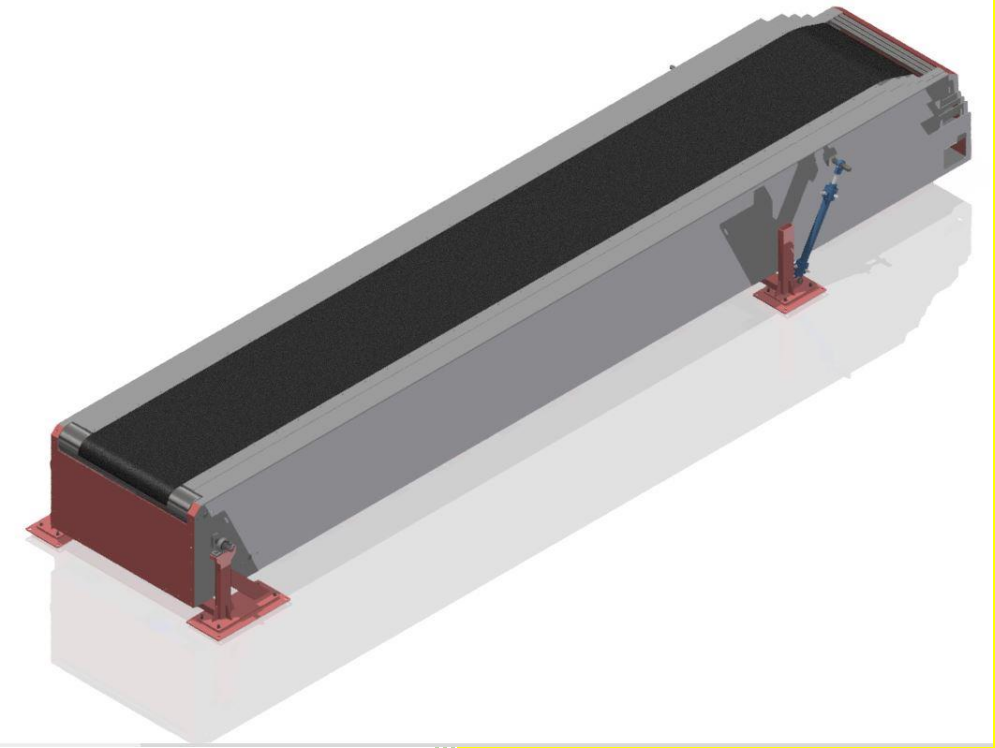
2020

TECHNICAL SPECIFICATIONS



Author	Date	Revision	Comments
JGL	2020/05/25	Rev1.00	Draft Document

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4/28/2020

AM LE Automation Machinery & Logistics Equipment

Contents

Introduction

The document describes the control system for the telescopic

The document is limited to the standard protocols and interfacing that is available on the control boards shipped with the machines.

Electrical specifications

- Supply requirement 40A 3Ph + Neutral & Earth
- Belt Variable speed drive 2.2Kw 3Ph 380VAC
- Extend & Retract variable speed drive 0.75Kw 3Ph 380VAC
- Hydraulic Power pack Contactor 2.2Kw 3Ph 380VAC (****Optional**)
- Control circuit 24VDC Master controller and slave station

Control system

The system consist of two controller stations, the main controller is mounted in the control panel at the back of the Telescopic conveyor and controls two variable speed drives, one for the belt and the other for the extension and retraction of the telescopic conveyor. The main controller communicates wirelessly to the slave controller mounted at the front of the telescopic.

Figure 1 - Control panel mounting

1.1 Main controller

1.1.1 Touch screen interface

The TELESCOPIC station connects to a 7" full color, 800 by 480 pixel, touch sensitive display which is used to display information and to control and setup the station. The display requires a 9v to 36v power supply. Most of the controls for the conveyor is done via the touch panel the following controls are available.

Description	Purpose
Belt Forward	Belt will run forward
Belt Reverse	Belt will run in reverse
Belt Stop	Belt will stop
Telescopic extend	Telescopic will extend till limit is reached or button is pressed.
Telescopic retract	Telescopic will retract till limit is reached or button is pressed.
Increment slope	Slope will increment till limit is reached or button is released.
Decrement slope	Slope will decrement till limit is reached or button is released.
Local / Remote	When local machine cannot be controlled from output commands.

1.1.2 Digital Inputs

All inputs are isolated (greater than 2500v) and each of them can be connected to their own ground. Digital inputs are protected against surges and reverse wiring and are low pass filtered to reduce their susceptibility to noise. Input voltage levels can be between 4.5v and 60v for logic high. A debounce time of 10mS is applied to the inputs which means that a new level must be present for at least 10mS before being recognized.

Digital IO number	Description	Input Type	Part Number
DI-01	Estop channel 1		
DI-02	Estop channel 2		
DI-03	Fully retracted Sensor	Inductive sensor	E2A-M12-KS08
DI-04	Chain slack detection	Inductive sensor	E2A-M08-KS04
DI-05	Stuck parcel detection sensor		
DI-06	Buffer sensors		
DI-07	Remote Stop for Buffer control	Signal from external system to allow stoppage of conveyor	
DI-08	Spare		

1.1.3 Digital Outputs

There are eight digital outputs which switch at the power supply voltage, these outputs can supply 200mA each and share a common with the power supply ground. These inputs are surge, short circuit and over current protected.

Digital IO number	Description	Output Type	Part Number
DO-01	Siren	Buzzer Relay	
DO-02	Tower Red Lamp	Alarm indication	
DO-03	Tower Yellow Lamp	System is starting, extending or retracting.	
DO-04	Tower Green Lamp	System is running.	
DO-05	Hydraulic Pump Start	Starting Hydraulic pump	
DO-06	Cylinder extend		
DO-07	Cylinder retract		
DO-08	Spare		

DO-01 – Sound Continues during extending and retracting, Intermediate buzzing during alarm conditions.

1.1.4 Serial interface

The main controller has two serial ports which can be set up to be RS232 or RS485. Each port can be configured for streaming ASCII data, or interrogated by making using of Modbus commands which will be explained later in this document.

1.1.5 Ethernet/TCP

Ethernet/TCP is available for communicating with the main control system this is defined later in the document.

1.1.6 Other features

The main controller has a battery backed real time clock to allow accurate time date stamps. There is an on board temperature controller used for health and diagnostic purposes. Non-volatile memory is used to store diagnostic information such as belt running hours.

1.2 Slave controller

The slave controller is installed at the end of the Telescopic conveyor which will be equipped with the following digital IO signals.

1.2.1 Digital inputs

Digital IO number	Description	Comment	Part Number
DI-01	FWD Selector switch	Forward control for belt running direction	
DI-02	REV selector switch	Reverse control for belt running direction	
DI-03	Joystick up	Increase the slope of the conveyor.	
DI-04	Joystick down	Decrease the slope of the conveyor	
DI-05	Joystick Forward	Extend the conveyor	
DI-06	Joystick Reverse	Retract the conveyor	
DI-07	Stop Button	Stop the movement of the belt	
DI-08	Reset Button	Reset in case of error	
DI-09	Front bumper limit switch	Sensors to stop movement once front bumper is touched	
DI-10	Product detection sensor	Sensor to detect product being loaded onto conveyor	
DI-11	Front Estop Channel 1	Dual Estop channel	
DI-12	Front Estop Channel 2	Dual Estop channel	
DI-13	Fully extended	Full extend position	
DI-14	Spare		
DI-15	Spare		

1.2.2 Digital outputs

Digital IO number	Description	Comment	Part Number
DO-01	Start Button LED	Indicated belt is running	
DO-02	Stop Button LED	Solid Red – Stopped Blinking Red - Error	
DO-03	LED light output	Control left side light	Special outputs (High current)
DO-04	LED Light output	Control right side light.	Special outputs (High current)
DO-05	Spare		
DO-06	Spare		

1.3 Communicating with the main control system

The master unit has an Ethernet port which can be used to communicate to a main control system such as a PC. The main control unit can read the status of the telescopic or write some commands to the telescopic through this port.

The Ethernet port is configured via the touch screen and is set up in slave mode with a default port number of 8100. The IP address is also configured in this screen. A standard Modbus protocol is used to read and write to the telescopic.

To communicate with the telescopic, the main control system needs to be set up to be an Ethernet client, it will open a socket when it needs to communicate and close the socket when communication is finished.

1.3.1 Read status

The following statuses can be read:

	Types A-B Trucks Unloading	Types C-D Trucks Reloading
Telescopic Ready status	X	X
Telescopic FAULT (Normally Closed)	X	X
Telescopic "Start" push-button	X	X
Telescopic "Stop" push-button (Normally Closed)	X	X
Telescopic "Reset" push-button	X	X
Telescopic "Buffer" sensor signal	X	
Telescopic "parcel size out of spec" alarm (Normally Closed)	X	
Telescopic "Extended and retracted" sensor condition		X
Telescopic Emergency Status (Normally Closed, redundancy signal)	X	X

Telescopic Ready status:

- The signal goes ON and stay ON until the telescopic is ready to operate.
- The signal goes OFF and stay OFF as soon as the telescopic belt stops or it is in Maintenance mode / e-stops / local stop / crash barrier / any fault condition.

Telescopic FAULT status:

- The signal goes ON and stay ON until the telescopic device is ready to operate.
- The signal goes OFF and stay OFF as soon as the telescopic is powered-off, a circuit breaks, a motor thermal protection trips, a safety protection breaks, and e-stop condition is active, etc.)

Telescopic "Start" push-button:

- The signal echoes the Start push-button.

Telescopic "Stop" push-button:

- The signal echoes the Stop push-button (Normally Closed, OFF when pressed).

Telescopic "Reset" push-button:

- The signal echoes the Reset push-button.

Telescopic "Buffer" sensor copy:

- The signal echoes the buffer photo-eye.

Telescopic "Out of Spec" sensor copy:

- Parcel Out of Range either to high or too wide.

Telescopic "Store and Forward" sensor copy:

- The signal echoes the Extended or retracted limits.

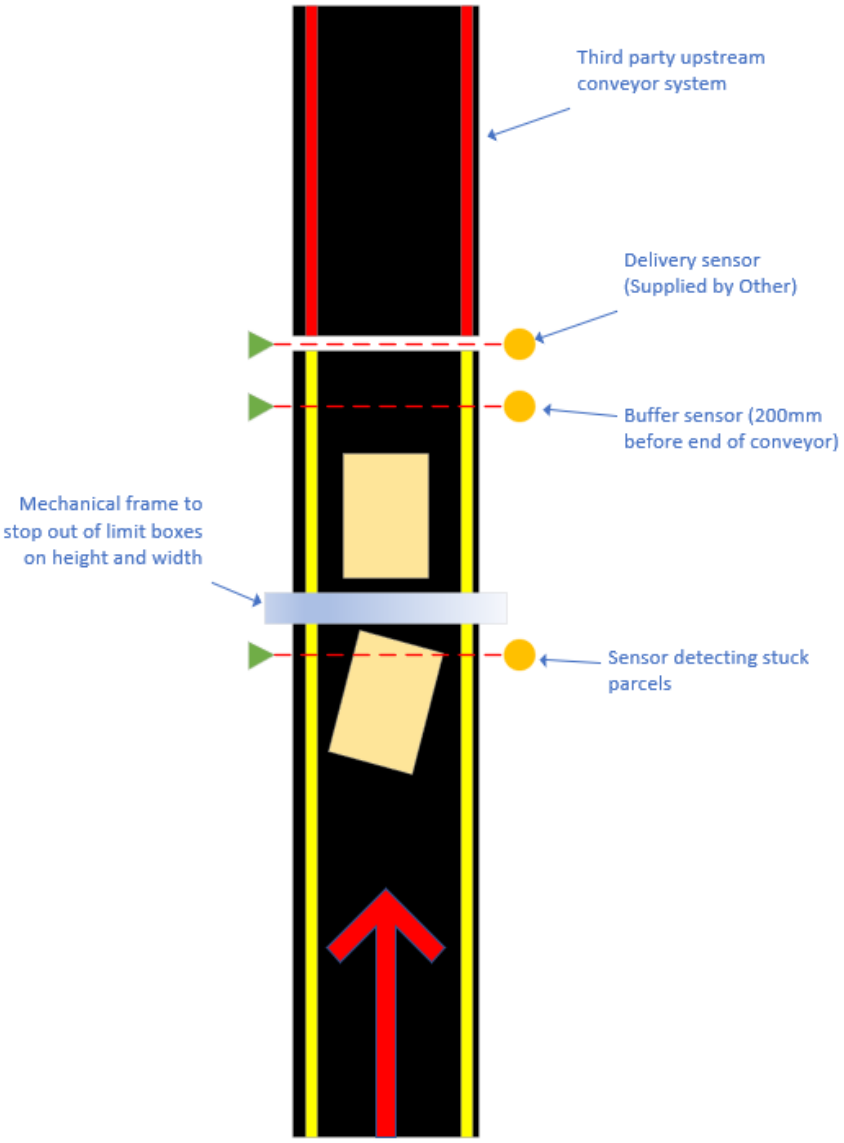


Figure 2 - Buffer and sensor logic

1.3.2 Write command

The main control system can command the telescopic to implement the following:

	Types A-B Trucks Unloading	Types C-D Trucks Reloading
Request to Suspend / Resume Telescopic belt	X	X
Alarm Reset	X	X

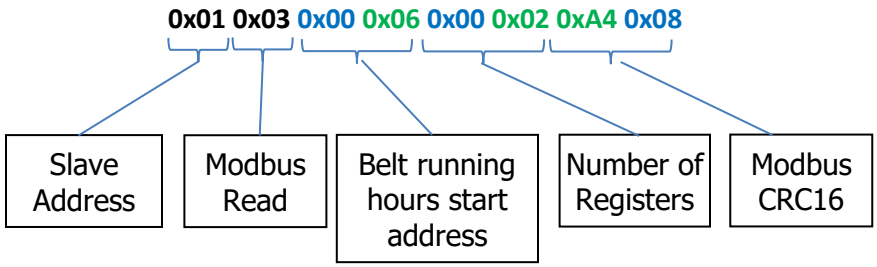
1.4 Modbus command protocols

Modbus registers

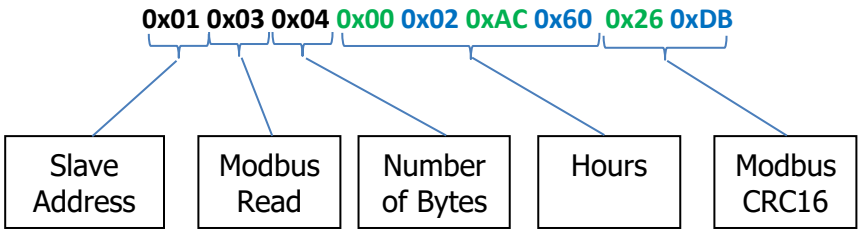
Status can be read from the telescopic station and commands can be written to the telescopic station through the Ethernet/IP or Ethernet server ports using the Modbus RTU protocol. The telescopic station is a Modbus slave with a default address of 0x01, this address can be changed in the system setup screen.

1.4.1 Modbus read

Status is read only and is read most significant byte first, an example of the Modbus communication between the main control system to the telescopic will look like:



If the conveyor has run for 175000 hours (2AC60 in hex), the telescopic will send the following back to the master:



1.4.1.1 Status registers

1.4.1.2

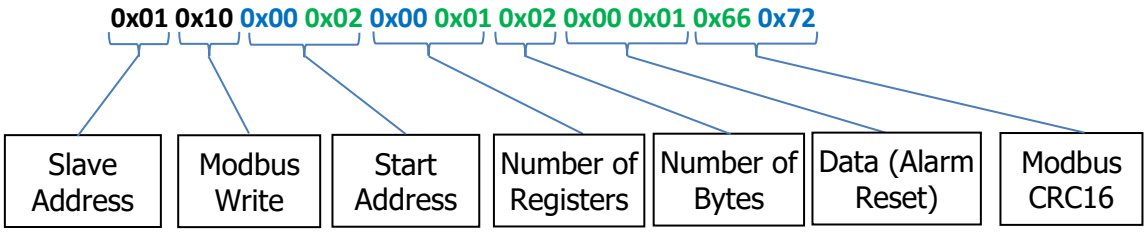
Address	Data		Type of Data	Number of Registers	Format	Read/Write	Comment
	MSB	LSB					
0x0000			Heartbeat	2	Int	Read	Incrementing
0x0002			Date/Time	2	ascii	Read	LCD Date Time
0x0004			Alarms / Status	2	Hex	Read	Alarm / Status
0x0006			Belt Running Hours	2	Int	Read	Actual Running hours
0x0008			Reserved	2	Int	Read	Future
0x0010			Reserved	2	Int	Read	Future
0x0012			Reserved	2	Int	Read	Future
0x0014			Reserved	2	Int	Read	Future
0x0016			Reserved	2	Int	Read	Future
0x0018			Reserved	2	Int	Read	Future
0x0020			Reserved	2	Int	Read	Future

Alarms / Status

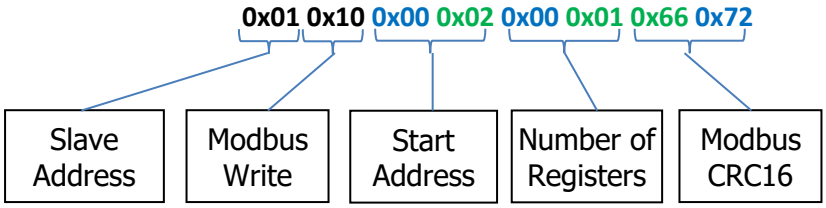
Bit	Description	Value
0	Telescopic Ready status	High when ready
1	Telescopic FAULT	High when no fault
2	Telescopic "Start" push-button	High when button is pressed
3	Telescopic "Stop" push-button	Low when button is pressed
4	Telescopic "Reset" push-button	High when button is pressed
5	Telescopic "Buffer" sensor signal	High when sensor is made
6	Telescopic "parcel out of range" alarm	Low when out of range
7	Telescopic "Extended sensor"	High when extended
8	Telescopic "Retracted sensor"	High when retracted
9	Telescopic Emergency Status	Low when in Estop state
10	Spare	
11	Spare	
12	Spare	
13	Spare	
14	Spare	
15	Spare	

1.4.2 Modbus Write

Commands are write only and are written most significant byte first, an example of the Modbus communication between the main control system to the telescopic where the alarm is reset will look like:



The telescopic will send the following back to the master:



Address	Data		Type of Data	Number of Registers	Format	Read/ Write	Comment
	MSB	LSB					
0x0000	0x00	0x00	Request to Suspend / Resume Telescopic belt	2	Hex	Write	**LSB** 0x00 – resume 0x01 = suspend
0x0002	0x00	0x01	Alarm Reset	2	Hex	Write	