

epac

Operation & Instruction Manual For Non-intrusive feature



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INTRODUCTION:

Auma India has developed a new range of electric actuators for Modbus application suitable for both weatherproof and explosion proof applications. These electric actuators have the following features:

1. Status Display: LCD screen for better visibility of status, operation and parameter setting details.
2. 2-wire communication with Channel redundancy: Two wire field bus (Modbus) communication is available with dual separate communication path, viz. Channel A & Channel B
3. No external tool required for configuration/setting: Options can be selected by using the selector switches, push buttons based on the instructions displayed on the LCD screen, without the need of hand held device or PC/laptop.

FRONT PANEL DETAILS:

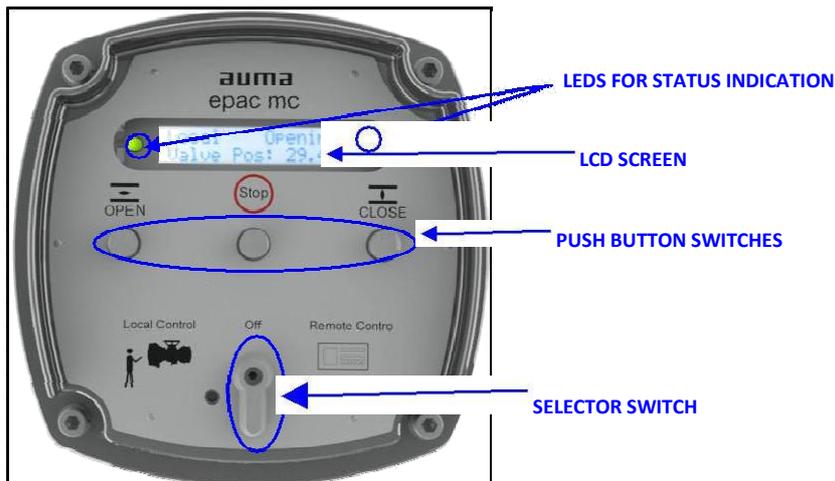
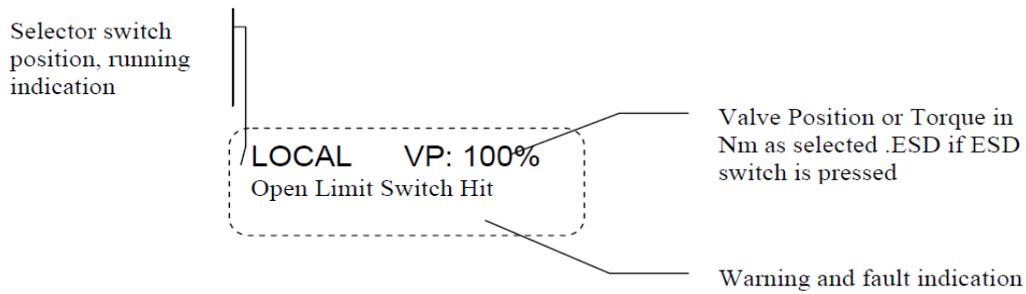


Fig. A: 3.XMP/MODBUS CONTROLS: FRONT PANEL

Selector Switch: There are 3 modes available; LOCAL, OFF & REMOTE. The mode selection can be done by using the selector switch.

Push Button Switches: Actuators are made to run in OPEN or CLOSE direction by pressing the respective push buttons and can be stopped in mid travel by pressing STOP push button. These three push buttons are also used for programming and calibrating the actuator.

LCD Screen: The LCD view is split into two lines. The first line shows the Status details; left side-selector switch position and right hand side-actuator's status. The second line shows the valve position or the faults/warnings if any (Fault/warnings toggle in the sequence of occurrence.) The details are as shown in the Fig. B



LEDs: Information regarding the selector switch positions and running indication of the actuator (status) are indicated by the LEDs present on the left and right side (respectively) of the LCD screen which is as shown in Fig. C.



Fig. C: LEDES ON THE FRONT PANEL

The color change on the LEDES indicates the information as tabulated below:

LED (right side): Color indication for Actuator Status

COLOR	INDICATION	MODE
GREEN		If LED is blinking then actuator is running in OPEN direction If blinking is stopped then actuator is fully OPENED
ORANGE		If LED is blinking then actuator is running in CLOSE direction If blinking is stopped then actuator is fully CLOSED
RED		If LED is blinking -- Fault condition If blinking is stopped-- Actuator stopped in Mid Travel

LED (left side): Color indication for Selector Switch Position

COLOR	INDICATION	MODE
GREEN		Local mode
ORANGE		Remote mode
RED		OFF mode

PROGRAM MODE IN 3.XMP MODULE: To enter into Program mode follow the below steps,
 Step1: Keep the selector switch in OFF position



Step2: Press Open + Close keys (together) approximately 6 sec



Step3: Press the STOP key on the display of "Program Mode" as shown in the below Figure.



In this mode the two options available for the users are, EDIT & VIEW which is as shown below;

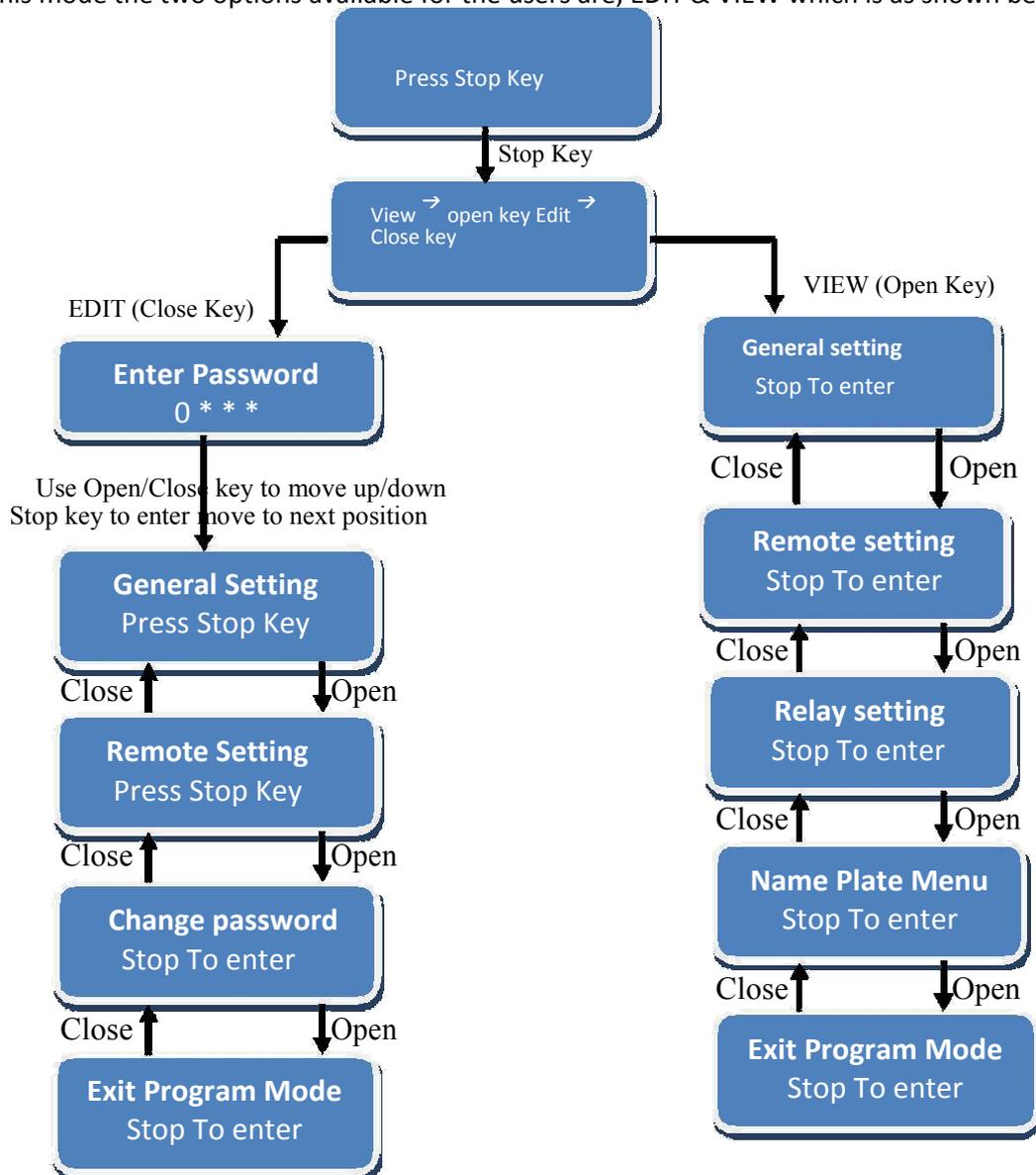


Fig. F: Program Mode Flow chart for 3.XMP (Version 2.0)

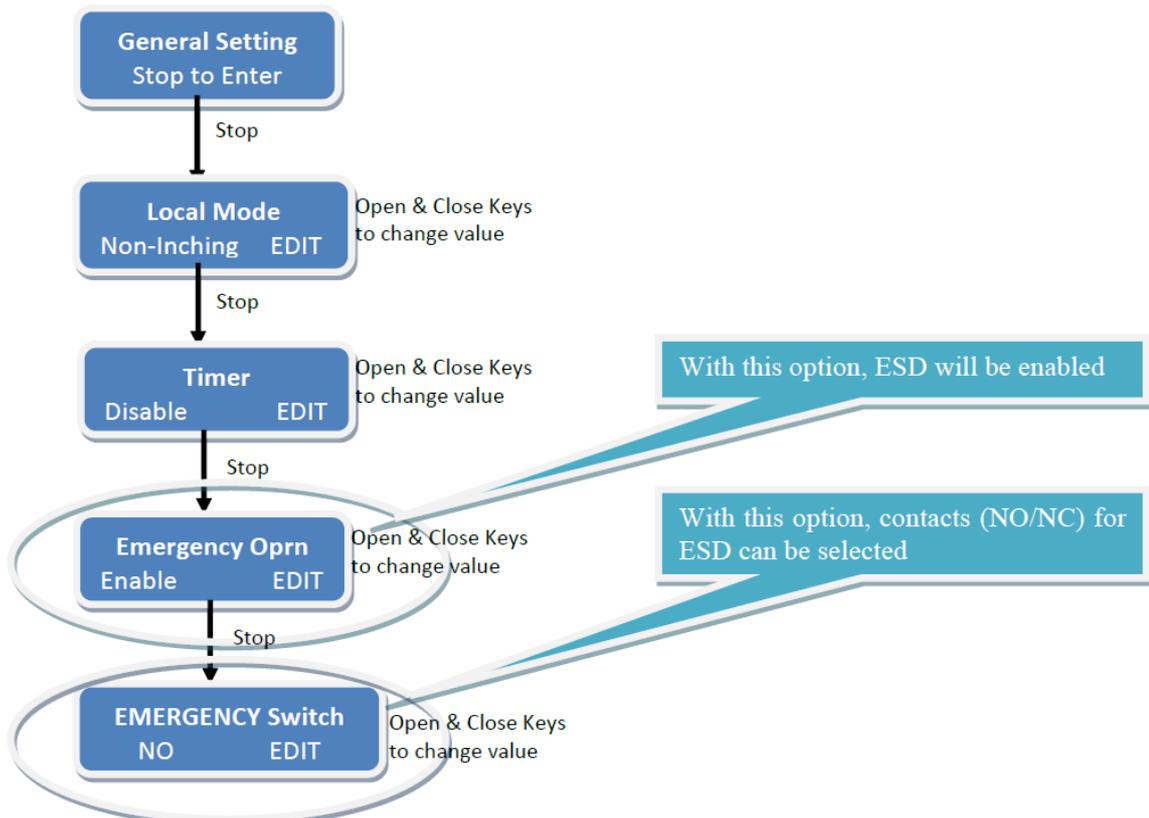
A. **EDIT option of the Program mode**: By entering the appropriate password (default password is 0000 for minor changes & 5555 for major changes), user can enter into the EDIT option. (The features relevant to Modbus communication are explained here);

1. **General Settings: ESD option**

ESD options can be excited in following ways;

1. **Hardwired ESD**: Use the customer end terminals ESD+ & ESD- for the external push button connection (planned usually outside the dyke area), for exciting the ESD over hard wired. This command has the highest priority compared to all other command including Modbus ESD
2. **Soft ESD**: To use the ESD command excitation over Modbus, ensure that the option ESD_MB is enabled. Soft ESD command can be excited/de-excited in 2 ways;
 - a. ESD excitation on individual actuator
 - b. Broadcast ESD
3. **Required option on ESD**: There are 3 modes in which the actuator can be made to operate on excitation of ESD command (either hardwired or soft ESD). They are;
 - a. Open
 - b. Close (*it is the default option*)
 - c. Stay as it is

For enabling “soft/Modbus ESD”, select the ESD option in general setting, which is as shown below :



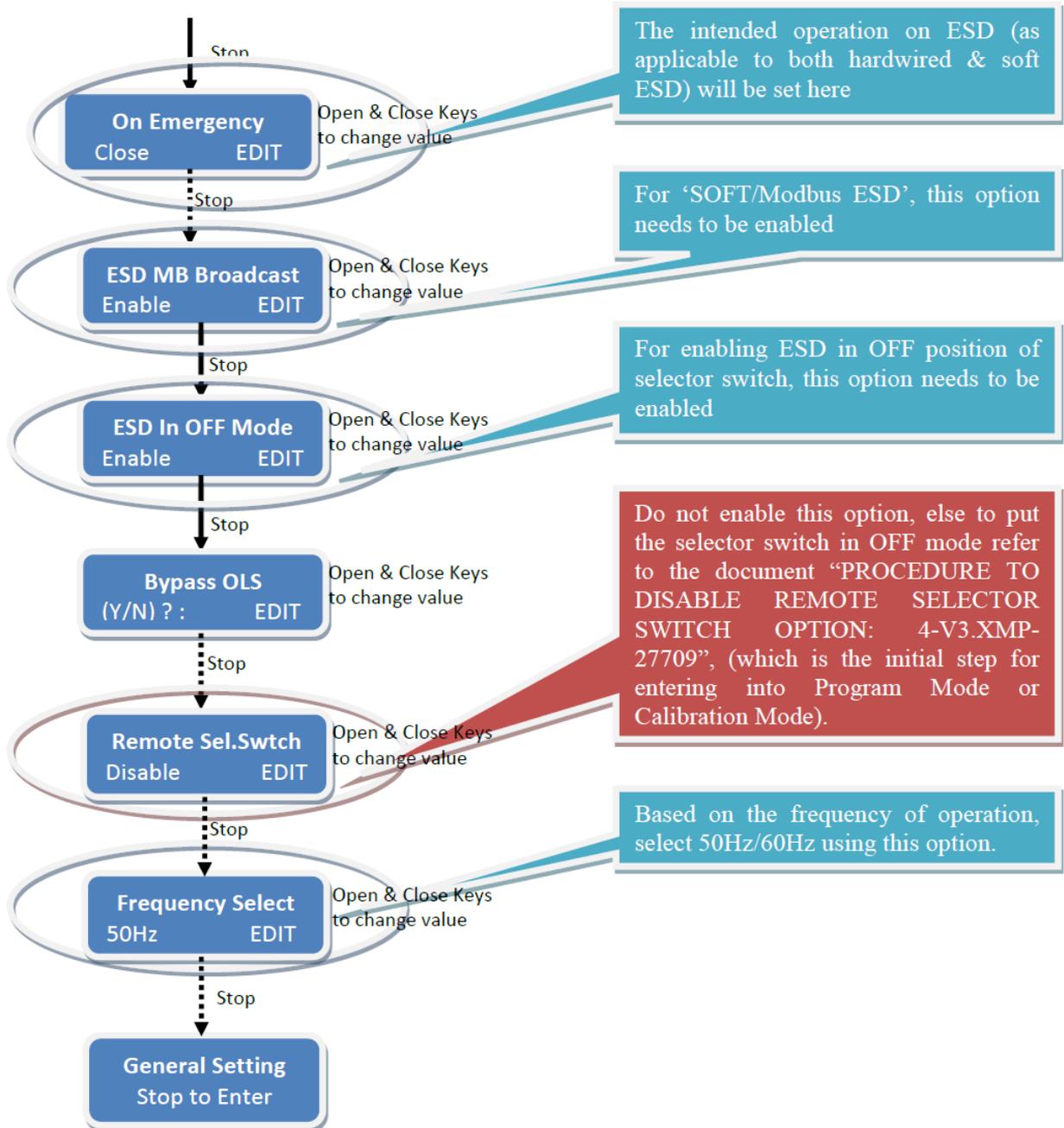


Fig. H: Program Mode (EDIT) -General Setting Flow chart for 3.XMP (Version 2.0)

2. **Remote Settings:** This menu is used for setting of the Modbus parameters such as device ID, baud rate, parity etc.

Please note the following, before the setting of Modbus parameters;

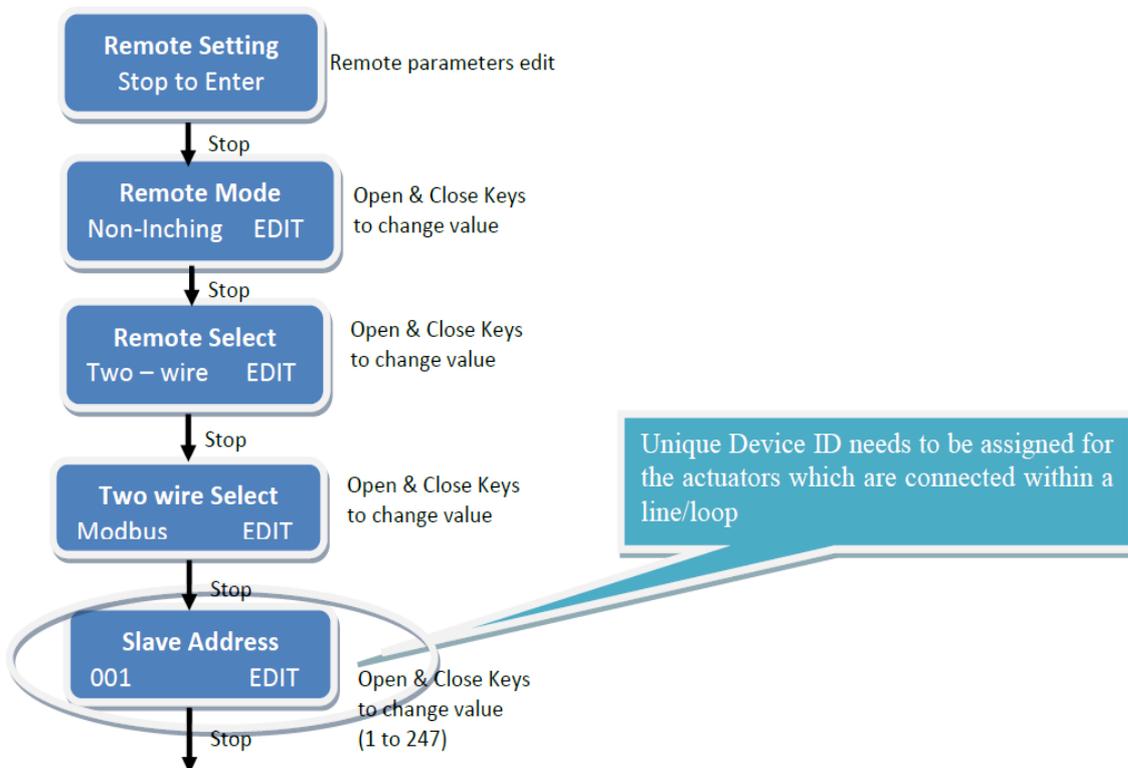
1. Unique "Device ID" should be set for individual actuators/participants which will be communicating with the DCS/AIMS on a single loop/line
2. Baud Rate (BPS), Parity of the individual actuators communicating over the same loop/line should be same and should match with the settings of the supervisory device (which can be DCS/AIMS)
3. Repeater functionality will be set to yes "Y", only for loop topology.

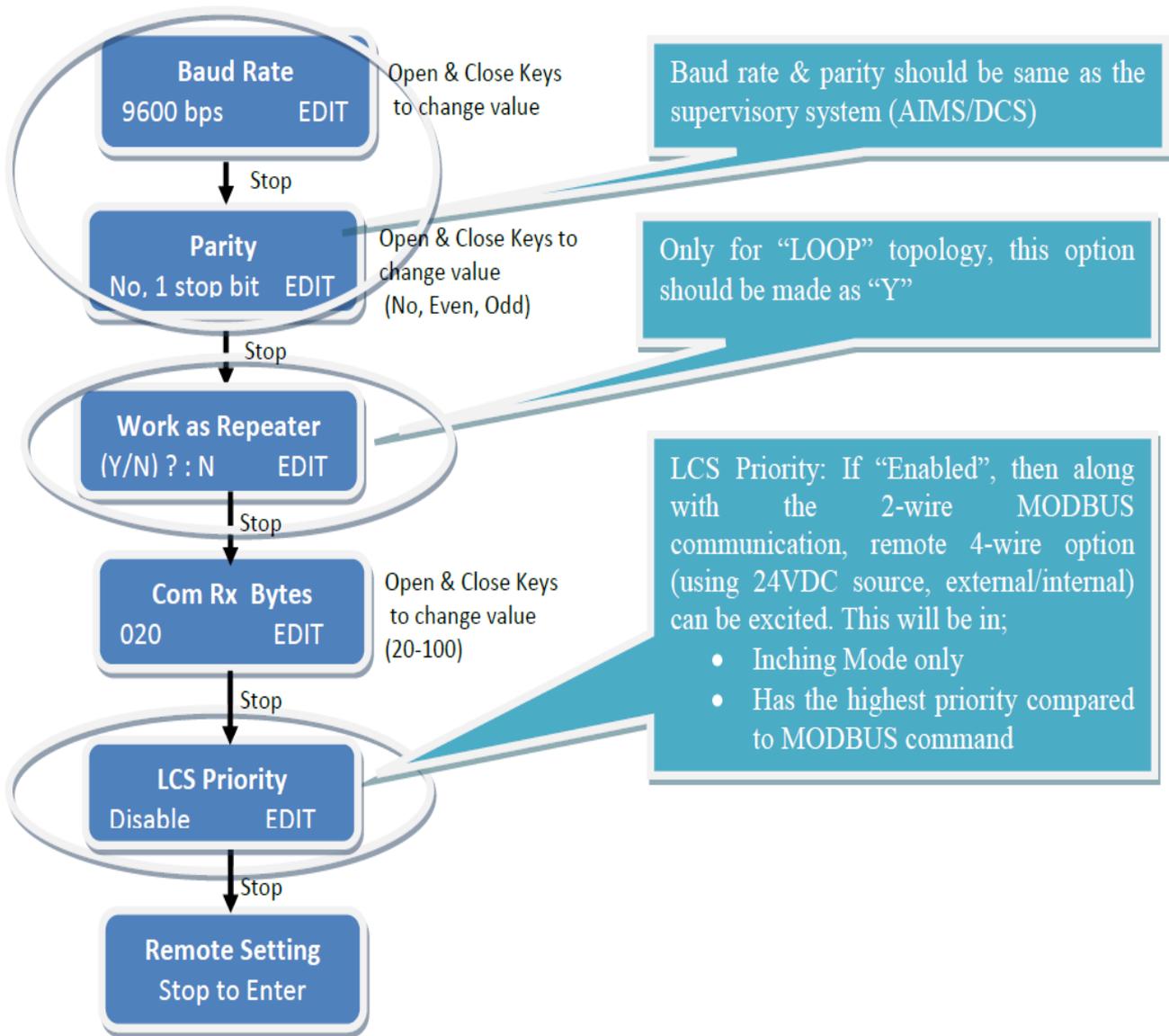
Note: Modbus settings of the actuators can be viewed on LCD, by keeping the selector switch in "REMOTE" & then pressing the "CLOSE" push button which is as shown below;



If the above displayed settings are not matching with the intended options for Modbus communication, then for changing the Modbus parameters, use the below flowchart.

The sub options available in this category are





**Fig. I: Program Mode (EDIT)-Remote Setting:
2 wire modbus for 3.XMP Version 2.0**

Note: LCS priority- LCS stands for Local Control Station.

To use the 4 wire remote option for Open, Stop & Close along with the regular Modbus mode, this option needs to be enabled.

By using the 24VDC (+ & -) with the customer end terminals RMO, RMS, RMC & RMN (of the individual actuators), these commands can be excited by using the external push button station assembly.

LCS will operate only in inching mode

LCS will have higher priority than Modbus commands

Option 2 – calibration mode

To enter into the Calibration Mode follow the below steps,

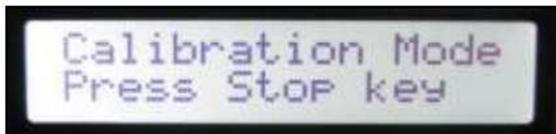
Step1: Keep the selector switch in OFF position



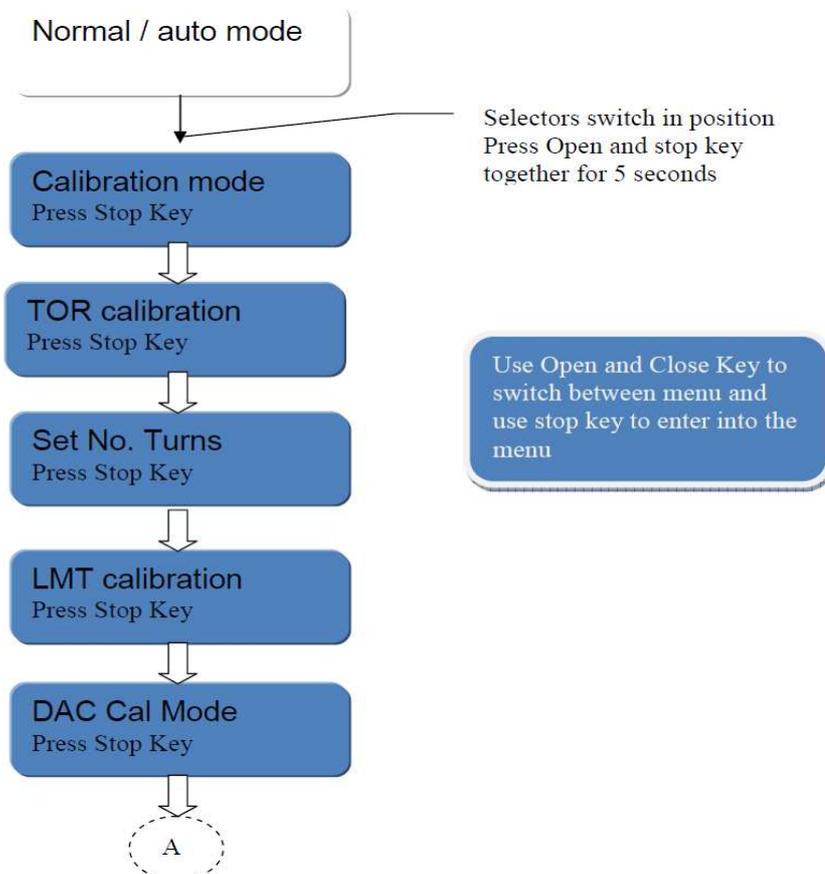
Step2: Press Open + Stop keys (together) approximately 6 sec



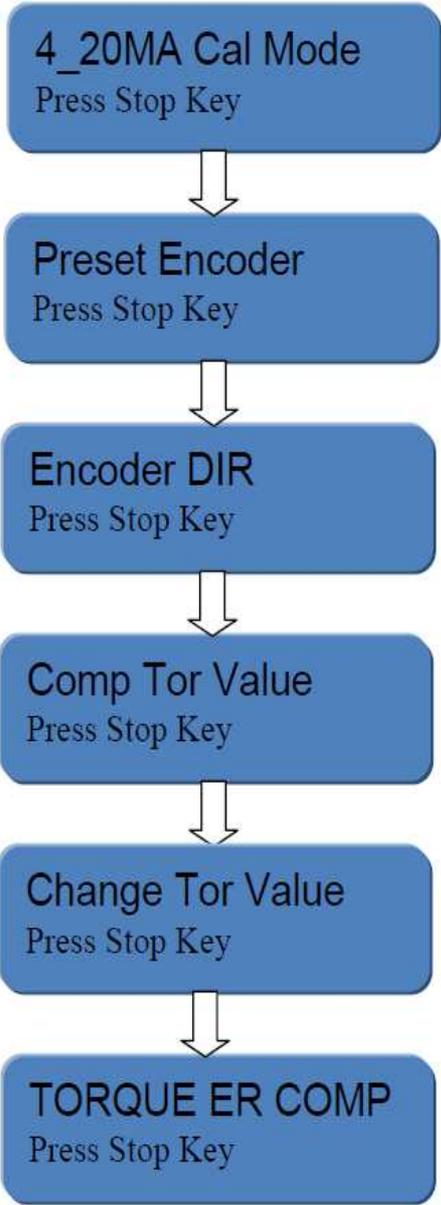
Step3: Press the STOP key on the display of "Calibration Mode" as shown in the below Figure.



Following flowchart can be followed for the calibration:



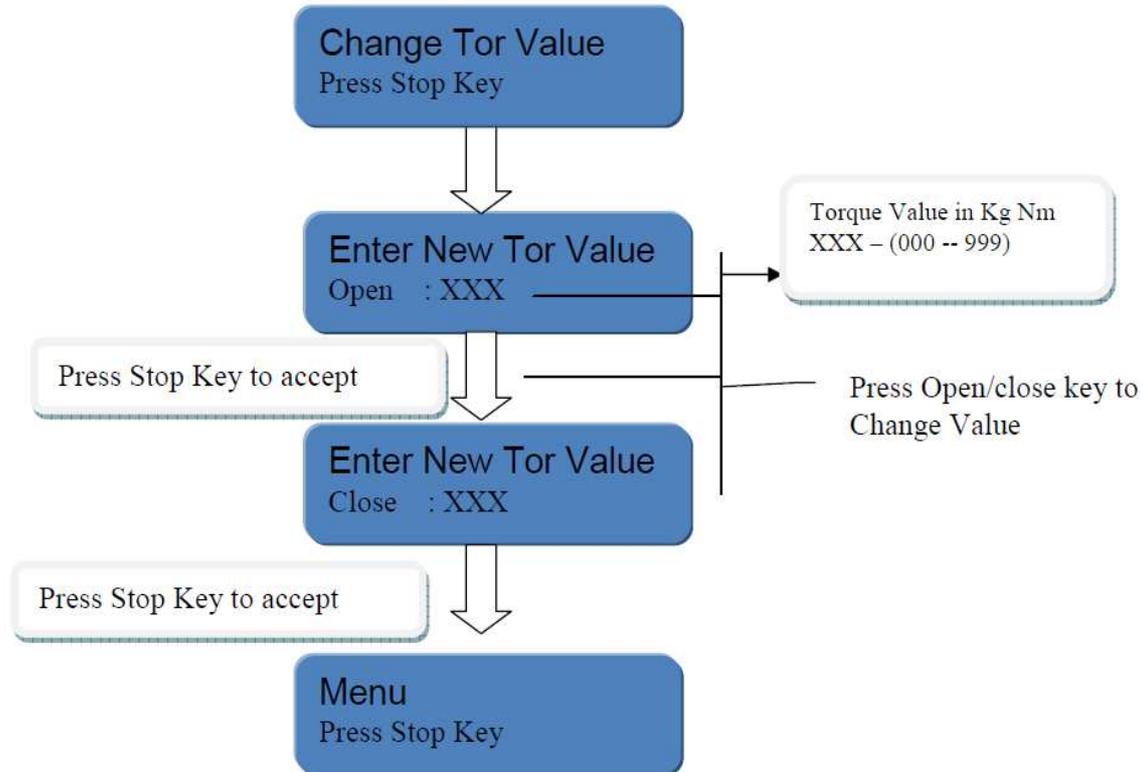
A



Use Open and Close Key to switch between menu and use stop key to enter into the menu

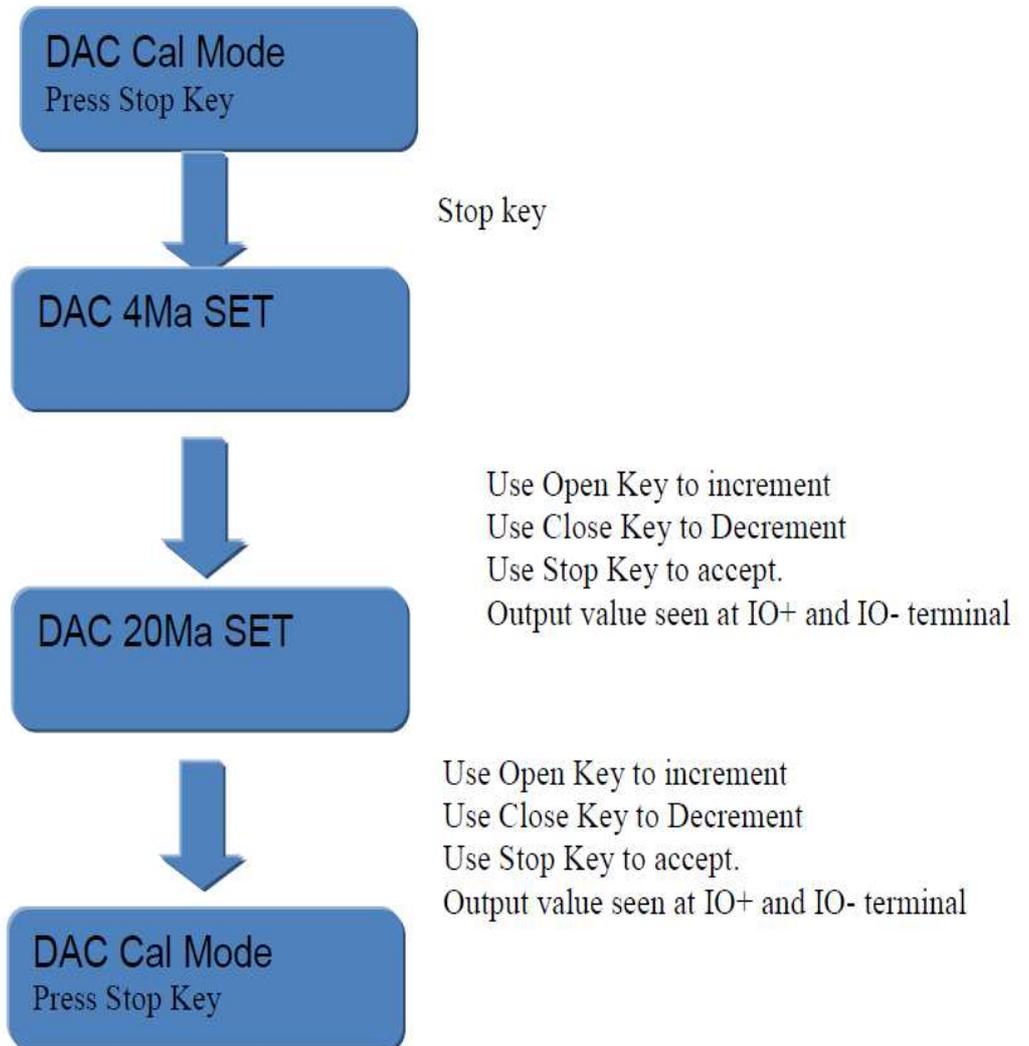
1. Torque setting :

Menu to change the Torque setting:



2. DAC output calibration :

DAC OUTPUT CALIBRATION:



3. 4 – 20 mA calibration:

4-20 Ma Input Calibration:

4-20Ma Cal Mode
Press Stop Key



Stop key

4-20Ma 4Ma SET
04.0



Apply the 4.0 Ma at II- and II+ terminal see the display is showing same if okay press Stop key to accept

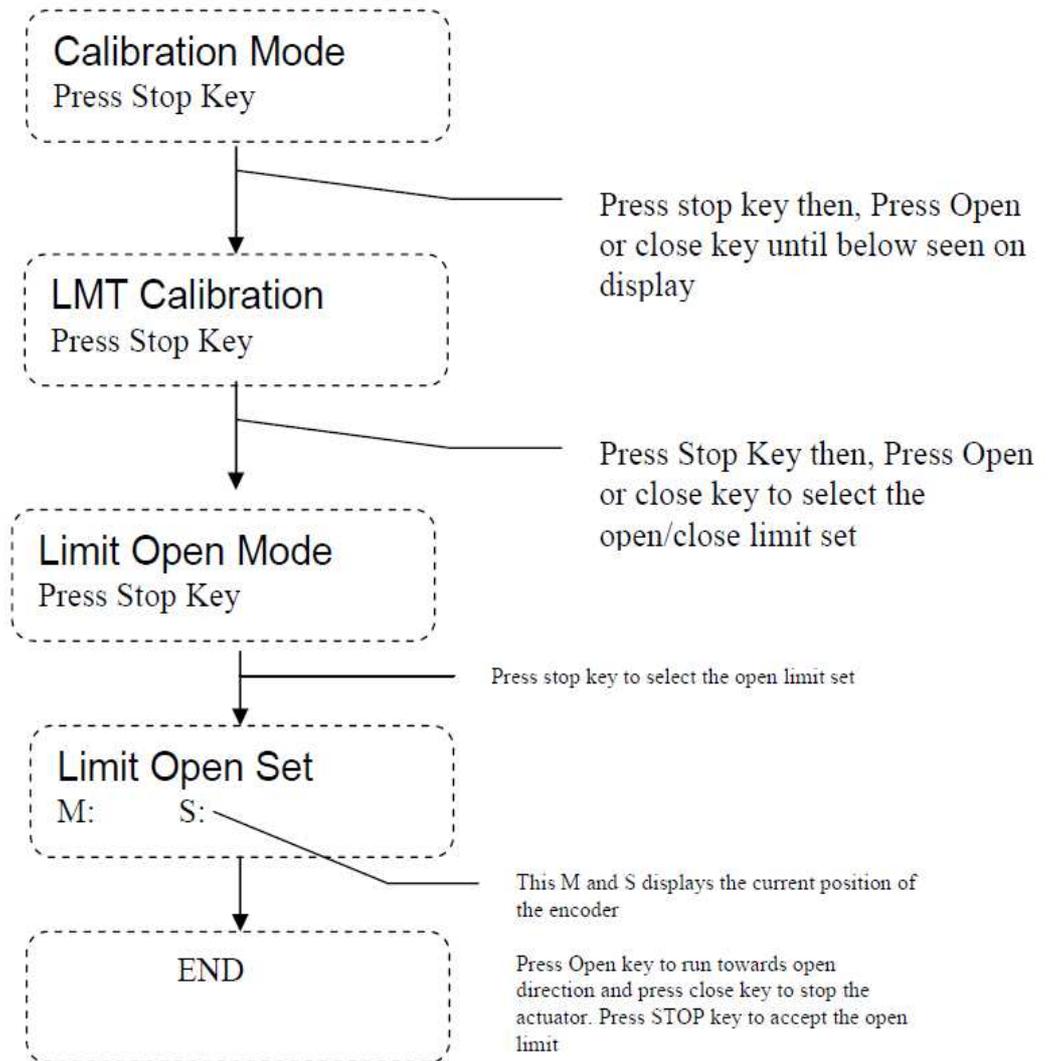
DAC 20Ma SET
20.0



Apply the 20.0 Ma at II- and II+ terminal see the display is showing same if okay press Stop key to accept

4-20Ma Cal Mode
Press Stop Key

4. Limit setting :



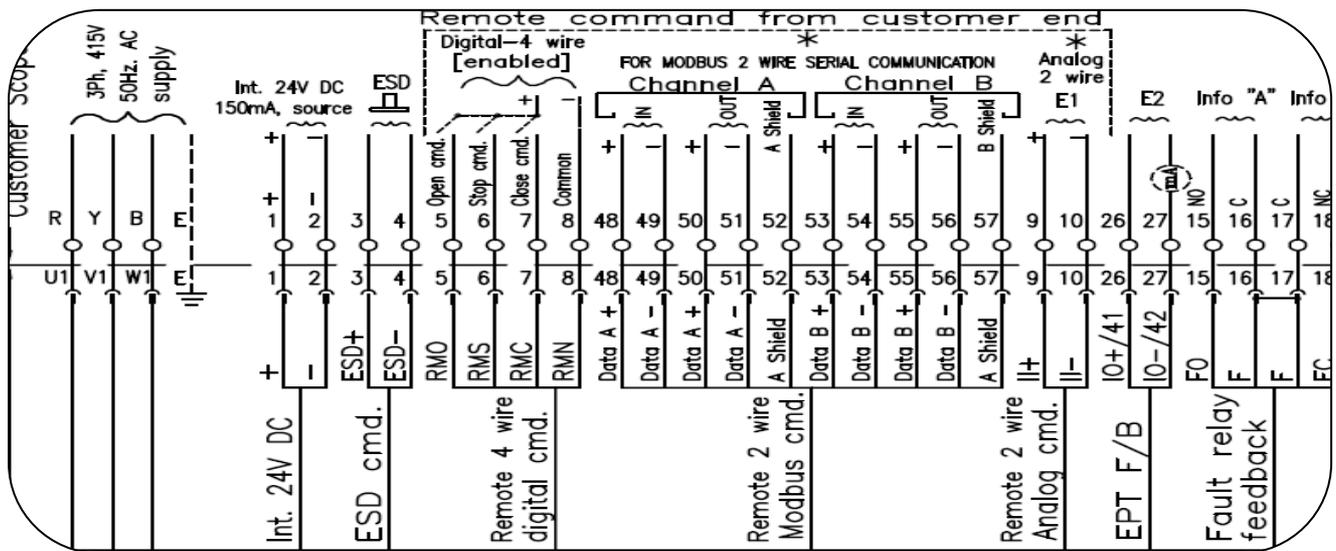
Repeat the process for Close limit Set here select the Limit Close Mode then Limit Close set , In the Limit Close Set mode Press Close key to run actuator to close direction press open key to stop the actuator , press stop key to accept the position.
Note: Please check the M and S values in limit open set mode should be greater than M: 0000 and S: 0000. And values in limit close set mode should be less than the M: 4096 and S: 4096.

TOPOLOGY CONNECTION:

The actuators can be connected to the DCS/AIMS on 2-wire (data line + & -) field bus mode, in the following ways;

- Loop topology
- Line topology or
- Redundant Line topology

Let us consider the customer end connection of the wiring diagram, to understand the fieldbus interconnection details;



Please note the below (w.r.t. the above WD) points for topology interconnection.

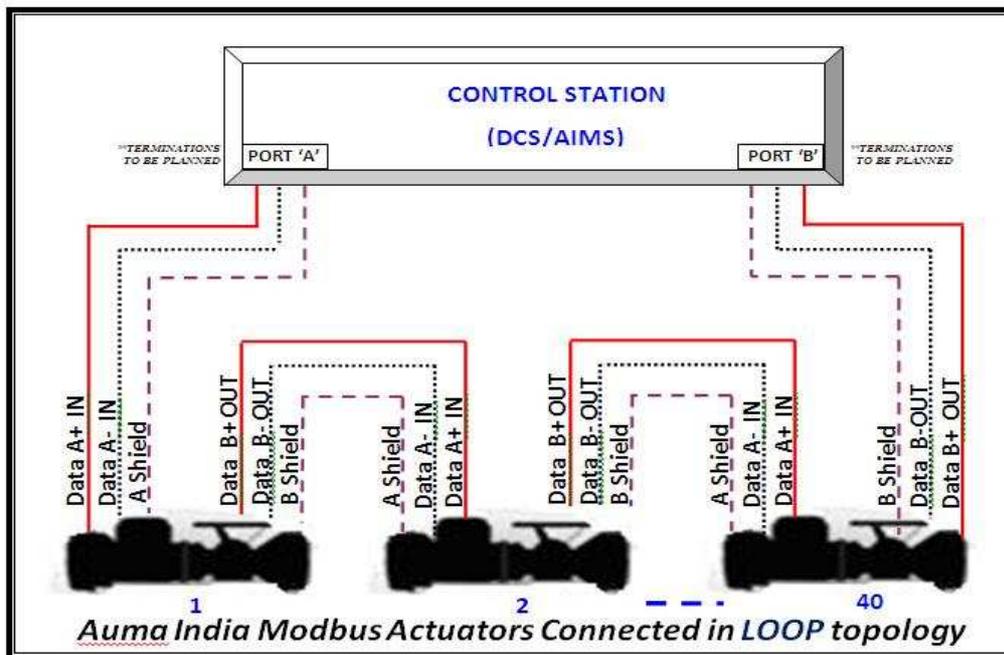
1. Data lines of channel A are A+ & A- which are made available at customer end terminals 1, 3 and 2, 4 respectively.
2. The signal ground/reference line for channel A communication is identified as “A Shield”, which should run along the channel (as per Modbus standard) and this is made available at customer end terminal 5.
3. Data lines of channel B are B+ & B- which are made available at customer end terminals 10, 12 and 11, 13 respectively.
4. The signal ground/reference line for channel B communication is identified as “B Shield”, which should run along the channel (as per Modbus standard) and this is made available at customer end terminal 14.
5. Terminations can be activated using the DIP switch available on the Interface Card

NOTE:

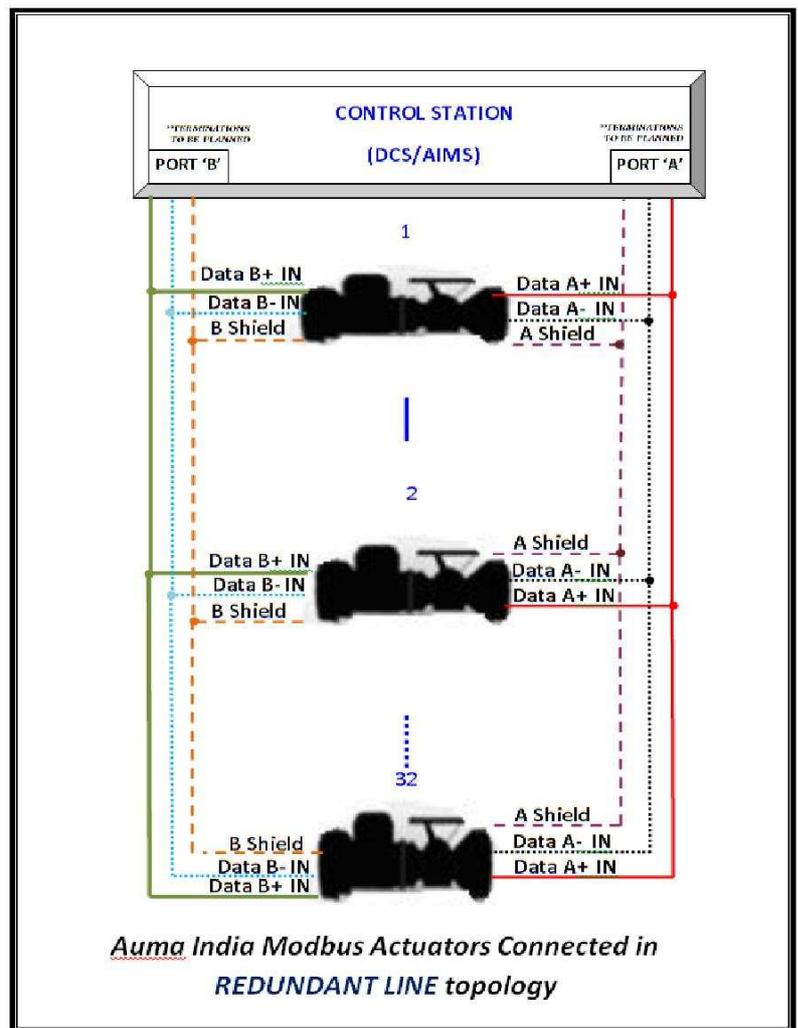
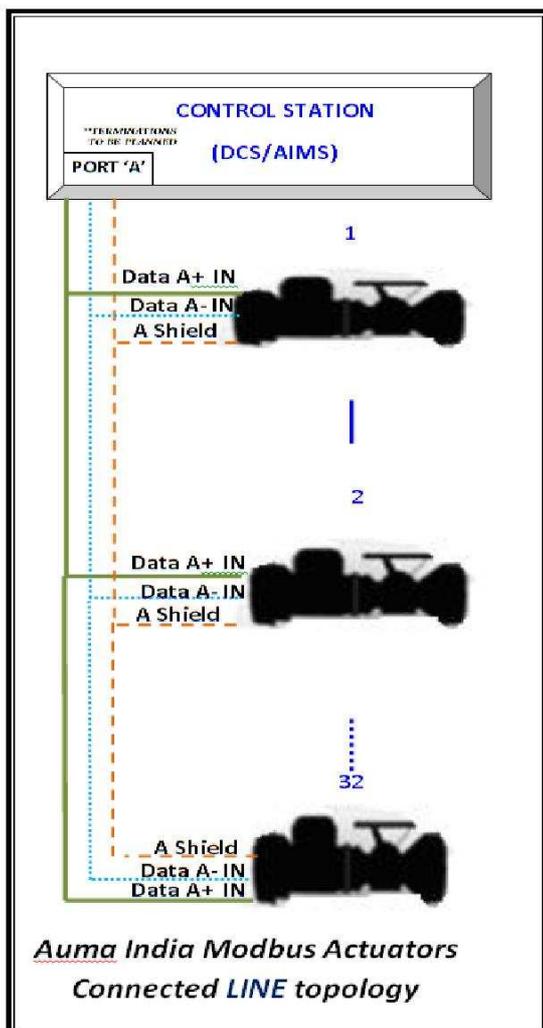
*Use the repeaters if the distance between the active adjacent participants exceeds 1.2km
In case of line/redundant line topology, use repeaters after 32 participants, with proper terminations even at repeaters.*

Termination resistors are to be planned at each port of the DCS (AIMS has termination built within)

Pictorial representation of topology (actuator interconnection) details:



Note: For Loop configuration, Terminations should be made ON for each channel.



REGISTER DETAILS FOR MODBUS COMMUNICATION:

The important register & function code details needed for command excitation and status reading are as below;

COMMAND EXCITATION:

Function Code 0x03, 0x06 & 0x10: The holding register details for read & write operations associated with these function codes are as below;

ADDRESS		DATA		
DESCRIPTION	VALUE	RANGE (MIN-MAX)	NOTE (MEANING)	
REMOTE COMMAND	0x03E8		BIT 8=1	OPEN
			BIT 9=1	CLOSE
			BIT 12=1	STOP
			BIT 10=1	SET POINT BIT
READ VALVE POSITION	0x03E9	0-1000		
SET VALVE POSITION	0x03EA	0-1000		
**REMOTE COMMAND (ESD)	0x0001		BIT 0=1	ESD

The byte sequence for *broadcast ESD (SOFT ESD) command in hexadecimal is:

Broadcast Address	Function Code	Start Address High	Start Address Low	Register Value High	Register Value Low	CRC High	CRC Low
0xF1	0x06	0x00	0x01	0x00	0x01	0x0D	0x3A

Note:

***:* Soft ESD at individual actuator is available with 3.XMP modules having 2nd Series of controller in CPU card, starting with the program version"VER2:2014-04-06" & the program version starting from Version 26 onwards in case of 1st series of 3.XMP CPU cards.

STATUS READING:

Function Code 0x04: There are two registers present with the address 0x03E8 & 0x03E9 from which the status details can be got. The details of the data associated with each address are as tabulated below;

ADDRESS	0x3E8	0x3E9	0x3EA
	DATA DETAILS		
BIT POSITION	DESCRIPTION		
0	LOCAL POSITION	TSC	Valve Position (0-1000)
1	REMOTE POSITION	TSO	
2	RUNNING OPEN	LSC	
3	RUNNING CLOSE	LSO	
4	STOPPED	LOCAL POSITION	
5	OPENED POSITION	REMOTE POSITION	
6	CLOSED POSITION	LOSS OF PHASE	
7	TSO	TH FAULT	
8	TSC	COMMON FAULT	
9	TH FAULT	PHASE REVERSE	
10	TOLR	RUNNING CLOSE	x
11	JAMMED VALVE	RUNNING OPEN	x
12	PHASE SEQ. ERROR	ESD-HARDWIRED	x
13	SET POINT REACHED	SET POINT REACHED	x
14	FAULT	CLOSED	x
15	LCS ACTIVATED	OPENED	x

The byte sequence for Command & Status consists of following fields;

Device ID (1 Byte)	Function Code (1 Byte)	Address (2 Bytes)		Data Value (2 Bytes)		CRC (2 Bytes)	
		High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte

As a general practice function code 0x06 is used for command excitation & for status reading the function code 0x04 will be used:

The other details needed for the modbus communications such as Function Code, address, Data to be written are listed below;

Function Code Details (as implemented by auma):

DESCRIPTION	VALUE
1. READ COIL STATUS	0x01
2. READ INPUT STATUS	0x02
3. READ HOLDING REGISTERS	0x03
4. READ INPUT REGISTERS	0x04
5. FORCE SINGLE COIL	0x05
6. FORCE MULTIPLE COIL	0x0F
7. PRESET SINGLE REGISTER	0x06
8. PRESET MULTIPLE REGISTERS	0x10
9. DIAGNOSTICS	0x08
a. LOOP BACK	0x00
b. CLEAR COUNTERS	0x0A
c. RETURN BUS MESSAGE COUNT	0x0B
d. RETURN BUS COMMUNICATION ERROR COUNT	0x0C
e. RETURN BUS EXCEPTION ERROR COUNT	0x0D
f. RETURN SLAVE MESSAGE COUNT	0x0E
g. RETURN SLAVE NO RESPONSE COUNT	0x0F

Function Code 0x02: The register details associated with this function code (Read Input Status) are as below;

DESCRIPTION	ADDRESS IN HEX
OPEN POSITION	0x0000
CLOSE POSITION	0x0001
SET POINT REACHED	0x0002
RUNNING OPEN	0x0004
RUNNING CLOSE	0x0005
THERMAL FAULT	0x0008
REMOTE SW POSITION	0x000A
LOCAL SW POSITION	0x000B
LSO	0x000C
LSC	0x000D
TSO	0x000E
TSC	0x000F

Note: The data values of this function code is to be indicated in binary (1/0)

Function Code 0x01, 0x05 & 0x0F: The register details for read & write operations associated with these function codes (coil status) are as below;

DESCRIPTION	ADDRESS IN HEX
1. REMOTE OPEN	0x0000
2. REMOTE CLOSE	0x0001
3. REMOTE SET POINT	0x0002
4. REMOTE SW POSITION	0x0020
5. OFF SW POSITION	0x0021
6. LOCAL SW POSITION	0x0022

Note: The data values of these function codes are to be indicated in binary (1/0)

General Guidelines for effective communication:

Ensure the following:

1. No short between the DATA+ & DATA- lines on each channel
2. No interchange/reversing in connection of DATA+ & DATA- lines of each channel, when polling from the external Master.
3. A common reference line/Signal Ground known as “A Shield” for Channel A or “B Shield” for Channel B runs along the communication path
4. Signal Ground is not connected to Earth point and it is referenced (shorted with device) only at one end
5. Minimum setting of Com receive byte value as 20 considering the 2 byte transfer on each poll; If the communication poll needs more than 2 bytes accordingly the Com RX byte to be varied in the range of 20 to 100
6. Repeater mode is kept “YES” only for loop topology

TROUBLE SHOOTING

If the right hand side LED (red color) blinks (as shown in Fig. C) it indicates the FAULT. To identify the fault, check the status displayed on the LCD; Following are the typical displays of the FAULT condition and the trouble shooting methods to resolve those issues.

1. DISPLAY-**24V supply fail**_

TROUBLESHOOTING:

- 1.1. Check whether FRC cable is properly connected between CPU card and Power Supply card.
- 1.2. Measure the DC voltage between terminals in Customer Terminal Compartment using a multimeter. Here we are suppose to get 24VDC, If no voltage is coming then measure the resistance between those terminals using a multimeter by disconnecting the MAINS, If there is a dead short, then replace Power Supply Card.

2. DISPLAY- **Single Phase**_

TROUBLESHOOTING:

- 2.1. Check whether the fuses in R (FS1) &/or B (FS2) phases are blown.
- 2.2. Ensure that the MAINS 3phase input supply voltage and frequency of operation is matching the ratings mentioned on the name plate.
- 2.3. Check whether FRC cable is properly connected between CPU card and Power Supply card.
- 2.4. Check J2 of Power Supply card is connected properly.
- 2.5. If still Single Phase indication is present then measure the AC Voltage in J2 Connector (Male) using multimeter between two white wires and two black wires; this voltage is suppose to be 16VAC. If this voltage is very less than 16VAC then problem could be with transformer; replace the transformer and check.

3. DISPLAY- **TH Litch Trip**_

TROUBLESHOOTING:

- 3.1. Check the motor thermo switch continuity; if continuity is not there then we have to replace the motor.
- 3.2. With motor thermo switch continuity check the continuity between wires with ferrule TH and F1 of the J6 on CPU card; if there is no continuity then check the wiring error.
- 3.3. With the above two corrections, if the same error message display continues, then replace the CPU card.

4. DISPLAY=**TOLR Trip**

TROUBLESHOOTING:

4.1. Disconnect the supply to actuator and check whether TOLR is tripped; if yes then reset TOLR using reset switch as shown in fig below.

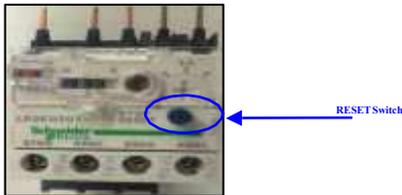


Fig. D: TOLR

4.2. Check the continuity between the input and output terminals of TOLR, if there is no continuity then TOLR are faulty, replace the TOLR.

4.3. If TOLR is not tripped and the error message continues then check the TOLR selection NO/NC under program mode; verify wires with ferrule 95 and 96 coming from J6 on Power Supply card are connected properly to TOLR's respective terminals depending on NO (Terminals-97, 98) or NC (Terminals-95, 96). Check continuity for these wires from TOLR terminals to J6 connector of Power Supply card.

4.4. If continuity is present but still TOLR trip is showing then check FRC Cable is connected properly between Power supply card and CPU Card.

4.5. If still problem continues then replace CPU and POWER cards.

5. DISPLAY=**Space Heater fault**

TROUBLESHOOTING:

5.1. Check whether Fuse -F4 is blown; if yes replace with good fuse of 1A, 250V rating

5.2. With the help of multimeter measure the Space heater voltage (ACV) voltage between brown and brown wires of J3 on Power Supply card. (The value will be 220VAC / 110VAC /24VAC depending on the customer requirement). If the requisite voltage is not measured then check the Molex connector between fuse plate and transformer.

5.3. If the requisite voltage is measured; but display continue to show the same error message then replace the power supply card. But if the requisite voltage is not measured then the fault could be with transformer, replace with new transformer and check again.

6. DISPLAY-Control supply fail

TROUBLESHOOTING:

- 6.1. Check whether Fuse-F3 is blown; if yes replace with good fuse of 1A, 250V rating
- 6.2. With the help of multimeter measure the control supply voltage (AC voltage between Orange and Black wires of J3 on Power Supply card), which is to be 220VAC/110VAC as per the customer requirement. If voltage is not coming then check the Molex connector between fuse plate and transformer.
- 6.3. If the requisite voltage is measured; but display continue to show the same error message then replace the power supply card. But if the requisite voltage is not measured then the fault could be with transformer, replace with new transformer and check again.

7. DISPLAY-Jammed Valve

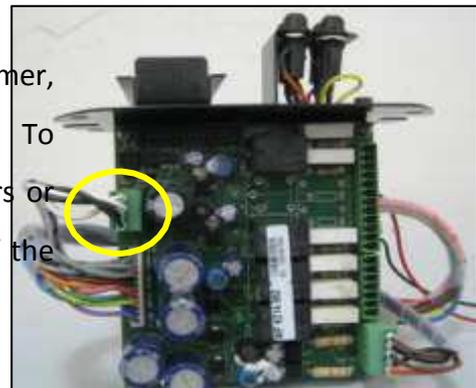
TROUBLESHOOTING:

- 7.1. The Jammed valve condition is to be released manually

8. DISPLAY-TW ERROR

TROUBLESHOOTING:

- 8.1. Whenever there is a replacement of new transformer, there is a possibility of occurrence of this error. To troubleshoot this interchange the 2 wires (white pairs or the black pairs) in the connector J2 (i.e. 1&2 or 3&4 of the connector J2) of the PS Card



9. Motor running in wrong direction: Whenever there is a replacement of Motor then there is a possibility of occurrence of this error i.e. the actuator will run in wrong direction for the respective command inputs (actuator runs in open direction for close command and vice versa). To troubleshoot this
 - 9.1. Interchange any 2 wires of the motor when the Motor is replaced
10. In case if Remote-local mode selection option from REMOTE is not happening (optional feature); check for the wiring at the customer end according to the WD.
11. In case of actuator running in wrong direction; with the message on LCD either OPEN or CLOSE direction depending on the selection done, check if ESD is activated (wiring mistake) using the WD

provided.

12. In case the actuator is not taking command in any particular direction check if INHIBIT feature is enabled (wiring mistake) using the WD provided.

13. In case the motor is not responding to the OPEN & CLOSE command and OPENING/CLOSING is indicated on LCD: Check if J4 of Power Supply card is plugged properly. Check the requisite voltages (110/230V) at the contactor terminals (K, K1 & K, K2

–refer Fig. E).

13.1. If the voltages are proper it could be the failure of the contactor; replace the contactor.

13.2. If the voltages are not proper, it means relay failure on the PS card; replace the PS card.



Fig. O: CONTACTOR

14. Actuator showing Single Phase error / TW error under running condition: This problem is due to Transformer module; hence it is to be replaced.

15. Mode selected in Local option is not displaying on the LCD screen: This problem arises if the mode “el. “||itDh_ optioŶ is eŶadled. To disadle this optioŶ, eŶter iŶto the PrograŶ Mode – General Settings or use the Remote-MODBU“ DoŵŵaŶd ;iŶput_Ŷ to the register 309 in the single register modbus function code).

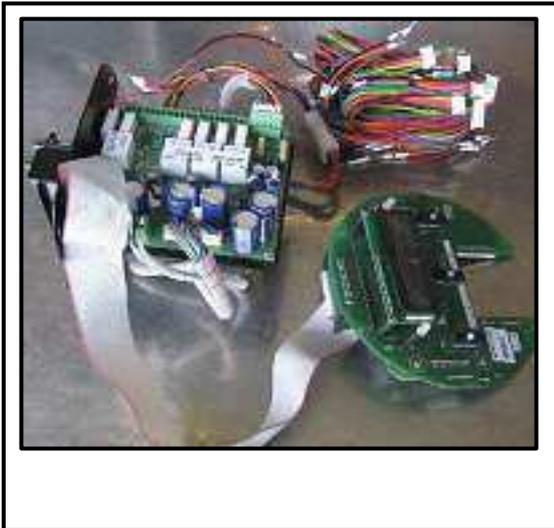
16. “igŶal Fault_ iŶdiDatioŶ iŶ reŵote-2Wire mode: Under Remote-regulating duty mode we have to give 4-20mA DC Current from external DC source to the respective terminals

;as per WDŶ Ŷaŵed ||ith ferrule_Ŷ+ aŶd_Ŷ-; CheDk the DoŶŶeDtility of JŶ DoŶŶeDtor at the Interface Board and also verify the wiring with respect to WD and ensure that the 4- 20mA input is coming from DCS.

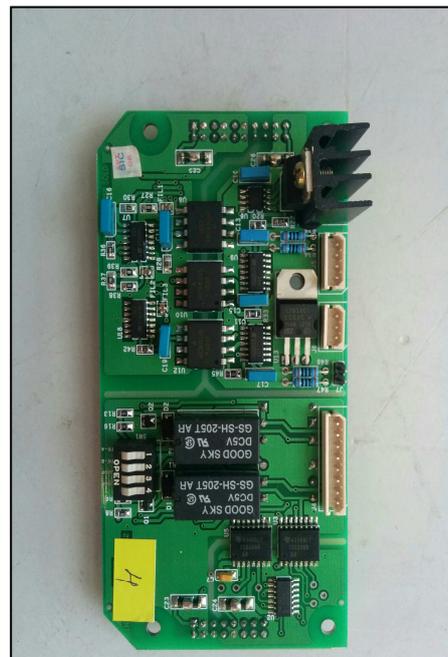
17. LCD Display is blank with back light ON: Check whether all respective connectors are plugged properly and ensure that the shorting link is connected properly (as shown) on J2 and J3 of CPU card



Spare Parts:



PS CARD



INTERFACE CARD

EPAC nameplate:

Identify the location of the epac name plate on the actuator which is as shown in the Fig. L

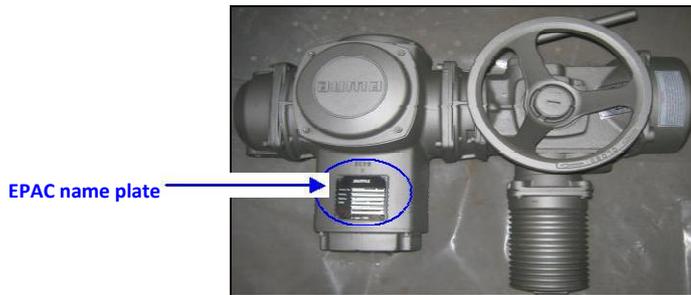


Fig. J: Actuator with EPAC

The following relevant details are available on the EPAC name plate to ensure our support after supply

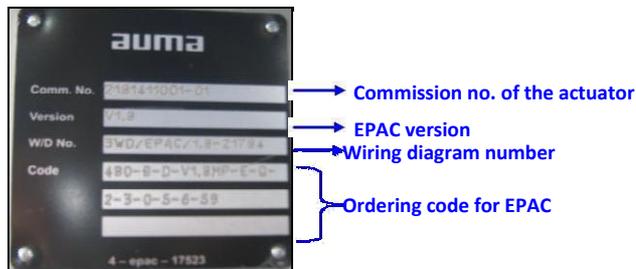


Fig. K: EPAC name plate

Please furnish the above details of the name plate while ordering spare parts/after sales support.

auma® india pvt ltd

Regd. Office & Works:

38A & 39-B, II Phase,
Peenya Industrial Area
Bangalore – 560058
Ph: 080-30412222/28394656
Fax: 080-28392809
Email: info@auma.co.in

Noida Branch:

1310, Tower 'A',
Corenthum Complex
Sector -62, Noida -201309
Ph: 0120-3060522 – 26
Fax: 0120-3060523
Email: veereshs@auma.co.in

Pune Branch:

712,713, Bldg.No. 1,
"Siddharth towers",
Kothrud, Pune - 411038
Ph: 020-25410465
Fax: 020-25443186
Email: ncpatil@aumaindia.com

Kolkata Branch:

Ph: 09883029170
Email: amab@auma.co.in

Chennai Branch:

Ph: 09884119795
Email: vramanan@aumaindia.com