

APPLICATION NOTE

GSM Configuration Guide for D-500 D-700

PRODUCTS AFFECTED:	D-500 / D-700
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Related documents	Rainbow Plus D-500 D-700 Installation Guide Rainbow Plus D-500 D-700 Usage Guide Dynamic DNS Account Setting for D-500 D-700 RainbowScada Installation Guide RainbowScada User Guide
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Introduction

The D-500/700 unit supports different modem configurations:

- internal GSM modem
- external Datakom GSM modem

Through the GSM modem, below features are supported:

- GPRS class 10
- Web client
- SMTP (simple mail transfer protocol)
- SMS
- Central Monitoring

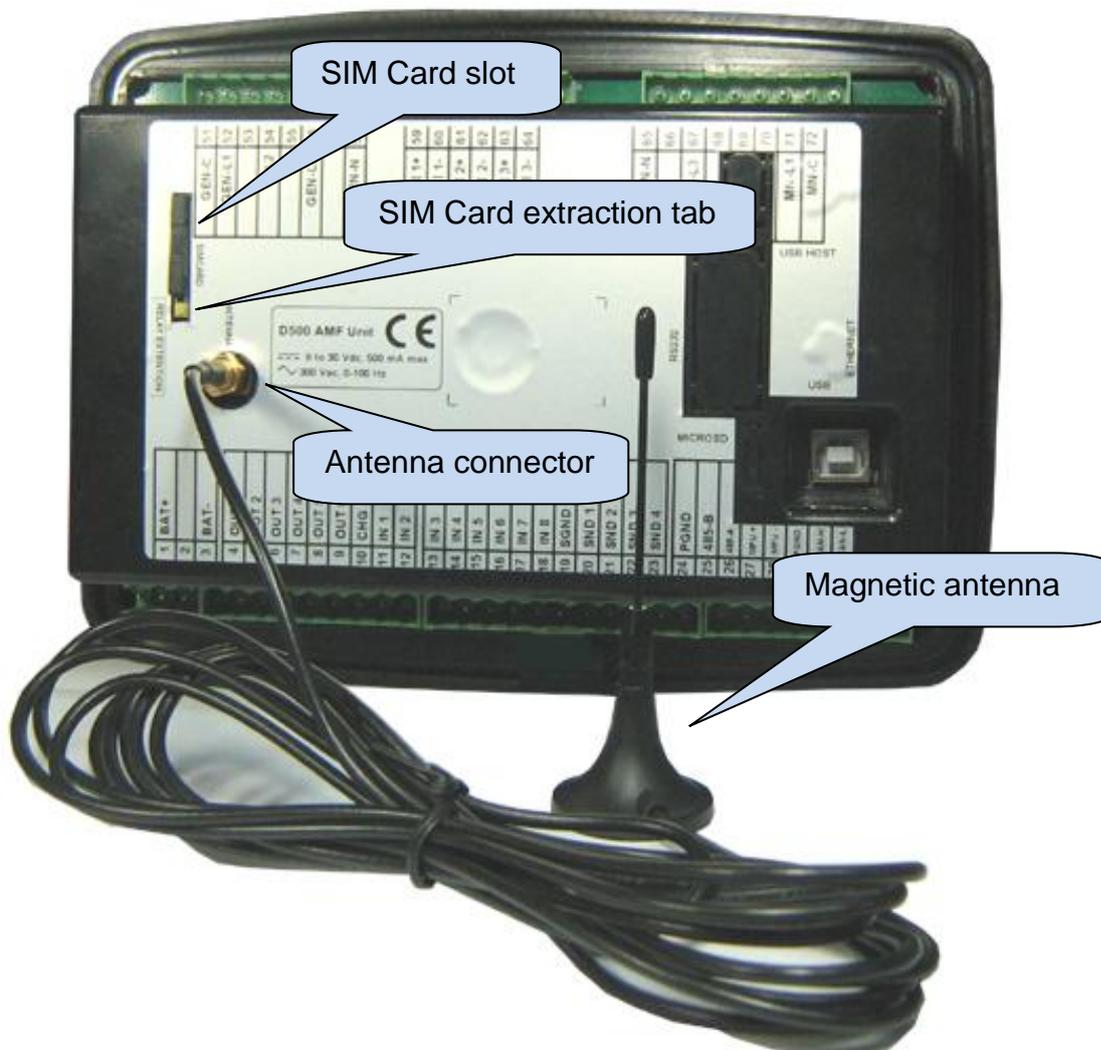
Modem connections



Do not power-up the D-500/700 unit before inserting the antenna and SIM Card.

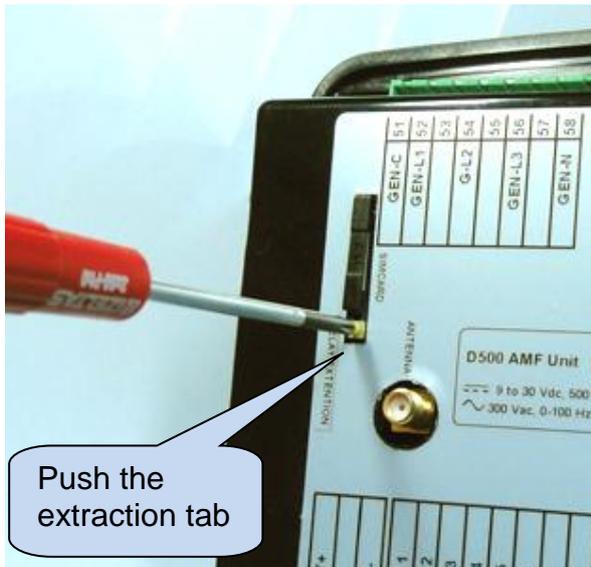
The optional internal GSM modem offers the advantage of being internally powered and is fully compatible with the unit.

The 1800/1900 MHz magnetic antenna is supplied together with the internal modem option. The antenna cable is 2 meters long. The antenna is intended to be placed outside of the genset panel for the best signal reception.



The module requires a GPRS enabled SIM card for full functionality.
Voice-only type SIM cards will usually not permit GPRS functionality.

SIM CARD EXTRACTION



SIM CARD EXTRACTION / INSERTION



SIM CARD PLACEMENT

Internal GSM Modem Technical Specifications	
Description:	Quad-band GSM/GPRS 850/900/1800/1900MHz module. GPRS multi-slot class 10/8 GPRS mobile station class B Compliant to GSM phase 2/2+. – Class 4 (2 W @ 850/ 900 MHz) – Class 1 (1 W @ 1800/1900MHz)
Operating temp range:	-40°C to +85 °C
Data speed:	max. 85.6 kbps (downlink), max 42.8 kbps (uplink)
SIM card type:	external SIM 3V/ 1.8V, GPRS enabled
Antenna:	Quad band, magnetic, with 2m cable
Module certificates:	CE, FCC, ROHS, PTCRB, GCF, IC, ICASA, REACH

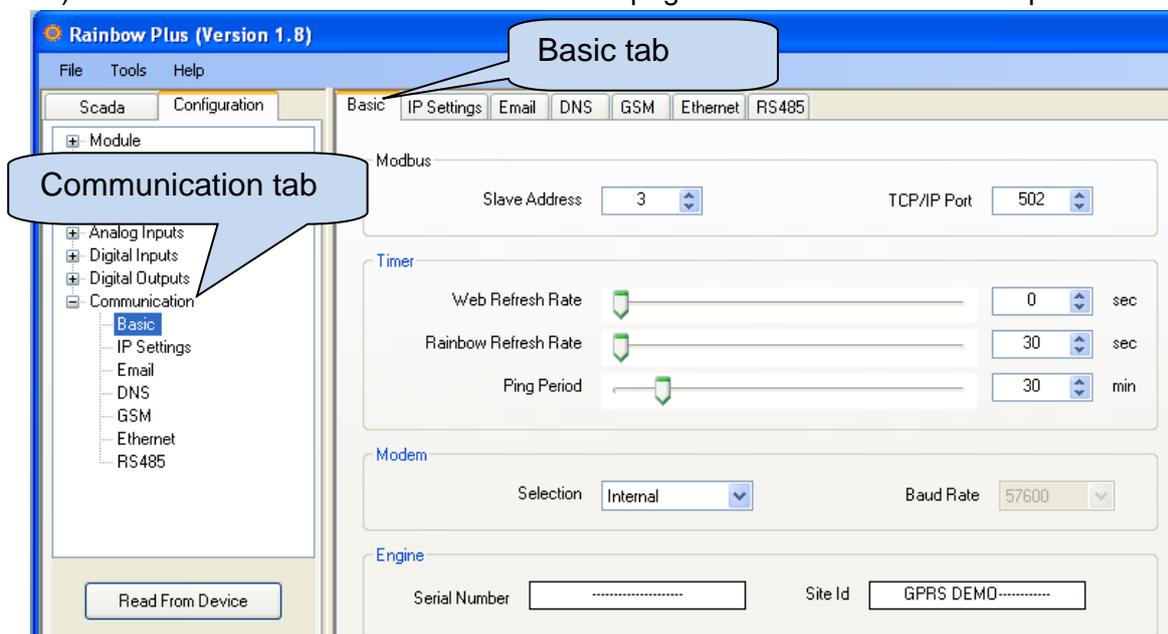
Modem setup

The modem setup is performed using the RainbowPlus program.

The RainbowPlus installation and usage is explained in related documents.

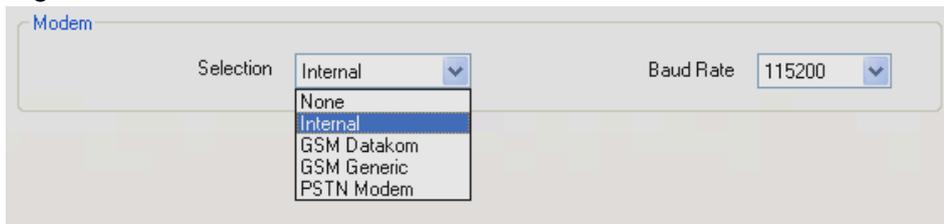
Only parameter setting will be referenced in this document.

- 1) Open the RainbowPlus program
- 2) Connect to the unit through USB
- 3) Select Configuration mode
- 4) Read parameters from device.
- 5) Select **Communication>Basic** tab. This page contains communication parameters.



- 6) **Engine Serial Number** and **Site Id** information are used in the header of SMS and e-mail messages for the identification of the genset sending these messages. Please enter these fields correctly for your ease of operation.
- 7) Do not change **Web Refresh Rate**, **Rainbow Refresh Rate** and **Ping Period** parameters.

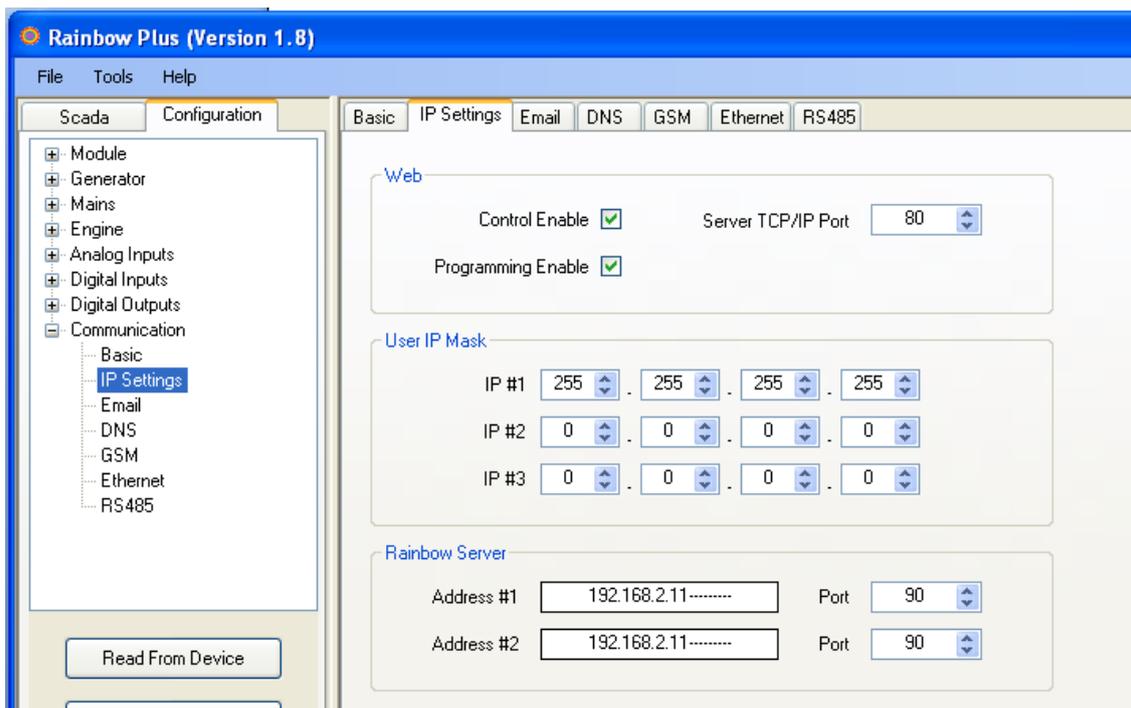
- 8) On **Modem** box select **Internal** or **GSM Datakom** following your modem configuration



- 9) **Baud rate** selection does not apply to internal modem. Select 57400 baud for external modem.



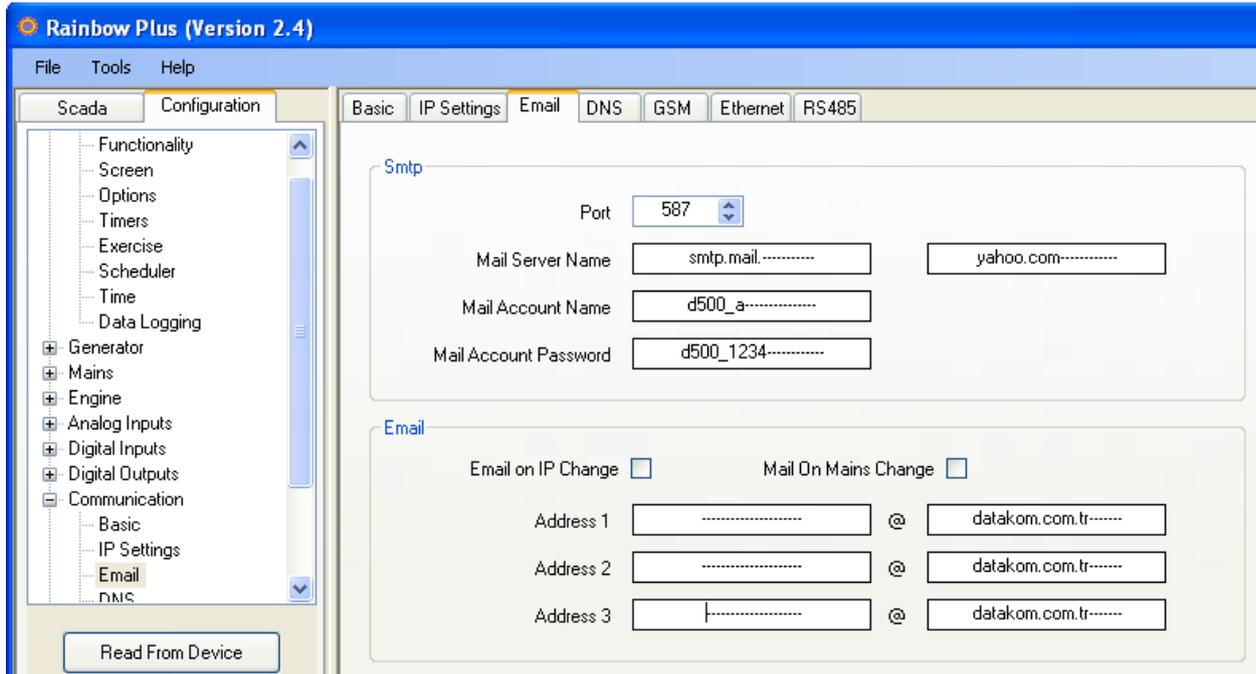
- 10) Select **Communication>IP Settings** tab. This page contains IP related communication parameters.



- 11) **User IP Mask** parameters are used for restricting the external access to the embedded web server. Leave these fields unchanged as above for unrestricted access. Please consult **Datakom** for more details.

- 12) **Rainbow Server Adresses** are used for **RainbowScada** remote monitoring program. If RainbowScada program is installed, the IP address (or domain name) of the central monitoring PC should be entered. If only one center is used, enter both addresses the same. Set the **Rainbow Server Port** to the same value set in the **RainbowScada** program.

13) Select **Communication>E-mail** tab. This page contains E-mail related parameters.



14) SMTP field should be filled appropriately. This is the e-mail address from where the unit will send e-mail messages. The information is the same as used in a computer.



The unit will come with ready to use SMTP parameters.

It is possible to use the unit without any modification to the SMTP field.



The originating e-mail address programmed in the SMTP field must be an activated address.

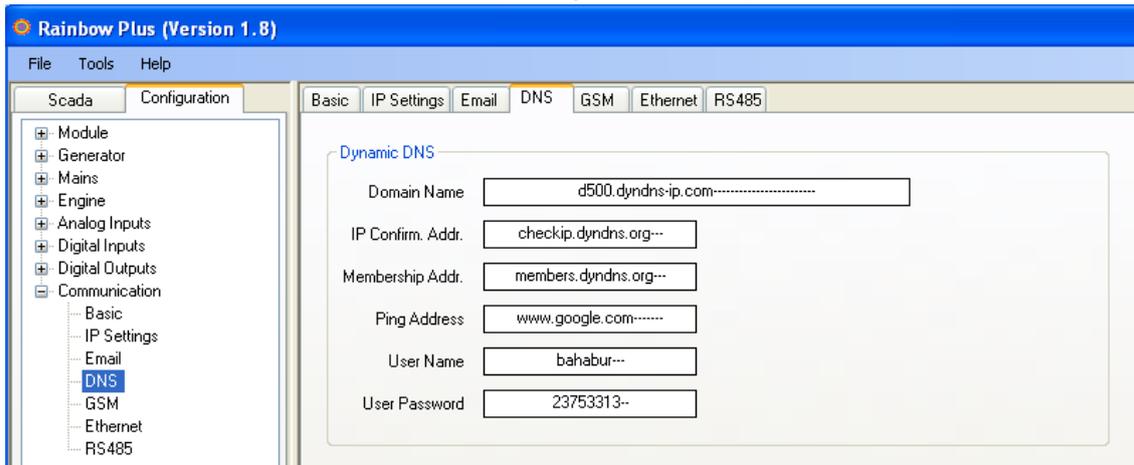
Otherwise the unit will fail to open a session in this server and cannot send e-mail messages.

15) Select **E-mail on IP Change** parameter as required. If this parameter is enabled, the D-500/700 device will send an e-mail message each time the IP is changed.

16) Select **E-mail on Mains Change** parameter as required. If this parameter is enabled, the D-500/700 device will send an e-mail message each time the mains status is changed.

17) **E-mail address 1 (2/3)** is the address to where e-mail messages will be sent. If e-mails are required, enter your e-mail addresses here. If e-mails are not required, then enter blank fields here. The unit can send up to 3 e-mails at once.

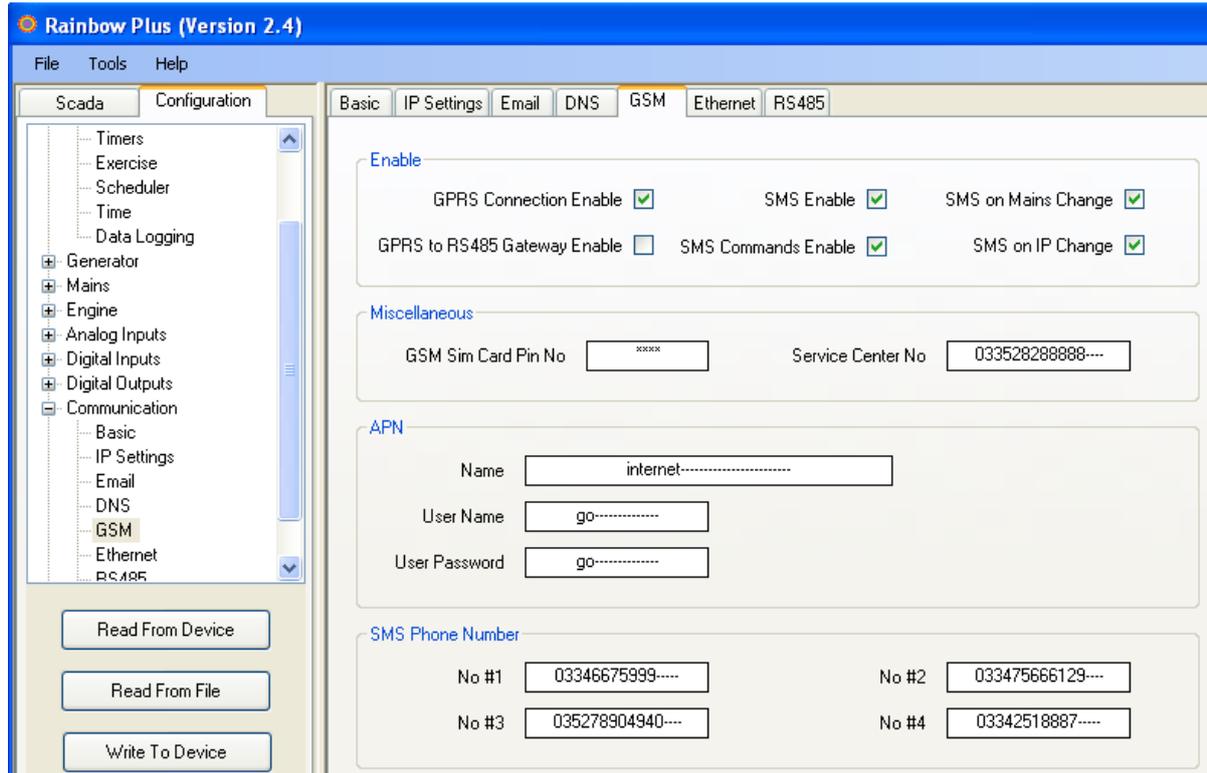
18) Select **Communication>DNS** tab. This page contains dynamic DNS update information.



19) **IP Confirmation address** field should not be modified and must be left as per above settings.

20) **Ping Address** may be set as required. But above address is the most reliable one. It is advised to leave it unchanged as above. This address is used for the verification of internet connectivity.

21) Select **Communication>GSM** tab. This page contains GSM-GPRS parameters.



22) Enable GPRS Connection Enable parameter. This parameter enables all IP services (web client, SMTP) after saving to the controller.

23) Enable SMS Enable parameter.

24) Set other parameters in the box as required.

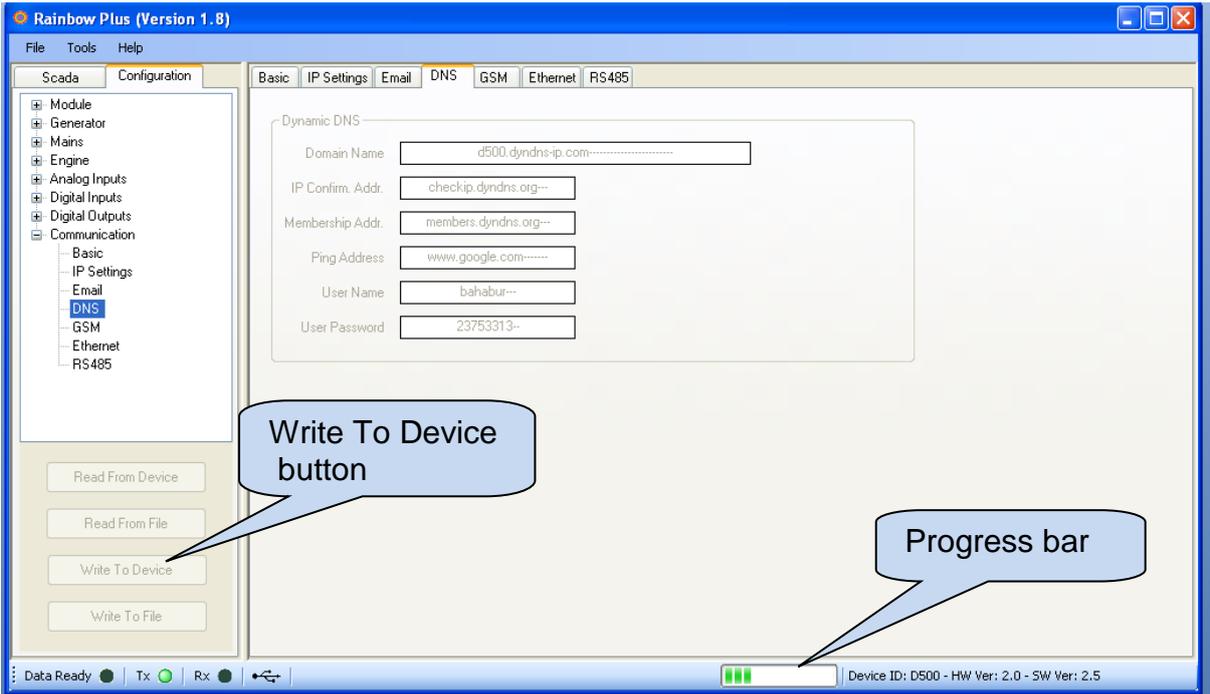
25) If PIN code is used in your SIM card, then enter this code in **GSM Sim Card Pin No** field. Usually new SIM cards come without pin code.

26) If **Service Center No** is not entered, then the controller will use the service center number recorded in the **SIM card**. If entered, this number will be used. Usually this information is not necessary.

27) APN (access point name) information are necessary to connect to the GPRS network, and **must** be entered correctly. Otherwise connection to the GPRS network may not take place. If APN parameters are faulty, "**GPRS unusable/Bad APN**" message will appear on the GSM Modem screen. These information is usually supplied by your GSM operator company.

28) Telephone numbers for SMS sending are recorded in above fields. A maximum of 6 numbers are available.

When parameter editing is over, click **Write To Device** button. A progress bar will open.



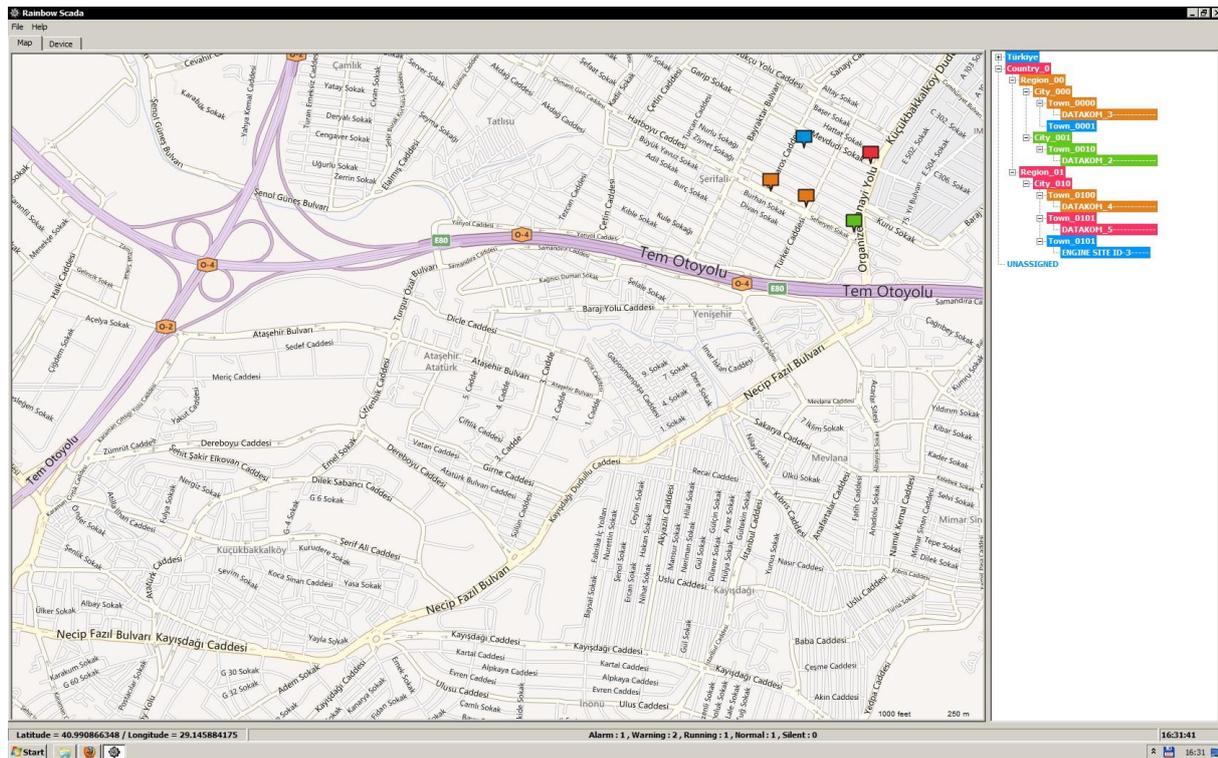
24)When the progress bar disappears the write process is done.

Central Monitoring

The RainbowScada program will allow the central monitoring of a large number of gensets through internet.

Please read documents on [RainbowScada installation](#) and [Rainbow Scada Usage](#) for more details.

A sample Rainbow Scada screen is below.



The program represents each unit as a coloured box on the map. The map is downloaded from the internet. The colour of the box will indicate the genset status for easy follow_up of the whole network.

An additional status and address bar at the right side of the screen will show the system structure and status.



The central monitoring is operational through GPRS with all data SIM cards, with real or local ip addresses.

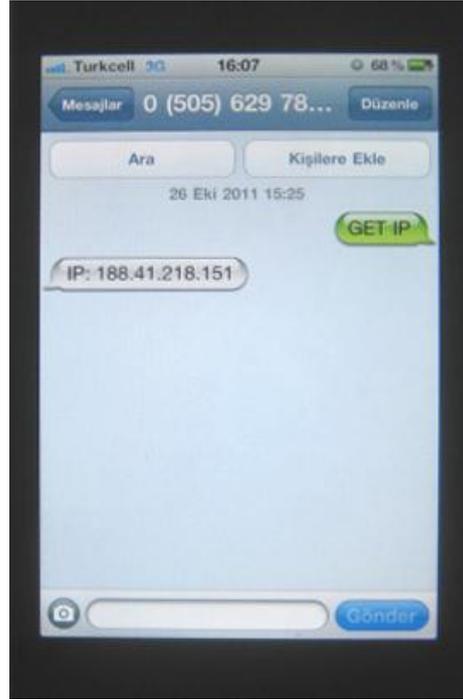
SMS Commands



SMS messages are accepted only from phone numbers recorded in the **Communication>GSM>Message Numbers** tab. Answers to SMS messages will be sent to all phone numbers in the list.



SMS messages should be written exactly as below, without any preceding blanks. Only **UPPERCASE** characters are permitted.



The display of the message may vary following mobile phone models.

COMMAND	DESCRIPTION	ANSWER
GET IP	If GPRS connection is active, the controller will reply by an SMS message indicating the IP address of the GSM modem.	IP: 188.41.10.244
GPRS 1	Activates the GPRS connection	GPRS enabled!
GPRS 0	Stops the GPRS connection	GPRS disabled!
RESET ALARMS	Clears alarms of the controller. The operating mode is not modified.	Alarms cleared!
REBOOT	Performs a hard reset on the controller	no answer
MODEM RESET	Performs a hard reset on the modem	no answer
GET INFO	Returns the alarm list and actual measured values	ALARMS (if exists) GEN: Vavg/I_{AVG}/kW_{tot}/pf/Freq MAINS: Vavg/I_{AVG}/kW_{tot} OIL_PR/TEMP/FUEL%
MODE STOP	Puts the controller into STOP mode. Alarms are also cleared.	Unit forced to STOP!
MODE AUTO	Puts the controller into AUTO mode. Alarms are also cleared.	Unit forced to AUTO!
MODE MANUAL	Puts the controller into MANUAL (RUN) mode. Alarms are also cleared.	Unit forced to RUN!
MODE TEST	Puts the controller into TEST mode. Alarms are also cleared.	Unit forced to TEST!
OUT1 ON	Sets remote controlled output #1 to active state	OUT 1 = ON
OUT1 OFF	Sets remote controlled output #1 to passive state	OUT 1 = OFF
OUTxx ON	Sets remote controlled output #xx to active state (xx denotes any number between 1 and 16).	OUT xx = ON
OUTxx OFF	Sets remote controlled output #xx to passive state (xx denotes any number between 1 and 16).	OUT xx = OFF

Information SMS Messages

The controller is able to send SMS messages under below non-fault circumstances.

IP Change

Mains Change

These messages are individually enabled or disabled by below program parameters:

Communication>GSM>SMS On IP Change

Communication>GSM>SMS On Mains Change

SMS messages are sent to all telephone numbers programmed in below tab:

Communication>GSM>Message Numbers

Alarm SMS Messages

The D-500/700 is able to send SMS messages under all fault conditions.

SMS messages are sent to all telephone numbers programmed in below tab:

Communication>GSM>Message Numbers

A sample message is below:



Information E-mail Messages

The D-500/700 is able to send an e-mail message when the GPRS IP number is changed.

This message is enabled or disabled by below program parameters:

Communication>Options-2>E-mail>E-mail on IP Change

A sample message is below:

This message will be sent via datakom@datakom.com.tr.

To: d500mail@gmail.com

Subject: D500 Notify

Site Id:ENGINE SITE ID-----
 Serial Number:-----
 WAN Ip: NA
 GPRS Ip: 188.41.22.69

Last 10 Events

##	Event	Alarm	Date	Time	Mode	State	Mains L1	Mains L2	Mains L3	Mains Frq.	Genset L1	Genset L2	Genset L3	Genset Tot Pf	Genset Tot Act. Pow.	Genset Frq.	Oil Prs.	Eng. Tmp.	Fuel Lvl.
0	--	--	02-01-2000	04:12:28	OFF	Mains Failure	201 V	0 V	201 V	49.9 Hz	202 V	201 V	201 V	0.64	42 kW	49.9 Hz	3.5Bar 50psi	50 °C 122 °F	60 %
1	Per. Rec.	--	02-01-2000	04:00:00	OFF	Mains Failure	0 V	0 V	0 V	0 Hz	0 V	0 V	0 V	0	0 kW	0 Hz	3.5Bar 50psi	50 °C 122 °F	60 %
2	Per. Rec.	--	02-01-2000	01:00:00	OFF	Mains Failure	0 V	0 V	0 V	0 Hz	0 V	0 V	0 V	0	0 kW	0 Hz	3.5Bar 50psi	50 °C 122 °F	60 %
3	Per. Rec.	--	01-01-2000	23:00:00	OFF	Mains Failure	0 V	0 V	0 V	0 Hz	0 V	0 V	0 V	0	0 kW	0 Hz	3.5Bar 50psi	50 °C 122 °F	60 %

Last 10 event logs together with measured parameters are always appended to the e-mail message.

Alarm E-mail Messages

The D-500/700 sends an e-mail message when any fault condition occurs.

A sample message is below:

This message will be sent via datakom@datakom.com.tr.

To: d500mail@gmail.com

Subject: D500 Notify

Site Id:ENGINE SITE ID-----
 Serial Number:-----
 ENGINE SHUTDOWN Emergency Stop

Alarm is indicated here

Last 10 Events

Last event log gives measured values

##	Event	Alarm	Date Time	Mode	State	Mains L1	Mains L2	Mains L3	Mains Frq.	Genset L1	Genset L2	Genset L3	Genset Tot Pf	Genset Tot Act. Pow.	Genset Frq.	Oil Prs.	Eng. Tmp.	Fuel Lvl.
0	Shtdwn	Emergency Stop	02-01-2000 04:58:58	OFF	Mains Failure	0 V	0 V	0 V	0 Hz	0 V	0 V	0 V	0	0 kW	0 Hz	3.5Bar 50psi	50 °C 122 °F	60 %
1	--	--	02-01-2000 04:12:28	OFF	Mains Failure	201 V	0 V	201 V	49.9 Hz	202 V	201 V	201 V	0.64	42 kW	49.9 Hz	3.5Bar 50psi	50 °C 122 °F	60 %
2	Per. Rec.	--	02-01-2000 04:00:00	OFF	Mains Failure	0 V	0 V	0 V	0 Hz	0 V	0 V	0 V	0	0 kW	0 Hz	3.5Bar 50psi	50 °C 122 °F	60 %

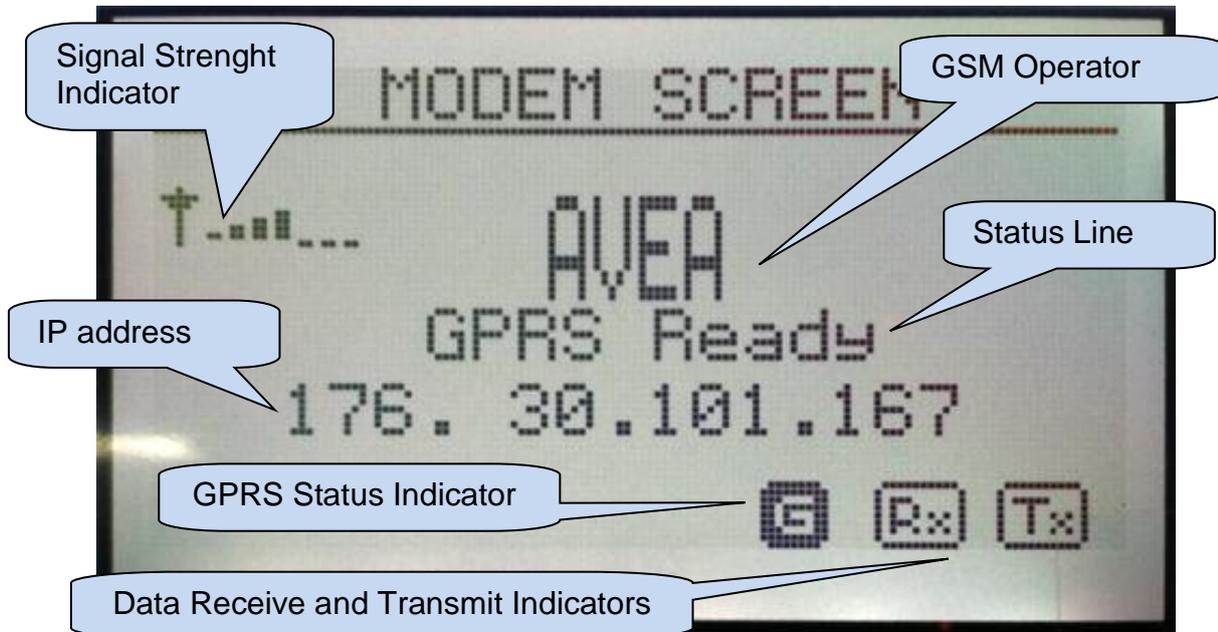
Last 10 event logs together with measured parameters are always appended to the e-mail message.

Troubleshooting

The GSM connection status is monitored at GSM screen pages.

In order to display the GSM screen pages press Right or Left Arrow buttons of the D-500/700 device until below screen appears.

Two more modem screens are available. They are accessed by pressing UP-Down Arrow buttons of the D-500/700 device.



Signal Strength Indicator:

This field is updated every 120 sec. The signal strength is displayed on a scale of/7. For a consistent GPRS communication, at least 2/7 level is required.

GSM Operator:

Received from the base station of the GSM operator.

IP Address:

This field is active only if GPRS is enabled through program parameter. Updated as soon as IP address is granted by the GSM system.

Data Receive and Transmit Indicators:

These indicators flash when data is received (or transmitted) through GPRS network. Note that data counters are available in the next modem page.

GPRS Status Indicator:

Active only if GPRS is enabled through program parameter. At startup, this indicator is flashing. When GPRS connection is established, this indicator turns on steadily.

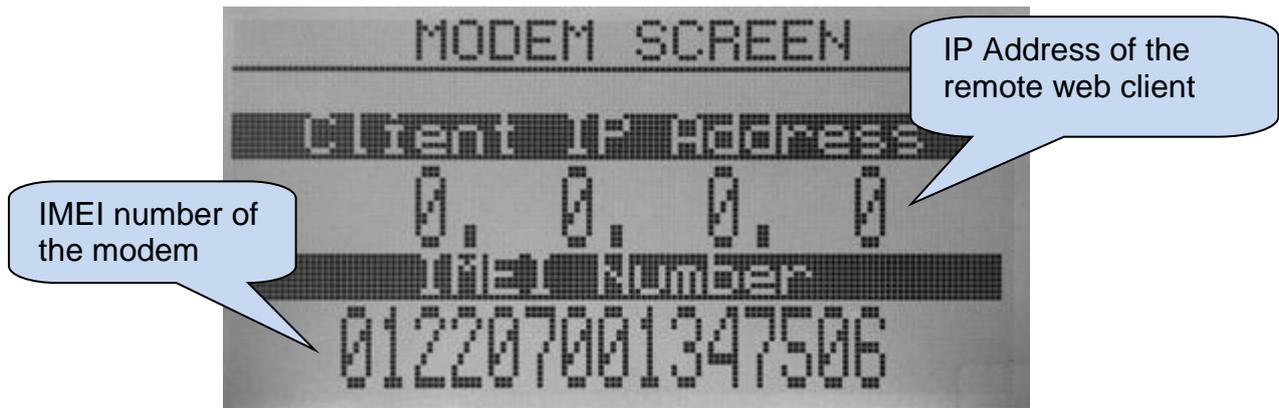
Status line:

This field gives information about the status of GPRS connection and is updated following various data exchanges between the GSM system and the D-500/700 device.

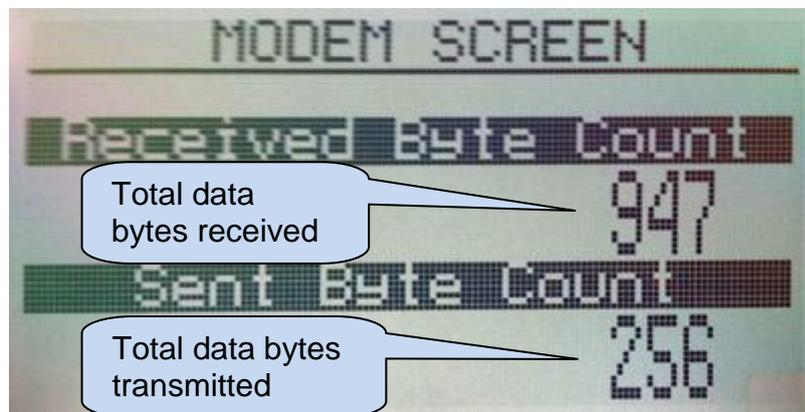


If the Modem Screen does not open, modem selection is set to "**None**". Select correct modem using the RainbowPlus program, **Communication>Basic>Modem** tab.

Additional modem screen:



Additional modem screen



Client IP address:

This field shows the IP address of the remote web client accessing the web server through GPRS. Only the last client is displayed.

IMEI Number:

This is the modem's unique identification number. Each GSM device has a different IMEI number.

Data Counters:

These counters increment with data received (or transmitted) through the ethernet port. The ethernet activity is precisely monitored with these counters.

Normal Status Messages (alphabetical order)

MESSAGE	DESCRIPTION
GPRS Ready	Modem connected to GPRS network successfully.
GPRS Ready on Roaming	Modem connected to GPRS network successfully. Roaming service is active.
Modem Connected !	A modem is found at D-500/700 initialization phase.
Modem Ready	Modem installation complete. GPRS not active yet.
New SMS received	An SMS is received. The D-500/700 device will execute the command given by the SMS message.
Sending SMS	SMS message sending is in progress.
SMS preparing	SMS message is about to be sent.
SMS Sent	SMS message was sent successfully. The GSM system confirmed SMS reception. The delivery of the SMS message is duty of the GSM system. The controller has no control on message delivery to the target phone number.
Remote Server Update	The modem is updating the remote central monitoring (Rainbow Scada) server.

Abnormal Status Messages (alphabetical order)

MESSAGE	DESCRIPTION	REMEDY
Bad Agent/Not permitted	The dyndns service rejects IP update request.	Check end reenter correct parameters using the RainbowPlus program, Communication>GSM>Dynamic DNS tab area.
Bad APN info	APN parameters are not acceptable.	Check end reenter correct APN parameters using the RainbowPlus program, Communication>GSM tab.
Bad Service Ctr. Nr	The GSM system rejects the SMS service center number.	Either the service center number of the Sim card or service center program parameter is faulty. Enter the correct Service Center No parameter using the RainbowPlus program, Communication>GSM tab.
Bad Telephone Nr.	The SMS number is not acceptable for the D-500/700 device. Or the GSM system rejects the SMS number.	Check end reenter correct message number parameters using the RainbowPlus program, Communication>GSM tab.
Command not supported.	An unrecognized SMS command is received.	Send correct SMS command as explained in the SMS COMMANDS section of this document.
Connection error	The dyndns service does not answer IP update request. The D-500/700 device will reattempt IP update.	If the message is not repeated then do not carry. Turn the DC power off, wait 10 seconds and turn the power on again.
Data sending error	Communication errors in IP network. May occur when the signal strength is low or GSM system is overloaded.	Relocate the antenna to a better reception place. Try other GSM operators. This error is not critical and may occur momentarily.
DynDNS Failed. Use IP	The central monitoring (Rainbow Scada) server is using the dyndns service and the dns address of the server cannot be resolved.	Check and correct Rainbow Server address parameters using the RainbowPlus program, Communication>IP Settings tab area.
Enter PIN Password	Sim card has PIN protection and correct pin is not programmed in the D-500/700 device.	Check end reenter correct GSM Sim Card PIN No parameter using the RainbowPlus program, Communication>GSM tab.

MESSAGE	DESCRIPTION	REMEDY
Enter PUK Password	Sim card PIN number is blocked because of repeated faulty PIN number setting.	Remove the Sim card from the D-500/700 device. Place Sim card in your mobile phone and enter correct PUK number.
GPRS reconnection...	GPRS connection is lost. The D-500/700 device is trying to reconnect. May occur when the signal strength is low or GSM system is overloaded.	If prepaid Sim card is used, credit may be insufficient. Relocate the antenna to a better reception place. Try other GSM operators. This error is not critical and may occur momentarily.
GPRS Stopped	GPRS connection is lost. The D-500/700 device will try to reconnect. May occur when the signal strength is low or GSM system is overloaded.	If prepaid Sim card is used, credit may be insufficient. Relocate the antenna to a better reception place. Try other GSM operators. This error is not critical and may occur momentarily.
GPRS unusable/Bad APN	GSM system rejects GPRS connection because of faulty APN parameters.	Check end reenter correct APN parameters using the RainbowPlus program, Communication>GSM tab.
Incorrect PIN	Sim card has PIN protection and correct pin is not programmed in the D-500/700 device.	Check end reenter correct GSM Sim Card PIN No parameter using the RainbowPlus program, Communication>GSM tab.
Insert SIM Card !	Sim card not found in dedicated slot.	Insert Sim card.
IP Error/No GPRS Serv.	The modem cannot be attached to the GPRS network. The GSM system does not grant IP address to the modem.	If prepaid Sim card is used, credit may be insufficient. Sim card is not data enabled. GPRS service is unavailable. Relocate the antenna to a better reception place. Try other GSM operators.
Low signal/No network	GSM network is not available. GSM operator indication disappears.	No GSM signal in current location. Check antenna and antenna connections. Relocate the antenna to a better reception place. Try other GSM operators. Place Sim card in your mobile phone and check signal level.

MESSAGE	DESCRIPTION	REMEDY
Modem error,resetting	The modem is not responding to commands sent from the D-500/700 device. The modem microprocessor is inactive. The D-500/700 device is resetting the modem.	Wait until the modem enters in service. If the modem does not enter in service, then turn the DC power off, wait 10 seconds and turn the power on again.
Modem searching	The D-500/700 is searching for a connected modem.	Select correct modem using the RainbowPlus program, Communication>Option1>Modem tab.
No Modem Response	The modem is not found, although defined by program parameter.	Select correct modem using the RainbowPlus program, Communication>Option1>Modem tab. If external modem is used, then check connections. If internal modem is used then turn the DC power off, wait 10 seconds and turn the power on again. If the same fault condition continues, then the modem is faulty.
Searching Network	GSM network is not available. GSM operator indication disappears.	No GSM signal in current location. Check antenna and antenna connections. Relocate the antenna to a better reception place. Try other GSM operators. Place Sim card in your mobile phone and check signal level.
Server Session Error	Modem is not responding IP commands sent by D-500/700 device.	Incorrect modem software version. Please contact Datakom.
SMS error, trying...	SMS message reception is not confirmed by the GSM system. The D-500/700 device will retry SMS sending 5 times.	The GSM system may be answering too late. This is not critical. If prepaid Sim card is used, credit may be insufficient.
SMS send/rcv error	SMS message reception is not confirmed by the GSM system after 5 SMS sending attempts.	The GSM system may be answering too late. This is not critical. If prepaid Sim card is used, credit may be insufficient.
SMS deleting error	SMS messages in the Sim card cannot be deleted.	Turn the DC power off, wait 10 seconds and turn the power on again. The D-500/700 device will erase all SMS messages in the Sim card at power-on.

MESSAGE	DESCRIPTION	REMEDY
Wrong Answer S:xx C:B	<p>The modem returns a command.</p> <p>xx denotes command step and C describes return type.:</p> <p>C:B → Bad response</p> <p>C:E → Error</p>	<p>These messages are not critical and does not affect operation. They are for debugging purposes only. Please contact Datakom if an operational problem occurs.</p>