IEC 60870-5-101 Driver

V1.0 or higher



Supported version TOP Design Studio

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We would like to thank our customers for using M2I's "Touch Operation Panel (M2I TOP) Series". Read this manual and familiarize yourself with the connection method and procedures of the "TOP and external device".

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Refer to this section to check the addresses which can communicate with an external device.



1. System configuration

The system configuration of TOP and "IEC 60870-5-101" is as follows:

Series	Link I/F	Communication method	Communication setting	Cable
IEC 60870-5-101	-	RS-232C	3. TOP communication setting	5.1. Cable table 1

■ Connection configuration

- 1:1 (one TOP and one external device) connection

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9			I	I	8	B



2. External device selection

■ Select a TOP model and a port, and then select an external device.

Select Device					×
PLC select [COM	11]				
Filter : [All]		~		Search :	
				Mod	del 🔿 Vendor
Vendor KOLVER Srl	^	Model	2020 5 404		
SENGENUITY		JEC 6	0870-5-101		
PELCO					
FASTECH Co., Ltd.					
HYOSUNG					
NMEA					
AJINEXTEK Co., Ltd.					
IEC Standard					
CAS					
A&D					
SEHWA CNM					
SHINHAN Electronics	- 1				
BONGSHIN LOADCELL					
FANUC Co., 1 td.	~				
Select Device					x
Select Device PLC Setting[IEC 608 Alias Name : PL Interface : III	70-5-101 .C1]			×
Select Device PLC Setting[IEC 608 Alias Name : P Interface : II Protocol : II	70-5-101 .C1 :C101 :C60870-5-10] V D1 Protocol V			x Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : Protocol : IE String Save Mode : Fi	70-5-101 C1 C101 C60870-5-10 rst LH HL] D1Protocol ~ Change		C	x Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I Protocol : II String Save Mode : F Use Redundancy	70-5-101 .C1 :C101 :C60870-5-10 rst LH HL])1 Protocol v Change		C	x Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : Protocol : I String Save Mode : F Operate Condition : AND	70-5-101 .C1 :C101 :C60870-5-10 rst LH HL])1 Protocol v Change			x
Select Device PLC Setting[IEC 608 Alias Name : Pl Interface : II Protocol : II String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tim	70-5-101 C1 C101 C60870-5-11 rstLH HL w neOut undition))1 Protocol ~ Change 5 • (Ser	cond)		Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tim Change Conditi	70-5-101 .C1 :C101 :C60870-5-10 rst LH HL))1 Protocol ~ Change 5 • (See	cond)		X Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I String Save Mode : P Use Redundancy Operate Condition : AND Change Condition : Tir C Co Primary Option Timeout	70-5-101 .C1 C6001 C60870-5-10 rstLH HL weOut indition) D1 Protocol v Change 5 (See	cond)		Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I Protocol : I String Save Mode : P Operate Condition : NND Change Condition : T II Change Condition : T II Change Condition : T III C	70-5-101 .C1 .C101 .CC00870-5-10 .CC0870-5-10 .CC0870-5-10 .CC0870-5-10 .CC0870-5-10 .CC0870-5-10 .CC101 .CC10 .CC101 .CC101 .CC101 .CC101 .CC101 .CC101 .CC101 .CC101 .CC))1Protocol v Change 5 (See msec msec	cond)		Edit
Select Device PLC Setting[IEC 608 Alias Name : P Interface : P String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tir Change Condition Timeout Send Wait Retry Setry Set	70-5-101 .C1 :C101 :C60870-5-10 rstLH HL))) Protocol ~ Change 5 \$ (See msec msec	cond)		Edit
Select Device PLC Setting[IEC 608 Alias Name : Pl Interface : II Protocol : II String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tir Co Primary Option Timeout Send Wait Retry S	70-5-101 .C1 :C50870-5-10 rst LH HL))) Protocol ~ Change (See msec msec msec	cond)		Comm Manual
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Timeout Send Wait Retry - IEC 60870-5-101 Parame	70-5-101 .C1 :C101 :C60870-5-10 rst LH HL mcDut indition))1Protocol v Change 5 (See msec msec	cond)		Edit
Select Device PLC Setting[IEC 608 Alias Name : P Interface : I Protocol : I String Save Mode : F Use Redundancy Operate Condition : ND Change Condition : T II Change Conditi	70-5-101 .C1 :C101 :C60870-5-10 rstLH HL))1 Protocol V Change 5 (See msec msec mbalanced V	cond)		Edit
Select Device PLC Setting[IEC 608 Alias Name : PL Interface : IE String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tir Change Condition Timeout Send Wait Retry IEC 60870-5-101 Parame Transmission_Mode Common_Address_of_ASD	70-5-101 .C1 .C00870-5-11 rst LH HL))) Protocol ~ Change 5 \$ (See msec msec mbalanced ~	cond)		Edit
Select Device PLC Setting[IEC 608 Alias Name : Pl Interface : II String Save Mode : F Use Redundancy Operate Condition : AND Change Condition : Tir Context Condition Timeout Send Wait Primary Option Timeout Send Wait EC 60870-5-101 Parame Transmission_Mode Common_Address_of_ASD Frame_Length	70-5-101 .C1 .C00870-5-10 rst LH HL))) Protocol ~ Change (See msec msec mbalanced ~ (See S5 •	cond)		Comm Manual
elect Device PLC Setting[IEC 608 Alias Name : P Interface : String Save Mode : Use Redundancy Operate Condition : AND Change Condition : Conger Condition : Conge	70-5-101 .C1 :C101 :C60870-5-10 C60870-5-10 C60870-5-10 meOut meOu))1 Protocol V Change (See msec msec mbalanced V (See S5 (See)	cond)		Edit

Sett	tings	Contents				
ТОР	Model	Check the TOP display and pro	Check the TOP display and process to select the touch model.			
External device	Vendor	Select the vendor of the external device to be connected to TOP. Select "IEC Standard".				
	PLC	Select an external device to cor	nnect to TOP.			
		Model	Interface	Protocol		
		IEC 60870-5-101 IEC101 IEC60870-5-101 prtoc				
		Please check the system config connect is a model whose syste	Please check the system configuration in Chapter 1 to see if the external device you want connect is a model whose system can be configured.			



3. TOP communication setting

The communication can be set in TOP Design Studio or TOP main menu. The communication should be set in the same way as that of the external device.

3.1 Communication setting in TOP Design Studio

(1) Communication interface setting

■ [Project > Project Property > TOP Setting] → [Project Option > "Use HMI Setup" Check > Edit > Serial]

- Set the TOP communication interface in TOP Design Studio.





Items	ТОР	External device	Remarks	
Signal Level (port)	RS-232C	RS-232C	Fixed	
Baud Rate	9600			
Data Bit	8			
Stop Bit	1			
Parity Bit	NON	NE		

 \ast The above settings are $\underline{examples}$ recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.

(2) Communication option setting

■ [Project > Pr	roject Prop	berty > Device se	atting > COMT > TEC 60870-5-101]	
– Set the opt	tions of the	e Computer Link	communication driver in TOP Design Studio.	
Project Option				
Change HMI[H]	Add P	PLC [A] TI Change	e PLC[C] Delete PLC[D]	
TOP Setting		PLC Setting[IEC	60870-5-101]	
V I Option Module Sett	tina	Alias Nam	ne : PLC1	
FieldBus (0)		Interfac	re : IEC101	
RFID (0)		Deater		
Device Setting		Protoco		Comm Manual
PLC1 : IEC	60870-5-101	String Save Mod	je : First LH HL Change	
COM3 (0)		Operate Condition :	AND	
USBDevice (0)		operate contration .		
		Change Condition :	TimeOut 5 C (Second)	
			Condition Edit	
		Primary Option		
		Printing Option		
		Timeout	3000 Smsec	Í
		Send Wait	n msec	
	:	Retry	5	
	:			
		- IEC 60870-5-101 Pa	arameters -	
		Transmission_Mode	Linbalanced ×	
		Common_Address_of	f_ASDU 1	
		Frame_Length	255	
		Size of Link Address		
		Size_or_Link_Address	s <u>1</u> ~	
		Size_of_ASDU_Addre	ess 1 v	
		Size of Object Info		
		Size_of_Cause_of_Tr	ransMission 1 ~	
		[Controlled Station]	1	

Apply Close

Items	Settings	Remarks
Interface	Configure the communication interface between the TOP and an external device.	Refer to "2. External
Protocol	Configure the communication protocol between the TOP and an external device.	device selection".
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and	
	sending the next command request.	

×

^



3.2. Communication setting in TOP

* This is a setting method when "Use HMI Setup" in the setting items in "3.1 TOP Design Studio" is not checked.

■ Touch the top of the TOP screen and drag it down. Touch "EXIT" in the pop-up window to go to the main screen.



(1) Communication interface setting

■ [Main Screen > Control Panel > Serial]



Items	ТОР	External device	Remarks
Signal Level (port)	RS-232C	RS-232C	Fixed
Baud Rate	9600		
Data Bit	8		
Stop Bit	1		
Parity Bit	NON	NE	

* The above settings are setting examples recommended by the company.

Items	Description
Signal Level	Select the serial communication method between the TOP and an external device.
Baud Rate	Select the serial communication speed between the TOP and an external device.
Data Bit	Select the serial communication data bit between the TOP and an external device.
Stop Bit	Select the serial communication stop bit between the TOP and an external device.
Parity Bit	Select the serial communication parity bit check method between the TOP and an external device.



(2) Communication option setting

■ [Main Screen > Control Panel > PLC]

	¢۵	100	PLC	×	
	🔯 System	Driver(COM1)	PLC1(IEC 60870-5-101) -		
Run		Interface	IEC101	<u> </u>	
		Protocol	IEC60870-5-101 Prot ▼		
VNC	PLC	Timeout	3000 🖨 msec		
		Send Wait	0 🖨 msec		
VNC Viewer		Retry	5		
			-101 Paramatara -		
	Ethernet	TEC UCUTO J	IUI Falameters		
Screen	- A	Transmiss	Unbala 💌		
shot	mili	Common_Ac			
	Diagnostic	Frame_Ler	255	-	
		•		•	
	[System]	Diagnostic		Apply Cancel	
	[0]01000]				

Items	Settings	Remarks
Interface	Configure the communication interface between the TOP and an external device.	Refer to "2. External
Protocol	Configure the communication protocol between the TOP and an external device.	device selection".
TimeOut (ms)	Set the time for the TOP to wait for a response from an external device.	
SendWait (ms)	Set the waiting time between TOP's receiving a response from an external device and	
	sending the next command request.	

Items	Description
Common Address of ASDU	Common Address of ASDU.
Size of Link Address	Select the Link Address Size. [1 or 2 Bytes]
Size of ASDU Address	Select the size of ASDU Address [1 or 2 Bytes]
Size of Object Information	Select the Size of Object Information address[1 or 2 or 3 Bytes]
Size of Cause of Transmission	Select the Size of Cause of Transmission [1 or 2 Bytes]
Link Address	Select the Link Address of the External Device/PLC
Common Address of ASDU	Address Select the Common ASDU Address of the External Device/PLC
Name	Address Object Information Name
Start Address	Address Object Information Start Address
Range	Address Object Information Range.
Clock Sync.Interval	Select the Time Interval (in minutes) to send Clock Synchronization command.



3.3 Communication diagnostics

■ Check the interface setting status between the TOP and external device.

- Touch the top of the TOP screen and drag it down. Touch "EXIT" in the pop-up window to go to the main screen.
- Check if the COM port settings you want to use in [Control Panel > Serial] are the same as those of the external device.
- Diagnosis of whether the port communication is normal or not
- Touch "Communication diagnostics" in [Control Panel > PLC].
- The Diagnostics dialog box pops up on the screen and determines the diagnostic status.

ОК	Communication setting normal
Time Out Error	Communication setting abnormal
	- Check the cable, TOP, and external device setting status. (Reference: Communication diagnostics sheet)

■ Communication diagnostics sheet

- If there is a problem with the communication connection with an external terminal, please check the settings in the sheet below.

Items	Contents		Check		Remarks
System	How to connect the system		OK	NG	1 Custom configuration
configuration	Connection cable name	OK	NG	1. System configuration	
ТОР	Version information		OK	NG	
	Port in use		OK	NG	
	Driver name		OK	NG	
	Other detailed settings		OK	NG	
	Relative prefix	Project setting	OK	NG	
		Communication diagnostics	ОК	NG	2. External device selection 3. Communication setting
	Serial Parameter	Transmission Speed	ОК	NG	
		Data Bit	ОК	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
External device	CPU name		OK	NG	
	Communication port name)	name (module	ОК	NG	
	Protocol (mode)	OK	NG		
	Setup Prefix	OK	NG		
	Other detailed settings		OK	NG	4. External device setting
	Serial Parameter	Transmission Speed	ОК	NG	
		Data Bit	OK	NG	
		Stop Bit	OK	NG	
		Parity Bit	OK	NG	
	Check address range		ОК	NG	<u>6. Supported addresses</u> (For details, please refer to the PLC vendor's manual.)



4. Cable table

This chapter introduces a cable diagram for normal communication between the TOP and the corresponding device. (The cable diagram described in this section may differ from the recommendations of "IEC60870-5-101")

4.1. Cable table 1

■ 1:1 connection					
COM Port (9 pm)					
CON	Λ			PLC	
Pin	Signal	Pin	Cable connection	Signal	Din number
arrangement*Note 1)	name	number		name	Fin humber
1 5	CD	1		1	CD
Ó Ő	RD	2		2	RD
	SD	3		3	SD
6 9	DTR	4		4	DTR
Based on	SG	5		5	SG
communication cable	DSR	6		6	DSR
connector front,	RTS	7		7	RTS
D-SUB 9 Pin male	CTS	8		8	CTS
(male, convex)		9		9	

*Note 1) The pin arrangement is as seen from the connecting side of the cable connection connector.



(5) Communication interface setting

Network configuration

- Multi-point-party line

Physical layer

Transmission speed -2400 bit/s -4800 bit/s -9600 bit/s -19200 bit/s (**NOT Defined in 870-5-101**)

Linked layer

Link transmission

- Unbalanced

Address field of the link

- One octet
- Two octets

Frame length

- 255 Maximum length L (number of octets)

Application layer

Common address of ASDU

- One octet
- Two octets

Information object address

- One octet
- Two octets
- Three octets

Cause of transmission

- One octet
- Two octets



ASDUs

Process information in monitor direction						
<1>	Single-point information					
<3>	Double-point information	M_DP_NA_1				
<5>	Step position information	M_ST_NA_1				
<11>	Measured value, scaled value	M_ME_NB_1				
<15>	Integrated totals	M_IT_NA_1				
<30>	Single-point information with time tag CP56Time2a	M_SP_TB_1				
<31>	Double-point information with time tag CP56Time2a	M_DP_TB_1				
<32>	Step position information with time tag CP56Time2a	M_ST_TB_1				
<35>	Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1				
<37>	Integrated totals with time tag CP56Time2a	M_IT_TB_1				
	Process information in control direction	Name				
<45>	Single command	C_SC_NA_1				
<46>	Double command	C_DC_NA_1				
<47>	Regulating step command	C_RC_NA_1				
<48>	Set point command, normalized value	C_SE_NA_1				



6. Device

Device Name	Description	Range	R/W
SP	Single Point Information	0–1999	Read only
DP	Double-Point Information	2000–3999	Read only
ME	Measured Value	4000–5999	Read only
SC	Single Command	6000–7999	Write only
IT	Integrated Totals	8000–9999	Read only
ST	Step Position Information	10000–11999	Read only
SE	Set Point Command	12000–13999	Write only
DC	Double Command	14000–15999	Write only
RC	Regulating Step Command	16000–17999	Write only

("Address range can be edited at PLC option. (User setting)[0-16777215](3 Byte) range settings should not overlap.)

Device	Sub Category	y / Element	Description	Data	
Name	Category	Element	Description	Туре	
		SPI	Single Point Information 0: OFF	*1	
			0: Not Blocked	1	
		BL	1: Blocked	*1	
	SIO	SB	0: Not Substituted	*1	
	510	NT	0: Topical	*1	
			0: Valid	•	
		IV	1: Invalid	*1	
SP		IV	Valid	*1	
		SU	Summer Time	*1	
		MSEC	Milliseconds	*2	
	TIME	MIN	Minute	*2	
		HOUR	Hour	*2	
			Day	*2	
		MONTH	Month	*2	
			Veer	*2	
			Teal Blocked / Not Blocked	<u>ک</u>	
			DIOCKEU / NOL DIOCKEU Substituted / Not Substituted	*1	
	DIQ		Topical / Not Topical	*1	
			Valid / Invalid	*1	
			Double Point Information	*2	
			Valid	*1	
DP		SU SU	Summer Time	*1	
		MSEC	Milliopoondo	*0	
			Minute	×0	
	TIME			2	
		HOUR	Hour	"Z	
		DAY	Day	*2	
		MONTH	Month	*2	
		YEAR	Year	*2	
	VTI	Т	Transient	*1	
		VAL	Value	*2	
	QDS	OV	Overflow / No Overflow	*1	
		BL	Blocked / Not Blocked	*1	
		SB	Substituted / Not Substituted	*1	
			I Opical / Not I Opical	*1	
				*1	
ST					
	TIME	50	Summer Time	"] *0	
		MSEC	Milliseconds	*2	
		MIN	Minute	*2	
		HOUR	Hour	*2	
		DAY	Day	*2	
		MONTH	Month	*2	
			YEAR	Year	*2



Device	Sub Category / Element		Description	Data
Name	Category	Element	Description	
		OV	Overflow / No Overflow	*1
		BL	Blocked / Not Blocked	*1
	QDS	SB	Substituted / Not Substituted	*1
		NT	Topical / Not Topical	*1
		IV	Valid / Invalid	*1
	VA	VAL	Measured Value	*2
ME		IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
	TIME	MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
	BCR	VAL	Counter value	*2
		SQ	Sequence	*2
		CY	(Carry) Counter Overflow / No Overflow	*1
		CA	Counter Adjusted / Not Adjusted	*1
		IV	Counter value Valid / Invalid	*1
IT	TIME	IV	Valid	*1
		SU	Summer Time	*1
		MSEC	Milliseconds	*2
		MIN	Minute	*2
		HOUR	Hour	*2
		DAY	Day	*2
		MONTH	Month	*2
		YEAR	Year	*2
SC	SCO	SCS	Single command state	*1
DC	DCO	DCS	Double command state	*2
RC	RCO	RCS	Regulating step command state	*2
SE	VA	VAL	Value (Normalized / Scaled /short floating point)	*2

*1 Bit Address Only *2 Word Address Only