
**EIG-Register Mappings for MODBUS® Protocol
Including Long Island Lighting Company Utility Standard Mappings**

FOR ELECTRO INDUSTRIES/GAUGETECH POWER MONITORING DEVICES

Futura+ Series
DM Series

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METER PROFILE BLOCK

Registers	Bits																584/984
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	VOLTS						AMPS				POWER						
0000	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40001
	W			VAR			VA			PF							
0001	A	B	C	A	B	C	A	B	C	A	B	C	REV	IMB	----	----	40002
	KF VOLTS			KF AMPS			HOUR										
0002	A	B	C	A	B	C	----	----	D	A	X	I	W	VAR	VA	----	40003
	THD VOLTS			THD AMPS			HARM VOLTS			HARM AMPS							
0003	A	B	C	A	B	C	----	----	A	B	C	A	B	C	----	----	40004
	LIMITS			RELAYS			KYZ										
0004	1	2	---	---	1	2	3	---	1 CH	3 CH	----	----	----	----	----	----	40005
0005+	RESERVED FOR FUTURE USE																40006+

RELAY AND KYZ:

A bit value of 1 means that the firmware supports features, but specific hardware is necessary for those features to operate. The hardware is only installed if the appropriate options are purchased for the meter. THESE BITS DO NOT GUARANTEE THESE FEATURES. A bit value of 0 means the features are not supported.

Other: A bit value of 1 means the features are supported.

METER INFORMATION BLOCK

Registers	Registers								584/984
	0	1	2	3	4	5	6	7	
	METER NAME								
0008+									40009+
	METER NAME		RESERVED FOR FUTURE USE						
0010+									40017+
	RESERVED FOR FUTURE USE								
0018+									40025+
	RESERVED FOR FUTURE USE				VERSION NUMBERS				
0020+	RESERVED FOR FUTURE USE				MODBUS	ANALOG	DIGITAL		40033+

Registers 0008-0011:

20 Bytes ASCII, containing the meter name, left justified and padded with ASCII SPACES (0x20)

Registers 0025-0027:

2 Bytes each two's complement number, representing a version number with a single implied decimal point.

PROGRAMMING DATA BLOCK

Registers	Registers								584/984
	0	1	2	3	4	5	6	7	
0028+									40041+
010C+									40269+

Registers 0028-0113:

Until written to, the Programming Data Block contains information accurate to the current operation of the meter. Changes written to the Programming Data Block do not go into effect until a system reset is requested through communication.

See Appendix A: Programming Data Block for specific information.

PHASE REVERSAL / IMBALANCE BLOCK

Registers Registers 584/984

	PHASE REVERSAL	
0114		40277
	PHASE IMBALANCE	
0115		40278

Register 0114: A 2 Byte value of 0 x 0000 means a phase sequence of A-B-C.

A 2-Byte non-zero value means a phase sequence of C-B-A.

Register 0115: 2 Byte two's compliment number, representing a percentage with a single implied decimal place.

DAXI DATA BLOCK

Registers 584/984 Registers 584/984 Registers 584/984 Registers 584/984

	INST (D)		AVE (A)		MAX (X)		MIN (I)	
VOLT AN	0116	40279	013D	40318	0164	40357	018B	40396
VOLT BN	0117	40280	013E	40319	0165	40358	018C	40397
VOLT CN	0118	40281	013F	40320	0166	40359	018D	40398
VOLT AB	0119	40282	0140	40321	0167	40360	018E	40399
VOLT BC	011A	40283	0141	40322	0168	40361	018F	40400
VOLT CA	011B	40284	0142	40323	0169	40362	0190	40401
AMP A	011C	40285	0143	40324	016A	40363	0191	40402
AMP B	011D	40286	0144	40325	016B	40364	0192	40403
AMP C	011E	40287	0145	40326	016C	40365	0193	40404
AMP N	011F	40288	0146	40327	016D	40366	0194	40405
WATT	0120	40289	0147	40328	016E	40367	0195	40406
VAR	0121	40290	0148	40329	016F	40368	0196	40407
VA	0122	40291	0149	40330	0170	40369	0197	40408
PF	0123	40292	014A	40331	0171	40370	0198	40409
FREQ	0124	40293	014B	40332	0172	40371	0199	40410
WATT A	0125	40294	014C	40333	0173	40372	019A	40411
WATT B	0126	40295	014D	40334	0174	40373	019B	40412
WATT C	0127	40296	014E	40335	0175	40374	019C	40413
VAR A	0128	40297	014F	40336	0176	40375	019D	40414
VAR B	0129	40298	0150	40337	0177	40376	019E	40415
VAR C	012A	40299	0151	40338	0178	40377	019F	40416
VA A	012B	40300	0152	40339	0179	40378	01A0	40417
VA B	012C	40301	0153	40340	017A	40379	01A1	40418
VA C	012D	40302	0154	40341	017B	40380	01A2	40419
PF A	012E	40303	0155	40342	017C	40381	01A3	40420
PF B	012F	40304	0156	40343	017D	40382	01A4	40421
PF C	0130	40305	0157	40344	017E	40383	01A5	40422
KF VOLT A	0131	40306	0158	40345	017F	40384	01A6	40423
KF VOLT B	0132	40307	0159	40346	0180	40385	01A7	40424
KF VOLT C	0133	40308	015A	40347	0181	40386	01A8	40425
KF AMP A	0134	40309	015B	40348	0182	40387	01A9	40426
KF AMP B	0135	40310	015C	40349	0183	40388	01AA	40427
KF AMP C	0136	40311	015D	40350	0184	40389	01AB	40428
RESERVED	0137	40312	015E	40351	0185	40390	01AC	40429
RESERVED	0138	40313	015F	40352	0186	40391	01AD	40430
RESERVED	0139	40314	0160	40353	0187	40392	01AE	40431
RESERVED	013A	40315	0161	40354	0188	40393	01AF	40432
RESERVED	013B	40316	0162	40355	0189	40394	01B0	40433
RESERVED	013C	40317	0163	40356	018A	40395	01B1	40434

Registers 0116-01B1: 2 Byte two's compliment numbers. Decimal placement and scales for appropriate readings are available from the Programming Data Block.

HOURLY BLOCK

	Registers								
	0	1	2	3	4	5	6	7	
	WATT HOUR								
01B2+									40435+
	VAR HOUR								
01BA+									40443+
	VA HOUR								
01C2+									40451+

Register 501B2-01C9:

16 Bytes each ASCII, representing a 16 Byte BCD count of the base Hour function. (Decimal placement and scales for the appropriate readings are available from within the Programming Data Block. See Appendix A: Programming Data Block Map, Config, bits KV and MW).

LIMIT DETECTION BLOCK

	LIMIT 1 BITS – LIMIT 2																
	FOR DM SERIES																
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
							THD VOLTS			THD AMPS							
01CA	----	----	----	----	----	----	----	----	A	B	C	A	B	C	REV	IMB	40459
	VOLTS					AMPS					POWER						
01CB	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40460
01CC+	RESERVED FOR FUTURE USE															40461+	

	LIMIT 2 BITS – LIMIT 1																
	FOR DM SERIES																
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
							THD VOLTS			THD AMPS							
01CE	----	----	----	----	----	----	----	----	A	B	C	A	B	C			40463
	VOLTS					AMPS					POWER						
01CF	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40464
01D0+	RESERVED FOR FUTURE USE															40465+	

Register 501CA-01CF:

A bit value of 1 means that the limit is being exceeded for the associated quantity.
 A bit value of 0 means that the limit is not being exceeded for the associated quantity.

RELAY STATUS BLOCK

	RELAY 1 BITS																
	FOR DM SERIES																
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
							STATUS	THD VOLTS			THD AMPS						
01DA	----	----	----	----	----	----	ON	LK	A	B	C	A	B	C	REV	IMB	40475
	VOLTS					AMPS					POWER						
01DB	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40476
01DC+	RESERVED FOR FUTURE USE															40477+	

	RELAY 2 BITS																
	FOR DM SERIES																
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
							STATUS	THD VOLTS			THD AMPS						
01DE	----	----	----	----	----	----	ON	LK	A	B	C	A	B	C	REV	IMB	40479
	VOLTS					AMPS					POWER						
01DF	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40480
01E0+	RESERVED FOR FUTURE USE															40481+	

Registers	RELAY 3 BITS														584/984		
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
							STATUS			THD VOLTS			THD AMPS				
01E2	----	----	----	----	----	----	ON	LK	A	B	C	A	B	C	REV	IMB	40483
	VOLTS						AMPS				POWER						
01E3	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40484
01E0+	RESERVED FOR FUTURE USE														40485+		

Registers 01DA-01E3:

- Status: A bit value of 1 for ON means the relay is activated, 0 means not activated.
- A bit of 1 for LK means the relay is locked, 0 means not locked.
- Other: A bit value of 1 means the associated limit has activated the relay.
- A bit value of 1 means the associated limit has not activated the relay.

THD SUMMARY BLOCK

	Registers	584/984 Registers	584/984 Registers	584/984 Registers	584/984 Registers		
	INST (D)		MAX (X)		MIN (I)		
THD VOLT A	01EA	40491	RESERVED	01F6	40503	01FC	40509
THD VOLT B	01EB	40492	RESERVED	01F7	40504	01FD	40510
THD VOLT C	01EC	40493	RESERVED	01F8	40505	01FE	40511
THD AMP A	01ED	40494	RESERVED	01F9	40506	01FF	40512
THD AMP B	01EE	40495	RESERVED	01FA	40507	0200	40513
THD AMP C	01EF	40496	RESERVED	01FB	40508	0201	40514

Registers 01EA-0201:

2 Byte each two's compliment numbers, representing a percentage with a single decimal point.

THD DETAIL BLOCK

HARM VOLT A Registers

	Registers	584/984 Registers	584/984			
	PERCENT		PHASE			
HARM 0	0202		40515	0203		40516
HARM 31	0240		40577	0241		40578
	0242+	RESERVED FOR FUTURE USE				40579+

HARM VOLT B Registers

HARM 0	0282		40643	0283		40644
HARM 31	02C0		40705	02C1		40706
	02C2+	RESERVED FOR FUTURE USE				40707+

HARM VOLT C Registers

HARM 0	0302		40771	0303		40772
HARM 31	0340		40833	0341		40834
	0342+	RESERVED FOR FUTURE USE				40835+

HARM AMP A Registers

HARM 0	0382		40899	0383		40900
HARM 31	03C0		40961	03C1		40962
	03C2+	RESERVED FOR FUTURE USE				40963+

HARM AMP B Registers

HARM 0	0402		41027	0403		41028
HARM 31	0440		41089	0441		41090
	0442+	RESERVED FOR FUTURE USE				41091+

HARM AMP C Registers

HARM 0	0482		41155	0483		41156
HARM 31	04C0		41217	04C1		41218
	04C2+	RESERVED FOR FUTURE USE				41219+

Register 0202-04C1:

Percent: 2 Bytes each two's compliment number, representing a percentage with a single implied decimal point.

Phase: 2 Bytes each two's compliment number, representing a phase angle with a single implied decimal point.

RESET BLOCK

Registers

Bits

584/984

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	VOLTS						AMPS				POWER						
0502	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	41283
	W			VAR			VA			PF							
0503	A	B	C	A	B	C	A	B	C	A	B	C	----	----	----	----	41284
	KF VOLTS			KF AMPS							RESET		HOURL				
0504	A	B	C	A	B	C	----	----	----	----	X	I	W	VAR	VA	----	41285
	THD VOLTS			THD AMPS													
0505	A	B	C	A	B	C	----	----	----	----	----	----	----	----	----	----	41286
0506+	RESERVED FOR FUTURE USE															41287+	

Registers 0502-0505:

Reset: A bit of 1 for X or I will reset the MAX or MIN, respectively, of indicated features.

The bits from indicated features will be cleared as their feature is reset.

Hour: A bit value of 1 for W, VAR, or VA will reset the WATT, VAR, or VA Hour counter.

Other: A bit value will reset the MAX or MIN of the associated feature upon setting either the X or I bit in the Reset Group.

COMMUNICATION PARAMETERS

Electro Industries meters with the MODBUS communication option can communicate with either ASCII or RTU framing.

ASCII framing - 7 data bits, even parity, 1 stop bit

RTU framing - 8 data bits, no parity, 1 stop bits

User selection of this parameter can be accomplished either through communication (see Appendix A: Programming Data Block Map) or by the user through the keypad.

Keypad selection is accomplished through the Programming mode in the System Configuration function, Group 0, Function 3. Switch PACK 2 Position C controls which framing mode to use for MODBUS communication.

Switch setting 0 signifies RTU framing, while switch settings 1 signifies ASCII framing.

For a detailed explanation of the Programming Mode, see the Programming Manual.

MODBUS communication for Electro Industries meters is limited to 50 registers per query.

APPENDIX A: PROGRAMMING DATA BLOCK MAP

Registers	Registers				584/984
	0	1	2	3	
0028+	Interval	Address	Baud Rate	Config	40041+
002C+	VOLTS Full Scale	AMPS Full Scale	Decimal Placement	LILCO	40045+
0030+	Set Above/Below Lim1	Set Above/Below Lim2	VOLTS AN Lim1	VOLTS AN Lim2	40049+
0034+	AMPS A Lim1	AMPS A Lim2	VOLTS BN Lim1	VOLTS BN Lim2	40053+
0038+	AMPS B Lim1	AMPS B Lim2	VOLTS CN Lim1	VOLTS CN Lim2	40057+
003C+	AMPS C Lim1	AMPS C Lim2	VOLTS AB Lim1	VOLTS AB Lim2	40061+
0040+	VOLTS BC Lim1	VOLTS BC Lim2	VOLTS CA Lim1	VOLTS CA Lim2	40065+
0044+	AMPS N Lim1	AMPS N Lim2	WATT Lim1	WATT Lim2	40069+
0048+	VAR Lim1	VAR Lim2	VA Lim1	VA Lim2	40073+
004C+	PF Lim1	PF Lim2	FREQ Lim1	FREQ Lim2	40077+
0050+	RESERVED FOR FUTURE USE				40081+
0054+					40085+
0058+					40089+
005C+					40093+
0060+					40097+
0064+					40101+
0068+					40105+
006C+					40109+
0070+					RLY1 Lim1
0074+	Delay on RLY1-2	SAB THD Lim1-2	RLY1 THD Lim1-2	RLY2 THD Lim1-2	40117+
0078+	THD VOLTS A Lim1	THD VOLTS A Lim2	THD AMPS A Lim1	THD AMPS A Lim2	40121+
007C+	THD VOLTS B Lim1	THD VOLTS B Lim2	THD AMPS B Lim1	THD AMPS B Lim2	40125+
0080+	THD VOLTS C Lim1	THD VOLTS C Lim2	THD AMPS C Lim1	THD AMPS C Lim2	40129+
0084+	RLY1-2 IMB Lim1	IMB Lim1	RELAY 1 MODE		40133+
0088+	RELAY 2 MODE		Delay off RLY1-2	KYZ MAP	40137+
008C+	KYZ MAP	KYZ FACTOR			40141+
0090+	RESERVED FOR FUTURE USE				40145+
0094+					40149+
0098+					40153+
009C+					40157+
00A0+					40161+
00A4+					40165+
00A8+					40169+
00AC+					40173+
00B0+					40177+
00B4+					40181+
00B8+					40185+
00BC+					40189+
00C0+					40193+
00C4+					40197+
00C8+					40201+
00CC+					40205+
00D0+					40209+
00D4+					40213+
00D8+					40217+
00DC+					40221+
00E0+					40225+
00E4+					40229+
00E8+					40233+
00EC+					40237+
00F0+	40241+				
00F4+	40245+				
00F8+	40249+				
00FC+	40253+				
0100+					40257+
0104+					40261+
0108+	CT Ratio	PT Ratio			40265+
010C+					40269+
0110+				SYSTEM RESET	40273+

CONFIGURATION INFORMATION

Interval

Register 0028:
2 Byte two's compliment number representing the Integration Interval in seconds.

Address

Register 0029:
2 Byte two's compliment number, which is the Address of the meter for communication purposes.
Under MODBUS communications, this address should be between 1 and 247, inclusive.

Baud Rate

Register 002A:
2 Byte two's compliment number, which is the Baud Rate being used for communications. Only baud rate valid for the meter in question should be used (e.g., 1200, 9600). Improper settings could disable communication.

Config

Register 002B:

Register	Bits																584/984
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
002B	KV	KA	MW	REV	LZ	RST	----	DLT	AVG	----	ASCII	MOD	RLY1	RLY2	COM	DC	40044

- KV:** A bit value of 1 means the meter is configured for kilovolt inputs. *
A bit value of 0 means the meter is configured for volt inputs. *
- KA:** A bit value of 1 means the meter is configured for kiloamp inputs. *
A bit value of 0 means the meter is configured for amps inputs. *
- MW:** A bit value of 1 means the meter is configured for megawatt inputs. *
A bit value of 0 means the meter is configured for kilowatt inputs. *
- REV:** A bit value of 1 means the Phase Reversal Limits are enabled.
A bit value of 0 means the Phase Reversal Limits are not enabled.
- LZ:** A bit value of 1 means leading zeros are blanked on the meter display.
A bit value of 0 means leading zeros are displayed on the meter display.
- RST:** A bit value of 1 means that Reset Protection is enabled. (Resetting max/min and hour function readings from the keypad requires the entry of a password).
A bit value of 0 means that Reset Protection is disabled. (Resetting hour function readings from the keypad requires the entry of a password).
- DLT:** A bit value of 1 means the meter is set up for Open Delta.
A bit value of 0 means the meter is set up for non Open Delta configuration.
- AVG:** A bit value of 1 means Limits are set by the Average Readings.
A bit value of 0 means Limits are set by the Instantaneous Readings.

ASCII:	ASCII	MOD	PROTOCOL
MOD:	0	0	Electro Industries
	0	1	Modbus RTU
	1	0	DNP 3.0
	1	1	Modbus ASCII

- RLY1:** Please see the Programming Manual about PACK 3 of Function 0, Group 3 for an explanation of the meaning of these bits.
- RLY2:** Please see the Programming Manual about PACK 3 of Function 0, Group 3 for an explanation of the meaning of these bits.
- COM:** Please see the Programming Manual about PACK 3 of Function 0, Group 3 for an explanation of the meaning of these bits.
- DC:** Please see the Programming Manual about PACK 3 of Function 0, Group 3 for an explanation of the meaning of these bits.

These features duplicate those available in the switch PACKS of Function 0, Group 3, in the meter's Programming Mode. For further information, please see the other manuals for the meter.

Should these features be changed, a replacement Bezel should be ordered to reflect the new units.

VOLTS Full Scale

Register 002C:

2 Byte two's compliment number representing the Full Scale for voltage. For decimal placement, see Decimal Placement below.

AMPS Full Scale

Register 002D:

2 Byte two's compliment number representing the Full Scale for current. For decimal placement, see Decimal Placement below.

DECIMAL PLACEMENT & LILCO CONFIGURATION

Registers	Registers				584/984
	0		1		
002E+	VOLTS DP	AMPS DP	WATT DP	LILCO CONFIG	40047+

Registers 002E-002F:

Each of the DP bytes represents the implied number decimal places in the associated values. Valid values are '0'-'4', with meanings from 'no implied decimal place' to 'four implied decimal places'. These values effect the meanings of INST, MAX, MIN, Hour functions, Full Scales, Limits and other readings.

LILCO CONFIGURATION

Register	Bits						584/984		
	7	6	5	4	3	2	1	0	
	VOLT		AMP		POWER			CONFIG	
002F	Round by 10	Current Scale		Power Scale			LILCO	40048	

Register 002F:

These settings effect readings in the LILCO mapping.

Round by 10: 0=no rounding 1=round raw readings down by 10 before scaling.

Current Scale: 00=1A Full Scale 01=2.5A Full Scale

 10= 5A Full Scale 11=7.5A Full Scale

Power Scale: 000=250W Full Scale 001=500W Full Scale

 010=1000W Full Scale 011=1500W Full Scale

 100=2000W Full Scale 101=2500W Full Scale

 110=3000W Full Scale 111=3500W Full Scale

LILCO Enable: 0=Normal Mapping 1=LILCO Mapping (Normal mapping starts at 100)

SET ABOVE/BELOW LIM 1

Register	Bits														584/984		
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	VOLTS				AMPS				POWER								
0030	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40049

Register 0030:

A bit value of 0 means the limit is exceeded if the associated value is greater than its Limit 1 value.

A bit value of 1 means the limit is exceeded if the associated value is less than its Limit 1 value.

For functions with negative numbers, the comparisons use absolute valued values.

SET ABOVE/BELOW LIM 2

Register 0031:

Same as Set Above/Below Lim1, but for Limit 2.

VOLTS AN Lim1-FREQ Lim2

Registers 0032-004F:

2 Byte two's compliment numbers, representing limit thresholds for the associated functions. Decimal placement is determined by the associated DP byte.

RLY LIM 1

Register Bits 584/984

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	VOLTS						AMPS				POWER						
0070	AN	BN	CN	AB	BC	CA	A	B	C	N	W	VAR	VA	PF	FQ	----	40113

Register 0070:

A bit value of 1 means that Limit 1 of the associated value will trigger Relay 1.

A bit value of 0 means that Limit 1 of the associated value will not trigger Relay 1.

RLY LIM 2-RLY2 LIM2

Register 0071-0073:

Same as RLY1 Lim 1, but for Relay 2 and Limit 2 where appropriate.

DELAY ON RLY1-2

Register Bits 584/984

	0								1								
0074	Relay 1								Relay 2								40117

Register 0074:

1 Byte unsigned binary number each, representing the delay time from a relay being reset before it could be set in seconds. Valid numbers are 0 to 250.

SAB THD LIM 1-2

Register Bits 584/984

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	Lim1						Lim2										
	THD VOLTS			THD AMPS			THD VOLTS			THD AMPS							
0075	A	B	C	A	B	C	----	----	A	B	C	A	B	C	----	----	40118

Register 0075:

A bit value of 0 = the limit is exceeded if the associated value is greater than its Limit 1 or 2.

A bit value of 1 = the limit is exceeded if the associated value is less than its Limit 1 or 2.

RLY THD LIM 1-2

Register Bits 584/984

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	RLY1 Lim1						RLY1 Lim2										
	THD VOLTS			THD AMPS			THD VOLTS			THD AMPS							
0076	A	B	C	A	B	C	----	----	A	B	C	A	B	C	----	----	40119

Register 0076:

A bit value of 1 means that the indicated limit of the associated value will trigger a Relay.

A bit value of 0 means that the indicated limit of associated value will not trigger Relay 1.

RLY2 THD LIM 1-2

Register 0077:

Same as RLY THD Lim 1-2, but for Relay 2.

THD VOLTS A LIM 1 - THD AMPS C LIM2

Registers 0078-0083:

2 Byte two's compliment numbers, representing the limit thresholds for the associated functions. Each represents a percentage with a single implied decimal.

RLY1-2 IMB LIM 1

Register	Bits														584/984		
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	RLY1							RLY2									
0084	REV	IMB	----	----	----	----	----	----	REV	IMB	----	----	----	----	----	----	40133

Register 0084:

- REV:** A bit value of 1 means that Limit 1 for Phase Reversal will trigger the indicated Relay.
A bit value of 0 means that Limit 1 for Phase Reversal will not trigger the indicated Relay.
Phase Reversal Limit 1 is enabled by the REV bit in Config.
- IMB:** A bit value of 1 means that Limit 1 for Phase Imbalance will trigger the indicated Relay.
A bit value of 0 means that Limit 1 for Phase Imbalance will not trigger the indicated Relay.
Phase Imbalance Limit 1 is always enabled.

IMB LIM 1

Register 0085:

2 Byte two's compliment number, representing the limit threshold for Imbalance. This number represents a percentage with a single implied decimal place. The Imbalance Limit is always set to be passed if the Imbalance percentage is greater than this limit.

RELAY 1 MODE:

Registers	Registers			584/984
	0		1	
0086+	IMB/REV CONTROL	LOGIC CONTROL	SET/ RESET CONTROL	40135+

Registers 0086-0087:

- IMB/REV/CONTROL:** 1 Byte two's compliment number, where a value of '0' means that Relay 1 is set by Phase Reversal or Imbalance Limits being exceeded and reset by normal Reversal and Imbalance conditions. Non-zero values mean that Relay 1 is reset by Phase Reversal or Imbalance Limits being exceeded and set by normal Reversal and Imbalance conditions.
- LOGIC CONTROL:** 1 Byte two's compliment number, where a value '0' means that all Limits triggering Relay 1 should be added to set or reset the Relay. Non-zero values means that all Limits triggering Relay 1 should be Ored to set or reset the Relay.
- SET RESET CONTROL:** 2 one Byte two's compliment numbers. Two non-zero values indicate that Relay 1 is normally reset, and exceeded limit set the Relay. Two values of zero indicate that Relay 1 is normally set and exceeded limits reset the Relay. Other combination are reserved for future use.

RELAY 2 MODE

Registers 0088-0089:

Same as RELAY 1 MODE, but for Relay 2.

Delay off RLY1-2

Registers	Bites		584/984
	0	1	
008A	Relay 1	Relay 2	40139+

Register 008A:

1 Byte unsigned binary number each, representing the delay time from a relay being set before it could be reset, in seconds. Valid numbers are from '0' to '250'

KYZ MAP, KYZ FACTOR

Registers	Registers						584/984
	0		1		2		
	KYZ MAP			KYZ FACTOR			
008B+	Port 1	Port 2	Port3	Port1	Port2	Port3	40143+

Register 008B-008D:

KYZ MAP: 1 Byte two's compliment numbers, signifying whether which ports should be enabled for KYZ outputs of which functions. Valid numbers are:

- | | |
|--------------------|--------------------|
| '0' KYZ disabled | '3' -Watt Hour KYZ |
| '1' +Watt Hour KYZ | '4' +VAR Hour KYZ |
| '2' VA Hour KYZ | '5' -VAR Hour KYZ |

KYZ FACTOR: 1 Byte two's compliment numbers, representing the KYZ change in level per Watt for each port. Valid number are:

- | | |
|--------------------------------|--|
| '0' one unit of Full Scale | '4' one unit of Full Scale |
| '1' two units of Full Scale | '5' half a unit of Full Scale |
| '2' ten units of Full Scale | '6' one tenth a unit of Full Scale |
| '3' twenty units of Full Scale | '7' one twentieth a unit of Full Scale |

CT/PT Ratios

Registers	Registers		584/984
	0	1	
0108+	CT Ratio	PT Ratio	40265+

Registers 0108-0109:

2 bytes, MSB first values. Displayed in the RTU Block in user definable format.

SYSTEM RESET

Register 0113:

2 Byte two's compliment number. When the meter is reset, this register contains the value '-32,768', (0x8000). It is recommended that communication with the meter begin with writing another value to this register. Thus, the device communicating would know if the meter was reset (through the keypad, power loss, etc.) by reading this register and checking for the value '-32768'.

Communication can request for a reset of the meter by writing the value '-1' (0xFFFF) to this register. Any changes made to the Programming Data Block through communication will go into effect only after this reset is performed. Any other form of reset will result in the loss of any modifications to the Programming Data since the last meter was reset.

Writing the value '0' (0x0000) to this register will reset the Programming Data Block, permanently removing any changes made to these registers since the last communication requested reset.

APPENDIX B: LILCO MAPPING

If this mapping is configured by setting the appropriate bit in the LILCO configuration register of the Programming Block, then all the register addresses shown in the regular mapping are moved down by 100. For example, Instantaneous Volts AN is normally accessed in register 0116 (40279). When LILCO mapping is selected, the old register information is now stored 100 registers lower, in register 017A (40379).

In addition to the bit which configures the mapping, the LILCO Configuration register contains other bits which provide scaling options for readings in this alternate mapping.

This register mapping is designed in conjunction with Long Island Lighting Company a proposed standard for utility RTUs. This is designed to give the maximum efficiency in polling information within the blocks.

SYSTEM SANITY

Registers Registers 584/984

SYSTEM SANITY		
0000		40001

Register 0000:
2-byte indication of proper operation of meter. A value of 0x0000 indicates the meter detects it is operating properly. Any other value is an indication that the meter detects an internal fault.

POLLING VALUES

Registers 584/984

	POLLING	
AMP A	0001	40002
AMP B	0002	40003
AMP C	0003	40004
VOLT AN	0004	40005
VOLT BN	0005	40006
VOLT CN	0006	40007
WATT	0007	40008
VAR	0008	40009

Registers 584/984

	POLLING	
WATT A	0009	40010
WATT B	000A	40011
WATT C	000B	40012
VAR A	000C	40013
VAR B	000D	40014
VAR C	000E	40015

Register 0001-000E:
All registers use the least significant 12 bits as signed magnitude numbers. All polling values report their magnitude based on the secondary currents and voltage, not the primaries. Scaling for these values should be interpreted as follows:

0x0000 (0) = negative Full Scale 0x07FF (2047) = 0 0x0FFF (4096) = positive Full Scale

Full Scale for Voltage is 150 V on the secondary.
Full Scale for Current and Power depends on the settings of the MODBUS RTU Configuration bits in the Programming Block.

CT/PT RATIOS

Registers Registers 584/984

CT RATIO		
000F		40016
PT RATIO		
0010		40017

Registers 000F - 0010:

These are two byte registers of raw binary data, stored by the meter in the Programming Block. These registers are MSB binary. Any value of any format may be used. These values may be modified through the CT/PT Ratio Registers in the Programming Block.

NEUTRAL CURRENT

Registers Registers 584/984

NEUTRAL CURRENT		
0011		40018

Register 0011:

This register is formatted the same as registers 0001 - 000E.

HOUR READINGS

Registers 584/984 Registers 584/984

	High		Low	
+KWatt/hour	0012	40019	0013	40020
-KWatt/hour	0014	40021	0015	40022
+KVAR/hour	0016	40023	0017	40024
-KVAR/hour	0018	40025	0019	40026

Register 0012 - 0019:

2 - byte MSB binary numbers. The registers marked Low contain the values 0x0000 - 0x270F, or 0 - 9999, representing KiloWatt/hour. The registers marked High contain the values 0x0000 - 0x270F, or 0 - 9999, representing 10's of MegaWatt/hour. Together, eight digits of KiloWatt/hour may be read.

FREQUENCY

Registers Registers 584/984

FREQUENCY		
001A		40027

Register 001A:

This register uses the least significant 12 bits as a signed magnitude number. Scaling for this values should be interpreted as follows:

$$0x0000 (0) = 45 \text{ Hz or less} \quad 0x07FF (2047) = 60 \text{ Hz} \quad 0x0FFF (4096) = 75 \text{ Hz or greater}$$

Register 001B - 0062

These registers are reserved for future use.

ENERGY RESET

Registers Registers 584/984

ENERGY RESET		
0063		40100

Register 0063:

When a value of 0x0001 is written to this register, the HOUR readings on the meter will be reset.

Appendix C: Floating Point Registers

NEGATIVE MAX/MIN BLOCK

Registers 584/984 Registers 584/984

	NEG MAX		NEG MIN	
WATT	050A	41291	0516	41303
VAR	050B	41292	0517	41304
PF	050C	41293	0518	41305
WATT A	050D	41294	0519	41306
WATT B	050E	41295	051A	41307
WATT C	050F	41296	051B	41308
VAR A	0510	41297	051C	41309
VAR B	0511	41298	051D	41310
VAR C	0512	41299	051E	41311
PF A	0513	41300	051F	41312
PF B	0514	41301	0520	41313
PF C	0515	41302	0521	41314

Registers 01EA-0201:

2 Byte two's compliment numbers. Decimal placement and scales for appropriate readings are available from the Programming Data Block.

FLOATING POINT DAXI DATA BLOCK

Registers 584/984 Registers 584/984 Registers 584/984 Registers 584/984

	INST (D)		AVE (A)		MAX (X)		MIN (I)	
VOLT AN	0522	41315	057C	41405	05D6	41495	0630	41585
VOLT BN	0524	41317	057E	41407	05D8	41497	0632	41587
VOLT CN	0526	41319	0580	41409	05DA	41499	0634	41589
VOLT AB	0528	41321	0582	41411	05DC	41501	0636	41591
VOLT BC	052A	41323	0584	41413	05DE	41503	0638	41593
VOLT CA	052C	41325	0586	41415	05E0	41505	063A	41595
AMP A	052E	41327	0588	41417	05E2	41507	063C	41597
AMP B	0530	41329	058A	41419	05E4	41509	063E	41599
AMP C	0532	41331	058C	41421	05E6	41511	0640	41601
AMP N	0534	41333	058E	41423	05E8	41513	0642	41603
WATT	0536	41335	0590	41425	05EA	41515	0644	41605
VAR	0538	41337	0592	41427	05EC	41517	0646	41607
VA	053A	41339	0594	41429	05EE	41519	0648	41609
PF	053C	41341	0596	41431	05F0	41521	064A	41611
FREQ	053E	41343	0598	41433	05F2	41523	064C	41613
WATT A	0540	41345	059A	41435	05F4	41525	064E	41615
WATT B	0542	41347	059C	41437	05F6	41527	0650	41617
WATT C	0544	41349	059E	41439	05F8	41529	0652	41619
VAR A	0546	41351	05A0	41441	05FA	41531	0654	41621
VAR B	0548	41353	05A2	41443	05FC	41533	0656	41623
VAR C	054A	41355	05A4	41445	05FE	41535	0658	41625
VA A	054C	41357	05A6	41447	0600	41537	065A	41627
VA B	054E	41359	05A8	41449	0602	41539	065C	41629
VA C	0550	41361	05AA	41451	0604	41541	065E	41631
PF A	0552	41363	05AC	41453	0606	41543	0660	41633
PF B	0554	41365	05AE	41455	0608	41545	0662	41635
PF C	0556	41367	05B0	41457	060A	41547	0664	41637

See next page for continuation and description.

	INST (D)		AVE (A)		MAX (X)		MIN (I)	
THD VOLT A	0558	41369	05B2	41459	060C	41548	0666	41639
THD VOLT B	055A	41371	05B4	41461	060E	41551	0668	41641
THD VOLT C	055C	41373	05B6	41463	0610	41553	066A	41643
THD AMP A	055E	41375	05B8	41465	0612	41555	066C	41645
THD AMP B	0560	41377	05BA	41467	0614	41557	066E	41647
THD AMP C	0562	41379	05BC	41469	0616	41559	0670	41649
KF VOLT A	0564	41381	05BE	41471	0618	41561	0672	41651
KF VOLT B	0566	41383	05C0	41473	061A	41563	0674	41653
KF VOLT C	0568	41385	05C2	41475	061C	41565	0676	41655
KF AMP A	056A	41387	05C4	41477	061E	41567	0678	41657
KF AMP B	056C	41389	05C6	41479	0620	41569	067A	41659
KF AMP C	056E	41391	05C8	41481	0622	41571	067C	41661
RESERVED	0570	41393	05CA	41483	0624	41573	067E	41663
RESERVED	0572	41395	05CC	41485	0626	41575	0680	41665
RESERVED	0574	41397	05CF	41487	0628	41577	0682	41667
RESERVED	0576	41399	05D0	41489	062A	41579	0684	41669
RESERVED	0578	41401	05D2	41491	062C	41581	0686	41671
RESERVED	057A	41403	05D4	41493	062E	41583	0688	41673

Registers 0522-0689:

Every 2 registers hold a 4 byte floating-point number. The format of a pair of registers is as follows:

Registers

584/984

	REGISTER 0						REGISTER 1			
	15	14	7	6	0	15	0	0	0	
	Sign	Exponent			Fraction					
0522+	0	7	0	22				0	41315+	

FLOATING-POINT NEGATIVE MAX/MIN BLOCK

Registers 584/984 Registers 584/984

	NEG MAX		NEG MIN	
WATT	068A	41675	06A2	41699
VAR	068C	41677	06A4	41701
PF	068E	41679	06A6	41703
WATT A	0690	41681	06A8	41705
WATT B	0692	41683	06AA	41707
WATT C	0694	41685	06AC	41709
VAR A	0696	41687	06AE	41711
VAR B	0698	41689	06B0	41713
VAR C	069A	41691	06B2	41715
PF A	069C	41693	06B4	41717
PF B	069E	41695	06B6	41719
PF C	06A0	41697	06B8	41721

Registers 068A-06B9:

Every 2 registers hold a 4-byte floating-point number.

FLOATING-POINT THD DETAIL BLOCK

HARM VOLT A Registers

Registers 584/984 Registers 584/984

		PERCENT		PHASE	
HARM 0	06BA		41723	06BC	41725
HARM 31	0736		41847	0738	41849

HARM VOLT B Registers

HARM 0	073A		41851	073C	41853
HARM 31	07B6		41975	07B8	41977

HARM VOLT C Registers

HARM 0	07BA		41979	0303	41981
HARM 31	0836		42103	0838	41205

HARM AMP A Registers

HARM 0	083A		42107	083C	42109
HARM 31	08B6		42231	08B8	42233

HARM AMP B Registers

HARM 0	08BA		42235	08BC	42237
HARM 31	0936		42359	0938	42361

HARM AMP C Registers

HARM 0	093A		42363	093C	42365
HARM 31	09B6		42487	09B8	42489

Register 0202-04C1:

Percent: 2 registers, a 4 byte floating-point number, representing a percentage with a single implied decimal point.

Phase: 2 registers, a 4 byte floating-point number representing a phase angle with a single implied decimal point.

Negative Hour Block

Registers

584/984

	0	1	2	3	4	5	6	7	
-WATT HOUR									
09BA +									42491+
-VAR HOUR									
09C2+									42499+

For Description: see description for HOUR BLOCK on page 5.

Appendix D: Mass Memory & Null Terminated Hour Readings

MASS MEMORY COUNTER

Registers 584/984

	0	1	
09CA+	Snapshot		42507+
09CC+	Event	Wave	42509+

Registers 09CA-09CD:

4-byte or 2-byte 2's compliment numbers representing the number of Snapshots, Events or Waveforms stored in the mass memory of the meter.

Null-Terminated Hour Readings

Registers 584/984

	0	1	2	3	4	5	6	7	
	WATT HOUR								
09CE+									42511+
	VAR HOUR								
09D6+									42519+
	VA HOUR								
09DE+									42527+
	-WATT HOUR								
09E6+									42535+
	-VAR HOUR								
09EE+									42543+

Registers 09CE-09F5:

16 Bytes each ASCII, representing a 15 Byte BCD count of the Hour Function. The least significant byte of the last register in each Hour Reading is the ASCII null character (0x 00).

EXCEPTION FLAGS

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
09F6	L1	L2	R	I	W	-	-	-	-	-	-	-	-	-	-	-	42551

Register 09F6:

- L1: A bit value of 1 means a Limit 1 is exceeded. Cleared when Read.
A bit value of 0 means no Limit 1's are exceeded.
- L2: A bit value of 1 means a Limit 2 is exceeded. Cleared when Read.
A bit value of 0 means no Limit 2's are exceeded.
- R: A bit value of 1 means a Relay is energized. Cleared when Read.
A bit value of 0 means no Relays are energized.
- I: A bit value of 1 means an Input is active.
A bit value of 0 means no Inputs are active.
- W: A bit value of 1 means at least 1 Waveform is stored.
A bit value of 0 means no Waveforms are stored.

Input Status:

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
09F7	I1	I2	I3	I4	-	-	-	-	-	-	-	-	-	-	-	-	42552

Register 09F7:

- A bit value of 1 means the associated input is active
- A bit value of 0 means the associated input is not active.

EXCEPTION BUFFER STATUS (Futura+ CPU1000 only)

09F8	Buffer Status	42553
09F9	Programming Status	42554

Register 09F8:
[Buffer Status] 2 Bytes

0x00000 = No change in Exception Buffer since the Buffer was last read.
 0x00001-0x0FFFFE = Number of update cycles where the Exception Buffer was updated since the buffer was last read.
 0x0FFFFF = 65535 or more update cycles where the Exception Buffer was updated since the buffer was last read.

Register 09F9:
[Programming Status] 2 Bytes

0x00000 = No change in Programming since the Buffer was last read.
 0x00001-0x0FFFFF = Programming was changed since the Buffer was last read.

EXCEPTION BUFFER (Futura+ CPU1000 only)

Current Limit Status

Registers 09FA-09FE:
[Delta] 10 bytes

Bit = 1 means a change occurred for the appropriate condition.
 Bit = 0 means no change occurred for the appropriate condition.

Limit 1 4 bytes

09FA	15	14	13	12	11	10	9	8	42555
	-	-	-	-	-	-	-	-	
	7	6	5	4	3	2	1	0	
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	REV	IMB	
09FB	15	14	13	12	11	10	9	8	42556
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Limit 2 4 bytes

09FC	15	14	13	12	11	10	9	8	42557
	-	-	-	-	-	-	-	-	
	7	6	5	4	3	2	1	0	
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	REV	IMB	
09FD	15	14	13	12	11	10	9	8	42558
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Inputs 2 bytes

09FE	15	14	13	12	11	10	9	8	42559
	Input 1	Input 2	Input 3	Input 4	-	-	-	-	
	7	6	5	4	3	2	1	0	
	-	-	-	-	-	-	-	-	

Registers 09FF-0A02:
 [Exceed] 8 bytes

Bit = 1 means this limit is being exceeded.
 Bit = 0 means this limit is not being exceeded.

Limit 1 4 bytes

09FF	15	14	13	12	11	10	9	8	42560
	-	-	-	-	-	-	-	-	
	7	6	5	4	3	2	1	0	
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	REV	IMB	
0A00	15	14	13	12	11	10	9	8	42561
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Limit 2 4 bytes

0A01	15	14	13	12	11	10	9	8	42562
	-	-	-	-	-	-	-	-	
	7	6	5	4	3	2	1	0	
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	REV	IMB	
0A02	15	14	13	12	11	10	9	8	42563
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Registers 0A03-0A2B:
 [Values] 82 bytes Instantaneous or Average values, 2 bytes, 2's comp, MSB

	0	1	2	3	4	5	6	7	
0A03+	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	42564+
0A0B+	IC	IN	W	VAR	VA	PF	FQ	W A	42572+
0A13+	W B	W C	VAR A	VAR B	VAR C	VA A	VA B	VA C	42580+
0A1B+	PF A	PF B	PF C	KF VA	KF VB	KF VC	KF IA	KF IB	42588+
0A23+	KF IC	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	Reversal	42596+
0A2B	Imbalance								42604

Register 0A2C:
 [Inputs] 2 bytes

0A2C	15	14	13	12	11	10	9	8	42605
	Input 1	Input 2	Input 3	Input 4	-	-	-	-	
	7	6	5	4	3	2	1	0	
	-	-	-	-	-	-	-	-	

Registers 0A2D-0A2F:
 [Time Stamp] 6 bytes

	0		1		2		
0A2D+	Day	Month	Year	Serial Seconds			42606+

- Day = 1~31, Day of the month
- Month = 1~12
- Year = 0~99. The century is assumed. (example: 2002 = 02)
- Serial Seconds = Seconds after midnight

Programmed Settings (Read only)

Registers 0A30-0A36:

[FSs]	4 bytes	Full Scale Volts, 2's comp, MSB Full Scale Current, 2's comp, MSB
[DPs]	4 bytes	Decimal Place Volts, 1byte Decimal Place Current, 1 byte Decimal Place Power, 1 byte Reserved, 1 byte
[FPs]	4 bytes	Face Plate Volts, 0x000 = Volts, 0x001-0x0FF = kVolts Face Plate Currents, 0x000 = Amps, 0x001-0x0FF = kAmps Face Plate Power, 0x000 = kWatts, 0x001-0x0FF = MWatts Reserved, 1 byte
[I/A]	1 byte	0x000 = Limits triggered by Instantaneous readings 0x001-0x0FF = Limits triggered by Average readings.
	1 byte	Reserved byte

	0		1		2		3		
0A30+	FS Volts				FS Amps				42609+
0A34+	FP Volts	FP Amps	FP watts	Reserved	I/A	Reserved			24613+

Registers 0A37-0A50:

[Limit 1] 52 bytes Limit 1 value, 2 bytes, 2's comp, MSB

	0	1	2	3	4	5	6	7	
0A37+	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	42616+
0A3F+	IC	IN	W	VAR	VA	PF	FQ	-W	42624+
0A47+	-VAR	-PF	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	42632+
0A4F+	Reversal	Imbalance							42640+

Registers 0A51-0A6A:

[Limit 2] 52 bytes Limit 2 values, 2 bytes, 2's comp, MSB

	0	1	2	3	4	5	6	7	
0A51+	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	42642+
0A59+	IC	IN	W	VAR	VA	PF	FQ	-W	42650+
0A61+	-VAR	-PF	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	42658+
0A69+	Reversal	Imbalance							42666+

Register 0A6B:

Set Above/Below

A bit value of 0 means the limit is exceeded if the associated value is greater than its Limit.

A bit value of 1 means the limit is exceeded if the associated value is less than its Limit.

[SAB1] 2 bytes for Limit 1

0A6B	15	14	13	12	11	10	9	8	42668
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Register 0A6C:

[SAB2] 2 bytes for Limit 2

0A6C	15	14	13	12	11	10	9	8	42669
	VAN	VBN	VCN	VAB	VBC	VCA	IA	IB	
	7	6	5	4	3	2	1	0	
	IC	IN	W	VAR	VA	PF	FQ	-	

Register 0A6D:

[SAB THD] 2 bytes, High byte is Limit 1, Low byte is Limit 2

0A6D	15	14	13	12	11	10	9	8	42670
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	-	-	
	7	6	5	4	3	2	1	0	
	THD VA	THD VB	THD VC	THD IA	THD IB	THD IC	-	-	