

Remote operator Manual

• 15P0071Q1 •
Soft Starters

ASA

AGG. 11/07/03 R. 00

English

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Elettronica Santerno is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Elettronica Santerno.
- Elettronica Santerno assumes no responsibility for the consequences resulting by the use of non original spare-parts.
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1 INTRODUCTION

1.1 Important

User Information



The Remote Operator allows remote operation of the soft starter. Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Use all International recognised standard practice for RS485 communications when installing and using this equipment.

Users are cautioned that the information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

1.2 General

The Remote Operator incorporates an RS485 serial communications facility which allows the remote control of a motor in the same way as the soft starter control function. It also acts as a gateway device for connection to an RS485 serial communications network. This allows for remote control of a motor from an RS485 serial communications network using Modbus RTU or standard AP ASCII communications protocol. These protocols are selectable.

With the Remote Operator you can start, stop, quick stop and reset trip conditions and read operational status and motor data, ie. motor current, motor temperature and trip status. There is also a 4-20 mA analogue output for motor current monitoring.

The Remote Operator is rated IP54 and NEMA 12 when installed as per instructions detailed in Sections 4.2 and 4.3 of this manual.

1.3. Manual Description

This manual describes the installation, connection, configuration and operation of the Remote Operator.

For details on soft starter compatibility refer to Section 4.5 of this manual.

Reference must be made to the ASA Users Manual where stated.



Indicates something to be noted by reader



Indicates a general warning

2 SPECIFICATION

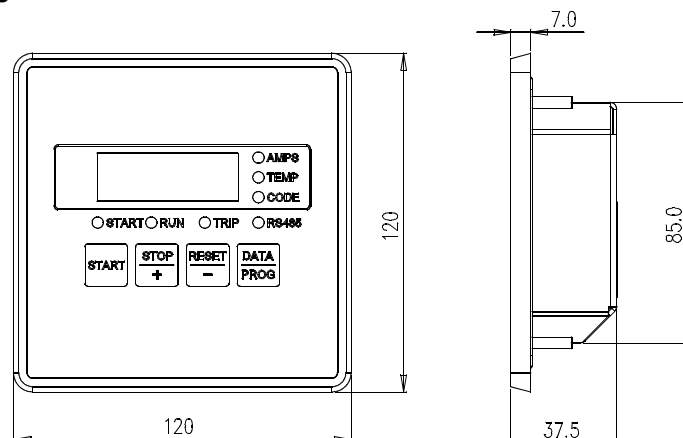
2.1 General Technical Data

Enclosure	
Front Panel Height	120 mm
Front Panel Width	120 mm
Inside Panel Depth (when mounted)	30 mm (max)
Panel Cut-out	92 mm ²
Weight	450 g
Power Supply	
Voltage	18 – 30 V DC or AC (50/60Hz)
Consumption	250 mA (max)
Connection (Terminals 1, 2)	2 pole spring clamp connector terminals
RS485 Serial Network Port (This Network Connection is Optional)	
RS485 Network Interface	AP ASCII or Modbus RTU protocol (selectable)
Connection (Terminals B6, B7, B8)	3 pole spring clamp connector terminals
RS485 Serial Starter Port (Soft Starter Connection)	
RS485 Soft Starter Interface	AP ASCII protocol as standard
Connection (Terminals B1, B2, B3)	3 pole spring clamp connector terminals
Analogue Output	
Motor Current Monitoring Interface	4 – 20 mA (max.burden 200 Ω)
Connection (Terminals B10, B11)	2 pole spring clamp connector terminals
Sundry	
Enclosure Rating	IP54 or NEMA 12 when correctly panel mounted
Pollution degree	Pollution Degree 3
Operating Temperature	- 5°C / + 60°C
Relative Humidity	5 – 95% (max non condensing)

This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

Standards Approvals	
CE	IEC 60947-4-2
UL and C-UL	UL 508
C✓	IEC 60947-4-2

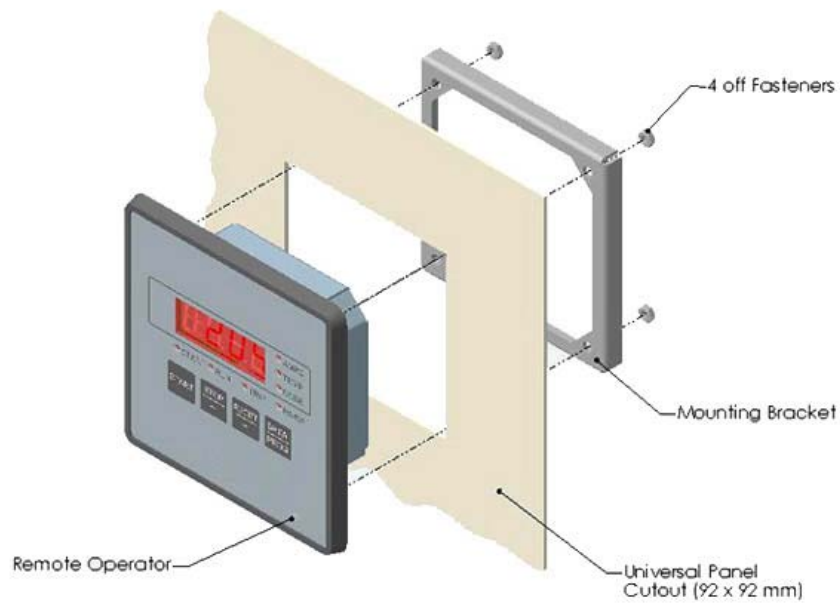
2.2 Dimensions



3 BASIC SET UP

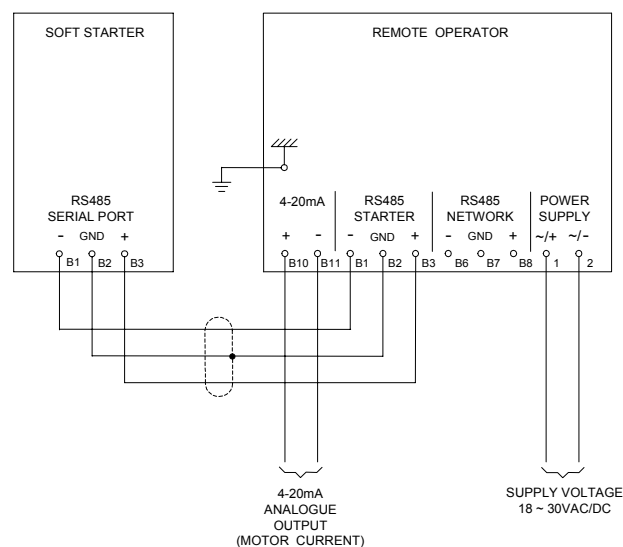
3.1 Definition If the Remote Operator is only being used with a soft starter, use the procedure detailed in this section. The Remote Operator is pre-configured to control a soft starter once control supply power is applied to these devices. No parameter adjustments are required to the Remote Operator or soft starter for basic operation.

3.2 Mounting Mount the Remote Operator as per the diagram below. A universal 92 x 92 mm panel cut out is required. For further details refer to Section 4.3 of this manual.



3.3 Electrical Connection

Once the Remote Operator is mounted, connect as per the following connection diagram. For further details refer to Section 4.4 of this manual.



CONNECTION DIAGRAM

3 BASIC SET UP

3.4 Front Panel Operation



The START, STOP and RESET pushbuttons are for motor control. Operating the STOP and RESET pushbuttons simultaneously will cause the motor to quick stop.

The DATA/PROG pushbutton when pressed momentarily changes the LED data displayed between motor current and motor temperature.

AMPS, TEMP and CODE LEDs indicate the data being displayed. START, RUN, TRIP and RS485 LEDs indicate the soft starter status.

For further details refer to Section 5.1 of this manual.

4 ADVANCED SET UP

4.1 Definition The Remote Operator can be connected to an RS485 serial communications network using AP ASCII or Modbus RTU selectable protocol. It also has a 4-20 mA analogue output for motor current monitoring. If these features are being used refer to the following details in this section.

4.2 Installation Sequence

To install the Remote Operator use the following procedure.

- Mount the Remote Operator at its intended location
- Connect the external power supply to the Remote Operator and the soft starter
- Connect the Remote Operator RS485 Starter port to the soft starter
- Connect the Remote Operator RS485 Network port to a serial communications network
- Configure the soft starter
- Configure the Remote Operator

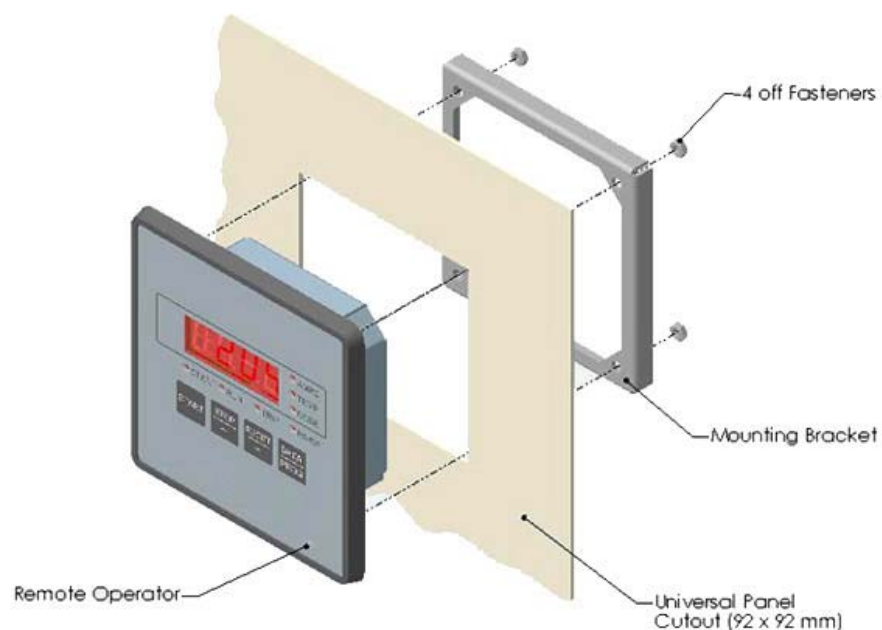
4.3 Mounting

The Remote Operator is rated IP54 or NEMA 12 * when mounted correctly as per these instructions. It is intended for use on the flat surface of a panel with all external wiring connected from behind the panel.

The Remote Operator is supplied with a mounting bracket and 4 fasteners. The built in gasket seal guarantees protection from outside the panel.

Choose the panel location of the Remote Operator. The required panel cut out is 92 x 92 mm. Place the Remote Operator through the cut out and locate the mounting bracket at the rear of the panel onto the 4 studs. Use the 4 fasteners to tighten the mounting bracket up to the rear of the panel.

* For use on a flat surface of a NEMA 1 or NEMA 12 enclosure.



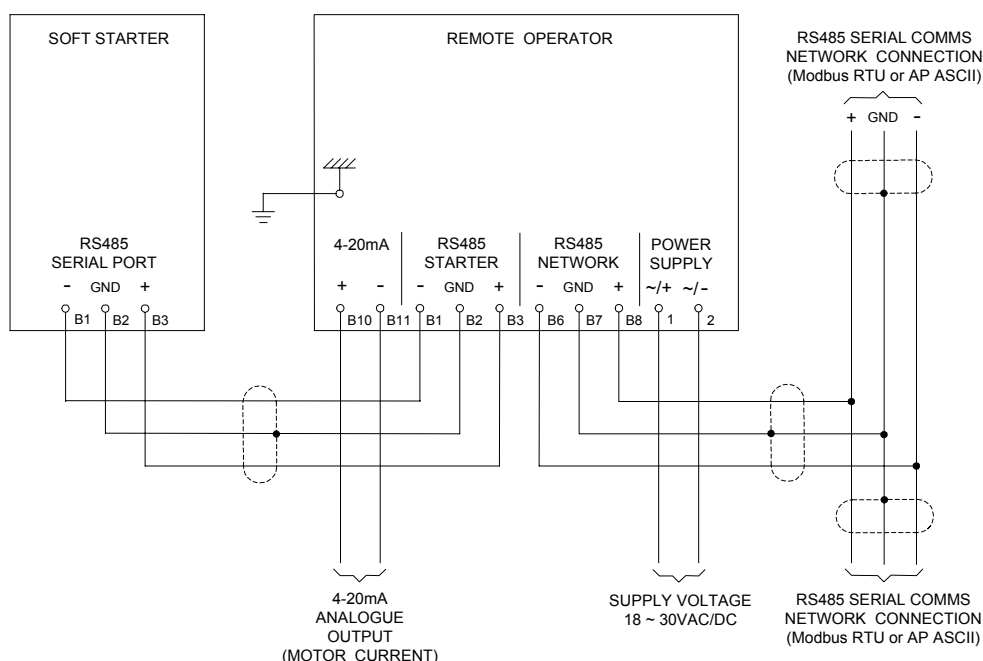
4 ADVANCED SET UP

4.4 Electrical Connection

The Remote Operator requires a minimum of three electrical connections – the external power supply, the chassis earth and the RS485 Starter port to the soft starter. When a serial communications network is being used, connect the RS485 Network port to the network. When the 4-20 mA output is being used connect to terminals B10 and B11.

Once the Remote Operator is mounted connect as per the following connection diagram.

All external wiring, except the chassis earth, (M4 stud provided) is connected to spring operated clamp connector terminals with a maximum wire size of 2.5 mm². No special tools are required.



CONNECTION DIAGRAM

Refer to the relevant sections of the ASA Users Manual for details.

4.5 Soft Starter Compatibility

The following table details soft starter compatibility when using the Remote Operator.

Soft starter model	Serial number format	Compatibility
ASA	xxxxx-3	fully compatible
ASA	xxxxx-2	see details below
ASA	xxxxx-1	non-compatible

4 ADVANCED SET UP

ASA models identified by unit serial number xxxxx-2 are limited such that;

- The Forced Communications Trip feature (display code H) is not available when networking.
- ASA trip codes C (RS485 Time Out), L (FLC Out of Range), U (CPU Fault) and Y (Incorrect Control Module) are displayed as 1- on the Remote Operator. These trip codes are displayed correctly on the soft starter front panel.



Consult your local supplier if the Remote Operator is to be used with a non-compatible soft starter.

4.6 Configuring the Soft Starter

No soft starter configuration is required unless RS485 Time Out Protection between the Remote Operator and soft starter is required.



The Remote Operator to soft starter Baud Rate (9,600 baud) and Satellite Address (20) are fixed within the Remote Operator. These parameters are default set within the soft starter.

The soft starter should be set for local operation only when using the Remote Operator.



For soft starter configuration details and set up procedures refer to the ASA Users Manual.

4.7 Configuring the Remote Operator



If the Remote Operator is not being used with a serial communications network no configuration of the Remote Operator is necessary unless the 4-20 mA analogue output is required.

When configuring the Remote Operator it must be powered up with the soft starter in the “off” mode.

When the Remote Operator is being used with a serial communications network configure the Remote Operator RS485 Network Baud Rate and Satellite Address to match that of the network. The Remote Operator RS485 Network Time Out protects the link between the Remote Operator and the serial communications network. Set this as required.

The Remote Operator to serial communications network protocol is default set for AP ASCII. This can be selected to Modbus RTU protocol. Set as required along with the Modbus Parity if applicable.

When the Remote Operator 4-20mA analogue output is being used set the Motor FLC and Analogue Output 4mA Offset parameters to suit the application.



Refer to parameter list and programming procedure in Section 5.2 of this manual.

5 OPERATION & PROGRAMMING

5.1 Front Panel Operation



The Remote Operator performs all soft starter functions except programming of the soft starter. The Remote Operator can only be used to program its own user adjustable parameters. Uploading and downloading of the soft starter parameters is achieved locally at the soft starter or through the serial communications network if connected.

The Remote Operator has four pushbuttons. Three are for motor control. These are START, STOP and RESET. Operating the STOP and RESET pushbuttons simultaneously will cause the motor to quick stop. Operation of the motor can be achieved using the Remote Operator pushbuttons and commands from the serial communications network together.

The DATA/PROG pushbutton has three functions:

If it is pressed momentarily it changes the LED data displayed between motor current and motor temperature.

If there is a problem with the serial communications network, the Remote Operator display will be cleared by momentarily pressing the DATA/PROG pushbutton.

If it is pressed for more than 4 seconds the Remote Operator will enter programming mode. This can only occur when the motor is not running, ie, "off".

The LED data display indicates motor current, motor temperature or a trip code in the event of a soft starter trip. If a trip code is displayed the CODE data display LED (Red) will illuminate. During normal operation the Remote Operator will display motor current or motor temperature. This is indicated by the AMPS or TEMP data display LED (Red) being illuminated.

There are three motor status LEDs that indicate the operating condition of the soft starter. The START LED (Green) indicates that the soft starter is starting, running or stopping. The RUN LED (Green) indicates that the soft starter is providing full voltage to the motor. The TRIP LED (Red) indicates that the soft starter has tripped.

There is an RS485 status indication LED (Green) which shows the condition of the serial link between the Remote Operator and the soft starter. When this is illuminated the condition is healthy. When it is flashing there has been loss of communication.



5 OPERATION & PROGRAMMING

5.2 Programming

The Remote Operator can only be used to change its own user adjustable parameters. Adjustment to the soft starter parameters must be made locally at the soft starter or remotely using the serial communications network.

The Remote Operator has 7 user adjustable parameters. These parameters relate to the Remote Operator to serial communication network connection and the 4-20 mA analogue output. Programming can not be carried out while the soft starter is running. Use the STOP/+ , RESET/- and DATA/PROG pushbuttons to program parameter settings.

Use the following procedure.

- To enter program mode, hold down the DATA/PROG pushbutton for 4 seconds.
- Parameter 1 (RS485 Network Baud Rate) setting is automatically displayed. To adjust parameter 1, press the STOP/+ or RESET/- pushbuttons. To store parameter 1 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 2 (RS485 Network Satellite Address) setting will be automatically displayed. To adjust parameter 2, press the STOP/+ or RESET/- pushbuttons. To store parameter 2 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 3 (RS485 Network Time Out) setting will be automatically displayed. To adjust parameter 3, press the STOP/+ or RESET/- pushbuttons. To store parameter 3 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 4 (RS485 Network Protocol) setting will be automatically displayed. To adjust parameter 4, press the STOP/+ or RESET/- pushbuttons. To store parameter 4 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 5 (Modbus Protocol Parity) setting will be automatically displayed. To adjust parameter 5, press the STOP/+ or RESET/- pushbuttons. To store parameter 5 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 6 (Motor FLC) setting will be automatically displayed. To adjust parameter 6, press the STOP/+ or RESET/- pushbuttons. To store parameter 6 setting and advance to the next parameter, press the DATA/PROG pushbutton.
- Parameter 7 (Analogue Output 4 mA Offset) setting will be automatically displayed. To adjust parameter 7, press the STOP/+ or RESET/- pushbuttons. To store parameter 7 setting and advance to the next parameter, press the DATA/PROG pushbutton. Program mode will be exited.



There is a 20 second “time out” when the Remote Operator is in programming mode. If no parameter setting is performed within this time period, programming mode is exited.

5 OPERATION & PROGRAMMING

Parameter List Details

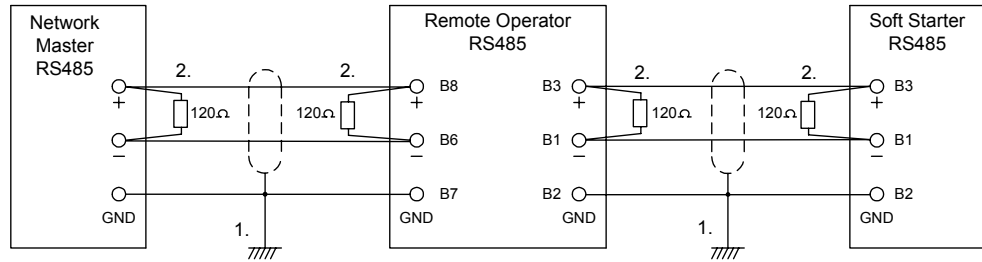
Parameter Number	Description	Default Setting	Adjustable Range
1	RS485 Network Baud Rate	4 (9600 baud)	2 = 2400 baud 3 = 4800 baud 4 = 9600 baud 5 = 19200 baud 6 = 38400 baud
2	RS485 Network Satellite Address	20	1 to 99
3	RS485 Network Time Out	0 seconds (= off)	0 to 100 seconds
4	RS485 Network Protocol	1 (AP ASCII)	1 = AP ASCII protocol 2 = Modbus RTU protocol
5	Modbus Protocol Parity	0 (no parity)	0 = no parity 1 = odd parity 2 = even parity
6	Motor FLC	10 A	1 to 2868 A
7	Analogue Output 4mA Offset	100%	80 to 120%

5 OPERATION & PROGRAMMING

5.3 RS485 Serial

Communications The Remote Operator to soft starter RS485 communications protocol is standard AP ASCII.

When the Remote Operator is used as a gateway device connected to a serial communications network the RS485 communications protocol is selectable between AP ASCII and Modbus RTU (Remote Operator Parameter 4. Default setting = 1, AP ASCII).



1. **Grounding and Shielding.**
Twisted pair data cable with earth shield is recommended. The cable shield should be connected to a GND device terminal at both ends and one point of the site protective earth.
2. **Termination Resistors.**
In long cable runs prone to excessive noise interference, termination resistors should be installed. This resistance should match the cable impedance (typically 120 Ω). Do not use wire wound resistors.
3. **RS485 Data Cable Connection.**
Daisy chain connection is recommended. This is achieved by parallel connections of the data cable at the actual device terminals.
4. **Remote Operator RS485 Network Connection Specifications.**
 Input Impedance: 12 kΩ
 Common Mode Voltage range: -7 to +12 V
 Input Sensitivity: +/- 200 mV
 Minimum Differential Output Voltage: 1.5 V (with max.loading of 54 Ω)

Serial communications – AP ASCII protocol

The details of the message fragments used in communicating with the soft starter are shown in the table below. The message fragments may be assembled into complete messages as described in the sections that follow.



Data transmitted to and from the Remote Operator and soft starter must be 8 bit ASCII, no parity, 1 stop bit.

Message Fragment Type	ASCII Character String or (Hexadecimal Character String)
Send Address	EOT [nn] [lrc] ENQ or (04h [nn] [lrc] 05h)
Send Command	STX [ccc] [lrc] ETX or (02h [ccc] [lrc] 03h)
Send Request	
Read Function Values	
Write Function Values	STX [dddd] [lrc] ETX or (02h [dddd] [lrc] 03h)
Receive Data	

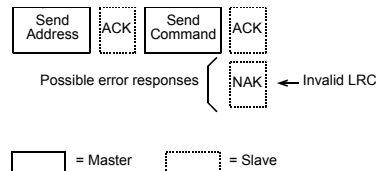
5 OPERATION & PROGRAMMING

Receive Status	STX [ssss] [lrc] ETX or (02h [ssss] [lrc] 03h)
Function Number	DC1 [pppp] [lrc] ETX or (011h [pppp] [lrc] 03h)
Function Value	DC2 [vvvv] [lrc] ETX or (012h [vvvv] [lrc] 03h)
ACK (Acknowledge)	ACK or (06h)
NAK (Negative Acknowledge)	NAK or (15h)
ERR (Error)	BEL or (07h)

- nn = two byte ASCII number representing the Remote Operator or soft starter address where each decimal digit is represented by n.
- lrc = two byte longitudinal redundancy check in hexadecimal.
- ccc = three byte ASCII command number where each character is represented by c.
- dddd = four byte ASCII number representing the current or temperature data where each decimal digit is represented by d.
- ssss= four byte ASCII number. The first two bytes are ASCII zero. The last two bytes represent the nibbles of a single byte of status data in hexadecimal.
- pppp = four byte ASCII number representing the function number where each decimal digit is represented by p.
- vvvv = four byte ASCII number representing the function value where each decimal digit is represented by v.

Commands.

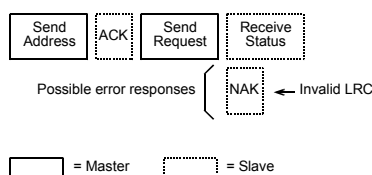
Commands can be sent to the soft starter using the following format:



Command	ASCII	Comment
Start	B10	Initiates a start
Stop	B12	Initiates a stop
Reset	B14	Resets a trip state
Coast to stop	B16	Initiates an immediate removal of voltage from the motor. Any soft stop or DC Brake settings are ignored.
Forced comms trip	B18	Causes a communications trip at the soft starter. Displayed as trip code `H`

Status retrieval.

Status can be retrieved from the soft starter using the following format:



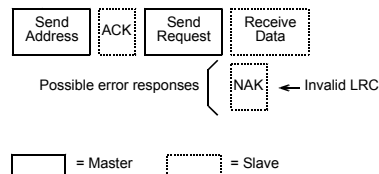
5 OPERATION & PROGRAMMING

The receive status register structure is detailed below.

Request	ASCII	Receive Status (ssss)
Version	C16	Serial protocol version number.
Trip Code	C18	Requests the trip status of the soft starter. 255 = No trip 0 = Shorted SCR 1 = Excess start time 2 = Motor thermal model 3 = Motor thermistor 4 = Phase imbalance 5 = Supply frequency 6 = Phase sequence 7 = Electronic shearpin 8 = Power circuit fault 9 = Undercurrent 10 = Heatsink overtemperature (F) 11 = Invalid motor connection (P) 12 = Auxiliary input (J) 13 = Out of range FLC (L) 14 = Incorrect main control module (Y) 15 = RS485 comms fault (C) 16 = Forced comms trip (H) 17 = CPU error (U)
Product Version	C20	Bit No. Description
		0 - 2 Function list version
		3 - 7 Starter type (ASA = 2)
Starter Status	C22	Bit No. Description
		0 - 3 0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 5 = Restart delay 6 = Tripped 7 = Programming mode
		4 1 = Positive phase sequence detected
		5 1 = Current exceeds the FLC
		6 0 = Uninitialised 1 = Initialised <i>nb: bit 4 is not valid unless bit 6 = 1</i>
		7 0 = Remote Operator comms status O.K. 1 = Remote Operator comms fault

Data retrieval.

Data can be retrieved from the soft starter using the following format:

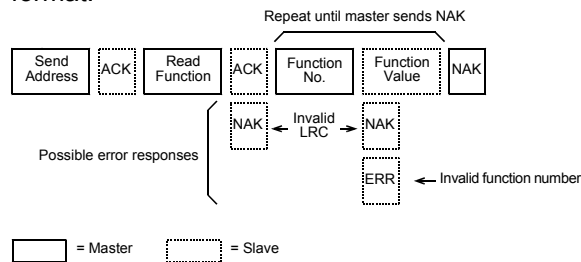


5 OPERATION & PROGRAMMING

Request	ASCII	Receive Data (dddd)
Current	D10	Requests motor current. The data is 4 byte decimal ASCII. Minimum value 0000 A, maximum value 9999 A.
Temperature	D12	Requests the calculated value of the motor thermal model as a % of Motor Thermal Capacity. The data is 4 byte decimal ASCII. Minimum value 0000%. Trip point 0105%.

Download function values from the soft starter

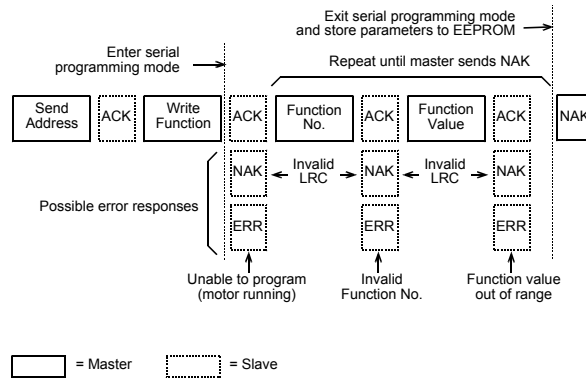
Function values may be downloaded from the ASA at any time using the following format:



Read Functions	ASCII	Comment
Download Functions	P10	Readies ASA to download function values.

Upload function values to the soft starter

Function values may be uploaded to the ASA only when it is in the off state, ie not starting, running, stopping or tripped. Use the following format to upload function values:



Write Functions	ASCII	Comment
Upload Functions	P12	Readies ASA to upload function values.

When the ASA receives an Upload Functions command it enters the Serial Programming mode. When in the Serial Programming mode, the ASA local push buttons and remote inputs are inoperative, the serial start command is disabled and the Remote Operator/ASA numeric displays flash with the letters 'SP'.

When the Upload Functions command is terminated by the master or with an error or timeout, the Functions are written to the EEPROM and the ASA exits Serial Programming mode.

5 OPERATION & PROGRAMMING

Calculating the check sum (LRC).

Each command string sent to and from the Remote Operator and soft starter includes a check sum. The form used is the Longitudinal Redundancy Check (LRC) in ASCII hex. This is an 8-bit binary number represented and transmitted as two ASCII hexadecimal characters.

To calculate LRC:

1. Sum all ASCII bytes
2. Mod 256
3. 2's complement
4. ASCII convert

For example Command String (Start):

ASCII STX B 1 0
 or 02h 42h 31h 30h

ASCII	Hex	Binary	
STX	02h	0000 0010	
B	42h	0100 0010	
1	31h	0011 0001	
0	30h	0011 0000	
	A5h	1010 0101	SUM (1)
	A5h	1010 0101	MOD 256 (2)
	5Ah	0101 1010	1's COMPLEMENT
	01h	0000 0001	+ 1 =
	5Bh	0101 1011	2's COMPLEMENT (3)
ASCII	5	B	ASCII CONVERT (4)
or	35h	42h	LRC CHECKSUM

The complete command string becomes

ASCII STX B 1 0 5 B ETX
 or 02h 42h 31h 30h 35h 42h 03h

To verify a received message containing an LRC:

1. Convert last two bytes of message from ASCII to binary.
2. Left shift 2nd to last byte 4 bits.
3. Add to last byte to get binary LRC.
4. Remove last two bytes from message.
5. Add remaining bytes of message.
6. Add binary LRC.
7. Round to one byte.
8. The result should be zero.

Response or status bytes are sent from the Remote Operator and soft starter as an ASCII string.

STX [d1]h [d2]h [d3]h [d4]h LRC1 LRC2 ETX
 d1 = 30h
 d2 = 30h
 d3 = 30h plus upper nibble of status byte right shifted by four binary places.
 d4 = 30h plus lower nibble of status byte.

For example status byte = 1Fh, response is

STX 30h 30h 31h 46h LRC1 LRC2 ETX

5 OPERATION & PROGRAMMING

Serial communications – MODBUS RTU protocol

The Remote Operator can be used on a Modbus RTU protocol network. In this situation, use the following Modbus Register.



1. Command, Starter Status, Trip Code, Current/Temperature, Product type/version, RS485 Protocol version and Parameter Uploading (writing) must be transmitted individually, i.e. one MODBUS function (single read/write) at a time.
2. MODBUS RTU protocol is restricted to transferring a maximum of 6 ASA Function Downloads (multiple reads) at a time.

Refer to the MODBUS standard at <http://www.modbus.org> for protocol details.

Register Address	Register	Type	Description	
40002	Command	Single Write	1 = Start 2 = Stop 3 = Reset 4 = Quick stop 5 = Forced comms trip	
40003	Starter Status	Single Read	Bit No. Description	
			0 - 3	0 = Not used 1 = Waiting 2 = Starting (incl. Pre-start tests) 3 = Running 4 = Stopping 5 = Restart delay 6 = Tripped 7 = Programming mode
			4	1 = Positive phase sequence detected
			5	1 = Current exceeds the FLC
			6	0 = Uninitialised 1 = Initialised <i>nb: bit 4 is not valid unless bit 6 = 1</i>
7	0 = Remote Operator status O.K. 1 = Remote Operator fault			
40004	Trip Code	Single Read	255 = No trip 0 = Shorted SCR 1 = Excess start time 2 = Motor thermal model 3 = Motor thermistor 4 = Phase imbalance 5 = Supply frequency 6 = Phase sequence 7 = Electronic shearpin 8 = Power circuit fault 9 = Undercurrent 10 = Heatsink overtemperature (F) 11 = Invalid motor connection (P) 12 = Auxiliary input (J) 13 = Out of range FLC (L) 14 = Incorrect control module (Y) 15 = RS485 comms fault (C) 16 = Forced comms trip (H) 17 = CPU error (U)	

5 OPERATION & PROGRAMMING

5.4 4-20mA

Analogue Output The Remote Operator has a 4-20 mA analogue output for monitoring motor current.

The Remote Operator Motor FLC parameter 6 must be adjusted to match the Motor FLC setting in the soft starter. The 4 mA end of the analogue output signal can be calibrated using the Remote Operator Analogue Output 4 mA Offset parameter 7. This is set to give a 4 mA output signal when the motor current is zero.

The analogue output signal spans from 4 mA when the motor current is zero (ie, soft starter is not running) to 20 mA when the motor current is 125% of the Motor FLC setting in the Remote Operator parameter 6.



The 4-20 mA analogue output must only be used for motor current monitoring and metering. It is not designed for process signal control use.

Only one Motor FLC setting can be used in the Remote Operator. For applications using both ASA primary and secondary parameter sets this is not suitable.

6 TROUBLE SHOOTING

6.1 General Faults The Remote Operator display and status indication LEDs can indicate abnormal operating or system conditions. This troubleshooting guide gives details of these conditions.

Indication	Problem	Possible Solution
No display	No control supply voltage.	Check that correct voltage is present at terminals 1 and 2.
AMPS or TEMP LED flashing	Soft starter in restart delay mode.	Wait for the soft starter programmed restart delay to time out.
Four dashes on display and RS485 LED flashing	A loss of communication has been detected on the RS485 link to the soft starter.	Verify and solve the cause for loss of communication. If communication is restored before a soft starter RS485 Time Out trip, the display will regain active status and the RS485 LED will illuminate. If communication is restored after a soft starter RS485 Time Out trip, the display will indicate a trip code. Use the Reset pushbutton to reset the soft starter fault.
nEt on display	A loss of communication has been detected on the RS485 link to the network.	The Remote Operator has an RS485 Network Time Out Protection setting (Parameter 3). This mode is entered when loss of communication is longer than this time setting. If communication is restored the system becomes active again. To clear nEt on the display, press the DATA/PROG pushbutton momentarily.
SP flashing on display	Soft starter is off and being programmed from the serial network.	Finish soft starter serial network programming procedure and exit program mode.
-	Incorrect or no 4-20 mA analogue output signal	Check the correct voltage is present at terminals 1 and 2. Check that correct polarity is used at terminals B10 and B11. Check that Motor FLC and Analogue Output 4 mA Offset parameters are set correctly.

6 TROUBLE SHOOTING

6.2 Trip Codes

When the soft starter trips the relevant trip code is displayed on the Remote Operator display. The CODE and TRIP LEDs are illuminated.

If the ASA soft starter has an internal problem indicated by a Code E (EEPROM read/write failure) or Code U (CPU error) on its display, no communication is active between the soft starter and the Remote Operator. The Remote Operator display will indicate four dashes and its RS485 LED will flash.



Refer to the Trip Codes section of the ASA Users Manual for details.