retries: 10
- o Unsolicited responses, confirmation time: 2000 ms
- o Activity timeout for TCP connection: 5 min

1.1. Device Profile Document

DNP V3.00 DEVICE PROFILE DOCUMENT This document must be accompanied by : Implementation Table and Point List.	
Vendor Name:  FANOX Electronic, S.L.	
Device Name: SIR-C	
Highest DNP Level Supported: For Requests 2 For Responses 2	Device Function: ☐ Master ☒ Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): Objects with variations on 16-bits and objects with variations on 32-bit without flags shall not be requested. Object 2 with variation 1 shall not be requested. No data is associated to object 60 variation 4 (class 3). Unsolicited responses are supported, enabling and disabling them by using object group 60 and function code 20 (enable) or 21 (Disable). Read request for many specific objects and variations can be responded.	
Maximum Data Link Frame Size (octets): Transmitted 255 Received 255	Maximum Application Fragment Size (octets): Transmitted 217 Received 217
Maximum Data Link Re-tries: ☒ None ☐ Fixed at _____ ☐ Configurable.	Maximum Application Layer Re-tries: ☐ None ☒ Fixed at 10. ☐ Configurable
Requires Data Link Layer Confirmation: ☒ Never ☐ Always ☐ Sometimes. If 'Sometimes', when? _____ ☐ Configurable as Never, Only for multi-frame messages, or Always. Default Never	

Requires Application Layer Confirmation:

- ☐ Never
- ☐ Always (not recommended)
- ☒ **When reporting Event Data (Slave devices only)**
- ☐ When sending multi-fragment responses (Slave devices only)
- ☐ Sometimes. If 'Sometimes', when?
- ☐ Configurable as: "Only when reporting event data", or "When reporting event data or multi-fragment messages."

Timeouts while waiting for:

Data Link Confirm	☒ None	☐ Default at 5000ms	☐ Variable	☐ Configurable
Complete Appl. Fragment	☒ None	☐ Fixed at _____	☐ Variable	☐ Configurable
Application Confirm	☐ None	☒ Fixed at 2s	☐ Variable	☐ Configurable
Complete Appl. Response	☒ None	☐ Fixed at _____	☐ Variable	☐ Configurable

Others

Sends/Executes Control Operations:

WRITE Binary Outputs	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
SELECT (3) / OPERATE (4)	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE (5)	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
DIRECT OPERATE - NO ACK (6)	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
Count > 1	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Pulse On	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Pulse Off	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Latch On	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
Latch Off	☐ Never	☒ Always	☐ Sometimes	☐ Configurable
Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable
Clear Queue	☒ Never	☐ Always	☐ Sometimes	☐ Configurable

Attach explanation:

All points support the same Function Codes: Select Before Operate (SBO) and Direct Operate (DO).

All points support the same Control Codes: Latch ON, Latch OFF.

FILL OUT THE FOLLOWING ITEMS FOR SLAVE DEVICES ONLY:

Reports Binary Input Change Events when no specific variation requested:

- ☐ Never
☒ **Only time-tagged**
☐ Only non-time-tagged
☐ Configurable to send both, one or the other (attach explanation)

Reports time-tagged Binary Input Change Events when no specific variation requested:

- ☐ Never
☒ **Binary Input Change with Time**
☐ Binary Input Change with Relative Time
☐ Configurable (attach explanation)

Sends Unsolicited Responses:

- ☐ Never
☐ Configurable
☐ Only certain objects (Class 1)
☐ Sometimes (attach explanation)

☒ **ENABLE / DISABLE UNSOLICITED**
Function codes supported

Sends Static Data in Unsolicited Responses:

- ☒ **Never**
☐ When Device Restarts
☐ When Status Flags Change

No other options are permitted.

Default Counter Object/Variation:

- ☐ No Counters Reported
☐ Configurable (attach explanation)
☒ **Default Object 20**
Default Variation 01
☐ Point-by-point list attached

Counters Roll Over at:

- ☐ No Counters Reported
☐ Configurable (attach explanation)
☐ 16 Bits
☒ **32 Bits**
☐ Other Value _____
☐ Point-by-point list attached

Sends Multi-Fragment Responses: ☐ Yes ☒ No

QUICK REFERENCE FOR DNP3.0 LEVEL 2 FUNCTION CODES & QUALIFIERS

Function Codes

- 1 Read
- 2 Write
- 3 Select
- 4 Operate
- 5 Direct Operate
- 6 Direct Operate-No ACK
- 13 Cold Start
- 14 Warm Start
- 20 Enable Unsol. Messages
- 21 Disable Unsol. Messages
- 23 Delay Measurement
- 129 Response
- 130 Unsolicited Message

7 6 5 4 3 2 1 0

☐ Index Size ☐ Qualifier Code

Index Size

- 0- No Index, Packed
- 1- 1 Byte Index
- 2- 2 Byte Index
- 3- 4 Byte Index
- 4- 1 Byte Object Size
- 5- 2 Byte Object Size
- 6- 4 Byte Object Size

Qualifier Code

- 0- 8-Bit Start and Stop Indices
- 1- 16-Bit Start and Stop Indices
- 2- 32-Bit Start and Stop Indices
- 3- 8-Bit Absolute Address Ident.
- 4- 16-Bit Absolute Address Ident.
- 5- 32-Bit Absolute Address Ident.
- 6- No Range Field (All)
- 7- 8-Bit Quantity
- 8- 16-Bit Quantity
- 9- 32-Bit Quantity
- 11-(0xB) Variable array

1.2. Implementation Table

The following implementation table identifies which object groups and variations, function codes and qualifiers the device supports in both requests and responses. The *Requests* columns identify all requests that may be sent by a master, or all requests that must be parsed by an outstation. The *Response* columns identify all responses that must be parsed by a Master, or all responses that may be sent by an outstation.

In the table below, text shaded as (start-stop) indicates subset Level 3 functionality (beyond Subset Level 2).

In the table below, text shaded as (limited qty) indicates functionality beyond Subset Level 3.

OBJECT			REQUEST (BCD will parse)		RESPONSE (BCD will respond)		
Obj	Var	Description	Func Codes (dec)	Qual Codes (hex)	Func Codes (dec)	Qual Codes (hex)	Notes
1	0	Binary Input - Any variation	1 (read)	06 (no range, or all)			
1	1	Binary Input - Packed Format (Default)	1 (read)	06 (no range, or all)	129 (response)	01 (start - stop)	
1	2	Binary Input - With Flags	1 (read)	06 (no range, or all)	129 (response)	01 (start - stop)	Assigned to Class 0
2	0	Binary Input Event - Any variation	1 (read)	06 (no range, or all)			
2	2	Binary Input Event – with absolute Time (Default)	1 (read)	06 (no range, or all)	129 (response), 130 (unsolicited)	28 (index)	Assigned to Class 1.
10	0	Binary Output – Any variation	1 (read)	06 (no range, or all)			
10	2	Binary Output – Output status with flags (Default)	1 (read)	06 (no range, or all)	129 (response)	01 (start - stop)	Assigned to Class 0.
11	0	Binary Output Event – Any Variation	1 (read)	06 (no range, or all)			
11	2	Binary Output Event – Status with Time (Default)	1 (read)	06 (no range, or all)	129 (response) 130 (unsolicited)	28 (index)	Assigned to Class 1
12	1	Binary Command – Control Relay Output Block (CROB)	3 (Select) 4 (Operate) 5 (Direct Operate)	28 (index)			
20	0	Counter – Any Variation	1 (read)	06 (no range, or all)			
20	1	Counter – 32 Bit with flag (Default)	1 (read)	06 (no range, or all)	129 (response)	01 (start - stop)	Assigned to Class 0

OBJECT			REQUEST (BCD will parse)		RESPONSE (BCD will respond)		
Obj	Var	Description	Func Codes (dec)	Qual Codes (hex)	Func Codes (dec)	Qual Codes (hex)	Notes
21	0	Frozen Counter – Any Variation	1 (read)	06 (no range, or all)			
21	1	Frozen Counter – 32 Bit with flag (Default)	1 (read)	06 (no range, or all)	129 (response)	01 (start - stop)	
22	0	Counter Event – Any Variation	1 (read)	06 (no range, or all)			Assigned to Class 1
22	1	Counter Event – 32 Bit with flag (Default)	1 (read)	06 (no range, or all)	129 (response) 130 (unsolicited)	28 (index)	
30	0	Analog Input – Any Variation	1 (read)	06 (no range, or all)			
30	1	Analog Input – 32-Bit with flag (Default)	1 (read)	06 (no range, or all)	129 (response)	00 (start - stop)	Assigned to Class 0
32	0	Analog Input Event – Any variation	1 (read)	06 (no range, or all)			
32	1	Analog Input Event – 32-Bit without Time (Default)	1 (read)	06 (no range, or all)	129 (response) 130 (unsolicited)	28 (index)	Assigned to Class 2
50	1	Time and Data – Absolute time	1 (read) 2 (write)	07 (limited qty = 1)			
60	1	Class Objects – Class 0 Data	1 (read)	06 (no range, or all)			
60	2	Class Objects – Class 1 Data	1 (read)	06 (no range, or all)			
60	3	Class Objects – Class 2 Data	1 (read)	06 (no range, or all)			

1.3. Point List

1.3.1. BINARY INPUT (OBJECT 1) -> Assigned to Class 0

1.3.2. BINARY INPUT (OBJECT 1) -> Assigned to Class 1

Configurable point list is available with memory for up to 256 configurable binary inputs. We recommend configuring only the necessary binary inputs, it is not necessary to configure all 256 signals. Gaps in the configuration are accepted. Non-configured signals will report "0" value when requested.

On the following tables, default configuration is shown.

Index By default	Criteria	Point
1	MEASUREMENTS	Measurement Error
-		Net frequency 50HZ
-		Line Frequency Blocked
-		Busbar Frequency Blocked
-		VA Zero Crossing
-		VB Zero Crossing
-		VC Zero Crossing
-		VLA Zero Crossing
-		VLB Zero Crossing
-		VLC Zero Crossing
-	SELF DIAGNOSIS	Model Error
2		Hardware Error
3		Communication Error
-		Test Mode
4		Default Settings
5		Settings Error
6		Default Configuration
7		Configuration Error
-		Curves Error
8	GENERAL	General Trip
9		Ready
10		Wrong Password
-		Set Date And Time
11		Local Control
-		SER (Events) Error
-		SER Erased
12		Wrong Access
-		Settings Changed
-		Configuration Changed

-		LDP Deleted
-		SER Overflow
-		New DFR
13		Phase Trip
14		Trip Block
15		General Pickup
16		Phase A Pickup
17		Phase B Pickup
18		Phase C Pickup
19		Neutral Pickup
20		Phase A Trip
21		Phase B Trip
22		Phase C Trip
23		Neutral Trip
24		Settings Group 1
25		Settings Group 2
26		Settings Group 3
27		Settings Group 4
28		Settings Group 5
29		Settings Group 6
-		Set to False
-		Set to True
-	52	52 Startup
-		52 Error
-		52 Open
-		52 Opening Time
-		52 Opening Error
30		52 Closed
-		52 Closing Time
-		52 Closing Error
-		52 Number of Openings Alarm
-		52 I2t Alarm
-		52 Openings/Time Alarm
31	79	79 Standby
-		79 Reclose Time
-		79 Is 52 Open
-		79 Hold Time
-		79 Close Time
-		79 Reset Time

32		79 Lockout
-		79 Safe Time
33		79 Block
-		Reclose Number 1
-		Reclose Number 2
-		Reclose Number 3
-		Reclose Number 4
-	SCM	Standby
-		Wait to Open
-		Lockout
-		Wait to 79
-		Reset Time
-	SZM	Standby
-		Wait to Open
-		Wait to Close
-		Reset Time
-		Open
-		Lockout
-	25*	25 Synchrocheck
-		25 DLDB
-		25 DLLB
-		25 LLDB
-		25 LLLB
-		25 Voltage Difference
-		25 Frequency Difference
-		25 Phase Difference
-	INPUTS	Input 1
-		Input 2
-		Input 3
-		Input 4
-		Input 5
-		Input 6
-		Input 7
-		Input 8
-		Input 9
-		Input 10
-		Input 11
-	PGC	PGC Open Command
-		PGC Close Command

-		PGC 79 Block Command
-		PGC 79 Unblock Command
-		PGC Local Command
-		PGC Remote Command
-		PGC 52 A
-		PGC 52 B
-		Settings Group x1
-		Settings Group x2
-		Settings Group x4
-		PGC SZM Start
-		PGC Hot Line Tag
-		PGC 79 Enable
-		PGC 79N1 Start
-		PGC 79N2 Start
-		PGC 79N3 Start
-		PGC 79N4 Start
-		PGC DFR Start
-		PGC 50BF Start
-		PGC SOTF Start
-		PGC Thermal Image Reset
-		PGC 74TCS Coil A Continuity
-		PGC 74TCS Coil B Continuity
-		PGC Neutral Block
-		PGC Phase Block
-		PGC External Trip
-		PGC - 1
-		PGC - 2
-		PGC - 3
-		PGC - 4
-		PGC - 5
-	LEDs (*)	Alarm 01
-		Alarm 02
-		Alarm 03
-		Alarm 04
-		Alarm 05
-		Alarm 06
-		Alarm 07
-		Alarm 08
-		Logic Alarm 09

-		Logic Alarm 10
-		Logic Alarm 11
-		Logic Alarm 12
-		Logic Alarm 13
-		Logic Alarm 14
-		Logic Alarm 15
-		Logic Alarm 16
-		Logic Alarm 17
-		Logic Alarm 18
-		Logic Alarm 19
-		Logic Alarm 20
-		Logic Alarm 21
-		Logic Alarm 22
-		Logic Alarm 23
-		Logic Alarm 24
-		Logic Alarm 25
-		Logic Alarm 26
-		Logic Alarm 27
-		Logic Alarm 28
-		Logic Alarm 29
-		Logic Alarm 30
-		Logic Alarm 31
-		Logic Alarm 32
-	SHB	Phase A Block
-		Phase B Block
-		Phase C Block
34		Phase Block
-	Control LEDs	Led Local
-		Led 79
-		Led 52
-		Virtual Led 1
-		Virtual Led 2
-		Virtual Led 3
-	CLP	CLP Disable
-		52 Closed
-		52 open
-		52 Def. Open
-		Close CLP
-		Open CLP

35		CLP Activation
-	SOTF	SOTF Phase A Pickup
-		SOTF Phase B Pickup
-		SOTF Phase C Pickup
36		SOTF Pickup
-		SOTF Phase A Trip
-		SOTF Phase B Trip
-		SOTF Phase C Trip
37		SOTF Trip
-		SOTF Activation
-	50-1	50-1 Phase A Pickup
-		50-1 Phase B Pickup
-		50-1 Phase C Pickup
-		50-1 Pickup
-		50-1 Phase A Trip
-		50-1 Phase B Trip
-		50-1 Phase C Trip
-		50-1 Trip
-	50-2	50-2 Phase A Pickup
-		50-2 Phase B Pickup
-		50-2 Phase C Pickup
-		50-2 Pickup
-		50-2 Phase A Trip
-		50-2 Phase B Trip
-		50-2 Phase C Trip
-		50-2 Trip
-	67-1	67-1 Phase A Pickup
-		67-1 Phase B Pickup
-		67-1 Phase C Pickup
-		67-1 Pickup
-		67-1 Phase A Trip
-		67-1 Phase B Trip
-		67-1 Phase C Trip
-		67-1 Trip
-		67-1 Directionality Phase A
-		67-1 Directionality Phase B
-		67-1 Directionality Phase C
-	67-2	67-2 Phase A Pickup
-		67-2 Phase B Pickup

-		67-2 Phase C Pickup
-		67-2 Pickup
-		67-2 Phase A Trip
-		67-2 Phase B Trip
-		67-2 Phase C Trip
-		67-2 Trip
-		67-2 Directionality Phase A
-		67-2 Directionality Phase B
-		67-2 Directionality Phase C
-	67-3	67-3 Phase A Pickup
-		67-3 Phase B Pickup
-		67-3 Phase C Pickup
-		67-3 Pickup
-		67-3 Phase A Trip
-		67-3 Phase B Trip
-		67-3 Phase C Trip
-		67-3 Trip
-		67-3 Directionality Phase A
-		67-3 Directionality Phase B
-		67-3 Directionality Phase C
-	67-4	67-4 Phase A Pickup
-		67-4 Phase B Pickup
-		67-4 Phase C Pickup
-		67-4 Pickup
-		67-4 Phase A Trip
-		67-4 Phase B Trip
-		67-4 Phase C Trip
-		67-4 Trip
-		67-4 Directionality Phase A
-		67-4 Directionality Phase B
-		67-4 Directionality Phase C
-	50G	50G Pickup
-		50G Trip
-	50N	50N Pickup
-		50N Trip
-	67G-1	67G-1 Pickup
-		67G-1 Trip
-		67G-1 Directionality
-	67G-2	67G-2 Pickup

-		67G-2 Trip
-		67G-2 Directionality
-	67N-1	67N-1 Pickup
-		67N-1 Trip
-		67N-1 Directionality
-	67N-2	67N-2 Pickup
-		67N-2 Trip
-		67N-2 Directionality
-	67GI	67GI Pickup
-		67GI Trip
-		67GI Directionality
-	67NI	67NI Pickup
-		67NI Trip
-		67NI Directionality
-	46	46 Pickup
-		46 Trip
-	46BC	46BC Pickup
-		46BC Trip
-	49	49 Alarm
-		49 Trip
-	37	37 Phase A Pickup
-		37 Phase B Pickup
-		37 Phase C Pickup
-		37 Pickup
-		37 Phase A Trip
-		37 Phase B Trip
-		37 Phase C Trip
-		37 Trip
38	50BF	50BF Pickup
39		50BF Alarm
-	27-1	27-1 Phase A Pickup
-		27-1 Phase B Pickup
-		27-1 Phase C Pickup
-		27-1 Pickup
-		27-1 Phase A Trip
-		27-1 Phase B Trip
-		27-1 Phase C Trip
-		27-1 Trip
-		27-1 Phase AB Trip
-		

-		27-1 Phase BC Trip
-		27-1 Phase CA Trip
-	27-2	27-2 Phase A Pickup
-		27-2 Phase B Pickup
-		27-2 Phase C Pickup
-		27-2 Pickup
-		27-2 Phase A Trip
-		27-2 Phase B Trip
-		27-2 Phase C Trip
-		27-2 Trip
-		27-2 Phase AB Trip
-		27-2 Phase BC Trip
-		27-2 Phase CA Trip
-	27L*	27L Pickup
-		27L Trip
-	27V1	27V1 Pickup
-		27V1 Trip
-	27V1-L*	27V1-L Pickup
-		27V1-L Trip
-	59-1	59-1 Phase A Pickup
-		59-1 Phase B Pickup
-		59-1 Phase C Pickup
-		59-1 Pickup
-		59-1 Phase A Trip
-		59-1 Phase B Trip
-		59-1 Phase C Trip
-		59-1 Trip
		59-1 AB Trip
		59-1 BC Trip
		59-1 CA Trip
-	59-2	59-2 Phase A Pickup
-		59-2 Phase B Pickup
-		59-2 Phase C Pickup
-		59-2 Pickup
-		59-2 Phase A Trip
-		59-2 Phase B Trip
-		59-2 Phase C Trip
-		59-2 Trip
		59-2 AB Trip

		59-2 BC Trip
		59-2 CA Trip
-	59-L*	59-L Pickup
-		59-L Trip
-	59N-L*	59N-L Pickup
-		59N-L Trip
-	59N-1	59N-1 Pickup
-		59N-1 Trip
-	59N-2	59N-2 Pickup
-		59N-2 Trip
-	47	47 Pickup
-		47 Trip
-	47-L*	47-L Pickup
-		47-L Trip
-	32-1	32-1 Phase A Pickup
-		32-1 Phase B Pickup
-		32-1 Phase C Pickup
-		32-1 Pickup
-		32-1 Phase A Trip
-		32-1 Phase B Trip
-		32-1 Phase C Trip
-		32-1 Trip
-	32-2	32-2 Phase A Pickup
-		32-2 Phase B Pickup
-		32-2 Phase C Pickup
-		32-2 Pickup
-		32-2 Phase A Trip
-		32-2 Phase B Trip
-		32-2 Phase C Trip
-		32-2 Trip
-	32-3	32-3 Phase A Pickup
-		32-3 Phase B Pickup
-		32-3 Phase C Pickup
-		32-3 Pickup
-		32-3 Phase A Trip
-		32-3 Phase B Trip
-		32-3 Phase C Trip
-		32-3 Trip
-	32-4	32-4 Phase A Pickup

-		32-4 Phase B Pickup
-		32-4 Phase C Pickup
-		32-4 Pickup
-		32-4 Phase A Trip
-		32-4 Phase B Trip
-		32-4 Phase C Trip
-		32-4 Trip
-	81-1	81-1 Pickup
-		81-1 Trip
-	81-2	81-2 Pickup
-		81-2 Trip
-	81-3	81-3 Pickup
-		81-3 Trip
-	81-4	81-4 Pickup
-		81-4 Trip
-	81-5	81-5 Pickup
-		81-5 Trip
-	81-6	81-6 Pickup
-		81-6 Trip
-	81R-1	81R-1 Pickup
-		81R-1 Trip
-	81R-2	81R-2 Pickup
-		81R-2 Trip
-	78	78 Trip
40	74TCS	74TCS Pickup
41		74TCS Alarm
42	60CTS	60CTS Pickup
43		60CTS Alarm
44	60VTS	60VTS Pickup
-		60VTS Phase A Alarm
-		60VTS Phase B Alarm
-		60VTS Phase C Alarm
45		60VTS Alarm
-	HMI	HMI 52 Open Command
-		HMI 52 Close Command
-		HMI 79 Block Command
-		HMI 79 Unblock Command
-		HMI Local Control Command
-		HMI Remote Control Command

-		HMI Reset
-		HMI Reset Thermal Image
-		HMI Hot Line Tag ON
-		HMI Hot Line Tag OFF
-		HMI User Command 1
-		HMI User Command 2
-		HMI User Command 3
-		HMI User Command 4
-		HMI User Command 5
-		HMI User Command 6
-		HMI Set Counter
-		HMI Key Reset
-		HMI Activity
46		HMI Identification
-		HMI Test State
-	USB COM	USB 52 Open Command
-		USB 52 Close Command
-		USB 79 Block Command
-		USB 79 Unblock Command
-		USB Local Control Command
-		USB Remote Control Command
-		USB Reset
-		USB Reset Thermal Image
		USB Hot Line Tag ON
		USB Hot Line Tag OFF
		USB User Command 1
		USB User Command 2
		USB User Command 3
		USB User Command 4
		USB User Command 5
		USB User Command 6
-		USB Set Counter
-		USB Activity
47		USB Identification
-	Modbus RTU	Modbus RTU 52 Open Command
-		Modbus RTU 52 Close Command
-		Modbus RTU 79 Block Command
-		Modbus RTU 79 Unblock Command
-		Modbus RTU Local Control Command

-		Modbus RTU Remote Control Command
-		Modbus RTU Reset
-		Modbus RTU Reset Thermal Image
		Modbus RTU Hot Line Tag ON
		Modbus RTU Hot Line Tag OFF
		Modbus RTU User Command 1
		Modbus RTU User Command 2
		Modbus RTU User Command 3
		Modbus RTU User Command 4
		Modbus RTU User Command 5
		Modbus RTU User Command 6
-		Modbus RTU Set Counter
-		Modbus RTU Activity
-		Modbus RTU Identification
-	DNP3 Serial	DNP3 52 Open Command
-		DNP3 52 Close Command
-		DNP3 79 Block Command
-		DNP3 79 Unblock Command
-		DNP3 Local Control Command
-		DNP3 Remote Control Command
-		DNP3 Reset
-		DNP3 Reset Thermal Image
		DNP3 Hot Line Tag ON
		DNP3 Hot Line Tag OFF
		DNP3 User Command 1
		DNP3 User Command 2
		DNP3 User Command 3
		DNP3 User Command 4
		DNP3 User Command 5
		DNP3 User Command 6
-		DNP3 Activity
-	IEC60870-5-103 Serial	IEC103 52 Open Command
-		IEC103 52 Close Command
-		IEC103 79 Block Command
-		IEC103 79 Unblock Command
-		IEC103 Local Control Command
-		IEC103 Remote Control Command
-		IEC103 Reset
-		IEC103 Reset Thermal Image

-		IEC103 Activity
-	Modbus TCP	Modbus TCP 52 Open Command
-		Modbus TCP 52 Close Command
-		Modbus TCP 79 Block Command
-		Modbus TCP 79 Unblock Command
-		Modbus TCP Local Control Command
-		Modbus TCP Remote Control Command
-		Modbus TCP Reset
-		Modbus TCP Reset Thermal Image
		Modbus TCP Hot Line Tag ON
		Modbus TCP Hot Line Tag OFF
		Modbus TCP User Command 1
		Modbus TCP User Command 2
		Modbus TCP User Command 3
		Modbus TCP User Command 4
		Modbus TCP User Command 5
		Modbus TCP User Command 6
-		Modbus TCP Set Counter
-		Modbus TCP Activity
-		Modbus TCP Identification
-	DNP3 TCP	DNP3 TCP 52 Open Command
-		DNP3 TCP 52 Close Command
-		DNP3 TCP 79 Block Command
-		DNP3 TCP 79 Unblock Command
-		DNP3 TCP Local Control Command
-		DNP3 TCP Remote Control Command
-		DNP3 TCP Reset
-		DNP3 TCP Reset Thermal Image
		DNP3 TCP Hot Line Tag ON
		DNP3 TCP Hot Line Tag OFF
		DNP3 TCP User Command 1
		DNP3 TCP User Command 2
		DNP3 TCP User Command 3
		DNP3 TCP User Command 4
		DNP3 TCP User Command 5
		DNP3 TCP User Command 6
-		DNP3 TCP Activity
-	IEC 104	IEC104 52 Open Command
-		IEC104 52 Close Command

-		IEC104 79 Block Command
-		IEC104 79 Unblock Command
-		IEC104 Local Control Command
-		IEC104 Remote Control Command
-		IEC104 Reset
-		IEC104 Reset Thermal Image
		IEC104 Hot Line Tag ON
		IEC104 Hot Line Tag OFF
		IEC104 User Command 1
		IEC104 User Command 2
		IEC104 User Command 3
		IEC104 User Command 4
		IEC104 User Command 5
		IEC104 User Command 6
-		IEC104 Activity
-	Web Server	Web 52 Open Command
-		Web 52 Close Command
-		Web 79 Block Command
-		Web 79 Unblock Command
-		Web Local Control Command
-		Web Remote Control Command
-		Web Reset
-		Web Reset Thermal Image
		Web Hot Line Tag ON
		Web Hot Line Tag OFF
		Web User Command 1
		Web User Command 2
		Web User Command 3
		Web User Command 4
		Web User Command 5
		Web User Command 6
-		Web Identification
-		Web Activity

(*) Depending on the model.

1.3.3. BINARY OUTPUT (OBJECT 10) -> Assigned to Class 0.

1.3.4. BINARY OUTPUT CHANGE (OBJECT 11) -> Assigned to Class 1.

Index	SIR-C
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5

1.3.5. ANALOG INPUT (OBJECT 30) -> Assigned to Class 0.

1.3.6. ANALOG INPUT CHANGE (OBJECT 32) -> Assigned to Class 2.

Configurable point list is available with memory for 32 configurable analog inputs. We recommend configuring only the necessary analog inputs, it is not necessary to configure all 32 signals. Gaps in the configuration are accepted.

On the following tables, default configuration is shown

	Criteria
1	Phase A current IA
2	Phase B current IB
3	Phase C current IC
4	Neutral current IN
5	Phase A Voltage VA
6	Phase B Voltage VB
7	Phase C Voltage VC
8	Phase N Voltage 3V0
9	Line Phase A Voltage VLA
10	Line Phase A Voltage VLB
-	Line Phase A Voltage VLC
-	Line Phase N Voltage 3VL0
-	Phase A second harmonic current IA-2H
-	Phase B second harmonic current IB-2H
-	Phase C second harmonic current IC-2H
-	3I-0
-	Positive sequence current I-1
-	Negative sequence current I-2
-	I-2/I-1
-	Maximum phase current IMAx
-	Positive phase sequence voltage V-1
-	Negative phase sequence voltage V-2

-	Positive line sequence voltage VL-1
-	Negative line sequence voltage VL-2
-	Phase UAB Voltage UAB
-	Phase UBC Voltage UBC
-	Phase UCA Voltage UCA
-	Maximun Phase Voltage V-Max
-	Maximun Line Voltage VL-Max
-	Total Active Power P-3P
-	Total Reactive Power Q-3P
-	Total Apparent Power S-3P
	cosPhi
-	Phase A Active Power PA
-	Phase A Reactive Power QA
-	Phase A Apparent Power SA
	cosPhi A
-	Phase B Active Power PB
-	Phase B Reactive Power QB
-	Phase B Apparent Power SB
	cosPhi B
-	Phase C Active Power PC
-	Phase C Reactive Power QC
-	Phase C Apparent Power SC
	cosPhi C
-	Bar frequency
-	Line frequency
-	df/dt
-	Ang IA
-	Ang IB
-	Ang IC
-	Ang IN
-	Ang 3I0
-	Ang VA
-	Ang VB
-	Ang VC
-	Ang 3V0
-	Ang VLA
-	Ang VLB
-	Ang VLC
-	Ang 3VL0
-	Ang UAB
-	Ang UBC
-	Ang UCA
-	Thermal Image

Measurements are in primary values with a scalefactor of 100.

i.e. A current measurement of 2A in secondary with a RT=20 will be shown as:

$$2 \times 20 \times 100 = 4000$$

The DeadBand of the measurements is adjustable by General settings, on the Measurements menu and it is the per unit of the Nominal Current or Voltage.

i.e. If $I_n = 1A$ and the deadband is adjusted to 0.1, then:

$$0.1 \times 1A = 0.1A \text{ (100mA)}$$

The measurement will be reported by event when it changes more than 100 mA and if the $I_n = 5A$, the deadband will be $0.1 \times 5A = 0.5$ (500mA), the measurement will be reported by event when it changes more than 500 mA.

1.3.7. COUNTER (OBJECT 20) -> Assigned to Class 0.

1.3.8. COUNTER EVENT (OBJECT 22) -> Assigned to Class 1.

1.3.9. FROZEN COUNTER (OBJECT 21)

Index	Description	Event Deadband
0	Openings Number	1
1	Recloses Number	1
2	Accumulated Amperes	1
3	AE+	100.000
4	AE-	100.000
5	RE+	100.000
6	RE-	100.000

1.3.10. CONTROL RELAY OUTPUT BLOCK (OBJECT 12)

Note: when the relay is in local control mode, for safety reasons, it is not possible to put it in remote mode through remote communications.

Description	Point number
Open Breaker Command	0 (ON)
Closing Breaker Command	0 (OFF)
79 Block Command	1 (ON)
79 Unblock Command	1 (OFF)
Local Control	2 (ON)
Remote Control	2 (OFF)
Reset Command	3 (ON)
Thermal Image Command	4 (ON)
Hot Line Tag ON	5 (ON)
Hot Line Tag OFF	5 (OFF)
User Command 1	6 (ON)
User Command 2	6 (OFF)
User Command 3	7 (ON)
User Command 4	7 (OFF)
User Command 5	8 (ON)
User Command 6	8 (OFF)

1.4. Example of Time and Date synchronization

Unix time is a system for describing a point in time. It is the number of milliseconds that have elapsed since 00:00:00 Thursday, 1 January 1970.

Example of date:

07/15/2019 @ 08:58:35 am (UTC)

Is equivalent to:

1563173915 in seconds → 1563173915000 in milliseconds → 016B F46D 0978 in HEX

This date shall be sent inside the frame as follows (less to more significant octet):

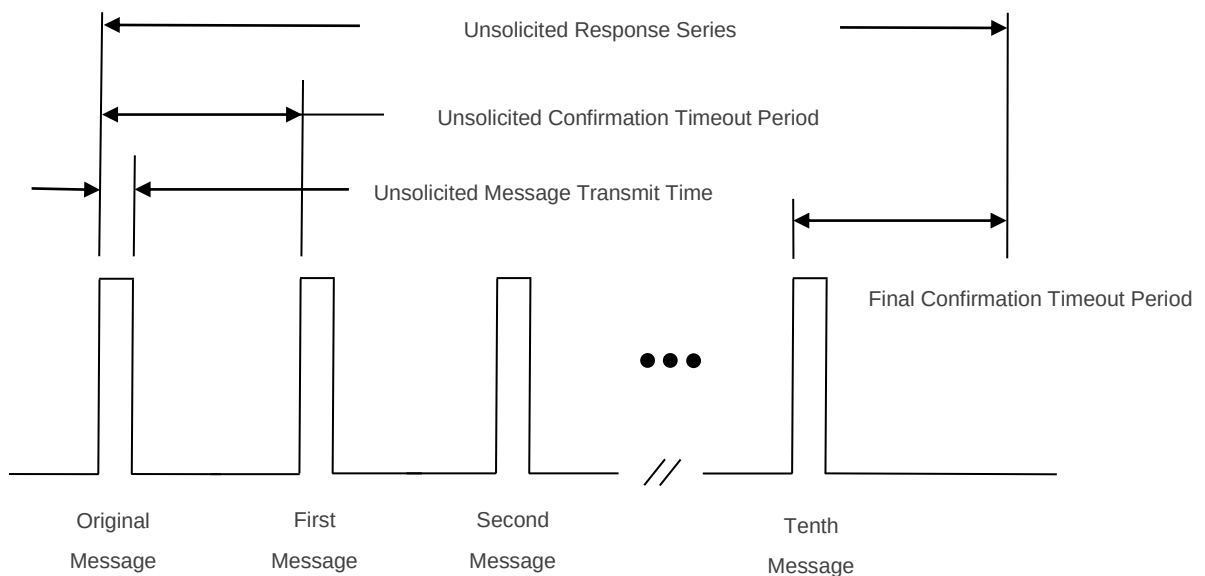
78 09 6D F4 6B 01

1.5. Unsolicited Responses

Unsolicited responses are messages spontaneously sent from SIR-C without a specific request from a master station when something of significance occurs.

The SIR-C relay supports the functions code 29 (Enable Unsolicited Responses) and 30 (Disable Unsolicited Responses). The SIR-C default configuration has the unsolicited responses disable, if the user wants to start using these messages must perform the function code 29. After the function code 29 is sent, the user must open the communication port. This communication port is set to 20000 as default.

The unsolicited responses behavior follows the procedure described in the standard and it is illustrated in the following diagram:



After the original message is sent, the relay waits two seconds for the master confirmation, this time is shown as the *Unsolicited Confirmation Timeout Period* in the figure. If the relay does not receive any confirmation from the master, then the relay replies the original message in a series of ten messages.

All the Binary Inputs, Outputs and Counter changes described previously in this document are available to be sent in an Unsolicited Response message.

The measurements sent via Analog Input objects are available to be sent in an Unsolicited response considering the deadband variation previously explained in this document regarding the specific data object (Current and Voltage).



Bizkaia Technology Park

Building, 604

Derio, 48160 Bizkaia SPAIN

T. +34 94 471 14 09

fanox@fanox.com

www.fanox.com