

SIEMENS

SIPROTEC Compact Feeder Protection and Recloser Con- troller 7SC80

Communication Module
DNP3 TCP

Bus Mapping/Point Lists

Preface

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NOTE

For your own safety, please observe the warnings and safety instructions contained in this document.

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Preface

Purpose of this manual

This manual describes the bus mapping of SIPROTEC 4 Communication Module with DNP3 TCP.

Target group

Protection engineers, commissioning engineers, persons who are involved in setting, testing and service of protection, automation, and control devices, as well as operation personnel in electrical plants and power stations.

Scope of validity of this manual

This manual is valid for SIPROTEC 4 Communication Module with DNP3 TCP.

Further support

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, the matter should be referred to the local Siemens representative.

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Notes On Safety

This manual does not constitute a complete catalog of all safety measures required for operating the equipment (module, device) in question, because special operating conditions may require additional measures. However, it does contain notes that must be adhered to for your own personal safety and to avoid damage to property. These notes are highlighted with a warning triangle and different keywords indicating different degrees of danger.



DANGER

DANGER means that death or severe injury **will** occur if the appropriate safety measures are not taken.

- ✧ Follow all advice instructions to prevent death or severe injury.
-



WARNING

WARNING means that death or severe injury **can** occur if the appropriate safety measures are not taken.

- ✧ Follow all advice instructions to prevent death or severe injury.
-



CAUTION

CAUTION means that minor or moderate injury **can** occur if the appropriate safety measures are not taken.

- ✧ Follow all advice instructions to prevent minor injury.
-

NOTICE

NOTICE means that damage to property **can** occur if the appropriate safety measures are not taken.

- ✧ Follow all advice instructions to prevent damage to property.
-



NOTE

It is important information about the product, the handling of the product, or the part of the documentation in question to which special attention must be paid.

Qualified Personnel

Commissioning and operation of the equipment (module, device) described in this manual must be performed by qualified personnel only. As used in the safety notes contained in this manual, qualified personnel are those persons who are authorized to commission, release, ground and tag devices, systems, and electrical circuits in accordance with safety standards.

Use as Prescribed

The equipment (device, module) must not be used for any other purposes than those described in the Catalog and the Technical Description. If it is used together with third-party devices and components, these must be recommended or approved by Siemens.

Correct and safe operation of the product requires adequate transportation, storage, installation, and mounting as well as appropriate use and maintenance.

During the operation of electrical equipment, it is unavoidable that certain parts of this equipment will carry dangerous voltages. Severe injury or damage to property can occur if the appropriate measures are not taken:

- Before making any connections at all, ground the equipment at the PE terminal.
- Hazardous voltages can be present on all switching components connected to the power supply.
- Even after the supply voltage has been disconnected, hazardous voltages can still be present in the equipment (capacitor storage).
- Equipment with current transformer circuits must not be operated while open.
- The limit values indicated in the manual or the operating instructions must not be exceeded; this also refers to testing and commissioning

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1 DNP3 TCP Device Profile

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**Note**

Further information see in the SIPROTEC 4 document Communication Module DNP3 TCP - Communication Profile, order number C53000-L2040-C354 or in Internet http://siemens.siprotec.de/download_neu/index_e.htm.

1.1 Data Objects Implementation

The following table identifies which object variations, function codes and qualifiers the DNP3 TCP implementation of the Feeder Protection and Recloser Controller 7SC80 will support in both request messages and in response messages.

For static (non-change-event) objects, requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01.

Requests sent with qualifiers 17 or 28 will be responded with qualifiers 17 or 28.

For change-event objects, qualifiers 17 or 28 are always responded.

Table 1-1 DNP3 TCP implementation table

| Objects | | | Request | | Response | |
|------------|----------|--------------------------------------|---|--|-------------------------------------|---------------------------------------|
| Object No. | Var. No. | Description | Function Codes (dec) | Qualifier Codes (hex) | Function Codes (dec) | Qualifier Codes (hex) |
| 1 | 0 | Binary Input - Any Variations | 1 (read) | 00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index) | | |
| 1 | 2 | Binary Input with Status | 1 (read) | 00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index) | 129 (response) | 00, 01 (start-stop) 17, 28 (index) |
| 2 | 0 | Binary Input Change - Any Variations | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | | |
| 2 | 2 | Binary Input Change with Time | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | 129 (response) 130 (unsol. resp) | 17, 28 (index) |
| 10 | 0 | Binary Output - Any Variations | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | | |
| 10 | 2 | Binary Output with Status | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | 129 (response) | 00, 01 (start-stop) 17, 28 (index) |
| 12 | 1 | Control Relay Output Block | 3 (select) 4 (operate) 5 (direct op.) 6 (dir. op. noack) | 17, 28 (index) | 129 (response) | echo of response |

Table 1-1 DNP3 TCP implementation table (Forts.)

| Objects | | | Request | | Response | |
|------------|----------|--|---|--|-------------------------------------|---------------------------------------|
| Object No. | Var. No. | Description | Function Codes (dec) | Qualifier Codes (hex) | Function Codes (dec) | Qualifier Codes (hex) |
| 20 | 0 | Binary Counter - Any Variations | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | | |
| 20 | 1 | 32-bit Binary Counter (with Flag) | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | 129 (response) | 00, 01 (start-stop) 17, 28 (index) |
| 22 | 0 | Counter Change Event - Any Variations | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | | |
| 22 | 1 | 32-bit Counter Change Event without Time | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | 129 (response) 130 (unsol. resp) | 17, 28 (index) |
| 30 | 0 | Analog Input - Any Variations (default variation = 2) | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | | |
| 30 | 1 | 32-bit Analog Input (used for 32-Bit statistic values) | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | 129 (response) | 00, 01 (start-stop) 17, 28 (index) |
| 30 | 2 | 16-bit Analog Input (used for measured values) | 1 (read) | 00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qfy) 17, 28 (index) | 129 (response) | 00, 01 (start-stop) 17, 28 (index) |
| 32 | 0 | Analog Change Event - Any Variations (default = 2) | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | | |
| 32 | 1 | 32-bit Analog Change Event without Time | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | 129 (response) 130 (unsol. resp) | 17, 28 (index) |
| 32 | 2 | 16-bit Analog Change Event without Time | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | 129 (response) 130 (unsol. resp) | 17, 28 (index) |
| 41 | 3 | Short Float Analog Output Block | 3 (select) 4 (operate) 5 (direct op.) 6 (dir. op. noack) | 17, 28 (index) | 129 (response) | echo of response |
| 50 | 1 | Time and Date | 1 (read) | 07 (limited qfy = 1) | 129 (response) | 07 (limited qfy = 1) |
| | | | 2 (write) | 07 (limited qfy = 1) | | |
| 60 | 1 | Class 0 Data | 1 (read) | 06 (no range, or all) | | |
| 60 | 2 | Class 1 Data | 1 (read) | 06 (no range, or all) 07, 08 (limited qfy) | | |

1.1 Data Objects Implementation

Table 1-1 DNP3 TCP implementation table (Forts.)

| Objects | | | Request | | Response | |
|------------|----------|----------------------|--------------------------|---|-------------------------------------|-----------------------|
| Object No. | Var. No. | Description | Function Codes (dec) | Qualifier Codes (hex) | Function Codes (dec) | Qualifier Codes (hex) |
| 60 | 3 | Class 2 Data | 1 (read) | 06 (no range, or all) 07, 08 (limited qty) | | |
| 60 | 4 | Class 3 Data | 1 (read) | 06 (no range, or all) 07, 08 (limited qty) | | |
| 70 | 3 | File Command | 25 (open) | 5b (free format) | | |
| 70 | 4 | File Command Status | 26 (close) 30 (abort) | 5b (free format) | 129 (response) 130 (unsol. resp) | 5B (free format) |
| 70 | 5 | File Transfer | 1 (read) | 5b (free format) | 129 (response) 130 (unsol. resp) | 5B (free format) |
| 70 | 6 | File Transfer Status | | | 129 (response) 130 (unsol. resp) | 5B (free format) |
| 70 | 7 | File Descriptor | 28 (get file info) | 5b (free format) | 129 (response) 130 (unsol. resp) | 5B (free format) |
| 80 | 1 | Internal Indications | 2 (write) | 00 (start-stop) (index must = 4 or 7) | | |

1.2 DNP3 TCP Device Profile Documents

| DNP3 TCP | |
|--|--|
| DEVICE PROFILE DOCUMENT | |
| Vendor Name: SIEMENS AG | |
| Device Name: 7SC80 | |
| Highest DNP Level Supported: For Requests Level 2 For Responses Level 2 | Device Function: <input type="checkbox"/> Master <input checked="" type="checkbox"/> Slave |
| <p>Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):</p> <p>For static (non-change-event) object requests, request qualifier codes 07 and 08 (limited quantity), and 17 and 28 (index) are supported. Static object requests sent with qualifiers 07, or 08, will be responded with qualifiers 00 or 01.</p> <p>16-bit and 32-bit Analog Change Events without Time may be requested.</p> <p>Sequential file transfer, Object 70, variations 3 through 7, are supported.</p> | |
| Maximum Data Link Frame Size (octets): Transmitted: 292 Received: 292 | Maximum Application Fragment Size (octets): Transmitted: 2048 Received: 2048 |
| Maximum Data Link Re-tries: <input type="checkbox"/> None <input checked="" type="checkbox"/> Fixed to 3 <input type="checkbox"/> Configurable from 0 to 65535 | Maximum Application Layer Re-tries: <input checked="" type="checkbox"/> None <input type="checkbox"/> Configurable |
| Requires Data Link Layer Confirmation: <input checked="" type="checkbox"/> Never <input type="checkbox"/> Always <input type="checkbox"/> Sometimes Configurable | |
| Requires Application Layer Confirmation: <input type="checkbox"/> Never <input type="checkbox"/> Always <input checked="" type="checkbox"/> When reporting Event Data (Slave devices only) <input checked="" type="checkbox"/> When sending multi-fragment responses (Slave devices only) <input type="checkbox"/> Sometimes <input type="checkbox"/> Configurable | |

DNP3 TCP

DEVICE PROFILE DOCUMENT

Timeouts while waiting for:

| | | | | |
|-------------------------|--|--|-----------------------------------|--|
| Data Link Confirm | <input type="checkbox"/> None | <input checked="" type="checkbox"/> Fixed at 2 s | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |
| Complete Appl. Fragment | <input checked="" type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |
| Application Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable (default: 5 s) |
| Complete Appl. Response | <input checked="" type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |

Others:

Transmission Delay:no intentional delay

Select/Operate Timeout:configurable (default: 3 s)

Need Time Interval:fixed to 60 s

Unsolicited Notification Delay:configurable (default: 5 s)

Unsolicited Response Retry Delay:configurable (default: 10 s)

Unsolicited Response Trigger Conditions:

Number of Class 1 events: Configurable, range 1 to 1 000 (default 5)

Number of Class 2 events: Configurable, range 1 to 1 000 (default 5)

Number of Class 3 events: Configurable, range 1 to 1 000 (default 5)

Hold time after Class 1 Events: : Configurable, range 1 ms to 36 000 ms (default 5 000 ms)

Hold time after Class 2 Events: : Configurable, range 1 ms to 36 000 ms (default 5 000 ms)

Hold time after Class 3 Events: : Configurable, range 1 ms to 36 000 ms (default 5 000 ms)

Time Synchronisation:

Maximum Time Base Drift ((milliseconds per minute): 10ms

Maximum Internal Time Reference Error when set via DNP: 10ms

Maximum Delay Measurement Error: 10 ms

Maximum Response Time: 20 ms

Maximum Event Time-tag error: 5 ms

When does outstation set IIN1.4: - Assorted at start up until first Time Synchronisation request received
- Periodically, every 60 s

DNP3 TCP

DEVICE PROFILE DOCUMENT

Sends/Executes Control Operations:

| | | | | |
|-------------------------|---|--|------------------------------------|---------------------------------------|
| WRITE Binary Outputs | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| SELECT/OPERATE | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| DIRECT OPERATE | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| DIRECT OPERATE - NO ACK | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Count > 1 | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Pulse On | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Pulse Off | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Latch On | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Latch Off | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Clear Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |

Note:

CONTROL RELAY OUTPUT BLOCK parameters (count, on-time, off-time) are ignored.

Reports Binary Input Change Events when no specific variation requested:

- Never
- Only time-tagged
- Only non-time-tagged
- Configurable to send one or the other

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

DNP3 TCP

DEVICE PROFILE DOCUMENT

Sends Unsolicited Responses:

- Never
 Configurable
 Only certain objects
 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
 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

Analog Inputs

How Deadbands are set

- Global Fixed
 Configurable through DNP
 Configurable via DIGSI

Analog Deadband Algorithm

- Simple
 Integrating
 Other

DNP3 TCP

DEVICE PROFILE DOCUMENT

Sends Multi-Fragment Responses:

- Yes
 No
 Configurable

| | | |
|------------------------------------|------------------------------|--|
| DNP3 Source Address Validation | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Support Collision Avoidance | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Support multi-drop physical layers | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

Sequential File Transfer Support:

| | | |
|-------------------------------|---|--|
| Append File Mode | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Custom Status Code Strings | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Permissions Field | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| File Events Assigned to Class | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| File Events Send Immediately | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Multiple Blocks in a Fragment | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Max Number of Files | 1 | |

2 Point Lists

| | | |
|-----|--|----|
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2.1 Binary Input Points

| Binary Input Points | | | |
|--|------------------|--|-------|
| Static (Steady-State) Object Number: 1 | | | |
| Change Event Object Number: 2 | | | |
| Request Function Codes supported: 1 (read) | | | |
| Static Variation reported when variation 0 requested: 1 (Binary Input with Status) | | | |
| Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time) | | | |
| Point Index | Name | Description | Class |
| Overcurrent Time Protection | | | |
| 0 | 50/51 PH ACT | 50/51 O/C is ACTIVE; ON = 1, OFF = 0 | 3 |
| 1 | 50N/51N ACT | 50N/51N is ACTIVE; ON = 1, OFF = 0 | 3 |
| 2 | 50(N)/51(N) PU | 50(N)/51(N) O/C PICKUP; ON = 1, OFF = 0 | 2 |
| 3 | 50/51 Ph A PU | 50/51 Phase A picked up; ON = 1, OFF = 0 | 2 |
| 4 | 50/51 Ph B PU | 50/51 Phase B picked up; ON = 1, OFF = 0 | 2 |
| 5 | 50/51 Ph C PU | 50/51 Phase C picked up; ON = 1, OFF = 0 | 2 |
| 6 | 50N/51NPickedup | 50N/51N picked up; ON = 1, OFF = 0 | 2 |
| 7 | 50 (N)/51(N)TRIP | 50(N)/51(N) TRIP; ON = 1, OFF = 0 | 2 |
| Directional Overcurrent Time Protection | | | |
| 8 | 67 ACTIVE | 67/67-TOC is ACTIVE; ON = 1, OFF = 0 | 3 |
| 9 | 67N ACTIVE | 67N/67N-TOC is ACTIVE; ON = 1, OFF = 0 | 3 |
| 10 | 67/67N pickedup | 67/67N picked up; ON = 1, OFF = 0 | 2 |
| 11 | 67 A picked up | 67/67-TOC Phase A picked up; ON = 1, OFF = 0 | 2 |
| 12 | 67 B picked up | 67/67-TOC Phase B picked up; ON = 1, OFF = 0 | 2 |
| 13 | 67 C picked up | 67/67-TOC Phase C picked up; ON = 1, OFF = 0 | 2 |
| 14 | 67N picked up | 67N/67N-TOC picked up; ON = 1, OFF = 0 | 2 |
| 15 | 67/67N TRIP | 67/67N TRIP; ON = 1, OFF = 0 | 2 |
| Frequency Protection | | | |
| 16 | 81 ACTIVE | 81 ACTIVE; ON = 1, OFF = 0 | 3 |
| 17 | 81-1 picked up | 81-1 picked up; ON = 1, OFF = 0 | 2 |
| 18 | 81-2 picked up | 81-2 picked up; ON = 1, OFF = 0 | 2 |
| 19 | 81-3 picked up | 81-3 picked up; ON = 1, OFF = 0 | 2 |
| 20 | 81-4 picked up | 81-4 picked up; ON = 1, OFF = 0 | 2 |
| 21 | 81-1 TRIP | 81-1 TRIP; ON = 1, OFF = 0 | 2 |
| 22 | 81-2 TRIP | 81-2 TRIP; ON = 1, OFF = 0 | 2 |
| 23 | 81-3 TRIP | 81-3 TRIP; ON = 1, OFF = 0 | 2 |
| 24 | 81-4 TRIP | 81-4 TRIP; ON = 1, OFF = 0 | 2 |
| Voltage Protection | | | |
| 25 | 27 ACTIVE | 27 under voltage protection is ACTIVE; ON = 1, OFF = 0 | 3 |
| 26 | 27-1 picked up | 27-1 under voltage picked up; ON = 1, OFF = 0 | 2 |
| 27 | 27-1 TRIP | 27-1 under voltage TRIP; ON = 1, OFF = 0 | 2 |
| 28 | 27-2 picked up | 27-2 under voltage picked up; ON = 1, OFF = 0 | 2 |

| Binary Input Points | | | |
|---|-----------------|---|-------|
| Static (Steady-State) Object Number: 1 | | | |
| Change Event Object Number: 2 | | | |
| Request Function Codes supported: 1 (read) | | | |
| Static Variation reported when variation 0 requested: 1 (Binary Input with Status) | | | |
| Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time) | | | |
| Point Index | Name | Description | Class |
| 29 | 27-2 TRIP | 27-2 under voltage TRIP; ON = 1, OFF = 0 | 2 |
| 30 | 27 Vx ACTIVE | 27 under voltage Vx is ACTIVE; ON = 1, OFF = 0 | 3 |
| 31 | 27-1 Vx PU | 27-1 under voltage Vx PICKUP; ON = 1, OFF = 0 | 2 |
| 32 | 27-1 Vx TRIP | 27-1 under voltage Vx TRIP; ON = 1, OFF = 0 | 2 |
| 33 | 27-2 Vx PU | 27-2 under voltage Vx PICKUP; ON = 1, OFF = 0 | 2 |
| 34 | 27-2 Vx TRIP | 27-2 under voltage Vx TRIP; ON = 1, OFF = 0 | 2 |
| 35 | 59 ACTIVE | 59 over voltage protection is ACTIVE; ON = 1, OFF = 0 | 3 |
| 36 | 59-1 picked up | 59-1 overvoltage V> picked up; ON = 1, OFF = 0 | 2 |
| 37 | 59-1 TRIP | 59-1 overvoltage V> TRIP; ON = 1, OFF = 0 | 2 |
| 38 | 59-2 picked up | 59-2 overvoltage V>> picked up; ON = 1, OFF = 0 | 2 |
| 39 | 59-2 TRIP | 59-2 overvoltage V>> TRIP; ON = 1, OFF = 0 | 2 |
| 40 | 59 Vx ACTIVE | 59 over voltage Vx is ACTIVE; ON = 1, OFF = 0 | 3 |
| 41 | 59-1 Vx PU | 59-1 over voltage Vx PICKUP; ON = 1, OFF = 0 | 2 |
| 42 | 59-1 Vx TRIP | 59-1 over voltage Vx TRIP; ON = 1, OFF = 0 | 2 |
| 43 | 59-2 Vx PU | 59-2 over voltage Vx PICKUP; ON = 1, OFF = 0 | 2 |
| 44 | 59-2 Vx TRIP | 59-2 over voltage Vx TRIP; ON = 1, OFF = 0 | 2 |
| 45 | 59-1 PhA pickup | 59-1 Phase A picked up; ON = 1, OFF = 0 | 2 |
| 46 | 59-1 PhB pickup | 59-1 Phase B picked up; ON = 1, OFF = 0 | 2 |
| 47 | 59-1 PhC pickup | 59-1 Phase C picked up; ON = 1, OFF = 0 | 2 |
| 48 | 59-1 PhA TRIP | 59-1 Phase A TRIP; ON = 1, OFF = 0 | 2 |
| 49 | 59-1 PhB TRIP | 59-1 Phase B TRIP; ON = 1, OFF = 0 | 2 |
| 50 | 59-1 PhC TRIP | 59-1 Phase C TRIP; ON = 1, OFF = 0 | 2 |
| 51 | 59-2 PhA pickup | 59-2 Phase A picked up; ON = 1, OFF = 0 | 2 |
| 52 | 59-2 PhB pickup | 59-2 Phase B picked up; ON = 1, OFF = 0 | 2 |
| 53 | 59-2 PhC pickup | 59-2 Phase C picked up; ON = 1, OFF = 0 | 2 |
| 54 | 59-2 PhA TRIP | 59-2 Phase A TRIP; ON = 1, OFF = 0 | 2 |
| 55 | 59-2 PhB TRIP | 59-2 Phase B TRIP; ON = 1, OFF = 0 | 2 |
| 56 | 59-2 PhC TRIP | 59-2 Phase C TRIP; ON = 1, OFF = 0 | 2 |
| Breaker failure protection | | | |
| 57 | 50BF ACTIVE | 50BF is ACTIVE; ON = 1, OFF = 0 | 3 |
| 58 | 50BF int Pickup | 50BF (internal) PICKUP; ON = 1, OFF = 0 | 2 |
| 59 | 50BF ext Pickup | 50BF (external) PICKUP; ON = 1, OFF = 0 | 2 |
| 60 | 50BF TRIP | 50BF TRIP; ON = 1, OFF = 0 | 2 |
| 61 | 50BF int TRIP | 50BF (internal) TRIP; ON = 1, OFF = 0 | 2 |
| 62 | 50BF ext TRIP | 50BF (external) TRIP; ON = 1, OFF = 0 | 2 |

2.1 Binary Input Points

| Binary Input Points | | | |
|--|-------------------|---|-------|
| Static (Steady-State) Object Number: 1 | | | |
| Change Event Object Number: 2 | | | |
| Request Function Codes supported: 1 (read) | | | |
| Static Variation reported when variation 0 requested: 1 (Binary Input with Status) | | | |
| Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time) | | | |
| Point Index | Name | Description | Class |
| Negative sequence protection | | | |
| 63 | 46 ACTIVE | 46 is ACTIVE; ON = 1, OFF = 0 | 3 |
| 64 | 46-1 picked up | 46-1 picked up; ON = 1, OFF = 0 | 2 |
| 65 | 46-2 picked up | 46-2 picked up; ON = 1, OFF = 0 | 2 |
| 66 | 46 TRIP | 46-2 TRIP; ON = 1, OFF = 0 | 2 |
| Internal Mode Status | | | |
| 67 | Cntrl Auth | Control Authority; LOCAL = 1, REMOTE = 0 | 3 |
| 68 | ModeLOCAL | Control mode LOCAL; UNLOCKED = 1, LOCKED = 0 | 3 |
| 69 | Device OK | Device is Operational and Protecting; ON = 1, OFF = 0 | 1 |
| 70 | Settings Calc. | Setting calculation is running; ON = 1, OFF = 0 | 3 |
| 71 | ProtActive | At least one protection function is active; ON = 1, OFF = 0 | 2 |
| 72 | Error Sum Alarm | Error with a summary alarm; ON = 1, OFF = 0 | 2 |
| 73 | Alarm Sum Event | Alarm Summary Event; ON = 1, OFF = 0 | 2 |
| 74 | Relay Pickup | Relay Pickup; ON = 1, OFF = 0 | 1 |
| 75 | Relay TRIP | General TRIP of the relay; ON = 1, OFF = 0 | 1 |
| 76 | Test mode | Test mode; ON = 1, OFF = 0 | 3 |
| 77 | Fail Battery | Failure: (internal) Battery empty; ON = 1, OFF = 0 | 2 |
| 78 | GPS ModuleError | GPS Module Error; ON = 1, OFF = 0 | 2 |
| 79 | BATTERY BAD | (external) Battery bad or defect; ON = 1, OFF = 0 | 2 |
| 80 | EXT.V.INVALID | Invalid external voltage; ON = 1, OFF = 0 | 2 |
| 81 | EXT.VOLT.VALID | Valid external voltage; ON = 1, OFF = 0 | 2 |
| Control Switches Return Position Indication (double point commands) | | | |
| 82 | 52 Breaker | input state of Breaker; 0 = open, 1 = close | 1 |
| 83 | 52 Breaker status | Breaker failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect. | 1 |
| 84 | Disc.Swit. | input state of Disconnect Switch; 0 = open, 1 = close | 1 |
| 85 | Disc.Swit. status | Disconnect Switch failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect. | 1 |
| 86 | GndSwit. | input state of Ground Switch; 0 = open, 1 = close | 1 |
| 87 | GndSwit. status | Ground Switch failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect. | 1 |
| Internal Controls | | | |
| 88 | P-GrpA act | Setting Group A; 0 = Group A is deactivated, 1 = Group A is activated and Groups B, C, D are deactivated. | 1 |
| 89 | P-GrpB act | Setting Group B; 0 = Group B is deactivated, 1 = Group B is activated and Groups A, C, D are deactivated. | 1 |

| Binary Input Points | | | |
|--|-----------------|--|--------------|
| Static (Steady-State) Object Number: 1 | | | |
| Change Event Object Number: 2 | | | |
| Request Function Codes supported: 1 (read) | | | |
| Static Variation reported when variation 0 requested: 1 (Binary Input with Status) | | | |
| Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time) | | | |
| Point Index | Name | Description | Class |
| 90 | P-GrpC act | Setting Group C; 0 = Group C is deactivated, 1 = Group C is activated and Groups A, B, D are deactivated. | 1 |
| 91 | P-GrpD act | Setting Group D; 0 = Group D is deactivated, 1 = Group D is activated and Groups A, B, C are deactivated. | 1 |
| 92 | ModeREMOTE | Control mode REMOTE; UNLOCKED = 1, LOCKED = 0 | 3 |
| HMI | | | |
| 93 | Local ON | Local Mode is active | 3 |
| 94 | Auto ON | Auto Mode is active | 3 |
| 95 | Restore ON | Restoration Mode is active | 3 |
| 96 | Simulation ON | Simulation Mode is active | 3 |
| 97 | HotLineTag ON | Hot Line Tag is active | 3 |
| 98 | MotorInhibit ON | Motor Inhibit is active | 3 |
| 99 | Lockout ON | Lockout is active | 3 |

2.2 Control Relay Output Blocks/Binary Output Status

| Point Index | Name | Description | Supported Control Relay Output Block Fields |
|---|------------|--|---|
| Binary Output Status Points | | | |
| Object Number: 10 | | | |
| Request Function Codes supported: 1 (Read) | | | |
| Default Variation reported when variation 0 requested: 2 (Binary Output Status) | | | |
| Control Relay Output Blocks/Binary Output Status | | | |
| Object Number: 12 | | | |
| Request Function Codes supported: 3 (select), 4 (operate), 5 (direct operate), 6 (direct operate, no ack) | | | |
| External Commands (double point commands) | | | |
| 0 | 52Breaker | Trip command for Circuit Breaker | Trip, Pulse On (On Time Fixed ¹) |
| 1 | 52Breaker | Close command for Circuit Breaker | Close, Pulse On (On Time Fixed ¹) |
| 2 | Disc.Swit. | Trip command for Disconnect Switch | Trip, Pulse On (On Time Fixed ¹) |
| 3 | Disc.Swit. | Close command for Disconnect Switch | Close, Pulse On (On Time Fixed ¹) |
| 4 | GndSwit. | Trip command for Ground Switch | Trip, Pulse On (On Time Fixed ¹) |
| 5 | GndSwit. | Close command for Ground Switch | Close, Pulse On (On Time Fixed ¹) |
| Internal Commands | | | |
| 6 | P-GrpA act | Select Setting Group A and deactivate Groups B, C, D | Latch On |
| 7 | P-GrpB act | Select Setting Group B and deactivate Groups A, C, D | Latch On |
| 8 | P-GrpC act | Select Setting Group C and deactivate Groups A, B, D | Latch On |
| 9 | P-GrpD act | Select Setting Group D and deactivate Groups A, B, C | Latch On |
| 10 | ModeREMOTE | Mode REMOTE control; Latch On = UNLOCKED Latch Off = LOCKED | Latch On; Latch Off |

- 1 The on-time is fixed within the SIPROTEC 4 parameter package for each command object. The Control Relay Output Block information on-time will be ignored.

Changing the Setting Group

Switching on one setting group automatically switches off the current active setting group. Transmission of the value OFF is insignificant for the change of the setting group and is refused by the device.

A change of the setting group is only possible via DNP3 if the parameter **Change to Another Setting Group** (parameter address = 302) has the value "Protocol".

Control Mode REMOTE

Control mode with control authority is REMOTE, option of unlocked control with DNP3.

- Changing the "Control mode REMOTE" to UNLOCKED permits one unlocked control operation via DNP3. After execution of the command, the "Control mode REMOTE" in the SIPROTEC 4 device will automatically be reset to LOCKED.
- A programmed test "Switch in position" for unlocked control operations will always be executed.

If, after changing the "Control mode REMOTE" to UNLOCKED, no command is received via DNP3 for a period of 5 minutes, then the "Control mode REMOTE" is automatically reset to LOCKED.

2.3 Counters

For scaling of counters please ref. to manual „DNP3 TCP communication profile“.

| Counters | | | | |
|--|------------|---|--|-------|
| Static (Steady-State) Object Number: 20 | | | | |
| Change Event Object Number: 22 | | | | |
| Request Function Codes supported: 1 (read) | | | | |
| Static Variation reported when variation 0 requested: 1 (32-bit Counter with Flag) | | | | |
| Change Event Variation reported when variation 0 requested: 1 (32-bit Counter without Time) | | | | |
| Point Index | Name | Description | Scaling ($2^{32}-1$ of the unsigned long-value corresponds to...) | Class |
| 0 | Wp+= | Wp Forward (metered measurand derived from measured value) | $2^{32}-1$ impulses | 2 |
| 1 | Wq+= | Wq Forward (metered measurand derived from measured value) | $2^{32}-1$ impulses | 2 |
| 2 | Wp-= | Wp Reverse (metered measurand derived from measured value) | $2^{32}-1$ impulses | 2 |
| 3 | Wq-= | Wq Reverse (metered measurand derived from measured value) | $2^{32}-1$ impulses | 2 |
| 4 | Wp(puls) = | Pulsed Energy Wp (active) (metering impulses at binary input) | $2^{32}-1$ impulses | 2 |
| 5 | Wq(puls) = | Pulsed Energy Wq (reactive) (metering impulses at binary input) | $2^{32}-1$ impulses | 2 |
| 6 | #of TRIPs | Number of TRIPs | $2^{32}-1$ TRIPs | 3 |

2.4 Analog Inputs

For scaling of measured values transmitted as 16-bit Analog Input please ref. to manual „DNP3 TCP communication profile“

| Analog Inputs | | | | |
|--|-----------|----------------------------|------------------------------------|-------|
| Static (Steady-State) Object Number: 30 | | | | |
| Change Event Object Number: 32 | | | | |
| Request Function Codes supported: 1 (read) | | | | |
| Static Variation reported when variation 0 requested: 02 (16-bit Analog Input) | | | | |
| Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time) | | | | |
| Point Index | Name | Description | Scaling (32767 corresponds to ...) | Class |
| Recorded Measured Values | | | | |
| 0 | Ia = | Current phase a | 3276.7 A | 1 |
| 1 | Ib = | Current phase b | 3276.7 A | 1 |
| 2 | Ic = | Current phase c | 3276.7 A | 1 |
| 3 | In = | Current In | 3276.7 A | 1 |
| 4 | Va = | Voltage phase a | 32.767 kV | 1 |
| 5 | Vb = | Voltage phase b | 32.767 kV | 1 |
| 6 | Vc = | Voltage phase c | 32.767 kV | 1 |
| 7 | Va-b = | Voltage phase a to phase b | 32.767 kV | 1 |
| 8 | Vb-c = | Voltage phase b to phase c | 32.767 kV | 1 |
| 9 | Vc-a = | Voltage phase c to phase a | 32.767 kV | 1 |
| 10 | VN = | Voltage ground | 32.767 kV | 1 |
| 11 | P = | Active power | 32767 kW | 1 |
| 12 | Q = | Reactive power | 32767 kVar | 1 |
| 13 | S = | Apparent power | 32767 kVar | 1 |
| 14 | Freq = | Frequency | 327.67 Hz | 1 |
| 15 | PF = | Power factor | 3.2767 | 1 |
| 16 | Vx = | 4th voltage input Vx | 32.767 kV | 1 |
| 17 | Vbat = | Battery voltage | 3276.7 V | 1 |
| 18 | SysTemp = | System temperature | 3276.7 °C / F | 1 |
| Min/Max Values | | | | |
| 19 | Ia Min= | Current phase a minimum | 3276.7 A | 3 |
| 20 | Ia Max= | Current phase a maximum | 3276.7 A | 3 |
| 21 | Ib Min= | Current phase b minimum | 3276.7 A | 3 |
| 22 | Ib Max= | Current phase b maximum | 3276.7 A | 3 |
| 23 | Ic Min= | Current phase c minimum | 3276.7 A | 3 |
| 24 | Ic Max= | Current phase c maximum | 3276.7 A | 3 |
| 25 | Va-nMin= | Voltage phase a minimum | 32.767 kV | 3 |
| 26 | Va-nMax= | Voltage phase a maximum | 32.767 kV | 3 |
| 27 | Vb-nMin= | Voltage phase b minimum | 32.767 kV | 3 |
| 28 | Vb-nMax= | Voltage phase b maximum | 32.767 kV | 3 |

| Analog Inputs | | | | |
|--|------------|--|------------------------------------|-------|
| Static (Steady-State) Object Number: 30 | | | | |
| Change Event Object Number: 32 | | | | |
| Request Function Codes supported: 1 (read) | | | | |
| Static Variation reported when variation 0 requested: 02 (16-bit Analog Input) | | | | |
| Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time) | | | | |
| Point Index | Name | Description | Scaling (32767 corresponds to ...) | Class |
| 29 | Vc-nMin= | Voltage phase c minimum | 32.767 kV | 3 |
| 30 | Vc-nMax= | Voltage phase c maximum | 32.767 kV | 3 |
| 31 | Vn Min= | Voltage neutral minimum | 32.767 kV | 3 |
| 32 | Vn Max= | Voltage neutral maximum | 32.767 kV | 3 |
| 33 | Pmin= | Active power minimum | 32767 kW | 3 |
| 34 | Pmax= | Active power maximum | 32767 kW | 3 |
| 35 | Qmin= | Reactive power minimum | 32767 kVar | 3 |
| 36 | Qmax= | Reactive power maximum | 32767 kVar | 3 |
| 37 | Smin= | Apparent power minimum | 32767 kVar | 3 |
| 38 | Smax= | Apparent power maximum | 32767 kVar | 3 |
| 39 | fmin= | frequency Minimum | 327.67 Hz | 3 |
| 40 | fmax= | frequency Maximum | 327.67 Hz | 3 |
| 41 | PF min= | Power factor minimum | 3.2767 | 3 |
| 42 | PF max= | Power factor maximum | 3.2767 | 3 |
| If Object 30 Variation 01 (32-bit Analog Input) requesten, additional: | | | | |
| Statistic Values | | | | |
| 43 | Ia = | Primary fault current Ia | 32767 A | 1 |
| 44 | Ib = | Primary fault current Ib | 32767 A | 1 |
| 45 | Ic = | Primary fault current Ic | 32767 A | 1 |
| 46 | Sum Ia = | Accumulation of interrupted current Ph A | 327.67 kA | 3 |
| 47 | Sum Ib = | Accumulation of interrupted current Ph B | 327.67 kA | 3 |
| 48 | Sum Ic = | Accumulation of interrupted current Ph C | 327.67 kA | 3 |
| 49 | Op. Hours= | Counter of operating hours | 32767 h | 1 |
| 50 | Q0 OpCnt= | Circuit Breaker operation counter | 32767 | 3 |
| 51 | Q1 OpCnt= | Disconnecter Switch operation counter | 32767 | 3 |
| 52 | Q8 OpCnt= | Ground Switch operation counter | 32767 | 3 |
| 53 | dist = | Fault locator: distance to fault | 3276.7 km/miles | 3 |

Fault currents and Fault locator

Always the latest fault currents and fault location is stored.

In the event of a fault, reading out the fault record protocol from the SIPROTEC 4 device is necessary for an exact diagnosis.

3 Flexible Mapping

| | |
|-----|------------------|
| 3.1 | Flexible Mapping |
|-----|------------------|

30

3.1 Flexible Mapping

The Flexible Mapping for DNP IP is a newly added function since 7SC80 V4.44. It can be selected by clicking the button **Additional protocol at device**.

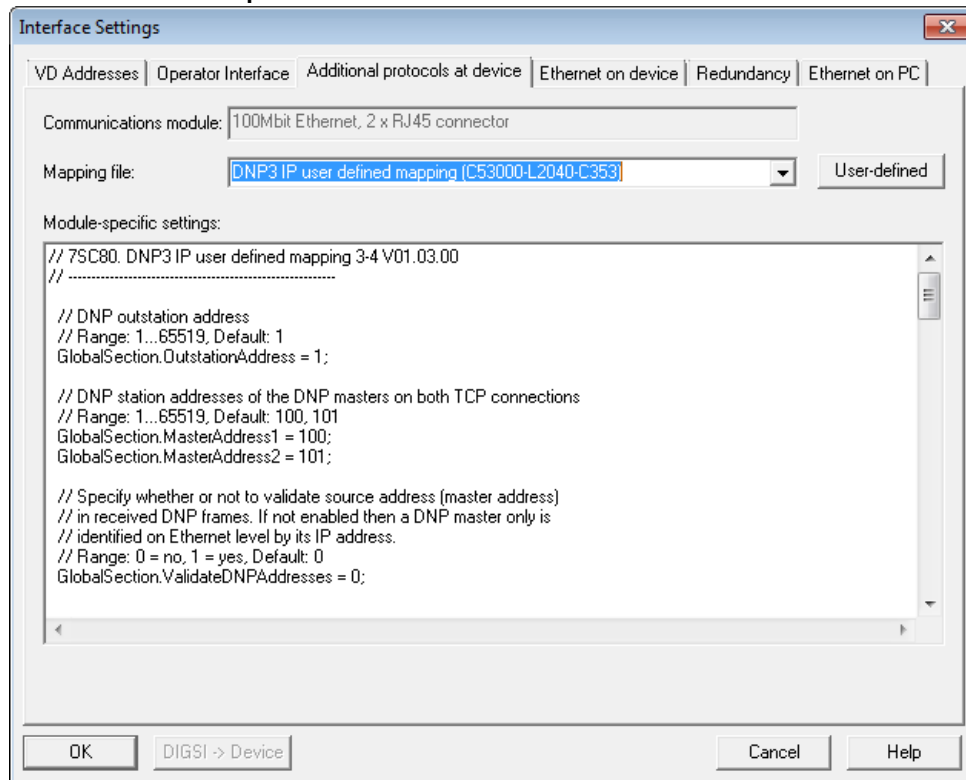


Figure 3-1 Selection of a Mapping File

To create a mapping and select the used indications, click the button **User-defined**.

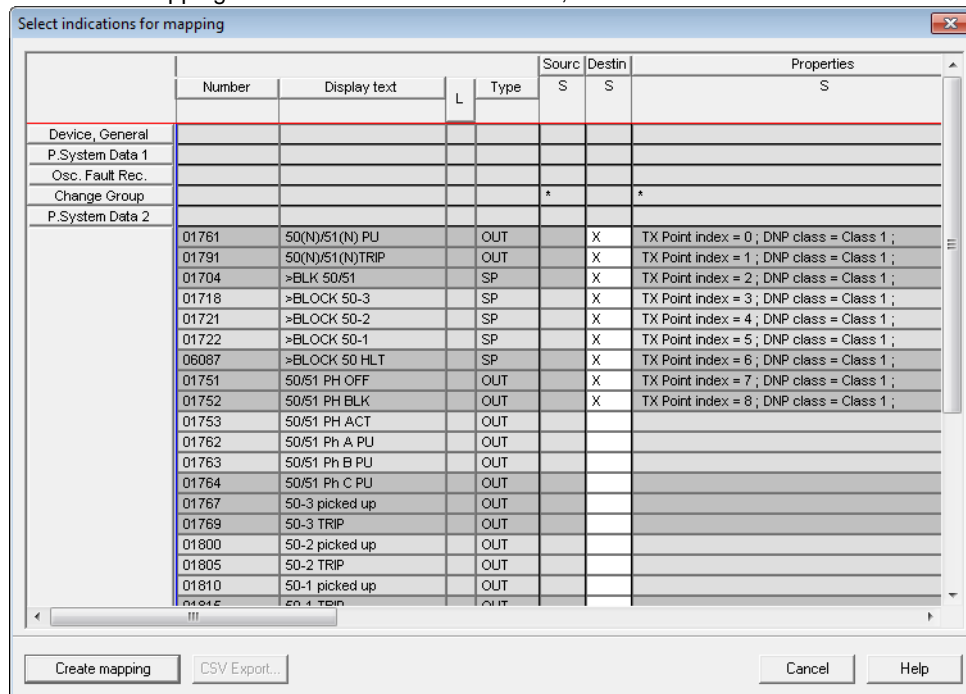


Figure 3-2 Creation of a Mapping

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