The SynQor MPFC-440-3PH-400-LE high voltage 3-Phase PFC contains a serial port to facilitate system monitoring. Commands are sent to request individual data, and the PFC responds to each command individually.

The PFC's external serial port IO pins are at 3.3V logic levels, not RS232 levels. See datasheet for IO details and polarity. Commercial data converters are available to translate these levels to RS232 or USB.

The serial port uses 9600 baud, 8 data bits, no parity, and one stop bit. Commands can be sent, and output viewed, with any standard terminal emulator. The interface is case sensitive. To view user text, set the terminal emulator for local echo.

Some data are writeable; written values are, however, volatile and will revert to default upon power cycling.

A pause of >5 seconds between any two comand characters will timeout/reset the command parser. No response is generated. This timeout value is user settable, see Hung Parser Timeout below.

The protocol supports single or multi-unit communication via a 'network address'. See Enumeration command (E). Every command must be terminated by either ascii 13 (cr) OR ascii 10 (lf) OR both (they're all equivalent). In this document, the symbol ∠ will be used to represent the termination character.

Command Format		
Command Syntax		

{Net Addr}	{Access Address}	{Action Specifier}	[Value]	{Terminator}
	0 1 2 7	? for read or	"String" or	(cr) or (lf)
m	0-127	= for write	16-bit numerical	or both, 🗹

Net Addr: The network address character presently of default value of 'm' or '@'. 'm' is taken as a single unit's address while '@' is interpreted as all units. To avoid collision, the response to '@' commands is automatically muted. See the Enumerate command for re-assigning network addresses in a multi-unit application.

#### Access Addr: The addres to access, see table below.

Addresses can be specified in char, hex, or int formats, see Value Formats below.

Action Specifier: character '?' specifies a data read or '=' specifies a data write. Only select addresses are writeable.

Value: Values can be supplied in the formats described below;

The supplied format will determine the format of the response datum.

Write commands take an argument of the value to be written.

Read commands take an optional value argument of 0 as a way to specify the response datum format.

Terminator: a carriage return character (cr) = ascii 13, OR a linefeed character (lf) = ascii 10, OR both ∠.

#### **Response Format**

Immediately after reception of its terminator, each valid command generates a response. Invalid commands do not generate a response.

#### **Response Syntax**

{Net addr}	{Access Address}	{Is Now}	{Value}	{Terminator}
m	0-127	=	"String" or 16-bit numerical	Ľ

Net Addr: The PFCs echoes its network address, the character 'm' by default. Access Address: Echo of the address specifier in the same format as supplied.

Char addresses will be prefixed by the ' character.

#### Is Now: The character '='

Value: The address's current value.

If responding to a write, the present value is returned in the same format its argument was supplied. If responding to a read, the value is returned in its natural format, (see Addresses table below) unless

the read was supplied an argument (of 0), in which case the response will use that argument's format.

Char format will always contain leading ', hex format will always contain 0x and four ascii hex value characters.

Terminator: ∠ concludes the response

#### Value Formats

Data supplied to, and returned from, the PFC can be communicated in several formats, broadly divided into string and numeric formats. While strings are a unique type, numeric data can be divided into serveral interchangeable formats.

Strings	Up to 64 ascii characters, and "enclosed in double quotes". A null string is "". Strings can contain unprintable and control						
Strings	charact	ers which can. of co	ourse, affect the appearance of any terminal emulator receiv	ving them.			
	Fmt	Numeric Range	Description				
rmats	char	0 - 128 An ascii character, optionally preceeded by single quote character ' to remove ambiguity.		aracter ' to remove ambiguity. x.			
Fo	hex	0 - 65536	Ox and then one to four ascii hex characters	Both hex and int formats have no			
ica	int	-32768 - 32767	Decimal numeral, optionally preceeded by '-'				
Numer	mks	±###.#	Decimal numerals containing a decimal point are interprete internally converted to/from machine units. MKS format is to a real-life datum.	ed as real MKS values and are recommended whenever referring			

#### Addresses

Acc	Access Address			Read /	Natural	Natural
hex,	dec,	or char	Name	Write	Format	Units
0x0	0		ID String	R	string	
0x1	1		Part Number	R	string	
0x2	2		Serial Number	R	string	
0xD	13		Code Revision	R	string	
0x2E	46	•	Code Version	R	hex	Rev<<8   Subrev
0x21	33	!	Net Address	R	quoted ch	aracter
0x22	34	"	Hung Parser Timeout	R/W	##.##	seconds
0x23	35	#	Powered Days	R/W	int	days
0x24	36	\$	Powered Hours	R/W	) int	hours
0x25	37	%	Powered Minutes	R/W	int	minutes
0x26	38	&	Powered Seconds	R/W	##.##	seconds
0x41	65	Α	Auto Command String	R/W	string	
0x61	97	а	Auto Command Interval	R/W	##.##	seconds
0x45	69	E	Enumerate Network Address	R/W	int	
0x46	70	F	AC Input Line Frequency	R	##.##	Hz
0x53	83	S	AC Input Voltage	R	###.##	Volts
0x73	115	S	AC Input Voltage Ripple/Imbalance	R	###.##	Volts
0x72	114	r	Estimated Input Capacitance (per Phase)	R/W	#.###	uF
0x6B	107	k	Angle of PFC Input Current	R	##.#	degrees
0x76	118	V	Midbus (Buck Stage) Output Voltage	R	###.##	Volts
0x69	105	i	Buck Stage Output Current	R	#.###	Amperes
0x70	112	р	Buck Stage Output Power	R	####	Watts
<b>0</b> x49	73	$\sim 1/$	Boost Stage Input Current	R	#.###	Amperes
0x50	80	Р	Boost Stage Input Power	R	int	Watts
0x56	86	v	Boost Output Voltage	R	###.##	Volts
0x54	84	Т	PCB Temperature	R	##.##	°C
0x4D	77	M	Machine State	R	int	
0x4E	78	N	PFC ENA Pin Override	R/W	int	
0x6E	110	n	Battle Short Mode Enable	R/W	int	
0x63	99	c	AC Line Status	R	hex	
0x65	101	е	Shutdown Source	R	hex	
0x77	119	w	BS Warnings	R	hex	

### Address Details

Address: Name: Description: Response units: Read/Write: Example Cmd: m0x0?√ m0?√	hex decimal char 0x0 0 <b>ID String</b> The unit's ID string "SynQor HV3PH PFC" string Read Only <b>Typical Response:</b> m0x0000= "SynQor HV3PH PFC"∠ m0= "SynQor HV3PH PFC"∠
Address: Name: Description: Response units: Read/Write:	hex decimal char Ox1 1 <b>Part Number</b> The part number "MPFC-440-3PH-400-EP" string Read Only
Example Cmd: m0x1?✓ m1?✓	Typical Response: m0x0001= "MPFC-115-3PH-270-FP"∠ m1= "MPFC-115-3PH-270-FP"∠
Address: Name: Description: Response units: Read/Write: Example Cmd: m0x2?√ m2?√	hex decimal char 0x2 2 Serial Number The unit's serial number String Read Only Typical Response: $m0x0002 = "S19095539" \checkmark$ $m2 = "S19095539" \checkmark$
Address: Name: Description: Response units: Read/Write: Example Cmd: m0xD?⊄ m13?⊄	hex       decimal       char         0xD       13       as a string         Code Revision       as a string         The unit's Code Revision       string         string       Read Only         Typical Response:       m0x000D= "Rev 4, v4.08" 2/ m13= "Rev 4, v4.08" 2/

Address: Name: Description: Response units: Read/Write: Discussion: Example Cmd:	hex decimal of 0x2E 46 . <b>Code Version</b> The unit's Code Version hex Read Only Code Version is returned a <b>Typical Response:</b>	char as a number as MainRev<<8   Subrev Interpretation:			
m.?∠	m'.= 0x0408⊭	0x0408 = 4<<8   8 Code Version is 4.08			
m.?u∠	m'.= 1032⊯∕	1032 = 4*256 + 8 Code Version is 4.08			
m.?b∠	m'.= b0000010000	0001000∠ Code Version is 4.08			
Address: Name: Description:	hex decimal o 0x21 33 ! <b>Net Address</b> Returns unit's Network Ad	char ! ddress as a guoted character			
Response units:	quoted character default	is 'm			
Read/Write:	Read Only				
Discussion:	For single unit operation, the default network address of "m" is adequate For multiple unit operation with a shared multi-drop serial bus, it is possible to address each unit individually by assigning each unit a different nework address using the Enumerate command ("E")				
Example Cmd:	Typical Response:				
m0x21?√	m0x0021= 'm∠				
m33?∠	m33= 'm∠				
m!?∡	m'!= 'm∠				
Address:	hex decimal o 0x22 34 '	char "			
Name:	Hung Parser Timeout				
Description:	The Hung Parser Timeout				
Response units:	decimal seconds				
Read/Write:	Read/Write				
Discussion:	A delay of >N.N seconds be	between any two command characters will reset the command parser.			
	This paramter controls the	e timeout value. It is both readable and writeable.			
	Supplied in hex or int form Supplied in MKS format, th	nat, the units are integer 1/16ths of second. he units are decimal seconds.			
Example Cmd:	Typical Responses:	Interpretation:			
m0x22?∠	m0x0022= 5.0∠	Parser timeout is 5.0 seconds (default)			
m"=60∡	m'"= 60∠	(Note int units supplied) Parser timeout set to $60/16 = 3.75$ secs.			
m"=?∠	m'"= 3.75∠	Confirm 3.75 sec timeout in MKS units.			
m34=60.∠	m34= 60.0∠	(Note MKS units supplied) Parser timout re-set to one minute			
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	hex	decimal	char	Response units	
Powered Days	0x23	35	#	int 0-65535	Read/Write
Powered Hours	0x24	36	\$	int 0-23	Read/Write
Powered Minutes	0x25	37	Ŷ %	int 0-59	Read/Write
Powered Seconds	0x26	38	8	decimal 0-59.9	Read/Write
	0/120		<u> </u>		,
Discussion:	Together They can	r these contain be written to	the number any value (o	r of days, hours, minut r cleared) at any time,	es and seconds that power has been applied. and will count time thereafter.
Example Cmds:	Typical <b>R</b>	Responses:		Interp	retation:
m35?∠	m3	5= 329⊻		Unit h	as been powered for 329 days
m36?∠	m3	6= 3∠		and 3	hours.
m35=0∠	m3	5= 0∠		Days v	ariable reset to 0.
m36=0∠	m3	6= 02		hours	variable reset to 0.
Address: Name: Description: Response units: Read/Write: Discussion:	hex 0x41 <b>Auto Cor</b> The Auto string Read/Wr The Auto contents	decimal 65 mmand String command String rite commandString are copied dir	char A ing will have ng is written ectly to the o	the PFC send the san to contain the exact o command parser inpu	ne data repeatedly and automatically. commands to read the desired data. The string's t at an interval given by the Auto Command Interval,
	units cou	ess 'a' below. Ild try to send	Using this co data at the s	ame time causing a bu	tible with a multi-drop serial bus because different us collision.
Example Cmd:	units cou	ess 'a' below. Ild try to send Typical Res	Using this co data at the s ponses:	ame time causing a bu	tible with a multi-drop serial bus because different is collision.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠	see addr units cou	ess 'a' below. Ild try to send Typical Res m' A m' A	Using this co data at the s sponses: x= "m/?∠"∠ X= "mS?∠ms	ommand is not compar ame time causing a bu ?∠mF?∠mP?∠"∠	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠	see ador units cou "∠ hex	ess 'a' below. Ild try to send Typical Res m' A m' A decimal	Using this co data at the s ponses: A= "m/?∠"∠ A= "mS?∠ms char	ommand is not compar ame time causing a bu	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address:	see addr units cou "∠ hex 0x61	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97	Using this co data at the s ponses: x= "m/?∠"∠ x= "mS?∠ms char a	ommand is not comparate ame time causing a bu	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name:	ee ador units cou "∠ hex 0x61 Auto Cor	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97 mmand Interva	Using this co data at the s ponses: x = "m/? < " < x = "mS? < mschara	ommand is not compar ame time causing a bu	tible with a multi-drop serial bus because different as collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description:	ee ador units cou "∠ hex 0x61 Auto Cor Controls	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97 mmand Interva how often the	Using this co data at the s ponses: = "m/?<" A= "mS?<" A= "mS? char a al Auto Comm	ame time causing a bu ame time causing a bu ?∠mF?∠mP?∠"∠	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units:	hex 0x61 Auto Cor Controls decimal s	ess 'a' below. Ild try to send Typical Res m'A m'A decimal 97 mmand Interva how often the seconds	Using this co data at the s ponses: (= "m/?<" (= "mS?	ame time causing a bu	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write:	hex 0x61 Auto Cor Controls decimal s Read/Wr	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97 mmand Interva how often the seconds rite	Using this co data at the s ponses: x= "m/?∠"⊄ x= "mS?∠ms char a Auto Comm	ame time causing a bu	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion:	hex 0x61 Auto Cor Controls decimal s Read/Wr	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu	Using this co data at the s ponses: A= "m/?∠"∠ A= "mS?∠ms char a Auto Comm	ame time causing a bu	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion:	hex ox61 Auto Cor Controls decimal s Read/Wr A value o The rang	ess 'a' below. Id try to send Typical Res m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu re of active value	Using this co data at the s ponses: A= "m/?∠"∠ A= "mS?∠ms char a Auto Comm urns OFF Aut	ame time causing a bu ame time causing a bu ? ? ∠mF? ∠mP? ∠ " ∠ and String is executed o Command execution to 65535 1/16ths of a	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power. d.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion:	hex ox61 Auto Cor Controls decimal s Read/Wr A value o The rang	ess 'a' below. Ild try to send Typical Res m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu te of active valu	Using this co data at the s <b>sponses:</b> x= "m/?∠"∠ x= "mS?∠ms char a Auto Comm urns OFF Aut ues is from 1 n bey or int	ame time causing a bu ame time causing a bu ?∠mF?∠mP?∠"∠ and String is executed o Command execution to 65535 1/16ths of a formats, the units are	tible with a multi-drop serial bus because different is collision. Interpretation: The default Auto Command String: Reports a variety of useful real-time data. Write the Auto Command String with: Read AC Input Voltage, Read AC Line Frequency, Read Boost Stage Power. d. second, a bit over an hour. 1/16ths of a second
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion:	hex 0x61 Auto Cor Controls decimal s Read/Wr A value o The rang If the val	ess 'a' below. Ild try to send Typical Res m' A m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu se of active valu ue is supplied i ue is supplied i	Using this co data at the s <b>ponses:</b> x= "m/?∠"∠ x= "mS?∠ms char a Auto Comm mns OFF Aut ues is from 1 in hex or int in MKS form	ame time causing a bu ame time causing a bu ? ∠mF?∠mP?∠"∠ and String is executed o Command execution to 65535 1/16ths of a formats, the units are at, the units are decim	tible with a multi-drop serial bus because different is collision.          Interpretation:         The default Auto Command String:         Reports a variety of useful real-time data.         Write the Auto Command String with:         Read AC Input Voltage, Read AC Line Frequency,         Read Boost Stage Power.         d.         n         esecond, a bit over an hour.         1/16ths of a second         hal seconds.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion: Example Cmd:	hex ox61 Auto Cor Controls decimal s Read/Wr A value of The rang If the val If the val	ess 'a' below. Id try to send Typical Res m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu te of active valu ue is supplied i Responses:	Using this co data at the s <b>sponses:</b> A= "m/?∠"∠ A= "mS?∠ms char a Auto Comm urns OFF Aut ues is from 1 in hex or int in MKS form:	ame time causing a but ame time causing a but ame time causing a but and String is executed o Command execution to 65535 1/16ths of a formats, the units are at, the units are decim	<b>Interpretation:</b> Interpretation:         The default Auto Command String:         Reports a variety of useful real-time data.         Write the Auto Command String with:         Read AC Input Voltage, Read AC Line Frequency,         Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion: Example Cmd: ma?∠	hex ox61 Auto Cor Controls decimal s Read/Wr A value o The rang If the val If the val	ess 'a' below. Ild try to send Typical Res m' A m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu te of active valu ue is supplied i ue is supplied i Responses: a = 0∠	Using this co data at the s <b>sponses:</b> A= "m/?∠"∠ A= "mS?∠ms char a Auto Comm urns OFF Aut ues is from 1 in hex or int in MKS forma	ame time causing a but ame time causing a but ame time causing a but and String is executed o Command execution to 65535 1/16ths of a formats, the units are at, the units are decim Interp Auto C	<b>Interpretation:</b> Interpretation:         The default Auto Command String:         Reports a variety of useful real-time data.         Write the Auto Command String with:         Read AC Input Voltage, Read AC Line Frequency,         Read Boost Stage Power.
Example Cmd: mA?∠ mA="mS?∠mF?∠mP?∠ Address: Name: Description: Response units: Read/Write: Discussion: Example Cmd: ma?∠ ma=0.5∠	hex units cou "∠ hex 0x61 Auto Cor Controls decimal s Read/Wr A value of The rang If the val If the val If the val	ess 'a' below. Ild try to send Typical Ress m' A m' A decimal 97 mmand Interva how often the seconds rite of 0 (default) tu te of active valu ue is supplied i ue is supplied i Responses: a = 0.5 ∠	Using this co data at the s <b>sponses:</b> x= "m/?∠"∠ x= "mS?∠ms char a Auto Comm urns OFF Aut ues is from 1 in hex or int in MKS forma	ame time causing a but ame time causing a but ame time causing a but and String is executed o Command execution to 65535 1/16ths of a formats, the units are at, the units are decim 	Interpretation:          Interpretation:         The default Auto Command String:         Reports a variety of useful real-time data.         Write the Auto Command String with:         Read AC Input Voltage, Read AC Line Frequency,         Read Boost Stage Power.

Address:     0x45     69     E       Description:     Enumerate Network Address     Description:     The value of the first addresses to be self assigned.       Read Response vulue:     The number of sequential addresses just assigned.       Read Response vulue:     The number of sequential addresses just assigned.       Read Response vulue:     The number of sequential addresses for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple unit shared 'm'.       Upon receiving an Enumerate command, all addressed units will communicate over their interconnected Starsync.     Enumerate addresses are volatile; they will rever to default whenever power is cycled.       Example Cind:     Typical Response muted for global addr @)     Interpretation:       Read Response vite:     The Ac lune frequency     Enumerate network: addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at 'A' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, begin assignments at CA' Unit X, how many addresses, beg		hex	decimal	char				
Name:     Enumeration automatically satis the network address of each unit in a multi-unit application.       Write Value Argument:     The number of sequential addresses (ust assigned.)       Read Response value:     The number of sequential addresses just assigned.       Read Response units:     int       Upon receiving an function and addresses (unit sile communicate over their interconnected StartSync line and assign themselves unique sequential network addresses. Note that the units must be disabled to communicate over StartSync.       Enumerated addresses are volatile; they will revert to default whenever power is cycled.       Impact Addresses     None (response mutted for global addr @)       Unit A, how many addres were assigned. Answer-5       Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.       Address:     berk       decimal     char       Default     mesurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotation       Marked X-r     mode (addresse)       Discussion:     The AC linpt Voltage       Discussion:     The AC linpt Voltage       Marked X-r     mode (addresse)       Marked X-r     mode (addresse)	Address:	0x45	69	E				
Description:       Enumeration automatically sets the network address of each unit in a multi-unit application.         Write Value Argument:       The number of sequential addresses just assigned.         Read Response value:       The number of sequential addresses just assigned.         Read Response value:       The number of sequential addresses just assigned.         Read Response value:       At power-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units what own would accur if multiple units what would addresses.         Note that the units must be disabled to communicate over StartSync.       Enumerate addresses are volatile; they will rever to default whenever power is cycled.         Example Cnd:       Typical Responses:       Interpretation:         none (response muted for global addr @)       Interpretation:       Interpretation:         AE?/       A'E=5'       The AC input Unit in Fequency         Post       Acdress:       hex       decimal       Char         0x46       70       F       F       Now many addresses, typically ±2%.         Read MeRSON:       The AC input Vinitine Frequency       Feed only       E         Discussion:       The AC input Vinitine feeguency       Feed only       Feed only         Discussion:       The AC input Vinitine Explance Char       60 Hz, ABC rotation <th>Name:</th> <th colspan="6">Enumerate Network Address</th>	Name:	Enumerate Network Address						
Write Value Argument:       The value of the first address to be self assigned.         Read Response units:       int         Miter Value Argument:       Rever-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         Up on receiving an Enumerate command, all addressed units will communicate over their interconnected StartSync.       Enumerate addressed units will communicate over their interconnected StartSync.         Example Cind:       Typical Response units:       Interpretation:         Response units:       A 1 = 5.2       Interpretation:         Name:       A C Input Unit Frequency       Response units:       decimal the         Address:       the A club Frequency       Response units:       decimal the         Name:       A C Input Unit Frequency       Response units:       decimal the         Response units:       decimal the       GRE A fore too       GO Ha, ABC rotation	Description:	Enumeration automatically sets the network address of each unit in a multi-unit application.						
Read Response value:       The number of sequential addresses just assigned.         Read Response units:       int         Read/Write:       R/W         Discussion:       At power-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, cesponse collision would occur if multiple units shared 'm'.         Upon receiving an Enumerate command, all addressed units will communicate over their interconnected StartSynci.       Interpretation         Enumerate addresses are volatile; they will revert to default whenever power is cycled.       Interpretation:         Example Cmd:       Typical Responses:       Interpretation:         Inner (response muted for global addr @)       Interpretation:       Interpretation:         AE27       A*E57       Typical Responses:       Interpretation:         Mame:       A C Input Unite Frequency       Example Answer=5       Interpretation:         Read/Write:       Read Only       Interpretation:       Example Cnd:       Typical Responses:         Mame:       A C Input Unite Frequency       Read/Write:       Read Only       Interpretation:         Discussion:       The accuracy of this measurement is limited by that of the internal timebase, typically ±2%.       Negative values indicate CBA rotation         Messadie Chrite:       Mr204 (S ± 5) (59/2)       Mr204 (S ± 5) (59/2)       G0 Hz, ABC rotation	Vrite Value Argument:	The value of the <b>first</b> adddress to be self assigned.						
Read Response units:       int         Read/Write:       R/W         Discussion:       At power-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         Upon receiving an Enumerate command, all addressed unit is will communicate over their interconnected StartSync.         Enumerated addresses are volatile; they will revert to default whenever power is cycled.         ME       Typical Responses:         Incer (response muted for global address)       Interpretation:         CEF=A/       none (response muted for global address)         ME       A'E=5/         Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.         Address:       hex         Mam:       Ac C linguit the Frequency         Description:       The Ac Line Frequency         Response units:       decimal char         Name:       Ac C linguit the requency         Response units:       decimal char         Name:       Responses:       Endermal         Marce & Ba Only       Discussion:         Discussion:       The accline Frequency         Response:       mox466.92         mox466.92       mox466.92         mox646.92       mox646.92 <td< th=""><th>Read Response value:</th><th colspan="7">The number of sequential addresses just assigned.</th></td<>	Read Response value:	The number of sequential addresses just assigned.						
Read/Write:       R/W         Discussion:       At power-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         Upon receiving an Enumerate command, all addressed units will communicate over their interconnected StarTsync line and assign themselves unique sequential network addresses. Note that the units must be disabled to communicate over StarTsync.         Example Cmd:       Typical Responses:       Interpretation:         none (response mutted for global addr co)       Interpretation:       Enumerate addresses are volatile; they will rever to default whenever power is cycled.         AE?       A 'E-5'       Interpretation:       Enumerate addresses, begin assignments at 'A' Unit A, how many addrs were assigned. Answer=5         Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.       Name:       A C Input Line Frequency         Description:       The AC Line frequency       Enumerate of the internal timebase, typically ±2%. Negative values indicate CBA rotation         Example Cmd:       Typical Responses:       Interpretation:         mdx4657/       m2762       60 Hz, ABC rotation         Maters:       hex decimal char os53       60 Hz, CBA rotation         Address:       m176 = 60.11x'       60 Hz, CBA rotation         Mdx4657/       m2762       60 Hz, CBA rotation         Stas	Read Response units:	int						
Discussion:       At power-up, network address for each unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         Upon receiving an Enumerate command, all addressed unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         Upon receiving an Enumerate command, all addressed unit is 'm'. While that's sufficient for single-unit applications, response collision would occur if multiple units shared 'm'.         We that the units must be disabled to communicate over startSync.         Enumerate addresses are volatile; they will revert to default whenever power is cycled.         Marce         QEFA/         A 'E = 5/         Tone (response muted for global addr.@).         Unit A, how many addresses, begin assignments at 'A'.         Marce         Marce         Address:         hex       decimal         Marce       The AC Line Frequency.         Discussion:       The AC Line Frequency.         Response units:       decimal hz         Response units:       mod value to the measurement is limited by that of the internal timebase, typically ±2%.         Margit evalues indicate CBA rotation       fo0 Hz, ABC rotation         move Address:       ps 0.97         m702 /       m702 + 400.25 /         m702 /       m702	Read/Write:	Read/Write: R/W						
response collision would occur if multiple units shared 'n'. Upon receiving an Enumerate command, all addressed units will communicate over their interconnected StartSync line and assign themselves unique sequential network addresses. Note that the units must be disabled to communicate over StartSync. Enumerated addresses are volatile; they will rever to default whenever power is cycled.	Discussion:	At powe	r-up, network	address for eacl	h unit is 'm'. While that's sufficient for single-unit applications,			
Upon receiving an Enumerate command, all addressed units will communicate over their interconnected StartSyn (in ead assign themselves unique sequential network addresses. Note that the units must be disabled to communicate over StartSync. Enumerated addresses are volatile; they will revert to default whenever power is cycled. <b>Example Cruit</b> ( $g \in A^{\prime}$ AE? <b>Typical Responses:</b> none (response muted for global addr $g$ )Interpretation: Enumerate network addresses, begin assignments at 'A' Unit A, how many addrs were assigned. Answer=5 Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.Address:hex 0x46 70decimal F 		response	e collision wou	ld occur if multi	iple units shared 'm'.			
$\begin{array}{c c} \mbox{interconnected StartSync line and assign themselves unique sequential network addresses. Note that the units must be disabled to communicate over StartSync. Enumerated addresses are volatile; they will revert to default whenever power is cycled. \\ \hline \mbox{issuescentration} \label{eq:startSync} \mbox{intercentration} \label{eq:startSync} \mbox{intercentration} interce$		Upon re	ceiving an Enu	merate commar	nd, all addressed units will communicate over their			
Note that the units must be disabled to communicate over StartSync. Enumerated addresses are volatile; they will revert to default whenever power is cycled.Example Cmd:Typical Responses: none (response muted for global addr (e))Interpretation: Fumerate network addresses, begin assignments at 'A' Unit A, how many addrs were assigned. Answer=5MatterA't=5xInterpretation: Fumerate network addresses, begin assignments at 'A' Unit A, how many addrs were assigned. Answer=5Address:hex Ox46decimal requency Response units: decimal tz Read OnlyInterpretation: Fumerate network addresses, begin assignments at 'A' Unit A, how many addrs were assigned. Answer=5Mare:AC Input Vine Frequency Response units: decimal tz Read OnlyThe acCuracy of this measurement is limited by that of the internal timebase, typically ±2%. Boscription: The AC Line Frequency Responses: m782 m782 m782 m782 m782 m782 m782 m782		intercon	nected StartSy	nc line and assi	ign themselves unique sequential network addresses.			
Enumerated addresses are volatile; they will revert to default whenever power is cycled.         Example Cmd:       Typical Response muted for global addr @)       Interpretation:         B2 //       A 'E 5 //       For the end of t		Note tha	at the units mu	st be disabled to	to communicate over StartSync.			
Example Cmd: ( $@ E=A^{\gamma}$ A ' $= 5^{\gamma}$ Typical Responses: none (response mutted for global addr @)Interpretation: Enumerate network addresses, begin assignments at 'A' Unt A, how many addrs were assigned. Answer=5 Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.Address:hexdecimal 0x46 70 0x6char FName:AC Input Line Frequency Description:The AC Line Frequency 0x46 TO The AC Line Frequency The act in the requency of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd:Typical Responses: m70+2400.252 / m70+2400.252 / m70+2400.252 / m70+2400.252 / m72+2Interpretation: 50 Hz, ABC rotation 400 Hz, ABC rotation 50 Hz, CBA rotationAddress:hexdecimal motodes s as a s m25+2 / m75+2Interpretation: 50 Hz, CBA rotation 50 Hz, CBA rotationAddress:hexdecimal max m25+2 / m75+2char m25+2 / sAddress:hexdecimal max m25+2 / m75+2Mame:AC Input Voltage Description:char Ox53 m3 s s s s s s max s maxAddress:Mexdecimal char Ox53 m3 s s s s s s s setsion:Interpretation: max for Hz, CBA rotation for Hz, CBA rotationImax max m2Mexdecimal char ox53 s s s s t m2Address:Mex decimal ods m3 s s s s s s s t set decimal char s s set decimal char s s<		Enumera	ated addresses	are volatile; the	ey will revert to default whenever power is cycled.			
	Example Cmd:	Typical I	Responses:		Interpretation:			
AE?/       A'E=5/       Unit A, how many addrs were assigned. Answer=5         Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.         Address:       hex       decimal       char         Name:       AC Input Line Frequency         Description:       The AC Line Frequency         Response units:       decimal H2         Read/Write:       Read Only         Discussion:       The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotation         Im0x46?/       m0x46?         m2?/       m26= 490.25/         m70?/       m1°F= -60.11/         Address:       hex         decimal       char         0x53       83         Name:       AC Input Voltage         Mare:       GL input Voltage (Vsys)         Read/Write:       Read Only         Discussion:       The AC input Voltage (Vsys)         Response units:       decimal       char         0x53       83       s         Name:       AC Input Voltage (Vsys)         Read/Write:       Read Only         Discussion:       The value is the peak L-N voltage; multiply by v(3/2) to obtain L-L rms.         A filter has be	@E=A∠∕	none (re	sponse muted	for global addr	<ul> <li>@) Enumerate network addresses, begin assignments at 'A'</li> </ul>			
Host now knows that there are 5 units on the network; their addresses are A, B, C, D, & E.Address:hex $0x46$ decimal $0x46$ char $0x46$ Description:The AC Line Frequency decimal Hz Read/Write:Read Only Biscussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cnd:Typical Response: m702+ 400.25 x m72+ 400.25 x m72+ 60.11 xInterpretation: 60 Hz, ABC rotationAddress:hex m6x465 for modeldecimal m0x2045= 59.69 x m72+ 400.25 x m72+ 60.11 xInterpretation: 60 Hz, ABC rotationAddress:hex m6x33 Mane:decimal AC Input Voltage (Vsys) Read/Write:hex Read Only MOHZdecimal for Hz, ABC rotationAddress:hex m6x33 Mane:decimal AC Input Voltage (Vsys) Read/Write:hex Read Only Mich and AS second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cnd:Typical Response: m Ts = 359.26 xInterpretation: The AC Input voltage is 359 Vpk L-N = 440 Vrms L-L	AE?∠	A'E=	5∠		Unit A, how many addrs were assigned. Answer=5			
Address:hex $0x46$ decimal $0$ $F$ Name: Description:AC Input Line Frequency $C$ mesponse units: decimal Hz Read/Write:Read Only $Response units:decimal HzRead/Write:Read OnlyDiscussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%.Response units:m0x4672m70?2Typical Responses:m0x46472m70?4m70?4m70?4m70?4Interpretation:60 Hz, ABC rotation400 Hz, ABC rotationExample Cmd:m0x4672m70?2Typical Responses:m0x46472m70?4Interpretation:60 Hz, CBA rotation400 Hz, ABC rotationMexMcdress:hex0x5383SMare:Mcd Input Voltagedecimal VoltageResponse units:decimal Voltage (Vsys)Response units:decimal VoltageRead OnlyMexDiscussion:Construction:A filter has been applied with a 0.25 second time constant.A filter has been applied with a 0.25 second time constant.A filter has been applied with a 0.25 second time constant.A filter has been applied with a 0.25 second time constant.E adatsheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:m'S= 359.267The C input voltage is 359 Vpk L-N = 440 Vrms L-L$	Host now knows the	at there are 5	units on the n	etwork; their ac	ddresses are A, B, C, D, & E.			
Address:hex $0x6$ $70$ char $70$ Name:AC Input Inferequency response units:decimal Frequency requencyDescription:The AC Line Frequency decimal Hz Read/Write:Read OnlyDiscussion:The accord this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd:Typical Responses: m0x06046= $59.692$ m70= 400.252Interpretation: $60$ Hz, ABC rotation $400$ Hz, ABC rotationMaximumTypical Responses: m0x06046= $59.692$ m70= $400.252$ m70= $400.252$ Interpretation: $60$ Hz, CBA rotationMaximumMaximum MOx06046= $59.692$ m70= $400.252$ m70= $400.252$ Interpretation: $60$ Hz, CBA rotationMaximumMaximum MOx06046= $59.692$ m70= $400.252$ m70= $400.252$ Interpretation: $60$ Hz, CBA rotationMaximumMaximum MOx06046= $59.692$ m70= $400.252$ m70= $400.252$ Interpretation: $60$ Hz, CBA rotationAddress:hex Maximum Maximum MS3decimal MS3char MS3MaximumAC Input Voltage MS4Same: MS4Acting Vision MS2Interpretation: The AC Input Voltage (Vision MS4MaximumActing Maximum MS4Maximum MS4Interpretation: The AC Input Voltage MS3Interpretation: MS4MaximumMaximum MS4Maximum MS4Maximum MS4Interpretation: The AC Input voltage is 359 Vpk L-N = 440 Vrms L-LMaximumMaximum MS4Maximum MS4Interpretation: The AC Input voltage is 359 Vpk L-N = 440 Vrms L-L								
Address:hex 0x46decimal 70FName:AC Input Une Frequency Description:The AC Input Une Frequency decimal HzResponse units: Read/Write:decimal HzRead/Write:Read Only Discussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotation $\overline{m0x46?7}$ $m70=400.25\%$ $m70=400.25\%$ $m70=400.25\%$ Interpretation: $60$ Hz, ABC rotation $\overline{m0x00046=59.69/}$ $m70=400.25\%$ $m70=400.25\%$ $m70=400.25\%$ $m70=400.25\%$ $m70=400.25\%$ Interpretation: $60$ Hz, CBA rotationAddress:hex $0x53$ $83$ $5$ Name: Description:Ac Input Voltage (Nsys) Readonly Discussion:Address:hex $0x53$ $83$ $5$ Name: $AC Input Voltage (Vsys)Readonly VoltageRead OnlyBusission:The AC Input Voltage; multiply by v(3/2) to obtain L-L rms.A filter has been applied with a 0.25 second time constant.See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:m'S=359.26\%Interpretation:The AC input voltage is 359 Vpk L-N = 440 Vrms L-L$								
Address: $0x46$ $70$ FName:AC Input Line FrequencyDescription:The AC Line FrequencyResponse units:decimal HzRead/Write:Read OnlyDiscussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd:Typical Responses:Interpretation: $60$ Hz, ABC rotation $m0x0046=59$ . $60 Hz$ , ABC rotation $m0x0046=59$ . $60 Hz$ , ABC rotation $m0x0046=59$ . $60 Hz$ , CBA rotation $mF2 \cdot$ $m^{2}F = -60.11 \cdot$ $0x53$ $83$ Name:AC Input Voltage Description:The AC Input Voltage (Vsys)Response units:decimal voltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by $v(3/2)$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: $m^{2} = 359.26 \cdot$ Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L		hex	decimal	char				
Name: Description: Response units: decimal Hz Read/Write: <th>Address:</th> <th>0x46</th> <th>70</th> <th>F</th> <th></th>	Address:	0x46	70	F				
Description:The AC Line Frequency decimal HzResponse units:decimal HzRead/Write:Read OnlyDiscussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd:Typical Responses:Interpretation: $m0x0466 - 59.69 \checkmark$ 	Name:	AC Input	t Line Frequen	су				
Response units: Read/Write:decimal Hz Read Only Discussion:Read Only The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd: $m0x0046=59.694'$ $m70=400.254'$ $m70=400.254'$ $m^{2} = -60.114'$ Interpretation: $60$ Hz, ABC rotationAddress: $0x53$ $0x53$ $83$ $5$ hex $0x53$ $83$ $5$ Interpretation: $60$ Hz, CBA rotationAddress: Description: $0x53$ $Response units:decimal VoltageCompt Voltage (Vsys)decimal VoltsRead/Write:Read Onlyhex heak L-N voltage; multiply by V(3/2) to obtain L-L rms.A filter has been applied with a 0.25 second time constant.See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:m^{2}S^{2}Typical Response:m^{2}S=359.264'Interpretation:The AC input voltage is 359 Vpk L-N = 440 Vrms L-L$	Description:	The AC L	ine Frequency	-				
Read/Write: Discussion:Read Only The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd: $m0x0646 = 59.69 / Micro M20 + 25 / Micro M20 + 26.0 + $	Response units:	decimal	Hz					
Discussion:The accuracy of this measurement is limited by that of the internal timebase, typically ±2%. Negative values indicate CBA rotationExample Cmd:Typical Responses:Interpretation: $00 \times 0046 = 59, 69 \checkmark$ $m70 = 400.25 \checkmark$ $m^{-70} = 400.25 \checkmark$ $m^{-70} = -60.11 \checkmark$ Interpretation: $60$ Hz, ABC rotation $60$ Hz, CBA rotationAddress:hex $0x53$ $0x53$ $83$ $S$ decimal $0x53$ $83$ $S$ Interpretation: $60$ Hz, CBA rotationAddress:hex $0x53$ $0x53$ $83$ $S$ decimal $0x53$ $83$ $S$ Name:AC Input Voltage Description:The AC Input Voltage (Vsys) Response units:Read/Write:Read Only $010$ The value is the peak L-N voltage; multiply by $v(3/2)$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: $m'S = 359.26 \checkmark$ Interpretation: The AC input voltage is $359$ Vpk L-N = 440 Vrms L-L	Read/Write:	Read On	lly					
Negative values indicate CBA rotationExample Cmd:Typical Responses:Interpretation: $m0x00046=59.69/$ $m70e 400.25/$ $400 Hz$ , ABC rotation $m72^2/$ $m7e - 60.11/$ $60 Hz$ , CBA rotation $mF2'$ $m'F= -60.11/$ $60 Hz$ , CBA rotationAddress:hexdecimal $0x53$ $83$ sName:AC Input VoltageDescription:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by v(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: m'S= 359.26/Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	Discussion:	The accu	$\operatorname{accuracy}$ of this measurement is limited by that of the internal timebase, typically ±2%.					
Example Cmd: $m0x46??$ $m70?4$ $m70?4$ Typical Responses: $m0x0046=59.697$ $m70=400.257$ $m'F=-60.117$ Interpretation: $60$ Hz, ABC rotation $400$ Hz, ABC rotation $60$ Hz, CBA rotationAddress:hex $0x53$ $83$ $5$ decimal $0x53$ $83$ $5$ char $0x53$ $83$ $5$ Name:AC Input Voltage Description: The AC Input Voltage (Vsys) Response units: $decimal Voltage$ Discussion:Hex $a cliput Voltage (Vsys)$ $C rotationA filter has been applied with a 0.25 second time constant.See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:m'S=359.267Typical Response:m'S=359 Vpk L-N = 440 Vrms L-L$		Negative	e values indicat	te CBA rotation				
m0x46?2' $m0x0046=59.692'$ $60$ Hz, ABC rotation $m70?2'$ $m70=400.252'$ $400$ Hz, ABC rotation $mF?2'$ $m'F=-60.112'$ $60$ Hz, CBA rotationAddress:hexdecimalchar $0x53$ 83SName:AC Input VoltageDescription:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by $v(3/2)$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: m' S= 359.262'Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	Example Cmd:	Typical I	Responses:		Interpretation:			
$m70? \chi'$ $m70=400.25\chi'$ $400$ Hz, ABC rotation $mF? \chi'$ $m'F=-60.11\chi'$ $60$ Hz, CBA rotationAddress:hex $0x53$ decimal $0x53$ $60$ Hz, CBA rotationAddress:hex $0x53$ decimal $0x53$ $60$ Hz, CBA rotationDescription:The AC Input Voltage decimal Voltage decimal Volts Read/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by $v(3/2)$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: $m'S=359.26\chi'$ Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	m0x46?∠	m0x004	6= 59.692		60 Hz, ABC rotation			
mF?m'F= -60.1160 Hz, CBA rotationAddress:hex 0x53decimal 0x53char 0x53Name: Description: Response units: decimal Voltage Head OnlyAC Input Voltage (Vsys) decimal Voltage Head OnlyDiscussion: Discussion: m S?The value is the peak L-N voltage; multiply by v(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd: m S?Typical Response: m S= 359.26Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	m70?∠	m7	0= 400.25√		400 Hz. ABC rotation			
Address:hexdecimalchar $0x53$ $83$ $s$ Name:AC Input VoltageDescription:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by $v(3/2)$ to obtain L-L rms.A filter has been applied with a 0.25 second time constant.See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: $m'S= 359.26z'$ The AC input voltage is $359$ Vpk L-N = 440 Vrms L-L	mF?∡	m '	F= -60.112		60 Hz, CBA rotation			
Address:hex $0x53$ decimal $0x53$ char $0x53$ Name:AC Input VoltageDescription:The AC Input Voltage (Vsys) decimal VoltsResponse units: decimal Volts: Read/Write: Discussion:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by V(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: m 'S = 359.262Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L								
Address:hex $0x53$ decimal $0x53$ char $0x53$ 83SName:AC Input Voltage Description:The AC Input Voltage (Vsys)Description:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by v(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: m'S= 359.262Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L								
0x5383SName:AC Input VoltageDescription:The AC Input Voltage (Vsys)Description:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by $\sqrt{3/2}$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response:m'S= 359.262Interpretation: The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	Address:	hex	decimal	char				
Name:AC Input VoltageDescription:The AC Input Voltage (Vsys)Response units:decimal VoltsRead/Write:Read OnlyDiscussion:The value is the peak L-N voltage; multiply by √(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd:Typical Response: m 'S= 359.26∠M'S= 359.26∠The AC input voltage is 359 Vpk L-N = 440 Vrms L-L		0x53	83	S				
Description:       The AC Input Voltage (Vsys)         Response units:       decimal Volts         Read/Write:       Read Only         Discussion:       The value is the peak L-N voltage; multiply by √(3/2) to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.         Example Cmd:       Typical Response:       Interpretation:         m'S= 359.26√       The AC input voltage is 359 Vpk L-N = 440 Vrms L-L	Name:	AC Input	t Voltage					
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Read/Write: Discussion:Read Only The value is the peak L-N voltage; multiply by $\sqrt{3/2}$ to obtain L-L rms. A filter has been applied with a 0.25 second time constant. See datasheet section entitled "Phase Imbalance Shutdown" for more information.Example Cmd: mS? $\checkmark$ Typical Response: m'S = 359.26 $\checkmark$ Interpretation: 	Response units:	decimal	Volts					
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	mS?	m'	S= 359.26/		The AC input voltage is $359 \text{ Vnk I - N} = 440 \text{ Vrms I - I}$			
			555.202					
		-						

Address: Name: Description: Response units: Read/Write: Discussion:	hexdecimalchar0x73115sAC Input Voltage Ripple/ImbalaThe AC Input Voltage Ripple/Imbadecimal pk-pk Volts.Read OnlyOver each line cycle, the instantaand the reported ripple value AFor perfectly balanced 3-phase liA non-zero ripple will be reporteIf the reported value exceeds theunless in battle short mode.See datasheet section entitled "F	nce alance (ΔVsys) neous minimum and maximum AC line voltage is captured, ΔVsys is equal to the difference (Max-Min). ne inputs, this value will be zero. d for any amplitude imbalance, phase imbalance, or distortion. e datasheet threshold for the specified time, the unit will shut down, Phase Imbalance Shutdown" for more information.
Example Cmd:	Typical Response:	Interpretation:
ms?∠	m's= 2.31∠	There's 2.3V p-p of imbalance.
Address: Name: Description: Response units: Read/Write: Discussion:	hex decimal char 0x72 114 r Estimated Input Capacitance (per The total estimated input capacit decimal uF Read/Write This value includes both cap inside This capacitance value is specifie The PFC uses this value to calcula This phase angle may be accesse At higher load levels (and therefor capacitors can be cancelled ou Note that the desired capacitance the value should be sent as "2. 1/1024 uF, so the text "2" (wit See datasheet section entitled "F	er Phase) :ance (1.5 uF default at power-up) le the PFC module and in the recommended external EMI filter. d in uF per phase assuming lumped WYE connected capacitors. ate a desired phase angle for input current, relative to input voltage. d via the serial port at address 0x6B / 107 / "k". ore input current amplitudes), the leading current drawn by EMI t by a lagging current drawn by the active PFC, yielding net unity PF. e value should be entered as a floating point value, so for 2.0 uF, 0" or "2." The internal digital representation is made in multiples of hout the radix point) indicates a (wrong) value of only 0.002 uF. Reactive Power at Fundamental" for further information. Interpretation:
mr?∠	m'r= 1.5002	The estimated input capacitance is 1.5 uF per phase
	have a start start	
Address:	Ox6B 107 k	
Name:	Angle of PFC Input Current	
Description:	The angle of input current drawn	ı by the PFC relative to the applied input voltage angle
Response units:	decimal degrees of angle	
Read/Write:	Read Only	
Discussion:	lagging currents drawn by the only by the power stage of the PFC module or by capacitors in Negative values indicate leading This reported angle includes an of This offset will be a function of fr The purpose of the offset is to co The offset can be measured by se The maximum correction angle is	PFC. This angle value represents the phase angle of the current drawn PFC. It does not include currents drawn by input capacitors inside the any external EMI filter. current. offset such that at 400 Hz, there is a -8.2 degree offset. requency; at 60 Hz, the offset is -1.2 degrees. ompensate for a fixed delay on acquisition of the input voltage readings. etting the "r" parameter above to zero, and then reading the angle "k". s limited to approximately 20-25 degrees (lagging).

Example Cmd: mk?✓ Typical Response: m'k= 14.3∠ Interpretation: The PFC input currents are lagging by 14.3 degrees

Address:	hex decimal char 0x76 118 v	
Name:	Midbus (Buck Stage) Output Voltage	
Description:	The +Midbus output voltage	
Response units:	decimal Volts DC	
Read/Write:	Read Only	
Example Cmd:	Typical Response:	Interpretation:
mv?∠	m'v= 205.1∠	The Mibdus output voltage is 205.1 VDC
	how desired they	
Address:		ШС
Nomo	0x09 105 1	
Name:	Buck Stage Output Current	
Description.	I ne Buck-Stage output current	
Response units.	Road Only	
Read/ write:	Read Only	
Example Cmd:	Typical Response:	Interpretation:
mi?∠	m'i= 3.21/	The buck stage is delivering 3.21 Adc (out)
Addross	hex decimal char	
Address:	0x70 112 p	
Name:	Buck Stage Output Power	
Description:	Returns the Buck-Stage output power	
Response units:	Watts	
Read/Write:	Read Only	
Example Cmd:	Typical Response:	Interpretation:
mp?∠	m'p= 658⊻	The buck stage is processing 658 W.
	her decimal char	
Address:		
Name	Boost Stage Input Current	
Description:	The Boost Stage input current	
Besponse units:	decimal Amperes DC	
Read/Write	Read Only	
Ready write.	Neau Only	
Example Cmd:	Typical Response:	Interpretation:
mI?	m'I= 3.265∠	The boost stage is also handling 3.2 A (input current)

Address:	hex decimal ch	ar
Nomo	Ux50 80 P	
Name:	Boost Stage Input Power	_
Description:	The Boost-Stage input powe	r
Response units:	Walls Bood Only	
Read/ Write:	Read Only	
Example Cmd:	Typical Response:	Interpretation:
mP?∠	m'P= 650⊄	The boost stage is drawing 650 W in.
Address:	hex decimal ch 0x56 86 V	ar
Name:	Boost Output Voltage	
Description:	The Boost-Stage output volt	age
Response units:	decimal Volts DC	
Read/Write:	Read Only	
Example Cmd:	Typical Posponso:	Interpretation:
mV2./	m'V= 403 75./	The boost stage is producing 404 Vdc
111V : E		The boost stage is producing 404 vac.
Address:	hex decimal ch	ar
Name:	BCB Temperature	
Description:	The unit's internal temperat	
Response units:	units are signed decimal °C	
Read/Write:	Read Only	
Discussion:		
Example Cmd:	Typical Response:	Interpretation:
mT?∠	m'T= 63.08∠	The PFC is at about 63 °C internally.
	hey docimal ch	
Address:	0x4D 77 M	a
Name:	Machine State	
Description:	The present operational stat	e number of the PEC
Responses:	1 Waiting for all o	anditions to be ready to start
	2 Starting	
	3 Running	
	4 Stopping	
	5 Waiting auto-res	start timeout
Read/Write:	Read Only	
Freemale Cristi	Turical Dear array	laters setation.
Example Cmd:	Typical Response:	The DEC is Durphing
11114 F 22	III 11- 52	

Address:       hex       decimal       char         0x4E       78       N         Name:       PFC ENA Pin Override         Description:       Allows overriding the PFC ENA pin via serial interface         nt       int         Read/Write:       Read / Write         Discussion:       value of 10 (0xA) allows unit operation to follow PFC ENA pin [default ] writing value of 11 (0xB) overrides PFC ENA pin and forces the unit ON						
E a mala Qual	writing a value of 12 (0)	xC) overrides PFC EN	A pin and forces the unit OFF			
Example Cmd:	Typical Response:		Interpretation:			
mN = 11 I	m'n= 0x000A⊵		value = 10; obey PFC ENA pin			
mN=10⊭	m N= 11⊄ m'N= 10⊄		set value back to 10; obey PFC ENA pin again			
Address:	hex decimal 0x6F 110	char n				
Name:	Battle Short Mode Ena	ble				
Description:	Allows engaging Battle Short mode via serial interface					
Response units:	hex					
Read/Write:	Read/Write					
Discussion:	value of 10 (0xA) allows	s Battle Short mode t	o follow BS Pin [default ]			
	writing value of 11 (0xB	3) turns on Battle sho	rt mode regardless of BS Pin value			
	-					
Example Cmd:	Typical Response:		Interpretation:			
mn?∠∕	m'n= 0x000A∠		value = 10; obey BS pin			
mn=11∠	m'n= 11∠		set value to 11, Battle Short Mode = On			
mn=10⊯	m'n= 10∠		set value back to 10; obey BS pin again			
Address:	hex decimal 0x63 99	char c				
Name: 🥚	AC Line Status					
Description:	Status flags relating to the AC Line					
Responses:	bit 0 AC Line Voltage has excessive imbalance / distortion past time limit (see AC GOOD specs)					
	bit 1 AC Line Fre	quency is outside no	rmal range (see datasheet for lower and upper thresholds)			
	bit 2 AC Line Vol	tage is below Low Th	reshold (see datasheet for value, hysteresis, and tolerance)			
	bit 3 AC Line Voltage is above High Threshold (see datasheet for value, hysteresis, and tolerance)					
Read/Write:	Read Only					
Discussion:	Any bit set indicates an	Any bit set indicates an out-of-range condition for the AC Line -> AC GOOD will be set low.				
	Bit 0 (imbalance / distortion) will shut down the unit after a timeout unless in battle short mode.					
	Bits 1-3 (freq / voltage)	will prevent startup	but will not shut down the unit if it is already running.			
Example Cmd:	Typical Response:		Interpretation:			
mc?∠	m'c= 0x0004∠		AC Line voltage is low			
			-			

Addross	hex	decimal	char				
Address:	0x65	101	е				
Name:	Shutdown Source						
Description:	Status bit	Status bits that indicate a no-operate condition. See also above AC Line Status command.					
Responses:	bits 0-2	NA					
	bit 3	Low bias su	uppply input voltage	e			
	bit 4	Over-Temperature Protection +MIDBUS below threshold & past time limit					
	bit 5						
	bit 6	Low bias suppply output voltage					
	bit 7	NA					
	bit 8	Unit disabl	ed by user				
	bit 9	NA					
	bit 10	Short circu	it detected				
	bits 11-15	5 NA					
Read/Write:	Read Only	/					
Discussion:	Any bit set here will shut down the unit. See also above AC Line Status command.						
Example Cmd:	Typical Response:			Interpretation:			
me?∠	m'e= 0x0100∠			PFC ENA set to OFF			
Address:	hex	decimal	char				
	0x77	119	W				
Name:	BS Warnings						
Description:	Status bits associated with Battle Short pin (v			n (warnings)			
Responses:	bit 0		NA				
	bit 1		Warn Over Tem	perature			
	bits 2-3		NA				
	bit 4 🚽		Warn AC Line Im	nbalance.			
	bits <mark>5-</mark> 15		NA				
Read/Write:	Read Only						
•	Read Only	/					
Discussion:	Read Only These flag	/ gs indicate the	e reason the Battle	Short pin has been let float			
Discussion: Example Cmd:	Read Only These flag Typical Re	/ gs indicate the esponse:	e reason the Battle	Short pin has been let float			