MOX

Special Function Blocks
Programming Guide

Preface

Scope of the User Guide

This programming guide provides basic information about all special function blocks. This information helps users to configure and create program code for a MOX system application. It is expected that the user is an engineer or similar with an understanding of the operating and programming requirements of the intended MOX system components.

Related Documents

A MOX system contains a collection of MOX equipment and several software packages. For this reason, a number of related documents should be read in conjunction with this guide.

The related documents are noted below:

- MoxIDE User Guide
- MoxGRAF User Guide
- MOX Open Controller User Guide
- MOX Unity Field Controller User Guide
- MOX IoNix Field Controller User Guide

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1 Overview

MoxGRAF supports special function blocks to extend the functionality of the MOX Open Controller, MOX Unity and MOX IoNix. The following tables give function block names and their description supported by different controllers.

For the MOX Open Controller

Function Block Name	Description
DTime	Digital data dalay
Eth2Com	Ethernet to serial port process
ModNetM	ModNet master
MoxGetTime	Read system time
MoxSetTime	Set system time
Socket	TCP/IP operation
SysInfo	System information

Table 1   Function Blocks Available for MOX Open Controller

For the MOX Unity and the MOX IoNix

Function Block Name	Description
AGA3	AGA3 orifice metering of natural gas
AGA7	AGA7 gas measurement
AGA8D	AGA8 detail characterization method
AGA8G	AGA8 gross characterization method
Ammeter645	Ammeter645 data access
AmmeterWS	Ammeter data access for WeiSheng
ComX	Comm port process
EmailRx	Email receiving
EmailTx	Email sending
Eth2Com	Ethernet to serial port process
F_Control	Open, close and delete the file
F_RW	Read from or write to the file
FileTrans	File transfer
FrameGrab	Frame grabber
GPRS	GPRS
ModBusM	ModBus master
Modem	Modem process
ModNetM	ModNet master
MoxGetTime	Read system time
MoxLog	Log data
MoxRxTX	Read or write remote data
MoxSetTime	Set system time
MXPower	Detect the MOX Unity power supplier
Ping	Ping Destination IP
PPP	ppp connection management
Socket	TCP/IP operation
SysInfo	System information
Temperature	Detect the CPU board temperature
UPSConf	UPS configuration
UPSMonitor	UPS monitoring
WatchDog	Watch dog timer

Table 2   Function Blocks Available for the MOX Unity and the MOX IoNix

2 Function Block Description

2.1 AGA3

The "AGA3" function block calculates natural gas flow through a flange-tapped, concentric orifice meter.

The calculation is based on the "Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids", Part3 Natural Gas Applications, AGA Report No. 3, Third Edition, August 1992.

2.1.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
CT	DINT	Perform a calculation in CT ms
P	REAL	Upstream pressure in Bar
dP	REAL	Orifice differential pressure in mbar
T	REAL	Temperature in degree Celsius
DEN	REAL	Density in Kg/m^3
BDEN	REAL	Standard density in Kg/m^3
D	REAL	Meter tube internal diameter calculated at flowing temperature (mm)
dd	REAL	Orifice plate bore diameter calculated at flowing temperature. (mm)
u	REAL	Viscosity in cP
K	REAL	Isentropic Exponent
Re1	REAL	Reserved
Rev2	REAL	Reserved
Re3	REAL	Reserved

Table 3   Calling Parameters of AGA3

2.1.2 Return Parameters

Name	Data Type	Description
St	SINT	Calculation status
QM	REAL	Mass flow rate (Kg/s)
QB	REAL	Volume flow rate at standard conditions. (m^3/s)
QL	REAL	Volume flow rate at flowing (actual) conditions. (m^3/s)
ReD	REAL	Pipe Reynolds number
Rev	REAL	Reserved

Table 4   Return Parameters of AGA3

2.1.3 Unit Conversion

Care should be taken with the unit of input/output parameters. A list of the unit conversions is provided below.

2.1.3.1. *Pressure Conversions*

From	To	Use
psia	MPa	VALUE*0.006894757
bar	MPa	VALUE*0.1
mmHg	MPa	VALUE*0.000133322
atm	MPa	VALUE*0.101325
Mpa gage	MPa	VALUE + 0.101325
psig	MPa	(VALUE+14.696)*0.006894757
bar gage	MPa	(VALUE+1.01325)*0.1
atm gage	MPa	(VALUE+1.0)*0.101325
mmHg gage	MPa	(VALUE+760)*0.00133322)
MPa	psia	VALUE/0.006894757
MPa	bar	VALUE*10
MPa	mmHg	VALUE/0.00013322
MPa	atm	VALUE/0.101325
MPa	MPa gage	VALUE-0.101325
MPa	psig	VALUE/0.006894757 – 14.696
MPa	bar gage	VALUE * 10 – 1.01325
MPa	atm gage	VALUE/0.10325 –1
MPa	mmHg gage	VALUE/0.000133322 -760

Table 5   Pressure Conversion

2.1.3.2. *Temperature Conversions*

FROM	To	Use
^{o}C	K	VALUE + 273.15
^{o}R	K	VALUE*5/9
^{o}F	K	5/9*(VALUE+459.67)
K	^{o}C	VALUE – 273.15
K	^{o}R	VALUE*9/5
K	^{o}F	VALUE*9/5 – 459.67

Table 6   Temperature Conversion

2.1.3.3. Density Conversions

From	To	Use
kg/m^3	mol/dm^3	VALUE/MW
lbm/ft^3	mol/dm^3	VALUE*16.01846/MW
m^3/kg	mol/dm^3	1.0/(VALUE*MW)
ft^3/lbm	mol/dm^3	16.01846/(VALUE*MV)
mol/dm^3	kg/m^3	VALUE*MW
mol/dm^3	lbm/ft^3	VALUE*MW/16.01846
mol/dm^3	m^3/kg	1.0/(VALUE*MW)
mol/dm^3	ft^3/lbm	16.01846/(VALUE*MW)

Table 7   Density Conversion

MW: Molecular Weight (Kg/Mol).

2.1.3.4. Gross Heating Value Conversions

From	To	Use
Btu/ft^3	KJ/dm^3	VALUE*1.055056/28.316846592
Btu/in^3	KJ/dm^3	VALUE*1.055056/0.016387064
kcal/m^3	KJ/dm^3	VALUE*4.184*10^{-3}
MJ/m^3	KJ/dm^3	VALUE
KJ/m^3	KJ/dm^3	VALUE*10^{-3}
KJ/dm^3	Btu/ft^3	VALUE*28.316846592/1.055056
KJ/dm^3	Btu/in^3	VALUE*0.016387064/1.055056
KJ/dm^3	kcal/m^3	VALUE/(4.184*10$^{-3)}$
KJ/dm^3	MJ/m^3	VALUE
KJ/dm^3	KJ/m^3	VALUE*10^3

Table 8   Gross Heating Value Conversion

2.1.3.5. Standard Conditions

Temperature: 20°C

Pressure: 1 atm

2.2 AGA7

The "AGA7" function block calculates the gas volumetric flow from flowing conditions to standard conditions. The calculation is based on the "Measurement of Gas by Turbine Meters", AGA Transmission Measurement Committee Report No. 7, Second Revision, April 1996.

2.2.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable calculation 1: Enable calculation
CT	DINT	Perform a calculation in CT ms
Pf	REAL	Pressure at flowing conditions in MPa
Tf	REAL	Temperature at flowing conditions in degree Celsius
Zf	REAL	Compressibility at flowing conditions
Qf	REAL	Flow rate at flowing conditions in cubic metres/second
Pb	REAL	Pressure at standard conditions in MPa
Tb	REAL	Temperature at standard conditions in degree Celsius
Zb	REAL	Compressibility at standard conditions

Table 9   Calling Parameters of AGA7

2.2.2 Return Parameters

Name	Data Type	Description
ST	SINT	Calculation status
Qb	REAL	Flow rate at standard conditions in cubic metres/second

Table 10   Return Parameters of AGA7

2.2.3 Unit Conversion

Care should be taken with the units associated with the input/output parameters. A list of the unit conversions is provided below.

2.2.3.1.   *Pressure Conversions*

From	To	Use
psia	MPa	VALUE*0.006894757
bar	MPa	VALUE*0.1
mmHg	MPa	VALUE*0.000133322
atm	MPa	VALUE*0.101325
Mpa gage	MPa	VALUE + 0.101325
psig	MPa	(VALUE+14.696)*0.006894757
bar gage	MPa	(VALUE+1.01325)*0.1
atm gage	MPa	(VALUE+1.0)*0.101325
mmHg gage	MPa	(VALUE+760)*0.00133322)
MPa	psia	VALUE/0.006894757
MPa	bar	VALUE*10
MPa	mmHg	VALUE/0.00013322
MPa	atm	VALUE/0.101325
MPa	MPa gage	VALUE-0.101325
MPa	psig	VALUE/0.006894757 – 14.696
MPa	bar gage	VALUE * 10 – 1.01325
MPa	atm gage	VALUE/0.10325 –1
MPa	mmHg gage	VALUE/0.000133322 -760

Table 11   Pressure Conversion of AGA7

2.2.3.2.   *Temperature Conversions*

From	To	Use
^{o}C	K	VALUE + 273.15
^{o}R	K	VALUE*5/9
^{o}F	K	5/9*(VALUE+459.67)
K	^{o}C	VALUE – 273.15
K	^{o}R	VALUE*9/5
K	^{o}F	VALUE*9/5 – 459.67

Table 12   Temperature Conversion of AGA7

2.3 AGA8d

The "AGA8d" function block calculates the compressibility factors of natural gas and other related hydrocarbon gases.

The calculation is based on the "Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases", AGA Transmission Measurement Committee Report No. 8, Second Edition, November 1992.

The AGA report No.8 provides 2 methods to calculate the compressibility, one is the detailed characterization method and the other is the gross characterization method. The function block AGA8d is based on the detailed characterization method.

2.3.1 Calling Parameters

Name	Data Type	Description
en	BOOL	Enable this function block 0: Disable calculation 1: Enable calculation
CT	DINT	Perform a calculation in CT ms
C1	REAL	Composition (% Mole) of Methane
N2	REAL	Composition (% Mole) of Nitrogen
CO2	REAL	Composition (% Mole) of Carbon dioxide
C2	REAL	Composition (% Mole) of Ethane
C3	REAL	Composition (% Mole) of Propane
H20	REAL	Composition (% Mole) of water
H2S	REAL	Composition (% Mole) of Hydrogen sulfide
H	REAL	Composition (% Mole) of Hydrogen
CO	REAL	Composition (% Mole) of Carbon monoxide
O2	REAL	Composition (% Mole) of Oxygen
iC4	REAL	Composition (% Mole) of iso-Butane
nC4	REAL	Composition (% Mole) of n-Butane
iC5	REAL	Composition (% Mole) of iso-Pentane
nC5	REAL	Composition (% Mole) of n-Pentane
nC6	REAL	Composition (% Mole) of n-Hexane
nC7	REAL	Composition (% Mole) of n-Heptane
nC8	REAL	Composition (% Mole) of n-Octane
nC9	REAL	Composition (% Mole) of n-Nonane
nC10	REAL	Composition (% Mole) of n-Decane
He	REAL	Composition (% Mole) of helium
Ar	REAL	Composition (% Mole) of Argon
T	REAL	Temperature in degree Celsius
P	REAL	Pressure in Bar
Re1	REAL	Reserved

Table 13   Calling Parameters of AGA8d

2.3.2   Return Parameters

Name	Data Type	Description
Status	SINT	Calculation status
Z	REAL	Compressibility
D	REAL	Density in Kg/(m^3)
CMW	REAL	Composition Mol Weight (Kg/Mol)
BD	REAL	Density at standard condition

Table 14   Return Parameters of AGA8d

2.3.3   Composition

Dividing each component's mole percent by the sum of all the component's mole percents will normalize the mole percent values.

The mole percent value should be 0 for components that are not present.

2.4 AGA8g

The "AGA8g" function block calculates the compressibility factors of natural gas and other related hydrocarbon gases.

The calculation is based on the "Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases", AGA Transmission Measurement Committee Report No. 8, Second Edition, November 1992.

The AGA report No.8 provides two methods to calculate the compressibility, one is the detailed characterization method and the other is the gross characterization method. The function block AGA8g is based on the gross characterization method.

2.4.1 Calling Parameters

Name	Data Type	Description
en	BOOL	Enable this function block 0: Disable calculation 1: Enable calculation
CT	DINT	Perform a calculation in CT ms
method	SINT	Methods for determining equivalent hydrocarbon properties
P	REAL	Pressure in MPa
T	REAL	Temperature in degree Celsius
HV	REAL	Composition (% Mole) of Methane in KJ/dm^3
TH	REAL	Reference temperature for heating value in degree Celsius
TD	REAL	Reference temperature for molar density in degree Celsius
PD	REAL	Reference pressure for molar density in MPa
GR	REAL	Relative density(specific gravity)
TGR	REAL	Reference temperature for relative density in degree Celsius
PGR	REAL	Reference pressure for relative density in MPa
N2	REAL	Composition (% Mole) of Nitrogen
CO2	REAL	Composition (% Mole) of Carbon dioxide
H	REAL	Composition (% Mole) of Hydrogen
CO	REAL	Composition (% Mole) of Carbon monoxide
Re1	REAL	Reserved

Table 15   Calling Parameters of AGA8g

2.4.2   Return Parameters

Name	Data Type	Description
Status	SINT	Calculation status
Z	REAL	Compressibility
FPV	REAL	Super compressibility
D	REAL	Density in Kg/(m^3)
CMW	REAL	Composition Mol Weight (Kg/Mol)
BD	REAL	Density at standard condition

Table 16   Return Parameters of AGA8g

2.4.3   Composition

Dividing each component's mole percent by the sum of all the component's mole percents will normalize the mole percent values.

For non-existing components, the mole percent value should be 0.

2.5 Ammeter645

The "Ammeter645" function block is used to access the Multi-function watt-hour meter via serial port (RS485/RS232). It uses the Multi-function watt-hour meter communication protocol DL/T 645-1997 published by power industry department of China on Feb 02, 1998. This standard was implemented on Jun 01, 1998.

2.5.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
PORT	SINT	Serial Port number 1: COM1 2: COM2 3: COM3 4: COM4
BAUD	DINT	Baud Rate
DATB	SINT	Data Bits
PAT	SINT	Parity 0: None 1: Odd 2: Even
STPB	SINT	Stop Bits 1: One stop 2: Two stops
MODE	SINT	Serial mode 1: RS232 2: RS485
CMND	SINT	Command 1: Read 2: Continue Read 3: Retry Read 4: Write 5: Adjust Date and Time 6: Write Device Address 7: Set Baud Rate 8: Set Password 9: Clear
DATY	SINT	Data Type
ADR0	SINT	Address 0 The first address
ADR1	SINT	Address 1 The second address
ADR2	SINT	Address 2 The third address
ADR3	SINT	Address 3 The fourth address
ADR4	SINT	Address 4 The fifth address
ADR5	SINT	Address 5 The sixth address

Name	Data Type	Description
DID0	SINT	Data ID 0 The first Data ID
DID1	SINT	Data ID 1 The second data ID
DLIN	SINT	Data Length Input The Input Data Bytes
NDIN	DINT	DINT Data Input
FDIN	REAL	Real Data Input
DIN0	SINT	Data Input 0 The first original input byte
DIN1	SINT	Data Input 1 The second original input byte
DIN2	SINT	Data Input 2 The third original input byte
DIN3	SINT	Data Input 3 The fourth original input byte
DIN4	SINT	Data Input 4 The fifth original input byte
DIN5	SINT	Data Input 5 The sixth original input byte
TOUT	DINT	Timeout Timeout in ms, the default is 5000

Table 17   Calling Parameters of Ammeter645

2.5.2   Return Parameters

Name	Data Type	Description
STAT	SINT	Process Status. -5: STATUS_INVALID_DATA -4: STATUS_INVALID_PARA -3: STATUS_PORT_ERROR -2: STATUS_DATA_ERROR -1: STATUS_TIMEOUT 0: INITIAL or RESET OK; 1: STATUS_PROCESS 2: STATUS_SUCCESS
RXOK	BOOL	RXOK Read complete. A positive pulse indicates the read complete.
FUNC	SINT	Function Code The return function code
DLEN	SINT	Data Length Output Received byte num
ERR	SINT	Error The error code from ammeter
DOUT	DINT	DINT Data Output DINT Data Output when DATY = 1 for read
FOUT	REAL	REAL Data Output REAL Data Output when DATY = 2 for read
OUT0	SINT	Data Output 0 The first original byte from ammeter
OUT1	SINT	Data Output 1 The second original byte from ammeter

Name	Data Type	Description
OUT2	SINT	Data Output 2 The third original byte from ammeter
OUT3	SINT	Data Output 3 The fourth original byte from ammeter
OUT4	SINT	Data Output 4 The fifth original byte from ammeter
OUT5	SINT	Data Output 5 The sixth original byte from ammeter

Table 18   Return Parameters of Ammeter645

2.5.3   Hints, Tips and FAQs

2.5.3.1.   Configure the Serial Port

The serial port can be fully configured by input parameters. The default baud rate for the ammeter is 1200 bps while the default parity is even. When the function block is initiated the serial ports will be opened when it is enabled. The serial ports will be closed when the function block is disabled.

2.5.3.2.   Usage of the Function Block

All serial port parameters should be set correctly. They cannot be modified during operation.

CMND:
0: no operation

1: Read
   Input Pin: CMND, DATY, ADR0 ~ ADR5, DID0, DID1
   Output Pin: STAT, RXOK, FUNC, DLEN, DOUT or FOUT, OUT0 ~ OUT5

2: Continue Read
   Input Pin: CMND, DATY, ADR0 ~ ADR5, DID0, DID1
   Output Pin: STAT, RXOK, FUNC, DLEN, DOUT or FOUT, OUT0 ~ OUT5

3: Retry Read
   Input Pin: CMND, DATY, ADR0 ~ ADR5
   Output Pin: STAT, RXOK, FUNC, DLEN, DOUT or FOUT, OUT0 ~ OUT5

4: Write
   Input Pin: CMND, DATY, ADR0 ~ ADR5, DID0, DID1, NDIN or FDIN, DIN0 ~ DIN5, DLIN
   Output Pin: STAT, RXOK, FUNC

5: Adjust Date and Time
   Input Pin: CMND, DIN0 ~ DIN5
   Output Pin: STAT

6: Write Device Address
   Input Pin: CMND, ADR0 ~ ADR5
   Output Pin: STAT, RXOK, FUNC

7: Set Baud Rate
   Input Pin: CMND, DIN0
   Output Pin: STAT, RXOK, FUNC

8: Set Password
   Input Pin: CMND, ADR0 ~ ADR5, DID0, DID1, DIN0 ~ DIN5

Output Pin: STAT, RXOK, FUNC

9: Clear
Input Pin: CMND, ADR0 ~ ADR5
Output Pin: STAT

Notes:
1) DINT, REAL and Original Bytes can be used for reading and writing. For original bytes, the byte number should be defined by the calling parameter DLIN and the physical data should be assigned from DIN0 ~ DIN5.

2) DIN0 = ss, DIN1 = mm, DIN2 = hh, DIN3 = DD, DIN4 = MM, DIN5 = YY is for adjusting the Date and Time.

3) DIN0 = z is for setting the BaudRate.

4) DID0 = PAo, DIN0 = P0o, DIN1 = P1o, DIN2 = P2o, DID1 = PAn, DIN3 = P0n, DIN4 = P1n, DIN5 = P2n is for setting the Password.

2.5.3.3.   Protocol

1)   Read Data

Request Packet:

68H	A_0	…	A_5	68H	01H	02H	DI_0	DI_1	CS	16H

Normal Finished Response:

68H	A_0	…	A_5	68H	81H	L	DI_0	DI_1	N_1	…	N_m	CS	16H

Need to Continue read Response:

68H	A_0	…	A_5	68H	A1H	L	DI_0	DI_1	N_1	…	N_m	CS	16H

Error Response:

68H	A_0	…	A_5	68H	C1H	01H	ERR			CS	16H

2)   Continue Read

Request Packet:

68H	A_0	…	A_5	68H	02H	02H	DI_0	DI_1	CS	16H

Normal Finished Response:

68H	A_0	…	A_5	68H	82H	L	DI_0	DI_1	N_1	…	N_m	CS	16H

Need to Continue read Response:

68H	A_0	…	A_5	68H	A2H	L	DI_0	DI_1	N_1	…	N_m	CS	16H

Error Response:

68H	A_0	…	A_5	68H	C2H	01H	ERR			CS	16H

3)   Retry Read

Request Packet:

68H	A$_0$	…	A$_5$	68H	03H	00H	CS	16H

Normal Finished Response:

68H	A$_0$	…	A$_5$	68H	83H	L	DI$_0$	DI$_1$	N$_1$	…	N$_m$	CS	16H

Need to Continue read Response:

68H	A$_0$	…	A$_5$	68H	A3H	L	DI$_0$	DI$_1$	N$_1$	…	N$_m$	CS	16H

Error Response:

68H	A$_0$	…	A$_5$	68H	C3H	01H	ERR	CS	16H

4) Write Data

Request Packet:

68H	A$_0$	…	A$_5$	68H	04H	L	DI$_0$	DI$_1$	N$_1$	…	N$_m$	CS	16H

Normal Response:

68H	A$_0$	…	A$_5$	68H	84H	00H	CS	16H

Error Response:

68H	A$_0$	…	A$_5$	68H	C4H	01H	ERR	CS	16H

5) Adjust Date and Time

Request Packet:

68H	99H	…	99H	68H	08H	06H	ss	mm	hh	DD	MM	YY	CS	16H

No Response

6) Write Device Address

Request Packet:

68H	99H	…	99H	68H	0AH	06H	A0	…	A5	CS	16H

Normal Response:

68H	A$_0$	…	A$_5$	68H	8AH	00H	CS	16H

7) Set Baud Rate

Request Packet:

68H	A$_0$	…	A$_5$	68H	0CH	01H	Z	CS	16H

Normal Response:

68H	A₀	…	A₅	68H	0CH	01H	Z	CS	16H

Error Response:

68H	A₀	…	A₅	68H	8CH	01H	Z	CS	16H

8) Set Password

Request Packet:

68H	A0	…	A5	68H	0FH	08H	PA0	P0o	P1o	P2o	PAN	P0N	P1N	P2N	CS	16H

Normal Response:

68H	A₀	…	A₅	68H	8FH	04H	PAN	P0N	P1N	P2N	CS	16H

9) Clear

Request Packet:

68H	A₀	…	A₅	68H	10H	00H	CS	16H

No Response.

2.6 AmmeterWS

The "AmmeterWS" function block is used to access the Multi-function watt-hour meter via serial ports (RS485/RS232). It uses a special communication protocol from HuNan WeiSheng Electronics Co. LTD. The testing has been done through DTSD341/DSSD331-2. As for other type of WeiSheng ammeters, please confirm the communication protocol with HuNan WeiSheng Electronics Co. LTD.

2.6.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
PORT	SINT	Serial Port Number 1: COM1 2: COM2 3: COM3 4: COM4
BAUD	DINT	Baud Rate
DATB	SINT	Data Bits
PAT	SINT	Parity 0: None 1: Odd 2: Even
STPB	SINT	Stop Bits 1: One stop 2: Two stops
MODE	SINT	Serial Mode 1: RS232 2: RS485
CMND	SINT	Command 1: Read 2: Continue Read 3: Write Device Address 4: Write 5: Adjust Date and Time 6: Adjust Date and Time for V41 7: Set Password
DATY	SINT	Data Type
AADR	SINT	Ammeter Address
DALO	SINT	Data Address Low
DAHI	SINT	Data Address High
DLIN	SINT	Data Length Input The Input Data Bytes
NDIN	DINT	DINT Data Input
FDIN	REAL	Real Data Input
DIN0	SINT	Data Input 0 The first original input byte
DIN1	SINT	Data Input 1 The second original input byte
DIN2	SINT	Data Input 2 The third original input byte
DIN3	SINT	Data Input 3 The fourth original input byte

Name	Data Type	Description
DIN4	SINT	Data Input 4 The fifth original input byte
DIN5	SINT	Data Input 5 The sixth original input byte
TOUT	DINT	Timeout Timeout in ms, the default is 5000

<p align="center">Table 19 Calling Parameters of AmmeterWS</p>

2.6.2 Return Parameters

Name	Data Type	Description
STAT	SINT	Process Status. -4: STATUS_INVALID_PARA -3: STATUS_PORT_ERROR -2: STATUS_DATA_ERROR -1: STATUS_TIMEOUT 0: INITIAL or RESET OK; 1: STATUS_PROCESS 2: STATUS_SUCCESS
RXOK	BOOL	Read Complete. A positive pulse indicates the read complete.
TLEN	SINT	Total Length The total received bytes
CLEN	SINT	Current Length The current received bytes
DLEN	SINT	Data Length Output Received byte num
DOUT	DINT	DINT Data Output DINT Data Output when DATY = 1 for read
FOUT	REAL	REAL Data Output REAL Data Output when DATY = 2 for read. FOUT = DOUT/1000.0, and no more than 10000.0, other format is not supported at present
OUT0	SINT	Data Output 0 The first original byte from ammeter
OUT1	SINT	Data Output 1 The second original byte from ammeter
OUT2	SINT	Data Output 2 The third original byte from ammeter
OUT3	SINT	Data Output 3 The fourth original byte from ammeter
OUT4	SINT	Data Output 4 The fifth original byte from ammeter
OUT5	SINT	Data Output 5 The sixth original byte from ammeter

<p align="center">Table 20 Return Parameters of AmmeterWS</p>

2.6.3   Hints, Tips and FAQs

2.6.3.1.   Configure the Serial Port

The serial ports can be fully configured using the input parameters. The default baud rate for the ammeter is 1200bps. The default parity is even. After the function is initialized the serial ports will open when this function block (FB) is enabled. The serial ports are closed when it is disabled.

2.6.3.2.   Usage of the Function Block

All serial port parameters should be set correctly as they cannot be modified on line.

CMND:
> 0: no operation

> 1: Read
>> Input Pin: CMND, DATY, AADR, DALO, DAHI, DLIN
>> Output Pin: STAT, RXOK, TLEN, CLEN, DOUT or FOUT, OUT0 ~ OUT5

> 2: Continue Read
>> Input Pin: CMND, DATY, AADR, DALO, DAHI, DLIN
>> Output Pin: STAT, RXOK, TLEN, CLEN, DOUT or FOUT, OUT0 ~ OUT5

> 3: Write Device Address
>> Input Pin: CMND, AADR
>> Output Pin: STAT

> 4: Write
>> Input Pin: CMND, DATY, AADR, DALO, DAHI, DLIN, DIN0 ~ DIN5
>> Output Pin: STAT, RXOK

> 5: Adjust Date and Time
>> Input Pin: CMND, DIN0 ~ DIN4
>> Output Pin: STAT

> 6: Adjust Date and Time for V41
>> Input Pin: CMND, DIN0 ~ DIN5
>> Output Pin: STAT

> 7: Set Password
>> Input Pin: CMND, DIN0 ~ DIN3
>> Output Pin: STAT

Notes:
1) DINT, REAL and Original Bytes can be used for reading. The number of bytes to be read must be defined correctly by DLIN along with correct data from DIN0 to DIN5.

2) CMND 2 should run after CMND 1, each time defining the correct beginning read index (NDIN) and number of bytes to be read (DLIN).

3) DIN0 = YY, DIN1 = MM, DIN2 = DD, DIN3 = hh, DIN4 = mm, DIN5 = ss is for adjusting the Date and Time

4) DIN0 ~ DIN3 are used as password when setting the password.

2.7 ComX

The "ComX" function block performs the basic functions of a MOX Unity serial port. Command operations include:

- open
- read from
- write to
- reset and close

2.7.1 Calling Parameters

Name	Data Type	Description
ENA	BOOL	Enable this function block 0: Disable 1: Enable
PORT	SINT	Port Number 1: COM1 2: COM2 3: COM3 4: COM4
BAUD	DINT	Baud Rate 9600,19200,38400,57600,115200,230400
DATB	SINT	Data Bits 5, 6, 7, 8
PAT	SINT	Parity 0: None 1: Odd 2: Even
STPB	SINT	Stop Bits 1: One stop 2: Two stops
CMD	SINT	Command 1: Open serial port 2: Read from serial port 3: Write to serial port 4: Clear n bytes in read string from the beginning to the end 5: Reset serial port 6: Close serial port
CLEN	DINT	Clear Length The length of clearing read string
WSTR	STRING	Write String Maximum size is 255

Table 21   Calling Parameters of ComX

2.7.2 Return Parameters

Name	Data Type	Description
STAT	BOOL	Command Status 0: No error 2: Error
PSTA	BOOL	Port Status 0: Not open 1: Open
RLEN	DINT	Read Length The string length of reading from COMM port (the max value is 255)
RSTR	STRING	Read String Maximum size is 255

Table 22   Return Parameters of ComX

2.8 DTime

The "DTIME" function block generates a delay for numerical input variables. The numerical output variable, FOUT, has the same behaviour as the numerical input variable when the delay (DLAY) is included. The amount of delay is variable.

2.8.1 Calling Parameters

Name	Data Type	Description
Enable (EN)	BOOL	Enable this function block 0: Disable 1: Enable
FDataIn (FDIN)	REAL	Real Data Input
Sample (SAMP)	DINT	Sample Time in ms
Delay (DLAY)	DINT	Time Delay in ms
Track (TRCK)	REAL	Initial Data/Track Data Input
TrackSW (TRSW)	BOOL	Track Switch
Reserve (RESV)	DINT	Reserved

Table 23   Calling Parameters of DTime

2.8.2 Return Parameters

Name	Data Type	Description
STATUS (STAT)	SINT	Process status. -2, STATUS_DATA_ERROR -1, STATUS_BUFFER_HIGHLIMIT 0, INITIAL or RESET OK; 1, STATUS_PROCESS
FOUT (FOUT)	REAL	REAL Data Output
CURP (CURP)	SINT	Current Sample Time in ms
BUFF (BUFFER)	DINT	Current number of real values used inside the function block. Maximum buffer length is 200.

Table 24   Return Parameters of DTime

2.9 EmailTx

The "EmailTx" function block performs the Email sending function which includes the message and attachment transfer. It can be used between MOX Unitys or with other Email applications.

2.9.1 Calling Parameters

Name	Data Type	Description
En	BOOL	Enable this function block 0: Enable 1: Disable
USR	STRING [30]	User account of email
PWD	STRING [30]	Pass word of account
IPA	STRING [30]	IP address of SMTP server
FRM	STRING [50]	Email sender
STO	STRING [120]	Email receiver
SUB	STRING [30]	Subject
TEXT	STRING [255]	The email body
ATCH	STRING [30]	The email attachment (file name)
CMND	SINT	Command of the function block 0: No operation 1: Send email

Table 25   Calling Parameters of EmailTx

2.9.2 Return Parameters

Name	Data Type	Description
STAT	SINT	The status of the command executed -2: Invalid parameter -1: Timeout 0: No operation 1: Command in process 2: Operation successful

Table 26   Return Parameters of EmailTx

2.9.3 Hints, Tips and FAQs

Email can only be transferred in 7-bit US ASCII. 8-bit ASCII and binary should be encoded before it is transferred. Since there is no support provided for the email body using 8-bit ASCII, such as Chinese, data of this type cannot be transferred directly.

Attachments can be in any type. The main encoding method is Base64 and is supported here for attachments. Other encode methods, such as Quoted-Printable, are not handled.

For some SMTP servers, authentication is needed before an email is sent. The main authentication mechanism, LOGIN, is supported. This function block does not support other authentication mechanisms, such as CRAM-MD5. For multiple receivers, each receiver should be separated with a comma.

2.10 EmailRx

The "EmailRx" function block performs the email receiving function which includes message and attachment receiving. It can be used between MOX Unitys or with other email applications.

2.10.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
USR	STRING [30]	User account of email
PWD	STRING [30]	Password of account
IPA	STRING [30]	IP address of POP3 server
CMND	SINT	Command 0: No operation 1: Scan email 2: Receive email 3: Delete email 4: Store attachment 5: Quit
IDX	SINT	The index of email

Table 27   Calling Parameters of EmailRx

2.10.2 Return Parameters

Name	Data Type	Description
STAT	SINT	The status of the command executed -4: Decode error -3: Overflow -2: Invalid parameter -1: Timeout; 0: No operation 1: Operation successful
NUM	SINT	Mail count
FRM	STRING [50]	Email sender
STO	STRING [120]	Email receiver
SUB	STRING [30]	Subject
TEXT	STRING [255]	The email body
ATCH	STRING [30]	The email attachment

Table 28   Return Parameters of EmailRx

2.10.3 Hints, Tips and FAQs

1) To check for new emails, set CMD to 1, then if no error occurs the result will be NUM = email count.

2) Next set IDX to the number of the email to be read and set CMD to 2. The sender, receiver, subject and email body will then appear in the corresponding text fields. If the email has an attachment the file name will appear in the ATCH field.

3) To download an attachment, CMD should be set to 4 with the IDX variable being unchanged.

Emails can only be transferred in 7-bit US ASCII. The function block will not support other mail body types, e.g. 8-bit ASCII. If the mail is in 8-bit ASCII, it will not be displayed correctly. The received attachment is treated as being encoded using the Base64 method. The only decoding method provided, by the function block, is Base64.

There are two email receiving protocols: POP3 and IMAP4. Only the POP3 protocol is supported.

For some POP3 servers, APOP authentication is adopted. The password is encoded before transfer. The function block does NOT provide this functionality.

2.11 Eth2Com

The "Eth2Com" function block performs transparent relay functions between the Ethernet and serial ports, including receiving and sending.

Eth2Com acts as the "ComX" function block when connecting remote serial ports. It needs to connect remote serial ports before sending and receiving data and to disconnect when the communication is complete. Connection and disconnection commands are not needed when performing common transparent gateway functions.

2.11.1 Calling Parameters

Name	Data Type	Description
En	BOOL	Enable this function block 0: Disable 1: Enable
IPAd	STRING	IP address of Ethernet Gateway
Port(PORT)	SINT	Serial Port 1: Via COM1 of gateway 2: Via COM2 of gateway 3: Via COM3 of gateway 4: Via COM4 of gateway 11: Via COMA on MoxCP Serial Comm 12: Via COMB on MoxCP Serial Comm
Command(CMD)	SINT	Command 0: Null Command 1: Connect Remote Serial 2: Receive from socket port 3: Send to socket port 4: Clear n bytes in receiving string from front to end 5: Disconnect Remote Serial Port
ClearLen(CLEN)	DINT	The length of clearing receiving string.
SendString(SSTR)	STRING	The string to be sent (the max size is 255)

Table 29   Calling Parameters of Eth2Com

2.11.2 Return Parameters

Name	Data Type	Description
Status(STAT)	SINT	The status of the command executed -2: Socket Error -1: Time out 0: No error 1: Command Processing 2: Command Success
RecvLen(RLEN)	DINT	The length of receiving data (the max size is 255)
RecvString(RSTR)	STRING	The receiving string (the max size is 255)

Table 30   Return Parameters of Eth2Com

2.12 F_Control

The "F_Control" function block performs operations to files.

2.12.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 1: Enable 0: Disable
COpt	SINT	Control option 0: Null option 1: Open the file according to the Name and Mode 2: Close the file according to the FCID 3: Delete the file
Name	STRING	File name opened and deleted The maximum size is 8 No extention name, no path
Mode	STRING	File mode opened **r:** Read only. File must exist. **w:** Write only at the beginning of the file. If the file does not exist, please create the file first; If file exists, its contents will be overwritten. **a:** Write only at the end of the file (appending). Creates the file first if it does not exist. **r+:** Read and write. File must exist. **w+:** Read and write. If file does not exist, please create the file first; If file exists, its contents will be overwritten. **a+:** Read and write. Write at the end of the file (appending). Create the file first if it does not exist.
FCID	DINT	The file ID to be closed

Table 31   Calling Parameters of F_Control

2.12.2   Return Parameters

Name	Data Type	Description
RUN	BOOL	The function block control 0: Disable this function block 1: Enable this function block
Result	SINT	The file control result 0: The file control succeeds 1: The file open fails 2: The file close fails 3: The file delete fails
FID	DINT	The file ID opened If opening the file fails, the file closes or the file is deleted, it is -1.
FLen	DINT	The file current length

Table 32   Return Parameters of F_Control

2.12.3   Hints, Tips and FAQs

Opening, closing and deleting files are executed in pulse mode operation, i.e. the option must have a change before it can again open, close and delete. For example, if you intend to open another file after just opening a file, you must set the COpt to 0 (Null option) and then reset the COpt to 1 (Open file).

Opening and deleting files are executed by name. If you are opening or deleting a file a file name must be entered.

Closing files is executed through FCID. The file ID must be entered when closing it.

2.13 F_RW

The "F_RW" function block performs file reading and writing functions.

2.13.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 1: Enable 0: Disable
FID	DINT	The file ID opened
Opt	SINT	The option 0: Null option 1: Read form the file 2: Write to the file
Addr	DINT	The MODBUS address (decimal) of reading or wiring variable.
Pont	SINT	The MODBUS points to be read or written

Table 33   Calling Parameters of F_RW

2.13.2   Return Parameters

Name	Data Type	Description
RUN	BOOL	The function block control 0: Disable this function block 1: Enable this function block
Result	SINT	The read or write result 0: The read or write succeeds 1: The read fails 2: The write fails
RWL	DINT	The length that has not been read from file, or the total file length if write to file.

Table 34   Return Parameters of F_RW

2.13.3   Hints, Tips and FAQs

Addr is the variable address mapped into MODBUS address.

The data being read from the file is put into the variable. Its MODBUS address is Addr.

The data being written to the file is taken from the variable value. Its MODBUS address is Addr.

The data type of the read or write variable can be BOOL, DINT, SINT, REAL, STRING and TIME.

You can set the number of MODBUS points (Pont) to read or written at one time beginning from address Addr. The STRING data type is not supported. For example, following is the MODBUS address variable map.

Address	Name	Data Type
40001	S_1	SINT
40002	D_1	DINT
40004	T_2	TIME
40006	S_2	SINT
40007	R_1	REAL
40009	String_1	STRING
40035	String_2	STRING
40061	R_2	REAL

Table 35   MODBUS Address Map Variables

1) If Addr is 40001 and Pont is 3, S_1 and D_1 will be read or written.

2) If Addr is 40001 and Pont is 4, S_1 and D_1 will be read or written. But T_2 will not be updated when a read or write is enabled because the length is not enough. For reading and writing T_2 as well in the one operation, you must set Pont to 5.

3) If Addr is 40001 and Pont is 9, S_1, D_1, T_2, S_2 and R_1 can be read or written and eventhough the point count is enough to read or write String_1, it cannot be read or written because the STRING variable cannot be read or written with the other variables.

4) If String_1 is to be read or written, set Addr to 40009 and Pont to 1.

Reading or writing a file is executed in pulse mode.,i.e. the option must have a change before again reading or writing.

For example, after you read the first data from file, if you intend to read the second data, you must set the Opt to 0(Null option), then reset the Opt to 1(Read from the file).

2.14 FileTrans

The "FileTrans" function block performs a file transfer function between MOX Unitys.

2.14.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
DEST	DINT	Destination Remote station number: 1~ 250.
IPA	STRING [15]	Slave IP Address
PORT	DINT	Port Socket port number, if this value is 0, use default port 502 for TCP and 503 for UDP.
TCP	BOOL	Use TCP or UDP 0: TCP 1: UDP
FILE	STRING [30]	Source File Name No path.
SVAS	STRING [30]	Save As Stored file name If NULL, it is the same as File;
LTP	SINT	Local Type File type 0: Disk file 1: Memory file
RTP	SINT	Remote Type 0: Disk file 1: Memory file
CMND	SINT	Command 0: No operation or Cancel 1: Receive file 2: Send file 3: Delete file 4: MemToDisk 5: DiskToMem 6: ScanSpace
STAT	DINT	Start Position The starting position of the file is used for resuming file sending or receiving.
RTY	SINT	Retry The number of retries if the communication times out.
TO	DINT	Timeout Timeout in ms for each packet of file, default value is 1000 ms.

Table 36   Calling Parameters of FileTrans

2.14.2 Return Parameters

Name	Data Type	Description
TAL	DINT	Total Total bytes of file.
CUR	DINT	Current The current processing position.
STUS	SINT	Operation Status: -10: Remote file fail -9: File conflict -8: Disk full -7: Memory full -6: Connect fail -5: Invalid parameters -4: Local file fail -3: Socket error -2: Serial error -1: Timeout 1: Processing 2: Success
OK	BOOL	OK Command complete. A positive pulse indicates that one command is complete.

Table 37   Return Parameters of FileTrans

2.14.3 Hints, Tips and FAQs

1) If IPA is not null, the Ethernet port will have higher priority than that of the serial port.

2) When a serial port is used, no serial port number needs to be specified but the user should configure the serial ports and the network correctly at both ends with MoxIDE. The protocol should be "mox". The destination (DEST) must be set as the remote station number.

The maximum number of packets for one file are 200. A resume mechanism is provided when one packet of a whole file transfer fails. To resume sending set the starting position (STAT) to the current (CUR) position and then set the command (CMND) to send or receive the file again.

2.15 FrameGrab

The "FrameGrab" function block performs the frame grabber functions. It is based on PixelSmart PC104 and operates for both a greyscale and a colour card. The PC104 bus can transfer data at about 1MegaByte per second. The frame is stored as a .BMP or .JPG file.

2.15.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
PIX	SINT	Byte Per Pixel: 0: 1Byte/pixel, 8-bit grey BMP file 1: 2Byte/pixel, 16-bit colour BMP file
MODE	SINT	Mode 0: Real time mode 1: History log mode
NUM	DINT	Frame Number; Real time: video1.bmp~videoN.bmp will be used in circle (memory file); History log: hisvideo1-xxxx.bmp~hisvideoN-xxxx.bmp will be used in circle (disk file, xxxx is suffix defined by suffix); The default num is 1;
FMAT	SINT	File Format: 0: BMP file (512 X 480) 1:JPG file (512 X 480)
SFIX	STRING [10]	Suffix If Suffix is NULL, hisvideo1.bmp~hisvideoN.bmp will be used in history log mode;
CMND	SINT	Command 0: No operation or Cancel 1: Grab frame 2: Set Brightness 3: Set Contrast 4: Set Width 5: Set Height 6: Reverse Frame
REV0	DINT	Reserve
REV1	DINT	Used for setting. Default value: Brightness = 107 Contrast = 94 Width = 512 Height = 480

Table 38   Calling Parameters FrameGrab

2.15.2   Return Parameters

Name	Data Type	Description
TAL	DINT	Total Total bytes of frame;
CUR	DINT	Current The current processing position.
STUS	SINT	Operation Status: -7: File conflict -6: Invalid parameter -5: Memory fail -4: Disk full -3: Memory full -2: Driver error -1: Timeout 1: Processing 2: Success
RECD	DINT	Record The current record index.

Table 39   Return Parameters of FrameGrab

2.15.3   View Utility

The Frame View Utility is used to get frames from the Mox Unity to the PC. To access this utility, start MoxIDE, select **"File Transfer"** from the **"Tools"** menu.
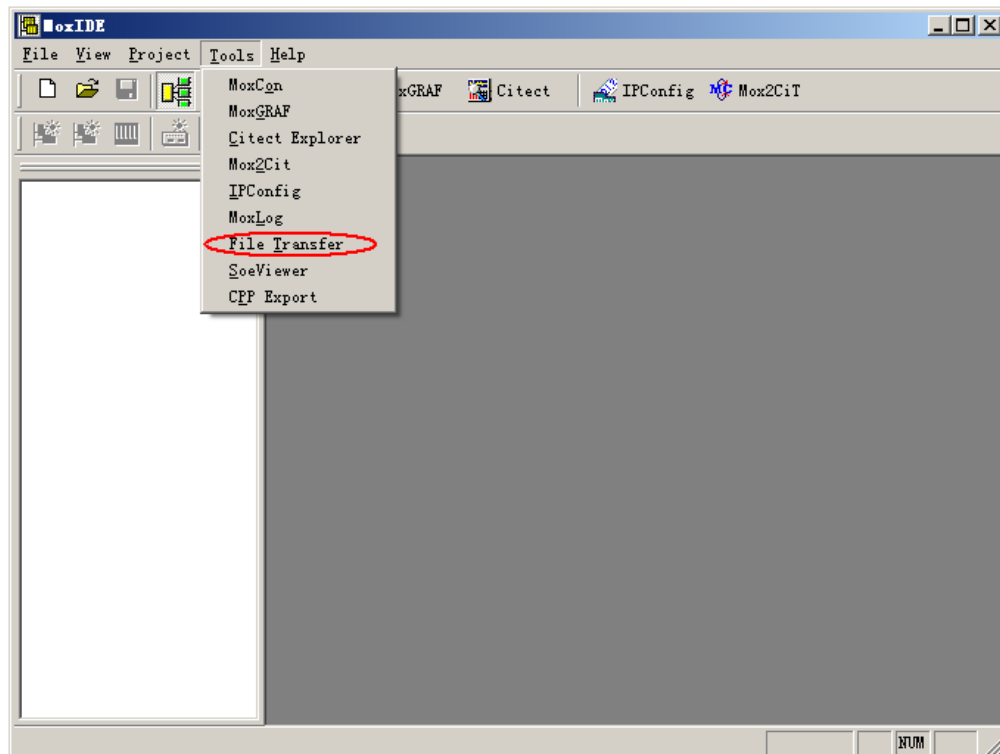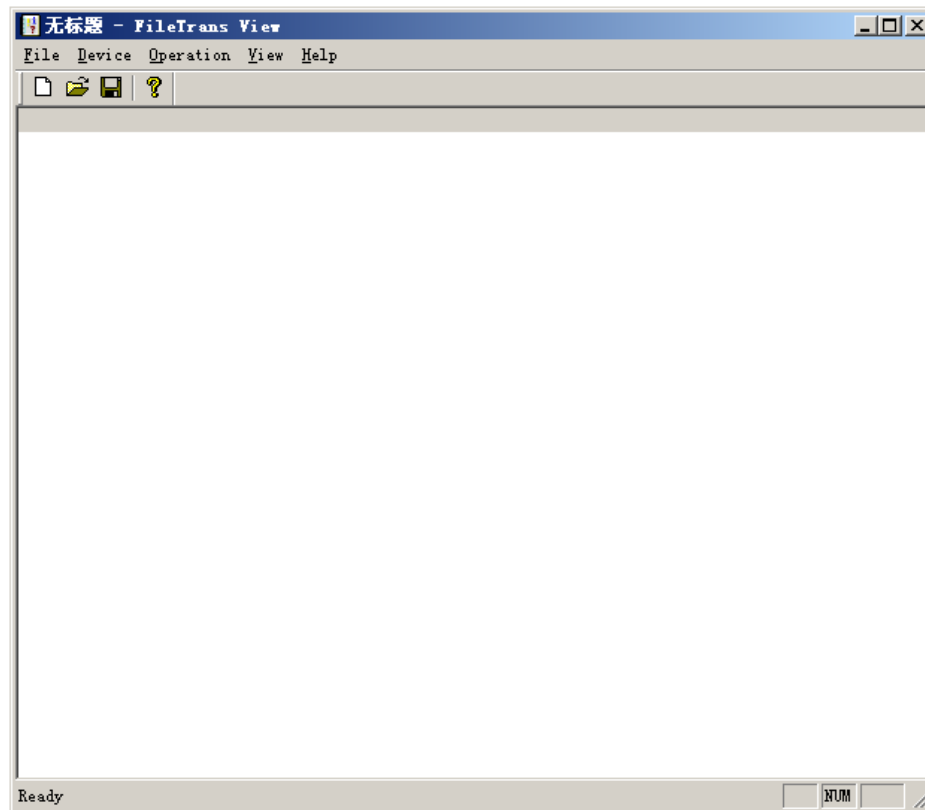
2.15.4   Hints, Tips and FAQ

1)   To activate the driver set the pixel (Pix) input correctly and then assert a positive pulse on the enable (EN) input parameter.

2)   If suffix (SFIX) is NULL, hisvideo1.bmp~hisvideoN.bmp will be used in the history log mode.

2.16 GPRS

GPRS communication is supported. Exchange of information between MOX Unitys can be done using the GPRS.

The function block also has the ability to send or receive short messages.

Please note that before using this function block, the GPRS should be configured correctly within MoxIDE. For more detailed information, please refer to MoxIDE User Guide.

2.16.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable Function Block 0: Disable 1: Enable
AIN	STRING [120]	Access information of network for IP Exchange USR, PWD, POP3IP, SMTPIP, MAILBOX **USR**: user account of email; **PWD**: password of email account; **POP3IP**: POP3 email server; **SMTPIP**: SMTP email server, if it is the same as POP3IP, it can be NULL, but the comma is still needed; **MAILBOX**: Email Box;
Cmnd	SINT	Command 0: No operation or cancel 1: Connect GPRS input: Access, LocalID output: Status, Result 2: Disconnect GPRS input: Cmnd output: Status 3: Send short message input: DestID, VarAddr, SendNum output: Result 4: Set centre number input: DestID output: Result 5: Send local ID and source IP (this cmnd will be executed automatically when cmnd = 1) input: Access, LocalID (LocalIP should exist) output: Result 6: Read short message input: ReadIndex, VarAddr output: Result, Num, SoureNum 7: Delete short message input: ReadIndex output: Result 8: Scan short message input: Cmnd output: Result, Num 9: Require dest IP input: Access, DestID

Name	Data Type	Description

		output: Result, DestIP
		10: Show local IP (this cmnd will be executed automatically when cmnd = 1)
		  input: Cmnd
		  output: Status, LocalIP
		11: Connect GPRS without automatic function
		  input: Cmnd
		  output: Status, Result
		12: Detect GPRS signal
		  input: Cmnd
		  output: Result
		13: Require remote PPP IP
		  input: Cmnd
		  output: Result, DestIP
		14: Send transparent short message
		  input: DestID, VarAddr
		  output: Result
		15: Read transparent short message
		  input: ReadIndex, VarAddr
		  output: Result, SoureNum
		31: Reset and Reconnect GPRS
		  input: Cmnd
		  output: Status, Result
		32: Reset GPRS
		  input: Cmnd
		  output: Status, Result
		33: Power off GPRS
		  input: Cmnd
		  output: Result
		34: Power on GPRS
		  input: Cmnd
		  output: Result
		
		100: Init mode 0
		  input: Cmnd
		  output: Result
		Support single service at one time. SMS and GPRS cannot work simultaneously. This is the default work mode.
		
		101: Init mode 1
		  input: Cmnd
		  output: Result
		Support multiplex services at the same time. For example:
		1) User can send, receive SMS or detect network signal on GPRS data transfer;
		2) User can send, receive SMS or detect network signal when GSM/GPRS modem is used by Modem FB;
		
		It is not recommend to switch between mode 0 and 1. If so, be sure to run right initial command before usage.
		Modem and GPRS function block should work in the same mode since they share the same modem.
		Multiple services will compete for serial port. And there is a little influence on efficiency when using multiplexer mode.
		
		Notes:
		+ Configure GPRS correctly with MoxIDE at first.
		+ IP exchange with email:

Name	Data Type	Description
		+ Set AIN and LID correctly and then set command to 1, the function will connect GPRS, show local IP and update email list with new local IP automatically. If success, the status will be true and the result will be 2. If automatic update fails, the result will be -1. Set command to 10 if local IP does not exist, then set command to 5 to update email list manually.
LID	STRING [15]	Local ID Local ID of GPRS
DID	STRING [15]	Destination ID cmnd = 3: called number of GPRS cmnd = 4: centre number of short message cmnd = 9: the destination ID of RTU
VAd	DINT	Variable Address The variable address of short message, it should be a STRING when using transparent short message.
IDX	SINT	Read Index Index of read Short Message to be read
SNm	SINT	Send Number Length of send Short Message

Table 40   Calling Parameters of GPRS

2.16.2   Return Parameters

Name	Data Type	Description
STAT	SINT	Status 0: the GPRS is disconnected 1: the GPRS is connected
RLT	SINT	Result 2: Command success 1: Command in process -1: Fail -2: Type mismatch -3: Check sum wrong -4: Input out of range -5: Com port error -6: Config file error -7: Memory malloc error -8: Unexpected short message When Cmnd = 12: 0: <= -113 dBm 1: -111 dBm 2-30: (-109) - (-53) dBm 31: >= -51 dBm 99: unkown or no signal
Num	SINT	Cmnd = 6: the length of received short message Cmnd = 8: the index of unread short message
SrcN	STRING	Source Number The number of Short Message originating GPRS
LIP	STRING	Local IP
DIP	STRING	Destination IP

Table 41   Return Parameters of GPRS

2.16.3   Hints, Tips and FAQs

The GPRS can work in either short message mode or data transfer mode.

1)   In data transfer mode, commands 1, 2, 5, 9 and 10 are available.

When using data transfer mode the **AIN** calling parameter should be set as:

USR, PWD, POP3IP, SMTPIP, MAILBOX

USR: User account of email

PWD: Password of email account

POP3IP: POP3 email server

SMTPIP: SMTP email server, if it has the same IP as the POP3 server then this should be NULL, but a comma is still needed

MAILBOX: Email Box

The commands to be used in data transfer mode, performed by setting the **CMD** parameter, include: When AIN and LID are correct, set command to 1, this function will connect the GPRS, show the local IP and update the email list with new local IP automatically. If successful, the status will be true and result will be 1. If automatic update fails, the result will be –1. Set command to10 if local IP does not exist, then set command to 5 to update email list manually. When data transfer is finished, set command to 2 to disconnect GPRS link.

DID is the destination ID of RTU. When using command 9, the corresponding destination IP will be returned.

2)   In short message mode, be sure that the STAT is false, i.e. GPRS is not working in data transfer mode.

When using Cmnd 3 and 6, programmers should bind variables with MODBUS addresses.

When using Cmnd 14 and 15, programmers should bind a string variable with a MODBUS address.

DID is the calling number of the GPRS module when the *Cmnd* = 3. When the *Cmnd* = 4 the **DID** is used as the index number of a short message.

2.17 ModBusM

The MOX Unity MODBUS master functionality is implemented as a function block.

This "ModBusM" function block is used to access MODBUS slave devices via the MOX Unity's serial ports (RS232, RS485).

2.17.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
Port	SINT	Com Port number 1-4
SlvA	DINT	Slave device address, 0 for broadcast
Opt	SINT	Option for data format. 0: 2 registers in remote station map to 1 local REAL/DINT variable. 1: 1 register in remote station map to 1 local REAL/DINT variable, High byte first. 2: 1 register in remote station map to 1 local REAL/DINT variable, Low byte first.
DF	SINT	Data format. For DINT: 0 = 10000 x low register + high register 1 = 65536 x low register + high register 2 = 10000 x high register + low register 3 = 65536 x high register + low register For real: 0 - Byte order = 1 0 3 2 1 - Byte order = 3 2 1 0 2 - Byte order = 0 1 2 3 3 - Byte order = 2 3 0 1
Cmd	SINT	Command 0: No operation; 1: Read; 2: Write; 3: Force single coil (function 05) or preset single register (function 06)
SA	DINT	MODBUS starting address of the source variable Coil status: 00001-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999 Extended register: 600001-665535
LA	DINT	MODBUS starting address of the local variable Coil status: 00001-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999

Name	Data Type	Description
Pnts	DINT	Data points to read/write in remote station. Minimum value: 1 Maximum value: 100
Rtr	SINT	The number of retry if communication timeout.
TO	DINT	Timeout in ms
Rev1	DINT	Reserved
fn	DINT	When SA is Extended register, fn is extended memory file number. (0-65535)

**Table 42   Calling Parameters of ModBusM**

2.17.2   Return Parameters

Name	Data Type	Description
ST	SINT	Process Status. 1: In process 2: Complete 3: Timeout error 4: Bad input parameters
OK	BOOL	Read/Write complete. A positive pulse indicates that the read/write is complete.

Table 43   Return Parameters of ModBusM

2.17.3   Hints, Tips and FAQs

Note that when the ModBusM function block is used the protocol assigned to a port should be "Modbus Master" or "ModbusA Master". Please refer to MoxIDE User Guide for detailed information. See the following snapshot depicting the selection of the protocol.
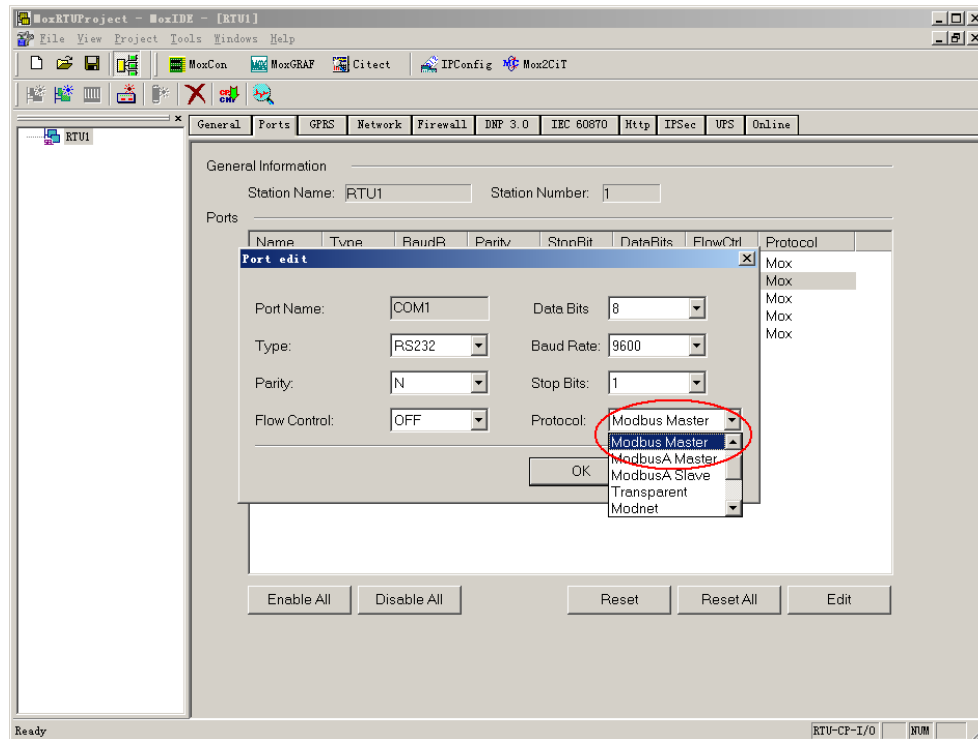
2.18 Modem

The "Modem" function block performs basic Modem functions, including initializing the Modem, dialling the remote Modem, auto-call back, password setting, max connect time, sending all AT commands by customer, etc.

2.18.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
PORT	SINT	Serial Port Number 0: Built-in 1: Port 1 2: Port 2 3: Port 3 4: Port 4
PWD	SINT	Password Mode: 0: No password, both for dial out and dial in modem; 1: Send password, usually for dial out modem; 2: Check password, usually for dial in modem; 3: Send User Defined Dial Prefix in MSG for dial out modem; Other: No password, both for dial out and dial in modem;
CMND	SINT	Modem Command. 0: NULL command

Name	Data Type	Description
		1: Initialize the Modem 2: Dial the remote Modem 3: Auto call back 4: Send password 5: Send AT command 6: Disconnect Modem or cancel dial 7: Auto data drive1 8: Auto data drive2 31: Send DialPrefix Delay
PN	STRING[100]	Phone Number The remote phone numbers a[b] or the call back phone number. a: The primary phone number; b: Optional. The standby phone number. If the primary phone number does not respond, the standby phone number will be used. Maximum phone number length is 100, and one phone number is recommended not to exceed 50 characters.
MSG	STRING[100]	If the CMND 1 is used, the MSG is modem type and work mode. If the CMND 5 is used, the MSG is the AT command. If the CMND 4 is used, the MSG is the password. If the PWD is 1 or 2, then MSG is the password. If PWD is 3, the MSG is user define dial prefix.
DTM	DINT	Dial Timeout Dial Timeout in second, the default value is 60 seconds.
MCT	DINT	Max Connection Time The max connection time in second. 0: Permanent connection; Else: The max connect time in second.

**Table 44   Calling Parameters of Modem**

2.18.2　Return Parameters

Name	Data Type	Description
COK	BOOL	Connection OK Modem connection is OK or False. 0: False 1: True.
ST	SINT	Modem Command Status. 4: CMND_SUCCESS 3: CMND_PROCESS 2: ONLINE_DATA 1: LOCAL_PWD_PASS; 0: INITIAL or RESET OK; -1: TIME_OUT -2: COM_ERROR -3: MODEM_ERROR -4: PWD_FAIL -5: MAX_TIMEOUT -6: SYSTEM_ERROR
RMSG	STRING[20]	Return Message The command return message.

Table 45　　Return Parameters of Modem

2.18.3　Usage

2.18.3.1.　Serial Port Configuration

You must use MoxIDE to configure the serial port connected with the Modem. See the following snapshot that depicts the selection of the modem.
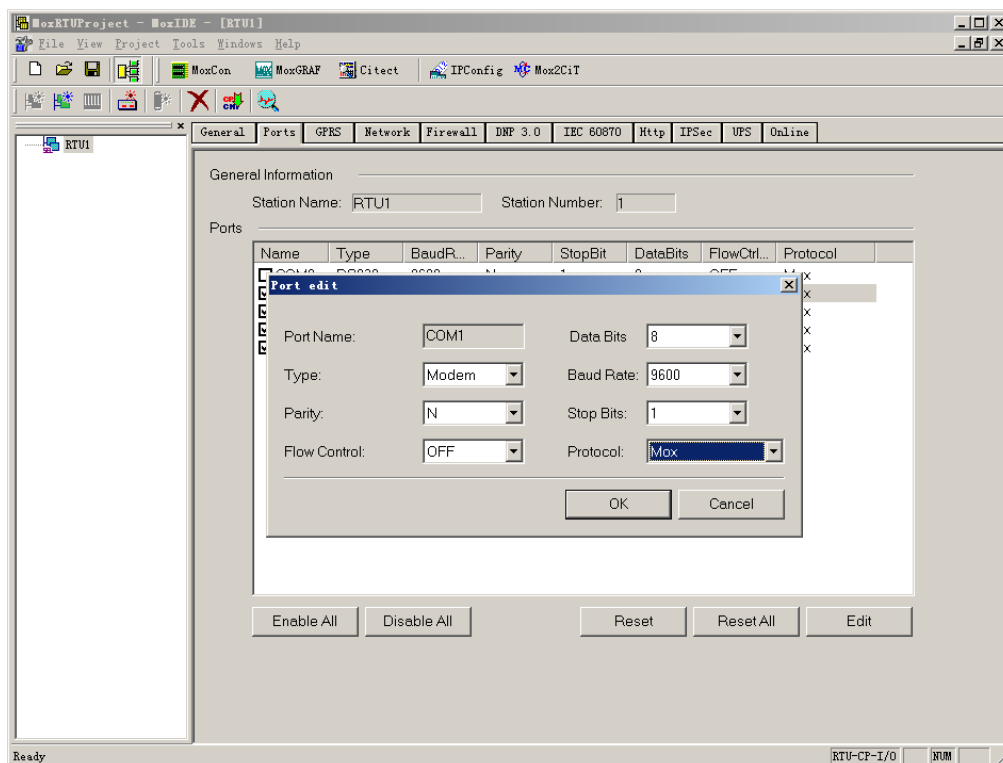
Note: The Type must be Modem.

2.18.3.2. *Functional Description*

2.18.3.2.1 *Initialize the Modem*

First restore the factory configuration: AT & F0. Then initialize the Modem: AT E1 Q0 V1 X3 &C1 M0 S0=1 \r.

2.18.3.2.2 *Call the Remote Modem*

Send the ATDT *n*, *n* is the primary phone number. If a connection can not be made, use the standby phone number to call the remote Modem.

2.18.3.2.3 *Auto Call Back*

This command is only used by the called Modem. When the called Modem responds to the call from the remote Modem, it firstly hangs up and then calls the remote Modem using an assigned phone number by **PhoneNum**.

2.18.3.2.4 *Send Password*

This command must be used after the connection has been established and the auto send password fails. The maximum length of the password is 100. The password is recommended not to exceed 10 characters (case sensitive). Be careful because the dial out modem will disconnect after retrying three times. Data transfer is permitted only after status (ST) returns a 1 (LOCAL_PWD_PASS).

2.18.3.2.5 *Send AT Command*

If the connection has not been established, the customer can send a valid AT command to the Modem. If the connection has been established, the Modem FB will send the change char to convert the online communication mode into online command mode so the user can still send the command directly. But the last command must be ATO to return to the online data mode, i.e. status (ST) should return a 2 (ONLINE_DATA).

Please refer to the user manual of the Modem that you are using concerning the AT command.

2.18.3.2.6 *Disconnect Modem*

Send the ATH0 to disconnect the Modem.

Notes: the default change char '+' and halt time of 1 second are used. If the customer resets them by setting the S register, the function will not succeed.

2.18.3.2.7 *Max Connection Time*

This parameter sets the maximum time for communications. The time is calculated from the very beginning of the connection. For example, if the parameter is 60 seconds, after connection is established the connection will be for 60 seconds. When 60 seconds expires, the Modem will disconnect. A 0 for this parameter means permanent connection; it will keep the connection until command 6 is used to disconnect the Modem.

2.18.3.2.8 *Send Dial Prefix*

The modem FB automatically sends the user-defined dial prefix in the MSG field when dialling out when PWD = 3. The default time delay before sending the dial prefix is 10s. Comand (CMND) 31 is used to change the time delay. The MCT field is used as time delay in seconds under this command and the range is 0~300s.

For example, the user should set MSG as cit*<caller ID>* when dialling out to connect to the PC.

2.18.4   Hints, Tips, and FAQs

The problems most often encountered when using modem communications involve speed, parity, and control signals from the connected equipment. Make sure that the related serial ports have been configured correctly and all settings agree with the remote settings. Then run the function block with CMND = 1 to initialize the modem. Command 5 is used to run user-defined init AT commands when the default initialization doesn't meet users need.

IOnce the modem has been successfully initialized,then it can wait for an incoming call or make an outgoing out.

There are two types of outgoing calls; when CMND = 2 or by use of Auto data drive. There are two types of hanging up; when CMND = 6 is used or by use of the MCT field total connection time.

Following are some common examples.
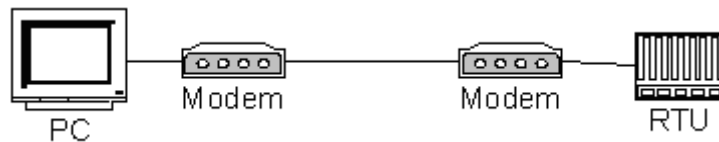
2.18.4.1.   PC – RTU Link

Figure 1   HMI-Modem-Modem-RTU Link

1) PC Calls RTU:
   There is no control on RTU side after it has been initialized successfully. Leave CMND = 1, PWD = 0, MCT = 0 since the PC has no password and it will disconnect the call.

2) RTU Calls PC by Command:
   Set the correct PN, PWD = 3, MSG = cit<xxxx>, CMND = 2. xxxx is the *caller ID* needed b*y* the PC. It will wait 10s before it transfers *caller ID and* data if the PC cannot recognize caller ID. CMND 31 can be used to change the time delay. The MCT field holds the new time delay when using this command. The range is 0~300s. Use CMND = 6 or MCT to disconnect the call.

3) RTU Calls PC by Data Driver:
   Set the correct PN, PWD = 3, MSG = cit<xxxx>, CMND = 7 after it has been successfully initialized. Set the protocol of the connected serial port as DNP. The RTU will call the PC automatically when there is DNP data to be transferred. The MCT field should be set in this case. The RTU will then automatically disconnect the call after an MCT timeout.

   If CMND = 8 is used, the RTU will disconnect the call automatically if there is no data to be transferred during the time specified by the MCT field.

   Sometimes case 1 and 3 happen simultaneously. If the dial-in fails on the RTU side, it will retry again after 20s.

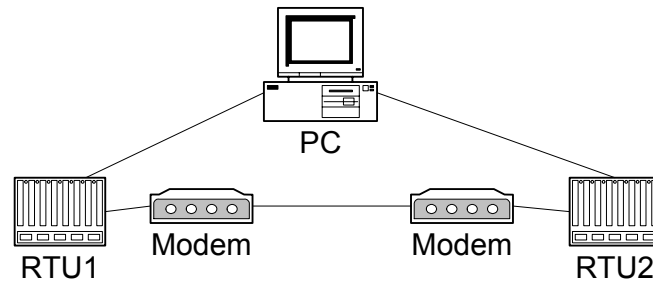### *2.18.4.2.   RTU – RTU link*

Figure 2   RTU-Modem-RTU Link

1) RTU1 Calls RTU2 by a Command:

  RTU1 side:
   Set CMND = 2, PWD = 1, use the correct PN and MSG; Use CMND = 6 or MCT to disconnect;

  RTU2 side:
   CMND = 1, PWD = 2, use correct MSG

 If there is no password to be used then ensure PWD = 0 on both sides. General speaking, a password is controlled from the called side and the calling side should disconnect the call.

2) RTU1 Calls RTU2 by Data Driver:

  RTU1 side:
   CMND = 7, PWD = 1, use the correct PN and MSG. Use MCT to disconnect.

  RTU2 side:
   CMND = 1, PWD = 2, use correct MSG.

 If there is no password to be used then ensure PWD = 0 on both sides. Set the protocol of the connected serial port as DNP. RTU1 will call RTU2 automatically when there is DNP data to be transferred. MCT should be set in this case to disconnect the call.

3) RTU1 Calls RTU2, RTU2 does a Call Back:

  RTU1 side:
   CMND = 2, PWD = 1, use the correct PN and MSG. Use CMND = 6 or MCT to disconnect.

  RTU2 side:
   CMND = 3, PWD = 2, correct PN and MSG.

 If there is no password to be used then ensure PWD = 0 on both sides.

Note:
1) The password is usually controlled by the dialed modem. If modem A calls modem B, then the password is controlled by modem B. If modem B uses the auto callback function, set CMND = 3 at modem B and CMND = 2 at modem A. In this case the password is still controlled by modem B. The password is stored in the message field (MSG). Ensure that PWD = 1 at modem A and PWD = 2 at modem B. PWD can be both 0 at modem A and modem B when no password is used.

2) The dial out modem will send password automatically if modem is connected. If connection OK (COK) is FALSE after dialling, the user should dial again. If COK is true and status is 4 (PWD_FAIL), the user should input the correct password for the MSG field and set CMND = 4. Note that the dial out modem will be disconnected after retrying three times. Data transfer is permitted only after the status returns PWD_PASS on both sides.

3) If modem has been connected without expiry of the maximum connection time (MCT) and then the user sets a new value for MCT during the connection, the time is still calculated from the very beginning.

4) If CMND = 5 is used during a connected state, the last command must be ATO to return to online data mode, i.e. Status should return ONLINE_DATA.

5) Initialize modem with different MSG:
   MSG contains GSM: initialize GSM/GPRS modem.
   MSG contains MUX: initialize GSM/GPRS modem in multiplexer mode.
   Otherwise: initialize common modem.

   User must disable or re-init Modem FB to disconnect GSM/GPRS data call in multiplexer mode. Auto callback is not supported in multiplexer mode. Make sure that the modem supports the MUX before using this mode. Otherwise the state maybe confused and user needs to init it with the correct mode again.

6) Auto data drive command: The modem FB will connect and disconnect automatically if there is data to be transferred. The multiplexer cannot be used in this case.

   Auto data drive1: Max timeout mode; the Modem FB will disconnect when **MaxConnTime** (MCT) is reached.

   Auto data drive2: Data over mode; the Modem FB will disconnect if there is no data transferred for **MaxConnTime.**

2.19 ModNetM

The MOX Unity MODBUS TCP/IP master functionality is implemented as a function block.

The "ModNetM" function block is used to access MODBUS TCP/IP slave devices via the MOX Unity's Ethernet ports.

2.19.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
DID	DINT	Destination ID. If not set to 0, destination will act as a MODBUS TCP/IP Gateway.
IP	STRING [15]	Slave device address
Port	DINT	Port number. If this value is 0, use default port number 502.
TCP	BOOL	Use TCP or UDP 0: TCP 1: Force to use UDP
Opt	SINT	Option for data format. 1: 1 register in remote station map to 1 local REAL/DINT variable. 0: 2 registers in remote station map to 1 local REAL/DINT variable.
DF	SINT	Data format. For DINT: 0 = 10000 x low register + high register 1 = 65536 x low register + high register 2 = 10000 x high register + low register 3 = 65536 x high register + low register For real: 0 - Byte order = 1 0 3 2 1 - Byte order = 3 2 1 0 2 - Byte order = 0 1 2 3 3 - Byte order = 2 3 0 1
Cmd	SINT	Command 0: No operation 1: Read 2: Write 3: Force signal coil (function 05) or preset single register (function 06)
SA	DINT	Starting remote MODBUS address of the source variable Coil status: 1-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999 Extended register: 600001-665535

Name	Data Type	Description
LA	DINT	Starting local MODBUS address Coil status: 1-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999
Pnts	DINT	Data points to read/write in remote station. Minimum value: 1 Maximum value: 100
Rtr	SINT	The number of retry if communication timeout.
TO	DINT	Timeout in ms
fn	DINT	When SA is extended register, fn is extended file number. (0-65535)

Table 46   Calling Parameters of ModNetM

2.19.2   *Return Parameters*

Name	Data Type	Description
ST	SINT	Process Status. 1: In process 2: Complete 3: Timeout error 4: Bad input parameters 5: Connection failed for TCP
OK	BOOL	Read/Write complete. A positive pulse indicates the read/write complete.

Table 47   Return Parameters of ModNetM

2.20 MoxGetTime

The "MoxGetTime" function block is used to get time of MOX Unity and MOX Open Controller.

2.20.1 Calling Parameters

Name	Data Type	Description
ENA	BOOL	Enable this function block 0: Disable; 1: Enable.

Table 48　　Calling Parameters of MoxGetTime

2.20.2 Return Parameters

| Name	Data Type	Description
YEAR	DINT	Year Min. value: 1980 Max. value: 2099
MON	SINT	Month Min. value: 1 Max value: 12
DAY	SINT	Day of month Min. value: 1 Max value: 31
HR	SINT	Hour Min. value: 0 Max value: 23
MIN	SINT	Minute Min. value: 0 Max value: 59
SEC	SINT	Seconds Min. value: 0 Max value: 59
MS	DINT	Millisecond Min. value: 0 Max value: 999
TM	DINT	Time since Epoch (00:00:00 UTC, January 1, 1970)

Table 49　　Return Parameters of MoxGetTime

2.21 MoxLog

The MOX Unity supports a data logging function. Data can be logged to the Unity in two different ways; the first is the periodic log way, the second is the event log way. A suite of protocols has been provided to retrieve the logged data from the MOX Unity. A utility named "MoxLog View" in MoxIDE can be used to retrieve logged data and it has the ability to store this data in a database.

If the log's allocated memory block is full, the oldest record will be overwritten one by one in sequence. The procedure is shown below:
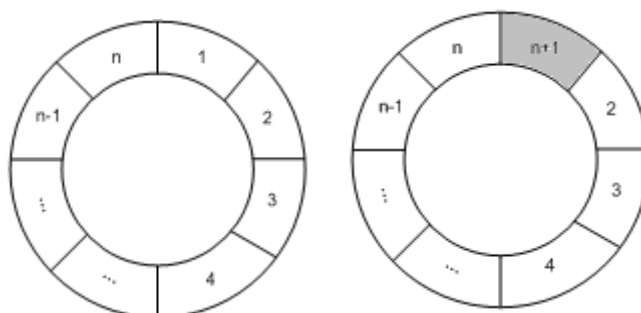
If the calling parameters, except enable (EN) are changed, the log will restart and the historical data will be deleted.

There is a time stamp attached to every log record. This time stamp is the time since the EPOCH (00:00:00 UTC, January 1, 1970). It is measured in seconds.

2.21.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable Function Block 0: Disable the data log 1: Enable the data log For event log: a positive pulse will log a record.
MODE	SINT	Mode 1: Period log 2: Event log
ID	STRING[4]	LogID A string of size 4 to identify the log. Should be unique in one MoxGRAF project.
SA	DINT	Start Address The start MODBUS address for variables to be logged.
PNT	DINT	Points The points of MODBUS coil status, input status, input register or holding registers to be logged.

Name	Data Type	Description
PRD	DINT	Period Period in second used for period log.
Size	DINT	Block Size The size in KByte of memory block to store log data for this function block instance.
Re	DINT	Reserved

Table 50   Calling Parameters of MoxLog

2.21.2   Return Parameters

Name	Data Type	Description
ST	SINT	Status The status of this function block. 0: Normal 1: Invalid parameter 2: Memory block allocation fail 127: unknown error
RC	DINT	Records The current number of records of this log

Table 51   Return Parameters of MoxLog

2.21.3   MoxLog Viewer Utility

The MoxLog Viewer is a utility used to retrieve logged data from the MOX Unity and store the log data onto a host PC. It is found in the main menu under the **tools|MoxLog** selection. See the following MoxLog View snapshot.
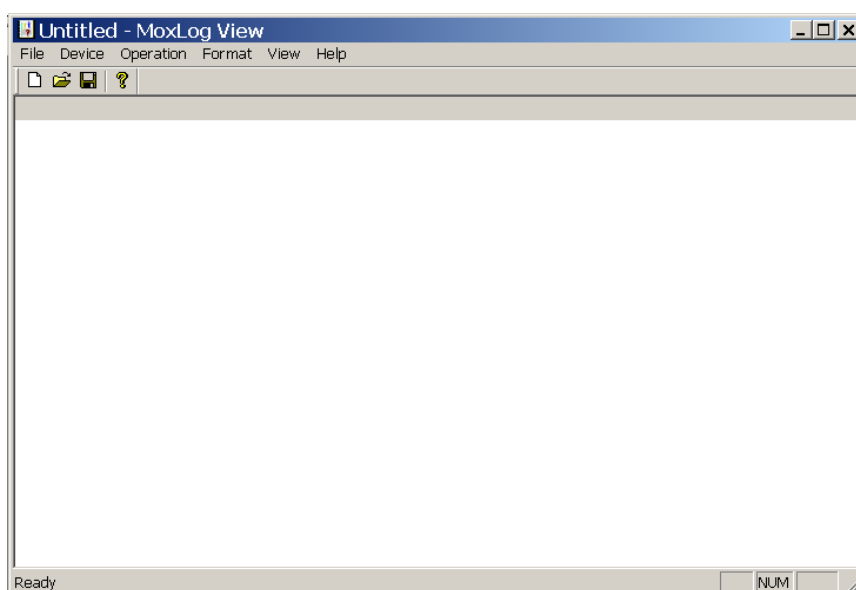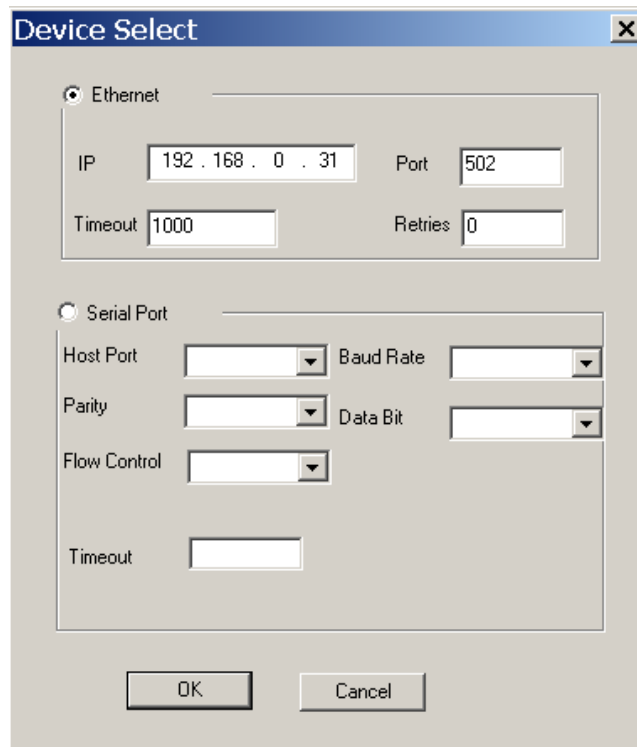

Figure 3   MoxLog Viewing Utility

2.21.3.1. *Procedures for Retrieving MoxLog Data*

Step 1: Select a device

Select **Device | Select** from the menu bar of the MoxLog View window and then fill in the requested communication parameters to select the desired MOX Unity.

Figure 4   MoxLog Device Select

Step 2: Connect the host PC with the MOX Unity

Make sure that Ethernet connection or serial cable is connected correctly. Connect to the controller by selecting **Operation** from the menu bar.

The host PC will try to communicate with the MOX Unity. If communication is successful, the PC will retrieve an overview of the information of Mox Log data being held on the MOX Unity.
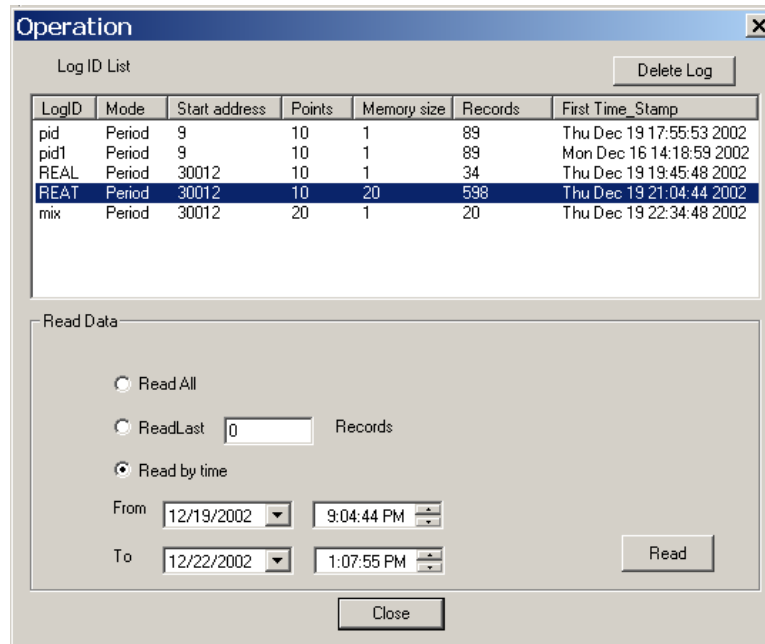
Figure 5   MoxLog Device Operation

Step 3: Read data from the MOX Unity

Select one of the three reading options before attempting to read any data. The three options are:

- Read all
- Read last *n* records
- Read by time

Click on the *Read* button. The host will start to read the records according to the read option selected.

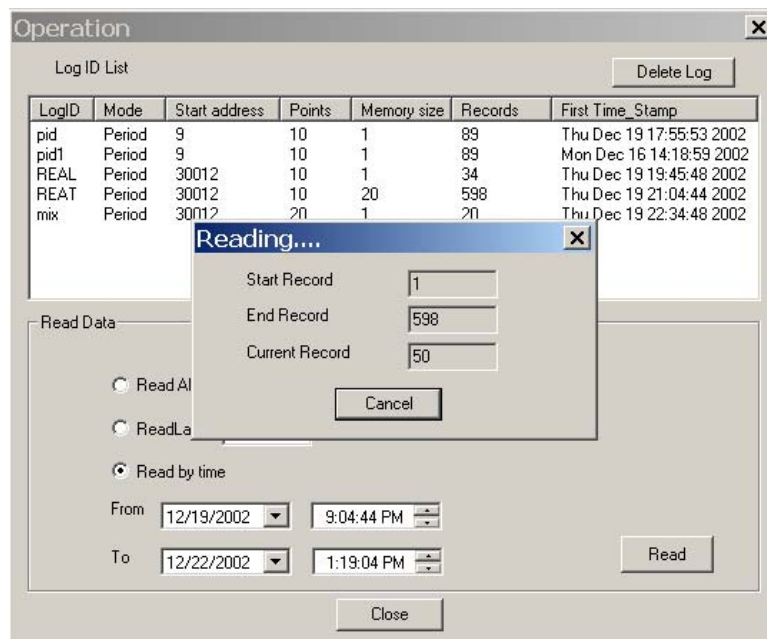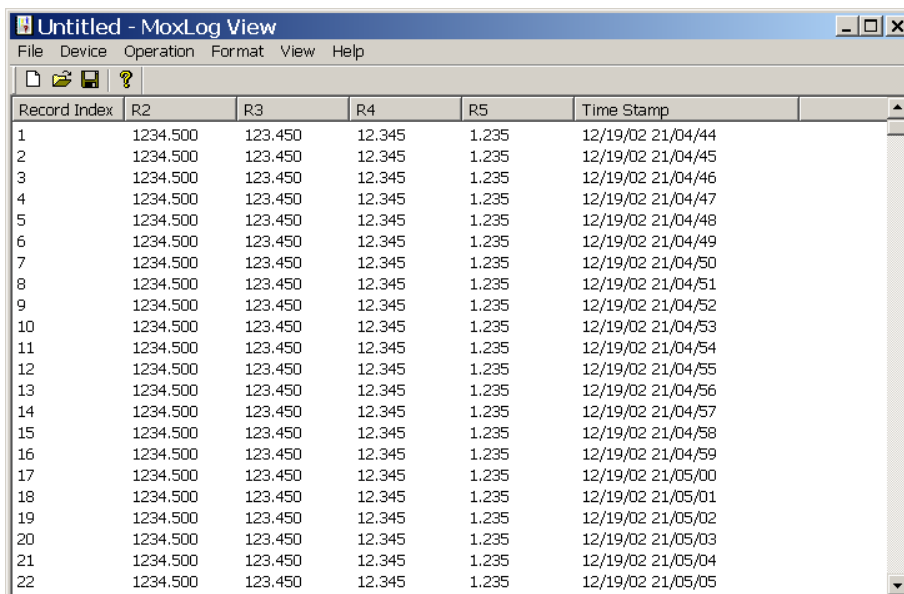**Figure 6   MoxLog Device Read**

Figure 7   MoxLog Record View

Step 4: Format the data

Select **Format** from the menu bar to open the data format options. The format options include float precision, Boolean format and time stamp format.
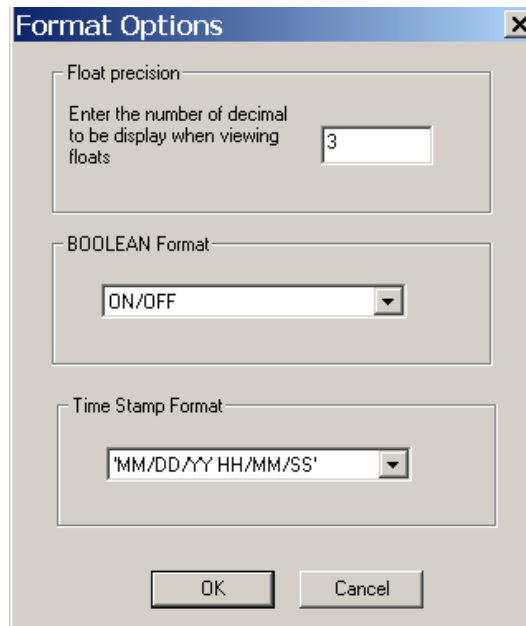
Figure 8   MoxLog Data Format Options

Step 5: Save log data

The log data can be saved as a .CSV file.

2.21.4   .CSV File Format

MoxLog data can be saved to a .CSV file.

The format of the .CSV file is a comma delineated ASCII file. ASCII data records will be created in accordance with the parameters set by the MoxLog function block and the variable MODBUS address mapping.

A typical example of the MoxLog .CSV file is as follows:

MoxLogName:,REAT

RecordNumber: 598

RecordIndex, R2, R3, R4, R5, Time Stamp

1,1234.500,123.450,12.345,1.235,12/19/02 21/04/44

2,1234.500,123.450,12.345,1.235,12/19/02 21/04/45

3,1234.500,123.450,12.345,1.235,12/19/02 21/04/46

4,1234.500,123.450,12.345,1.235,12/19/02 21/04/47

….

2.21.5   Hints, Tips and FAQs

The user should calculate the size of memory block needed to store the log data when using this function block. If there is not enough available memory for this function block the log will be disabled, and the return parameter status will be 2.

For input and holding registers, the size of one log record is (data size * points) + 9 where the data size is 2 bytes.

For coil status or input status values, the size of one log record is (bytes +9) where bytes = points / 8 + 1.

For example:

A user wants to log 10 input registers (10 points) every 2 minutes for 30 days.

The memory block size should be (10 points* 2 + 9) * 30 days * 24 hours * 60 minutes / 2 minutes / 1024 bytes = 612 Kbytes.

2.22 MoxRxTx

The "MoxRxTx" function block processes the serial communication between two MOX Unitys. The communication is based on the MODBUS protocol.

The client station will read the specified MODBUS variables from the remote station and store the data to the specified local MODBUS variables. When writing, the client gets data from the specified local MODBUS variables and writes to the specified remote station.

The MoxRxTx function block is only required by the client station in order for it to operate successfully.

The communication between MOX Unitys supports the store-and-forward method. Store-and-forward is a type of data communication in which data are sent to an intermediate station and are later forwarded to the receiver or another intermediate station. This technique is preferable in situations when a direct end-to-end connection is not available.

2.22.1   Calling Parameters

Name	Data Type	Description
Cmd	SINT	Command 0: Disable 1: Read 2: Write
Dest	DINT	Remote station number Minimum Value: 1 Maximum Value: 250
SA	DINT	MODBUS starting address of the remote variable Coil status: 00001-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999
LA	DINT	Local MODBUS starting address Coil status: 00001-9999 Input status: 10001-19999 Input register: 30001-39999 Holding register: 40001-49999
Pnts	DINT	Data points Minimum value: 1 Maximum value: 100
Rtr	SINT	The number of retry if communication timeout.
TO	DINT	Timeout in ms

Table 52   Calling Parameters of MoxRxTx

2.22.2   Return Parameters

Name	Data Type	Description
St	SINT	Process status. 1: In process 2: Complete 3: Timeout error 4: Bad input parameters
OK	BOOL	RxTx complete. A positive pulse indicates the RxTx complete.

Table 53   Return Parameters of MoxRxTx

2.22.3   Hints, Tips and FAQs

In order to use this function block properly, the port and network need to be configured in MoxIDE. Please refer to MOX Unity Field Controller User Guide for detailed information. See the following snapshots that show where the protocol for the serial ports is chosen and where the station set is done in MoxIDE.
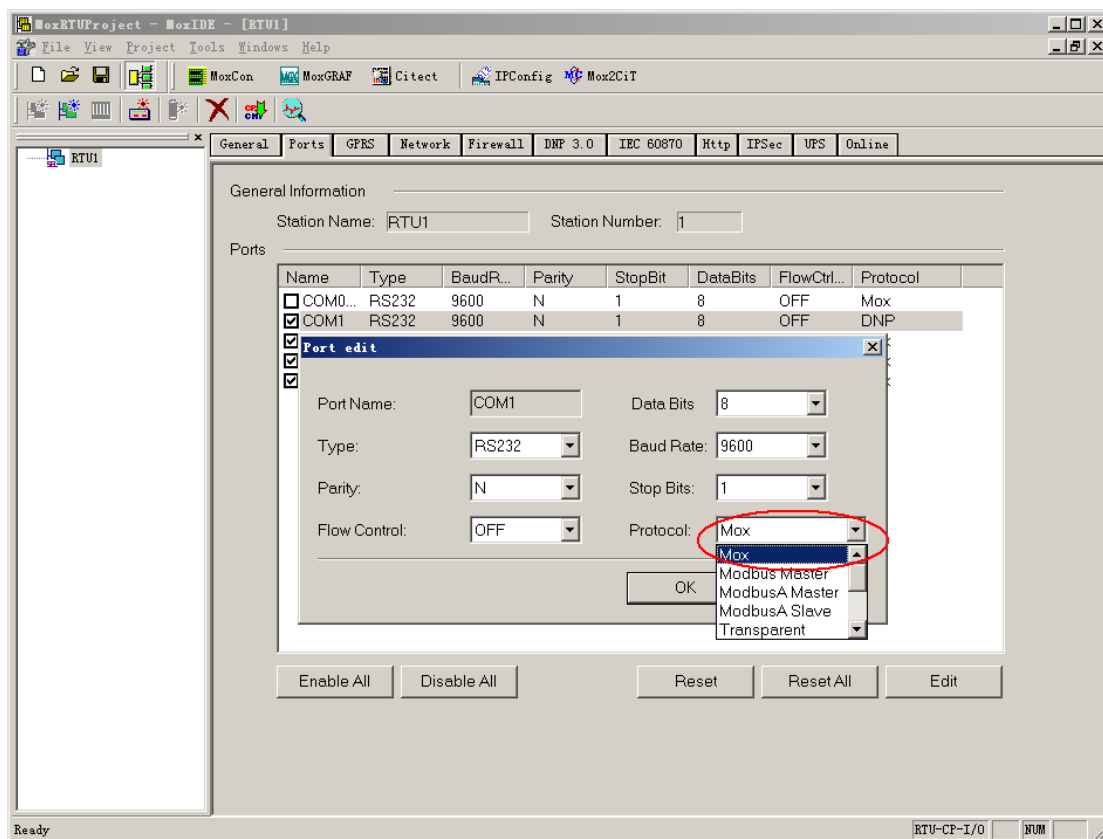
Figure 9   Configuring the Protocol of the Serial Port for MoxRxTx
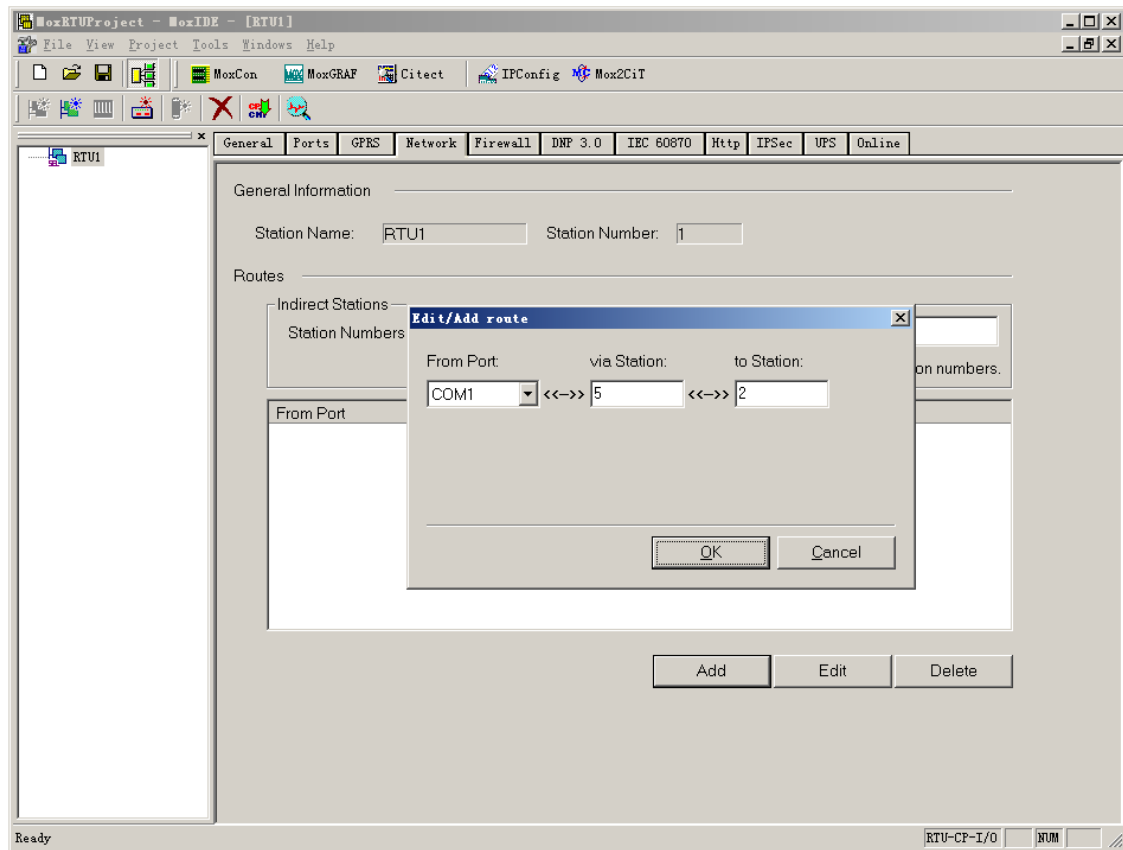
Figure 10   Configure Network for MoxRxTx

2.23 MoxSetTime

The "MoxSetTime" function block is used to set the time for MOX Unity and MOX Open Controller.

2.23.1 Calling Parameters

Name	Data Type	Description
YEAR	DINT	Year Min. value: 1980 Max. value: 2099
MON	SINT	Month Min. value: 1 Max value: 12
DAY	SINT	Day of the month Min. value: 1 Max. value: 31
HR	SINT	Hour Min. value: 0 Max. value: 23
MIN	SINT	Minute Min. value: 0 Max. value: 59
SEC	SINT	Second Min. value: 0 Max. value: 59
MS	DINT	Millisecond Min. value: 0 Max. value: 999
TM	DINT	Time since Epoch (00:00:00 UTC, January 1, 1970), measured in seconds.

Table 54   Calling Parameters of MoxSetTime

2.23.2 Return Parameters

Name	Data Type	Description
ST	SINT	Status 1: In process 2: Complete 3: Timeout error 4: Bad input parameters
OK	BOOL	Set time OK, a positive pulse

Table 55   Return Parameters of MoxSetTime

2.24 MXPower

The MOX Unity has two power supply sources; one is from external 24V power and the other is from battery. The user could monitor the power supplier by using the function block MXPower.

To use this function block, the part numbers for the MOX Unity are required to be MX602-24-xx-xx-xxxx or MX602-26-xx-xx-xxxx while for the MOX Gateway the part number should be MX602-30-xx-xx-xx.

2.24.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable

Table 56   Calling Parameters of MXPower

2.24.2 Return Parameters

Name	Data Type	Description
Stat	BOOL	FALSE: the result is not valid TRUE: the result detected correctly.
result	SINT	Power supply 0: external 24V. 1: battery.

Table 57   Return Parameters of MXPower

2.25 Ping

The "Ping" function block provides a ping function to test if the destination IP is reachable.

2.25.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable function block 0: Disable 1: Enable
DIP	STRING [15]	Destination IP address
CMND	SINT	Command 0: No operation 1: Ping destination IP with one packet 2: Ping destination IP continually 3: Stop Ping
L	DINT	Packet size in byte Default: 64 bytes; Max: 4096 bytes
T	DINT	Timeout in ms Default: 5000ms

Table 58   Calling Parameters of Ping

2.25.2 Return Parameters

Name	Data Type	Description
RLT	SINT	Result -2: Socket error -1: Timeout 1: Ok
SEND	DINT	Send packets
RECV	DINT	Receive packets
RTT	REAL	Return time of one packet in ms

Table 59   Return Parameters of Ping

2.25.3   Hints, Tips and FAQs

Within a local network, one packet only takes less than one millisecond to transmit and receive, while the cycle time of a MoxGRAF program is usually 20~30ms. In this case the return time (RTT) may not be correct.

In a GPRS network, the first packet may take more than 40 seconds. If command 2 is used a timeout will often occur at the very beginning of the call.

2.26 PPP

When there is no way to access the network directly by Ethernet or Token-Ring link, a good way is to set up a point-to-point link by serial connection. This function can set up PPP link between the Unity and the PPP server. After the PPP link is set up, all the applications based on the TCP/IP can be used.

2.26.1   Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable; 1: Enable;
PHON	STRING [15]	Telephone number
USR	STRING [15]	User account
PWD	STRING [15]	Password
CMND	SINT	Command 0: No operation 1: Connect PPP 2: Get local IP 3: Get PPP server IP 4: Disconnect PPP
COM	SINT	Serial port 1: COM1 2: COM2 3: COM3 4: COM4
BAUD	DINT	Baud rate 9600,19200,38400,57600,115200,230400

Table 60   Calling Parameters of PPP

2.26.2   Return Parameters

Name	Data Type	Description
STAT	SINT	Status 0: PPP is disconnected 1: PPP is connected
RLT	SINT	Result of operation
IPA	STRING[15]	Return IP address

Table 61   Return Parameters of PPP

2.27 Socket

The "Socket" function block (Socket FB) performs the device connection via the TCP/IP protocol and provides the functions listed below. The established TCP/IP link allows transparent data transfer based on the user defined protocol.

- Operation Mode: Server and Client

- Protocol: TCP and UDP

- Data Transmission Format: ASCII and HEX.

2.27.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable 1: Enable
RIP	STRING[15]	Remote IP Address Enter the remote IP address.
RPT	DINT	Remote Port Number Enter the remote socket port number.
LPT	DINT	Local Port Number Enter local socket port number.
TCP	SINT	Protocol Type 0: TCP 1: UDP
MODE	SINT	Operation Mode 0: Server 1: Client
FMT	SINT	Data Format 0: CHAR 1: HEX
CMND	SINT	Command 1: Send once 2: Clear n bytes in receive string from the beginning to the end
CLEN	DINT	Length of Received String Clearance Enter the number of bytes to be erased in the received string.
SSTR	STRING[255]	Send String Enter a send out string.
AUTO	BOOL	Auto Send Selection 0: No auto send 1: Automatic send
TI	DINT	Time Interval Enter a time interval in ms for auto send packet every a period of time, default value is 3000ms

Table 62   Calling Parameters of Socket

2.27.2 Return Parameters

Name	Data Type	Description
STAT	BOOL	Connection Status 0: Not ready 1: Connected
IP	STRING[15]	Remote IP Address Indicate remote IP address when Socket FB is in server mode; Not defined when Socket FB is in client mode.
PT	DINT	Socket Port Number Indicate remote port number when Socket FB is in server mode; Indicate local port when Socket FB is in client mode.
SEND	DINT	Number of Sent Packets Indicate the number of packets have been sent successfully.
RECV	DINT	Number of Receive Packets Indicate the number of packets have been received successfully.
RLEN	DINT	Length of Received String Indicate the length of the received string.
RSTR	STRING[255]	Received String Indicate the received string, possession of 255 bytes maximum.

Table 63   Return Parameters of Socket

2.27.3 Hints, Tips and FAQs

The Socket FB can act in three ways: as a TCP Server, as a TCP Client and in UDP mode. The following table shows the IP settings in these three different roles.

Acting Role	Local IP Address	Local Port Number (LPT)	Remote IP Address (RIP)	Remote Port Number (RPT)
TCP Server	×	√	×	×
TCP Client	×	OPT	√	√
UDP	×/×	√/OPT	OPT/√	OPT/√

Table 64   IP Settings in Different Rolls

Remark:

" √ " indicates mandatory input by user.

"×" indicates that the input field does not exist or need to be activated. It will be auto-assigned by the MOX Controller.

"OPT" indicates optional input. The function block will automatically generate this value when this input field remains empty or zero.

2.28 SysInfo

The "SysInfo" function block provides system information.

2.28.1 Calling Parameters

Name	Data Type	Description
Enable (EN)	BOOL	Enable this function block 0: Enable 1: Disable
Command (CMND)	SINT	Command 0: No operation or Cancel; 1: ScanFreeSpace; 2: ScanTotalSpace; 3: ScanFreeMem; 4: ScanTotalMem;
Reserved (REV1)	DINT	Reserved

Table 65   Calling Parameters of SysInfo

2.28.2 Return Parameters

Name	Data Type	Description
Data1 (DAT1)	DINT	Output for DINT type; Return bytes in K when CMND from 1~4;
Data2 (DAT2)	REAL	Output for REAL type;
Status (STAT)	SINT	Operate status: 1: In process 2: Complete 3: Timeout error 4: Bad input parameters
Reserved (REV2)	DINT	Reserved

Table 66   Return Parameters of SysInfo

2.29 Temperature

The MOX Unity has a temperature detector on the CPU. This "Temperature" function block is used to read the CPU board's operating temperature.

2.29.1 Calling Parameters

Name	Data Type	Description
EN	BOOL	Enable function block 0: Disable 1: Enable

Table 67   Calling Parameters of Temperature

2.29.2 Return Parameters

Name	Data Type	Description
STAT	BOOL	Status 0: The temperature is not valid 1: The temperature is detected correctly
TEMP	REAL	Temperature The CPU board temperature in Celsius. Valid when status is 1.

Table 68   Return Parameters of Temperature

2.30 UPSConf

The "UPSConf" function block is used to configure UPS's settings.

2.30.1 Calling Parameters

Parameter Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable [Default] 1: Enable
CMD	DINT	Command Function block sent read / write configuration variable commands to UPS. 0: Null Operation [Default] 1: Send Read Configuration Variable Command 2: Send Write Configuration Variable Command
WCAP	REAL	Nominal Capacity User must give an initial value before enable function block. **Battery Capacity** cannot be measured without this input. Suggested Value: 2.0+ Unit: Ampere-Hour Warning: + Battery would be damaged by 500mA charge if **Nominal Capacity** value were lower than 2AH. + Invalid input value with negative number, then it would auto recognized as zero.
SSD	REAL	System Shutdown Level Unity system will start up a power off program if its battery voltage was lower than this setting value. Default: 10.6 Range: 10.5~11.0 Unit: Voltage
WLCC	REAL	Low Current Charge Level UPS will start up a charge 100mA or 500mA program when the battery was in cycle use stage and its voltage was lower than this setting value. Default: 12.0 Range: 11.5 ~ 12.0 Unit: Voltage

Parameter Name	Data Type	Description
WHCC	REAL	High Current Charge Level UPS will start up a charge 500mA or 1.5A program when the battery was in cycle use stage and its voltage was higher than **Low Current Charge Level** value and lower than this setting value. Default: 14.4 Range: 14.4 ~ 14.8 Unit: Voltage
WCPC	REAL	Constant Potential Charge Level UPS will start up a charge program when the battery was in float charge stage and its voltage was lower than this setting value. Default: 13.6 Range: 13.4 ~ 13.8 (Not include 13.8) Unit: Voltage
WPC	REAL	Pulse Charge Level UPS will start up a charge 100mA or 500mA program when the battery was in float charge stage and its voltage was higher than **Constant Potential Charge Level** value and lower than this setting value. Default: 13.8 Range: 13.8 ~ 14.0 (Not include 14.0) Unit: Voltage
RSV1	REAL	32 bits reserved for later usage

Table 69   Calling Parameters of UPSConf

2.30.2   Return Parameters

Parameter Name	Data Type	Description
State Information:		
STAT	DINT	Function Block State Shows current function block state. 2: Success 1: Processing 0: Idle -1: Error -2: Invalid Command
Configuration Variables:		
RCAP	REAL	Nominal Capacity Shows the current setting value of **Nominal Capacity** in UPS.
RSSD	REAL	System Shutdown Level Shows the current setting value of **System Shutdown Level** in UPS.

Parameter Name	Data Type	Description
RLCC	REAL	Low Current Charge Level Shows the current setting value of **Low Current Charge Level** in UPS.
RHCC	REAL	High Current Charge Level Shows the current setting value of **High Current Charge Level** in UPS.
RCPC	REAL	Constant Potential Charge Level Shows the current setting value of **Constant Potential Charge Level** in UPS.
RPC	REAL	Pulse Charge Level Shows the current setting value of **Pulse Charge Level** in UPS.
WARN	DINT	Configure Warning Shows function block configuration warning when UPSConf received "write" command. 0: No Warning 1: Nominal Capacitance has defined with a value that less than 2AH. (Has Higher Priority) 2: At least one configuration variable had defined as ZERO or exceeded its limit.
RSV2	REAL	32 bits reserved for later usage

Table 70   Return Parameters of UPSConf

2.31 UPSMonitor

The "UPSMonitor" function block is used to monitor the UPS status.

2.31.1 Calling Parameters

Parameter Name	Data Type	Description
EN	BOOL	Enable this function block 0: Disable [Default] 1: Enable
RSV1	REAL	32 bits reserved for later usage

Table 71   Calling Parameters of UPSMonitor

2.31.2 Return Parameters

Parameter Name	Data Type	Description
Diagnostic Information:		
MODS	DINT	UPS Module State Shows the existence of UPS module and its configuration status. Definition: 0: Initial 1: UPS module existed 2: UPS module not existed 3: UPS module existed with invalid *Nominal Capacitance* input value
BST	DINT	Battery State Shows the connected battery status. Definition: 0: Initial 1: Charging 2: Discharging 3: Missing Battery
Monitoring Variables:		
BCAP	REAL	Battery Capacity Shows the current status of battery capacity when battery is charging or discharging. It is available only when *Nominal Capacity* is configured. Unit: Ampere-Hour
BLVL	REAL	Battery Level Shows the remaining battery capacity in percentage Unit: %

Parameter Name	Data Type	Description
BCUR	REAL	Battery Current Shows the battery current when it is charging or discharging. Unit: Ampere
BVLT	REAL	Battery Voltage Shows the battery voltage. Unit: Voltage
XPWC	REAL	External Power Current Shows the current of the connected external 24VDC input. Unit: Ampere
XPWV	REAL	External Power Voltage Shows the voltage of the connected external 24VDC input. Unit: Voltage
RSV2	REAL	32 bits reserved for later usage

Table 72   **Return Parameters of UPSMonitor**

2.32 WatchDog

The "WatchDog" function block provides a watch dog timer function. This function block will automatically reboot the controller when the timer expires. This allows the programmer to ensure that the system will never reach a locked state, by means of a last resort (rebooting the system).

2.32.1 Calling Parameters

Name	Data Type	Description
ENA	BOOL	Enable this function block 1: Enable 0: Disable
wt	SINT	Watchdog time 5-127 second. If wt<5, then 5 is used.
Cmd	SINT	Command 0: Disable watchdog 1: Enable watchdog 2: Test watchdog, this command will reboot the system.

Table 73   Calling Parameters of WatchDog

2.32.2 Return Parameters

Name	Data Type	Description
STAT	BOOL	The status of this function block TRUE: This function block is enabled FALSE: This function block is disabled

Table 74   Return Parameters of WatchDog

Appendix A Product Support

Warranty Information

All MOX manufactured products are warranted to be free from defects in material and workmanship. Our obligation under this warranty will be limited to repairing or replacing, at our option, the defective parts within 1 year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may only be returned under authorization. The purchaser will prepay all freight charges to return any products with a valid return authorization number to the designated repair facility.

This limited warranty does not cover loss or damage that may occur in shipment of the goods or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial use. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied.

Liability associated with all MOX products shall not exceed the price of the individual unit that is the basis of the claim. In no event will there be liability for any loss of profits, loss of use of facilities or equipment or other indirect, incidental or consequential damages.

Contact Details

To obtain support for MOX products, call MOX Group on the following numbers or your designated support provider and ask for MOX Support.

E-mail addresses:

support@mox.com.au

sales@mox.com.au

Visit our web page at:

http://www.mox.com.au

Service Information

If you require service, contact your local MOX Group representative. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit, an RMA (Return Material Authorization) number will be provided.

All returned materials are tracked with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

Your MOX Group authorized applications engineer will complete an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you provide a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Most repairs are completed within two days. During busy periods, there may be a longer delay.

If you need a quicker turnaround, ship the unit to us by airfreight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by midmorning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience

Please fill in the following information and keep this manual with your MOX system for future reference:

P.O. #: _____ Date Purchased: _____

Purchased From: _____

MOX Group
Web: www.mox.com.au
Email: info@mox.com.au