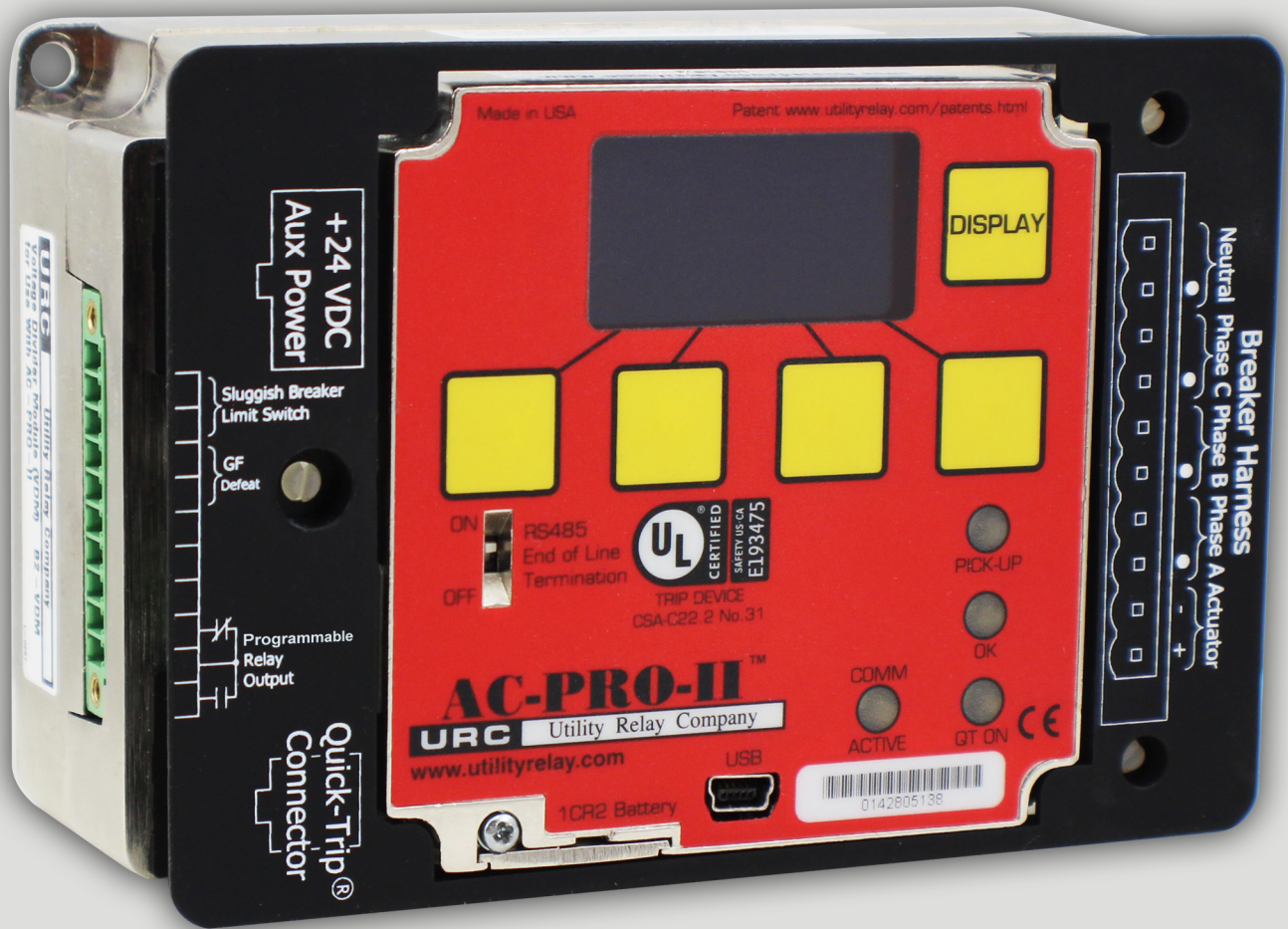AC Trip Unit
Manual v4.0

AC-PRO-II®

State of the Art Technology for
Low Voltage Circuit Breaker Modernization

URC Utility Relay Company
UTILITYRELAY.COM

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USA
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AC-PRO-II® Communications Modbus Register Map   **Document Revision 4.0**
                                                              Firmware v4.0.65

AC-PRO-II: Registers   7000 – 7019: **Output Coils**
                        7020 – 7099: **Information**
                        7107 – 7199: **User settings** (can be set using Modbus Communications)
                        7100, 7101, 7102, 7104, 7105, 7149, 7150: **System settings**, set at trip unit only
                        7200 – 7399: **Trip History data**
AC-PRO-II: Registers   83 – 324 are "backwards" compatible with existing AC-PRO registers. Exceptions are noted.

Data Types:
    OC = Output Coil (write only)
    IR = Information Register (read only)
    HR = Holding Register (read/write). See note 6 at the end of this document.
    * = future

See the end of the document for Modbus Register Notes.

Table A: AC-PRO-II Modbus Register Map

Item Register Address	Description (Data Point Name)	Unit	Size	Data Type	Revision Notes
7000	Force Reset	N/A	Word	OC	
7001	Force Trip (permission must be set. see note 6)	N/A	Word	OC	
7002	Force Acknowledge Trip Event (Clears Alarm Code Register 7040 Word 0 bit 0)	N/A	Word	OC	
7003	Force Clear Trip History and Trip Totals	N/A	Word	OC	
7004	Force Clear Power / KVA-Hrs and KW-Hrs	N/A	Word	OC	
7005	Force Clear Alarm Relay #1 (AC-PRO-II)	N/A	Word	OC	
7006	Close Breaker (any relay assigned as breaker)	N/A	Word	OC	Register added in v4.0
* 7007	Force Relay #3 (future) (on for 100ms)	N/A	Word	OC	
7008	Soft QT Switch ON	N/A	Word	OC	Register added in v4.0
7009	Soft QT Switch OFF	N/A	Word	OC	Register added in v4.0
7010	Force Clear Power / KVAD and KWD	N/A	Word	OC	Register added in v4.0
* 7011	Reserved				
7012	Reset Breaker Cycle Counter	N/A	Word	OC	Register added in v4.0
* 7013 – 7019	Reserved				
7020	Trip Unit RS-485 Address	N/A	Word	IR	
7021	Reply Delay, range: 0-10 (min added delay)	msec	Word	IR	
7022	Trip Unit Serial Number Word 0 – Most Significant	N/A	Word	IR	
7023	Trip Unit Serial Number Word 1	N/A	Word	IR	
7024	Trip Unit Serial Number Word 2	N/A	Word	IR	
7025	Trip Unit Serial Number Word 3	N/A	Word	IR	
7026	Trip Unit Serial Number Word 4	N/A	Word	IR	
7027	Firmware Version Word 0 (Most Significant) MS Byte = Major, LS Byte = Minor	N/A	Word	IR	
7028	Firmware Version Word 1 MS Byte = Build, LS Byte = Revision	N/A	Word	IR	
7029	Special Factory Settings Configuration Bit 0; 1 = LT can be OFF Enabled Bit 1; 1 = LT Pickup up to 120% Enabled Bit 2; 1 = LT Delay up to 50 msec Enabled Bit 3; 1 = I-OVRD Enabled Bit 4; 1 = I-CLOS Enabled Bit 5; 1 = GF Only Enabled Bit 6: 1 = future Bit 7: 1 = VDM rev2 hardware ("backfed" VDM) Bit 8: 1 = Main board hardware with EEPOT feedback Bit 9: 1 = Max RMS is 10xCT *Bit 14; Reserved: Future *Bit 15: Future Remaining Bits = 0 (not used)	N/A	Word	IR	V2.0.19 added bits 7,8 Note 15 V4.0 added bit 9
7030	RS-485 Baud Rate (divided by 100)	Bits/s	Word	IR	Register added in v4.0

7031	RS-485 Parity: 0 = None, 1 = Odd, 2 = Even	N/A	Word	IR	Register added in v4.0
* 7032 – 7039	Reserved	N/A	Word	IR	
7040	Alarm/Status Code Word 0 – Most Significant Bit 0; 1 = Trip Event Alarm Bit 1; 1 = Current > LT Pickup Alarm Bit 2; 1 = Actuator Open Alarm Bit 3; 1 = Internal Error Alarm Bit 4; 1 = Phase Loss / Reverse Bit 5; 1 = Ground Fault Alarm Bit 6; 1 = Breaker Closed 0 = Breaker Open or feature unused	N/A	Word	IR	V2.0.19 added Phase Loss, Test Mode, GF Alarm Note 15
7040 (continued)	Bit 7; 1 = Sluggish or Stuck Breaker Alarm Bit 8; 1 = QT Switch is ON Bit 9; 1 = Service Due Alarm Bit 10; 1 = Reverse Power Alarm *Bit 11; 1 = Battery Low Bit 12; 1 = UV Under Voltage Alarm (relay operated) Bit 13; 1 = OV Over Voltage Alarm event (relay operated) Bit 14; 1 = GF Defeated by Input Bit 15; 1 = VDM Attached				V4.0 added bit 9 - 10
* 7041	*Alarm Code Word 1 *Bit 0; 1 = FUTURE *Bit 1; 1 = FUTURE *Bit 2; 1 = FUTURE *Bit 3; 1 = FUTURE *Bit 4: 1 = Reversed Phase CT Polarity *Bit 5: 1 = Phase Unbalanced Alarm Bits 6-15 not used	N/A	Word	IR	V4.0 changed bit 5
7042	Current Phase A (standard accuracy)	Amps	Word	IR	Note 11
7043	Current Phase B (standard accuracy)	Amps	Word	IR	Note 11
7044	Current Phase C (standard accuracy)	Amps	Word	IR	Note11
7045	Current Neutral (standard accuracy)	Amps	Word	IR	V1.1-1.6: unscaled V1.7 and later: scaled Note 13
7046	Current GF	Amps	Word	IR	V1.1-1.6: unscaled V1.7 and later: scaled Note 13
7047	Voltage A-N	Volts	Word	IR	
7048	Voltage B-N	Volts	Word	IR	
7049	Voltage C-N	Volts	Word	IR	
7050	Voltage AB	Volts	Word	IR	Register added in v1.9. Note 14
7051	Voltage BC	Volts	Word	IR	Register added in v1.9. Note 14
7052	Voltage CA	Volts	Word	IR	Register added in v1.9. Note 14
7053	KW Phase A	KW	Word	IR	Note 11
7054	KW Phase B	KW	Word	IR	Note 11
7055	KW Phase C	KW	Word	IR	Note 11
7056	KVA Phase A	KVA	Word	IR	Note 11
7057	KVA Phase B	KVA	Word	IR	Note 11
7058	KVA Phase C	KVA	Word	IR	Note 11
7059	KW Total	KW	Word	IR	
7060	KVA Total	KVA	Word	IR	
7061	PF Total	%	Word	IR	
7062	KVA-Hrs Register – Most Significant (note 7)	KVAH	Word	IR	
7063	KVA-Hrs Register – Least Significant (note 7)	KVAH	Word	IR	

7064	KW-Hrs Register – Most Significant (note 7)	KWH	Word	IR	
7065	KW-Hrs Register - Least Significant (note 7)	KWH	Word	IR	
7066	KW Signs & Lead/Lag PF *Bits 0, 1,2 are future: *Bit 0; Phase A, 1 = Lead PF, 0 = Lag PF *Bit 1; Phase B, 1 = Lead PF, 0 = Lag PF *Bit 2; Phase C, 1 = Lead PF, 0 = Lag PF Bit 8; Phase A KW, 1 = Pos, 0 = Neg Bit 9; Phase B KW, 1 = Pos, 0 = Neg Bit 10; Phase C KW, 1 = Pos, 0 = Neg Bit 11; KW-Hrs, 1 = Pos, 0 = Neg Btis 3-7, and 12-15 = 0 (not used)	N/A	Word	IR	
7067	KW-Hrs (alt) signed 32-bits – Most Significant	KWH	Word	IR	
7068	KW-Hrs (alt) - Least Significant	KWH	Word	IR	
7069	Frequency	Hertz	Word	IR	Register added in v2.0.27 Note 16
7070	Negative Sequence OverVoltage (NSOV) (only available if Phase Loss enabled)	%	Word	IR	Note 17
7071	Status Bit 0: Relay #1 is Closed Bit 1: Hard QT Switch is ON Bit 2: Soft QT Switch is ON Bit 3: Service Now Bit 4: Relay #2 is Closed Bit 5 – 15: Future	N/A	Word	IR	Register added in v4.0
7072	Special use: Current Phase A (with "Low" filter at 2%)	Amps	Word	IR	Register added in v2.0.31. Note 17
7073	Special use: Current Phase B (with "Low" filter at 2%)	Amps	Word	IR	Register added in v2.0.31. Note 17
7074	Special use: Current Phase C (with "Low" filter at 2%)	Amps	Word	IR	Register added in v2.0.31. Note 17
7075	Special use: Neutral Current (with "Low" filter at 2%)	Amps	Word	IR	Register added in v2.0.31. Note 17
7076	Special use: GF Current (with "Low" filter at 2%)	Amps	Word	IR	Register added in v2.0.31. Note 17Added in v2.0.31. Note 17
7077 – 7087	Smart 1-Line Waveforms	N/A	11 Words	IR	Registers added in v4.0
* 7088 – 7089	Reserved				Register added in v4.0
7090	Breaker Cycle Count	N/A	Word	IR	Register added in v4.0
* 7091 – 7099	Reserved				
* 7077 – 7099	Reserved	N/A	N/A		N/A
7100	CT Rating	Amps	Word	IR	
7101	CT Secondary	Amps	Word	IR	
	0 = 1 1 = 0.50 2 = 0.40 3 = 0.25 4 = 0.20 5 = 0.18				
7102	Neutral CT Secondary 0 = 2 1 = 1.5 2 = 1 3 = 0.50 4 = 0.40 5 = 0.25 6 = 0.20 7 = 0.18	Amps	Word	IR	
7103 (note 11)	Range (Modbus only) and Miscellaneous (Scaling) Bit 0; 1 = x1 Bit 1; 1 = x10 Bit 2; 1 = divide by 10 Bits 0-2: Scaling applies CT Rating, settings Pickups,	N/A	Word	IR	Bits 5 - 6 added in v4.0

Register	Description	Units	Type	Access	Notes
	Currents, and Last Trip Currents Bit 3; 1 = Forced Trip Enabled Bit 4; 1 = User Settings can be changed over communications Bit 5; 1 = Modbus Soft QT SW Enabled Bit 6; 1 = CT Auto Polarity is ON Bits 7-15 = 0 (not used)				
7104	Frequency setting	Hz	Word	IR	
7105	System Rotation (Phase Loss/Reverse feature only) (0=CBA, 1= ABC)	N/A	Word	IR	Register added in v2.0.19 Note 15
* 7106	Reserved	N/A	Word	IR	
7107	System Time: hrs (24-hr) MS, mins LS (note 9)	N/A	Word	HR	V1.1-v1.6 performs different than v1.7 and later. Note 9
7108	System Time: secs MS, month LS (note 9)	N/A	Word	HR	V1.1-v1.6 performs different than v1.7 and later. Note 9
7109	System Time: day MS, year (0-99) LS (note 9)	N/A	Word	HR	V1.1-v1.6 performs different than v1.7 and later. Note 9
7110	Operate Alarm Relay #1 Setting (Alarm relay operation settings) Bit 0; 1 = Actuator Open Alarm Bit 1; 1 = Internal Error Alarm Bit 2; 1 = UnderVoltage Alarm Bit 3; 1 = OverVoltage Alarm Bit 4; 1 = Sluggish Breaker Bit 5; 1 = LT Pickup Alarm Bit 6; 1 = Trip Alarm Bit 7; 1 = GF Alarm Bit 8; 1 = Phase Loss / Reverse Bit 9: 1 = Reversed CT Alarm Bit 10: = 0 (not used) Bit 11: 1 =Phase Unbalanced Alarm Bit 12: 1 =Service Due Bits 13 - 14= 0 (not used) Bit 15: 1 = Reverse Power Alarm	N/A	Word	HR	V2.0.19 added Phase Loss, Test Mode, GF Alarm Note 15 Bits 9, 11 - 12, 15 added in v4.0
* 7111	Alarm Relay #2 (future)	N/A	Word	HR	
* 7112	Alarm Relay #3 (future)	N/A	Word	HR	
7113	LT Pickup (0 = OFF, only available if trip unit shipped with special factory setting)	Amps	Word	HR	
7114	LT Delay x2 (value is 2 times actual delay in seconds)	sec	Word	HR	
7115	LT Thermal Memory 1 = On, 0 = Off	N/A	Word	HR	
7116	ST Pickup (0 = OFF)	Amps	Word	HR	
7117	ST Delay – Delay Band: 1 = 0.07 2 = 0.10 3 = 0.15 4 = 0.20 5 = 0.30 6 = 0.40	sec	Word	HR	
7118	ST I^2 T 1 = On, 0 = Off	N/A	Word	HR	
7119	I Pickup (0 = OFF)	Amps	Word	HR	
7120	GF Pickup (applies to either Trip or Alarm, 0 = OFF)	Amps	Word	HR	
7121	GF Delay – Delay Band: (applies to either Trip or Alarm) 1 = 0.1 2 = 0.2 3 = 0.3 4 = 0.4 5 = 0.5	sec	Word	HR	
7122	GF Slope (applies to either Trip or Alarm) 0 = None, 1 = I2T, 2 = I5T	N/A	Word	HR	Register added in v1.9. Note 14
7123	GF Type (applies to either Trip or Alarm): 0=both Trip and Alarm OFF 1= Residual 2=Ground Return	N/A	Word	HR	See Note 15

	If value is 1 or 2: see register 7110 bit 7 to determine if GF is set to Trip (bit 7 = 0) or Alarm (bit 7 = 1)				
7124	Neutral Protection Percent	%	Word	HR	Register repurposed in v4.0
* 7125 - 7126	Reserved	N/A	Word	IR	Register removed in v4.0
7127	Quick-Trip Instantaneous Pickup	Amps	Word	HR	
7128	Quick-Trip GF Pickup	Amps	Word	HR	
7129	QT-GF Type: 0=Off, 1=Residual, 2=Ground Return (when GF Type is OFF then no restrictions; otherwise must either be OFF or match GF Type)	N/A	Word	HR	
7130	Phase Loss / Reverse Trip Enable 1 = On, 0 = Off	N/A	Word	HR	Register added in v2.0.19. Note 15
7131	Phase Loss / Reverse Delay	sec	Word	HR	Register added in v2.0.19. Note 15
7132	Phase Loss / Reverse Negative Sequence OverVoltage Pickup	%	Word	HR	Register added in v2.0.19. Note 15
7133	Reserved	N/A	Word	HR	
7134	UV Trip Enable 1 = On, 0 = Off	N/A	Word	HR	
7135	UV Trip Pickup	Volts	Word	HR	
7136	UV Trip Delay	sec	Word	HR	
7137	UV Alarm Pickup	Volts	Word	HR	Register added in v2.0.19. Note 15
7138	UV Alarm Delay	sec	Word	HR	Register added in v2.0.19. Note 15
* 7139	Reserved	N/A	Word	HR	
7140	OV Trip Enable 1 = On, 0 = Off	N/A	Word	HR	
7141	OV Trip Pickup	Volts	Word	HR	
7142	OV Trip Delay	sec	Word	HR	
7143	OV Alarm Pickup	Volts	Word	HR	Register added in v2.0.19. Note 15
7144	OV Alarm Delay	sec	Word	HR	Register added in v2.0.19. Note 15
7145	Reserved				
7146	Sluggish Breaker Detect Threshold	msec	Word	HR	
* 7147-7148	Future	N/A	Word	HR	
7149	Limit Switch Type (setting): 0 = None (no contact wired in) 1 = 52a (contact open when breaker open) 2 = 52b (contact closed when breaker open)	N/A	Word	HR	
7150	Power Flow Direction Setting 0 = Normal 1 = Reverse	N/A	Word	HR	
7151	Programmable Relay: Bit 0 - 3: Relay #1 Bit 4 - 7: Relay #2 0 = Alarm 1 = Zone Block 2 = Close Breaker 3 = Off 4 - 15 = Undefined Bit 8 - 15: Future	N/A	Word	HR	Register added in v4.0
7152	Zone Block: Bit 0: Relay #1 ST Bit 1: Relay # 1 INST Bit 2: Relay #1 GF Bit 3: Future Bit 4: Relay #2 ST Bit 5: Relay #2 INST Bit 6: Relay #2 GF Bit 7: Future Bit 8 – 15: Future	N/A	Word	HR	Register added in v4.0
7153	Reverse Power Enabled 1 = On, 0 = Off	N/A	Word	HR	Register added in v4.0
7154	Reverse Power Pickup	KW	Word	HR	Register added in v4.0
7155	Reverse Power Delay	sec	Word	HR	Register added in v4.0
7156	Phase Current Unbalanced Pickup	%	Word	HR	Register added in v4.0
7157	Phase Current Unbalanced Delay	sec	Word	HR	Register added in v4.0
7158	Phase Current Unbalanced Enabled 2 = Trip, 1 = On, 0 = Off	N/A	Word	HR	Register added in v4.0

7159	User Settings Change Request: 0 = OK; 1 = Out-Of-Range: No changes made See Register 7159 notes at the end of this table	N/A	Word	IR	
7160	Last Settings Change: Hrs MS, mins LS	N/A	Word	IR	
7161	Last Settings Change: secs MS, month LS	N/A	Word	IR	
7162	Last Settings Change: day MS, year LS	N/A	Word	IR	
7163	Last Settings Changed Via: Bits 0 - 4: 0 = Uncommishioned 1 = Local Display 2 = InfoPro AC 3 = Bluetooth (future) 4 = Modbus RS-485 5 = URC Utility (future) 6 = Network GUI (future) 7 = Future 8 = Future 9 = Unidentified	N/A	Word	IR	
7164	Unbalance Percent	N/A	Word	IR	
* 7165 – 7199	Reserved	N/A	N/A	N/A	
	See separate table below for trips #2 through 8				
7200	Trip #1 Type Bits 0-4 0 = No Last Trip 1 = I (Instantaneous) 2 = ST 3 = LT 4 = GF 5 = QT-I 6 = QT-GF 7 = I-OVRD 8 = I-CLOS *9 = FUTURE (Remote Trip) *10 = FUTURE (Actuator Test – URC Internal) 11 = NOL *12 = FUTURE 13 = UV 14 = OV *15–16 = FUTURE 17 = FUTURE 18 = Phase U/B 19 = Phase Loss/Reverse 20 = GF Test 21 = Reverse Power 22 = Forced Trip Thru Communications 23 = SAFE-T-TRIP *24-25 = FUTURE 26 = GF Test Trip 27 = Neutral Protection 28 = Future 29 = Future 30 = Future 31 = Future Bit 5: 0 (not used) Bit 6: 1= Last Trip; 0 = not Last Trip Bit 7: Future Bit 8: Invalid Phase Current Bit 9: Invalid Neutral Current Bit 10: High Phase Current Bit 11: High Neutral Current Bit 12: Sluggish Breaker Bit 13: Stuck Breaker Bit 14: QT Switch ON	N/A	Word	IR	Added trip types in v2.0.19.0 Note 15 Bit 0 – 4 value 18, 20 – 21, 27 and Bit 6 – 15 added in v4.0

	Bit 15: Detected Reversed CT				
	See Note 16b for additional trip data info/status				
7201	Trip #1 Trip Time: hrs (24-hr) MS, mins LS	N/A	Word	IR	
7202	Trip #1 Trip Time: secs MS, month LS	N/A	Word	IR	
7203	Trip #1 Trip Time: day MS, year (0-99) LS	N/A	Word	IR	
7204	Trip #1 Current Phase A	Amps	Word	IR	
7205	Trip #1 Current Phase B	Amps	Word	IR	
7206	Trip #1 Current Phase C	Amps	Word	IR	
7207	Trip #1 Current N	Amps	Word	IR	
7208	Trip #1 Current GF	Amps	Word	IR	
7209	Trip #1 Voltage A-N	Volts	Word	IR	
7210	Trip #1 Voltage B-N	Volts	Word	IR	
7211	Trip #1 Voltage C-N	Volts	Word	IR	
7212	Trip #1 Voltage A-B	Volts	Word	IR	Added in v1.9. Note 14
7213	Trip #1 Voltage B-C	Volts	Word	IR	Added in v1.9. Note 14
7214	Trip #1 Voltage C-A	Volts	Word	IR	Added in v1.9. Note 14
7215	Trip #1 Breaker Mechanism Time Phase A	msec x 10	Word	IR	
7216	Trip #1 Breaker Mechanism Time Phase B	msec x 10	Word	IR	
7217	Trip #1 Breaker Mechanism Time Phase C	msec x 10	Word	IR	
7218	Trip #1 Negative Sequence Over Voltage (NSOV)	%	Word	IR	Register added in v2.0.19.0 Note 15
7219	Future				
7220 – 7359	**See separate table below for trips #2 through 8**				
7360	Trip Count I (Instantaneous)	N/A	Word	IR	
7361	Trip Count ST	N/A	Word	IR	
7362	Trip Count LT	N/A	Word	IR	
7363	Trip Count GF	N/A	Word	IR	
7364	Trip Count QT-I	N/A	Word	IR	
7365	Trip Count QT-GF	N/A	Word	IR	
7366	Trip Count I-OVRD	N/A	Word	IR	
7367	Trip Count I-CLOS	N/A	Word	IR	
7368	Trip Count UB	N/A	Word	IR	Added in v4.0
7369	Trip Count NP	N/A	Word	IR	Added in v4.0
7370	Trip Count NOL	N/A	Word	IR	
* 7371	Trip Count Future	N/A	Word	IR	
7372	Trip Count UV	N/A	Word	IR	
7373	Trip Count OV	N/A	Word	IR	
* 7374	Trip Count FUTURE	N/A	Word	IR	
* 7375	Trip Count FUTURE	N/A	Word	IR	
* 7376	Trip Count FUTURE	N/A	Word	IR	
* 7377	Trip Count FUTURE	N/A	Word	IR	
7378	Trip Count Phase Loss / Reverse	N/A	Word	IR	Register added in v2.0.19.0 Note 15
* 7379	Trip Count (FUTURE)	N/A	Word	IR	
7380	Trip Count Reverse Power	N/A	Word	IR	Added in v4.0
7381	Trip Count Forced Thru Communications	N/A	Word	IR	
7382	Trip Count SAFE-T-TRIP	N/A	Word	IR	
7383	Sluggish or Stuck Breaker Occurrences	N/A	Word	IR	
7384	Trip Count GF Test	N/A	Word	IR	Added in v4.0
* 7385 – 7399	Reserved	N/A	N/A	N/A	
7400-7409	URC Internal Trip History	N/A	Word	IR	Registers added in v4.0

7410 – 7479	**See separate table below for trips #2 through 8 (7410 – 7479 are URC internal)**				
* 7480 – 7899	Reserved	N/A	N/A	N/A	
7900	Power Demand Period	sec	Word	HR	Register added in v4.0
7901	Last KWD	KW	Word	IR	Register added in v4.0
7902	Last KVAD	KVA	Word	IR	
7903	Peak KWD	KW	Word	IR	
7904	Peak KVAD	KVA	Word	IR	
7905	Demand Period	sec	Word	IR	
7906	Service Reminder Year	N/A	Word	HR	Register added in v4.0 Must read address 7906 and length of 3 words
7907	Service Reminder Month	N/A	Word	HR	
7908	Service Reminder Day	N/A	Word	HR	
7910 – 7925	Service Reminder Company Name	N/A	16 Words	HR	Register added in v4.0 Must read address 7910 and length of 32 words
7926 - 7941	Service Reminder Contact Information	N/A	16 Words	HR	
* 7942 - 7979	Reserved	N/A	N/A	N/A	
7980 - 7999	URC Internal	N/A	34 Words	IR	Register added in v4.0
* 8000 - 8999	Reserved	N/A	N/A	N/A	
9000	URC Internal	N/A	1-n Words	IR	Register added in v4.0
9500	URC Internal	N/A	1-n Words	IR	Register added in v4.0
9990	Time/Date Binary Year (21 – 99)	N/A	Word	HR	Register added in v4.0 Must read address 9900 and length of 6 words
9991	Time/Date Binary Month (1 – 12)	N/A	Word	HR	
9992	Time/Date Binary Day (1 – 31)	N/A	Word	HR	
9993	Time/Date Binary Hour (0 – 23)	N/A	Word	HR	
9994	Time/Date Binary Minute (0 – 59)	N/A	Word	HR	
9995	Time/Date Binary Second (0 – 59)	N/A	Word	HR	
9996	URC Internal	N/A	52 Words	IR	Register added in v4.0
9997	URC Internal	N/A	18 Words	IR	Register added in v4.0
9998	URC Internal	N/A	64 Words	IR	Register added in v4.0

* = future release (Returns a value of 0 when read)
Register addresses 7091 – 7099, 7164-7199, 7385-7399, 7480-7899, 7942-7979, 7989-7996, and 8000-8999 are reserved – do not access, results are undefined.

Trip History: Registers for Trips #1 through #8

Description	Trip #1	Trip #2	Trip #3	Trip #4	Trip #5	Trip #6	Trip #7	Trip #8
Trip Type /Info	7200	7220	7240	7260	7280	7300	7320	7340
Trip Time: hrs (24-hr) MS, mins LS	7201	7221	7241	7261	7281	7301	7321	7341
Trip Time: secs MS, month LS	7202	7222	7242	7262	7282	7302	7322	7342
Trip Time: day MS, year (0-99) LS	7203	7223	7243	7263	7283	7303	7323	7343
Current Phase A	7204	7224	7244	7264	7284	7304	7324	7344
Current Phase B	7205	7225	7245	7265	7285	7305	7325	7345
Current Phase C	7206	7226	7246	7266	7286	7306	7326	7346
Current N	7207	7227	7247	7267	7287	7307	7327	7347
Current GF	7208	7228	7248	7268	7288	7308	7328	7348
Voltage A-N	7209	7229	7249	7269	7289	7309	7329	7349
Voltage B-N	7210	7230	7250	7270	7290	7310	7330	7350
Voltage C-N	7211	7231	7251	7271	7291	7311	7331	7351
Voltage A-B	7212	7232	7252	7272	7292	7312	7332	7352
Voltage B-C	7213	7233	7253	7273	7293	7313	7333	7353
Voltage C-A	7214	7234	7254	7274	7294	7314	7334	7354
Breaker Mechanism Time Phase A	7215	7235	7255	7275	7295	7315	7335	7355
Breaker Mechanism Time Phase B	7216	7236	7256	7276	7296	7316	7336	7356
Breaker Mechanism Time Phase C	7217	7237	7257	7277	7297	7317	7337	7357
Negative Sequence Over Voltage (NSOV)	7218	7238	7258	7278	7298	7318	7338	7358
Future	7219	7239	7259	7279	7299	7319	7339	7359

AC-PRO-II backwards compatible registers

If the AC-PRO-II is installed as a direct replacement of an existing communicating AC-PRO trip unit, the same communications registers can be used to maintain the existing AC-PRO communications capabilities.
Note: These registers do not address features and information that is unique to AC-PRO-II. To utilize and communicate all information from AC-PRO-II, see Table A, and the AC-PRO-II Instruction Manual.

AC-PRO-II: Registers 83 – 324 are "backwards" compatible with existing AC-PRO registers

Data Types:
     OC = Output Coil (write only)
     IR = Information Register (read only)
     HR = Holding Register (read/write)

* = future

Table B: AC-PRO-II backwards compatible registers

Item Register Address	Description (Data Point Name)	Unit	Size	Data Type	
83	Force Reset	N/A	Word	OC	
84	Force Trip	N/A	Word	OC	
86	Force Clear Last Trip Data	N/A	Word	OC	
111	Force Clear KW-Hrs	N/A	Word	OC	
*112	Force Relay 1 (on for 100mS)	N/A	Word	OC	
*113	Force Relay 2 (on for 100mS)	N/A	Word	OC	
256	Current Phase A	Amps	Word	IR	Note 11
257	Current Phase B	Amps	Word	IR	Note 11
258	Current Phase C	Amps	Word	IR	Note 11
259	Current GF	Amps	Word	IR	V1.1-1.6: unscaled V1.7 and later: scaled Note 13
260	Current UB	%	Word	IR	
262	Voltage AN	Volts	Word	IR	
263	Voltage BN	Volts	Word	IR	
264	Voltage CN	Volts	Word	IR	
265	Voltage AB	Volts	Word	IR	
266	Voltage BC	Volts	Word	IR	
267	Voltage CA	Volts	Word	IR	
268	KW Phase A	kW	Word	IR	Note 11
269	KW Phase B	kW	Word	IR	Note 11
270	KW Phase C	kW	Word	IR	Note 11
271	KVA Phase A	kVA	Word	IR	Note 11
272	KVA Phase B	kVA	Word	IR	Note 11
273	KVA Phase C	kVA	Word	IR	Note 11
274	KW-Hrs Register 3	0.1 KWH * 2^{32}	Word	IR	
275	KW-Hrs Register 2	0.1 KWH * 2^{16}	Word	IR	
276	KW-Hrs Register 1	0.1 KWH	Word	IR	
277	KW Signs & Lead/Lag PF *Bit 0; Phase A, 1 = Lead PF, 0 = Lag PF *Bit 1; Phase B, 1 = Lead PF, 0 = Lag PF *Bit 2; Phase C, 1 = Lead PF, 0 = Lag PF Bit 8; Phase A KW, 1 = Pos, 0 = Neg Bit 9; Phase B KW, 1 = Pos, 0 = Neg Bit 10; Phase C KW, 1 = Pos, 0 = Neg Bit 11; KW-Hrs, 1 = Pos, 0 = Neg	N/A	Word	IR	

Item *Register Address*	Description (Data Point Name)	Unit	Size	Data Type	
278	Alarm Code Bit 0; 1 = Trip Output Bit 1; 1 = Current > LT Pickup Bit 3; 1 = Actuator Disconnected Bit 4; 1 = Memory Error Bit 6; 1 = A/D Error Bit 8; 1 = Breaker Closed, 0 = Breaker Open or Feature Unused Bit 9; 1 = Times 10 Range Bit 11; 1 = Divide by 10 Range	N/A	Word	IR	
279	CT Rating	Amps	Word	HR	
280	LT Pickup	Amps	Word	HR	
281	LT Delay Value stored is 2 times the actual delay in seconds	Sec.	Word	HR	
282	ST Pickup	Amps	Word	HR	
283	ST Delay Binary 0 =. 07 Sec Delay Band Binary 1 = .10 Sec Delay Band Binary 2 = .15 Sec Delay Band Binary 3 = .20 Sec Delay Band Binary 4 = .30 Sec Delay Band Binary 5 = .40 Sec Delay Band	Sec.	Word	HR	
284	ST I^2 T Bit 0; 0 = Off, 1 =On	N/A	Word	HR	
285	I Pickup	Amps	Word	HR	
286	GF Pickup	Amps	Word	HR	
287	GF Delay Binary 0 = .10 Sec Delay Band Binary 1 = .20 Sec Delay Band Binary 2 = .30 Sec Delay Band Binary 3 = .40 Sec Delay Band Binary 4 = .50 Sec Delay Band	Sec.	Word	HR	
288	GF I^2 T Bit 0; 0 = Off, 1 = On	N/A	Word	HR	
289	U/B Pickup	%	Word	HR	
290	U/B Delay	Sec.	Word	HR	
291	Trip Unit Address	N/A	Word	**IR**	
292	Reply Delay	mS	Word	**IR**	
293	Last Trip Current Phase A	Amps	Word	IR	
294	Last Trip Current Phase B	Amps	Word	IR	
295	Last Trip Current Phase C	Amps	Word	IR	
296	Last Trip Current GF	Amps	Word	IR	
297	Last Trip Current U/B	%	Word	IR	
298	Last Trip Code Binary 65535 = No Last Trip Binary 0 = Instantaneous Binary 1 = LT Binary 2 = ST Binary 3 = GF (Binary 4 = Unbalanced . does not apply to AC-PRO-II) Binary 5 = Forced Trip via Communications Binary 6 = Close Fault Binary 7 = QT Ground Fault Binary 8 = QT Instantaneous * Binary 9 = FUTURE	N/A	Word	IR	

298 (continued)	* Binary 10 = FUTURE Binary 11 = I-Override Binary 12 = NOL * Binary 13 = Under Current (FUTURE) Binary 14 = UV Binary 15 = OV * Binary 16 = UF * Binary 17 = OF * Binary 18 = REV-PCT * Binary 19 = REV-NCT * Binary 20 = Phase Loss * Binary 21 = Phase ROT * Binary 22 = REV-PWR Binary 23 = N/A Binary 24 = SAFE-T-TRIP				
299	Trip Count Instantaneous	N/A	Word	IR	
300	Trip Count LT	N/A	Word	IR	
301	Trip Count ST	N/A	Word	IR	
302	Trip Count GF	N/A	Word	IR	
303	Trip Count U/B	N/A	Word	IR	
304	Trip Count Forced	N/A	Word	IR	
305	Trip Count Close Fault	N/A	Word	IR	
306	Trip Unit Serial Number Byte 0	N/A	Word	IR	
307	Trip Unit Serial Number Byte 1	N/A	Word	IR	
308	Trip Unit Serial Number Byte 2	N/A	Word	IR	
309	Trip Unit Serial Number Byte 3	N/A	Word	IR	
310	Trip Unit Serial Number Byte 4	N/A	Word	IR	
311	Trip Unit Serial Number Byte 5	N/A	Word	IR	
312	Trip Unit Serial Number Byte 6	N/A	Word	IR	
316	Range Multiplier 0-X1 1-X10 2-X0.1	N/A	Word	IR	
317	Quick-Trip GF Pickup	Amp	Word	HR	
318	Quick-Trip Instantaneous Pickup	Amp	Word	HR	
319	KWH MS	KWH	Word	IR	
320	KWH LS	KWH	Word	IR	
321	Trip Count Quick-Trip GF	N/A	Word	IR	
322	Trip Count Quick-Trip Instantaneous	N/A	Word	IR	
323	Thermal Memory, 0 = Off, 1 = On	N/A	Word	HR	
324	QT-Switch, 0 = Off, 1 = On	N/A	Word	IR	

Modbus Register Notes:

1. If "Pickup" setting register = 0, the function is disabled.
2. If Trip History current = 65535A, AC-PRO-II determined RMS current(s) were greater than 12x CT rating, indicating CT saturation is possible, making RMS current readings inaccurate.
3. In Trip History, for Instantaneous trips: If all three phase currents are equal and not greater than 12x CT rating, then the trip occurred too rapidly for the AC-PRO-II to determine accurate current(s). In this case, the three currents reported over Communications will be equal to the Instantaneous or Quick-Trip Instantaneous pickup, whichever was the trip type.
4. See notes in Tables for multipliers. Some of the registers where multipliers apply are: 7114, 7115, all breaker Mechanism times (i.e. 7215), ETC.
5. Register 7159 : If an error occurs when attempting to change settings using Communications, the following error codes will be returned, indicating the related reasons:

Setting that was out of range	Error Code
CT_RATING	2000
CT_SECONDARY	2001
CT_NEUTRAL_SEC	2002
FREQUENCY	2003
BKR_POS_CNT_TYPE	2004
POWER_DIRECTION	2005
AUTO_POLARITY_CT	2006
ROGOWSKI_COIL_SENSITIVITY	2007
ROGOWSKI_COIL_SENSOR_TYPE	2008
LT_ENABLED	2010
LT_PICKUP	2011
LT_DELAY	2012
LT_THERM_MEM	2013
ST_ENABLED	2014
ST_PICKUP	2015
ST_DELAY	2016
ST_I2T	2017
GF_TYPE	2018
GF_PICKUP	2019
GF_DELAY	2020
GF_SLOPE	2021
GF_QT_TYPE	2022
GF_QT_PICKUP	2023
QT_INST_PICKUP	2024
INSTANT_ENABLED	2025
INSTANT_PICKUP	2026
NOL_ENABLED	2027
NOL_PICKUP	2028
NOL_DELAY	2029
NOL_THERM_MEM	2030
UV_TRIP_ENABLED	2031
UV_PICKUP	2032
UV_DELAY	2033
OV_TRIP_ENABLED	2034
OV_PICKUP	2035
OV_DELAY	2036
PV_LOSS_ENABLED	2037
PV_LOSS_DELAY	2038
NSOV_PICKUP_PERCENT	2039
SB_THRESHOLD	2043
FORCED_TRIP_ENABLED	2044
REMOTE_ENABLED	2045
POWER_REVERSED	2046
ALARM_RELAY_TU	2047
ALARM_RELAY_RIU1	2048
ALARM_RELAY_RIU2	2049
QT_SWITCH_ENABLED	2052
UB_ENABLED	2053
UB_PICKUP	2054
UB_DELAY	2055
DATE_FORMAT	2056
SAFE_T_CLOSE	2057
PROGRAMMABLE_RELAY	2058
ZONE_BLOCK	2059
LANGUAGE	2060
NEUTRAL_PROTECTION	2061
THRESHOLD_PHASE_CT	2062
THRESHOLD_NEUTRAL_CT	2063

GF_I2T_AMPS	2064
DINF	2065
RP_ENABLED	2066
RP_PICKUP	2067
RP_DELAY	2068

6. Permission for Forced Trip Over Communications and Settings Changes Over Communications must be set at the trip unit. "Settings Changes Over Communications" does NOT need to be enabled to allow writing to the System Time registers. (See note 9 below).

7. KW-hours and KVA-hours max value is 99,999,999. These energy counters rollover to zero after this value is exceeded.

8. If a voltage, current, or power value is "Low", then the respective register will read zero (0). Refer to the AC-PRO-II Instruction manual for "LOW" values criteria.

9. System clock:
    a. <u>Writing</u> date time setting registers in v1.1 – v1.6 needed to be done in HEX.
    b. Reading all date time registers in v1.1 – v1.6 done in BCD
    c. Writing and Reading all date/time registers in v1.7 and later in BCD.
System time registers notes and examples: each of the 6 bytes are coded as HEX. That is, if it is October 16 then DAY= 0x16 and MONTH= 0x10. So register values for 12:30:57 on October 16, 2015 would be:
        7107 = 0x1230
        7108 = 0x5710
        7109x1615

10. Unless noted otherwise, words are 16-bit unsigned integers. The "high byte" (most significant) is transmitted first.

11. When the CT Rating is set to 200A and below, or 5250A and above, some registers are scaled (divided or multiplied by 10). For range (scaling) adjustments, see register 7103, bits 0, 1, and 2. The registers affected by this scaling are the Currents, all settings Pickups, Trip History Currents, Total Power (KW & KVA). (see Note 14 regarding Neutral and GF currents).

12. Voltage readings:
    a. If register value = 0, then measured voltage is "LOW" (less than 90V line-to-line).
    b. If register value = 65535, then AC-PRO-II could not determine/measure the voltage.

13. Scaling of Neutral and GF currents.
Firmware V1.1-1.6 : Neutral and GF currents were unscaled.
Firmware V1.7 and later : Neutral and GF currents are scaled similar to phase currents (refer to note 11 above).

14. Firmware version 1.9 affected the following registers:
    a. Line-to-Line voltage registers were added (made active) in v1.9.
    b. Added GF I5t slope in v1.9.

15. Firmware version 2.0.19 added or affected these registers. Firmware version 2 added the following:
    a. Added Phase Loss / Reverse Protection feature ***
    b. Added "Test Mode" for testing convenience.
    c. Added Line-to-Line Voltage measurement, and removed Line-to-Neutral voltages (for AC-PRO-II with Voltage Divider Module).
    d. Improved UnderVoltage protection ***
    e. OverVoltage and UnderVoltage now have dedicated pickup settings and delay settings for both Trip and Alarm features.
        i. Versions 1.1-1.9: Registers 7135, 7136, 7141, 7142 were used for trip OR alarm settings, because either trip OR alarm could be enabled.
        ii. Version 2: Trip and Alarm functions now have dedicated registers.
    f. Added Ground Fault Alarm feature
    g. Added Ground Fault Test trip function
    h. Phase Loss / Reverse feature and improved UnderVoltage require AC-PRO-II with VDM rev 2 hardware ('backfed VDM'), which is present in AC-PRO-II with VDM units shipped 2016 & later
    i. Added bits 7 and 8 to register 7029 in v2.0.

16. Firmware version 2.0.40 affected these registers
    a. Added commissioned status register 7163
    b. Added Frequency reading register 7069
    c. Added Negative Sequence OV register 7070.

17. Firmware version 4.0.65 affected these registers.
    a. 7006
    b. 7008-7010
    c. 7012
    d. 7029-7031
    e. 7040
    f. 7041
    g. 7071
    h. 7077-7087
    i. 7090

j. 7103
k. 7110
l. 7124
m. 7151-7158
n. 7200
o. 7368
p. 7369
q. 7380
r. 7384
s. 7400-7409
t. 7900-7941

18. Registers 7072-7076 are for current readings for special use only. Currents values are provided down to 2% of CT rating. Use caution when using readings below 10% of CT rating, as accuracy is not guaranteed, and these readings may not be accurate.