SRS

XMPS-1000

(GUI for programming software of PLC)

Version<2.0>

1. **Graphical UI of programming software**
   Ladder, Predefined FB, user defined FB etc.
2. **Interpreter (Application program)**
3. **Interpreter (PLC configuration settings)**

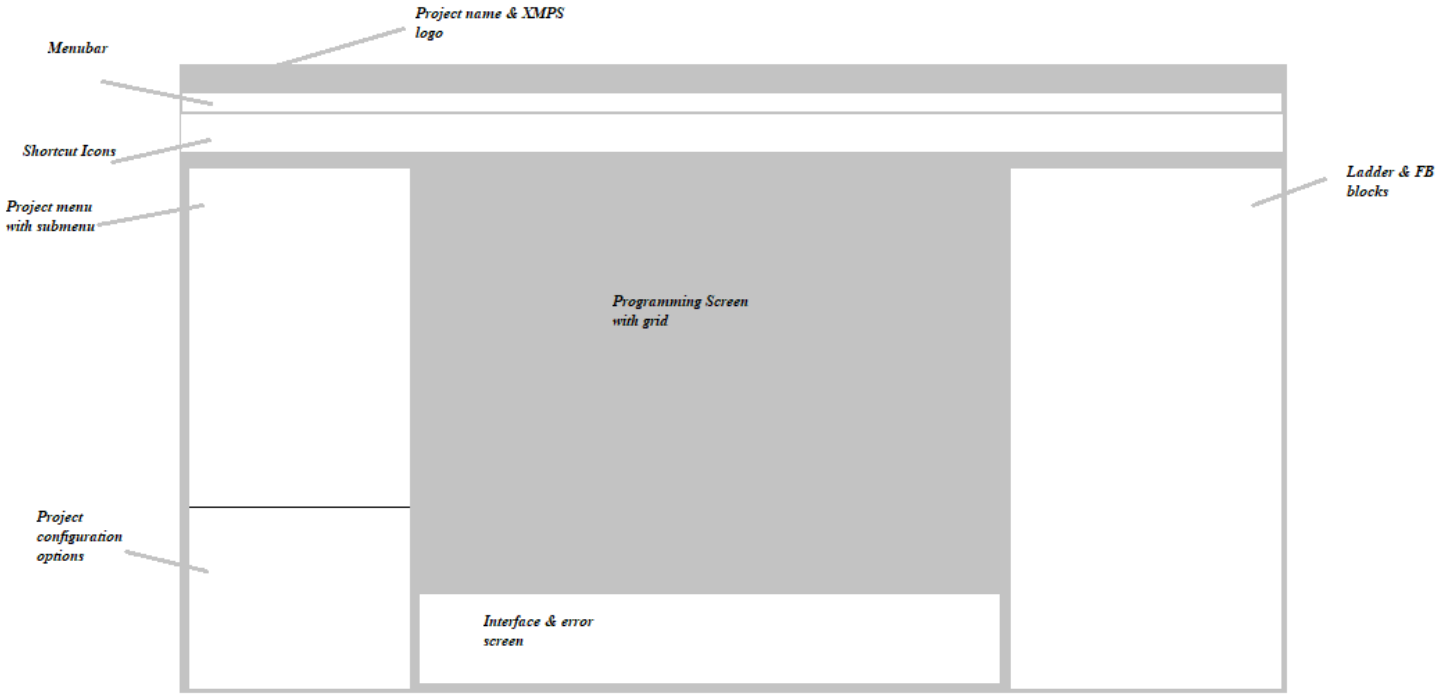
1. Introduction :

This is the Software Requirements Specification (SRS) document which provides an overview of the entire XMPS-1000 requirements.

2. Purpose:

In short, the purpose of this SRS document is to provide a detailed overview of our XMPS- 1000 software product, its parameters and goals. This document describes the project's user interface requirements. It will explain the purpose and features of the system, the interfaces of the system, Interpreter (code generation).

Provisional Proposed UI :



4. Menu Bar :

4.1. Project : In “Project” menu following options should be added.

4.1.1 New Project

Frontend-New Project

Backend – a. New path for project

b. Select CPU option

c. If existing path choosed popup of warning.

4.1.2 Open Project

Frontend- Open Project

Backend- a. Open project popup

b. If exixsting project not saved then popup for saving the project

4.1.3 - Save project

Frontend- Save project

Backend- a.Save project latest changes

4.1.4 Save As..

Frontend-Save As..

Backend- a.Ask for saving project path

4.1.5 Close Project

Frontend- Close Project

Backend- a. Save the latest changes and close the project

b. only project should close not programming software

4.1.6 Print

Frontend- Print

Backend- a. Same as what we have done in XMPS-100

Print the ladder main program & configuration settings.

4.1.7 Exit

Frontend-Exit

Backend- a.Save and close the software.

4.2 Edit : In “Edit” menu following options should be added.

4.2.1 Undo

Frontend-Undo

Backend- a. Undo the latest change (atleast last 15 changes)

4.2.2 Redo

Frontend- Redo

Bacckend- a. Redo the changes (atleast 15 changes)

4.2.3 Copy

Frontend-Copy

Backend- a. Copy the selescted rung/instruction

b. Copy the selected project folder

c. Copy the selected program logic file

4. 2.4 Paste

Frontend-Paste

Backend- a.Paste the copied /cutted rung, instruction

b. Paste the copied/cutted folder

c. Paste the copied program logic file

4. 2.5 Cut

Frontend-Cut

Backend- a.Cut the selected rung/ instruction

b. Cut the folder

c. Cut the Program logic file

4. 2.6 Delete

Frontend-Delete

Backend- a.Delete the selected rung/ instruction

b. Delete the slecetd folder

c. Delet the selected program logic file

4.2.7 Find & Replace

Frontend-Find & Replace

Backend- a. Find the text

b. Fing & replace the text

4.3 View : In “View” menu following options should be added.

4.3.1 Device info

Frontend-Device info

After Click- It will show the XMPRo CPU parameters

4.3.2 Zoom

Frontend-Zoom

Backend-Should able to zoom the programming grid window

4.3.3 Project Window

Frontend-Project Window

Backend-After click project window should Enable or Disable

4.3.4 Compiler error screen

Frontend-Compiler error screen

Backend-After click compiler screen should Enable or Disable

4.4 Mode : In “Mode” menu following options should be added.

4.4.1 Login

Frontend- Login

Backend-Sotware should connect with PLC via ethernet port & all editable functions should be disable, no program will edit in this mode only start & stop plc command should accept.

Online Monitering option should enable.

4.4.2 Logout

Frontend-Logout

Backend- Logout the Login mode and Normal mode activate.

4.4.3 Download Project

Frontend- Download Project

Backend-Save - Compile - Download the compiled file into the PLC via ethernet port

4.4.4 Upload Project

Frontend- Upload project

Backend- Upload the project from PLC & display the project

4.4.5 Offline Simulation

Frontend-Offline simulation

Backend- TBD

4.4.6 PLC Start

Frontend- PLC start

Backend-PLC start command shoud go to PLC & this mode should active only if the user is Login to PLC

4.4.7 PLC Stop

Frontend- PLC stop

Backend-PLC stop command shoud go to PLC & this mode should active only if the user is Login to PLC

4.4.8 Compile

Frontend- Compile

Backend- Generate code as per requirement.

4.5 Help : In “Help” menu following options should be added.

4.5.1 Index

Frontend Index

After click the Index of XMPS-1000 intruction help window should be open. And after clicking each of index point it will show the detail information of perticuler point.

4.5.2 Contents

Frontend-Contents

After click the Contents all help related to XMPS-1000 software should open.

4.5.3 Search

Frontend-Search

Should open the search bar for the user.

4.5.4 User amnual

User manual PDf open.

5. Shortcut Bar :

In shortcut bar following symbols should be present:

5.1 New
5.2 Open
5.3 Save
5.4 Project close
5.5 Upload
5.6 Download
5.7 Zoom IN
5.8 Zoom out
5.9 Zoom % selection
5.10 Compile
5.11 Login
5.12 Logout
5.13 Run Online Monitering
5.14 Help
5.15 Cut
5.16 Copy
5.17 Paste
5.18 Select
5.19 Undo
5.20 Redo
5.21 Delete
5.22 Previous screen
5.23 Next screen
5.24 Find
5.25 Ladder components (Contact,Coil,Parallel contact,Parallel coil, Variable,New rung,New comment)

After click on perticuler shortcut related action should be taken.

6. Project Menu

In Left side of screen there should be the Project Menu with the Submenus as follows:

-All files

6.1 Project List

6.1.1 Project name XXXXXX

6.1.1.1 Powerup routine (Init)

6.1.1.1.1 Logic 1

6.1.1.1.2 Logic 2

6.1.1.1.3 xxxxxx

6.1.1.2 Main

6.1.1.2.1 Main program (should call the Logic blocks as per sequence)

6.1.1.3 Library

6.1.1.3.1 Logic blocks

6.1.1.3.1.1 Logic 1

6.1.1.3.1.2 Logic 2

6.1.1.3.1.3 Logic 3

6.1.1.3.1.4 Logic 4

6.1.1.3.1.5 xxxxxx

6.1.1.3.2 Hardware Interrupt

6.1.1.3.2.1 Logic 1

6.1.1.3.2.2 Logic 2

6.1.1.3.3 UDFB

6.1.1.3.3.1 FB 1 xxxxx

6.1.1.3.3.2 FB 2 xxxxx

6.1.1.3.3.3 FB 3 xxxxx

6.1.1.4 IO configuration

6.1.1.4.1 Base (XMPRO-10)

6.1.1.4.2 Local IO 1 (xxxx)

6.1.1.4.3 Local IO 2 (xxxx)

6.1.1.4.4 Local IO 3 (xxxx)

6.1.1.4.5 Local IO 4 (xxxx)

6.1.1.4.6 Local IO 5 (xxxx)

6.1.1.5 Tags

6.1.1.6 Error diagnostic tags

6.1.1.7 System Configuration

6.1.1.7.1 Ethernet

6.1.1.7.1.1 Modbus TCP Server

6.1.1.7.1.2 Modbus TCP Client

6.1.1.7.1.2.1 Slave 1
6.1.1.7.1.2.2 Slave 2
6.1.1.7.1.2.3 Slave 3
6.1.1.7.1.2.4 xxxxxx

6.1.1.7.2 RS485
6.1.1.7.2.1 Modbus RTU Master
6.1.1.7.2.1.1 Slave 1 (MOD-DI-8)
6.1.1.7.2.1.2 Slave 2 (xxxxx)
6.1.1.7.2.1.3 Slave 3 (xxxxx)
6.1.1.7.2.1.4 Xxxxx

6.1.1.7.3 CAN
6.1.1.7.3.1 CANOpen Master
6.1.1.7.3.1.1 CANOpen Slave 1 (CAN -DI16)
6.1.1.7.3.1.2 CANOpen Slave 2
6.1.1.7.3.1.3 CANOpen Slave 3
6.1.1.7.3.1.4 xxxxxxx

6.1.2 Project name XXXXXX

Same as project 1 …….

All tabs should include the dedicated screen as defined below.

Project name Screen- After click it should display the overall program information

(No.of Power up blocks, No of Logic blocks,Total IO used,Total tags defined etc)

Powerup routine (Init) Screen- Under this tab Logic blocks should be added as per requirement of user.

Main- Under this tab one “Main Program” block should add. Here user can call the Logic blocks as per their sequence. (It will be the programming grid screen)

Library- In this tab user should able to select the which following library he wants to use for his application.

Logic blocks-Under this tab user should add the Logic blocks as per their requiement and should rename that block as per their requirement.

Hardware interrupt- In this tab user should configure the Interrupt Input and Under that Input tab user should add the Logic blocks which should run when Interrupt is occure.

UDFB- User defined function block. Under this tab user can create his own programmed function block.

Function block has Inputs & outputs, so user will able to add the Inputs & can create his own logic as per received input and gives the Output.

IO configuration- Under this tab user should able to configure the Onboard and Local IO modules.

Tags- In this tab all pregenerated CPU & Local IO tags should be automatically assigned as per predefined address.

User can able to add the memory tags as per their requirement in Logic block screen only and same tag should add in Tags screen automatically.

User should able to rename the tag name only.

User should able to add the memory address tags as per their requirement.

All memory tags which will generate in all logic blocks during the program should add here automatically.

Error Diagnostic tags- In this tab all predefined error tags will be added as per added configuration.

System Configuration- Under this tab all settings and requests of Ethernet,Modbus TCP Server,Modbus TCP Client,RS485,Modbus RTU masterSlave 1,Slave 2,Slave xxx ,CAN, CANOpen master,CANOpen slave 1, CANOpen slave xx should be added.

7. Ladder & FB Blocks screen

This screen should be activate when user will click on any Logic block screen.

Under this screen all below instructions predefined FB should be present.

All Ladder components should be present here.

All UDFB blocks also should be added here automatically when user creates any UDFB.

A. Ladder components:

7.1 Contact
7.2 Coil
7.3 Insert after contact
7.4 Parallel Contact
7.5 Insert FB
7.6 Variable
7.7 Set Coil
7.8 Reset Coil
7.9 Negate Contact
7.10 Negate Parallel contact
7.11 Comment
7.12 Insert branch

B. Predefined Function blocks:

7.13 Logical
- 7.13.1 AND
- 7.13.2 OR
- 7.13.3 XOR
- 7.13.4 NOT

7.14 Arithmatic
- 7.14.1 ADD
- 7.14.2 SUB
- 7.14.3 MUL
- 7.14.4 DIV
- 7.14.5 MOD
- 7.14.6 MOV

7.15 Bitshift
- 7.15.1 SHL
- 7.15.2 SHR
- 7.15.3 ROR
- 7.15.4 ROL

7.16 Limit
7.17 Compare
- 7.17.1 GT
- 7.17.2 GE
- 7.17.3 LT
- 7.17.4 LE
- 7.17.5 EQ

7.17.6 NE

7.18 Edge detector

7.18.1 Rising edge

7.18.2 Falling edge

7.19 Counter

7.19.1 CTU

7.19.2 CTD

7.20 Timer

7.20.1 0.01S TON

7.20.2 0.1S TON

7.20.3 1S TON

7.20.4 0.01S TOFF

7.20.5 0.1S TOFF

7.20.6 1S TOFF

7.20.7 0.01S TP

7.20.8 0.1S TP

7.20.9 1S TP

7.21 Flipflop

7.21.1 RS

7.21.2 SR

8. Interface & Error screen

8.1 This screen will appear when user will build or compile the project and shows the status of compilation. If any error is present then it should show the error.

(Next version of this document will explain the details about this screen).

9. Programming grid screen

In this screen user can drag and drop the all ladder components & function blocks.

Screen grid should be adjustable.

Presently we will limit the 8 ladder components in one rung.

And same for parallel also, we will limit this to 8 rungs.

Use the right click & double click for adding & displaying the ladder components & its information.

10.Interpreter (Application program)

10.1 Application program interpreter

Logic blocks which is called sequentially in “Main program” tab should create the “MCode” buffer as per the given format.

Eg—

Main Program

Motor1
Motor2
Motor3

Library

Logic blocks

Motor1------50 rungs of logic

Motor2------20 rungs of logic

Motor3------30 rungs of logic

Motor4------60 rungs of logic

In above example under the “Main program” tab we have called the 3 logic blocks. “Motor1”, “Motor2”, “Motor3”. So, 50 + 20 + 30 =100 rungs of MCode should be generated sequentially when user click on compile/generate code option.

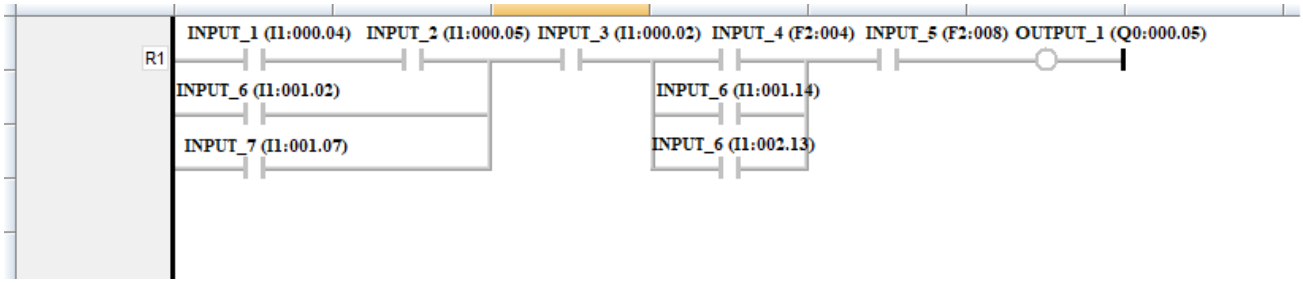
All logic blocks should save in the laptop memory when user opens the existing project all blocks should open as it is.

GUI Logic:

1. When user added any ladder component or function block in a programming grid then at backend the equivalent C code should create.
2. C code should create using the CPU defined address only. Not by user defined tags
3. CPU address details as follows:

XM-Pro CPU Addressing Scheme				
Block No	**Type**	**Logical Address Range**	**Used as**	**Remark**
0	Output address	Q0:000 to Q0:255	Word and Bit	Physical Digital+Analog Outputs. (local+Expn+Remote)
1	Input adress	I1:000 to I1:255	Word and Bit	Physical Digital+Analog Inputs. (local+Expn+Remote)
2	Flags (Memory bits)	F2.000 to F2.255	Bit	Memory bits
3	Status	S3:000 to S3:255	Word	PLC Status & dignostics
4	Integer Word	W4:000 to W4:255	Word	Memory word address
5	Floating Point	P5:000 to P5:255	Real	Memory Real address
6	Timers	T6:000 to T6:255	Word	Timer word address
7	Counters	C7:000 to C7:255	Word	Counter word address
8	Reserved for future	X8.000 to X8.255	Word	
9	Reserved for future	Y9.000 to Y9.255	Word	
10	Auto memory flag	D10:000 to D10:2048	Bit	Auto generated flags not for user, it will create by utility when user added multiple ladder components , function blocks in parallal with one rung

4. Ex-1 : Following is the example for creating Mcode:



Equivalent backend code for above rung-

Q0:000.05=(((I1:000.04 AND I1:000.05) OR I1:001.02 OR I1:001.07) AND (I1:000.02) AND (F2:004 OR I1:001.14 OR I1:002.13) AND F2:008);

5. This equivalent code should convert into Messung “Mcode” format.
6. Messung Mcode format for 1 Rung is:

1	Rung No.	4	byte
2	Data type	4	byte
3	Enable Type	4	byte
4	Enable	4	byte
5	OPCODE	4	byte
6	Type of operand 1	4	byte
7	OP1	4	byte
8	Type of operand 2	4	byte
9	OP2	4	byte
10	Type of operand 3	4	byte
11	OP3	4	byte
12	Type of operand 4	4	byte
13	OP4	4	byte
14	Type of operand 5	4	byte
15	OP5	4	byte
16	Type of operand 6	4	byte
17	OP6	4	byte
18	Type of operand 7	4	byte
19	OP7	4	byte
20	Type of operand 8	4	byte
21	OP8	4	byte
22	No. of Operand	4	byte
23	T_C Name	4	byte
24	Output 1	4	byte
25	Output 2	4	byte

MCODE detailed description is in section 11

7. Above Ex1 equivalent C code conversion example for Mcode buffer creation:

Q0:000.05=(((I1:000.04 AND I1:000.05) OR I1:001.02 OR I1:001.07) AND (I1:000.02) AND (F2:004 OR I1:001.14 OR I1:002.13) AND F2:008);

Rung 1---
D10:000=I1:000.04 AND I1:000.05
Rung 2---
D10:001=D10:000 OR I1:001.02 OR I1:001.07
Rung 3---
D10:002=D10:001 AND I1:000.02
Rung 4---
D10:003=F2:004 OR I1:001.14 OR I1:002.13
Rung 5---
Q0:000.05=D10:002 AND D10:003 AND F2:008

8. Mcode for above Ex1—(not actual calculated address of Oprands just dummy address)

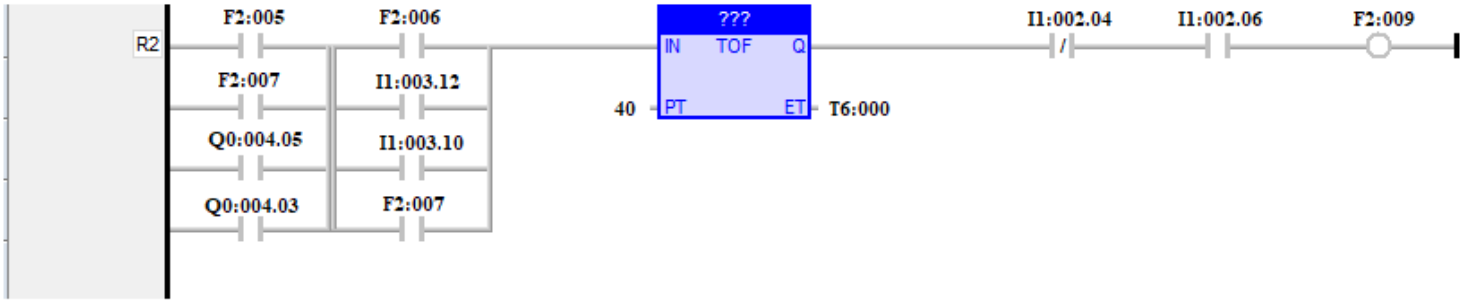
Sr.no.	***Description***	***Actual Mcode Buffer values***	***explanation***
1	Rung No.	0x01	
2	Data type	0x00	
3	Enable Type	0x00	
4	Enable	-	
5	OPCODE	0x0000	AND
6	Type of operand 1	0x01	
7	OP1	0x22204000	Actual address of I1:000.04
8	Type of operand 2	0x01	
9	OP2	0x22204001	Actual address of I1:000.05
10	Type of operand 3	-	
11	OP3	-	
12	Type of operand 4	-	
13	OP4	-	
14	Type of operand 5	-	
15	OP5	-	
16	Type of operand 6	-	
17	OP6	-	
18	Type of operand 7	-	
19	OP7	-	
20	Type of operand 8	-	
21	OP8	-	
22	No. of Operand	0x02	
23	T_C Name	-	
24	Output 1	0x20034445	Actual address of D10:000
25	Output 2	-	
26	Rung No.	0x02	
27	Data type	0x00	

28	Enable Type	0x00	
29	Enable	-	
30	OPCODE	0X0010	OR
31	Type of operand 1	0x01	
32	OP1	0x22204002	Actual address of D10:000
33	Type of operand 2	0x01	
34	OP2	0x22204003	Actual address of I1:001.02
35	Type of operand 3	0x01	
36	OP3	0x22204004	Actual address of I1:001.07
37	Type of operand 4	-	
38	OP4	-	
39	Type of operand 5	-	
40	OP5	-	
41	Type of operand 6	-	
42	OP6	-	
43	Type of operand 7	-	
44	OP7	-	
45	Type of operand 8	-	
46	OP8	-	
47	No. of Operand	0x03	
48	T_C Name	-	
49	Output 1	0x20034447	Actual address of D10:001
50	Output 2	-	
51	Rung No.	0x03	
52	Data type	0x00	
53	Enable Type	0x00	
54	Enable	-	
55	OPCODE	0X0000	AND
56	Type of operand 1	0x01	
57	OP1	0x22204005	D10:001
58	Type of operand 2	0x01	
59	OP2	0x22204006	I1:000.02
60	Type of operand 3	-	
61	OP3	-	
62	Type of operand 4	-	
63	OP4	-	
64	Type of operand 5	-	
65	OP5	-	
66	Type of operand 6	-	
67	OP6	-	
68	Type of operand 7	-	
69	OP7	-	
70	Type of operand 8	-	
71	OP8	-	
72	No. of Operand	0x02	

73	T_C Name	-	
74	Output 1	0x20034447	D10:002
75	Output 2	-	
76	Rung No.	0x04	
77	Data type	0x00	
78	Enable Type	0x00	
79	Enable	-	
80	OPCODE	0X0010	OR
81	Type of operand 1	0x01	
82	OP1	0x22204008	F2:004
83	Type of operand 2	0x01	
84	OP2	0x22204009	I1:001.14
85	Type of operand 3	0x01	
86	OP3	0x22204010	I1:002.13
87	Type of operand 4	-	
88	OP4	-	
89	Type of operand 5	-	
90	OP5	-	
91	Type of operand 6	-	
92	OP6	-	
93	Type of operand 7	-	
94	OP7	-	
95	Type of operand 8	-	
96	OP8	-	
97	No. of Operand	0x03	
98	T_C Name	-	
99	Output 1	0x20034448	D10:003
100	Output 2	-	
101	Rung No.	0x05	
102	Data type	0x00	
103	Enable Type	0x00	
104	Enable	-	
105	OPCODE	0X0000	AND
106	Type of operand 1	0x01	
107	OP1	0x22204011	D10:002
108	Type of operand 2	0x01	
109	OP2	0x22204012	D10:003
110	Type of operand 3	0x01	
111	OP3	0x22204013	F2:008
112	Type of operand 4	-	
113	OP4	-	
114	Type of operand 5	-	
115	OP5	-	
116	Type of operand 6	-	
117	OP6	-	
118	Type of operand 7	-	
119	OP7	-	
120	Type of operand 8	-	

121	OP8	-	
122	No. of Operand	0x03	
123	T_C Name	-	
124	Output 1	0x20034449	Q0:000.05
125	Output 2	-	

9. Ex-2: (Not mentioning user tags just mentioning equivalent address…consider there will be an user tags)



Equivalent C code for above-

F2:009=(TOF0.01S_T151((F2:005 OR F2:007 OR Q0:004.05 OR Q0:004.03) AND (F2:006 OR I1:003.12 OR I1:003.10 OR F2:007)) 40 , T151.Q , T6:000) AND (NOTI1:002.04 AND I1:002.06))

10. Above Ex2 equivalent code conversion example for Mcode buffer creation:

Rung 1---

D10:000=F2:005 OR F2:007 OR Q0:004.05 OR Q0:004.03

Rung 2---

D10:001=F2:006 OR I1:003.12 OR I1:003.10 OR F2:007

Rung 3---

D10:002=D10:000 AND D10:001

Rung 4---

D10:003=NOTI1:002.04 AND I1:002.06

Rung 5---

D10:004,T6:000 =TOF 0.01S_T151(D10:002 , 40)

Rung 6---

F2:009=D10:004 AND D10:003

11. Mcode for above Ex2— (not actual calculated address of Oprands just dummy address)

Sr.no.	Description	Actual Mcode Buffer values	Explanation
1	Rung No.	0x01	
2	Data type	0x00	
3	Enable Type	0x00	
4	Enable	-	
5	OPCODE	0x0010	OR
6	Type of operand 1	0x01	
7	OP1	0x22204000	F2:005
8	Type of operand 2	0x01	
9	OP2	0x22204001	F2:007
10	Type of operand 3	0x01	
11	OP3	0x22204002	Q0:004.05
12	Type of operand 4	0x01	
13	OP4	0x22204003	Q0:004.03
14	Type of operand 5	-	
15	OP5	-	
16	Type of operand 6	-	
17	OP6	-	
18	Type of operand 7	-	
19	OP7	-	
20	Type of operand 8	-	
21	OP8	-	
22	No. of Operand	0x04	
23	T_C Name	-	
24	Output 1	0x20034447	D10:000
25	Output 2	-	
26	Rung No.	0x02	
27	Data type	0x00	
28	Enable Type	0x00	
29	Enable	-	
30	OPCODE	0X0010	OR
31	Type of operand 1	0x01	
32	OP1	0x22204012	F2:006
33	Type of operand 2	0x01	
34	OP2	0x22204013	I1:003.12
35	Type of operand 3	0x01	
36	OP3	0x22204014	I1:003.10
37	Type of operand 4	0x01	
38	OP4	0x22204015	F2:007
39	Type of operand 5	-	
40	OP5	-	
41	Type of operand 6	-	
42	OP6	-	
43	Type of operand 7	-	

44	OP7	-	
45	Type of operand 8	-	
46	OP8	-	
47	No. of Operand	0x04	
48	T_C Name	-	
49	Output 1	0x20034447	D10:001
50	Output 2	-	
51	Rung No.	0x03	
52	Data type	0x00	
53	Enable Type	0x00	
54	Enable	-	
55	OPCODE	0X0000	AND
56	Type of operand 1	0x01	
57	OP1	0x22204015	D10:000
58	Type of operand 2	0x01	
59	OP2	0x22204016	D10:001
60	Type of operand 3	-	
61	OP3	-	
62	Type of operand 4	-	
63	OP4	-	
64	Type of operand 5	-	
65	OP5	-	
66	Type of operand 6	-	
67	OP6	-	
68	Type of operand 7	-	
69	OP7	-	
70	Type of operand 8	-	
71	OP8	-	
72	No. of Operand	0x02	
73	T_C Name	-	
74	Output 1	0x20034447	D10:002
75	Output 2	-	
76	Rung No.	0x04	
77	Data type	0x00	
78	Enable Type	0x00	
79	Enable	-	
80	OPCODE	0X0000	AND
81	Type of operand 1	0x02	
82	OP1	0x22204008	NOTI1:002.04
83	Type of operand 2	0x01	
84	OP2	0x22204009	I1:002.06
85	Type of operand 3	-	
86	OP3	-	I1:002.13
87	Type of operand 4	-	
88	OP4	-	
89	Type of operand 5	-	
90	OP5	-	
91	Type of operand 6	-	

92	OP6	-	
93	Type of operand 7	-	
94	OP7	-	
95	Type of operand 8	-	
96	OP8	-	
97	No. of Operand	0x02	
98	T_C Name	-	
99	Output 1	0x20034448	D10:003
100	Output 2	-	
101	Rung No.	0x05	
102	Data type	**0x07**	
103	Enable Type	0x00	
104	Enable	-	
105	OPCODE	0x01E7	TOF0.01S
106	Type of operand 1	0x01	
107	OP1	0x22204011	D10:002
108	Type of operand 2	0x03	
109	OP2	0x22204012	40
110	Type of operand 3	-	
111	OP3	-	
112	Type of operand 4	-	
113	OP4	-	
114	Type of operand 5	-	
115	OP5	-	
116	Type of operand 6	-	
117	OP6	-	
118	Type of operand 7	-	
119	OP7	-	
120	Type of operand 8	-	
121	OP8	-	
122	No. of Operand	0x02	
123	T_C Name	T151	
124	Output 1	0x20034450	D10:004
125	Output 2	0x20037450	T6:000
126	Rung No.	0x06	
127	Data type	**0x00**	
128	Enable Type	0x00	
129	Enable	-	
130	OPCODE	0x0000	AND
131	Type of operand 1	0x01	
132	OP1	0x22204011	D10:004
133	Type of operand 2	0x01	
134	OP2	0x22204012	D10:003
135	Type of operand 3	-	
136	OP3	-	
137	Type of operand 4	-	
138	OP4	-	
139	Type of operand 5	-	

140	OP5	-	
141	Type of operand 6	-	
142	OP6	-	
143	Type of operand 7	-	
144	OP7	-	
145	Type of operand 8	-	
146	OP8	-	
147	No. of Operand	0x02	
148	T_C Name	-	
149	Output 1	0x20038450	F2:009
150	Output 2	-	

12. Before first rung and after last rung there will be some addition like beow.

Before first Rung-

Description			
SOF	$	1	byte
No. of Rungs	MAX 1000	2	byte

After Last Rung-

Description			
EOF	#	1	byte

11. MCode details.

11.1 SOF- Start of Frame ---

We have defined "$" as a start of Mcode buffer.
Size - 1 byte

11.2 No. of Rungs---

No. of rungs will be calculate after compilation of code of total no. of Mcode rungs.

Size-2 bytes

11.3 Rung no.---

Rung no. ---Rung no as per sequential flow of program
Size- 2 bytes

11.4 Data Type---

As per Opcode –(defined earlier same as per XMPS-100)
Size- 2 bytes

Datatype representation in OPCODE	Description
0x0000	BOOL
0x0001	BYTE
0x0002	WORD
0x0003	DOUBLE WORD
0x0004	INT
0x0005	REAL
0x0006	TON
0x0007	TOFF
0x0008	CTU
0x0009	CTD
0x000A	TP

11.5 Enable type---

This is applicable when FB with enable is used by user.
Size- 1 byte

11.6 Enable—

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.7 Opcode---

This is the Opcode of Rung operation as per below table.
Size- 2 bytes

Instruction representation in OPCODE	Description
0x000x	AND
0x001x	OR
0x002x	XOR
0x003x	NOT
0x004x	ADD
0x005x	SUB

0x006x	MUL
0x007x	DIV
0x008x	MOD
0x009x	MOV
0x00Ax	SHL
0x00Bx	SHR
0x00Cx	ROR
0x00Dx	ROL
0x00Ex	MAX
0x00Fx	MIN
0x010x	LIMIT
0x011x	GT
0x012x	GE
0x013x	LT
0x014x	LE
0x015x	EQ
0X016X	NE
0x017x	Rising Edge
0x018x	Falling Edge
0x019x	CTU
0x01Ax	CTD
0x01Bx	0.01S TON
0x01Cx	0.1TON
0x01Dx	1s TON
0x01Ex	0.01S TOFF
0x01Fx	0.1TOFF
0x020x	1s TOFF
0x021x	0.01s TP
0x022x	0.1s TP
0x023x	1s TP
0x024x	RS
0x025x	SR

11.8 Type of operand 1---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions

(same as XMPS-100)
Size- 1 byte

11.9 OP1---

Oprand 1

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.10 Type of operand 2---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.11 OP2---

Oprand 2

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.12 Type of operand 3---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.13 OP3---

Oprand 3

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.14 Type of operand 5---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.15 OP5---

Oprand 5

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.16 Type of operand 6---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.17 OP6---

Oprand 6

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.18 Type of operand 7---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.19 OP7---

Oprand 7

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.20 Type of operand 8---

Normal, Negation or Numeric—for logical instructions
Normal, Numeric—for other instructions
(same as XMPS-100)
Size- 1 byte

11.21 OP8---

Oprand 8

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.22 No. of Operand---

We have given max 8 address for any instruction.

User can use greater than 1 address for any instruction.

So for perticuler rung how many operands are used that count should be here.

11.23 T_C Name---

Timer Counter No.

We have limit the Max 255 all types of Timers & Max 255 all types of counters.

So according to this it will increase. And do not repeat.

11.24 Output1---

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

Size- 4 bytes

11.25 Output2---

Here actual MCU address will come….(after conversion of I1,Q0,F2 etc)

During compilation/ generate code command each address will convert into MCU address. (Check section xxx for more details)

This is right now applicable for Time 7 Counter instructions only.

Size- 4 bytes

11.26 EOF---

End of frame—"#"

After generation of Mcode for all backend rungs at last this character should add.

Size-1 byte

12.CPU address to MCU address conversion idea & base address:

Block No	***Type***	***Logical Address Range***	***Total nos PLC address***	***MCU Address starting Address***	***Next address ---***
0	Output address	Q0:000 to Q0:255	256	0X2001 C000	Plus 2
		Q0:000.00...Q0:000.15 to Q0:255.00…Q0:255.15	4096	0x2238 0000	Plus 4
1	Input adress	I1:000 to I1:255	256	0X2001 C200	Plus 2
		I1:000.00…I1:000.15 to I1:255.00…I1:255.15	4096	0X2238 4000	Plus 4
2	Flags (Memory bits)	F2.000 to F2.255	256	0x2238 8000	Plus 4
3	Status	S3:000 to S3:255	256	0x2001 C420	Plus 2
4	Integer Word	W4:000 to W4:255	256	0x2001 C620	Plus 2
5	Floating Point	P5:000 to P5:255	256	0x2001 C820	Plus 4
6	Timers	T6:000 to T6:255	256	0x2001 CC20	Plus 2
7	Counters	C7:000 to C7:255	256	0x2001 CE20	Plus 2
8	Reserved for future	X8.000 to X8.255	256	0x2001 D020	Plus 2
9	Reserved for future	Y9.000 to Y9.255	256	0x2001 D220	Plus 2
10	Auto memory flag	D10:000 to D10:2048	2048	0x223A8400	Plus 4

13. Interpreter (PLC configuration settings)

We need byte by byte data of all PLC configuration settings.

We will download the same using TFTP or TCP same as per the Application Mcode data.

Configuration interpreter will intrerpret the PLC configuration settings in below format:

Sr.no.	*Data Sequence*	*Codes*
1	SOF	#
2	COM Settings	0x31
3	Ethernet Settings	0x32
4	PLC model	0x33
5	PLC onboard IO setting & count	0x34
6	Expansion IO	0x35
7	Remote IO	0x36
8	Modbus RTU requests	0x37
9	Modbus TCP server requests	0x38
10	Modbus TCP client requests	0x39
11	Retentive address	0x3A
12	Initial value of address	0x3B
13	EOF	&

Example:

This is only example not actual address or data.

We need all data in hex format only.

Weneed only Data coloumn . (Comments are given for understanding of data.)

PLC Configuration Settings

Byte no.	Data	Comment
0	#	SOF
1	0x31	Com settings
2	0 to 4	Baudrate
3	0 to 2	datalength
4	0 to 1	stopbit
5	0 to 3	parity
6	0	send delay

7	35	minimum_interface
8	0x32	ethernet settings
9	0 /1	use dhcp /static
10	192	IP address 1st byte
11	168	IP address 2nd byte
12	15	IP address 3rd byte
13	15	IP address 4th byte
14	255	Subnet 1st byte
15	255	Subnet 2nd byte
16	255	Subnet 3rd byte
17	0	Subnet 4th byte
18	192	Gateway 1st byte
19	168	Gateway 2nd byte
20	15	Gateway 3rd byte
21	1	Gateway 4th byte
22	502	port no
23	0	
24	0x33	PLC model
25	1 to 2	XM-14DT/XM-17-ADT
26	0x34	PLC on board IO settings
27	0 to 4	AI1 mode
28	0 to 4	AI2 mode
29	0 to 4	AO1 mode
30	10	Total DI count
31	20	Total DO count
32	2	Total AI count
33	2	Total AO count
34	0x35	Expansion IO
35	1 to 5	Total local expansion modules connected
36	xxxx	Model code eg- XM-DI-16 code is 0x12
37	0x22	Logical address assigned CPU address eg.- I1:001.00
38	0x22	
39	0x65	
40	0x87	
41	0x22	Logical address assigned CPU address eg.- I1:001.01
42	0x22	
43	0x65	
44	0x87	
45	0x22	Logical address assigned CPU address eg.- I1:001.02
46	0x22	
47	0x65	

48	0x87	
49	0x22	Logical address assigned CPU address eg.- I1:001.03
50	0x22	
51	0x65	
52	0x87	
53	0x22	Logical address assigned CPU address eg.- I1:001.04
54	0x22	
55	0x65	
56	0x87	
57	0x22	Logical address assigned CPU address eg.- I1:001.05
58	0x22	
59	0x65	
60	0x87	
61	0x22	Logical address assigned CPU address eg.- I1:001.06
62	0x22	
63	0x65	
64	0x87	
65	0x22	Logical address assigned CPU address eg.- I1:001.07
66	0x22	
67	0x65	
68	0x87	
69	0x22	Logical address assigned CPU address eg.- I1:001.08
70	0x22	
71	0x65	
72	0x87	
73	0x22	Logical address assigned CPU address eg.- I1:001.09
74	0x22	
75	0x65	
76	0x87	
77	0x22	Logical address assigned CPU address eg.- I1:001.10
78	0x22	
79	0x65	
80	0x87	
81	0x22	Logical address assigned CPU address eg.- I1:001.11
82	0x22	
83	0x65	
84	0x87	
85	0x22	Logical address assigned CPU address eg.- I1:001.12
86	0x22	
87	0x65	
88	0x87	

89	0x22	Logical address assigned CPU address eg.- I1:001.13
90	0x22	
91	0x65	
92	0x87	
93	0x22	Logical address assigned CPU address eg.- I1:001.14
94	0x22	
95	0x65	
96	0x87	
97	0x22	Logical address assigned CPU address eg.- I1:001.15
98	0x22	
99	0x65	
100	0x87	
101	0x35	Expansion IO (3 for
102	xxxx	Model code eg- XM-DI-16 code is 0x12
103	0x22	Logical address assigned CPU address eg.- I1:002.00
104	0x22	
105	0x65	
106	0x87	
107	0x22	Logical address assigned CPU address eg.- I1:002.01
108	0x22	
109	0x65	
110	0x87	
111	0x22	Logical address assigned CPU address eg.- I1:002.02
112	0x22	
113	0x65	
114	0x87	
115	0x22	Logical address assigned CPU address eg.- I1:002.03
116	0x22	
117	0x65	
118	0x87	
119	0x22	Logical address assigned CPU address eg.- I1:002.04
120	0x22	
121	0x65	
122	0x87	
123	0x22	Logical address assigned CPU address eg.- I1:002.05
124	0x22	
125	0x65	
126	0x87	
127	0x22	Logical address assigned CPU address eg.- I1:002.06
128	0x22	
129	0x65	

130	0x87	
131	0x22	Logical address assigned CPU address eg.- I1:002.07
132	0x22	
133	0x65	
134	0x87	
135	0x22	Logical address assigned CPU address eg.- I1:002.08
136	0x22	
137	0x65	
138	0x87	
139	0x22	Logical address assigned CPU address eg.- I1:002.09
140	0x22	
141	0x65	
142	0x87	
143	0x22	Logical address assigned CPU address eg.- I1:002.10
144	0x22	
145	0x65	
146	0x87	
147	0x22	Logical address assigned CPU address eg.- I1:002.11
148	0x22	
149	0x65	
150	0x87	
151	0x22	Logical address assigned CPU address eg.- I1:002.12
152	0x22	
153	0x65	
154	0x87	
155	0x22	Logical address assigned CPU address eg.- I1:002.13
156	0x22	
157	0x65	
158	0x87	
159	0x22	Logical address assigned CPU address eg.- I1:002.14
160	0x22	
161	0x65	
162	0x87	
163	0x22	Logical address assigned CPU address eg.- I1:002.15
164	0x22	
165	0x65	
166	0x87	
167	0x35	Expansion IO (3 for
168	xxxx	Model code eg- XM-DO-16T code is 0x13
169	0x22	Logical address assigned CPU address eg.- Q0:00Q.00
170	0x22	

171	0x65	
172	0x87	
173	0x22	Logical address assigned CPU address eg.- Q0:00Q.01
174	0x22	
175	0x65	
176	0x87	
177	0x22	Logical address assigned CPU address eg.- Q0:00Q.02
178	0x22	
179	0x65	
180	0x87	
181	0x22	Logical address assigned CPU address eg.- Q0:00Q.03
182	0x22	
183	0x65	
184	0x87	
185	0x22	Logical address assigned CPU address eg.- Q0:00Q.04
186	0x22	
187	0x65	
188	0x87	
189	0x22	Logical address assigned CPU address eg.- Q0:00Q.05
190	0x22	
191	0x65	
192	0x87	
193	0x22	Logical address assigned CPU address eg.- Q0:00Q.06
194	0x22	
195	0x65	
196	0x87	
197	0x22	Logical address assigned CPU address eg.- Q0:00Q.07
198	0x22	
199	0x65	
200	0x87	
201	0x22	Logical address assigned CPU address eg.- Q0:00Q.08
202	0x22	
203	0x65	
204	0x87	
205	0x22	Logical address assigned CPU address eg.- Q0:00Q.09
206	0x22	
207	0x65	
208	0x87	
209	0x22	Logical address assigned CPU address eg.- Q0:00Q.10
210	0x22	
211	0x65	

212	0x87	
213	0x22	Logical address assigned CPU address eg.- Q0:00Q.11
214	0x22	
215	0x65	
216	0x87	
217	0x22	Logical address assigned CPU address eg.- Q0:00Q.12
218	0x22	
219	0x65	
220	0x87	
221	0x22	Logical address assigned CPU address eg.- Q0:00Q.13
222	0x22	
223	0x65	
224	0x87	
225	0x22	Logical address assigned CPU address eg.- Q0:00Q.14
226	0x22	
227	0x65	
228	0x87	
229	0x22	Logical address assigned CPU address eg.- Q0:00Q.15
230	0x22	
231	0x65	
232	0x87	
233	0x35	Expansion IO
234	xxxx	Model code eg- XM-AI2-AO2 code is 0x14
235	0 to 4	Mode of AI1
236	0 to 4	Mode of AI2
237	0 to 4	Mode of AO1
238	0 to 4	Mode of AO2
239	0x22	Logical address assigned CPU address eg.- AI1-I0:003
240	0x22	
241	0x65	
242	0x87	
243	0x22	Logical address assigned CPU address eg.- AI2-I0:004
244	0x22	
245	0x65	
246	0x87	
247	0x22	
248	0x22	Logical address assigned CPU address eg.- AO1-Q0:003
249	0x22	
250	0x65	
251	0x87	
252	0x22	

253	0x22	Logical address assigned CPU address eg.- AO2-Q0:004
254	0x65	
255	0x87	
256	0x36	Remote IO
257	1 to 5	Total remote IO modules connected
258	xxxx	Model code eg- MOD-DO-16R code is 0x21
259	0x22	Logical address assigned CPU address eg.- Q0:004.00
260	0x22	
261	0x65	
262	0x87	
263	0x22	Logical address assigned CPU address eg.- Q0:004.01
264	0x22	
265	0x65	
266	0x87	
267	0x22	Logical address assigned CPU address eg.- Q0:004.02
268	0x22	
269	0x65	
270	0x87	
271	0x22	Logical address assigned CPU address eg.- Q0:004.03
272	0x22	
273	0x65	
274	0x87	
275	0x22	Logical address assigned CPU address eg.- Q0:004.04
276	0x22	
277	0x65	
278	0x87	
279	0x22	Logical address assigned CPU address eg.- Q0:004.05
280	0x22	
281	0x65	
282	0x87	
283	0x22	Logical address assigned CPU address eg.- Q0:004.06
284	0x22	
285	0x65	
286	0x87	
287	0x22	Logical address assigned CPU address eg.- Q0:004.07
288	0x22	
289	0x65	
290	0x87	
291	0x22	Logical address assigned CPU address eg.- Q0:004.08
292	0x22	
293	0x65	

294	0x87	
295	0x22	Logical address assigned CPU address eg.- Q0:004.09
296	0x22	
297	0x65	
298	0x87	
299	0x22	Logical address assigned CPU address eg.- Q0:004.10
300	0x22	
301	0x65	
302	0x87	
303	0x22	Logical address assigned CPU address eg.- Q0:004.11
304	0x22	
305	0x65	
306	0x87	
307	0x22	Logical address assigned CPU address eg.- Q0:004.12
308	0x22	
309	0x65	
310	0x87	
311	0x22	Logical address assigned CPU address eg.- Q0:004.13
312	0x22	
313	0x65	
314	0x87	
315	0x22	Logical address assigned CPU address eg.- Q0:004.14
316	0x22	
317	0x65	
318	0x87	
319	0x22	Logical address assigned CPU address eg.- Q0:004.15
320	0x22	
321	0x65	
322	0x87	
323	0x36	Remote IO
324	xxxx	Model code eg- MOD-DI-8 code is 0x22
325	0x22	Logical address assigned CPU address eg.- I1:005.00
326	0x22	
327	0x65	
328	0x87	
329	0x22	Logical address assigned CPU address eg.- I1:005.01
330	0x22	
331	0x65	
332	0x87	
333	0x22	Logical address assigned CPU address eg.- I1:005.02
334	0x22	

335	0x65	
336	0x87	
337	0x22	Logical address assigned CPU address eg.- I1:005.03
338	0x22	
339	0x65	
340	0x87	
341	0x22	Logical address assigned CPU address eg.- I1:005.04
342	0x22	
343	0x65	
344	0x87	
345	0x22	Logical address assigned CPU address eg.- I1:005.05
346	0x22	
347	0x65	
348	0x87	
349	0x22	Logical address assigned CPU address eg.- I1:005.06
350	0x22	
351	0x65	
352	0x87	
353	0x22	Logical address assigned CPU address eg.- I1:005.07
354	0x22	
355	0x65	
356	0x87	
357	0x22	Logical address assigned CPU address eg.- I1:005.08
358	0x22	
359	0x65	
360	0x87	
361	0x22	Logical address assigned CPU address eg.- I1:005.09
362	0x22	
363	0x65	
364	0x87	
365	0x22	Logical address assigned CPU address eg.- I1:005.10
366	0x22	
367	0x65	
368	0x87	
369	0x22	Logical address assigned CPU address eg.- I1:005.11
370	0x22	
371	0x65	
372	0x87	
373	0x22	Logical address assigned CPU address eg.- I1:005.12
374	0x22	
375	0x65	

376	0x87	
377	0x22	Logical address assigned CPU address eg.- I1:005.13
378	0x22	
379	0x65	
380	0x87	
381	0x22	Logical address assigned CPU address eg.- I1:005.14
382	0x22	
383	0x65	
384	0x87	
385	0x22	Logical address assigned CPU address eg.- I1:005.15
386	0x22	
387	0x65	
388	0x87	
389	0x36	Remote IO
390	xxxx	Model code eg- MOD-AI2-AO2 code is 0x24
391	0 to 4	Mode of AI1
392	0 to 4	Mode of AI2
393	0 to 4	Mode of AO1
394	0 to 4	Mode of AO2
395	0x22	Logical address assigned CPU address eg.- AI1-I0:006
396	0x22	
397	0x65	
398	0x87	
399	0x22	Logical address assigned CPU address eg.- AI1-I0:007
400	0x22	
401	0x65	
402	0x87	
403	0x22	Logical address assigned CPU address eg.- AO1-Q0:006
404	0x22	
405	0x65	
406	0x87	
407	0x22	Logical address assigned CPU address eg.- AO1-Q0:007
408	0x22	
409	0x65	
410	0x87	
411	0x37	Modbus RTU requests
412	3	Total no of requests
413	1	Slave id
414	0b	com.timeout
415	b8	
416	2	no. of retries

417	0	polling
418	10	
419	0x22	variable CPU address
420	0x23	
421	0x24	
422	0x25	
423	0x00	data start address
424	0x01	
425	0x00	data size
426	0x01	
427	0x06	function code
428	2	Slave id
429	0b	com.timeout
430	b9	
431	12	no. of retries
432	16	polling
433	20	
434	0x22	variable CPU address
435	0x23	
436	0x24	
437	0x25	
438	0x00	data start address
439	0x01	
440	0x00	data size
441	0x01	
442	0x06	function code
443	3	Slave id
444	0b	com.timeout
445	b9	
446	12	no. of retries
447	16	polling
448	20	
449	0x22	variable CPU address
450	0x23	
451	0x24	
452	0x25	
453	0x00	data start address
454	0x01	
455	0x00	data size
456	0x01	
457	0x06	function code

458	4	Slave id
459	0b	com.timeout
460	b10	
461	24	no. of retries
462	28	polling
463	32	
464	0x22	variable CPU address
465	0x23	
466	0x24	
467	0x25	
468	0x00	data start address
469	0x01	
470	0x00	data size
471	0x01	
472	0x06	function code
473	0x38	Modbus TCP server requests
474	1	Total no of requests
475	0x00	Port
476	0x02	
477	0x22	variable CPU address
478	0x23	
479	0x24	
480	0x25	
481	0x00	data start address
482	0x01	
483	0x00	length
484	0x01	
485	0x06	function code
486	0x39	Modbus TCP client requests
487	1	Total no of requests
488	192	Slave address
489	168	
490	15	
491	30	
492	0x00	Port
493	0x02	
494	0	polling
495	10	
496	0x01	device id
497	0x22	variable CPU address
498	0x23	

499	0x24	
500	0x25	
501	0x00	data start address
502	0x01	
503	0x00	length
504	0x01	
505	0x06	function code
506	0x3A	Retentive address
507	1	No of retentive address
508	0x22	Main address (CPU convertible address value)
509	0x23	
510	0x24	
511	0x25	
512	0x40	Retentive address (CPU convertible address value)
513	0x41	
514	0x42	
515	0x43	
516	0x3B	Initial value of address
517	1	Total No of address
518	0x22	Main address (CPU convertible address value)
519	0x23	
520	0x24	
521	0x25	
522	0x67	Data
523	0x00	
524	&	EOF

Data should be hex format
This is example data for understanding only.