MICROTEL 700

MICROTEL 700 communication protocol

Supported device types and versions

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Communication line configuration

- Category of communication line: Serial, SerialOverUDP Device Redundant, RFC2217 Client, TCP/IP-UDP
- Parameters of the serial line according to the setting of the telemetric system.
- UDP Parameters:
    - The parameters of a primary server or a secondary one (or parameters of primary/secondary network interface in case of a server with multiple network interfaces) are mandatory.
    - Host: string max. 80 characters – a server name in the INET form (the name or numerical address a.b.c.d).
    - Port: UDP port number (1 to 65535).

Global parameters:

Keyword	Full name	Description	Unit / Size	Default value
SCAN	Scan	Permanent passive mode (Scan only) only for data reading (mode 2).	YES /NO	NO
MOXAT	Moxa Timeout	The setting of timeout for change to a backup communication device on SerialOverUDP Device Redundant line. If the valid data are not received from the communication device within the timeout, the other device is used (backup or primary, if it is configured).	20	sec

Communication station configuration

- Communication protocol: **Microtel 700**.
- The station address is a number within the range 1 to 253. Do not use the addresses 0, 254, and 255. They are filtered because they often occur at the beginning of response (error in transmission system).

Parameters of station protocol

Dialog window of station configuration - the "**Protocol parameters**" tab.

Table 1

Keyword	Full name	Description	Unit / size	Default value
RC	Retry Count	The number of request retries when an error in communication occurs.	-	2
RT	Retry Timeout	Delay between request retries if a communication error occurs.	ms	500 millisec.
WFT	Wait First Timeout	The first waiting for a response after sending a request.	ms	300 millisec.

WT	Wait Timeout	Delay between individual readings of a response until it is completed.	ms	200 millisec.
MWR	Max Wait Retry	The number of response readings until the response is completed.	-	20
MODULE_CNT	Module Count	The maximum number of modules that are read in one request. The value must be in the range of 1 to 5. If not, the default value is used.	-	5
INV_MOD	Inversed Modules	An analysis of sectors that have been changed (the COS function - CHANGE OF STATE) is done in inverse order, that is: bit 0 LSB - modules 0..7, bit 1 - modules 8..15, ... bit 7 MSB - modules 56..63.	YES /NO	NO
AHOST	Alternative Path Host(s) 1, 2	The configuration of the so-called alternative communication path. It is an IP address, hostname, or several IP addresses/hosts separated by commas or semicolons. The total number of alternate communication paths entered under these parameters is 12. An empty value means that an alternative path is not used.		
APORT	Alternative Path Port 1,2	UDP port(s) to which data will be sent when using the alternative communication path.		0
APRC	Alternative Path Retry Count	The number of request retries if the alternative communication path is used.	-	2
APUT	Alternative Path Use Timeout	After the elapse of the defined time since the start of using an alternative communication path, the viability of communication through the standard path is tested again according to the communication line configuration. Value 0 turns off the testing (communication uses an alternative path while it works). **Note:** The parameter value also changes the order of trying the alternative communication paths in case of their malfunction. If the value is nonzero, the standard communication path is always tried after an alternate communication path. If the value is zero, then all alternative communication paths are tried first and only then the standard communication path.	sec	600

Alternative communication path

With help of protocol parameters, you can configure a so-called alternative communication path for the particular station (only for SerialOverUDP Device Redundant and TCP/IP-UDP lines). If the communication via the standard path fails, the availability of communication via the alternative path (when configured) is tested. The communication via the alternative path uses UDP packets that are identical to packets used in SerialOverUDP Device Redundant line. The usage of the alternative path is signalized by the FLB flag and a combination of FLN, FLO, FLP flags in the station value.

I/O tag configuration

Possible I/O tag: **Ai, Ao, Ci, Co, Di, Do, Qi**.

The I/O tags of Ci and Co type are not used for a usual operation but only for service purposes. They display and record the values of modules in a raw form without the conversion to a physical value. The values of modules are 16-bit, thus a numerical in the range of 0 to 65535.

The structure of I/O tag address:

- All types of values require the setting of the basic address, the so-called **module**, which is the number in the range of 0 to 63.
- Set the bit number in the range of 0 to 15 for Di, Do, and 0 to 14 for Qi.
- For Ai and Ao type values - insert data for conversion of a raw form to the physical value, so-called "RTU table index", and minimum/maximum of physical value. RTU table index defines the range of raw values which is used in the next recalculation (see Table 2).

Table 2

RTU table index	Min / Max	Note
1. 0-20 mA	0 .. 3600	It is used for Ai inputs.
2. 4-30 mA	720 .. 3600	It is used for Ai inputs.
3. Pt100	-500 .. 1000	It is used for Ai values.
4.	-4095 .. 4095	Not applicable.
5.	-4095 .. 4095	Not applicable.
6.	-500 .. 1000	Not applicable.
7. 4-20 mA	800 .. 4000	It is used for Ao outputs.
8. 0-20 mA	0 .. 4000	It is used for Ao outputs.

The conversion of Ai inputs from the raw values "Raw_Value" to the physical value (Physical_VALUE) is done according to this formula:

Scale = (Physical_MAX - Physical_MIN) / (RTU_MAX - RTU_MIN)

Offset = ((Physical_MIN * RTU_MAX) - (Physical_MAX * RTU_MIN)) / (RTU_MAX - RTU_MIN)

Physical_VALUE = (Raw_Value * Scale) + Offset

The conversion of Ao outputs from the physical value to the raw one is done by the inverse function:

Raw_Value = (Physical_VALUE - Offset) / Scale

The calculation of value "Scale" is modified to 0 (zero) so the recorded value is 0. This situation occurs if a user configures the physical minimum the same as the maximum.

I/O tags of Qi type may use a special setting for the conversion of a 2-bit input value to a required status value. The implicit conversion is stated in Table 3.

Table 3

Binary value	Meaning
00 (0)	FAILED (v D2000 "ERROR")
01 (1)	CLOSED (v D2000 "OFF")
10 (2)	OPEN (v D2000 "ON")
11 (3)	MOVING (v D2000 "TRANS")

Redundant system

This protocol supports two modes of activity:

1. The connection to the "hot" server (HS). The protocol executes the active communication by sending the request for data according to configuration.
2. The connection to the "standby" server (SBS). The protocol just reads and analyzes the received data. To get the line and all the stations to this status at any time, you can activate the SCAN protocol parameter in the configuration of at least one station.

The change from SBS -> SS is done with a transient phase. It means that data are read during one minute to detect inactivity on the communication line and whether the previous D2000 KOM, connected to the HS server, has changed to mode 2 (SBS).

Errors and problems

The error messages, mentioned below, may occur during the startup or during communication. It is recommended to activate the monitoring of communication in the configuration of lines for easier identification of problems. You can choose it from these levels:

- Monitor (at least)
- Monitor & Disk (recommended)
- Disk (recommended)

When you set "Monitor & Disk" or "Disk", the *line_name.LOG* file will be created in the *Trace* subdirectory in the application directory on the computer with the running communication process. This file contains all the debug and error messages.

Error:	**>MTEL700 : Station address error: '*station_name*' !**
Description:	The address of this station is not a number from the required range. Carry out the change in configuration and modify the address according to the Communication station configuration section.
Error:	**>MTEL700 : Invalid min/max value, difference is zero, point: '*point_name*'!**
Description:	The address configuration of the I/O tag contains identical numbers for both physical maximum and minimum. The result of this could be a wrong conversion to a physical value.
Error:	**>MTEL700 : Error in address, point: '*point_name*'!**
Description:	The address of the I/O tag contains the wrong data. Check the validity and range of all address parameters of this I/O tag.
Error:	**>MTEL700 : High Security Relay, St: '*station_name*', Point: '*point_name*', Module: *module*, Bit: *bit*, Unknown DATA2 response *nr* !**
Description:	A wrong response to the HIGH SECURITY RELAY function, the writing to Do point value. Contact Technical Support of Ipesoft.

Error:	**>MTEL700 : High Security Relay, St: '*station_name*', Point: '*point_name*', Module: *module*, Bit: *bit*, Module is faulty or missing !**
Description:	A response to the HIGH SECURITY RELAY function, the writing to Do point value. The values can not be written into this module.
Error:	**>MTEL700 : General Purpose Output Error, St: '*station_name*', Point: '*point_name*', Module: *module* , Module is faulty or missing !**
Description:	A response to the function GENERAL PURPOSE OUTPUT, writing to Ao point value. It is impossible to write to this module.
Error:	**>MTEL700 : Detected zero module count in response, St: '*station_name*', Addr: *station_address*, requested Module: *module*, requested MCount: *module_count***
Description:	No modules (no valid data) have been detected in the response to the DATA STREAMING function.
Error:	**>MTEL700 : Detected non identically module count in response, St: '*station_name*', Addr: *station_address*, requested Module: *module_number*, requested MCount: *requested_module_count*, acquired MCount: *acquired_module_count***
Description:	The module count in the response to the DATA STREAMING function is different than it was required in the request. Missing data.
Error:	**>MTEL700 : Cannot get understanding response, St: '*station_name*', Addr: *station_address*, requested Module: *module*, requested MCount: *module_count***
Description:	The legible response to the DATA STREAMING function cannot be obtained. Received data were illegible.
Error:	**>MTEL700 : No response to request, St: '*station_name*', Addr: *station_address*, requested Module: *module*, requested MCount: *module_count***
Description:	No response to the DATA STREAMING function has been received. The station does not answer.

Errors in the passive phase of communication

The D2000 KOM process connected to the SBS server could display the following error messages:

Error:	**>MTEL700-SCAN : Line: '*line_name*', Unknown command response! Data buffer: *data***
Description:	Unknown function - response. Data are ignored.
Error:	**>MTEL700-SCAN : Line: '*line_name*', Unknown command request! Data buffer: *data***
Description:	Unknown function - request. Data are ignored.
Error:	**>MTEL700-SCAN : Line: '*line_name*', Module count number too big! Data buffer: *data***
Description:	The module count in the received message DATA STREAMING exceeded the permitted count. Data are ignored.
Error:	**>MTEL700-SCAN : Line: '*line_name*", BCH ERROR! Data buffer: *data***
Description:	A wrong checksum of the received message. The message is ignored.
Error:	**> Microtel 700 : Scan task, Line '*line_name*', received valid data during scan stop timeout !**
Description:	During the transition phase after connecting to HS, the valid packets of Microtel 700 were received. This status may be transient and may take only several seconds. In case of any problems, contact Technical Support of Ipesoft.

Details of the protocol implementation

Supported and used functions:

COMMAND 3 - Change of State Scanning

Scanning of the changes in the block of modules since the last data reading. This function is not used after starting the communication (all the values are unknown) and for the reading which comes after the communication error. In these situations, the value of all configured I/O tags is read.

COMMAND 2 - Data Streaming

The value reading of the modules. It optimizes the reading of the configured (configured only!) adjacent modules en bloc until completing of MODULE_CNT by one datagram.

COMMAND 7 - High Security Relay

The writing of the new value for binary I/O tag of Do type. It is executed in two phases.

COMMAND 4 - General Purpose Output

The writing of the new value for I/O tags of Co or Ao type.

Tell commands

Command	Syntax	Description
STALTERPATH	STALTERPATH StationName ON|OFF	Tell command activates or deactivates the alternative path. After activating the alternate route, the main route is no longer used and will not be used even if the alternate route does not work.
STWATCH	STWATCH StationName	Tell command sends commands for the reading of values of all configured I/O tag

Literature

- MICROTEL 700 Telemetry.

Changes and modifications

- January 9, 2008 - Alternative communication path.
- September 19, 2017 - Multiple hosts can be entered in the alternative communication paths, TCI/IP-UDP line is supported.

Document revisions

- Ver. 1.0 - September 2, 2003 - Document created
- Ver. 1.1 - January 9, 2008 - Document updated
- Ver. 1.2 - September 19, 2017 - Document updated

ⓘ **Related pages:**

Communication protocols