auma®
Solutions for a world in motion

AIMS

Operation & Spare Parts Manual

VERSION: 3.0

(To be used with Auma India Modbus actuators)

INDEX:

I. INTRODUCTION:

Auma India has designed and developed the centralized control system known as AIMS, Auma India Master Station which controls and monitors the actuators located at field using the field bus protocol. It is the actuator control system that enables the easy integration of AUMA actuators into various host system solutions and as well it has the ability to act as a standalone master, independent of DCS.

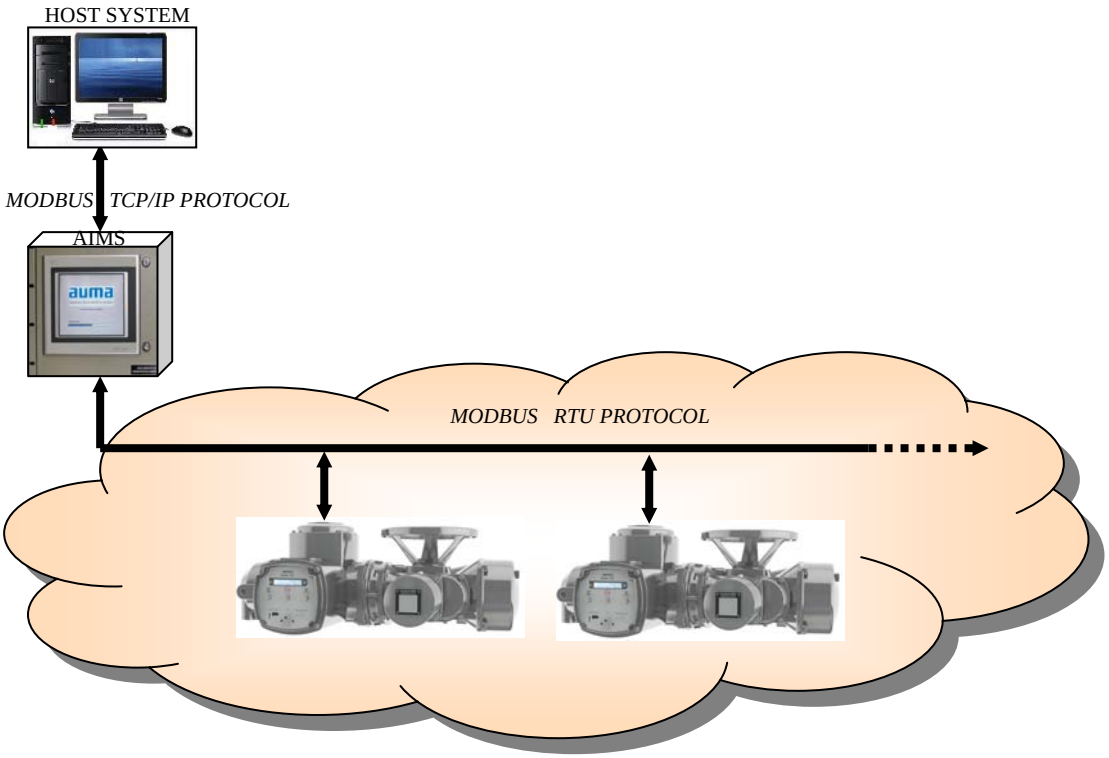


FIGURE 1: AIMS ARCHTECTURE

Features:

1. Dual nature: It acts as standalone master and as well an interface between the field actuators & the host system.
2. Redundancy (Master/Standby Architecture): It has a built in standby support, which will actively take up the responsibilities of the Master when Master is non-functional/unavailable. Network redundancy is also part of the feature offered with AIMS.
3. Dual topology: It supports Line as well as Loop topology with the field actuators, connecting about 240 actuators in 3 concurrent loops, with maximum of 80 actuators in one loop over modbus RTU protocol.
4. HMI Display: It has got a touch screen which displays the actuator's status, helps in sending the commands to field actuators and also acts as a user interface for communication settings.
5. Open Standard fieldbus protocol support: AIMS uses modbus TCP/IP protocol to communicate with the Host System and modbus RTU protocol to connect to the field actuators

II. SAFETY INSTRUCTIONS

RANGE OF APPLICATION

AIMS is designed to communicate with AUMA actuators equipped with fieldbus interfaces. For other applications please contact us. AUMA is not liable for any possible damage resulting from use in other than the designated applications. Such risk lies entirely with the user.

Observance of these operation instructions is considered as part of the AIMS designated use.

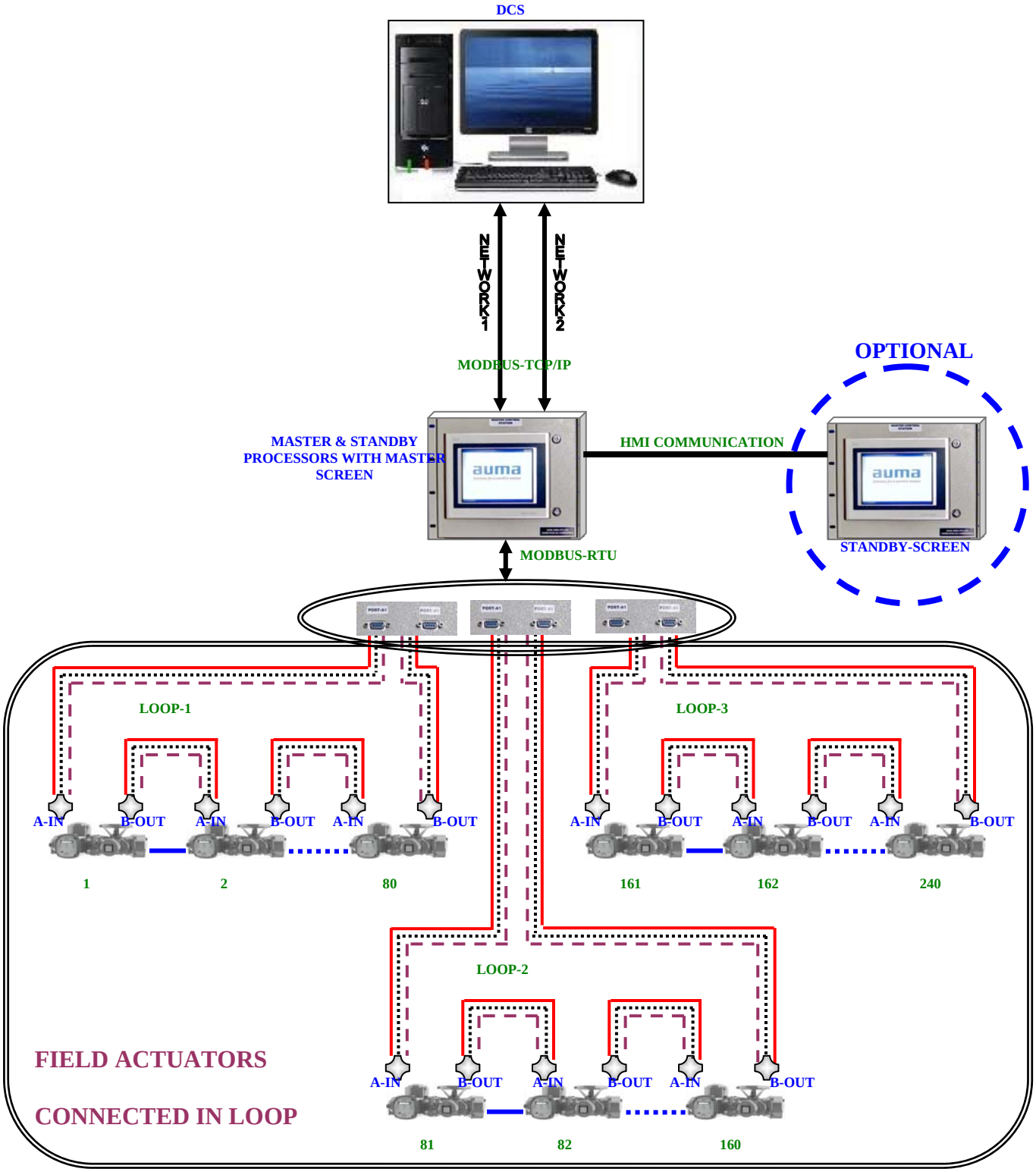
PRE-REQUISITES/INITIAL REQUIREMENTS AT THE ACTUATOR:

- EPAC to be used is 3.XMP Module
- Operating Mode of the EPAC: REMOTE Mode
- Use the EDIT option of the Program Mode to set the following in the EPAC
    - Remote - 2 wire – modbus communication
    - Assign the unique ID for the individual actuator

COMMISSIONING (ELECTRICAL CONNECTION)

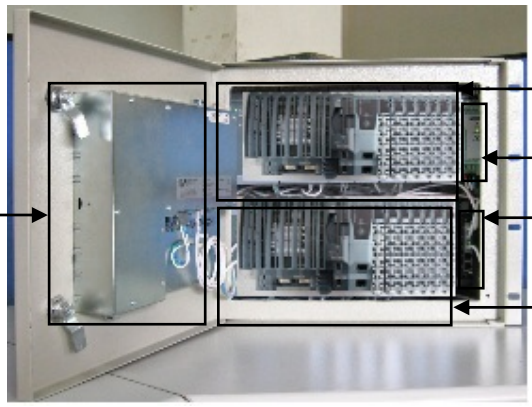
During electrical operation certain parts inevitably carry lethal voltages. Be sure to use a power outlet or connector equipped with a PE (protective earth) terminal. Work on the electrical system or equipment must only be carried out by a skilled electrician himself or by specially instructed personnel under the control and supervision of such an electrician and in accordance with the applicable electrical engineering rules.

III. SYSTEM CONFIGURATION:

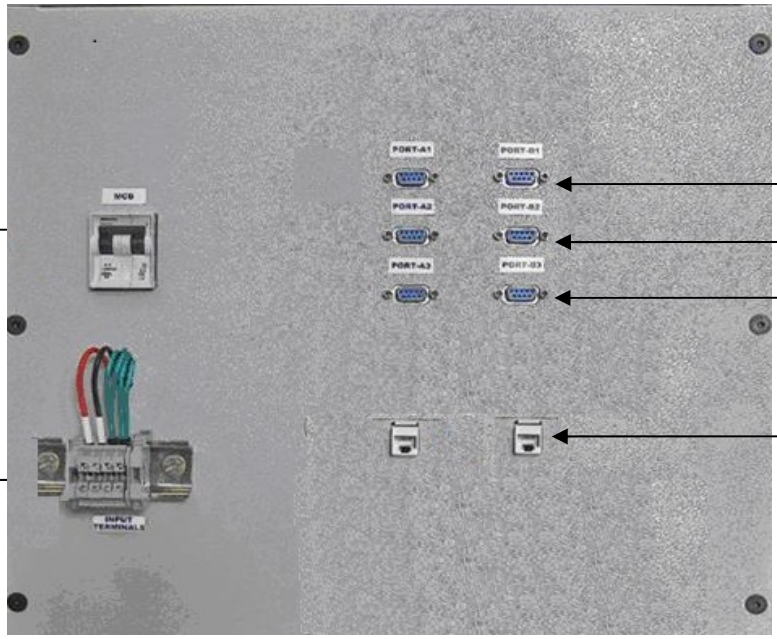


PHYSICAL APPEARANCE:

AIMS – FRONT VIEW
(HMI ON THE FRONT COVER)



AIMS – INTERNAL APPEARANCE



AIMS – REAR VIEW
(PORTS & HOST CONNECTION)

FIGURE 3: AIMS PHYSICAL APPEARANCE

Note:

Nominal input voltage: 100 V AC ... 240 V AC

INTERCONNECTION BETWEEN THE FIELD ACTUATORS:

Recommended Cable: Industrial RS-485 cable, 2 pair with shield

Cable cross-section:

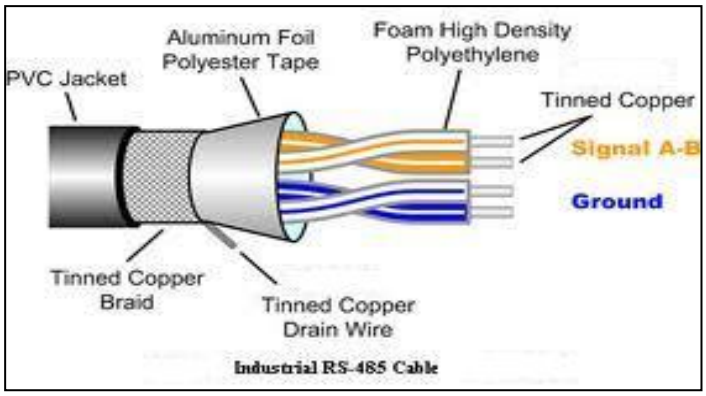


FIGURE 4: RS-485 CABLE CROSS-SECTION

Notation:

Sl. No.	Color Code	Notation	Usage	Auma Actuator Terminals	
				CH-A	CH-B
1	Orange with white stripe		D+	3 (A+)	12 (B+)
2	White with orange stripe		D-	4 (A-)	13 (B-)
3	Blue with white stripe		Signal GND	7 (A Shield)	16 (B Shield)
4	White with blue stripe		Unconnected	-	-
5	Grey wire(Drain wire) or meshed cable (Braid)		EARTH	-	-

Connection Details:

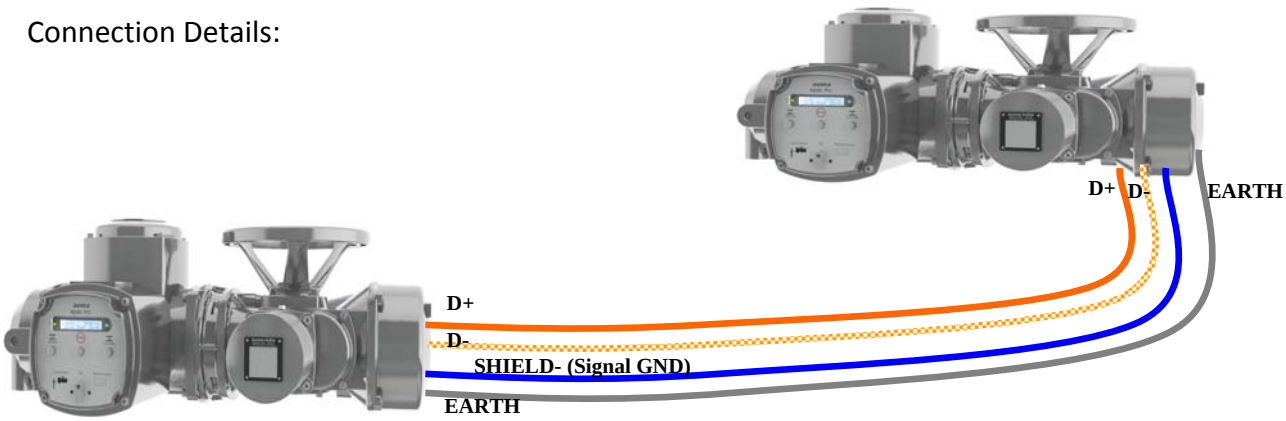


FIGURE 5: INTERCONNECTION BETWEEN FIELD ACTUATORS

INTERCONNECTION BETWEEN THE AIMS & THE FIELD ACTUATORS:

The field actuator (the end actuator) is connected to AIMS via the DB-9 Connector, which is present at the back panel of the AIMS, separately identified for Ch-A & Ch-B terminations.

DB-9 Connectors:

FIGURE 6: DB-9 CONNECTOR PIN CONFIGURATION

Note: DB-9 Female connector is at the back panel of AIMS enclosure and male connector (a mating connector) will be used to connect the end (or the first) field actuator to AIMS.

DB-9 Connector Pin Details (as used in AIMS connection):

DB-9 Pin Number	Notation (used for)	Field Actuator Pin (To connect with DB-9)	
		CH-A	CH-B
5	Shield (Signal GND)	7	16
3	D+	3	12
8	D-	4	13

NOTE:

- *Protocol used is Modbus RTU with RS485*
- *Redundant Fieldbus wiring: Auto changeover of the communication channel in case of line fault is possible*
- *It is the cost-effective solution (reduced wiring, only two fieldbus cables per actuator necessary)*
- *Distances between the actuators up to 1200 m, without repeaters is possible (as per modbus open protocol standards)*
- *Preservation of loop-integrity during power down*

The field actuators can be connected to AIMS in one of the following three ways;

A. Loop Topology
B. Line Topology
C. Redundant Line Topology

A. LOOP TOPOLOGY: Field actuators are connected to both Master & Standby units of AIMS in 3 loops with a maximum of 80 actuators per loop. (Thus maximum of 240 nos. of actuators can be connected to one AIMS). Loop1 connection is as shown below; similarly the other 2 Loops can be connected.

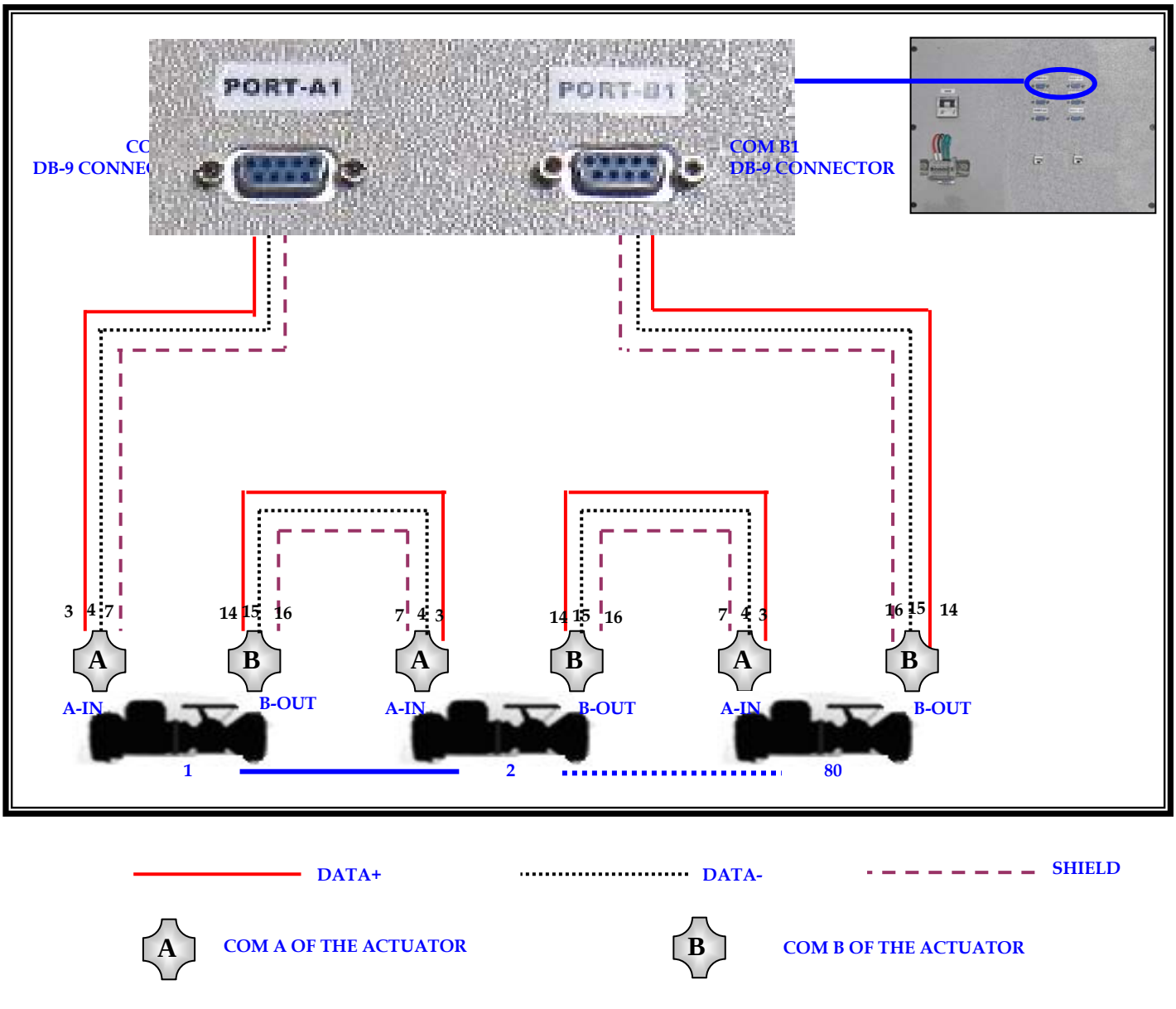


FIGURE 7: AIMS LOOP TOPOLOGY

B. LINE TOPOLOGY: In case of Line Topology, field actuators are connected to both Master & Standby units of AIMS in multi-drop configuration. In case of LINE topology please note;

1. The maximum distance between the last actuator & the AIMS should be less than 1200 mts., to operate without the Repeater.
2. The maximum number of the actuators that can be connected to the AIMS (one COM port) is 32 nos. (Multi-drop configuration) without the Repeater.
3. Termination resistances are to be used both at the start (COM port) and the end point (actuator)

Line1 connection is as shown below;

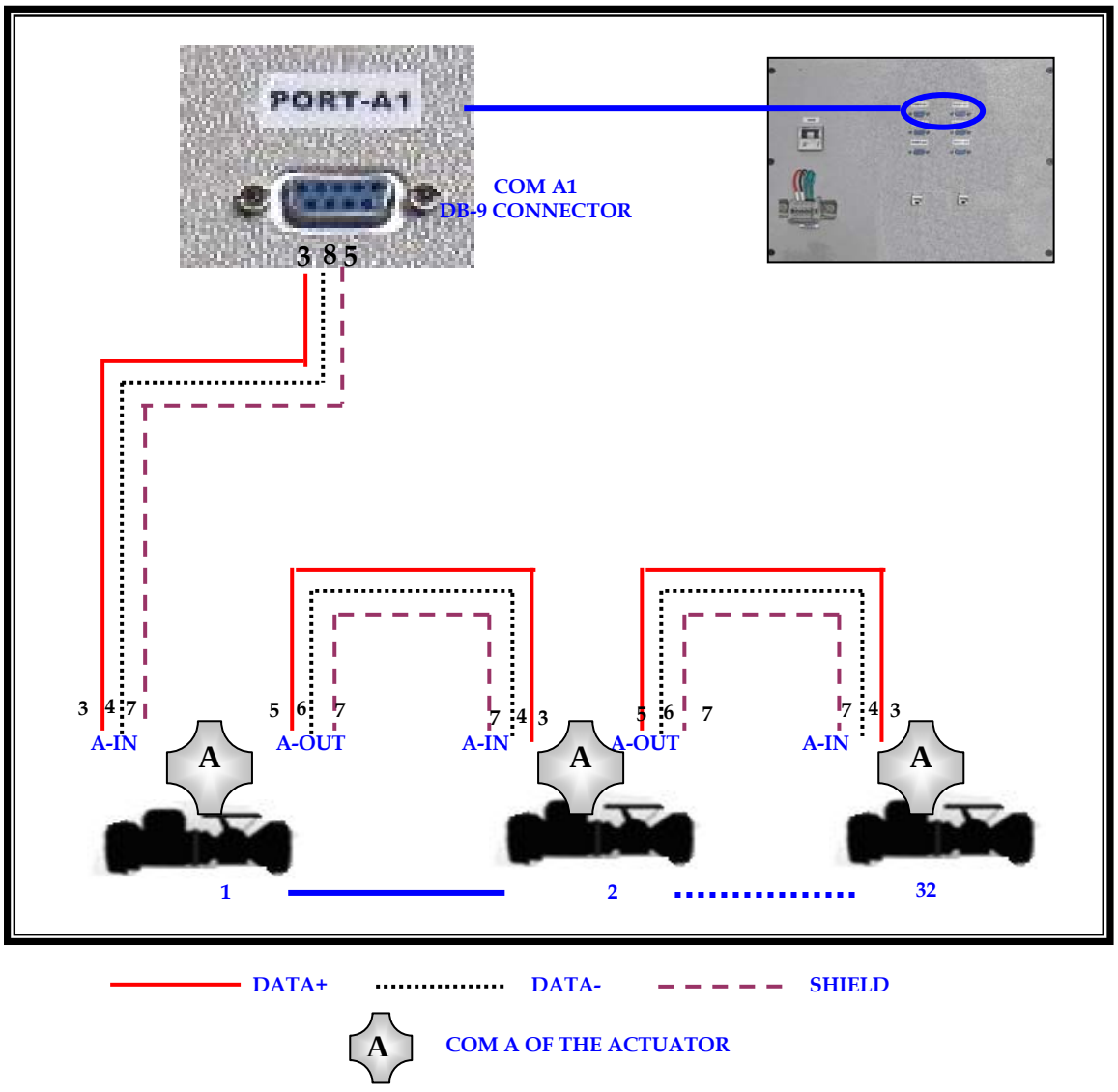


FIGURE 8: AIMS LINE TOPOLOGY

C. REDUNDANT LINE TOPOLOGY: In case of Redundant Line configuration, one more additional link is setup with the available COM port B. The configuration setup is as shown below;

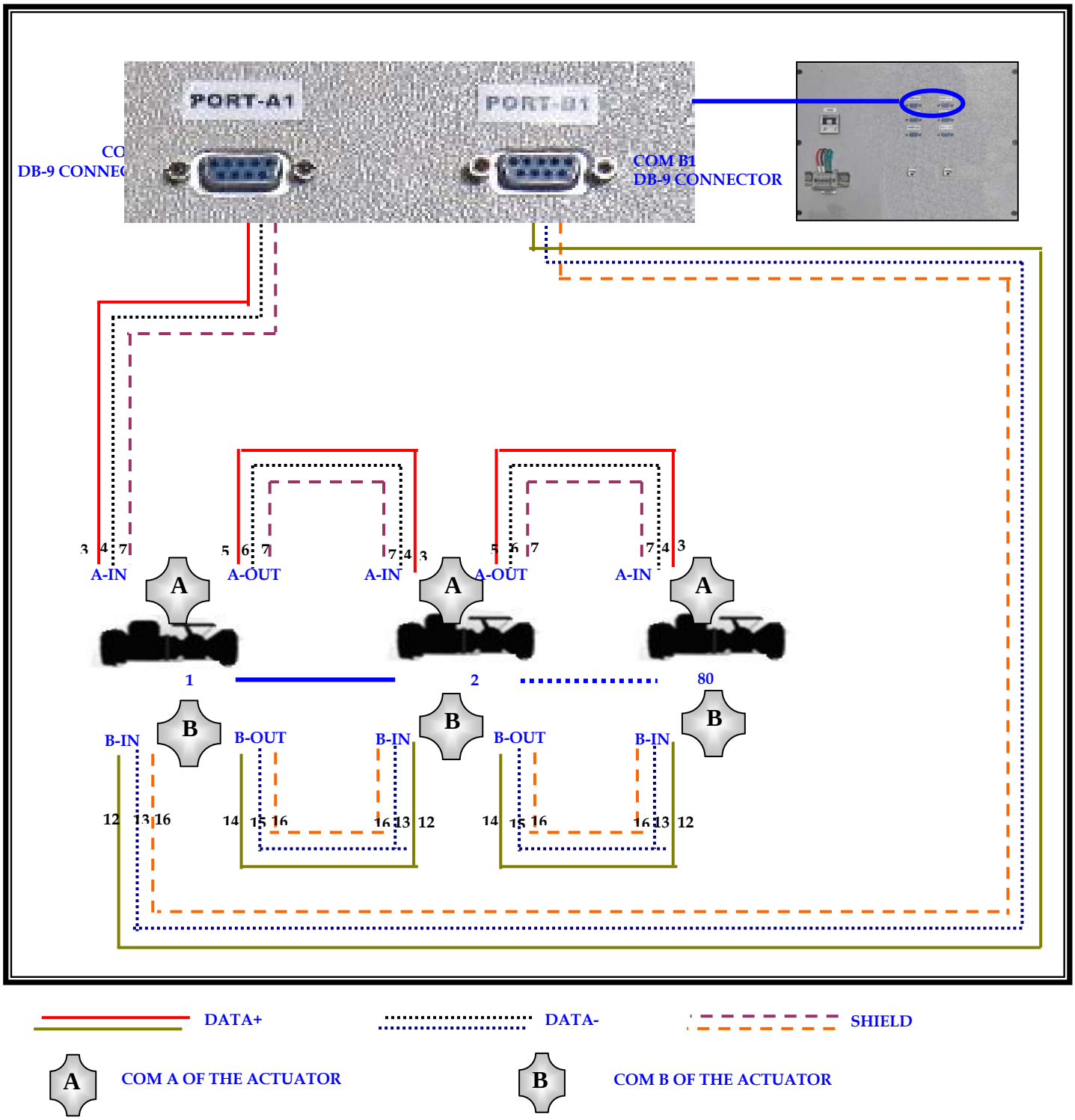


FIGURE 9: AIMS REDUNDANDANT LOOP TOPOLOGY

INTERCONNECTION BETWEEN THE AIMS & THE HOST SYSTEM:

Use the host communication port Master or the host communication port Standby available on the reverse side of the AIMS enclosure to connect the AIMS to the external Host system. To establish this connection plug the RJ45 cable on one of the following ports (as shown below);

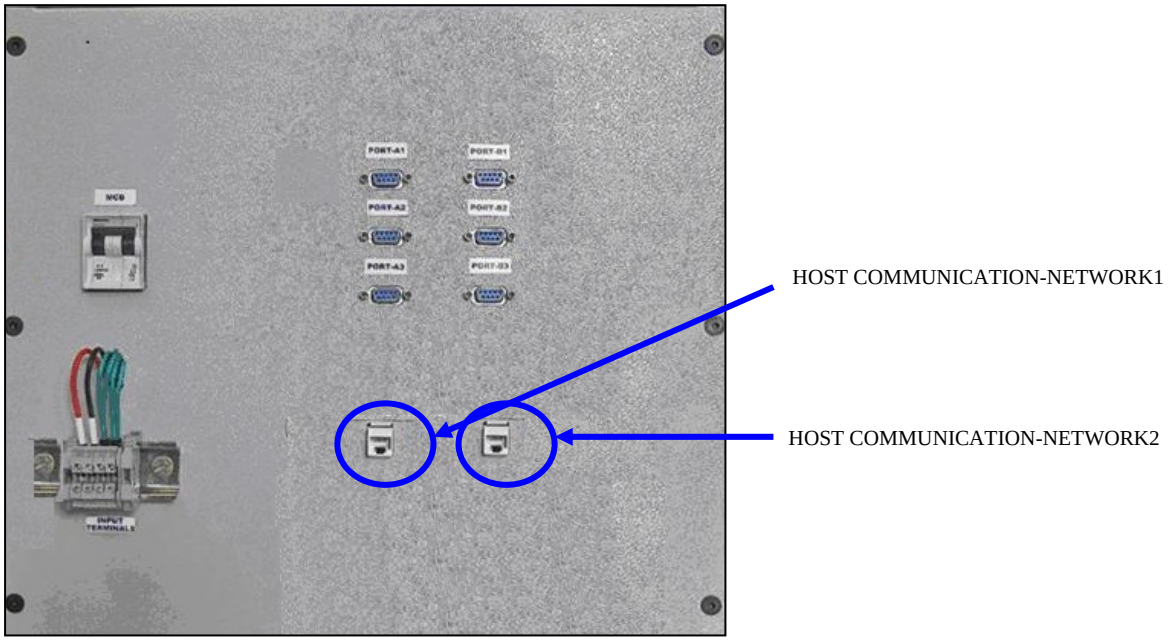


FIGURE 10: AIMS BACKPANEL
(SHOWING THE CONNECTION TO HOST SYSTEM)

Note: In case of a redundant AIMS master station, the STAND-BY AIMS will automatically take over the communication as soon as the MASTER AIMS is not available.

Cable Details:

Recommended Cable: 2-pair (one for each Master & Standby stations), Cat-5 (Max. length: 100m), Crossover Cables

Pin Configuration of RJ45:

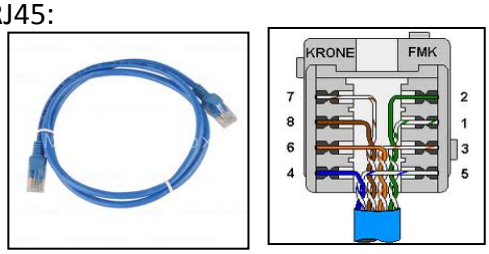


FIGURE 11: RJ-45 PIN CONFIGURATION

RJ-45 Pin Number	Notation
1	TX+
2	TX-
3	RX+
6	RX-

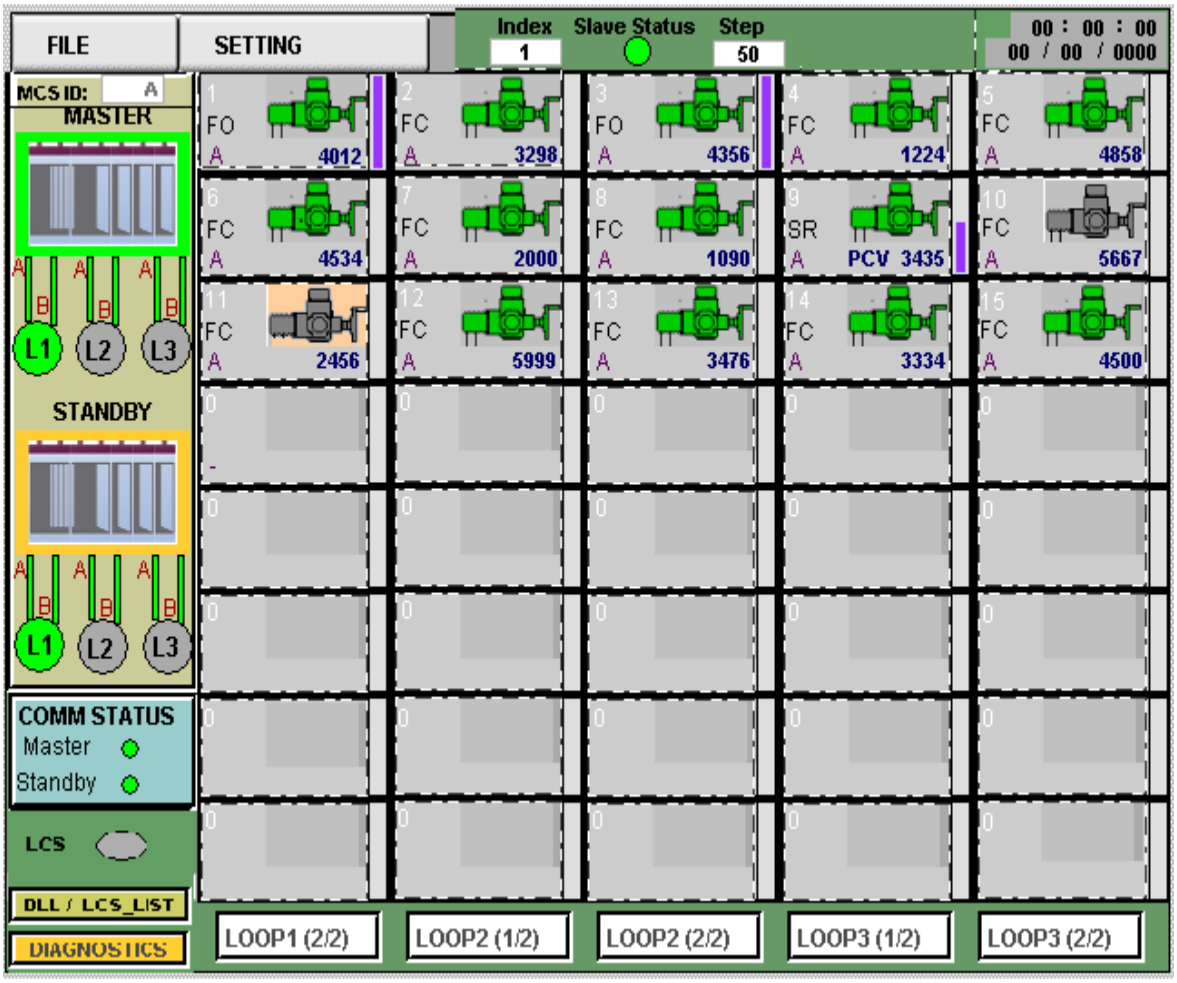
The list of data exchange between the host and AIMS system is tabulated below;

Command signals to actuators	OPEN CLOSE STOP SET POINT VALUE SET POINT COMMAND
Process data from actuators	Running OPEN Running CLOSE SET POINT Reached OPENED position CLOSED position Selector switch REMOTE Selector switch LOCAL Valve Position Limit switch OPEN Limit switch CLOSE Torque switch fault in direction OPEN Torque switch fault in direction CLOSE
Process data from actuators	Collective Fault Thermal Fault Loss of Phase

IV. HMI SCREEN:

After the power ON, the system boots and the AUMA logo window with Enter button appears on the screen, which is as shown below.

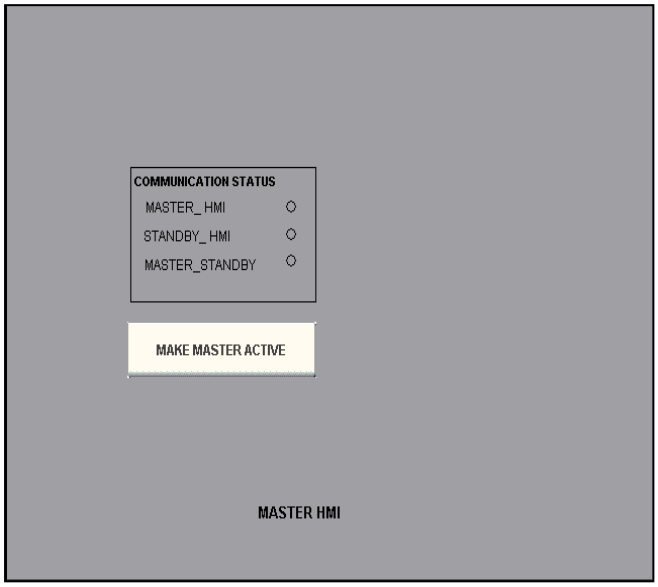
When you press on the ENTER button, following screen appears, (where we need to configure the actuators using the guidance as explained in View Setting options);

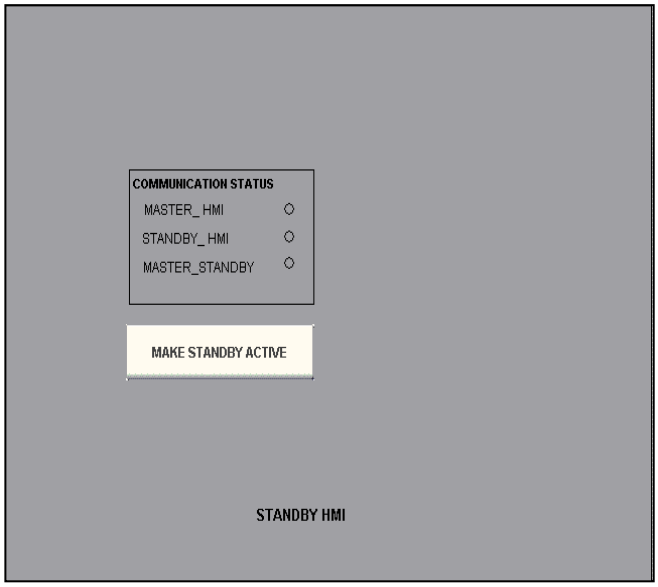


Special Case:

For Redundant screen option, 2 screens one associated with Master Processor and one more with Standby Processor will be available. The respective screen activation depends on the Processor Activation state and at given instant of time only one screen (/processor) will be functional.

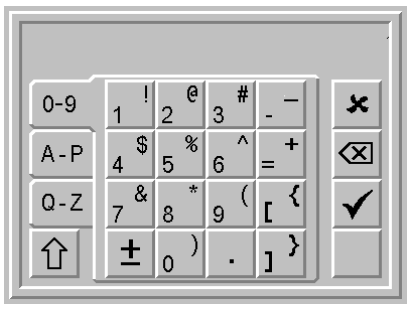
The blank screen indicating the inactive state of Mater or Standby will look like this, where the communication status indication decides on selection of the screens/HMI.





Note: *The AIMS (available with touch screen) can be operated without the need of additional keyboard or mouse. Wherever text or number inputs are requested, a dialog window is displayed. The dialog window gets active with a double click on the input box. The following dialog window will be opened if an input box for alphanumeric values (i.e. actuator tags) is double clicked:*

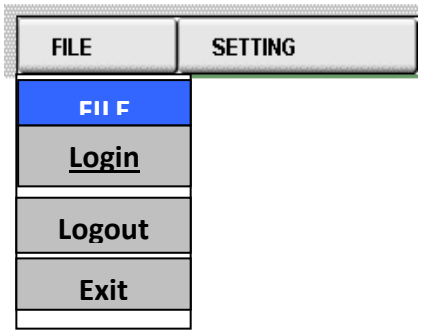
For entering the numeric values following keypads can be used:



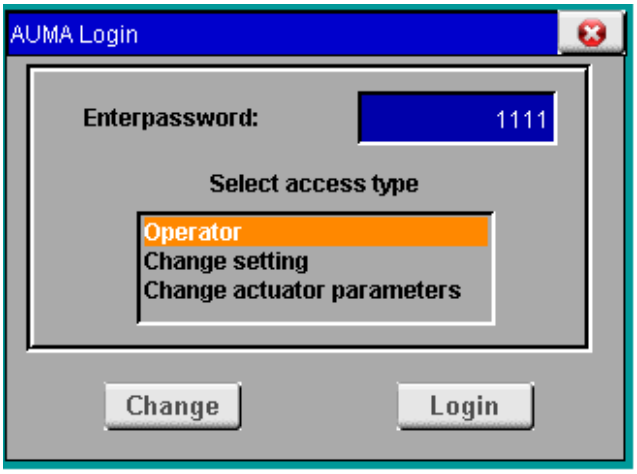
A. MENU Options:

FILE MENU:

Options available with FILE Menu are:



1. **AIMS Login window:** The login window has got 3 levels of the password access, which is as shown below;



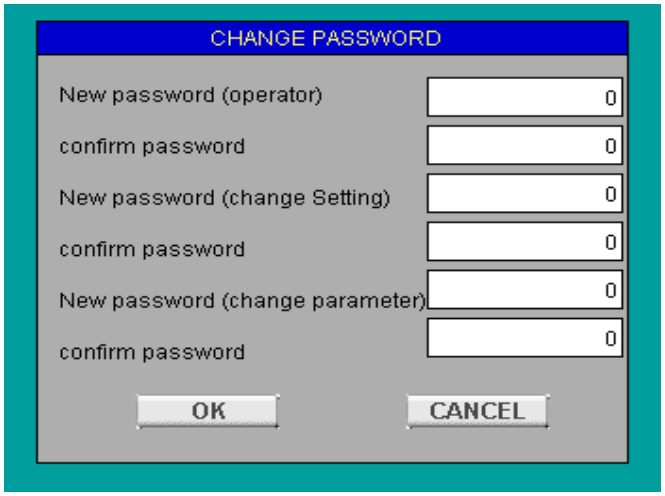
NOTE:

OPERATOR: *With this option operator can excite the commands and actuator positions can be set but has got no authorities to add or remove the actuator from the live list. (Default Password is 123)*

CHANGE SETTINGS: *In this level user has got the rights on above option and also can add/remove the actuators from the live list. (Default Password is 456)*

CHANGE ACTUATOR PARAMETERS: *In this level user has got the rights on above options and can change the communication settings. (Default Password is 789)*

The default passwords can be altered using the Change button. The following screen appears when the user clicks on Change button;

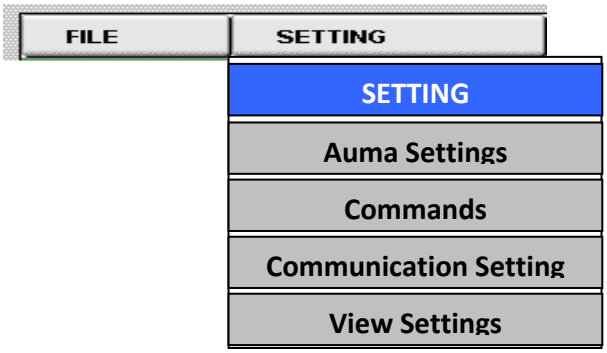


2. **AIMS Logout window:** The user comes out of the password authorities when this option is clicked.

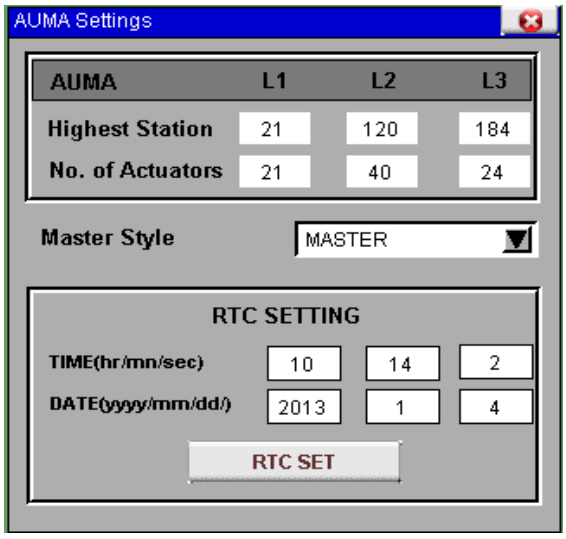
3. **Exit window:** The user comes to Main screen if this option is selected

SETTING MENU:

Options available with Setting Menu are:



1. **AUMA Setting Window:**



The following options can be viewed using this window;

Highest Station — The highest station address in the LOOP

No. Of Actuators — The number of actuators available in the live list of each loop

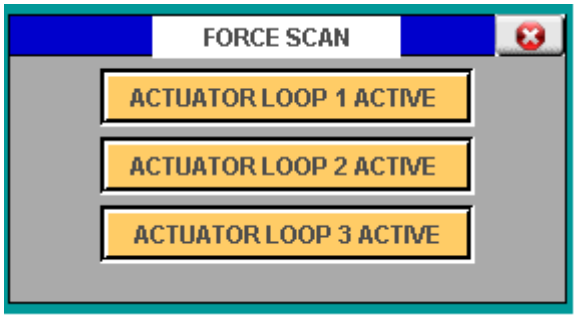
Also the below options can be set using this window:

Master Style — The currently running Station (either MASTER/STANDBY). This option can also be used to switch between MASTER/STANDBY (from the drop down menu)

RTC SETTING — RTC time & the date values can be set using the button "RTC SET"

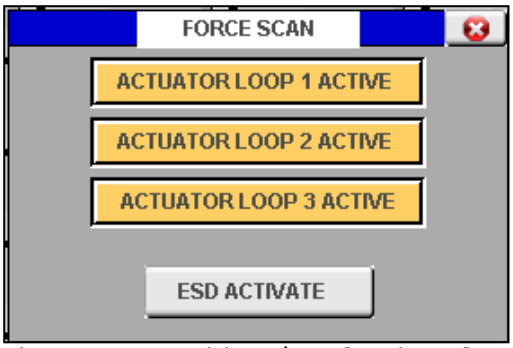
Note: Each of the above options can be set by the User, using the keypad that appear when the respective field is selected. Press on the ACCEPT button once the desired values are entered in the text box.

2. **Commands Window:** This window is used to enable the live list scanning after addition or deletion of the actuators in the respective loops from the live list.



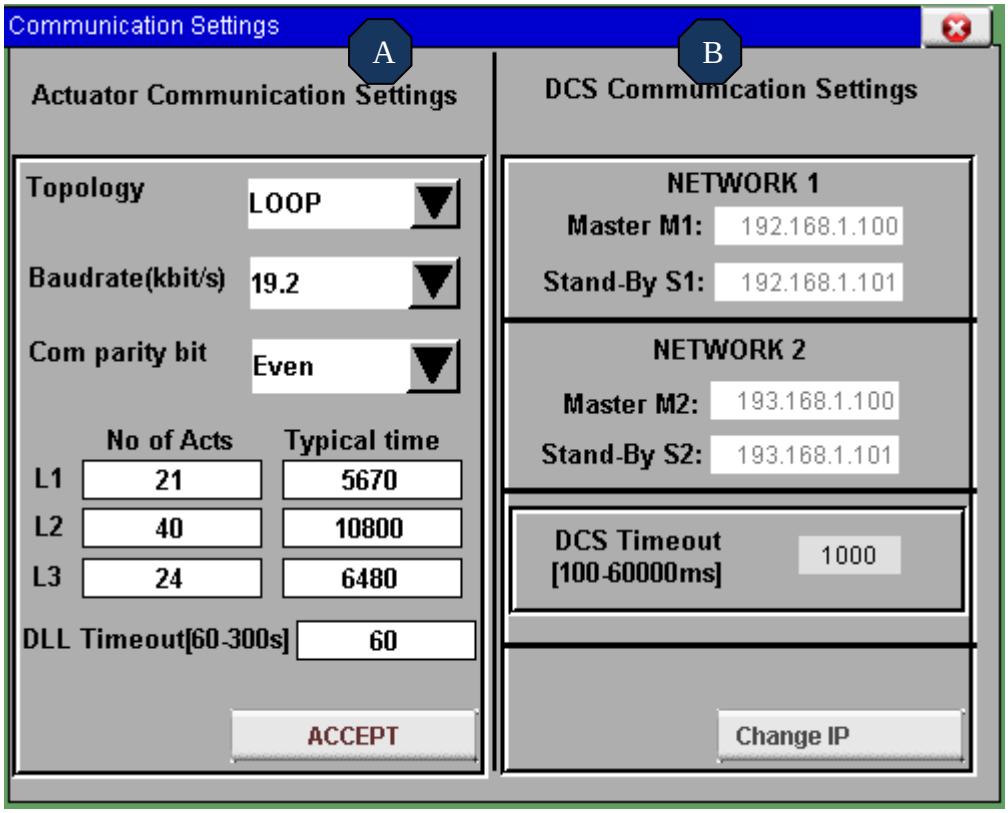
Special Case:

ESD via 2 wire/MODBUS: In order to excite the ESD Modbus broadcast command via HMI, "ESD ACTIVATE" button available in the command window can be pressed.



This button press action is same as exciting the ESD via MODBUS from DCS using the offset address 516.

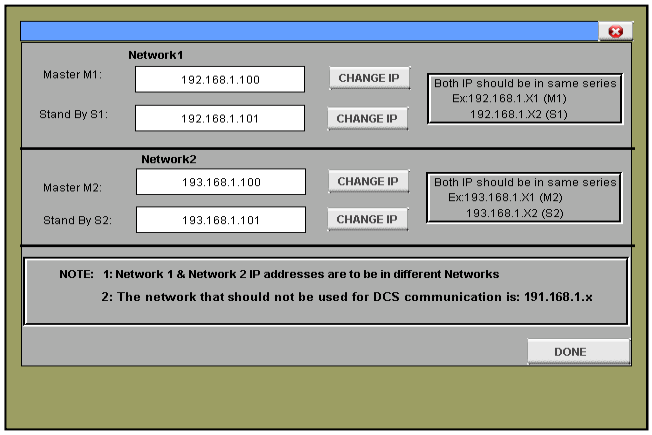
3. **Communication Settings Window:**



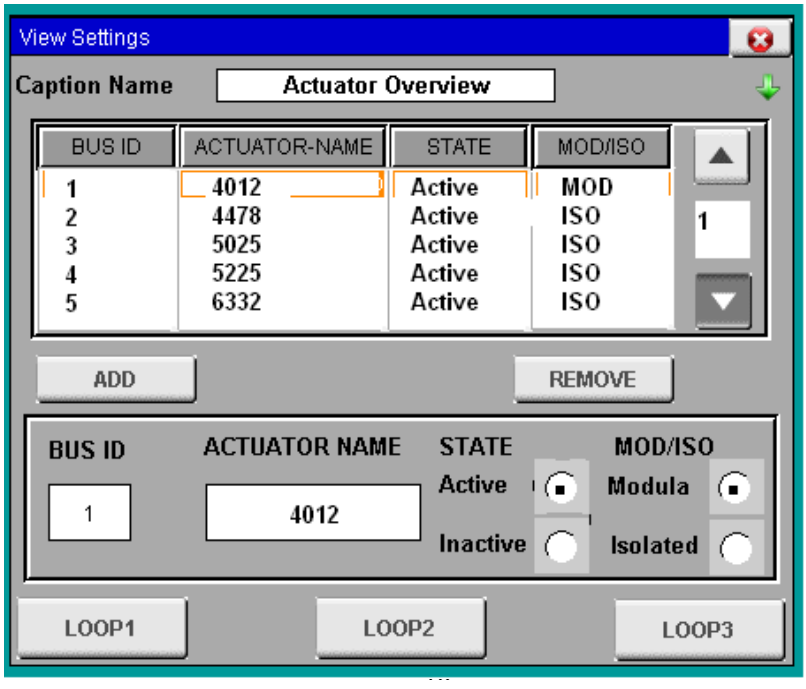
The following options can be set or viewed using this window;
Option-A: Actuator Communication Setting: The options that are to be set here are;

Baud Rate	The various baud rates that can be selected are – 9600, 19200, and 38400 bps.
Com Parity bits	Parity bit can be set as – ODD, EVEN and NONE.
No. Of Acts	The number of actuator in each LOOP can be added here (as per the LIVE LIST).
Typical Time	The typical time period, which will be calculated internally, is displayed here (this is the typical time out period of that particular loop).
DLL Timeout	It is time out response for the actuator when it is in remote mode
ACCEPT	If any changes in the above parameter then Press ACCEPT button to store the new configuration.

Option-B: Network1 & Network 2 IP addresses and DCS time out (It is the Host communication response time out) can be viewed in this window. Also if the IP addresses are to be altered for the 2 networks, press the "Change IP" button appearing on the screen which displays the following window where the required IP settings can be done for both Master & Standby systems.



4. **<u>View Settings</u>:** View setting is used to add, delete and view the actuator state.

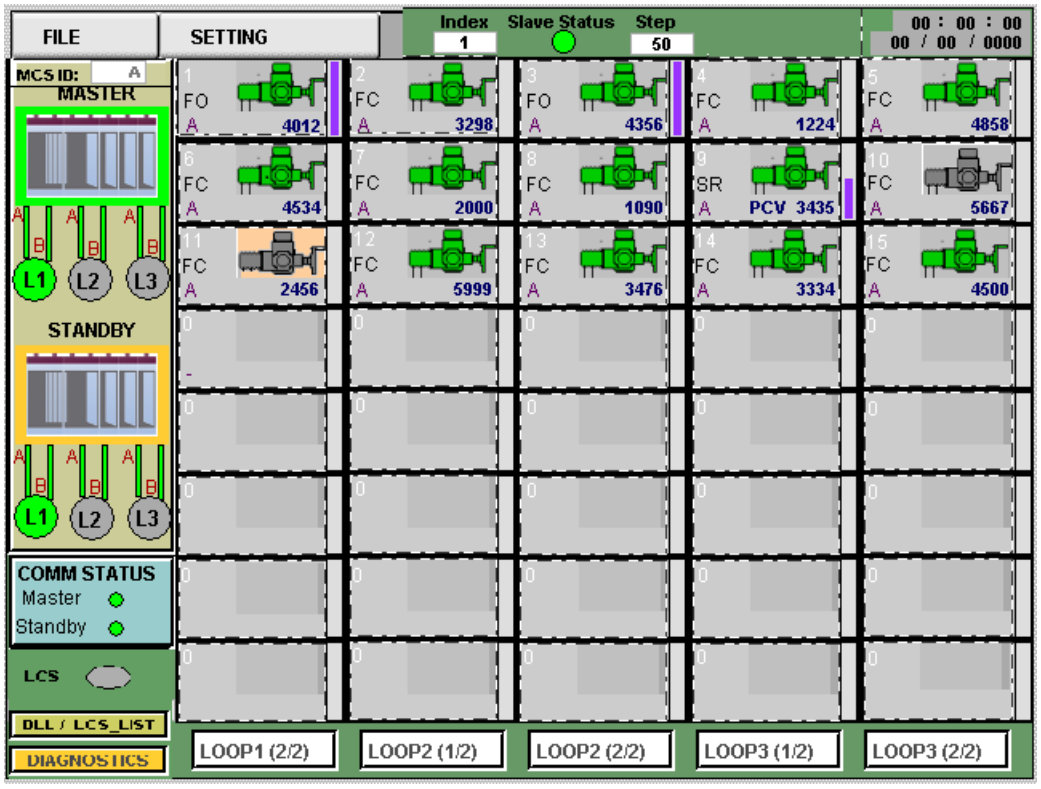


The table has the following options, which can be set by the user;

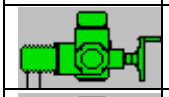
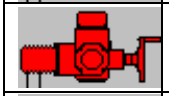
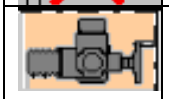
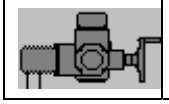
BUS ID: Slave address of the actuator
ACTUATOR-NAME: The name of the actuator
STATE: Indicates the actuator status, whether it exists (active) in the field or not (active). The status can be set using the radio buttons.
MOD/ISO: It indicates the type of the actuator; Modulating (if it is regulating type) or Isolating (ON/OFF type). The option can be set using the radio button
ADD: To add/alter the actuator settings (mentioned above) use the ADD button so that the same is updated in the LIVE LIST
REMOVE: To delete the actuator from live list go to the actuator status using UP/DOWN arrow & once it gets highlighted in the menu click on the REMOVE Button to delete from LIVE LIST
LOOP1, LOOP2, LOOP3: Respective Loop can be selected using these buttons

B. MAIN SCREEN

1. **MAIN SCREEN:** By clicking on the ENTER button on the first screen which appears during the startup, the MAIN screen appears, which displays status information of all the identified actuators (set by using the View setting window). As we know that there are 3 loops with 80 actuators in each loop, the individual screen in the HMI is configured with the display status of the 40 actuators and the respective loop selection can be done with the touch screen loop buttons which is as shown below.

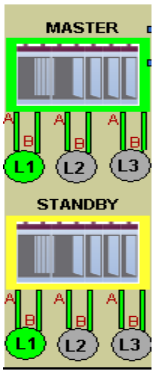


Interpretation of the symbols:

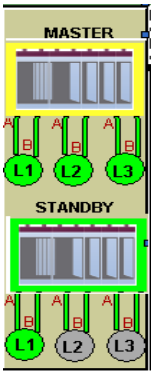
Symbol	Explanation	Description
	Green actuator bitmap	Actuator is in REMOTE Mode; ready for Remote Communication
	Red actuator bitmap	Actuator has a fault
	Red Cross with Grey actuator bitmap	No communication between master station and actuator
	Grey actuator bitmap with saffron background	Actuator is in OFF mode (selector switch)
	Grey actuator bitmap	Actuator is in LOCAL mode (selector switch)

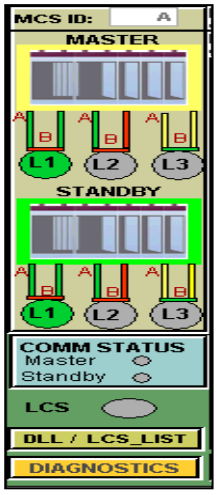
The green background to the PLC indicates the active mode of the particular PLC, which is as show below;

Master Active



Standby active





The red color on the Loop (A or B) as shown below, indicates the failure of the particular channel (In the below figure, it indicates the failure in channel B of Loop2 & Line break at Loop1)

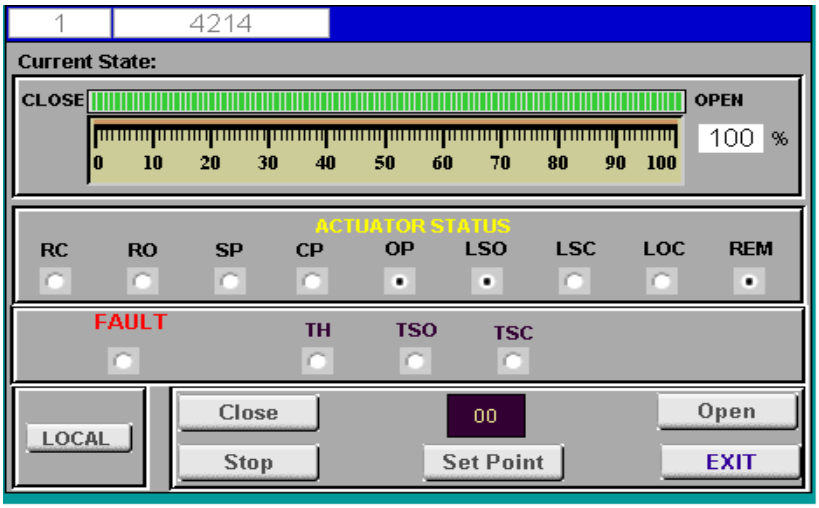
<u>Special Case:</u>

Depending on the special requirements as below, following changes will appear on this window;

1. LCS Command (Remote 4 wire command supersedes the MODBUS command): A button for viewing the LCS list & Indication if LCS is excited

2. ESD via MODBUS: A button for viewing the hardwired ESD list & Indication if ESD command is excited

2. **Actuator Status Window:** We enter into the Actuator Status Window by clicking on the actuator displayed on the main screen. This window will show the current status like position of the valve, running status, fault and warning (if any) etc.



Note:

The control of field actuator can be made either from the DCS or the AIMS itself and the same is indicated in HMI touch screen as a button with label LOCAL. If local button is enabled; it indicates that the control is from AIMS and if the local button is disabled then it indicates that the control is from DCS

Close, Stop, Open: These are the buttons used to control the actuator from AIMS HMI. These Buttons are activated only when actuator is in Remote mode and the LOCAL button is in active state.

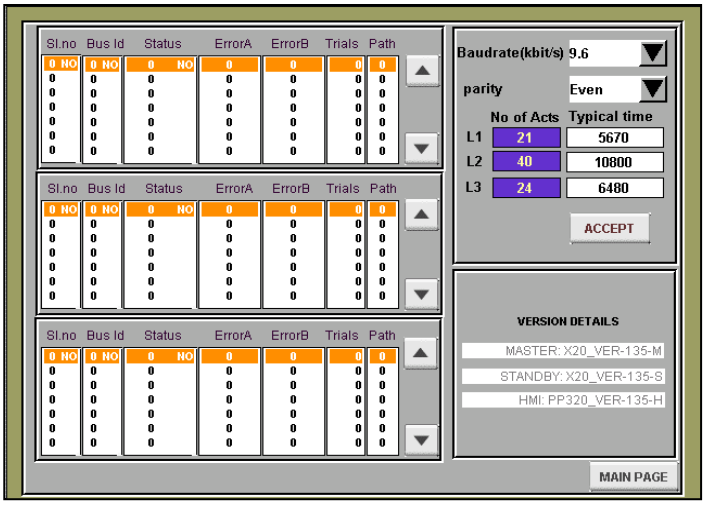
Set point: The actuator position in terms of the percentage can be set using this button, by using the numeric key pad. When the actuator reaches the respective position, the same is indicated on the SP check box.

The status of the actuator are as indicated below;

FC	Full Close
FO	Full Open
RO	Running Open
RC	Running Close
SP	Set point Reach
TSO	Torque switch open
TSC	Torque switch close

TH	Thermal Fault
FAULT	Common fault indication
LSO	Limit switch open
LSC	Limit switch close
LOC	Selector switch in LOCAL
REM	Selector switch in REMOTE

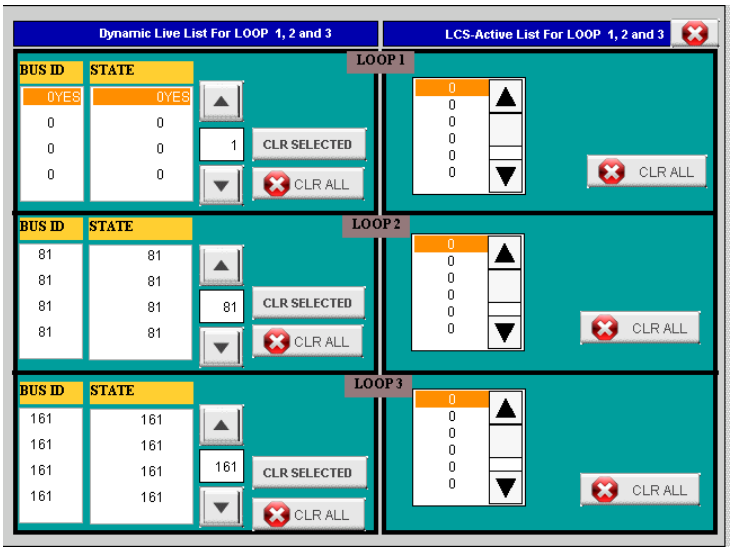
3. **Diagnose window:** On pressing the 'Diagnostics' button available in the main window, the Diagnose window opens.



This is the information window, which shows the version details and the Communication settings of the actuator connected in each loop (do not edit these settings)

If the actuator is not communicating to AIMS see the Error A (from channel A) and Error B (From Channel B) columns in the diagnostic window to know that problem is with wiring (Error number displayed is 20261), or it is not added to live list (Error number displayed is 20220). Press MAIN PAGE button to go back to main window.

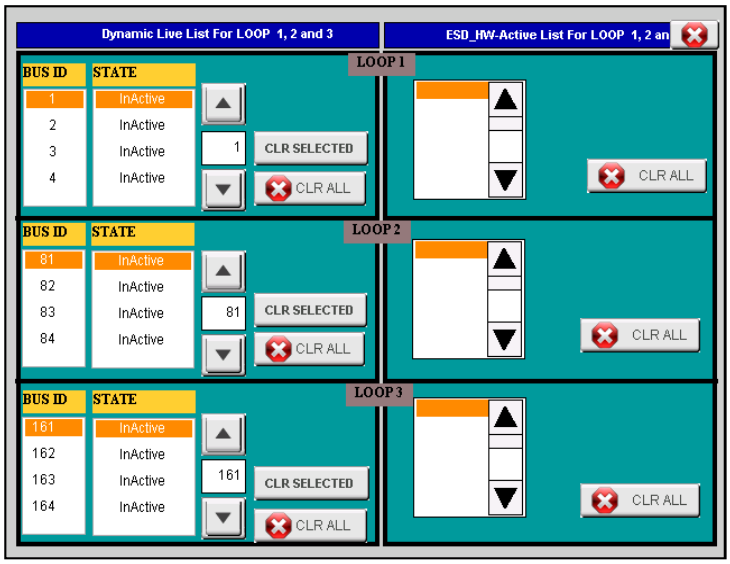
4. **DLL Window:** The 2 options that appears with DLL window are;
   - **DLL & LCS_LIST:** On pressing the 'DLL/LCS_LIST button available in the main window, this window opens.



This is the information window which is split into two parts.
Part1: (LEFT SIDE) shows the actuator list on which the command exists from the DCS
Part2: (RIGHT SIDE) shows the actuator list on which the LCS command exists

Note: If LCS command exists on the particular actuator, then LCS button appearing on the Main screen blinks during the regular scan indicating the excitation of the LCS command on that particular actuator

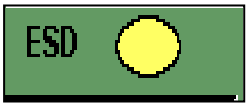
- DLL & HW_ESD: On pressing the 'DLL/HW-ESD button available in the main window, this window opens.



This is the information window which is split into two parts.

Part1: (LEFT SIDE) shows the actuator list on which the command exists from the DCS

Part2: (RIGHT SIDE) shows the actuator list on which the ESD Hardwired command exists



Note: If ESD command exists on the particular actuator, then ESD button appearing on the Main screen blinks during the regular scan indicating the excitation of the ESD command on that particular actuator

V. MODBUS COMMUNICATION BETWEEN AIMS AND HOST SYSTEM

AIMS's Modbus interface to the host system is able to control and receive information of up to 240 actuators and are available with two network configurations (illustration as below);

Network 1: The IP address of Master & Standby stations (illustration):

Station	IP Address
Master	192.9.201.150
Standby	192.9.201.151

Network 2: The IP address of Master, Standby stations (illustration):

Station	IP Address
Master	192.9.200.150
Standby	192.9.200.151

*One more network is to be reserved for auma, to establish the internal communication (Only for AIMS internal communication & not for DCS communication). Please note the network series 191.168.1.x should not be used for the DCS communication address assignment***

***Note: In case of further clarification on Network ID assignment please contact auma*

In case of a redundant AIMS master station, the STAND-BY processor will automatically take over the communication as soon as the MASTER processor fails.

Modbus functions:

The following Modbus functions are supported for the communication between AIMS and Host:

Function	Function code	Description
Force Single Coil	05	Forces a single coil to either ON or OFF. During broadcast the function forces the same coil reference in all attached slaves.
Force Multiple Coils	15	Forces each coil in a sequence of coils to either ON or OFF. During broadcast the function forces the same coil references in all attached slaves.
Read Coil Status	01	Reads the ON/OFF status of discrete outputs in the AIMS. Broadcast is not supported.
Preset Single Register	06	Presets a value into a single holding register. When broadcast, the function presets the same register reference in all attached slaves.
Preset Multiple Registers	16	Presets values into a sequence of holding registers. When broadcast, the function presets the same register references in all attached slaves.
Read Input Registers	04	Reads the binary content of input registers in the AIMS. Broadcast is not supported.
Read Holding Registers	03	Reads the binary content of holding registers in the AIMS. Broadcast is not supported.
Read Input Status	02	Reads the status of the discrete inputs in the AIMS. Broadcast is not supported.

Command List:

1. **Output commands to AIMS (access via holding registers – FC: 06, 16, 03):** Output command actuator with address x part 1 and 2 are holding registers which are used to send operation commands to the designated actuators connected to AIMS.

Modbus function	Function code	Offset address	Data content (description)
Preset Single Register Preset Multiple Register Read Holding Register	06 16 03	0	Output command actuator with address 1 part 1
		1	Output command actuator with address 1 part 2
		2	Output command actuator 2 part 1
		3	Output command actuator 2 part 2
		…	…
		252	Output command actuator 127 part 1
		253	Output command actuator 127 part 2
		…	…
		492	Output command actuator 240 part 1
		493	Output command actuator 240 part 2
		512	Output command AIMS part 1
		513	Output command AIMS part 2
		514	Output command AIMS part 3
		515	Clear LCS/ESD List from DCS
		516	ESD via MODBUS

Description

Output command Actuator with address x part 1: (first offset address = 0 [for actuator 1])

Bit position	Description
Bit 15	Reserved
Bit 14	Reserved
Bit 13	Reserved
Bit 12	Reserved
Bit 11	STOP
Bit 10	REMOTE SET POINT
Bit 9	REMOTE CLOSE
Bit 8	REMOTE OPEN
Bit 0 – Bit 7	Reserved

Output command Actuator with address x part 2: (first offset address = 1 [for actuator 1])

Bit position	Description
Bit 15 – Bit 8, high – byte	Actuator SET POINT high – byte
Bit 7 – Bit 0, low – byte	Actuator SET POINT low – byte

NOTE:

- With the bits 8 – 11 the commands are transmitted to the actuators. Only one of these bits may be set at any given time, otherwise the actuator will respond with the signal “Not ready REMOTE”.
- A change of the data in the output command actuator x part 1 will also change the content of the corresponding coils.
- If Remote SETPOINT (remote nominal) is set, the value of the setpoint set with output command actuator part 2 is regarded.
- The setpoint has to be transmitted as value between 0 and 1000 per mil.
- If this range is exceeded the actuator will respond with the signal “Not ready REMOTE”.

Output command to AIMS part 1 (Offset address = 512)

Bit position	Description
Bit 15 – Bit 8, high – byte	Reserved
Bit 7 – Bit 0, low – byte	No. of slaves

With output command AIMS part 1, the no. of slaves connected has to be defined. This value is stored in AIMS configuration from the screen input.

NOTE:

- *As soon as more or less slaves are found on the Modbus channels to the actuators the AIMS will show an indication in its status information (see 2.4.10.2 , page 14)*

Output command AIMS part 2 (Offset address = 513)

Bit position	Description
Bit 15	Reserved
Bit 14	Reserved
Bit 13	Reserved
Bit 12	Reserved

Bit 11	Reserved
Bit 10	Reserved
Bit 9	Reserved
Bit 8	Reserved
Bit 7	Reserved
Bit 6	Reserved
Bit 5	Reserved
Bit 4	Reserved
Bit 3	Reserved
Bit 2	Reserved
Bit 1	Reserved
Bit 0	Force scan

NOTE:

- *As soon as Bit 0 (**FORCE SCAN)** is set from "0" to "1", the AIMS creates a new Live list by scanning for all slave address from 1 to HIGHEST STATION ADDRESS (max 240). All slaves found are listed then in a live list (see clause 2.4.11 page 22)*
- *Status information above live list: The no. of actuators in this live list has to match the no. of actuators (which is to be either with output command AIMS part 1 or AIMS SETTINGS). Otherwise the AIMS will indicate this mismatch by setting the bits 10 to 13 of 2.4.10.2 with value "0" signaling a fault in the live list.*
- *In addition to the bit 0 ("Force Scan") setting, the AIMS create a new live list during the start up procedure. The created live list is used to define the actuators that are scanned for new actuator information.*

Output command AIMS part 3 (Offset address = 514)

Bit position	Description
Bit 15 – Bit 8, high – byte	Reserved
Bit 7 – Bit 0, low – byte	Highest station address

NOTE:

- *With output command AIMS part 3, the highest Modbus slave address that is to be found during a FORCE SCAN cycle is defined. The FORCE SCAN cycle can be shortened by entering a value which is lower than 240. The value is stored in AIMS configuration.*

Output command at Offset address = 515

Bit position	Description
Bit 15 – Bit 3	Reserved
Bit 2 - Bit 0	Refer to the below table* for LCS/ESD clearing option

**LCS/ESD clearing option:*

Bit2	Bit1	Bit0	Description
0	0	1	Clear LCS/ESD at Loop1
0	1	0	Clear LCS/ESD at Loop2
1	0	0	Clear LCS/ESD at Loop3
1	1	1	Clear LCS/ESD at Loop 1,2 & 3

Output command at Offset address = 516 (ESD command)

Bit position	Value
Bit 15 – Bit 1	0
Bit 0	1

2. **Output commands to AIMS (access via coils - FC: 05, 15, 01)**

Modbus function	Function code	Offset address	Data content (Descriptions)
Force Single Coil Force Multiple Coils Read Coil Status	05 15 01	0	Output command actuator 1 remote OPEN
		1	Output command actuator 1 remote CLOSE
		2	Output command actuator 1 remote SETPOINT
		3	Output command actuator 1 remote STOP
		4	Reserved
		5	Reserved
		6	Reserved
		7	Reserved
		8	Output command actuator 2 remote OPEN
		9	Output command actuator 2 remote CLOSE
		10	Output command actuator 2 remote SETPOINT
		11	Output command actuator 2 remote STOP
		12-15	Reserved

Modbus function	Function code	Offset address	Data content (Descriptions)
		16	Output command actuator 3 remote OPEN
		17	Output command actuator 3 remote CLOSE
		18	Output command actuator 3 remote SETPOINT
		19	Output command actuator 3 remote STOP
		…	…
		1008	Output command actuator 127 remote OPEN
		1009	Output command actuator 127 remote CLOSE
		1010	Output command actuator 127 remote SETPOINT
		1011	Output command actuator 127 remote STOP
		1012-15	Reserved
		…	…
		1968	Output command actuator 240 remote OPEN
		1969	Output command actuator 240 remote CLOSE
		1970	Output command actuator 240 remote SETPOINT
		1971	Output command actuator 240 remote STOP

3. **Input information from AIMS (access via input registers –FC:04)**

Modbus function	Function code	Offset Address	Data content (Descriptions)
Read Input Register	04	0	Input information actuator 1 part 1
		1	Input information actuator 1 part 2
		2	Input information actuator 1 part 3
		3	Input information actuator 2 part 1
		4	Input information actuator 2 part 2
		5	Input information actuator 2 part 3
		…	…
		378	Input information actuator 127 part 1
		379	Input information actuator 127 part 2
		380	Input information actuator 127 part 3
		…	…
		717	Input information actuator 240 part 1
		718	Input information actuator 240 part 2
		719	Input information actuator 240 part 3

Description

Input information actuator x part 1 (first offset address = 0 [for actuator 1]):

Bit position	Description
Bit 15	Fault indication
Bit 14	Warning indication
Bit 13	Running CLOSE
Bit 12	Running OPEN
Bit 11	LCS/ESD
Bit 10	Setpoint reached
Bit 9	Closed position
Bit 8	Open position
Bit 7	TSC (Torque Switch Close)
Bit 6	TSO (Torque Switch Open)
Bit 5	LSC (Limit Switch Close)
Bit 4	LSO (Limit Switch Open)
Bit 3	Local switch position
Bit 2	Remote switch position
Bit 1	Loss of phase
Bit0	Thermo switch Trip

Input information actuator x part 2 (first offset address = 1 [for actuator 1]):

Bit position	Description
Bit 15 – Bit 8, high – byte	Actuator position high-byte
Bit 7 – Bit 0, low – byte	Actuator position low-byte

Input information actuator x part 3 (first offset address = 2 [for actuator 1]):

Bit position	Description
Bit 7 – 15	Reserved
Bit 6	Communication through loop-3
Bit 5	Communication through loop-2
Bit 4	Communication through loop-1
Bit 3	No communication (set to ‘1’, if the actuator can neither be accessed via channel A nor via channel)

Bit 2	Communication channel B (set to '1', if actuator communicates using channel B)
Bit 1	Communication channel A (set to '1', if actuator communicates using channel A)
Bit 0	DCS/AIMS (set to '1' if the actuator accepts commands from AIMS interface and '0' if DCS commands are accepted

4. **Input information from AIMS (Read discrete Inputs – FC: 02)**

MODBUS function	**Function code**	**Offset address**	**Data content *default* setting** (descriptions)
READ INPUT STATUS	02	0	FAULT indication actuator 1
		1	OPEN position actuator 1
		2	CLOSED position actuator 1
		3	REMOTE switch position actuator 1
		4	TSO (DOL) Torque switch OPEN operated act. 1
		5	TSC (DSR) Torque switch CLOSE operated act. 1
		6	FAULT indication actuator 2
		7	OPEN position actuator 2
		8	CLOSED position actuator 2
		9	REMOTE switch position actuator 2
		10	TSO (DOL) Torque switch OPEN operated act. 2
		11	TSC (DSR) Torque switch CLOSE operated act. 2
		….	**…..**
		1476	FAULT indication actuator 240
		1477	OPEN position actuator 240
		1478	CLOSED position actuator 240
		1479	REMOTE switch position actuator 240
		1480	TSO (DOL) Torque switch OPEN operated act. 240
		1481	TSC (DSR) Torque switch CLOSE operated act. 240

5. **Status of loop communication of AIMS:** The AIMS monitors the status of the loop connection and updates the status accordingly.

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3501	Bit 15 Bit 14	ACTUATOR with break of strip/short circuit LOOP A1 & B1 Communication between MASTER and STAND-BY
			Bit 13 Bit 12	RESERVED RESERVED
			Bit 11 Bit 10	RESERVED RESERVED
			Bit 9 Bit 8	STAND-BY AIMS communicates with host system MASTER AIMS communicates with host system
			Bit 7 Bit 6	STAND-BY AIMS communicates with the actuators by using loop B1 STAND-BY AIMS communicates with the actuators by using loop A1
			Bit 5 Bit 4	MASTER AIMS communicates with the actuators by using loop B1 MASTER AIMS communicates with the actuators by using loop A1
			Bit 3 Bit 2	LOOP B1 OF STAND-BY AIMS has no faults LOOP A1 OF STAND-BY AIMS has no faults
			Bit 1 Bit 0	LOOP B1 OF MASTER AIMS has no faults LOOP A1 OF MASTER AIMS has no faults
Read Input Register	04	3502	Bit 15 Bit 14	ACTUATOR with break of strip/short circuit LOOP A2 & B2 Communication between MASTER and STAND-BY
			Bit 13 Bit 12	RESERVED RESERVED
			Bit 11 Bit 10	RESERVED RESERVED
			Bit 9 Bit 8	STAND-BY AIMS communicates with host system MASTER AIMS communicates with host system

			Bit 7 Bit 6	STAND-BY AIMS communicates with the actuators by using loop B2 STAND-BY AIMS communicates with the actuators by using loop A2
			Bit 5 Bit 4	MASTER AIMS communicates with the actuators by using loop B2 MASTER AIMS communicates with the actuators by using loop A2
			Bit 3 Bit 2	LOOP B2 OF STAND-BY AIMS has no faults LOOP A2 OF STAND-BY AIMS has no faults
			Bit 1 Bit 0	LOOP B2 OF MASTER AIMS has no faults LOOP A2 OF MASTER AIMS has no faults
Read Input Register	04	3503	Bit 15 Bit 14	ACTUATOR with break of strip/short circuit LOOP A3 & B3 Communication between MASTER and STAND-BY
			Bit 13 Bit 12	RESERVED RESERVED
			Bit 11 Bit 10	RESERVED RESERVED
			Bit 9 Bit 8	STAND-BY AIMS communicates with host system MASTER AIMS communicates with host system
			Bit 7 Bit 6	STAND-BY AIMS communicates with the actuators by using loop B3 STAND-BY AIMS communicates with the actuators by using loop A3
			Bit 5 Bit 4	MASTER AIMS communicates with the actuators by using loop B3 MASTER AIMS communicates with the actuators by using loop A3
			Bit 3 Bit 2	LOOP B3 OF STAND-BY AIMS has no faults LOOP A3 OF STAND-BY AIMS has no faults
			Bit 1 Bit 0	LOOP B3 OF MASTER AIMS has no faults LOOP A3 OF MASTER AIMS has no faults

6. **Status of communication of AIMS with DCS & actuators:** The AIMS monitors and updates the status of communication with DCS and actuators. The information is made available in the following registries.

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3504	Bit 15	STAND-BY AIMS No communication to DCS channel
			Bit 14 Bit 13	Reserved MASTER AIMS no communication to DCS channel
			Bit 12 Bit 11 Bit 10	Reserved STAND-BY AIMS no communication to actuators via B1 STAND-BY AIMS no communication to actuators via A1
			Bit 9 Bit 8	MASTER AIMS no communication to actuators via B1 MASTER AIMS no communication to actuators via A1
			Bit 7 Bit 6	Reserved Reserved
			Bit 5 Bit 4	MODBUS ESD excited from DCS MODBUS ESD excited from HMI
			Bit 3 Bit 2	Act. accepts commands from the AIMS AIMS system is ready
			Bit 1 Bit 0	STAND-BY AIMS is active MASTER AIMS is active
Read Input Register	04	3505	Bit 15	STAND-BY AIMS No communication to DCS channel
			Bit 14 Bit 13	Reserved MASTER AIMS no communication to DCS channel
			Bit 12 Bit 11 Bit 10	Reserved STAND-BY AIMS no communication to actuators via B2 STAND-BY AIMS no communication to actuator via A2
			Bit 9 Bit 8	MASTER AIMS no communication to actuators viaB2 MASTER AIMS no communication to actuators viaA2
			Bit 7 Bit 6	Reserved Reserved

			Bit 5 Bit 4	MODBUS ESD excited from DCS MODBUS ESD excited from HMI
			Bit 3 Bit 2	Act. accepts commands from the AIMS AIMS system is ready
			Bit 1 Bit 0	STAND-BY AIMS is active MASTER AIMS is active
Read Input Register	04	3506	Bit 15	STAND-BY AIMS No communication to DCS channel
			Bit 14 Bit 13	Reserved MASTER AIMS no communication to DCS channel
			Bit 12 Bit 11 Bit 10	Reserved STAND-BY AIMS no communication to actuators via B3 STAND-BY AIMS no communication to actuators via A3
			Bit 9 Bit 8	MASTER AIMS no communication to actuators via B3 MASTER AIMS no communication to actuators via A3
			Bit 7 Bit 6	Reserved Reserved
			Bit 5 Bit 4	MODBUS ESD excited from DCS MODBUS ESD excited from HMI
			Bit 3 Bit 2	Act. Accepts commands from the AIMS AIMS system is ready
			Bit 1 Bit 0	STAND-BY AIMS is active MASTER AIMS is active

7. **Total number of actuators found in each loop by the Master (on Loop1,2,3 of port A)**

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3507	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on A1
Read Input Register	04	3508	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on A2
Read Input Register	04	3509	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on A3

8. **Total number of actuators found in each loop by the Master (on Loop1, 2, 3 of port B)**

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3510	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on B1
Read Input Register	04	3511	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on B2
Read Input Register	04	3512	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by MASTER on B3

9. **Total number of actuators found in each loop by the Standby station (on Loop1,2,3 of port A)**

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3513	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on A1
Read Input Register	04	3514	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on A2
Read Input Register	04	3515	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on A3

10. **Total number of actuators found in each loop by the Standby station (on Loop1,2,3 of port B)**

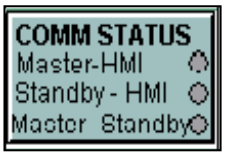
Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3516	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on B1
Read Input Register	04	3517	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on B2
Read Input Register	04	3518	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved No. of actuators found by STANDBY on B3

11. **Generation of Live List:** AIMS will list all the actuator addresses that were found during the scan procedure (system boot or command FORCE SCAN) starting with input information AIMS live list. The addresses found are listed without a specific order. If the communication to one actuator is lost the forming gap is filled by shifting all succeeding values towards the first entry.

Modbus Function	Function Code	Offset Address	Bit Position	Data Content
Read Input Register	04	3521 to 3600	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved Actuator address low-byte for loop 1 (A1 & B1) (Actuators 1-80)
Read Input Register	04	3601 to 3680	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved Actuator address low-byte for loop 2 (A2 & B2) (Actuators 81-160)
Read Input Register	04	3681 to 3760	Bit 15 – Bit 8, high – byte Bit 7 – Bit 0, low - byte	Reserved Actuator address low-byte for loop 3 (A3 & B3) (Actuators 161-240)

VI. TROUBLESHOOTING

1. Communication Status (displayed on the Main Window) is blinking with RED & GREEN indication:



   Reason: No communication between Processors & HMI or between 2 processors.
   Remedy:
   - If Processor has gone to error mode, RESTART the Master Station
   - Check for any damage in the cable between Processors & HMI or between 2 processors

2. RED CROSS on grey bitmap of the actuator (displayed on the Main Window)

   Reason: No communication between Master Station & Actuator
   Remedy:
   - Check for the availability of the actuator (with relevant communication setting) in that particular loop
   - Check for interchangeability of TX & RX line of RS-485 link
   - Check for any damage in the cable between the Master Station & Actuator
   - Check for the failure in the actuator

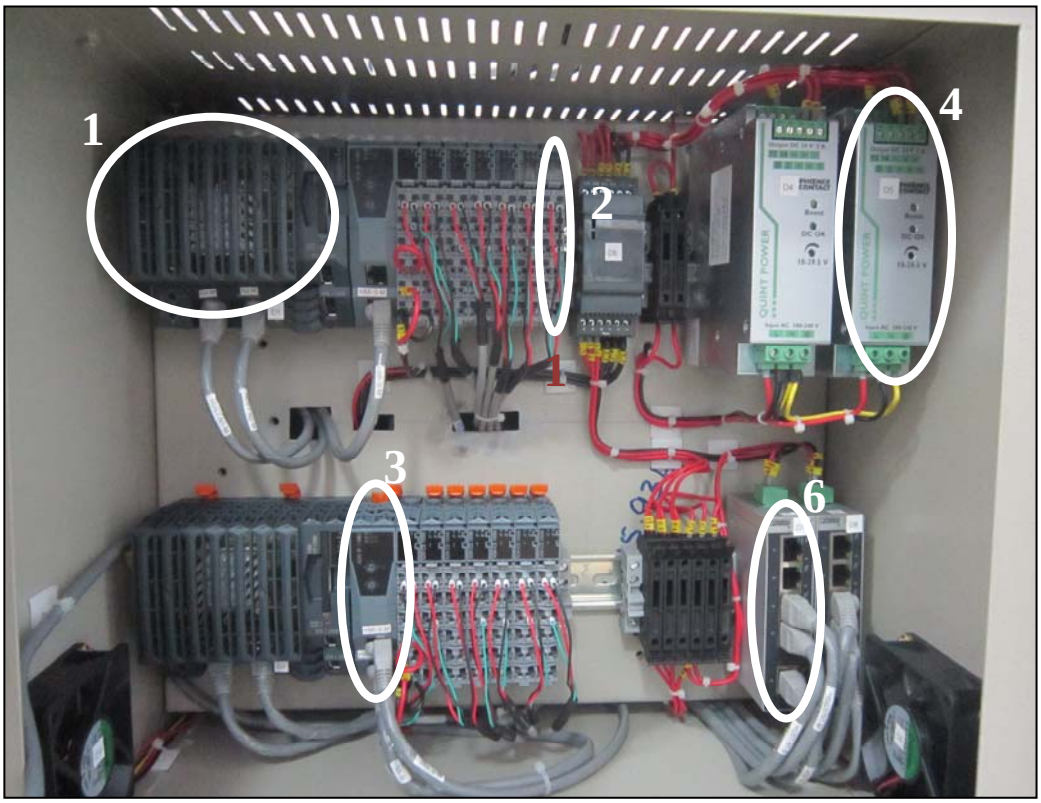
3. Index number (displayed on the Main Window) is not updating

   Reason: Command excited on the particular actuator
   Remedy:
   - Terminate the Command via DCS
   - Restart the Master Station
   - Go to DLL list window, select the index & terminate the command using the HMI screen (applicable only for the new Code Version)

4. HMI screen not accepting any user command
   Reason: Over temperature for the HMI screen
   Remedy: Shut down the Master Station, wait few minutes for HMI to cool down & then RESTART the Master Station

5. ESD command excitation is visible on HMI, but the command is not reaching the actuator
   Reason: Loop is hanged
   Remedy: Configure at least 2 actuators in each loop even though; physically there are no actuators present

VII. SPARE PARTS



SL. NO.	SPARE PART DESCRIPTION	CONTENTS	ARTICLE NO	QTY USED (FOR COMPLETE REDUNDANCY FEATURE)
1	CPU CARD FOR MASTER STATION	PROCESSOR MODULE	K215.783	2
2	2 WIRE COMMUNICATION CARD	RS485 INTERFACE CARD WITH BASE MODULE & TERMINAL BLOCK	K215.786+ K215.788+ K215.789	12
3	HOST COMMUNICATION CARD	INTERFACE MODULE	K215.785	2
4	POWER SUPPLY CARD	POWER SUPPLY UNIT	K215.923	2
5	HMI	TOUCHSCREEN 10.4" DISPLAY WITH FLASH CARD & CONNECTOR	K215.790+ K215.791+ K215.792	2
6	NETWORK HUB	ETHERNET SWITCH/HUB	K215.924	3

NAME PLATE DETAILS:

Identify the location of the name plate sticker on the AIMS (at two places) which is as shown below;

IDENTIFICATION STICKERS (EXTERNAL & INTERNAL) AT THE RIGHT SIDE OF THE AIMS

auma india pvt ltd

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Pune Branch:
712,713, Bldg.No. 1,
"Siddharth towers",
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