RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

INTERROGATORY 1:

Reference(s): Decision and Order on Motion, December 9, 2011, p. 10

"Therefore, the Board will order THESL to:

(a) Confirm whether THESI has a distribution pole attachment agreement with Cogeco in respect of One Zone attachments to poles that are to be transferred to THESL. If so,

(b) Explain whether THESL will be bound by any existing contract between THESI and Cogeco? If so, produce the relevant agreement.

(c) If the answer to (b) is no, provide a copy of any agreement which will govern the relationship between THESL and Cogeco in respect of the One Zone attachments on poles which are transferred from THESI to THESL.

(d) If there is no agreement, explain what arrangements will govern the relationship between THESL and Cogeco in respect of the One Zone attachments on poles which will be transferred from THESI to THESL.

(e) Provide an estimate of the number of THESI poles which will be transferred to THESL and which have One Zone attachments."

RESPONSE:

(a) Yes, THESI has a pole attachment agreement with Cogeco in respect of wireless attachments on THESI poles (the "Agreement").

(b) Yes, THESL will be bound by the Agreement to the extent that such Agreement applies to the streetlighting poles to be transferred from THESI to THESL pursuant to the August 2011 Board Decision on that matter. A copy of the agreement is being filed on a confidential basis as Attachment 1 to this interrogatory.

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

(c) n/a

(d) n/a

(e) THESL estimates that there are approximately 132 THESI streetlighting poles with wireless attachments which were erected by the former Toronto Hydro Telecom Inc. (which was sold to Cogeco in 2008) which will be transferred to THESL pursuant to the above-noted decision. As noted in THESL's response to a number of interrogatories in this proceeding, the transfer of assets between THESI and THESL has not yet occurred.

Toronto Hydro-Electric
System Limited
EB-2011-0120
Interrogatory Responses
Tab 7
Schedule 1
Attachment 1
Filed: 2011 Dec 23
(18 pages)

This document will be filed in confidence.

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

INTERROGATORY 2:

Reference(s): Decision and Order on Motion, December 9, 2011, p. 12
CANDAS IR Byrne 15(g)(iv)

"The Board will however require THESL to provide a list of all the types of wireless attachments used for electricity distribution and the technical information for a representative sample of each type of wireless attachment."

RESPONSE:

Further to the information on the SCADA equipment used at THESL provided in the response to CANDAS Byrne IR 15 (g), additional information is provided below.

The lists provided as Attachment 1 and Attachment 2 in CANDAS Byrne IR 15 (g) included all equipment, in addition to that located on poles. Only the wireless equipment items that are on poles are further described here. Equipment items that are mounted on or in buildings or in substations are not included.

The SCADA equipment generally consists of a switch, control unit, and an antenna. The following attachments provide further information on SCADA equipment:

- Attachment 1 – Photograph of a typical overhead SCADA operated switch, antenna and control unit
- Attachment 2 – Standard 10-3600 3 Phase Load Interrupter Switch
- Attachment 3 – Standard 10-3700 Communication and Control Unit for SCADA
- Attachment 4 – Standard 10-3710 SCADA Antenna
- Attachment 5 – SCADA Antenna Specifications

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

There are various types of control units used. These are known as remote terminal units ("RTUs").

The RTU monitors the overhead switch OPEN/CLOSE status, battery alarms, voltage and currents. The RTU also has remote control capabilities. THESL Control Room staff can remotely operate the overhead switch to isolate faults and restore power. They are also used to remotely reconfigure the feeder for overload situations or scheduled outages. Most of the RTUs have fault indicators. The fault indicators would allow Control Room staff to pinpoint the outage area and dispatch a crew to repair the fault.

The RTUs communicate wirelessly through a remote radio with THESL Supervisory Control and Data Acquisition system (SCADA).

There are five types of RTUs used in THESL:

1. S&C Intelli-link 5801 RTU with SpeedNet radio:

Intelli-link 5801 RTU isolates faults and restores power from alternate feeders through tie-point automatically within 1 minute. Intelli-link 5801 RTU requires talking to its neighbor 5801 RTU to locate faults and to calculate the capacity to restore power. There are about 54 Intelli-link 5801 RTUs used in THESL.

S&C SpeedNet radio provides peer to peer communication for the 5801 RTUs as well as the communication with SCADA. SpeedNet radio uses an unlicensed frequency.

Please see the following attachments:

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

- Attachment 6 – S&C 5800 Specifications
- Attachment 7 – Sketch 15 Radio Interface
- Attachment 8 – S&C SpeedNet Radio Specifications
- Attachment 9 – S&C SpeedNet Radio Information

2. S&C 5801 RTU with GENERAL ELECTRIC MDS transit radio:

The S&C 5801 RTU, unlike the S&C Intelli-link 5801 RTU, does not have fault isolation and power restoration capabilities. It has the general RTU features described above. There are about 495 S&C 5801 RTUs use in THESL.

General Electric MDS Transit radio uses a licensed frequency. There are six master radio sites located in tall condominiums throughout the city of Toronto. These master radio sites provide the wireless coverage for the city except downtown area. Wireless radio communication is seldom used in downtown area because of tall buildings.

Please see Attachment 10 for information on MDS Transit Radio.

3. General Electric DART RTU with General Electric MDS transit radio:

General Electric DART has the general RTU features described above. There are about 131 GE DART RTUs used in THESL.

General Electric DART also uses the General Electric MDS transit radio

Please see Attachment 11 – DART Specifications.

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

4. Motorola MOSCAD RTU with DARCOM radio

MOSCAD RTU has the general RTU features described above. There are 161 MOSCAD RTUs for overhead switch and 67 MOSCAD RTUs for substation control and monitoring.

MOSCAD RTU uses Motorola DARCOM radio. DARCOM radio uses a licensed frequency. The master radio site is located at 330 Dixon road. The master radio covers the old city of Etobicoke.

Please see Attachment 12 – MOSCAD Drawing.

5. Motorola RTU with UHF radio

This is the oldest version of RTU used in THESL. It only provides overhead switch status monitoring and control. There is no voltage and current monitoring. THESL is in the process of replacing these RTUs with S&C 5801. There are about 19 Motorola RTUs are still being used in THESL.

The UHF radio master site covers the old city of North York.

Please see the following attachments:

- Attachment 13 – North York Legacy Standard for RTU
- Attachment 14 – Motorola RTU Drawing

In addition the SCADA equipment, there are also WiMax equipment units mounted on poles.

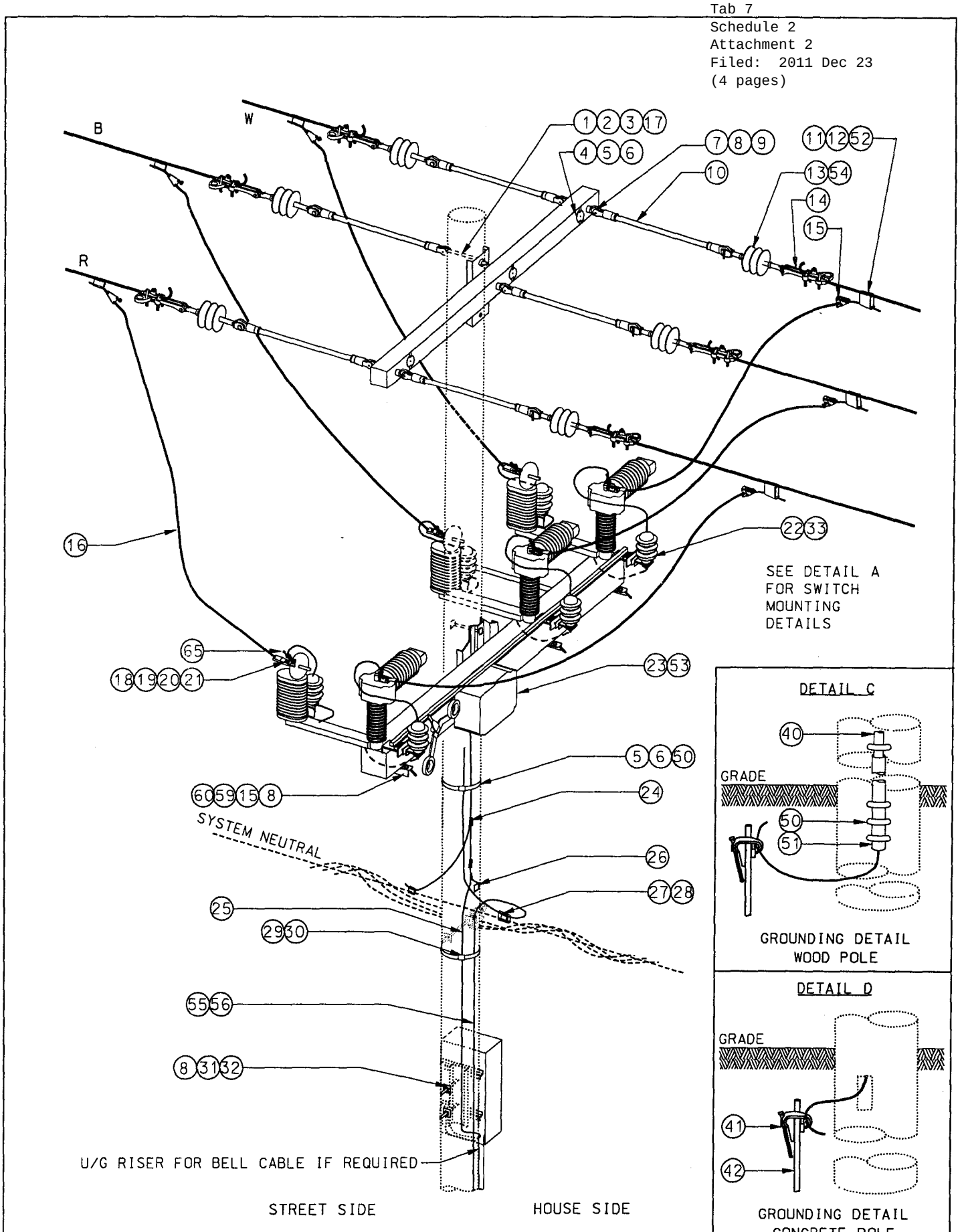
RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

Information on these units is as follows:

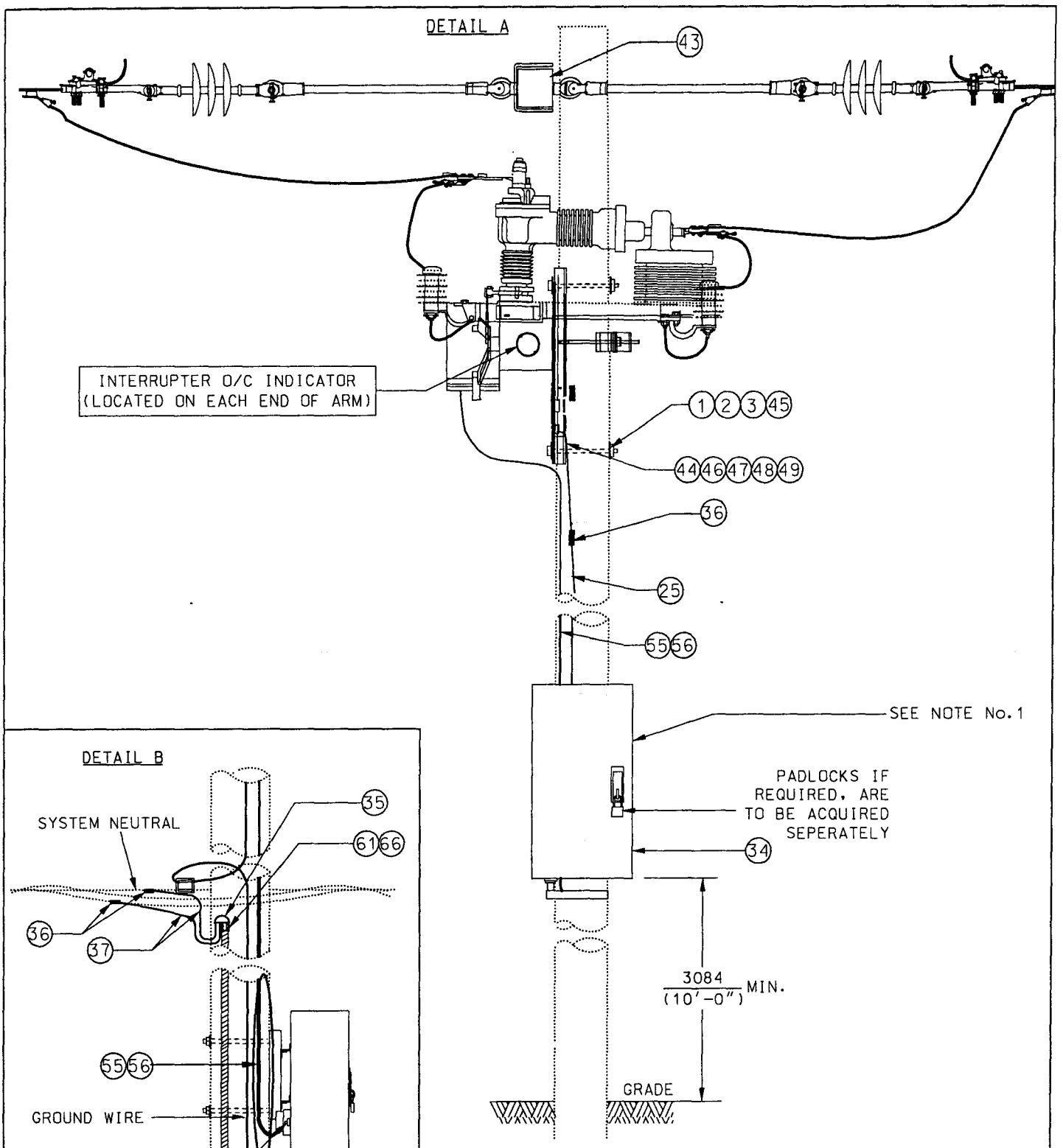
Unit	Depth (cm)	Width (cm)	Height (cm)	Weight (kg)
CPE Enclosure	23	42	62	**32 inc. LP**
Load Panel (LP)	11	23	32	**5.5**
Elster Enclosure	15	30	36	**17.3**
Antenna	4.8	31	31	**1.3**

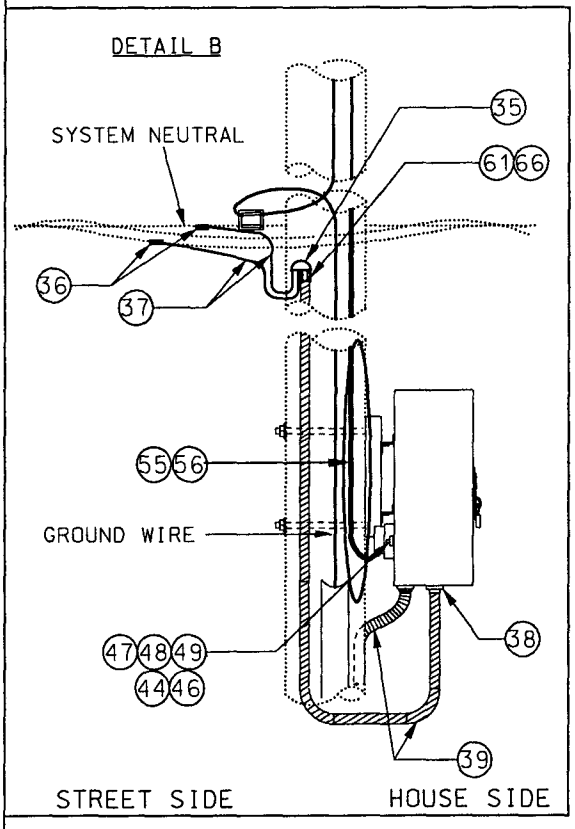
Please see Attachment 15 – Sketch 25 of WiMax CPE.

Toronto Hydro-Electric System Limited
EB-2011-0120
Interrogatory Responses
Tab 7
Schedule 2
Attachment 1
Filed: 2011 Dec 23
(1 page)



DISTRIBUTION CONSTRUCTION STANDARD Overhead Switches			3 PHASE LOAD INTERRUPTER SWITCH SCADA-OPERATED 13.8kV & 27.6kV UPRIGHT TYPE					
toronto hydro electric system	civil:	electrical: C. P.						
	original issue: 2003-06-10	scale: N.T.S.	rev. 4 K.S. 2008-11-05	rev. 5 Sep 8 / 2009	rev. 6	10-3600	1/4





SCADA SWITCH MOUNTING – LOOKING AT POLE FROM SIDEWALK

DISTRIBUTION CONSTRUCTION STANDARD Overhead Switches			3 PHASE LOAD INTERRUPTER SWITCH SCADA-OPERATED 13.8kV & 27.6kV UPRIGHT TYPE ⚠6				
toronto hydro electric system	civil:	electrical: C. P.					
	original issue: 2003-06-10	scale: N.T.S.	rev. 4 C. P. 2007-10-16	rev. 5 K.S. 2008-11-05	rev. 6 Sep 8/2009	10-3600	2/4

BOM LEGEND			
	TREE-PROOF PRIMARY CONDUCTOR SIZE	PRIMARY VOLTAGE	POLE TYPE
A	336 KCMIL	13.8KV	CONCRETE
B	336 KCMIL	13.8KV	WOOD
C	556 KCMIL	27.6KV	CONCRETE
D	556 KCMIL	27.6KV	WOOD

BILL OF MATERIALS FOR 10-3600

ITEM NO.	DESCRIPTION	ITEM I.D.	QTY A	B	C	D
1	BOLT MACH 3/4" X 10" SH GALV W/SQ NUT	2510221	4	4	4	–
2	WASHER ROUND 13/16" 1.5" ID 7/64" THICK	2530085	2	2	2	2
3	WASHER CURVED 13/16" X 3"	2530025	4	4	4	4
4	RWB DISCS WHITE, RED, BLUE	8220194	1	1	1	1
5	BUCKLE BANDING 1/2" STAINLESS STEEL	7903985	5	3	5	3
6	TAPE BANDING STAINLESS STEEL 1/2" X .030"	7903980	8	6	8	6
7	BOLT EYE 5/8" X 6" GALV	2510022	3	3	3	3
8	WASHER ROUND 1 3/4" GALV C/W 11/16" I.D. HOLE	2530084	11	11	11	11
9	NUT, OVAL EYE, 5/8"	2520024	3	3	3	3
10	INSULATOR 18" GUY STRAIN	7630048	6	6	6	6
11	CONN AMP YEL 556 CU -.336 AL	7230430	–	–	6	6
12	CARTRIDGE YEL AMPACT MP/69338-4	7231380	12	12	12	12
13	INSUL DEADEND POLYMETRIC 46KV	7630058	–	–	6	6
14	CLAMP DEAD END 3/0 - 556 KCMIL AL CABLE	7210029	6	6	6	6
15	CONN PACKAGE PIGTAIL	7251215	6	6	6	6
16	COND CU 350 KCMIL FLEX 427 STR BARE	7105230	12	12	12	12
17	BOLT MACH 3/4" X 12" SH GALV W/SQ NUT	2510222	–	–	–	4
18	BOLT STAINLESS STEEL 2" LG 1/2" HH	2550245	18	18	18	18
19	WASHER STAINLESS STEEL 1/2"	2530036	36	36	36	36
20	NUT, HEX-HEAD, STAINLESS STEEL, 1/2"	2520065	18	18	18	18
21	WASHER LOCK STAINLESS STEEL 1/2"	2530128	18	18	18	18
22	ARRESTOR LIGHTNING 27.6kV	7700014	–	–	6	6
23	SWITCH SCADA-MATE UPRIGHT 600A 27kV	9656700	–	–	1	1
24	CONN AMP AL MINIWEDGE #2 - #2 AL/CU	7231010	12	12	12	12
25	COND CU #2 19 STR BARE	7105045	25	25	25	25
26	CONNECTOR CU GROUND SERVICE POST, #8 STR	7214165	1	–	1	–
27	CONN AMP BLU 3/0 TO #2	7230100	2	2	2	2
28	CARTRIDGE BLU AMPACT NO. 69338-1	7231385	2	2	2	2
29	BUCKLE BANDING 3/4" STNLS	7903986	4	–	4	–
30	TAPE BANDING STAINLESS STEEL 3/4" X .030"	8220072	24	–	24	–
31	BOLT MACH 5/8" X 14" SH UNC GALV	2510202	2	2	2	2
32	WASHER CURVED 5/8" BOLT SIZE 2" X 2" X 3/16"	2530020	1	1	1	1
33	ARRESTOR LIGHTNING 13.8kV	7700017	6	6	–	–
35	WEATHERHEAD 25mm SERV. ENT.(1") CAST AL.	9662710	1	1	1	1
36	CONN AMP AL MINIWEDGE 266-#10,12&14 AL/CU	7231210	9	9	9	
37	CABLE 2/C #12 SOFT SOLID CU, BLACK/WHITE	9656812	5	5	5	9
38	CONNECTOR 1" LIQUID TIGHT FLEX CONDUIT	7250904	1	1	1	1
39	FLEX CONDUIT 1" METAL LIQUID TIGHT	5100120	10	10	10	10
40	CABLE GUARD 1/2" X 8' BLK PLASTIC U TYPE	2430025	3	3	3	3

9

NOTES:

1) CONTROL AND COMMUNICATION UNIT SEE STANDARD DRAWING#10-3700 FOR OPTION

DISTRIBUTION CONSTRUCTION STANDARD
Overhead Switches

3 PHASE LOAD INTERRUPTER SWITCH SCADA-OPERATED 13.8kV & 27.6kV UPRIGHT TYPE 9

toronto hydro electric system

civil:	electrical: C. P.					
original issue: 2003-06-10	scale: N.T.S.	rev. 7 C. P. 2007-10-16	rev. 8 K.S. 2008-11-05	rev. 9 Kolarkar Sep 8/2009	10-3600	3/4

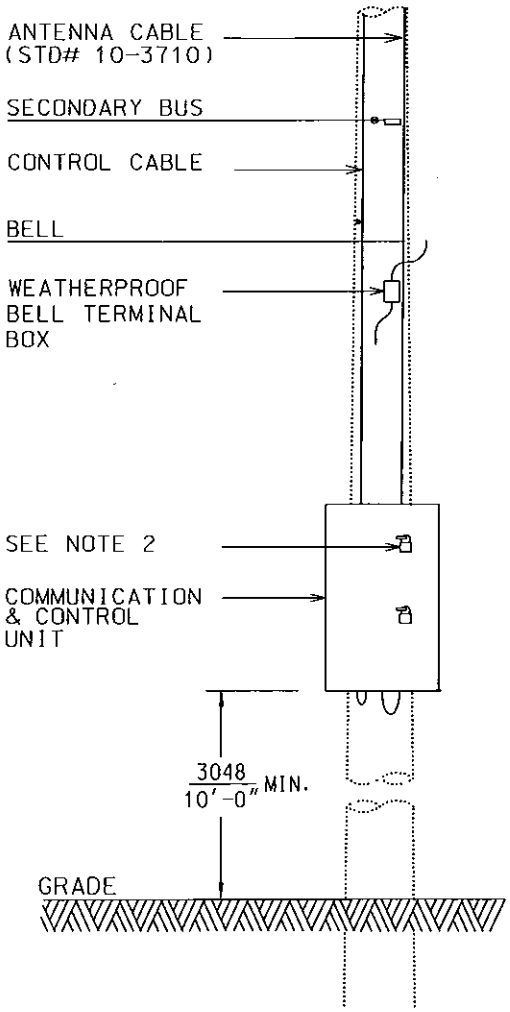
BILL OF MATERIALS FOR 10-3600						
ITEM NO.	DESCRIPTION	ITEM I.D.	QTY A	QTY B	QTY C	QTY D
41	CONNECTOR, GROUND ROD, AMPACT WRENCH-LOK	7214201	1	1	1	1
42	ROD 3/4" X 10' GROUND STEEL GALVANIZED	2470102	1	1	1	1
43	CROSSARM, FIBERGLASS, 3 5/8" X 4 5/8" X 10'	9656876	1	1	1	1
44	CONN COMPR NO.2	9662098	3	3	3	3
45	BOLT MACH 5/8" X 12" SH UNC GALV	2510222	2	2	2	2
46	BOLT MACH HEX 3/8" X 1" STAINLESS STEEL	2550224	2	2	2	2
47	NUT HEX 3/8" STAINLESS STEEL	2520064	2	2	2	2
48	WASHER 3/8" STAINLESS STEEL	2530035	4	4	4	4
49	WASHER LOCK 3/8" STAINLESS STEEL	2530127	2	2	2	2
50	STAPLE STEEL GALVANIZED 1-1/4" X 3/8"	2540031	-	8	-	8
51	GUARD-CABLE 3/4" X 8' GALVANIZED U TYPE	2430010	1	1	1	1
52	CONN AMP YEL 336 CU - 336 AL	7230350	6	6	-	-
53	SWITCH SCADA-MATE UPRIGHT 600A 15kV	9656715	1	1	-	-
54	INSUL DEADEND POLYMETRIC 28KV	7630057	6	6	-	-
55	CABLE, SHIELDED CONTROL, 25'	9656781	1	1	-	-
56	CABLE, SHIELDED CONTROL, 35'	9656780	-	-	1	1
57	LIVE LINE STIRRUP 336 THUR WIRE 1/0 BAIL	7251045	6	6	6	6
58	HOT LINE CLAMP	7210049	6	6	6	6
59	WASHER LOCK 5/8" GALV	2530161	6	6	6	6
60	BOLT MACH 5/8" X 1 1/2" SH UNC GALV	2510165	6	6	6	6
61	CONN 1"STRAIGHT MALLEABLE IRON C/W O'RING & LOCKNUT	9662711	1	1	1	1
62	STRAP PIPE 1/2" GALVANIZED STEEL 2-HOLE	2310001	10	10	10	10
63	STRAP PIPE 3/4" GALVANIZED STEEL 2-HOLE	2310006	10	10	10	10
64	STRAP PIPE 1" GALVANIZED STEEL 2-HOLE	2310008	10	10	10	10
65	CONNECTOR STIRRUPS GROUNDING	7251095	3	3	3	3
66	ADAPTER FEMALE 1" PVC AS PER CSA 22.2	9662922	1	1	1	1
67	----------	9663059	30	30	30	30

NOTES:

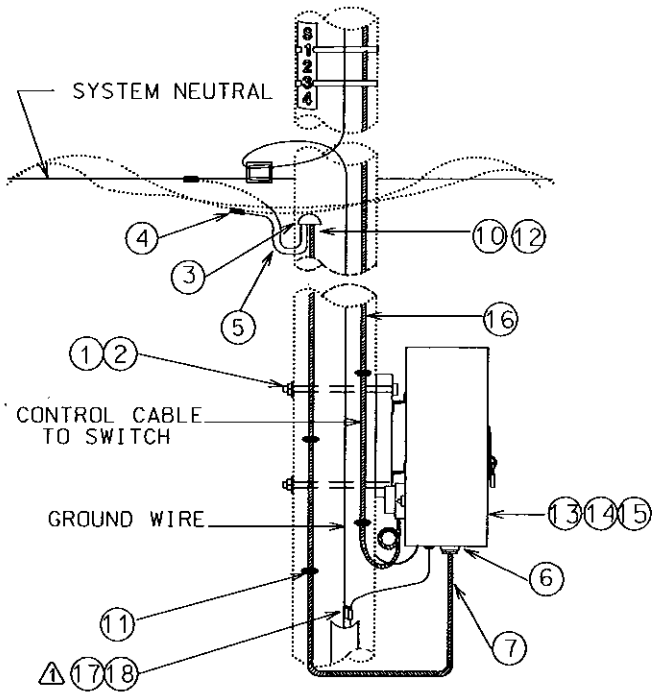
1) CONTROL AND COMMUNICATION UNIT SEE STANDARD DRAWING#10-3700 FOR OPTION

DISTRIBUTION CONSTRUCTION STANDARD Overhead Switches			3 PHASE LOAD INTERRUPTER SWITCH SCADA-OPERATED 13.8kV & 27.6kV UPRIGHT TYPE				
toronto hydro electric system	civil:	electrical: kdarker					
	original issue: Sep 8/2009	scale: N.T.S.	rev. 1	rev. 2	rev. 3	10-3600	4/4

FRONT VIEW



SIDE VIEW



NOTES:

1) PADLOCKS, IF REQUIRED, ARE TO BE ACQUIRED SEPERATELY.
2) A 120V SUPPLY IS REQUIRED FOR OPERATION OF CCU.
3) REFER TO STD# 10-3710 FOR ANTENNA INSTALLATION .

DISTRIBUTION CONSTRUCTION STANDARD Overhead Switches			COMMUNICATION AND CONTROL UNIT FOR SCADA 13.8 kV / 27.6 kV SYSTEM				
toronto hydro electric system	civil:	electrical: K.S.					
	original issue: 2010-10-07	scale: N.T.S.	rev. 1 Nov 22/2010	rev. 2	rev. 3	10-3700	1/2

BOM LEGEND		
	COMMUNICATION TYPE	POLE TYPE
A	WIRED	CONCRETE
B	WIRELESS	CONCRETE 5
C	WIRED	WOOD 5
D	WIRELESS	WOOD

BILL OF MATERIALS FOR 10-3700

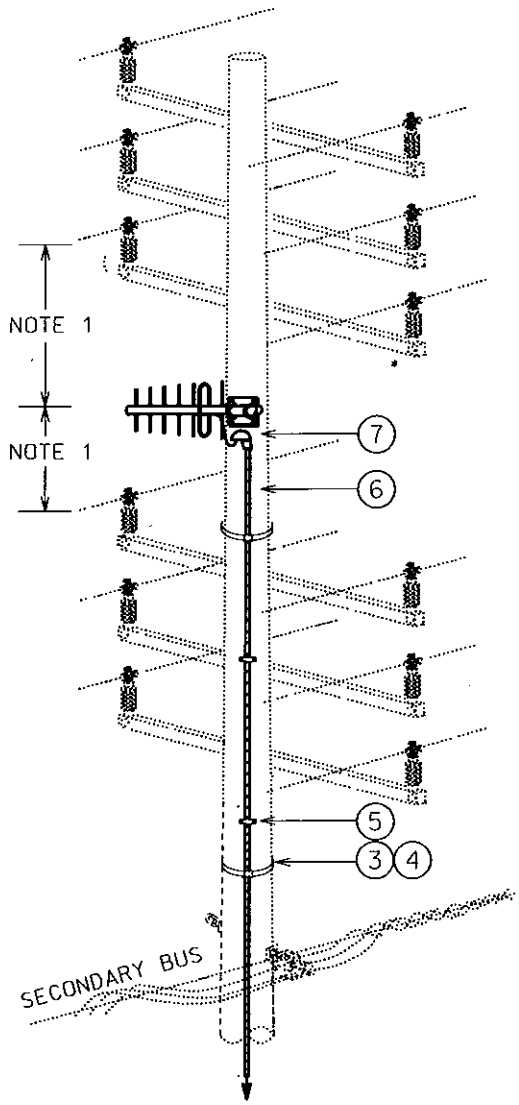
ITEM NO.	DESCRIPTION	ITEM I.D.	QUANTITY A	B	C	D	
1	WASHER ROUND HOLE 5/8" GALV.	2530084	4	4	4	4	
2	BOLT MACH 5/8" x 14" SH UNC GALV.	2510202	2	2	2	2	
3	WEATHERHEAD 25mm SERVICE ENTRANCE (1") CAST ALUMINUM	9662710	1	1	1	1	
4	CONN AMP AL MINIWEDGE 226-#10.12&14 AL/CU	7231210	2	2	2	2	
5	CABLE 2/C #12 SOFT SOLID CU, BLACK/WHITE XLPE RW90 INS	9656812	5	5	5	5	
6	CONNECTOR 1" LIQUID TIGHT FLEX CONDUIT	7250904	1	1	1	1	
7	FLEX CONDUIT 1" METAL LIQUID TIGHT	5100120	10	10	10	10	
8	TAPE BANDING STAINLESS STEEL 3/4" X 0.030"	8220072	24	24	–	–	5
9	BUCKLE, 3/4" BANDING STEEL	7903986	6	6	–	–	5
10	CONN. 1" STRAIGHT MALLEABLE IRON, C/W 'O'RING & LOCKNUT	9662711	1	1	1	1	
11	STRAP PIPE 1" GALVANIZED STEEL 2-HOLE	2310008	–	–	10	10	5
12	ADAPTER FEMALE 1" PVC AS PER CSA 22.2	9662922	1	1	1	1	
13	MODEM, DART, BELL 202, 1200 BAUD	9656828	1	–	1	–	
14	MDS TRANSIT REMOTE RADIO MODEM, 800-960 MHZ LICENCED FREQUENCY RANGE, 9.6KBPS DATA RATE, WITH RS-232 SERIAL PORT	9656829	–	1	–	1	
15	COMMUNICATION & CONTROL UNIT, AUTOMATIC SWITCH CONTROL FOR USE WITH AN S&C SCADA-MATE SWITCH	9657029	1	1	1	1	
16	CABLE, SHIELDED CONTROL, 35'	9656780	1	1	1	1	
17	CONNECTOR, AMPACT, AL TAP, #2 ACSR - #2 ACSR	7230050	1	1	1	1	5
18	AMPACT CARTRIDGE WHITE	7231395	1	1	1	1	5

NOTES:

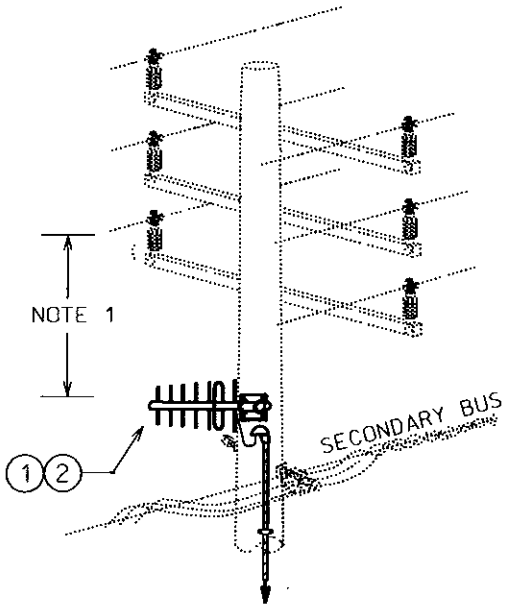
1) ITEM 13 IS FOR A BELL CONNECTION
2) ITEM 14 IS FOR WIRELESS COMMUNICATION
3) SELECTION OF COMMUNICATION CHANNEL (WIRED OR WIRELESS) DEPENDS ON LOCATION AND AVAILABILITY OF INFRASTRUCTURE. CHECK WITH SCADA SERVICES AND PROTECTION & CONTROL.

DISTRIBUTION CONSTRUCTION STANDARD Overhead Switches			COMMUNICATION AND CONTROL UNIT FOR SCADA 13.8 kV / 27.6 kV SYSTEM				
toronto hydro electric system	civil:	electrical: C. P.					
	original issue: 2004-07-30	scale: N.T.S.	rev. 4 K.S. 2010-10-07	rev. 5 Nov 22/2010	rev. 6	10-3700	2/2

MULTIPLE VOLTAGE CLASSES



SINGLE VOLTAGE CLASS



NOTES:

1) ANTENNA TO BE INSTALLED WITH A MINIMUM CLEARANCE OF 1016 mm (3'-4") FROM THE NEAREST PRIMARY CONDUCTOR. ANTENNA IS NOT TO BE INSTALLED AT THE TOP OF THE POLE.

2) REFER TO STD 10-3700 FOR COMMUNICATION & CONTROL UNIT INSTALLATION.

3) POLE FRAMING MAY VARY.

BOM LEGEND		
	VOLTAGE CLASS	POLE TYPE
A	MULTIPLE	CONCRETE
B	SINGLE	CONCRETE
C	MULTIPLE	WOOD
D	SINGLE	WOOD

BILL OF MATERIALS FOR 10-3710							
ITEM NO.	DESCRIPTION	ITEM I.D.	QUANTITY				
			A	B	C	D	
1	ANTENNA KIT, SWEEP TESTED FOR SCADA SWITCH INSTALLATIONS C/W 45 FT EUPEN CABLE	9656820	–	1	–	1	
2	ANTENNA KIT, SWEEP TESTED FOR SCADA SWITCH INSTALLATIONS C/W 90 FT EUPEN CABLE	9663047	1	–	1	–	
3	TAPE BANDING STAINLESS STEEL 3/4 " x 0.030"	8220072	24	24	–	–	1
4	BUCKLE, 3/4 " BANDING STEEL	7903986	6	6	–	–	1
5	STAPLE STEEL GALVANIZED 1-1/4" X 3/8"	2540031	–	–	8	8	1
6	CONDUIT PVC RIGID 1 1/4" – IN 10'	5230003	3	2	3	2	
7	WEATHERHEAD 1 1/4" PVC AS PER CSA SPEC.	9662043	1	1	1	1	

DISTRIBUTION CONSTRUCTION STANDARD
Overhead Switches

SCADA ANTENNA MOUNTING DETAIL
4.16KV TO 27.6KV SYSTEM

toronto hydro electric system

civil:	electrical: K.S.					
original issue: 2010-10-07	scale: N.T.S.	rev. 1 Nov 22/2010	rev. 2	rev. 3	10-3710	1/1

WaveLink
Antenna Systems Inc.

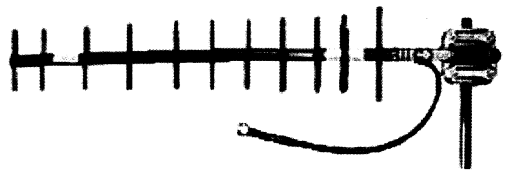
PROFESSIONAL GRADE YAGI

PRO890-14

890-960 MHz

ANTENNA SPECIFICATIONS

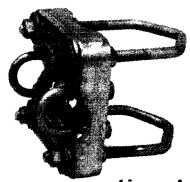
Operating Frequency (VSWR ≤ 1.5) MHz	890-960
Nominal Gain (dBi)	14
Horizontal Beamwidth (Deg-3dB)	40
Vertical Beamwidth (Deg-3dB)	34
Front To Back Ratio (dB)	20
Power Rating (W)	200
Length (inches)	37
Width (inches)	6.6
Antenna Weight (lbs.)	2.5
Cross Sectional Area (Max. Ft²)	0.35
Lateral Thrust at 100mph (lbs.)	8.75
Rated Wind Velocity (mph)	125
Rated Wind Velocity with 1/2" radial ice (mph)	120



PRO890-14 is equipped with a standard feed line length of 2' LMR400 UltraFlex cable and N-Female connector. Please contact our sales staff for alternate connector requirements.

Extended feed line available in 5' increments up to a maximum of 50 '. All extended feed line antennas equipped with LMR400 cable.

The **PRO890-14** is specifically engineered to meet or exceed the requirements of a broadband, high gain *Professional Grade* antenna. This antenna provides **14 dBi** gain and operates effectively across the operating range of **890-960 MHz** with a VSWR of 1.5:1 or less. All ***WaveLink*** *Professional Grade* antennas are manufactured using only high strength 6061-T6 aluminum and are fully welded to ensure optimum performance in the most severe operating conditions. The dipole design incorporates an integral feed cable available in lengths up to 50', allowing ease of installation and ensuring long-term dependability. The dipole and directive elements are fully welded to the boom so all potential intermod or misalignment problems are eliminated. The **PRO890-14** is anodized to protect against environmental degradation.



Includes mounting bracket
C1001

Easily permits vertical or horizontal polarization. Mounts on 1"-2⅜" pipe.

WaveLink
Antenna Systems Inc.

SPECIFICATIONS

Conditions of Sale

STANDARD: Seller's standard conditions of sale set forth in Price Sheet 150 apply, except as modified by the "SPECIAL WARRANTY PROVISIONS," and "WARRANTY QUALIFICATIONS" sections in this specification bulletin.

SPECIAL TO THIS PRODUCT:

INCLUSIONS: S&C 5800 Series Automatic Switch Controls combine sophisticated automatic control schemes with RTU functionality, data logging, and advanced communication capabilities in a single package. Models are available for outdoor pole or pedestal mounting, as well as for integration in pad-mounted gear. 5800 Series Controls manage distribution switches and can automatically sectionalize a feeder based on factors such as overcurrent, loss of voltage, and phase unbalance. One control can automate one, two, or three switches, and multiple controls can be programmed to communicate with each other using the optional IntelliTEAM II® Automatic Restoration System.

The IntelliTEAM II Automatic Restoration System allows multiple switch controls to work together in teams, using peer-to-peer communication, and quickly transfer load to minimize the number of customers affected by a fault or outage. The system uses distributed intelligence; no central processing or SCADA is required (though fully supported). Different types of switches, reclosers, and controls can be included in the same team.

Utility personnel can communicate with 5800 Series Controls to identify and isolate faults and restore service—with or without a SCADA master station. DNP 3.0 is the standard protocol. A variety of radios, modems, and pager modules (for one-way communication) may be factory- or field-installed inside the switch control enclosure.

5800 Series Controls provide true RMS voltage and current readings. Over the operating temperature range of -40°F to 158°F, current readings are accurate to ±0.5% full scale, with a resolution of 1 ampere RMS; voltage readings are accurate to ±0.5% full scale, with a resolution of 0.1 Vac. Phase angle readings are accurate to ±1° at 5% of full-scale current, with a resolution of 1/8°. The switch controls have a current sensor input range of 0 to 800 amperes RMS.

5800 Series Controls are configured specifically for fault detection. Over the overcurrent fault detection range of 0 to 4000 amperes RMS, overcurrent readings are accurate to ±0.5% full scale, with a resolution of 1 ampere RMS.

5800 Series Controls have extensive data logging capabilities. Voltage, current, and kVARs are logged every 15 minutes for one week; daily maximum and minimum voltage, current, kVARs, and power factor are logged for one month. (If the IntelliTEAM II System has been furnished, daily highs/lows are logged for one week.) Overcurrent, loss-of-voltage, and fault magnitude and duration data, as well as equipment diagnostics are also recorded. A crystal-controlled, temperature-compensated clock provides accurate time-stamping of the data. The information collected at the switch location is invaluable for analyzing problems on the circuit, troubleshooting, optimizing performance of the installation, and planning for future requirements. With IntelliTEAM-equipped controls, data logging is especially useful for determining the sequence of events during a team reconfiguration, and for comparing the information with substation data.

A PC operating under Windows® 98 or later can be connected via a DB9 faceplate connector and IntelliLINK® Setup Software used to view real-time data, manage set points, troubleshoot, and download historical data for reports. Set points and data can also be accessed remotely using S&C's WinMon® Graphical User Interface.

5800 Series Controls utilize a single power supply and battery, eliminating the problems inherent in controls with multiple power supplies and batteries. This highly efficient power supply delivers 12 Vdc to the entire system, and supplies 24-Vdc or 36-Vdc temperature-compensated battery charging and float charging to maximize battery life. Battery condition is periodically checked under varying loads. Detailed information on battery and power supply status is available at the faceplate liquid-crystal display and is accessible at remote locations in communication-device-equipped controls. Most 5800 Series Controls for use with S&C switching devices can accept control power from a 100- to 140-Vac or 200- to 280-Vac source, or S&C sensor outputs. If both sources are available, the control automatically uses control power and switches to sensor power if control power is lost.

Automatic Sectionalizing

5800 Series Controls have automatic sectionalizing capabilities that can improve circuit reliability when coordinated with source-side reclosing devices. The controls can help reduce loss of service and locate faulted line sections. Controls equipped with IntelliTEAM II automatic circuit reconfiguration can provide full restoration of unaffected customer loads, if circuit capacity will allow it.

Supersedes Specification Bulletin 1041-31 dated 12-18-06

Shots to Lockout

The selectable shots-to-lockout feature prevents the source-side protective device from reclosing into a fault multiple times.

Loss of Phase

5800 Series Controls protect three-phase loads from single-phasing by automatically opening the switch. The controls can be programmed to automatically reclose the switch when three-phase voltage returns.

Switching Devices Supported

5800 Series Controls support the following switching devices:

- S&C Scada-Mate® Switches
- S&C Automated Omni-Rupter® Switches
- S&C Remote Supervisory PME Pad-Mounted Gear
- S&C Remote Supervisory PMH Pad-Mounted Gear
- S&C Remote Supervisory Vista® Underground Distribution Switchgear
- Trayer Interrupters
- Trayer Motopaks
- Cooper GWC Sectionalizers
- Cooper F Switches
- Cooper NOVA™ Reclosers
- Cooper VFI Vacuum Fault Interrupters
- Joslyn VBM Vacuum Switches

For applicability to other switching devices, refer to your nearest S&C Sales Office.

EXCLUSIONS: An S&C 5800 Series Automatic Switch Control does not include a communication device, antenna, or antenna connections.

SPECIFICATION DEVIATIONS: Refer to the "OPTIONS" table on pages 5 and 6.

SPECIAL WARRANTY PROVISIONS: The standard warranty contained in seller's standard conditions of sale, as set forth in Price Sheet 150, applies to S&C 5800 Series Automatic Switch Controls, except that the first paragraph of said warranty is replaced by the following:

(1) General: Seller warrants to immediate purchaser or end user for a period of 10 years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within ten years after the date of shipment the seller agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at seller's option) by shipment of necessary replacement parts. The seller's warranty does not apply to any equipment that has been disassembled, repaired, or altered by anyone other than the seller. This limited warranty is granted only to the immediate purchaser or, if the equipment is purchased by a third party for installation in third-party equipment, the end user of the equipment. The seller's duty to perform under any warranty may be delayed, at the seller's sole option, until the seller has been paid in full for all goods purchased by the immediate purchaser. No such delay shall extend the warranty period.

Replacement parts provided by seller or repairs performed by seller under the warranty for the original equipment will be covered by the above special warranty provision for its duration. Replacement parts purchased separately will be covered by the above special warranty provision.

WARRANTY QUALIFICATIONS: Warranty of S&C 5800 Series Automatic Switch Controls is contingent upon the installation, configuration, and use of the control or software in accordance with S&C's applicable instruction sheets. This warranty does not apply to major components not of S&C manufacture, such as batteries, communication devices, and remote terminal units. However, S&C will assign to immediate purchaser or end user all manufacturers' warranties that apply to such major components.

How to Order

Select the catalog number of the desired 5800 Series Automatic Switch Control from the table on page 3. Add the suffix for the type of switching device from the table on page 3. Add the suffix for the software type from the table on page 4. Add the suffix for the mounting type from the table on page 4. Add the suffix(s) for any options desired from the table on pages 5 and 6. Add the suffixes for gateway applications, if required, from the table on page 7.

S&C 5800 SERIES AUTOMATIC SWITCH CONTROLS

Device	Control Source	Number of Switches Controlled	Catalog Number
5800 Series Automatic Switch Control①	100 to 140 Vac or 200 to 280 Vac, 50 or 60 Hz	One	5801
		Two	5802
		Three	5803

① No communication device, antenna, or antenna connections are included. Switching device, software type, and mounting type must be specified from the tables below.

FOR USE WITH SWITCHING DEVICE—Must Be Specified

Switching Device	Suffix to be Added to Switch Control Catalog Number
S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch	-F01
S&C Remote Supervisory PME Pad-Mounted Gear	-F02
S&C Remote Supervisory PMH Pad-Mounted Gear	-F03
S&C Remote Supervisory Vista Underground Distribution Switchgear	-F04
S&C Alduti-Rupter® Switch with Type AS-1A Switch Operator	-F05
Trayer Interrupter	-F10
Trayer Motopak	-F11
Joslyn VBM Vacuum Switch	-F20
Cooper GWC Sectionalizer	-F30
Cooper F Switch	-F31
Cooper NOVA Recloser	-F32
Cooper VFI Vacuum Fault Interrupter	-F33

SOFTWARE TYPE—Must Be Specified

Software Type	Suffix to be Added to Switch Control Catalog Number
S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch	-G1●
S&C Remote Supervisory PME Pad-Mounted Gear or Remote Supervisory PMH Pad-Mounted Gear	-G2★
Trayer	-G3
Universal (Joslyn and Cooper switches)	-G4
Universal, with IntelliTEAM System (Joslyn and Cooper switches)	-G5●
S&C Remote Supervisory Vista Underground Distribution Switchgear	-G6■
S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch, with IntelliTEAM System	-H1●
S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch, with IntelliTEAM System as Gateway①	-H2●
S&C Remote Supervisory PME Pad-Mounted Gear or Remote Supervisory PMH Pad-Mounted Gear, with IntelliTEAM System	-H3★
S&C Remote Supervisory PME Pad-Mounted Gear or Remote Supervisory PMH Pad-Mounted Gear, with IntelliTEAM System as Gateway①	-H4★
Source-Transfer Application	-H5
S&C Remote Supervisory Vista Underground Distribution Switchgear, with IntelliTEAM System	-H6■
S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch, with IntelliTEAM II System	-H7●
S&C Remote Supervisory PME Pad-Mounted Gear, Remote Supervisory PMH Pad-Mounted Gear, or Remote Supervisory Vista Underground Distribution Switchgear, with IntelliTEAM II System	-H8★◆

① The communication protocol, communication device, antenna connections, and antenna for the gateway must be specified. See table on page 7.

● For use with Catalog Number 5801 only.

■ For use with Catalog Number 5802 only.

◆ For use with option suffixes "-F01," "-F02," "-F03," and "-F04" only.

★ For use with Catalog Numbers 5802 or 5803 only. Vista software can only operate the 5802. For other software with the 5803, the third switch is not automated, and can only be opened/closed, either locally or via SCADA.

MOUNTING TYPE—Must be Specified

Mounting Type	Suffix to be Added to Switch Control Catalog Number
No Enclosure	-JB0
Pole Mounting, in Padlockable Corrosion-Resistant Aluminum Enclosure, 18" W × 24" H × 9½" D	-JB1
Pad Mounting, to be Integrated into Customer-Furnished Low-Voltage Enclosure	-JB3
Pedestal Mounting, in Padlockable Corrosion-Resistant Aluminum Enclosure with Rear Hinge, 18" W × 36" H × 9½" D	-JB4
Pedestal Mounting, in Padlockable Corrosion-Resistant Aluminum Enclosure with Front Hinge, 18" W × 36" H × 9½" D	-JB5

OPTIONS

Item	Suffix to be Added to Switch Control Catalog Number
Sensing Inputs (sensors not included)	
Three S&C Current/Voltage Sensors	-K1
Six S&C Current/Voltage Sensors	-K2
Three S&C Current/Voltage Sensors and Nine S&C Current Sensors	-K3
Six Lindsey Voltage Sensors and Three Lindsey Current Sensors	-K4
Three Lindsey Current and Voltage Sensors	-K5
One Potential Transformer and Three Split-Core Current Sensors	-K6
One Potential Transformer and Six Split-Core Current Sensors	-K7
One Potential Transformer and Three 1000:1 Current Transformers	-K8
Three S&C Current Sensors and Six S&C Voltage Sensors	-K9
Indicator Option	
Reversed Colors for Open/Closed Indicating Lamps (green = closed, red = open)	-L1
Communication Protocol	
DNP 3.0	-P0
PG&E SCADA (Cooper 2179)	-P2
Landis & Gyr Telegyr 8979	-P3
UtiliNet LAN Packet	-P4
Motorola Intrac	-P5
Communication Device (furnished by S&C, requires Suffix "-R98")	
MDS 9810 Radio	-R13
MDS 9710A Radio with Diagnostics (for new systems)	-R14▲
MDS 9710B Radio (for existing systems)	-R15▲
Prosoft RLX-FHS-US	-R17
MDS TransNet 900 Transceiver	-R18
MDS TransNet 900 Transceiver with Diagnostics	-R19
Single-Mode Dymec 5843SHRT Fiber-Optic Modem	-R44
Multi-Mode Dymec 5843HRT Fiber-Optic Modem	-R45
Sixnet VT-Modem-1 (Hayes-Compatible)	-R50
Scandata Bell 202 Modem	-R53
Telemetric DNP RTM Transceiver	-R61
Internal UtiliNet Series 3000 IWR Radio	-R67
Data Remote CDS-9022 CDMA Modem	-R70
MDS NR104L IP Radio (includes serial to ethernet device server)	-R71
Data Remote CDS-9060 Modem for Verizon CDMA	-R73

▲ Select the appropriate receive frequency band by adding the appropriate letter (A, B, or C) and select the appropriate *transmit* frequency band by adding the appropriate number (7, 8, 9, or 0), as follows:

Receive Frequency Band		Transmit Frequency Band	
Range, MHz	**Suffix**	**Range, MHz**	**Suffix**
800 to 860	A	800 to 840	7
860 to 900	B	840 to 880	8
900 to 960	C	880 to 920	9
		920 to 960	0

Any combination of receive and transmit frequency bands is permissible. For example, for an MDS 9710A Radio with Diagnostics, with a receive frequency band of 860 to 900 MHz and a transmit frequency band of 880 to 920 MHz, specify Switch Control Catalog Number Suffix "-R14B9."

TABLE CONTINUED ►

OPTIONS—Continued

Item	Suffix to be Added to Switch Control Catalog Number
Communication Device Ready (communication device furnished by customer)	
Ready for CellNet 9QPR Radio	-R01
Ready for MDS 9810 Radio	-R02
Ready for MDS 9710A Radio (for new systems)	-R03
Ready for MDS 9710B Radio (for existing systems)	-R04
Ready for External UtiliNet Radio	-R06
Ready for MDS Transnet 900 Radio	-R07
Ready for Prosoft RLX-FHS-US	-R08
Ready for MCS 2000 (replaces Motorola MaxTrac FUD)	-R20
Ready for Motorola HR2	-R21
Ready for Data Radio Model T96SR	-R25
Ready for MDS 2710D Radio	-R27
Ready for FreeWave FGR-115RC Radio	-R30
Ready for MDS 2710 Radio	-R32
Ready for RFI 594 UHF Radio Modem	-R33
Ready for Internal MDS iNET 900 Radio	-R34
Ready for FreeWave DTR-115RU Radio	-R35
Ready for FreeWave FGR-09CSU Radio	-R36
Ready for Single-Mode Dymec 5843SHRT Fiber-Optic Modem	-R42
Ready for Multi-Mode Dymec 5843HRT Fiber-Optic Modem	-R43
Ready for Scadata Bell 202 Modem	-R57
Ready for Sixnet VT-Modem-1 (Hayes-Compatible)	-R59
Ready for Telemetric DNP RTM	-R60
Ready for AirLink Raven CDMA Modem	-R65
Ready for Internal UtiliNet Series 3000 IWR Radio	-R66
Ready for AirLink Raven GPRS Modem	-R68
Ready for Data Remote CDS-9022 Modem	-R69
Ready for Data Remote CDS-9060 CDMA Modem	-R72
Factory Installation of Communication Device	
Furnished by S&C	-R98
Furnished by Customer	-R99
Antenna Connections (multiple types may be specified)	
N-Type Connector, Bottom Mounted, for Remote Antenna Installation	-S2
PolyPhaser® Surge Suppressor, N-Type Connector, Bottom Mounted, for Remote Antenna Installation	-S3
Antennex NMO Mounting	-S4
Antenna	
900-Mhz 5-dB Gain Antenna, N-Type Male Connector	-T2
Lo Pro Transit Antenna	-T5
Control Power	
From PT	-W1
From Sensors	-W2

OPTIONS FOR GATEWAY APPLICATIONS

Item	Suffix to be Added to Switch Control Catalog Number
Communication Protocol	
DNP 3.0	-XP0
PG&E SCADA (Cooper 2179)	-XP2◩
Landis & Gyr Telegyr 8979	-XP3◩
Pager	-XP6◩
Communication Device (furnished by S&C, requires Suffix "-XR98")	
MDS 9810 Radio	-XR13
MDS 9710A Radio (for new systems)	-XR14▲
MDS 9710B Radio (for existing systems)	-XR15▲
Prosoft RLX-FHS-US Radio	-XR17
Single-Mode Dymec 5843SHRT Fiber-Optic Modem	-XR44
Multi-Mode Dymec 5843HRT Fiber-Optic Modem	-XR45
Sixnet VT-Modem (Hayes-Compatible)	-XR50
Scandata Bell 202 Modem	-XR53
Telemetric DNP-RTM Transceiver	-XR61
Data Remote CDS-9060 Modem for Verizon CDMA	-XR73
Communication Device Ready (communication device furnished by customer)	
Ready for CellNet 9QPR Radio	-XR01
Ready for MDS 9810 Radio	-XR02
Ready for MDS 9710A Radio (for new systems)	-XR03
Ready for MDS 9710B Radio (for existing system)	-XR04
Ready for MDS 2710D Radio	-XR27
Ready for FreeWave FGR-115RC Radio	-XR30
Ready for Single-Mode Dymec 5843SHRT Fiber-Optic Modem	-XR42
Ready for Multi-Mode Dymec 5843HRT Fiber-Optic Modem	-XR43
Ready for Sixnet VT-Modem-1 (Hayes-Compatible)	-XR59
Ready for Data Remote CDS-9060 CDMA Modem	-XR72
Factory Installation of Communication Device	
Furnished by S&C	-XR98
Furnished by Customer	-XR99
Antenna Connections	
N-Type Connector, Bottom Mounted, for Remote Antenna Installation	-XS2
PolyPhaser® Surge Suppressor, Bottom Mounted	-XS3
Antennex NMO Mounting	-XS4
Antenna	
900-Mhz 5-dB Gain Antenna	-XT2
Lo Pro Transit Antenna	-XT3

◩ For use with option suffixes "-H2" and "-H4" only.

▲ Select the appropriate *receive* frequency band by adding the appropriate letter (A, B, or C) and select the appropriate *transmit* frequency band by adding the appropriate number (7, 8, 9, or 0), as follows:

Receive Frequency Band		Transmit Frequency Band	
Range, MHz	**Suffix**	**Range, MHz**	**Suffix**
800 to 860	A	800 to 840	7
860 to 900	B	840 to 880	8
900 to 960	C	880 to 920	9
		920 to 960	0

Any combination of receive and transmit frequency bands is permissible. For example, for an MDS 9710A Radio with Diagnostics, with a receive frequency band of 860 to 900 MHz and a transmit frequency band of 880 to 920 MHz, specify Switch Control Catalog Number Suffix "-R14B9."

ACCESSORIES

Description	Model Number	Catalog Number
Spare 8-Ampere-Hour Gates Battery Block (24 Vdc)	B1	591-000190-01
Battery Charger for up to eight 24 Vdc switch control batteries	BC-8-24	904-000057-01
Current Sensor for use with pedestal or pad-mounted switch controls. Set of three each with 30-foot cables	CU-3	904-000004-00
Current Sensor for use with pedestal or pad-mounted dual switch controls. Set of six each with 30-foot cables	CU-6	904-000004-01
UtiliNet Remote Antenna Kit, includes omni-directional antenna, pole-mounted antenna arm, and 30-foot coaxial cable with connectors on both ends	MA-30-PM	903-002132-02
UtiliNet Remote Antenna Kit, includes omni-directional antenna, pole-mounted antenna arm, and 50-foot coaxial cable with connectors on both ends	MA-50-PM	903-002132-03
UtiliNet and Cellular Remote Dual-Antenna Kit, includes omni-directional antenna, pole-mounted antenna arm, and both 30-foot coaxial cable with connectors on both ends	—	903-002172-02
UtiliNet and Cellular Remote Dual-Antenna Kit, includes omni-directional antennas, pole-mounted antenna arm, and both 50-foot coaxial cables with connectors on both ends	—	903-002172-03
FIC Test Fixture, simulates overhead switch disconnect status and switch position	TF-SC	906-000001-01
Portable Test Switch, electrically operates S&C Scada-Mate or Automated Omni-Rupter Switches, independently of switch control	TS-SC	904-000050-01

SOFTWARE UPGRADE—From IntelliTEAM to IntelliTEAM II①②

Description	Catalog Number
For Automatic Switch Controls manufactured **before** 1-1-2005	
Model 5801	903-004000-01
Model 5802, used with pad-mounted gear	903-004000-02
Model 5802, used with Vista switchgear	903-004000-03
Model 5803, used with pad-mounted gear	903-004000-04
For Automatic Switch Controls manufactured **after** 1-1-2005	
Model 5801	008-004000-01
Model 5802, used with pad-mounted gear	008-004000-02
Model 5802, used with Vista switchgear	008-004000-03
Model 5803, used with pad-mounted gear	008-004000-02

① Only available with option suffixes "-F01," "-F02," "-F03," and "-F04." See page 3.

② Not available with non-DNP Gateway option suffixes "-XP2," "-XP3," and "-XP6." See page 6.

SOFTWARE UPGRADE—From Non-IntelliTEAM to IntelliTEAM II①②

Description	Catalog Number
For Automatic Switch Controls manufactured **before** 1-1-2005	
Model 5801	903-004001-01
Model 5802, used with pad-mounted gear	903-004001-02
Model 5802, used with Vista switchgear	903-004001-03
Model 5803, used with pad-mounted gear	903-004001-04
For Automatic Switch Controls manufactured **after** 1-1-2005	
Model 5801	008-004001-01
Model 5802, used with pad-mounted gear	008-004001-02
Model 5802, used with Vista switchgear	008-004001-03
Model 5803, used with pad-mounted gear	008-004001-02

① Only available with option suffixes "-F01," "-F02," "-F03," and "-F04." See page 3.

② Not available with non-DNP Gateway option suffixes "-XP2," "-XP3," and "-XP6." See page 6.

SOFTWARE UPGRADE—From Non-IntelliTEAM to IntelliTEAM

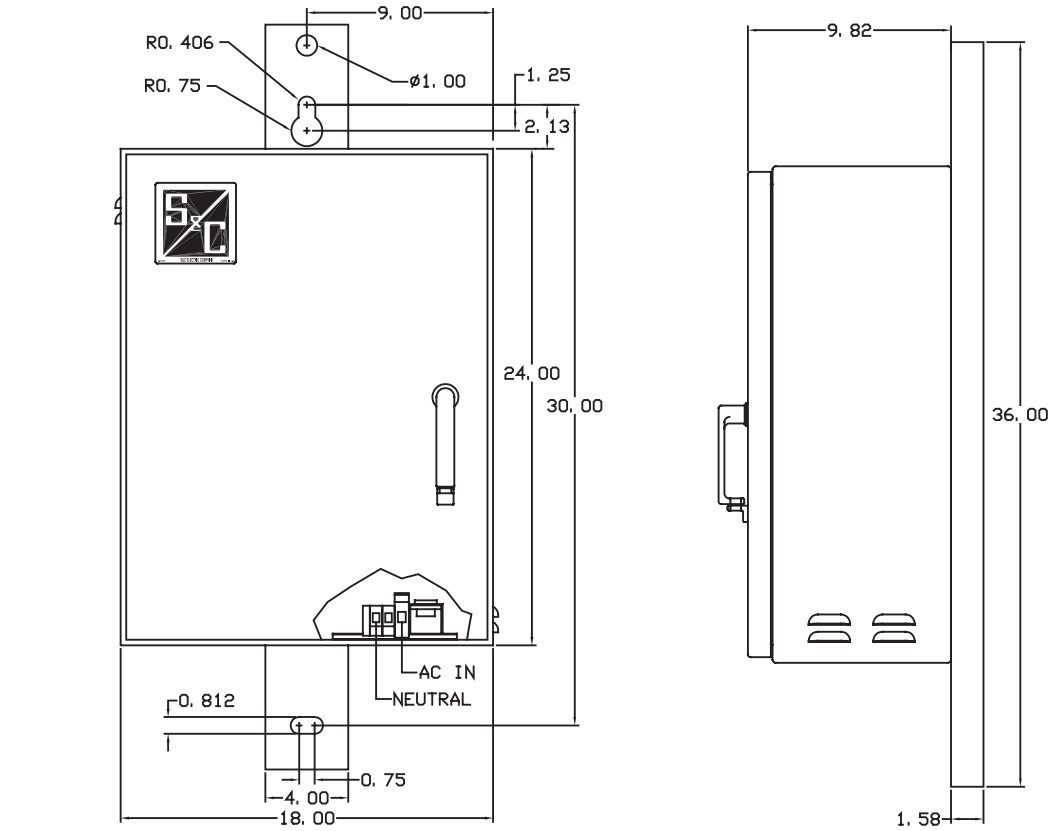
Description	Catalog Number
Model 5801, used with S&C Scada-Mate Switch or S&C Automated Omni-Rupter Switch	008-004002-01

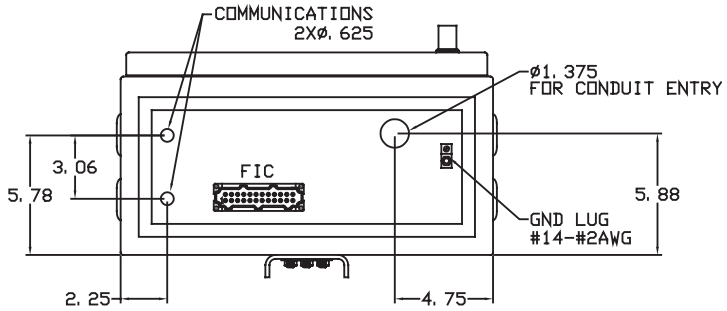
SOFTWARE UPGRADE—From Non-IntelliTEAM to Source-Transfer

Description	Model(s)	Catalog Number
For Automatic Switch Controls manufactured **before** 1-1-2005	5801	903-004003-01
	5802	903-004003-02
	5803	903-004003-03
For Automatic Switch Controls manufactured **after** 1-1-2005	5801	008-004003-01
	5802 and 5803	008-004003-02

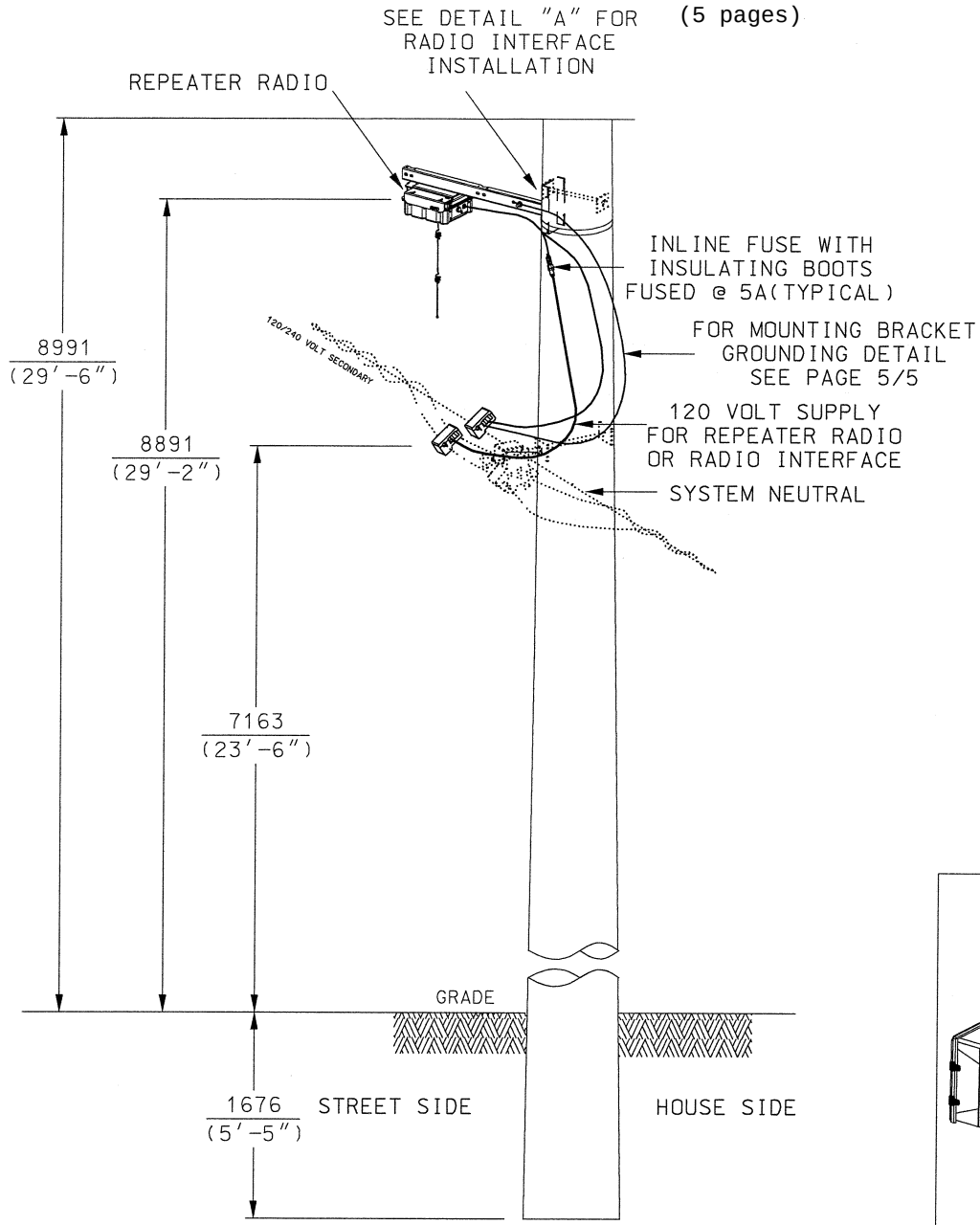
5800 Series Automatic Switch Control

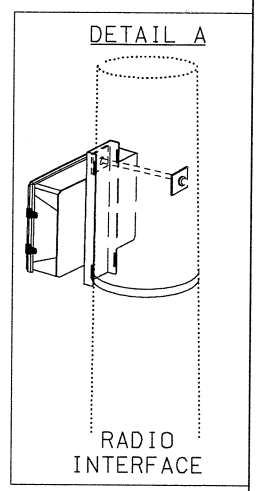
Dimensions in Inches





Printed in U.S.A.





NOTES:

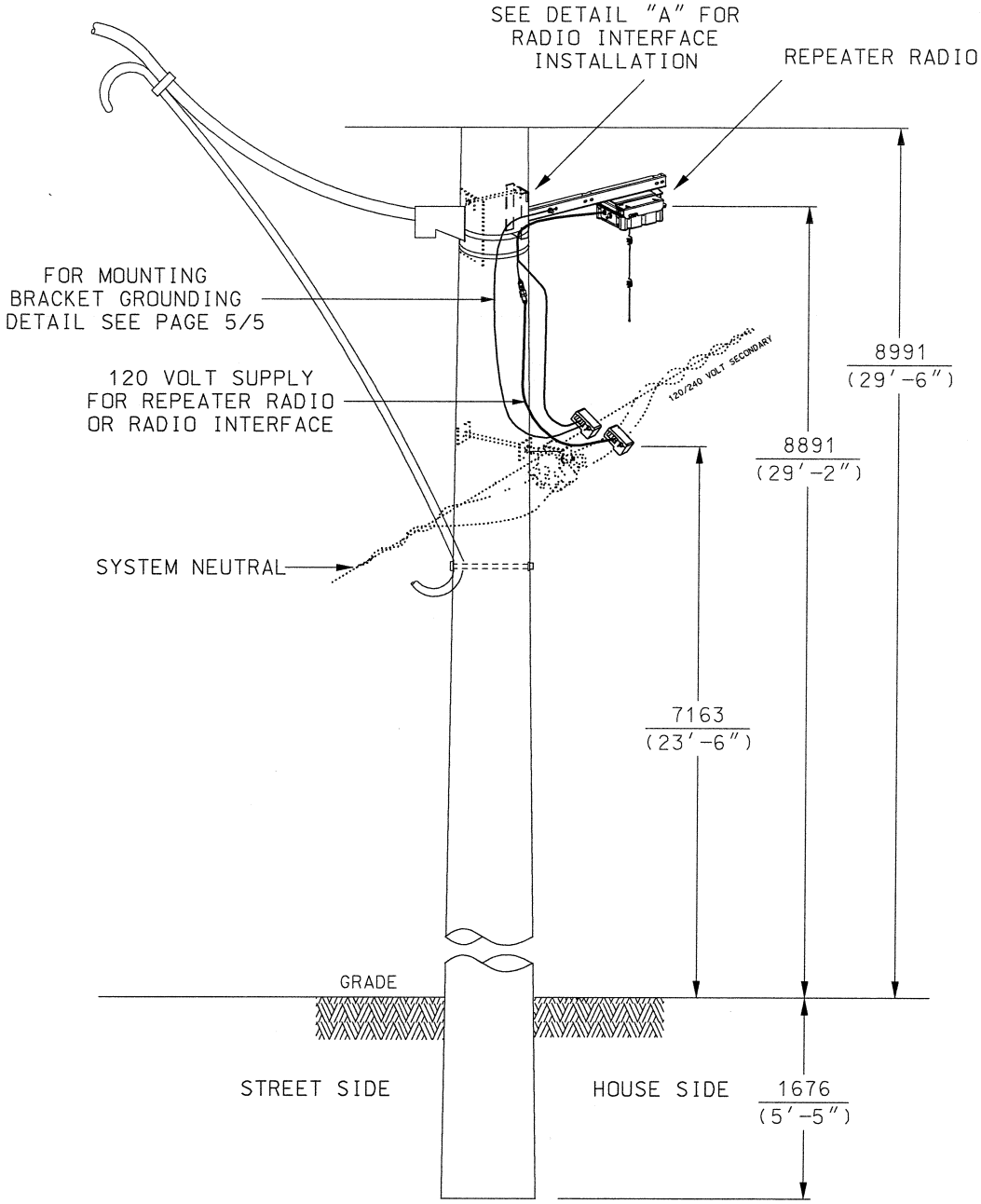
△3

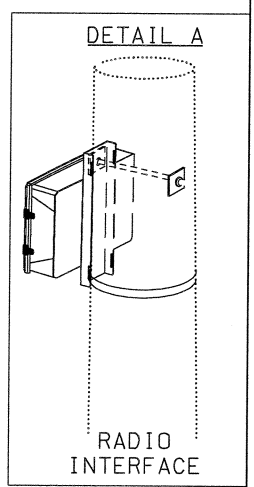
1) THIS SKETCH IS ONLY TO BE USED FOR INITIAL PILOT INSTALLATION. CREATION OF CONSTRUCTION STANDARD WILL BE SUBJECT TO REVIEW OF PILOT INSTALLATION REPORT RESULTS.

2) REFER TO SKE-18 FOR NOMENCLATURE.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

DISTRIBUTION CONSTRUCTION SKETCH △3			RADIO INTERFACE ON 35 FT. CONC. OR WOOD POLE INSTALLATION DETAILS WITHOUT STREET LIGHT △3				
toronto hydro electric system	Approved By: 2011-05-18						
	Drafted By: A.M.E.	Designed By: C.T.	Original Issue: K.S. 2010-02-03	Scale: N.T.S	Rev: 3	SKE-15	1/5





NOTES:

△3 1) THIS SKETCH IS ONLY TO BE USED FOR INITIAL PILOT INSTALLATION. CREATION OF CONSTRUCTION STANDARD WILL BE SUBJECT TO REVIEW OF PILOT INSTALLATION REPORT RESULTS.

2) REFER TO SKE-18 FOR NOMENCLATURE.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

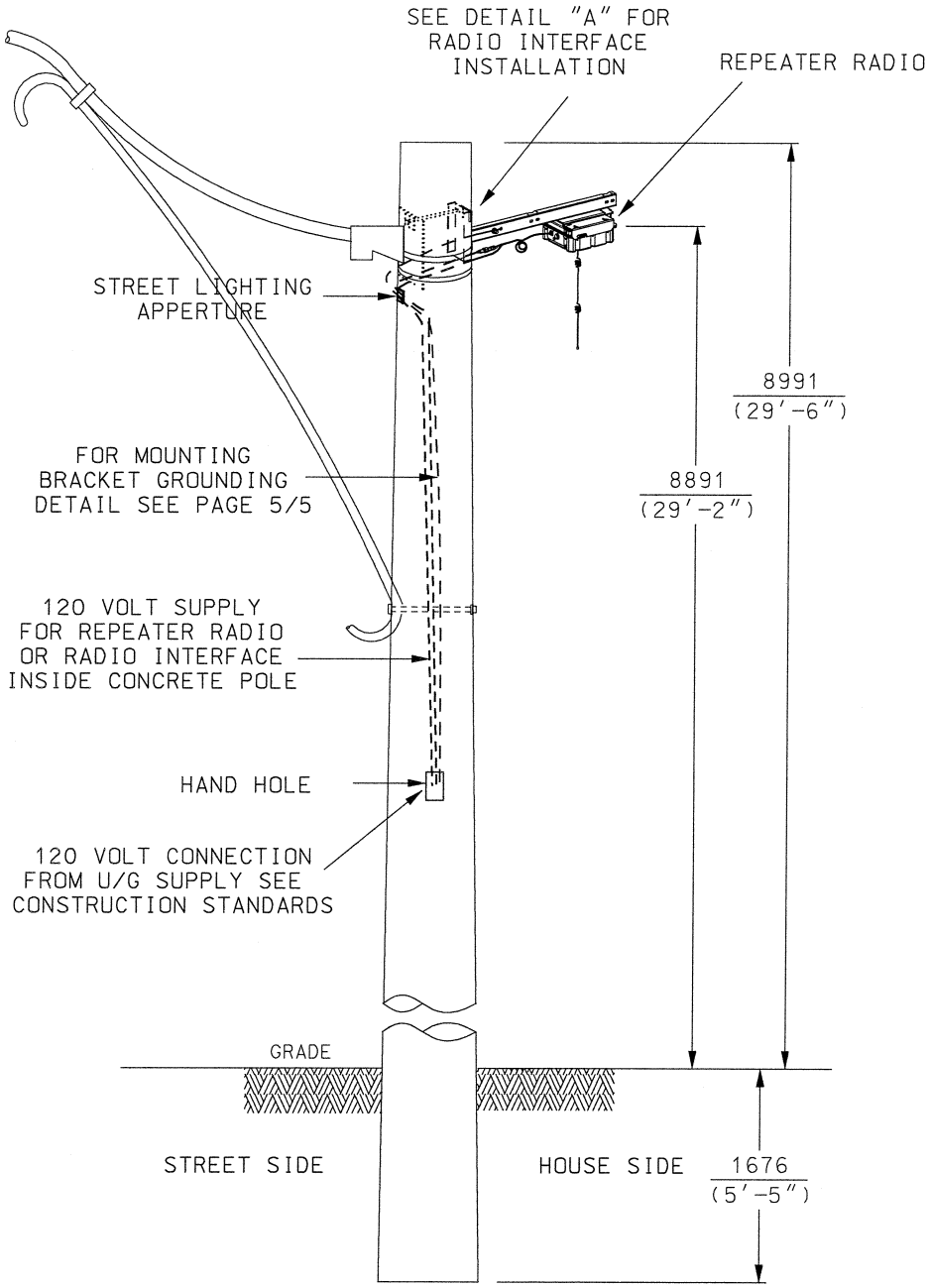
DISTRIBUTION CONSTRUCTION SKETCH △3

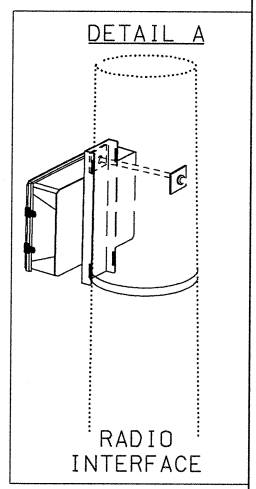
RADIO INTERFACE ON 35 FT. CONC. OR WOOD POLE

INSTALLATION DETAILS WITH STREET LIGHT △3

toronto hydro electric system

Approved By:	Drafted By:	Designed By:	Original Issue:	Scale:	Rev:		
2011-05-18	A.M.E.	C.T.	K.S. 2010-06-02	N.T.S.	3	SKE-15	2/5





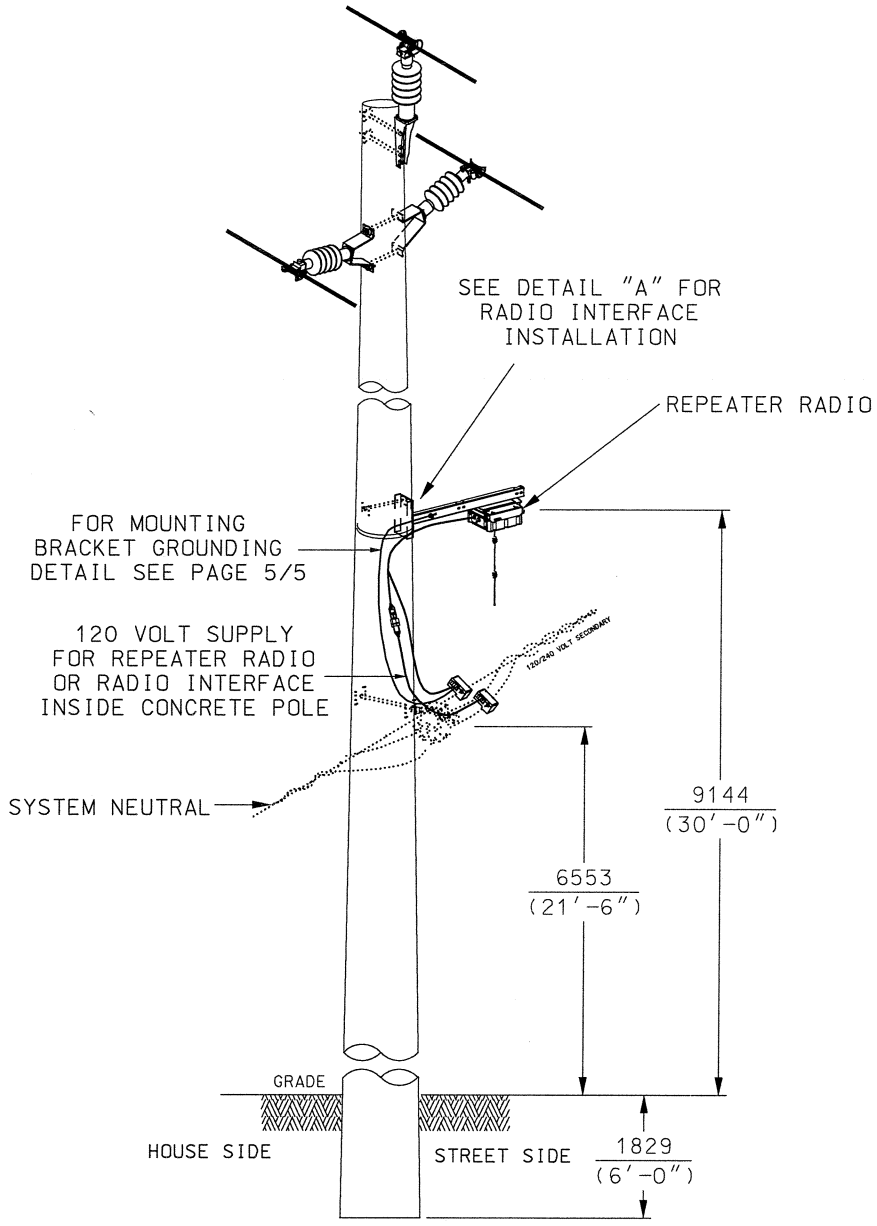
NOTES:

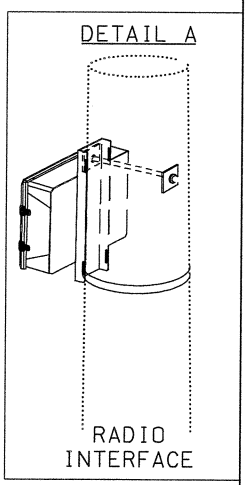
△3 1) THIS SKETCH IS ONLY TO BE USED FOR INITIAL PILOT INSTALLATION. CREATION OF CONSTRUCTION STANDARD WILL BE SUBJECT TO REVIEW OF PILOT INSTALLATION REPORT RESULTS.

2) REFER TO SKE-18 FOR NOMENCLATURE.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

DISTRIBUTION CONSTRUCTION SKETCH △3			RADIO INTERFACE ON 35 FT. CONC. OR WOOD POLE INSTALLATION DETAILS WITH STREET LIGHT (U/G FEED) △3				
toronto hydro electric system	Approved By: klacka 2011-05-18						
	Drafted By: A.M.E.	Designed By: C.T.	Original Issue: K.S. 2010-06-02	Scale: N.T.S.	Rev: 3	SKE-15	3/5





NOTES:

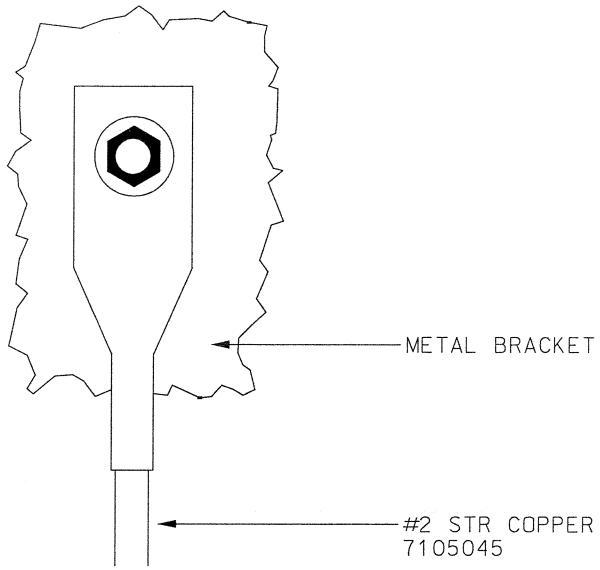
△3 1) THIS SKETCH IS ONLY TO BE USED FOR INITIAL PILOT INSTALLATION. CREATION OF CONSTRUCTION STANDARD WILL BE SUBJECT TO REVIEW OF PILOT INSTALLATION REPORT RESULTS.

2) REFER TO SKE-18 FOR NOMENCLATURE.

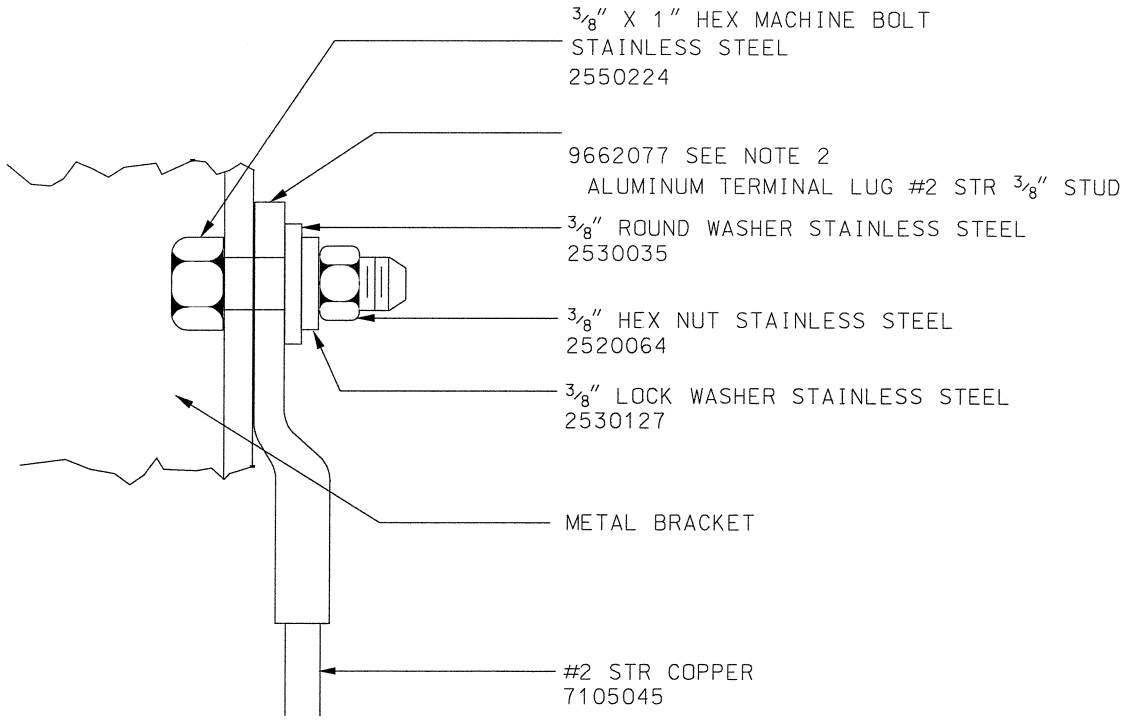
3) INSTALL REPEATER RADIO ONLY ON DISTRIBUTION LINE POLES ON WHICH NO TRANSFORMER(S) ARE MOUNTED.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

DISTRIBUTION CONSTRUCTION SKETCH △3			RADIO INTERFACE ON DISTRIBUTION POLE INSTALLATION DETAILS WITHOUT STREET LIGHT △3				
toronto hydro electric system	Approved By: Klack 2011-05-18						
	Drafted By: A.M.E.	Designed By: C.T.	Original Issue: K.S. 2010-06-02	Scale: N.T.S.	Rev: 3	SKE-15	4/5



FRONT VIEW



SIDE VIEW

NOTES:

1) ALL MATERIALS WILL BE INCLUDED IN APPROPRIATE CONSTRUCTION STANDARD BOM.
2) IF 9662077 IS UNAVAILABLE, USE 7211134.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

DISTRIBUTION CONSTRUCTION SKETCH 3			RADIO INTERFACE MOUNTING BRACKET 3 GROUNDING DETAIL				
toronto hydro electric system	Approved By: 2011-05-18						
	Drafted By: A.M.E.	Designed By: C.T.	Original Issue: K.S. 2010-06-02	Scale: N.T.S.	Rev: 3	SKE-15	5/5

Specifications

Conditions of Sale

STANDARD: Seller's standard conditions of sale set forth in Price Sheet 150 apply, except as modified under "SPECIAL WARRANTY PROVISIONS" on page 2.

SPECIAL TO THIS PRODUCT:

INCLUSIONS: S&C SpeedNet Radios provide high-speed, long-range, peer-to-peer data communication for fixed point-to-point nodes up to 25 miles apart. They feature:

- Unlicensed 902- to 928-MHz operating band
- Fast data transmission rates—up to 650 kbps
- Message latency is 6 to 12 ms/per link, for a 300 byte DNP packet payload
- Rapid dwell time, averaging 10 to 12 ms
- Adaptive power control—limits maximum and minimum transmission power, to optimize bandwidth efficiency for a high-density network
- Serial and Ethernet data inputs
- Secure 128-bit AES data encryption
- Mesh network uses IP addresses
- Assignable message priority—for example, S&C IntelliRupter® PulseCloser operation messages can be configured to transmit first
- SNMP-based client tool
- Multi-level administrative passwords
- Over-the-air configuration and software updates
- Received signal strength indication statistics are available in real time and from data logs
- Simple Network Management Protocol interface can be programmed to automate data collection
- Battery back-up with remote battery testing on repeater and gateway models

A highly adaptive IP-addressable mesh network of SpeedNet Radios is easy to set up and maintain. SpeedNet Radios can communicate through each other to establish new message paths when a node is lost, providing excellent signal-loss tolerance and network reliability.

SpeedNet Radios provide highly secure transmission too. Their frequency-hopping spread-spectrum signals are inherently difficult to intercept and jam. IP/MAC address filtering prevents unauthorized users from accessing the network. And 128-bit AES encryption ensures that critical data is not compromised.

SpeedNet Radios are offered in four versions:

- **SpeedNet Radio** for installation in a user-furnished enclosure.
- **SpeedNet Streetlight-Mounted Repeater Radio** in cast-aluminum weatherproof enclosure that mounts on a streetlight arm. Extends communication range and expands network area.
- **SpeedNet Utility-Pole-Mounted Repeater Radio** in padlockable plastic weatherproof enclosure that mounts directly on a utility pole. Extends communication range and expands network area.
- **SpeedGate™ Radio Interface System** in padlockable plastic weatherproof enclosure that mounts directly on a utility pole. Includes provision for a gateway communication device, permitting data exchange with a different communication system.

Device Compatibility

SpeedNet Radios cannot communicate directly with other types of radios because of differences in frequency selection, spread-spectrum frequency hopping patterns, channel use, and network management algorithms. A SpeedGate Repeater Radio, with an appropriate gateway communication device, is required in such instances.

Conditions of Sale—Continued

Antennas

SpeedNet Radios are FCC approved for use only with the antenna/cable combinations offered in this specification bulletin.

EXCLUSIONS: If the user's communication system also requires licensed radios, frequency selection and FCC license application are to be provided by others.

SPECIAL WARRANTY PROVISIONS: The standard warranty contained in seller's standard conditions of sale, as set forth in Price Sheet 150, applies to S&C SpeedNet Radios, except that the first paragraph of said warranty is replaced by the following:

(1) General: Seller warrants to purchaser for a period of 10 years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within ten years after the date of shipment the seller agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at seller's option) by shipment of necessary replacement parts.

The above special warranty does not apply to gateway communication devices applied with SpeedNet Radios.

How To Order

Select catalog numbers for the radios and accessories, and catalog number suffixes for the desired options.

SPEEDNET RADIOS AND SPEEDGATE	
Item	**Catalog Number**
SpeedNet Radio①—for mounting in user-furnished enclosure. Includes 4-foot power cord for connection to user-furnished 12-Vdc power source	110-000555-01
SpeedNet Streetlight-Mounted Repeater Radio②—in cast-aluminum weatherproof enclosure. Includes adjustable galvanized-steel mounting bracket for attachment to streetlight arm or other circular cross-section, battery charger, battery providing 8-hour minimum backup on loss of ac control power③, 3-foot streetlight photocell adaptor power cable, and omni-directional 5-dBd whip antenna on bottom of enclosure	908-000958-01
With 900-MHz band pass filter	908-000959-01
With 10-foot unterminated cable for connection to user-furnished 110-240 Vac, 50/60-Hz power source, instead of streetlight photocell adaptor power cable	908-000956-01
With 10-foot unterminated cable for connection to user-furnished 110-240 Vac, 50/60-Hz power source, instead of streetlight photocell adaptor power cable, and 900-MHz band pass filter	908-000957-01
SpeedNet Utility-Pole-Mounted Repeater Radio②—in padlockable plastic weatherproof enclosure. Includes aluminum bracket for direct attachment to utility pole, battery charger, battery providing 8-hour minimum backup on loss of ac control power③, connector for user-furnished 110-240 Vac, 50/60-Hz power source, and omni-directional 5-dBd whip antenna on top of door	908-000953-01
With 900-MHz band pass filter	908-000953-04
With PolyPhaser® surge suppressor on bottom of enclosure	908-000953-03
With PolyPhaser surge suppressor on bottom of enclosure and 900-MHz band pass filter	908-000953-02
SpeedGate Radio Interface System④—in padlockable weatherproof plastic enclosure. Includes aluminum bracket for direct attachment to utility pole, battery charger, battery providing 8-hour minimum backup on loss of ac control power③, connector for user-furnished 110-240 Vac, 50/60-Hz power source, and omni-directional 5-dBd whip antenna on top of the enclosure	908-000954-01
Also includes provision for installing a gateway radio or fiber-optic transceiver and PolyPhaser surge suppressor with N-Type connector on the bottom of the enclosure, for connecting gateway radio to a remote antenna⑤	
With two 900-MHz band pass filters	908-000954-02
With second PolyPhaser surge suppressor on the bottom of the enclosure, for connecting SpeedGate radio to a remote antenna	908-000954-03
With second PolyPhaser surge suppressor on the bottom of the enclosure, for connecting SpeedGate radio to a remote antenna, and two 900-MHz band pass filters	908-000954-04

① Select accessories from “SpeedNet Radio Accessories” table on page 5.

② Select accessories from “SpeedNet Repeater Radio Accessories” table on page 5.

③ Assuming typical IntelliTEAM II® Automatic Restoration System communications traffic and an enclosure temperature of 25°C.

④ Select accessories from “SpeedGate Radio Interface System Accessories” table on page 6.

⑤ Select gateway communication device from the “Gateway Communication Devices for SpeedGate” table on page 4.

GATEWAY COMMUNICATION DEVICES FOR SPEEDGATE (FURNISHED BY S&C)		
Item①	**Approximate Battery Carryover Time, Hours②**	**Suffix to be Added to SpeedGate Radio Catalog Number**
UtiliNet® Series 3000 Radio	9	-XR1
MDS 9810 Radio	9	-XR2
MDS 9710A Radio	8	-XR3▲
MDS Transnet 900 Transceiver	8	-XR4
MDS Transnet 900 Transceiver with Diagnostics	8	-XR5
Single-Mode Dymec 5843SHRT Fiber-Optic Modem	13	-XR6
Multi-Mode Dymec 5843HRT Fiber-Optic Modem	18	-XR7
Sixnet VT-Modem-1 (Hayes-Compatible)	18	-XR8
Telemetric™ DNP-RTM Transceiver	9	-XR9
DataRemote CDS-9060 Modem for AT&T CDMA	9	-XR10

① Contact your local S&C Sales Office regarding other communication devices.

② Battery carryover time is dependent on transmission polling rate, ambient temperature, and radio power consumption. Time indicated assumes typical IntelliTEAM II® Automatic Restoration System communications traffic and an enclosure temperature of 25°C.

▲ Select *receive* frequency band by adding appropriate letter suffix (-A, -B, or -C) and select *transmit* frequency band by adding appropriate number suffix (7, 8, 9, or 0), as follows:

Receive Frequency Band		Transmit Frequency Band	
Range, MHz	Suffix	Range, MHz	Suffix
800 to 860	-A	800 to 840	7
860 to 900	-B	840 to 880	8
900 to 960	-C	880 to 920	9
		920 to 960	0

Any combination of receive and transmit frequency bands is permissible. For example, for an MDS 9710A Radio, with a receive frequency band of 860 to 900 MHz and a transmit frequency band of 880 to 920 MHz, specify "-XR3B9."

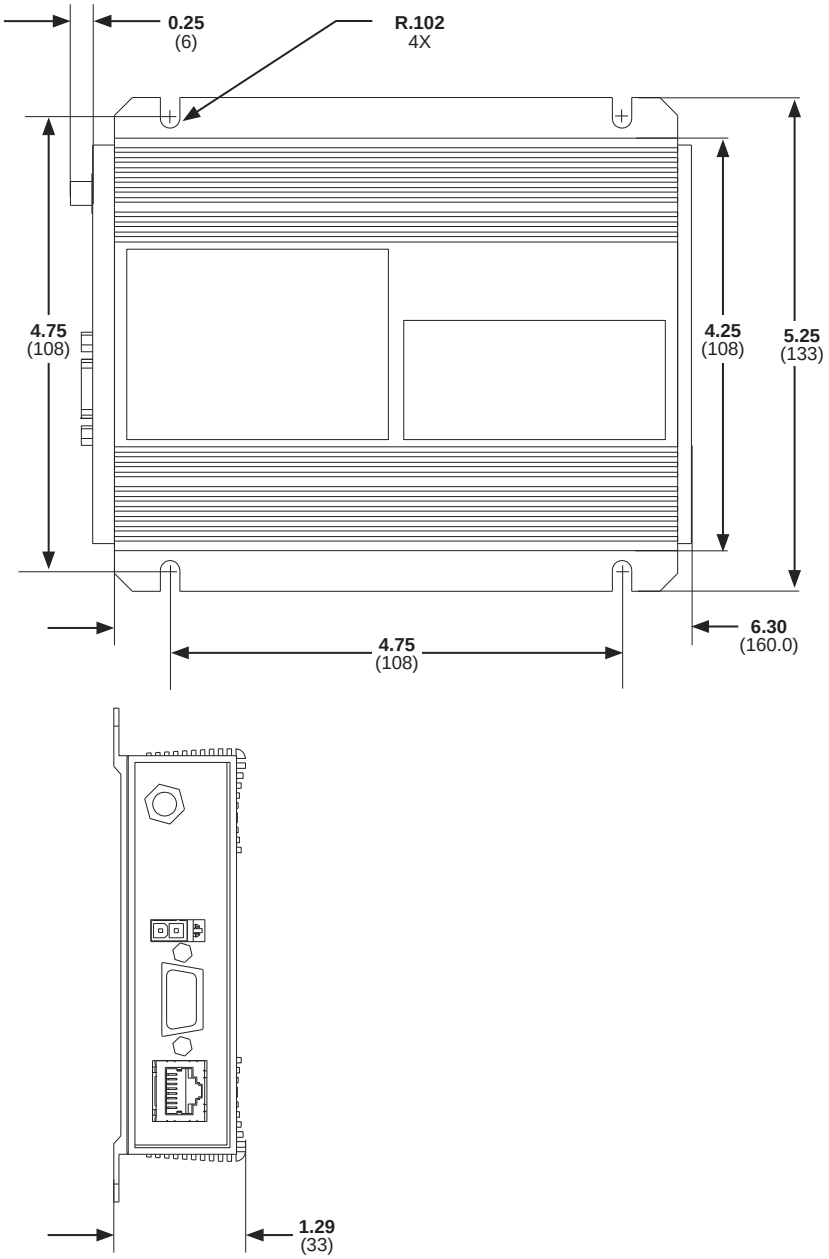
SPEEDNET RADIO ACCESSORIES	
Item	**Catalog Number**
12-Vdc Power Cord—4 foot, with connector on one end and bare wires on the other end	007-001496-01
120-Vac Power Adapter—supplies 12 Vdc to radio	904-001171-01
Antenna Cable—22 inch, with SMA male to N-Type male connectors and bulkhead connector	903-002320-01
External 900-MHz Band Pass Filter Kit	903-001174-01
Omni-Directional 5-dBd Whip Antenna—mounts on bulkhead connector	904-000071-00
Remote Antenna Kit—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 30-foot coaxial cable with N-Type male connectors on both ends	903-002132-02
Remote Antenna Kit—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 50-foot coaxial cable with N-Type male connectors on both ends	903-002132-03
Remote Antenna Kit—includes uni-directional Yagi antenna, pole-mounted single antenna arm, and 30-foot coaxial cable with N-Type male connectors on both ends	903-002321-01
Remote Antenna Kit—includes uni-directional Yagi antenna, pole-mounted single antenna arm, and 50-foot coaxial cable with N-Type male connectors on both ends	903-002321-02
Retrofit Kit for Replacing a UtiliNet® Series II or Series 3000 Radio with a SpeedNet Radio. Includes mounting bracket, power- and antenna-adaptor cables	904-001172-01
Programming Cable—7 foot, for Ethernet connection	904-001175-01

SPEEDNET REPEATER RADIO ACCESSORIES	
Item	**Catalog Number**
Ac Power Cable—10-foot unterminated #10 wire	007-001468-01
Ac Power Cable—6-foot cable with plug for ac outlet	007-001495-01
Streetlight Photocell Adaptor—includes 3-foot cord	007-001467-01
External 900-MHz Band Pass Filter Kit	903-001174-01
Replacement Battery, 4.5 Ampere-Hour, 12 Vdc	591-000860-01
Replacement Omni-Directional 5-dBd Whip Antenna	904-000071-00
Remote Antenna Kit for SpeedNet Utility-Pole-Mounted Repeater Radio—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 30-foot coaxial cable with N-Type male connectors on both ends	903-002132-02
Remote Antenna Kit for SpeedNet Utility-Pole-Mounted Repeater Radio—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 50-foot coaxial cable with N-Type male connectors on both ends	903-002132-03
Programming Cable—7 foot, for Ethernet connection	904-001175-01

SPEEDGATE RADIO INTERFACE SYSTEM ACCESSORIES	
Item	**Catalog Number**
Ac Power Cable—10-foot unterminated #10 wire	007-001511-01
Streetlight Photocell Adaptor—includes 12-foot cord	007-001515-01
External 900-MHz Band Pass Filter Kit	903-001174-01
Replacement Battery, 4.5 Ampere-Hour, 12 Vdc	591-000860-01
Replacement Omni-Directional 5-dBd Whip Antenna	904-000071-00
Remote Antenna Kit—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 30-foot coaxial cable with N-Type male connectors on both ends	903-002132-02
Remote Antenna Kit—includes omni-directional fiberglass antenna, pole-mounted single antenna arm, and 50-foot coaxial cable with N-Type male connectors on both ends	903-002132-03
Remote Antenna Kit—includes uni-directional Yagi antenna, pole-mounted single antenna arm, and 30-foot coaxial cable with N-Type male connectors on both ends	903-002321-01
Remote Antenna Kit—includes uni-directional Yagi antenna, pole-mounted single antenna arm, and 50-foot coaxial cable with N-Type male connectors on both ends	903-002321-02
Remote Dual-Antenna Kit—includes omni-directional fiberglass SpeedNet antenna, cellular antenna, pole-mounted dual-antenna arm, and two 30-foot coaxial cables with N-Type male connectors on both ends	903-002172-02
Remote Dual-Antenna Kit—includes omni-directional fiberglass SpeedNet antenna, cellular antenna, pole-mounted dual-antenna arm, and two 50-foot coaxial cables with N-Type male connectors on both ends	903-002172-03
Programming Cable—7 foot, for Ethernet connection	904-001175-01

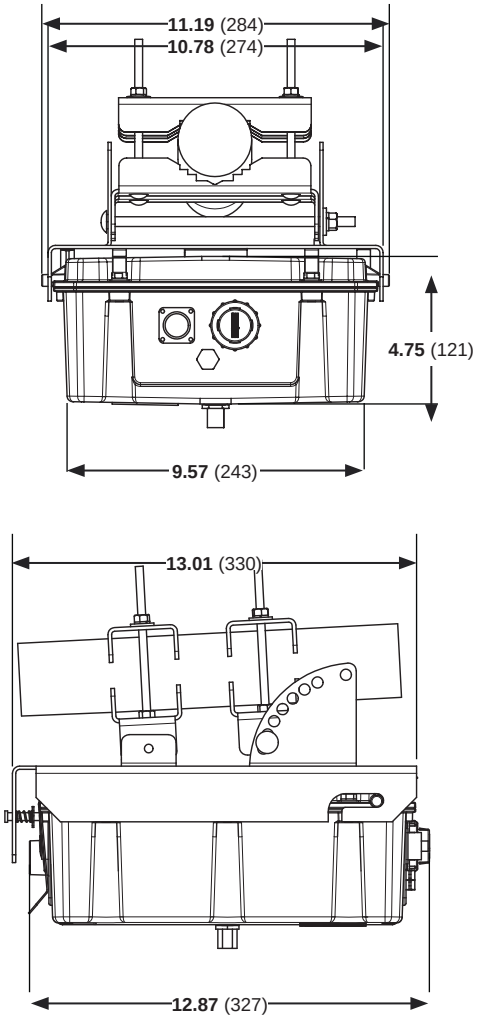
SpeedNet Radio

Dimensions in inches (mm)



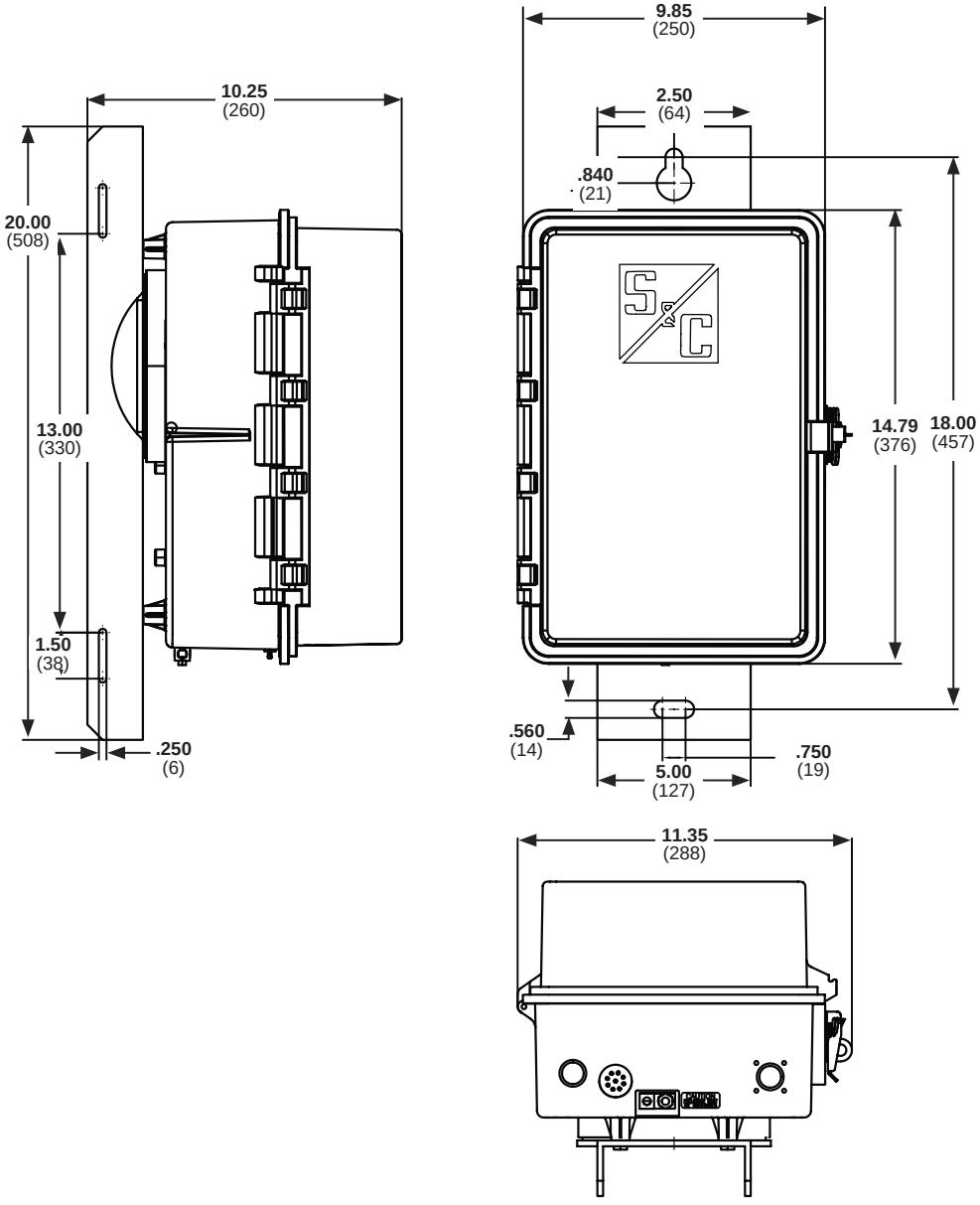
SpeedNet Streetlight-Mounted Repeater Radio

Dimensions in inches (mm)



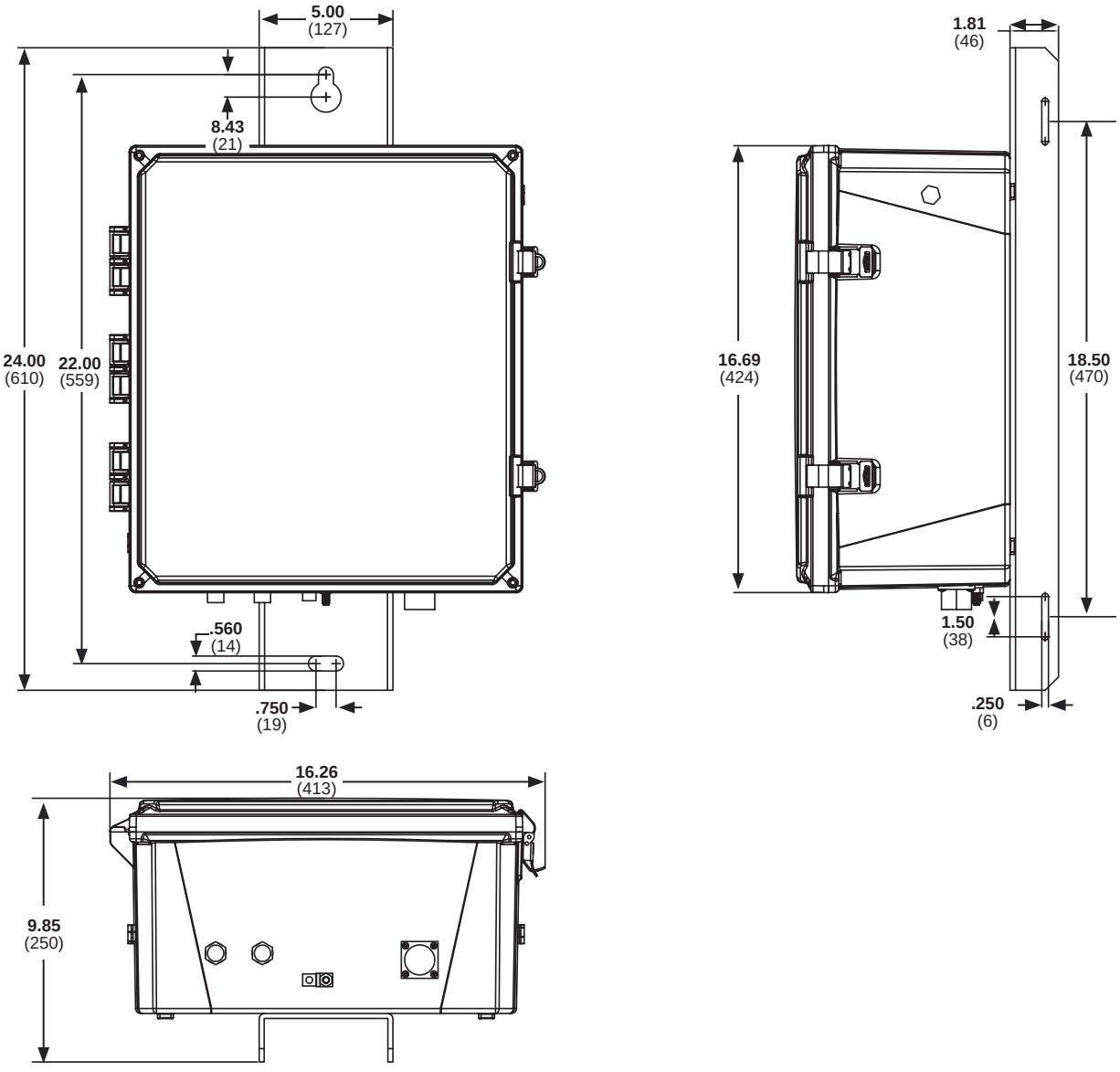
SpeedNet Utility-Pole-Mounted Repeater Radio

Dimensions in inches (mm)

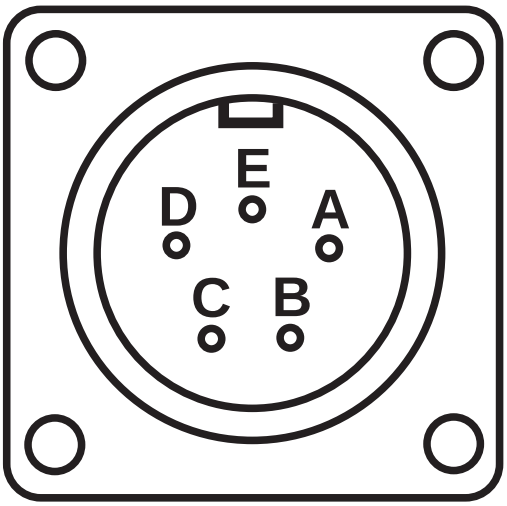


SpeedGate Radio Interface System

Dimensions in inches (mm)



Power Connector on the SpeedNet Repeater Radios and SpeedGate Radio Interface System



The connector on the power cable has a jumper between pins D and E. When the power cable is plugged in, it connects the positive terminal of the battery to the battery charger, and the battery will be disconnected whenever the power cable is removed. The system is off when the power cable is removed, so the radio will not discharge the battery before installation. A Repeater or SpeedGate is always operated with ac power connected, and battery backup is only used during a power outage.

Pin	Connection
A	Ac Supply
B	Ac Supply
C	Not used
D	Battery Charger—Positive Output
E	Battery—Positive Terminal

S&C SpeedNet™ Radios

SpeedNet Radios combine extremely secure long-range communication, high-volume data transmission, and flexible mesh networking to provide benchmark performance for critical industrial monitoring, automation, and control applications.

Reliable Transmission. A peer-to-peer mesh network of SpeedNet Radios is easy to set up and maintain. SpeedNet Radios automatically build routing tables that define message paths; if a node is lost, a new path will be quickly established.

Operating in the unlicensed 902-928 MHz band, line-of-sight single-node communication extends up to 25 miles. If needed, SpeedNet Repeater Radios can be installed to increase transmission range and provide alternate nodes for message routing.

Powerful Multi-Level Security. SpeedNet Radio frequency-hopping spread-spectrum transmissions are inherently difficult to intercept and jam. Its 10-ms dwell time on a frequency is 60 times faster than other systems, making each transmission a very small target for jamming, and much less susceptible to interference. Address filtering denies network access to unauthorized radios, and 128-bit encryption protects mission-critical data.

Exceptional Speed. SpeedNet can transmit 600 bytes and acknowledge receipt within 10-ms, which is optimal for the DNP 3.0 SCADA data packet size of 300 bytes. Radio data processing time is also very rapid, so total time for data to enter a node, transmit, and begin to leave the receiving node is 16-ms. SpeedNet Radio quickly moves a lot more data, making it ideal for backhaul routing applications.

Unmatched Standard Features

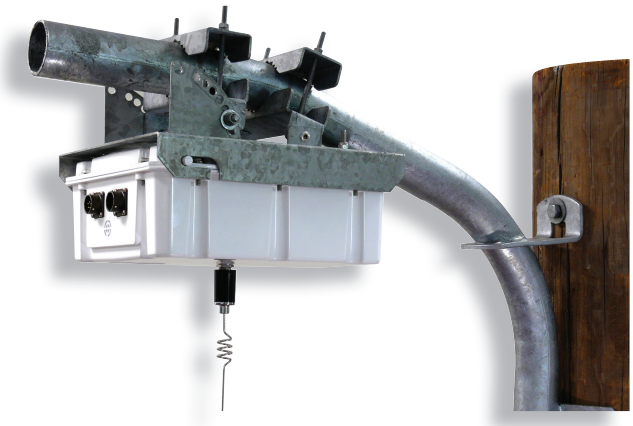
- Unlicensed 902- to 928-MHz operating band
- Fast data transmission rates—up to 650 kbps
- Message latency is 6 to 12 ms/per link, for a 300 byte DNP packet payload
- Rapid dwell time, averaging 10 to 12 ms
- Adaptive power control—limits maximum and minimum transmission power, to optimize bandwidth efficiency for a high-density network
- Serial and Ethernet data inputs
- Secure 128-bit AES data encryption
- Mesh network uses IP addresses
- Assignable message priority—for example, S&C IntelliRupter® PulseCloser operation messages can be configured to transmit first
- SNMP-based client tool
- Multi-level administrative passwords
- Over-the-air configuration and software updates
- Received signal strength indication statistics are available in real time and from data logs
- Simple Network Management Protocol interface can be programmed to automate data collection
- Battery back-up with remote battery testing on repeater and gateway models.

SpeedNet Radio ready for installation.

SpeedNet Radios are offered in four versions:

- **SpeedNet Radio** For installation in a user-furnished enclosure, it requires a 12-Vdc power source. The antenna can be a whip mounted on the enclosure, or a remotely mounted omni-directional or Yagi antenna can be used.
- **SpeedNet Streetlight-Mounted Repeater Radio** In a cast-aluminum weatherproof enclosure that mounts on a streetlight arm. Extends communication range and expands network area. Can be powered from a photocell socket or 110-240 Vac, 50 or 60 Hz; includes battery back-up. A whip antenna is mounted on the bottom of the enclosure.
- **SpeedNet Utility-Pole-Mounted Repeater Radio** In a padlockable plastic weatherproof enclosure that mounts directly on a utility pole. Extends communication range and expands network area. Powered from 110-240 Vac, 50 or 60 Hz; includes battery back-up. Antenna can be a whip mounted on the enclosure, or a remotely mounted omni-directional antenna can be used.
- **SpeedGate™ Radio Interface System** In a padlockable plastic weatherproof enclosure that mounts directly on a utility pole. Includes provision for a gateway communication device, permitting data exchange with a different communication system. Powered from 110-240 Vac, 50 or 60 Hz; includes battery back-up. Antenna can be a whip mounted on the enclosure, or a remotely mounted omni-directional or Yagi antenna can be used.

SpeedNet Radios cannot communicate directly with other types of radios because of differences in frequency selection, spread-spectrum frequency hopping patterns, channel use, and network management algorithms. A SpeedGate Radio Interface System, with an appropriate gateway communication device, is required in such instances.



SpeedNet Streelight-Mounted Repeater Radio.

SpeedNet Utility-Pole-Mounted Repeater Radio.

SpeedGate Utility-Pole-Mounted Radio Interface System.

Antenna, power, and serial and Ethernet data input connections on SpeedNet Radio.

S&C SpeedNet Radio Specifications

Basic	
Description	Fixed mesh network wireless router
Agency Approvals	FCC in the USA, IC in Canada

Wireless Transceiver Performance	
Frequency	Unlicensed 902- to 928-MHz band
Modulation	4-Gaussian frequency-shift keying
Transmission	Frequency-hopping spread-spectrum
Data Transmission Rate	650 kbps
Occupied Bandwidth at 20 dB	500 kHz
Maximum Hopset	51 channels
Frequency Dwell Time	10 - 12 ms
Hopping Patterns	16, user-selectable
Transmit Power	+10 to +27.8 dBm, automatic transmit power control or user-selectable
Sensitivity	-100 dBm (10^{-5} bit error rate)
Error Detection and Correction	16-bit cyclic redundancy check, resend on error, Reed-Solomon forward error correction

Network and Data Security	
Wireless Network Structure	Mesh, multi-hop, point-to-multipoint, point-to-point
Co-located Networks	Up to 16 networks
Wireless Protocol	Modified Carrier Sense Media Access
Ethernet Protocols	IP, TCP, UDP, ICMP, IGMP
Network Protocol	Modified Ad-hoc On-demand Distance Vector
Data Encryption	128-bit, Advanced Encryption Standard
Additional Features	MAC address filtering, transmission priority differentiated by quality of service required, multicast, default Internet gateway with Network Address Translation, firmware field-upgradeable over-the-air

SpeedNet Radio	
Case	Extruded-aluminum
Dimensions	6.30″ L × 4.25″ W (5.25″ W with mounting flanges) × 1.29″ H, excluding connectors
Weight	0.88 lb (0.40 kg)
Ambient Temperature	-40°C to +70°C, operating and storage
Power Consumption	2.5-watt receive, 9.5-watt transmit @ +12 Vdc and 1-watt transmit power
Power Connection	Molex Mini-Fit Jr.™ 2-pin male connector (pin 1 = ground, pin 2 = +12 Vdc), for regulated +10 to +18 Vdc
Antenna Connection	50-ohm SMA connector, standard polarity
Ethernet Data Connection	RJ45 connector, 10/100 Base-T, with auto-negotiation and auto-cross
Serial Data Connection	DB9 female, asynchronous RS-232 at 115.2 kbps max, DNP/IP tunneling

SpeedNet Streetlight-Mounted Repeater Radio	
Dimensions	13.01″ L × 11.19″ W × 4.75″ H, excluding mounting bracket
Weight	12 lb (5.45 kg)
Ambient Temperature	-40°C to +70°C, operating and storage
Power Consumption	2.5-watt receive, 9.5-watt transmit @ +12 Vdc and 1-watt transmit power
Battery	4.5 ampere-hour, 12 Vdc
Power Connector	5-position Mil-spec Cannon connector for control power, 100-240 Vac, 50 or 60 Hz
Antenna Connector	N-Type female, standard polarity, for 5-dBd whip antenna
Data Connector	External RJ45 connector, 10/100 Base-T, with auto-negotiation and auto-cross, for programming and testing

SpeedNet Utility-Pole-Mounted Repeater Radio	
Dimensions	14.79″ L x 11.35″ W x 8.50″ H, excluding mounting bracket
Weight	12 lb (5.45 kg)
Ambient Temperature	-40°C to +70°C, operating and storage
Power Consumption	2.5-watt receive, 9.5-watt transmit @ +12 Vdc and 1-watt transmit power
Battery	4.5 ampere-hour, 12 Vdc
Power Connector	5-position Mil-spec Cannon connector for control power, 100-240 Vac, 50 or 60 Hz
Antenna Connector	N-Type female, standard polarity, for 5-dBd whip antenna
Data Connector	External RJ45 connector, 10/100 Base-T, with auto-negotiation and auto-cross, for programming and testing

SpeedGate Radio Interface System	
Dimensions	16.69″ L × 16.26″ W × 8.25″ H, excluding mounting bracket
Weight	18 lb (8.18 kg)
Ambient Temperature	-40°C to +70°C, operating and storage
Power Consumption	SpeedNet Radio = 2.5-watt receive, 9.5-watt transmit @ +12 Vdc and 1-watt transmit power. Total power consumption depends on the gateway radio requirement.
Battery	4.5 ampere-hour, 12 Vdc (Multiple batteries may be used when the gateway radio has a higher power requirement.)
Power Connector	5-position Mil-spec Cannon connector for control power, 100-240 Vac, 50 or 60 Hz
Antenna Connector	2 each N-Type female, standard polarity

Accessories	
AC to DC Power Adaptor	100 to 240 Vac at 50 or 60 Hz, +15 Vdc output
Operator Interface	Password-protected SNMP open protocol with quick-setup wizard
Antennas	Enclosure mounted 5-dBd whip antenna, omni- and directional-antennas for remote installation, mounting brackets, and cables

Printed in U.S.A.

MDS TransIt® NR-100

Licensed Band Multi-Protocol Remote Radio

Features

- Long Range - Up to 30 Miles
- High Power/Licensed Band - Reduced Interference
- Multiple Protocols - Two Serial Ports or One Ethernet and One Serial
- Serial Pass-Through or Encapsulation of Serial Data Over TCP or UDP.
- Filtering of IP Traffic at Ethernet remotes - Optimizes Traffic Over the Radio Link
- Controlled Access of Remotes - a Restricted Access List is Kept by the Master Station

Low Traffic Applications in:

- Oil and Gas SCADA
- Electric Distribution Automation
- Water Management
- Lottery Networks
- Automated Teller Machines (ATM)
- Point of Sale (POS)

GE MDS

GE MDS...Global wireless solutions. Industrial Wireless Performance.

For more than two decades, GE MDS has been providing highly secure, industrial strength mission critical wireless communications solutions for a broad spectrum of public and private sector clients worldwide. With an installed base approaching 1,000,000 radios in 110 countries,
GE MDS offers both licensed and license-free solutions with applications in SCADA, telemetry, public safety, telecommunications, and online transaction markets.

MDS TransIt® System Overview

An MDS Transit point-to-multipoint system is organized in cells. Each cell consists of one NM-200 master station and multiple NR-100 remote radios managed by Transit NMS (Network Management System) software. Multiple master stations are typically connected through a TCP/IP WAN to one or multiple processing centers.

Transit integrates into existing customer networks allowing the wireless network to seamlessly coexist with a wired network infrastructure.

The NR-100 Remote

The TransIt NR-100 family of radios utilizes DSP technology to offer a highly efficient radio network with extended range capability to support bursty data applications.

TransIt NR-100 is based on our reliable family of licensed narrowband radios (200 MHz to 960 MHz) that have made GE MDS a leader in the wireless industry.

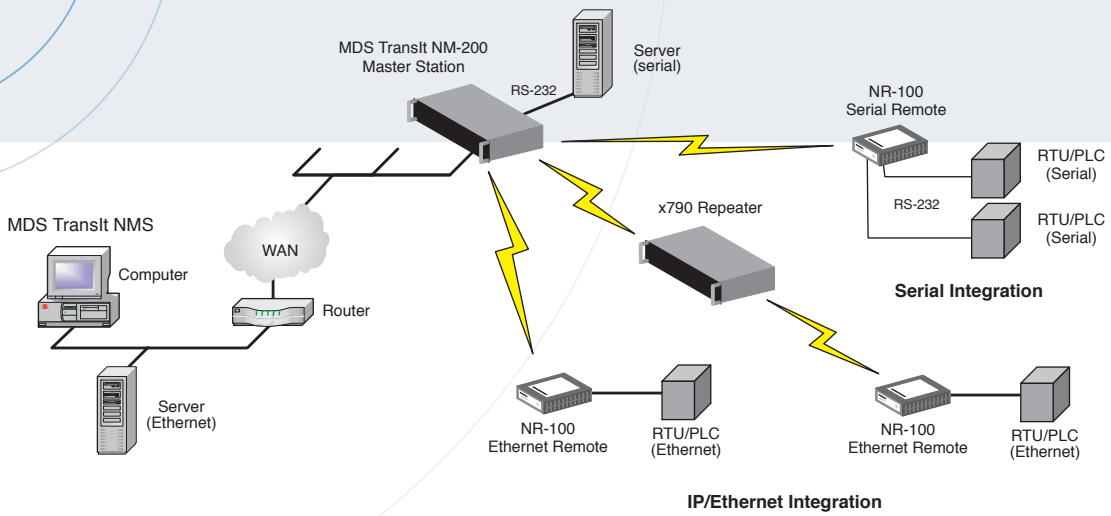
The NR-100 Ethernet option provides one Ethernet and one serial port, while the NR-100 serial option provides two serial ports. The ports operate independent from one another and can pass data up to 19,200 bps.

The proprietary wireless MAC runs simultaneously and independently from the user data port protocol. The wireless MAC ensures fair and immediate access to all remotes sharing the wireless media. It also has the functionality required to provide a reliable data delivery service in a potentially noisy radio environment. With its collision avoidance mechanism the wireless MAC virtually eliminates unnecessary retries and maximizes user data throughput.

Why Consider a MDS TransIt Solution?

- **Reliable** – Designed and built for low failure rates and reduced maintenance costs.
- **Resilient** – TransIt architecture offers a redundancy option at the master station for increased availability in mission-critical systems.
- **Flexible** – TransIt supports multiple users connecting to multiple applications via multiple protocols on the same MDS TransIt unit or the same network - simultaneously!
- **Comprehensive Network Management** – manage the radios using Telnet and the embedded menu interface. Use SNMP to monitor traps and alarms. Use the Windows based GUI to manage alarms, statistics, diagnostic tools and remote control functionality.

MDS TransIt® NR-100 Remote Radio Specifications



Serial Integration

IP/Ethernet Integration

General
- Data Rate: 9,600 bps @ 12.5 kHz
- Frequency Band: 900, 400, 200 MHz Licensed

Radio
- Carrier Power: 0.1 to 5 watts (20 to 37 dBm)
- Modulation: CPFSK
- Transceiver Options:

Model	Transceiver	Frequency Range	Rate (kbps)
NR-102L	MDS 2710	220-240 MHz	3.2 - 19.2
NR-104L	MDS 4710	330-512 MHz	4.8 - 19.2
NR-109L	MDS 9710	800-960 MHz	9.6

(Consult transceiver specifications for additional details)

Physical Interface
- Serial: Com 1: RS-232/V24[2] (DB-25F, DCE)
  Com 2: RS-232 (DB-11, DCE)
- Ethernet[1]: 10 BaseT (RJ-45, DTE)
- Antenna: N-Type (female)

Protocols
- Wireless: proprietary sloted Aloha with collision avoidance.
- Ethernet[1]: IEEE 802.3, Ethernet II
- TCP/IP[1]: IPv4, TCP, UDP, ICMP, DHCP, Multicast
- Serial:
  - async pass-through
  - encapsulation over IP (tunneling) of serial async multidrop protocols including Modbus, DNP.3, DF1, BSAP
  - SLIP
  - X.25
  - X.28 Async PAD (X.3/X.28/X.29)

Environmental
- Temperature: -30°C to +60°C (-22°F to +140°F)
- Humidity: 95% at 40°C (104°F) non-condensing

Electrical
- Input Power: 13.6 Vdc nominal
- Current: Tx: 2.1 A at 5 Watts, Rx: < 205 mA, (add 0.2 A when using Ethernet)

Mechanical
- Case: Die cast aluminum
- Dimensions: 5.08 H x 14.29 W x 18.4 D cm. (2.0 H x 5.625 W x 7.25 D in.)
- Weight: 1.27 kg. (2.8 lbs.)
- Mounting options: Flat surface mount brackets

Management
- Local Console
- Telnet
- SNMP v1, MIB-II, Enterpriose MIB
- TransIt NMS. Windows 95, 98 or Windows NT™ compatible system for configuration, fault and performance management over TCP/IP.

Agency Approvals
- FCC part 101 (licensed)
- IC/UL
- ETSI[3]
- CE Mark
- MPT 1411[4]

[1] *On units with Ethernet option.*
[2] *On units with Serial option.*
[3] *NR-104L with MDS 4710E transceiver @ 4.8 Kbps*
[4] *NR-104L with MDS 4710M transceiver @ 4.8 Kbps*

GE MDS

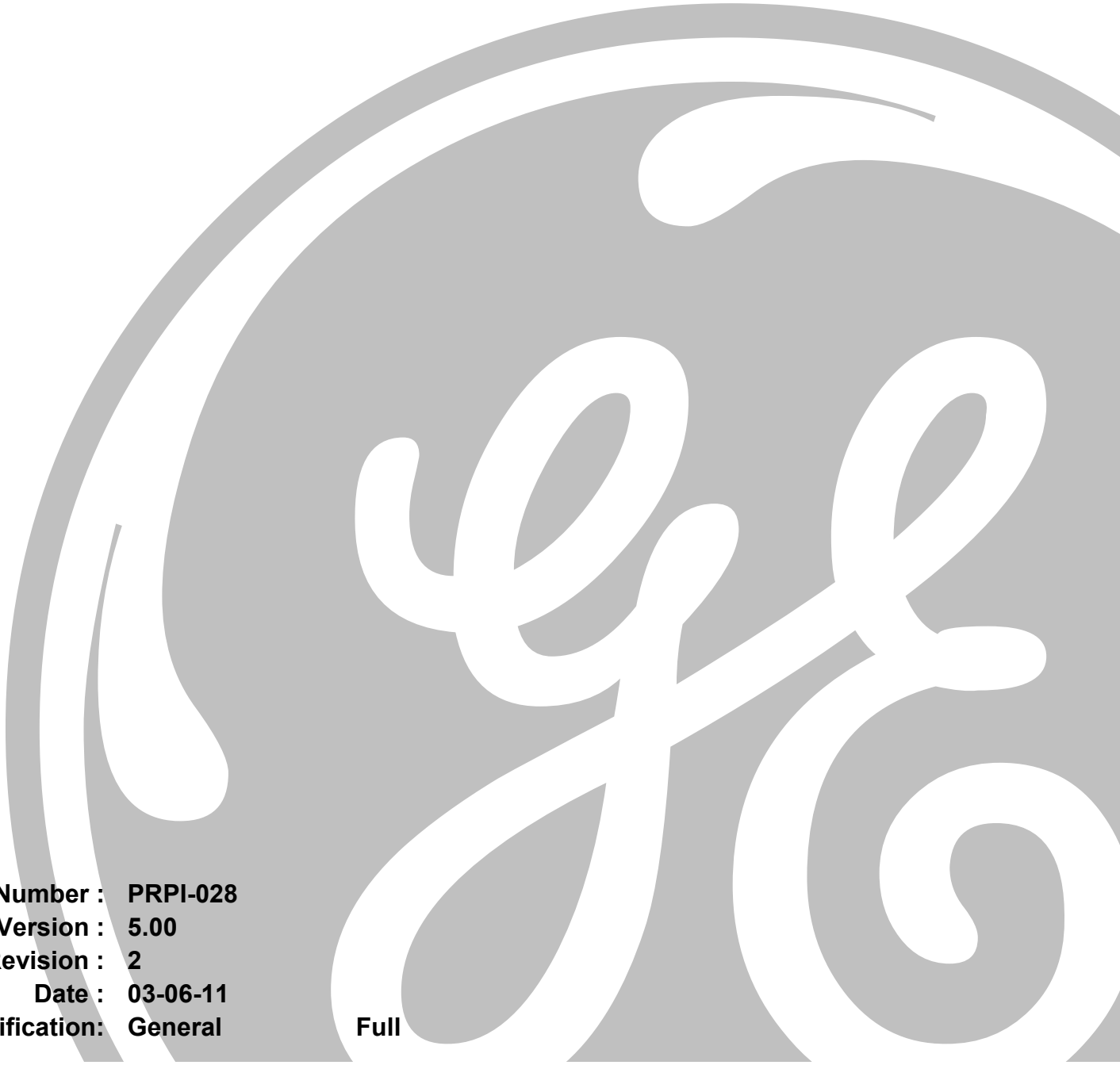
GE MDS
175 Science Parkway
Rochester, New York 14620, USA
Phone (585) 242-9600
Fax (585) 242-9620
www.gemds.com

Toronto Hydro-Electric System Limited
EB-2011-0120
Interrogatory Responses
Tab 7
Schedule 2
Attachment 11
Filed: 2011 Dec 23
(38 pages)

GE Energy Services

DART Product Family

Product Description, Information and Specification



Document Number : PRPI-028
Version : 5.00
Revision : 2
Date : 03-06-11
Classification: General Full

NOTICE OF COPYRIGHT & PROPRIETARY RIGHTS

TRADEMARK NOTICES

Table of Contents

Chapter 4: Product Specification

List of Figures

List of Tables

Introduction

Purpose of this Document

The purpose of this document is to fully describe the capabilities of the DART Product Family. GE Energy Services staff and customers should use the document to specify, design and test systems which employ DART products. This document supersedes any other literature that may contain product information on the DART.

Distribution of this Document

GE Energy Services Product Management Department will distribute this document to the people outlined on the Document Distribution List. GE Energy Services Product Management Department manages the Document Distribution List.

Control of this Document

The master copy is retained under the control of the Product Manager.

All errors or omissions related to this document are to be brought to the attention of the Product Manager.

Chapter 1: Guideform Specification

Fault detection, transducer-less metering, SCADA and communications for one, two or three feeders shall be provided in one accurate, efficient and easy to use intelligent electronic device (IED) suitable for incorporation into a feeder control system.

1.1 Fault Detection

The fault detector shall be capable of:

- Alarming over-current, breaker operation and breaker lockout by monitoring voltage and current quantities.
- Discriminating between load and source side faults for accurate fault location.
- Monitoring radial or networked feeders.
- Being configured on a per feeder basis since different feeders may have different ratings.
- Alarming on a per phase basis line to line and/or line to ground faults for the purposes of conducting post-fault analysis and taking remedial action.
- Operating on peak values rather than RMS values.
- Reporting alarms as latched or fleeting. In latched mode, the alarms shall be cleared via SCADA. In fleeting mode, the alarms shall be cleared once the event has cleared. Latched mode frees the dispatcher from having to review historical alarms during a fault. Fleeting mode is useful when an upstream platform is used to operate on the fault detector data prior to reporting to the dispatcher.
- Alarming voltage unbalance that can be used to deduce broken conductors and alarming neutral faults, which can be used to deduce load imbalance.
- Reporting alarms as sequence of events (SOE) for post-fault analysis or change of state (COS) for reducing communication traffic.

1.2 Metering

Metering capabilities shall include:

- Monitoring up to 12 AC voltage and current inputs directly from PTs, CTs and line post sensors without the need for transducers. A lack of transducers results in reduced capital, maintenance and engineering costs, greater reliability and accuracy.
- Calculating values using a digital signal processor (DSP) by sampling the input waveforms 21 times per power line cycle.
- Reporting per phase voltage, current, phase angle and power factor.
- Reporting per feeder real power, reactive power and power factor.
- Reporting per feeder export and import energy.
- A resolution of 12 bits plus sign and over-range.

1.3 SCADA

SCADA capabilities shall include:

- A real-time, multi-tasking, pre-emptive, event-driven operating system.
- 16 digital inputs in two groups of eight configurable as simple status, COS, SOE or accumulators.
- SOE resolution of 10 msec.
- 8 control relays with an option to expand to an additional 8 control relays.
- 1 DC analog input with multiple input options.
- Reporting of current direction.

1.4 Communications

Communication capabilities shall include:

- Compatibility with any communication link.
- A real time communication port that speaks DNP 3.0 and a maintenance port compatible with a VT100 terminal.
- An optional, on-board, 202/CCITT V.23 modem.
- Support for RTS, CTS and DCD hand-shaking lines with configurable settings to offer maximum flexibility for system integration.
- Unsolicited report by exception (URBX) with a collision avoidance algorithm to increase the URBX communication efficiency. URBX shall be under the control of SCADA. URBX shall be available for all real and software inputs and outputs. ACCURACY

The IED's accuracy shall be assessed by measuring its reliability, robustness and safety. The IED shall:

- Have a mean time between failures (MTBF) of 40,000 hours.
- Comply with IEC electromagnetic compatibility (EMC) requirements for CE mark and applicable IEEE EMC standards.
- Be validated by an installed base of over 6000 units and over 100 different customers world-wide.
- Incorporate single point of failure and select-check-before operate control integrity.
- Include optically isolated communication ports and digital inputs.
- Have a dielectric strength of 1500 VDC between any communication port and ground and input/output line and ground.
- Be able to withstand 14 times nominal current on the CT inputs for one second without damage.
- Be able to withstand 4 times nominal current on the CT inputs continuously without damage.
- Be able to withstand 2 times nominal voltage on the PT inputs continuously without damage.
- Operate from –40C to +80C in environments of 100% condensing humidity without environmental control equipment such as fans and/or heaters.
- Be accompanied by documentation that details the verification methodologies and results for all specifications.

1.5 Efficiency

The IED shall operate for 48 hours from an 8 Amp-hour battery. At the end of the 48 hour period, the battery must contain 30% of its original charge.

1.6 Ease of Use

The IED shall:

- Not require any scheduled maintenance.
- Support configuration upload and download via the maintenance and real time ports.
- Permit the user to enter PT and CT nominal and actual ratings that will be applied as correction factors to the measured data.
- Have an optional on-board digital input display.
- Have an indicator for microprocessor health.
- Have an indicator for the on-board local/remote switch.
- Have a battery test that can be executed automatically or configured for execution on a monthly basis.
- Connect to field inputs and outputs using quick disconnect terminal blocks to reduce the chances of wiring errors during field replacement.
- Require less than 10 minutes to field repair.
- Be configurable using a configuration system with drop-down menus.
- Not require a PC to configure the communication address.

Chapter 2: Ordering DART Series Products

2.1 DART Logic Module

To order a DART logic module, order the appropriate product part number:

Part Number	Description
512-0001	12V status wetting for both status groups
512-0002	24V status wetting for both status groups
512-0007	24V for group 1/12V status wetting for group 2
512-0008	12V for group 1/24V status wetting for group 2

Table 1 DART Logic Module Part Numbers

2.2 DART Termination Module

To order a DART termination module, order the appropriate product part number:

In the following table, X/Y indicates the number of voltage and current inputs (e.g. 3/3 = single feeder, three phase voltage and current monitoring). Other abbreviations are listed below:

S&C	Developed for the S&C voltage sensor
FP	Developed for the Fisher-Pierce 1301 current only sensor
SD	Developed for the Square D LSCV-110-122 current/voltage line post sensor
NGK	Developed for the NGK optical current sensor
L	Developed for the Lindsey line post sensor
Z	input impedance

		Nominal Current Input Signal (AMPS OR VOLTS RMS)						
		1 A	**5 A**	**10 V**	**2.4 V HI Z**	**5 V HI Z**	**10 V HI Z**	**11.67 V**
Nominal Voltage Input Signal (VOLTS RMS)	5.7		3/3 S&C 517-0185					
			6/6 S&C 517-0186					
			3/9 S&C 517-0187					
	69		3/3 517-0200					
			6/6 517-0201					
			3/9 517-0202					
	120	3/3 517-0311	3/3 517-0197	3/3 517-0308				1/3 FP 517-0265
		6/6 517-0312	6/6 517-0198	6/6 517-0309				
		3/9 517-0313	3/9 517-0199	3/9 517-0310				
	220	3/3 517-0422	3/3 517-0419					
		6/6 517-0423	6/6 517-0420					
		3/9 517-0424	3/9 517-0421					
	0.75 HI Z				3/3 SD 517-0264			
	7.5 HI Z		3/3 L 517-0317				3/3 L 517-0320	
			6/6 L 517-0318				6/6 L 517-0321	
			3/9 L 517-0319				3/9 L 517-0322	
	120 HI Z					3/3 NGK 517-0314	3/3 L 517-0255	
						6/6 NGK 517-0315	6/6 L 517-0256	
						3/9 NGK 517-0316	3/9 L 517-0257	

Table 2 Nominal Current Input Signal

2.3 DART DC Analog Input Module

To order the DC analog input module, specify the appropriate product part number:

Part Number	Description
540-0400	Temperature Input
540-0401	+/- 15V
540-0402	+/- 30V
540-0403	+/- 1mA
540-0404	+/- 5 mA
540-0405	+/- 20 mA
540-0406	+/- 1.25 mA
540-0407	+/- 5V
540-0409	+/- 1.5 mA
540-0410	+/- 60V

Table 3 DC Analog Input Module Part Numbers

2.4 Other Components

Part Number	Description
540-0167	DART MODEM
540-0193	DART Control Expansion
540-0191	DART LED Status Display
976-0122	Logic module to analog termination cable

Table 4 Other Components Part Numbers

Chapter 3: Product Description

3.1 Hardware Architecture

The DART Product Family is composed of components that are assembled to form discrete modules. These modules are integrated within an enclosure to form a complete IED assembly. Illustrated below is the over-all architecture of the DART Product Family.

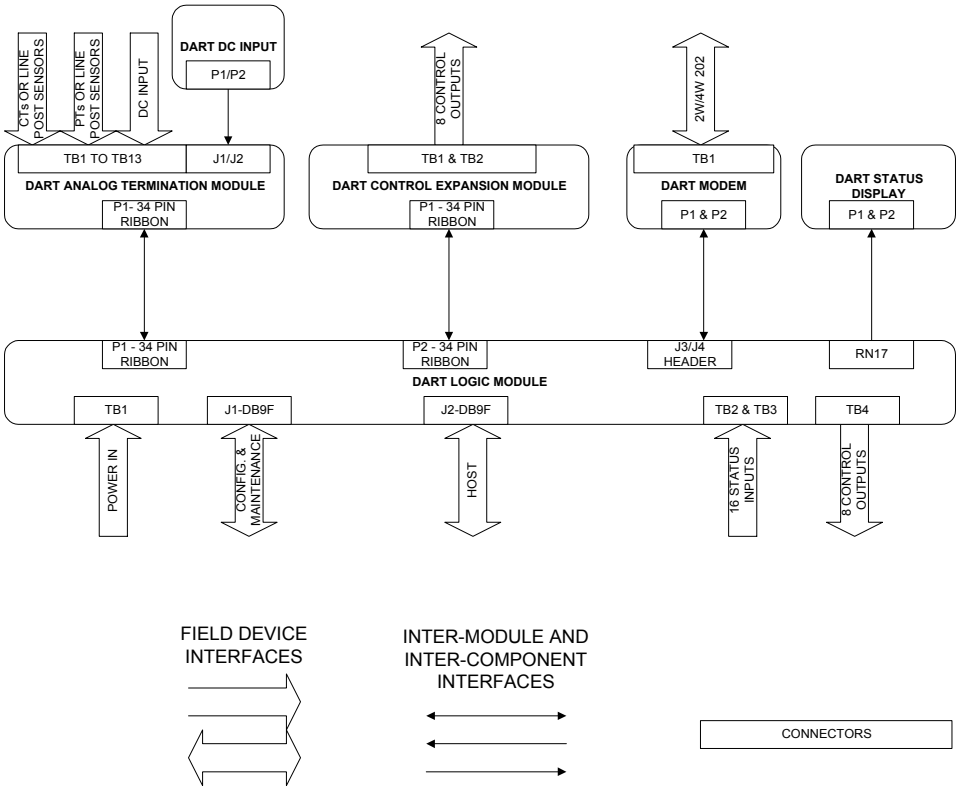


Figure 1 IED Assembly

3.1.1 DART Logic Module

The DART logic module contains six major functional blocks: the power supply, the status inputs, the control outputs, the analog input processing section, communications and the microcontroller. The DART logic module contains pre-programmed instructions for the digital signal processor (DSP) and Motorola microcontroller in EPROM. Application specific configuration instructions are contained in the on-board EEPROM. The DART logic module is made up of one printed circuit board, which employs through-hole technology.

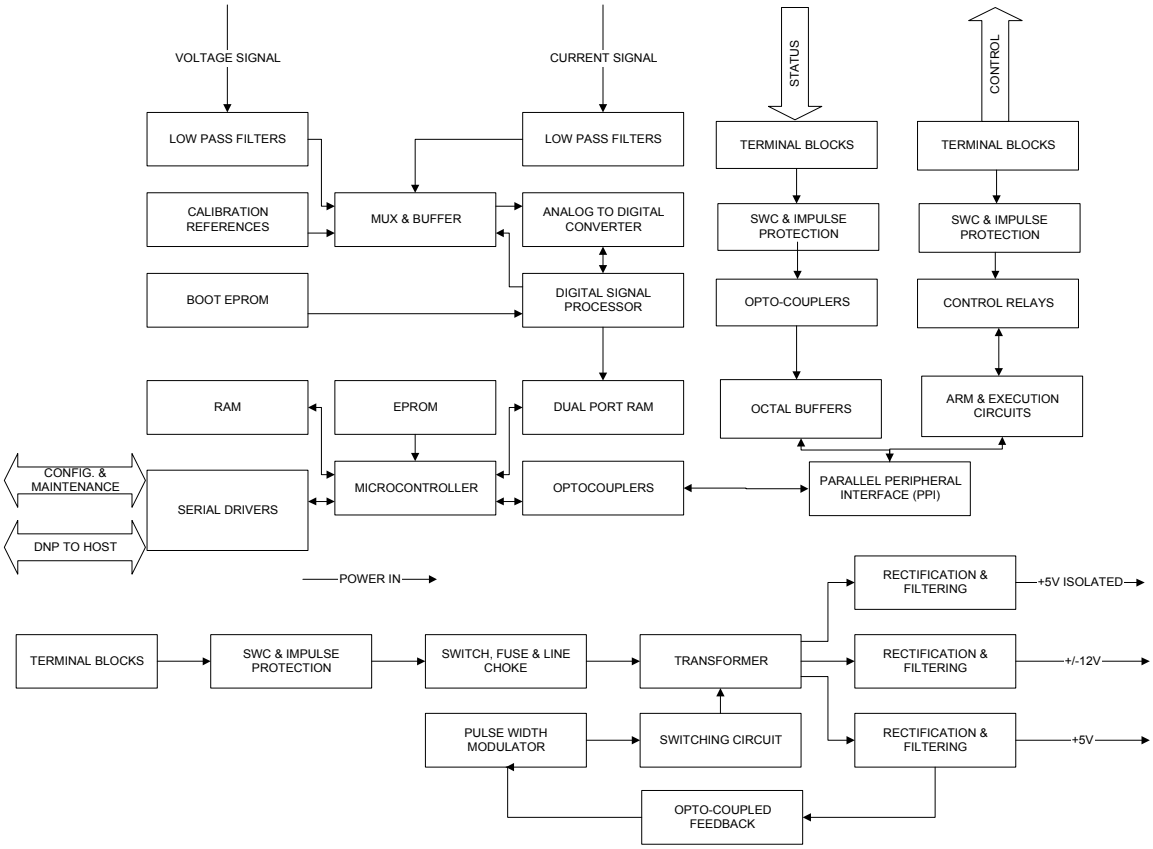


Figure 2 DART Logic Module

3.1.2 DART Analog Termination Module

The DART analog termination module normalizes the PT, CT or line post sensor inputs for use by the DART logic module.

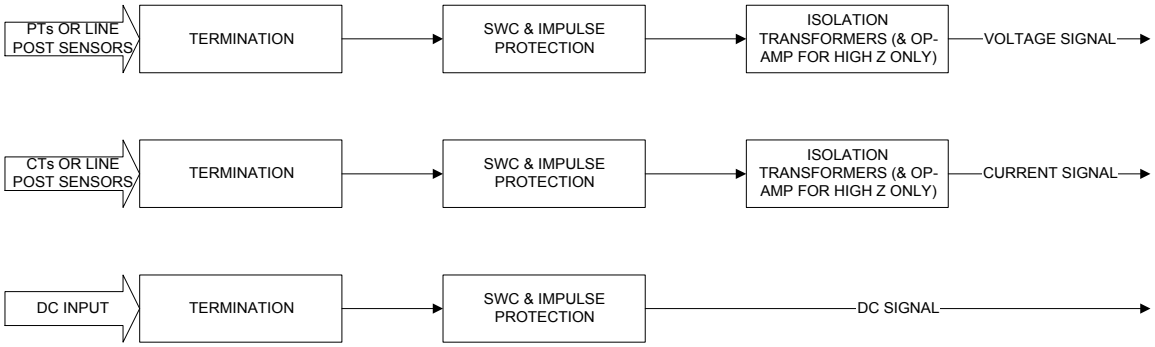


Figure 3 DART Analog Termination Module

3.1.3 DART Modem

The DART modem provides a two or four wire Bell 202 or CCITT V.23 interface at 1200 baud. The DART modem mounts on the DART logic module with its two header connectors.

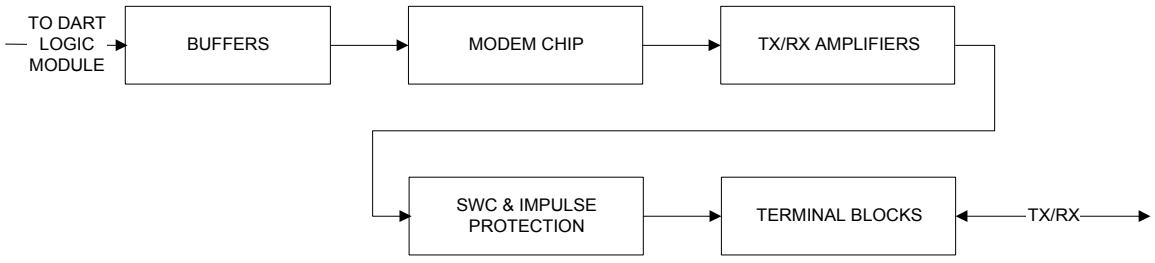


Figure 4 DART Modem

3.1.4 DART Control Expansion Module

The DART control expansion module allows the user to expand the DART's control output section from 8 relays to 16. The expansion module also has status display LEDs. The expansion module is mounted on stand-offs above the DART logic module and connects to the logic module via a ribbon cable.

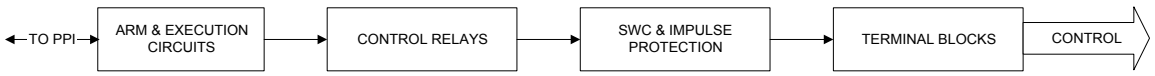


Figure 5 DART Control Expansion Module

3.1.5 DART DC Analog Input Module

The DC analog input module allows the user to monitor one DC input (e.g. battery voltage) or temperature. This module mounts on the DART analog termination module with its two header connectors.

3.1.6 DART Status Display Module

The DART status display module gives visual indication of the status inputs via LEDs. This board mounts on the DART logic module using IC sockets.

3.2 Software Architecture

3.2.1 Software Background

Because of the rigorous requirements of automation applications, the DART is designed to operate reliably in time-critical situations and to respond quickly to unscheduled changes in its environment. This is possible because the DART uses a real-time operating system, which, by the use of software features like multi-tasking and interrupts, can carry out a complex set of inter-related and inter-dependent activities within strict time limits.

3.2.2 Software Context

Software for the DART is divided into digital signal processing (DSP) software and operating software. Use of assembly language reduces the memory requirements and decreases execution time. The DSP software is used to calculate AC signal parameters. The operating software is responsible for DNP3.0 communications, the maintenance program, I/O processing and the fault detector.

The DART uses memory in the form of EPROM, EEPROM, and RAM. EPROM is used to store the DSP and operating software. The application-specific configuration is stored in EEPROM. RAM is used for storing tables and variables during program execution. The following software context diagram illustrates the software environment for the DART.

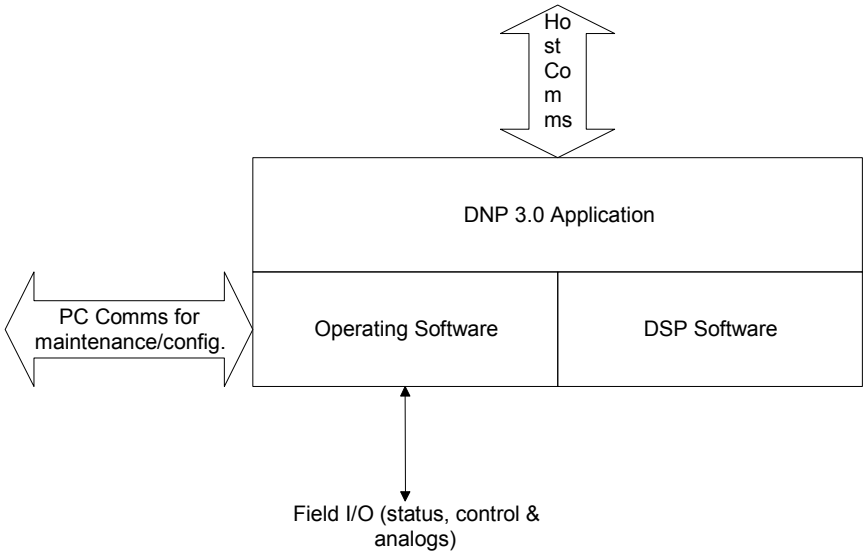


Figure 6 Software Environment of the DART

3.3 Electromagnetic Immunity

Pole-top IEDs (Intelligent Electronic Devices) are subjected to a wide spectrum of electromagnetic disturbances. This paper discusses the specific design measures that were implemented on the GE Energy Services DART to achieve electromagnetic immunity.

To enjoy high availability and a long lifecycle, pole-top IEDs must be immune to conducted and radiated interference. Conducted and radiated interference may be in the form of transient or steady state variations. Transient variations result from capacitor bank switching, lightning strokes, short circuits, open circuits, sags, swells, electrostatic discharge and spurious noise sources. Steady state variations result from conducted noise, radiated emissions due to various communication media and time-varying electric and magnetic fields.

These disturbances were foremost in the minds of the DART architect and the following specific measures were taken to design for, implement and verify immunity into each and every DART sub-system:

- Identification of worldwide, recognised standards that properly reflected the utility field environment. These standards represented quantitative goals, that when complied to, represented a higher than normal degree of immunity. The selected standards are described in the DART PRPI document.
- Design approaches that seeked to maximize immunity to the disturbances described in these standards. These approaches include:
    - Multi-layered printed circuit boards with large, well-isolated ground, analog and digital power planes as well as over-size tracks to minimize noise and increase stability.
    - Physical and optical isolation between sensitive electronic components and the field interface.
    - Stiff on-board power supply with a Faraday shield around the switching transformer's core.
    - Component placement and printed circuit board layout geometry that provides the shortest exit path for disturbances for oscillatory transients that are applied in positive or negative polarities.
    - Transformer isolated AC analog inputs. The transformers resist low frequency disturbances such as the kind caused by capacitor bank switching and slow down higher frequency content such as that contained in lightning strokes.

- A scheme that protects against high frequency transients AND limits the voltage impressed across upstream components. High dielectric constant, paper capacitors with excellent self-healing properties and low inductance characteristics shunt high frequency transients that are impressed in common or normal modes. Fast acting, high energy, metal oxide varistors (MOVs) clamp the incoming energy. These large surface area MOVs permit repetitive transients to be dissipated without loss of performance. In addition to this front-line protection, the secondaries of the AC transformers contain clamping MOVs and capacitors with shunting diodes.

Verification activities included tests at the factory and accredited facilities that specialised in such testing. Tests methods, apparatus set-up and results have been documented for most products in the DART Family and are available to the public.The true testament to the DART's robustness can be found in its in-field performance.

Chapter 4: Product Specification

4.1 Engine

Microprocessors	Motorola 68HC11, 8 bit, 2 MHz
	Analog Devices ADSP-2105 digital signal processor, 16/24 bit, 8 MHz
Memory	68HC11: 32K bytes EPROM, 30K bytes SRAM, 256 bytes RAM, 512 bytes EEPROM
	ADSP-2105: 8K bytes boot EPROM, 1K x 24 bit internal program RAM, 512 x 16-bit internal data RAM, 8K x 24 bit external program RAM
	2 K bytes dual-ported RAM shared between the 68HC11 and the ADSP-2105
Indicators	68HC11 red run LED; normal = 5 pulses/sec, fault = 1 pulse/2 sec
Time clock drift	+/- 360 msec per hour @ 25 degrees C (higher accuracy clock is available for special orders)

4.2 Analog Processing Sub-System

Number of feeders	up to three
A/D references	three internal, autocalibrating, high accuracy references; no adjustments required
Sampling rate	21 times per cycle
Resolution	12-bit plus sign and overrange

4.3 AC Voltage Inputs

Input measurement range	up to 1.33 times nominal
Type	transducerless; signal is transformer coupled to logic module
Burden	0.05 VA maximum (low Z versions)
	800 K Ohms to 1.5 M Ohms @ 60 Hz and nominal voltage for HI Z versions
Accuracy (@ 25 degrees C)	+/- 0.2% of full scale
Termination configuration	line and common for each phase
Power system configuration	grounded wye
Power frequency	50 Hz/60 Hz
Overload rating	2 times nominal continuous

4.4 AC Current Inputs

Input measurement range	up to 2.5 times nominal
Type	transducerless; signal is transformer coupled to logic module
Burden	0.5 VA maximum for CT interface; 500 K Ohms to 1.5 M Ohms @ 60 Hz and nominal voltage for HI Z versions
Accuracy (@ 25 degrees C)	+/- 0.2% of full scale
Accuracy is ultimately dependent on the transfer function of the line sensing device.	
Termination configuration	line and common for each phase
Power system configuration	grounded wye
Power frequency	50 Hz/60 Hz
Overload rating	4 times nominal continuous; 14 times nominal for 1 second. Higher ratings are available for special orders.

4.5 DC Analog Input

Accuracy	+/	5V input:	+/	0.05V
	+/	15V input:	+/	0.2V
	+/	30V input:	+/	0.3V
	+/	60V input:	+/	0.75V
Current input:	+/	(range/4095)*75 Amps		

4.6 Status Inputs

Number of inputs	sixteen
Number of groups	two groups of eight
Input wetting	12VDC or 24VDC
Type	optically isolated
Burden	5 mA typical
Thresholds (@ 25 deg. C)	12VDC nominal: on > 9VDC, off < 6VDC
	24VDC nominal: on > 18VDC, off < 12VDC
Overload (@ 25 deg. C)	2 times nominal
Rating	reverse polarity protected
Visual indicators	via DART status display module or control expansion module options; one red LED per status point which illuminates when the point is energized
Configurable parameters	16-bit pulse counters configurable on all points (point-by-point)
	COS configurable point-by-point
	Time tagging SOE with 10-msec resolution configurable on point-by-point
Scan rate and debounce	scanned every 10 msec
	20 msec debounce (2 scans)

4.7 Control Outputs

Number of outputs	four trip/close relay pairs (8 relays); expandable to 8 trip/close relay pairs (16 relays) via DART control expansion module
Contact rating	N.O. Contacts: 5 A @ 28VDC (200,000 operations)
Contact rating	N.C. Contacts: 3 A @ 28VDC (200,000 operations)
Contact rating	N.O. Contacts: 10 A/1 sec. @ 28VDC (50,000 ops.)
Contact configuration	form C
Configurable parameters	contact duration from 10 msec to 10 min in 10 msec increments
Security features	single point of failure integrity; select-check-before operate functionality; control enable/disable switch with red LED indicator (on indicates enabled); maximum one relay operation at any one time

4.8 Communications

4.8.1 Host Port

Protocol	DNP 3.0 Level 1 subset (not yet independently verified)

4.8.1.1 Digital Interface

Speed	75 baud to 9600 baud
Hand-shaking	TX, RX, RTS, CTS, DCD
Connection	RS232; DB9F

4.8.1.2 Analog Interface (via optional DART modem)

Speed	1200 baud		
Modes	2-wire/4-wire frequency shift keying via header jumper		
Compatibility	Bell 202/CCITT V.23 compatible via header jumper		
Transmit output	-15 dBm to –9 dBm (fixed)		
Receive input	-40 dBm (minimum); adjustable receive bias		
TX/RX impedance	600 Ohm +/- 2%		
Frequencies	Bell 202	Mark	1200+/- 5 Hz
		Space	2200+/- 5 Hz
	CCITT V.23	Mark	1300+/- 5 Hz
		Space	2100+/- 5 Hz

4.8.2 Maintenance/Configuration Port

Speed	2400 baud
Hand-shaking	TX, RX
Connection	RS232; DB9F

4.8.3 Site Addressing

Size	16-bit; 65536 discrete addresses
Method	via header jumpers

4.9 Power Supply

User controls	on/off switch
Topology	flyback
Method of control	pulse width modulation
Input voltage	9VDC to 36VDC
Input power	2 Watts (without installed options)
Protection	MDL 1A fuse
Inrush current	700 mA

4.10 Physical

Weight	DART logic module	1 pound
	DART analog termination board	2 pounds
	DART control expansion	1 pound
	DART modem	¼ pound
	DART LED status display	¼ pound
	DART DC analog input	¼ pound
Mounting	DART logic board – 13.5” long x 12.6” wide; mounts via	holes located on periphery
	DART analog termination board – 8” long x 12.6” wide; mounts via holes located on periphery	
	DART modem – mounts on the DART logic module via two header connectors	
	DART LED status display – mounts on the DART logic module via two header connectors	
	DART DC analog input – mounts on the DART termination module via two header connectors	
Terminations	Removable Phoenix screw compression with AWG #12 wire capacity	
Manufacturing technology	through-hole	

4.11 Environmental

Operating ambient	
Temperature	-40 deg. C to +80 deg. C
Humidity	DART logic module, analog termination module and DART Charger: 100% condensing (conformal coated)
	All other modules: less than 95% non-condensing

4.12 Reliability Prediction

MTBF 44,230 hours (5 years); consult document STRP-003/1.0 for further information

4.13 Standards & Protection

All of the following verification tests were conducted with the described components mounted in an outdoor enclosure and wired to GE Energy Services wiring standards. See the legend at the end of this section for an explanation of the codes found in the chart. The components may meet specifications that are not listed in the chart. Additional verification testing can be conducted at the user's request:

Table 5 Verification Tests

Standards Body	Standard	Component					
		WD DART	WT DART	DART Charger	CPM	DART DC Input	DART Modem
ANSI/IEEE	C37.90.1-1989 SWC & Fast Transient.	1	1	5	5	5	5
	C62.41-1980 Category B 1.2 X 50 us 6KV, 8 X 20 us 3 kA, 0.5 X 100 kHz 6KV/500 A.	1	1	5	5	5	5
	1500VDC dielectric.	1	1	5	5	5	5
Directive 89/336/EEC (EMC): EN 50082-2 (susceptibility) **The EUT maintained performance criteria A.**	EN 61000-4-2 (IEC1000-4-2) Electrostatic discharge immunity test: 4KV contact discharge; 4KV coupling planes discharge; 8KV air discharge.	2	2	2	2	2	6
	EN 61000-4-3 (IEC1000-4-3) Radiated radio frequency electromagnetic field immunity test: a) 10V/m, 80% amplitude modulated with 1KHz, carrier of 80 – 1000 MHz b) 10 V/m, 50% duty cycle pulse modulated with a 200 Hz tone, carrier of 900+/- 5 MHz.	2	2	2	2	2	6
	EN 61000-4-4 (IEC1000-4-4) Electrical fast transients: 2KV (on all lines).	2	2	2	2	2	6
	EN 61000-4-5 (IEC1000-4-5) Surge immunity test Power Lines: 4KV common mode; 2KV differential mode.	2	2	2	2	2	6
Directive 89/336/EEC (EMC): EN 50082-2 (susceptibility) **The EUT** maintained performance criteria A.	EN 61000-4-6 (IEC1000-4-6) Immunity to conducted disturbances induced by radio-frequency fields: 10VRMS (on every line, including ground strap), 80% amplitude modulated with 1KHz, carrier of 0.150 – 80 MHz.	2	2	2	2	2	6
	ENV 50140 (ENV50204) Radio electro-magnetic field transmitted by radio telephones. Immunity test: 10V/m, 50% duty cycle pulse modulated with a 200 Hz tone, carrier of 895 – 905 MHz.	2	2	2	2	2	6

Standards Body	Standard	Component					
		WD DART	WT DART	DART Charger	CPM	DART DC Input	DART Modem
Directive 89/336/EEC (EMC): EN 50081-2 (emission)	EN 55011 (CISPR11) Limits and Methods of measurement of radio disturbances characteristic of Industrial Scientifical Medical radio frequency equipment. a. RADIATED (classB): 30 – 230 Mhz, 40.45dBuV/m at 3m; 230 – 1000 Mhz, 47.45dbuV/m at 3m. b.CONDUCTED (class B): 150KHz – 500KHZ, limit from 56dBuV to 46 dBuV; 500KHz – 5MHz, 46 dBuV (constant) ; 5MHz – 30 MHz, 50 dBuV (constant)	2	2	2	2	2	6
LAPEM (Mexico)	Vibration: 10 Hz-500 Hz with an acceleration of 0.5 g with a change rate of one eighth per minute for 90 minutes.	3	3	3	6	6	6
	Fast transient: 1Mhz – 1.5MHz, 2KV to 3KV	3	3	3	6	6	6
	Radiated radio frequency electromagnetic field immunity test: 10 V/m Amplitude modulated 90%, 10KHz square wave, from 25 – 1000 MHz (carrier); 100% modulation keying test.	3	3	3	3	6	6
	Sensitivity to broadband emissions: 1 V/m/MHz for five minutes.	3	3	3	3	6	6
	Radiated emissions: 1 V/m/MHz, from 10 KHz to 1000 MHz.	3	3	3	3	6	6
	2 minute spark test both polarities.	3	3	3	6	6	6
	16 hour, 60C dry heat	3	3	3	6	6	6
	100 hour, 60C burn-in	3	3	3	6	6	6
	50 mm free fall on concrete without functional damage	3	3	3	6	6	6
GE Energy Services	Analog accuracy, status & control functionality and communications accuracy as a function of temperature and input supply variance: -40C to +80C	4	4	4	5	5	5

Legend:

1. Refer to document number Gen-0020.
2. Refer to document title “Project No. 324A24”.
3. Refer to document titles “Report No. K3042-011/97” & “Report No. 324A16-R01”.
4. Refer to document title “Qualification type test log for WESDAC DART” .
5. Verified but documentation is not available.
6. Not verified.

4.14 Calculated Data

Calculated data is a function of the firmware set. The standard firmware set provides the following data.

4.14.1 Analog Values

Specifications referenced to line sensing device secondaries.

Units	Raw values	
Per phase	RMS current and voltage	
	Phase angle	(range: 0 to +/- 180 degrees)
	Power factor	(range: -0.5 to +0.5)
Per feeder	reactive power	(range: configurable from 1802 VARs to 6000 VARs)
Real power		(range: configurable from 1802 W to 6000W)
	Power factor	(range: -0.5 to +0.5)
	Neutral current	
	Voltage sum	

Table 6 Analog Values

4.14.2 Pseudo Status Points

Per phase	overcurrent
	breaker operation
	lockout
	backfeed
	current direction
Per feeder	neutral fault
	voltage and current unbalance

4.14.3 Accumulators

Export and import Wh and VARh 32 bit accumulators (contents retained in RAM); range: configurable from 1,116,691 Wh/VARh to 3,722,304 Wh/VARh.

4.15 Standard Firmware

Key functions supported by the standard firmware include:

- Data frame timeout.
- Data link confirm timeout.
- Application confirm timeout.
- Data link retries.
- Hayes modem: phone number, setup string, idle time before hanging up.
- Data collision avoidance: minimum link idle time (half-duplex line) and maximum random delay before message is transmitted.
- 8 group addresses.
- Configurable user octets per frame.
- Unsolicited message tries.
- Unsolicited messages can be enabled for class 1, class 2 and/or class 3 data.
- Classes can be assigned to COS, SOE and/or changed analogs.
- Unsolicited analogs support individual magnitude thresholds for RMS voltage, RMS current, power factor, Watts/VARs, phase angle, voltage vector sum and current vector sum. Global qualification consists of a maximum change period and minimum number of changes.
- Fault detectors are configured on a per feeder basis. Modes supported include forward faults with backfeed (for radial distribution systems) and forward and reverse faults without backfeed (for networks).
- Fault detector points can be configured for SOE or COS on a global basis.
- The fault detectors supports fleeting or latched alarms on a global basis. Latching is cleared through a pseudo control.
- Battery test can be enabled to automatically test the batteries once every 30 days.

4.16 Configuration Software

Name	DART Configuration System
System requirements	IBM PC or compatible computer (XT or higher), DOS or Windows 3.x, communication cable
Features	menu-driven using arrow keys
	create new configuration
	retrieve and update a saved configuration
	upload a configuration
	configure the host port and fault detector
	configure the status inputs
	configure the control outputs
	choose feeder configuration, CT/VT corrections, Watt/Var scaling
	log file which displays the point descriptors and points

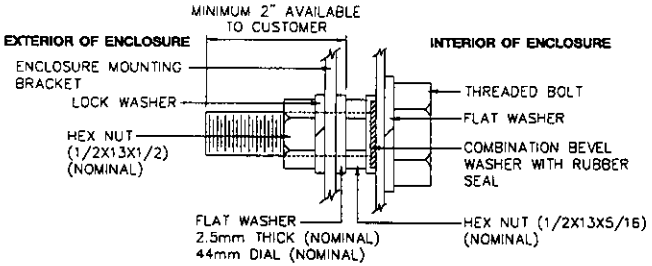
4.17 Maintenance Software

Name	DARTMAINT
System requirements	IBM PC or compatible computer (XT or higher), terminal emulation software that can emulate a VT100 or compatible terminal, DOS or Windows 3.x, communication cable
Features	command driven
	help screen
	display memory
	store to memory
	reset
	bulk erase EEPROM
	display analog values
	arm a control point
	operate a control point
	display status input states
	display fault detector states

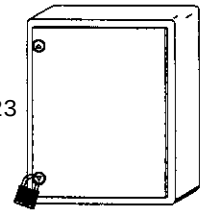
4.18 Product Documentation

Standard	Product Description, Information and Specification, Installation Manual, DARTMAINT User's Guide, DART Configuration System User's Guide

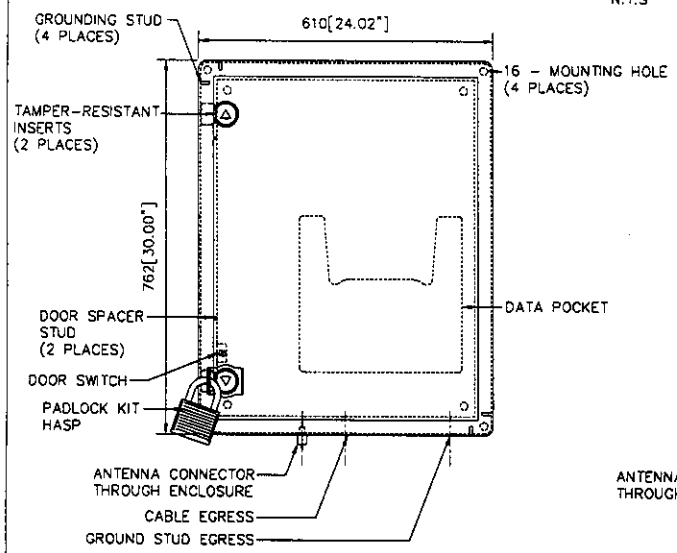
Quantity of product documentation is defined on a per contract basis. Documentation for additional contract deliverables is arranged on a per contract basis.

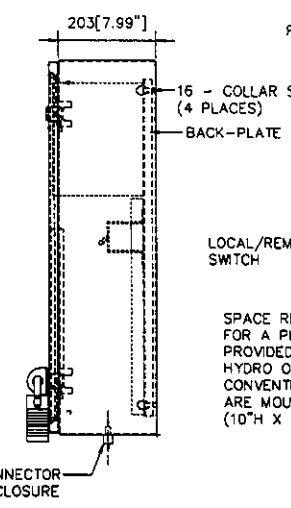


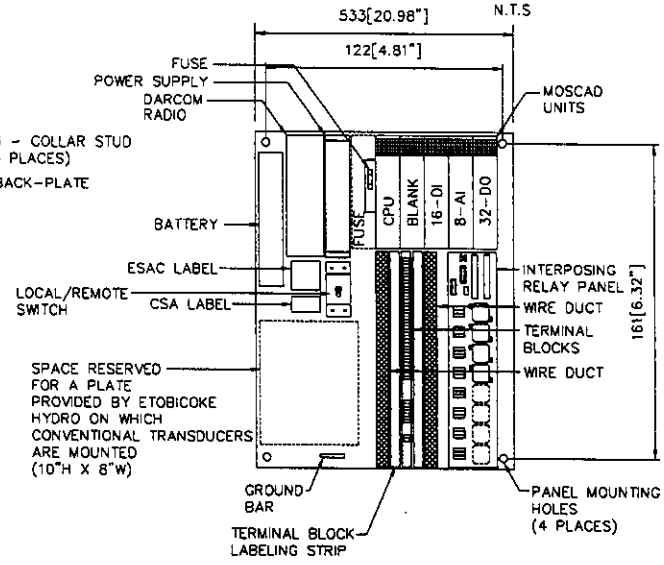
MOUNTING BOLT AND BRACKET DETAILS
N.T.S



ISOMETRIC VIEW
N.T.S

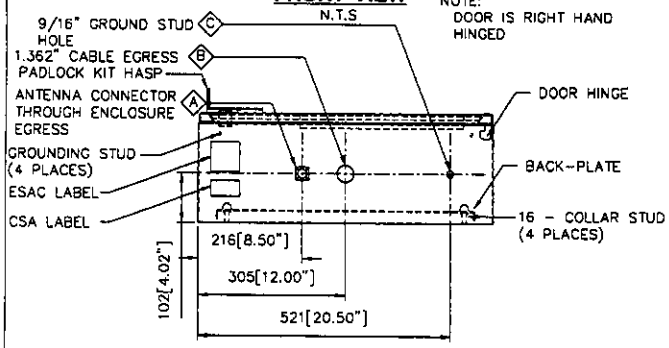






FRONT VIEW
N.T.S

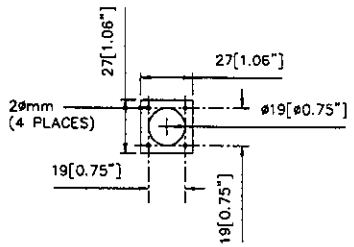
NOTE:
DOOR IS RIGHT HAND HINGED



BOTTOM VIEW
N.T.S

SIDE VIEW
N.T.S

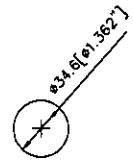
NOTE:
ALL CONTENTS NOT SHOWN FOR CLARITY



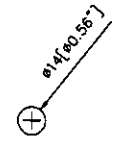
Ⓐ ANTENNA EGRESS
N.T.S

BACKPLATE LAYOUT
N.T.S

NOTE:
FOR MANUFACTURING DIMENSIONING REFER TO DRAWING 0001-02



Ⓑ CABLE EGRESS
N.T.S



Ⓒ GROUND STUD EGRESS
N.T.S

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS DENOTED [0.00"] ARE IN INCHES.
3. STANDARD ARRANGEMENT OF MOSCAD DI AND AI MODULE TO ACCOMMODATE WIRING HARNESS WHICH IS TO BE REVIEWED BY TORONTO HYDRO.

REVISIONS		
DATE	BY	DESCRIPTION

CLIENT:

toronto hydro
NORTHWEST DISTRICT
10 BELFIELD ROAD
TORONTO, ONTARIO
M9W 1G1

TITLE:

POLE TOP RTU BACK-PLATE GENERAL LAYOUT

ESAC
ELECTRICAL & SYSTEMS ADVANCED CONTROL INC.
25 Spruce St., Unit #2
Tillsonburg, Ont., Canada N4G 4N6
TEL : (519) 842-4291
FAX : (519) 842-8132

DRAWN	DATE	CHECK	CHECK	DATE
T.B	MAR.'00			04/00

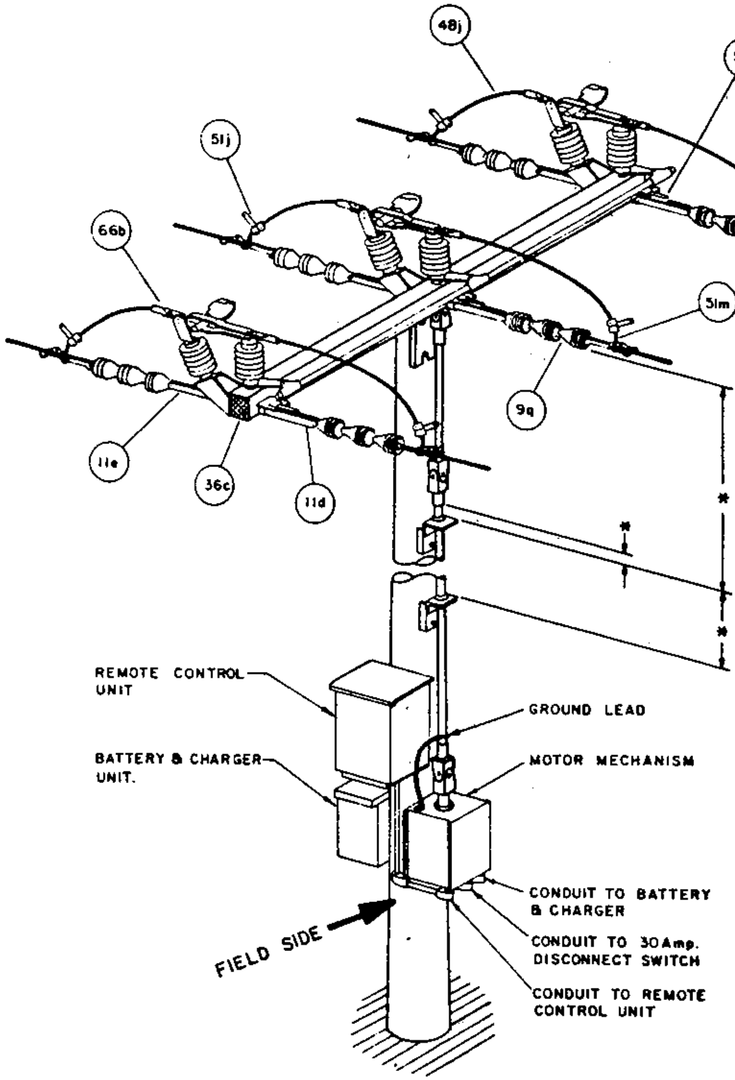
PROJECT	SHEET	SCALE
99P030	0007-01	AS NOTED

NORTH YORK HYDRO

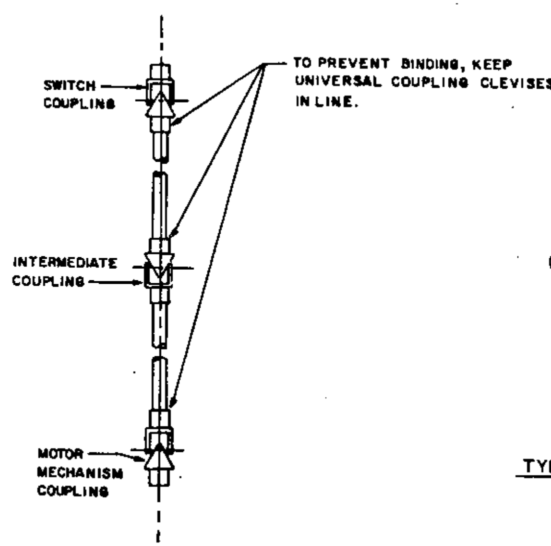
29-33
85·02·08

NOTES

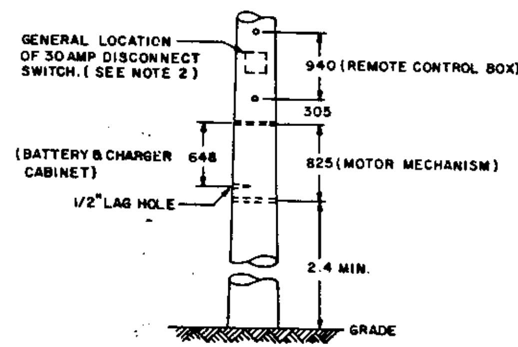
1. INSTALLATION CREW TO CONSULT WITH P&C DEPT. IF DEVIATIONS ARE REQUIRED FROM PREFERRED MOUNTING LOCATION OF MOTORIZING EQUIPMENT.
2. 30 AMP. DISCONNECT SWITCH TO BE INSTALLED ON ROAD SIDE OF POLE. (NOT SHOWN IN ISOMETRIC DETAIL)
3. PVC CONDUITS TO BE KEPT AS CLOSE AS POSSIBLE TO THE POLE AND MOTORIZING EQUIPMENT CABINETS, BY USE OF 90° ELBOWS, TO FACILITATE MAINTENANCE ACCESS TO MOTORIZING EQUIPMENT BY LADDER.



* DIMENSION AS PER SWITCH MANUFACTURER'S ASSEMBLY DRAWING.



UNIVERSAL COUPLING ASSEMBLY



TYPICAL MOUNTING DIMENSIONS FOR MOTOR MECHANISM, ASSOCIATED CONTROL AND BATTERY UNIT

REFERENCE	SECTION
MATERIAL	15
GROUNDING	41
NUMBERING	35
MANUFACTURERS INSTALLATION DWG.	SUPPLIED WITH SWITCH

CHECKED [signature]

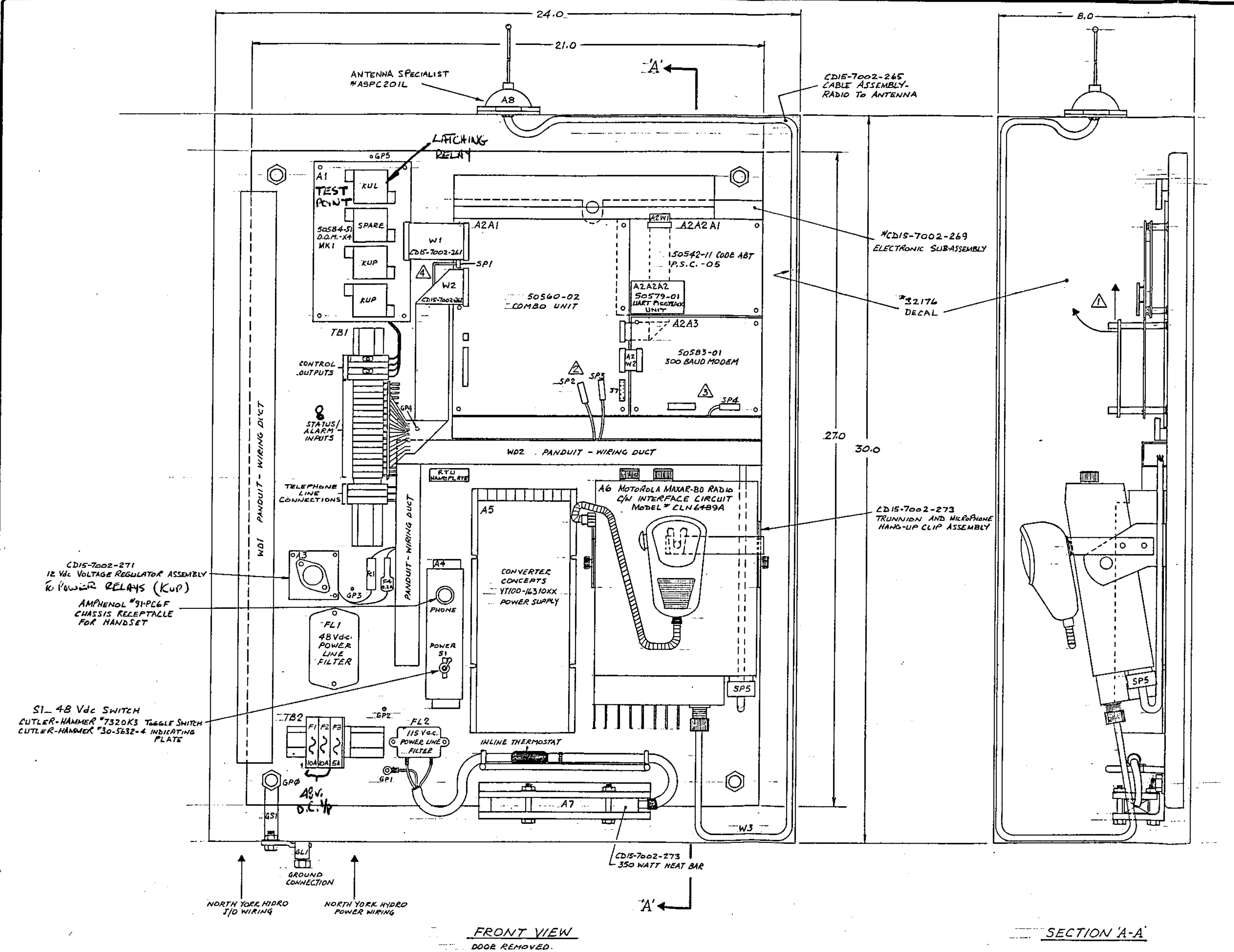
APPROVED [signature]

ORIGINAL ISSUE: FEB 8/80

600A MOTORIZED LOAD INTERRUPTER SWITCH HORIZONTAL MOUNTING

Toronto Hydro-Electric System Limited
EB-2011-0120
Interrogatory Responses
Tab 7
Schedule 2
Attachment 14
Filed: 2011 Dec 23
(2 pages)

ISSUE	UNIT ISSUE	DESCRIPTION	DATE	APPD
1		RELEASED FOR PRODUCTION	SEPT 85	
2		CORRECTED LAYOUT TO REFLECT PRODUCT DEVELOPEMENT PER ECN 802	DEC 85	
3		ADDED CODE ABT TO 50542-11; CORRECTED HEATER GUARD LENGTH, CHANGES PER ECN 821	FEB 1986	



NOTES

1. THE COMBO UNIT (50560), THE PROGRAMMABLE SLICE CONTROLLER - 05 (50542) AND THE 300 BAUD MODEM (50583) ARE MOUNTED ON A QUICK RELEASING PLATE FOR SERVICE.
2. TWO PLUGS ARE SHOWN. SWITCHOVER FROM RADIO TO TELEPHONE LINE OPERATION IS ACCOMPLISHED BY REMOVING THE RADIO PLUG FROM THE COMBO JACK J7 AND INSTALLING THE TELEPHONE PLUG IN ITS PLACE.
3. TEST SET AND HANDSET CONNECTIONS ON THE MODEM.
4. 12 V d.c. AND 48 V d.c. CONNECTION
5. FOR COMPONENT INTERCONNECTION REFER TO RTU WIRING DIAGRAM CD15-7002-260
6. FOR EXTERNAL CONNECTIONS AND TERMINAL BLOCK DESCRIPTIONS REFER TO RTU EXTERNAL CONNECTION DWG. CD15-7002-240.
7. MISCELLANEOUS ITEMS.
   - F1, F2 _ BUSS MDA 10A (¼"x1¼")
   - F3 _ BUSS MDA 6A (¼"x1¼")
   - F4 _ BUSS AGC 2/10 (¼"x1¼")
   - XF4 _ BUSS HH1-A FUSE HOLDER
   - FC1 _ MOLEX #03-09-1032, #02-09-1202, #03-09-2032 AND #02-09-2202 FLYING CONNECTOR
   - FL1 _ CURTIS #F1200AA20 FILTER
   - FL2 _ CURTIS #F1100AA06 FILTER
   - SP1-SP5 _ MOLEX #22-01-XXXX CONNECTOR HOUSING; MOLEX #08-50-0114 CRIMP TERMINAL; MOLEX #15-04-9209 POLARIZING KEY
   - WD1 _ PANDUIT 1.5"x1.5" WIRING DUCT & COVER (E1.5x1.5 LG6; C1.5 LG6)
   - WD2 _ PANDUIT 1.0"x1.0" WIRING DUCT & COVER (E1x1LG6; C1LG6)

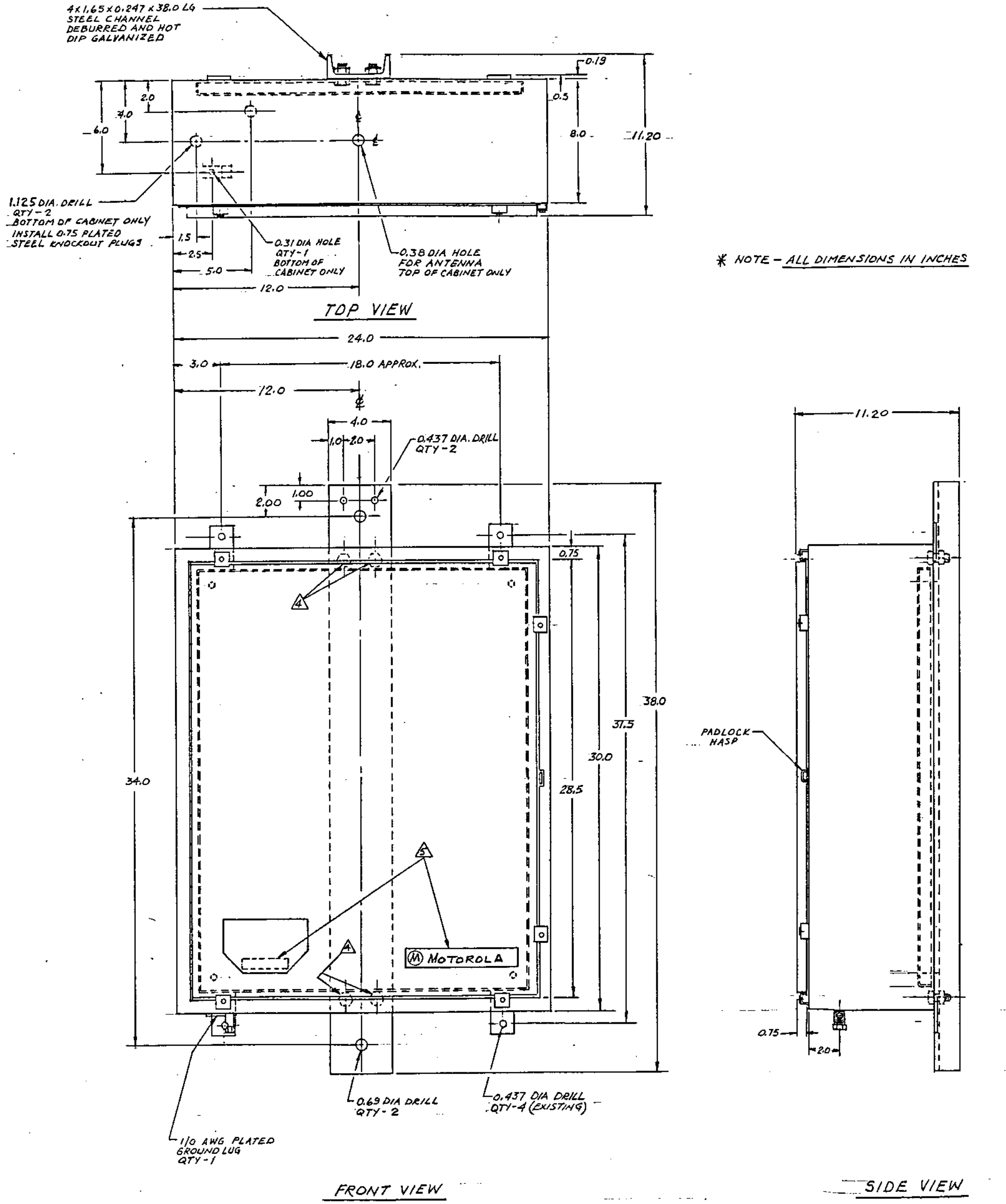
MOTOROLA Dacscan Limited

NORTH YORK HYDRO

RTU
GENERAL ARRANGEMENT

DRAWN	T. LANZILLOTTA	CHECKED	
DESIGNED	J. FALUDI	APPROVED	
DATE	21 JUNE 1985	DACSCAN	
ISSUE 3	SHEET 1 OF 2		CD15-7002-220

ISSUE	UNIT ISSUE	DESCRIPTION	DATE	APPD
3		SEE SHEET 1		



✱ NOTE – ALL DIMENSIONS IN INCHES

NOTES

1. CABINET - HAMMOND Nº 1418 N4 K8 OR EQUIVALENT, NEMA 4 RATED (OUTDOOR TYPE). FINISH IS ASA 61 GREY BAKED ENAMEL. THE CABINET IS NOT VENTILATED
2. THE MOUNTING CHANNEL IS 4.0" x 1.65" x 0.247" x 38.0" LG.
3. THE MOUNTING CHANNEL - IS TO BE HOT-DIPPED GALVANIZED AFTER THE CUTTING AND DRILLING OPERATIONS.
4. USE 0.50" DIA DRILL FOR HOLES IN CABINET. USE 0.56" DIA DRILL FOR HOLES IN CHANNEL. FIX CHANNEL TO CABINET USING 0.50"-13 x 1.25" LG. CAD-PLATED HEX HEAD BOLTS AND 0.50" CAD-PLATED HEX HEAD NUTS, WASHES AND LOCK WASHER. USE SILICONE SEALER TO ENSURE A WATER TIGHT JOINT
5. 32092-02 MOTOROLA LOGO'S :- ONE LOGO SECURED TO THE BOTTOM RIGHT HAND CORNER OF DOOR. ONE LOGO SECURED TO THE BOTTOM OF THE DOOR DATA POCKET

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	
2 PLACE DEC	±.010
3 PLACE DEC	±.005
HOLES	±.005
ANGLES	± 1°
SCALE: 1/4	
DO NOT SCALE DWG	

MOTOROLA Dacscan Limited

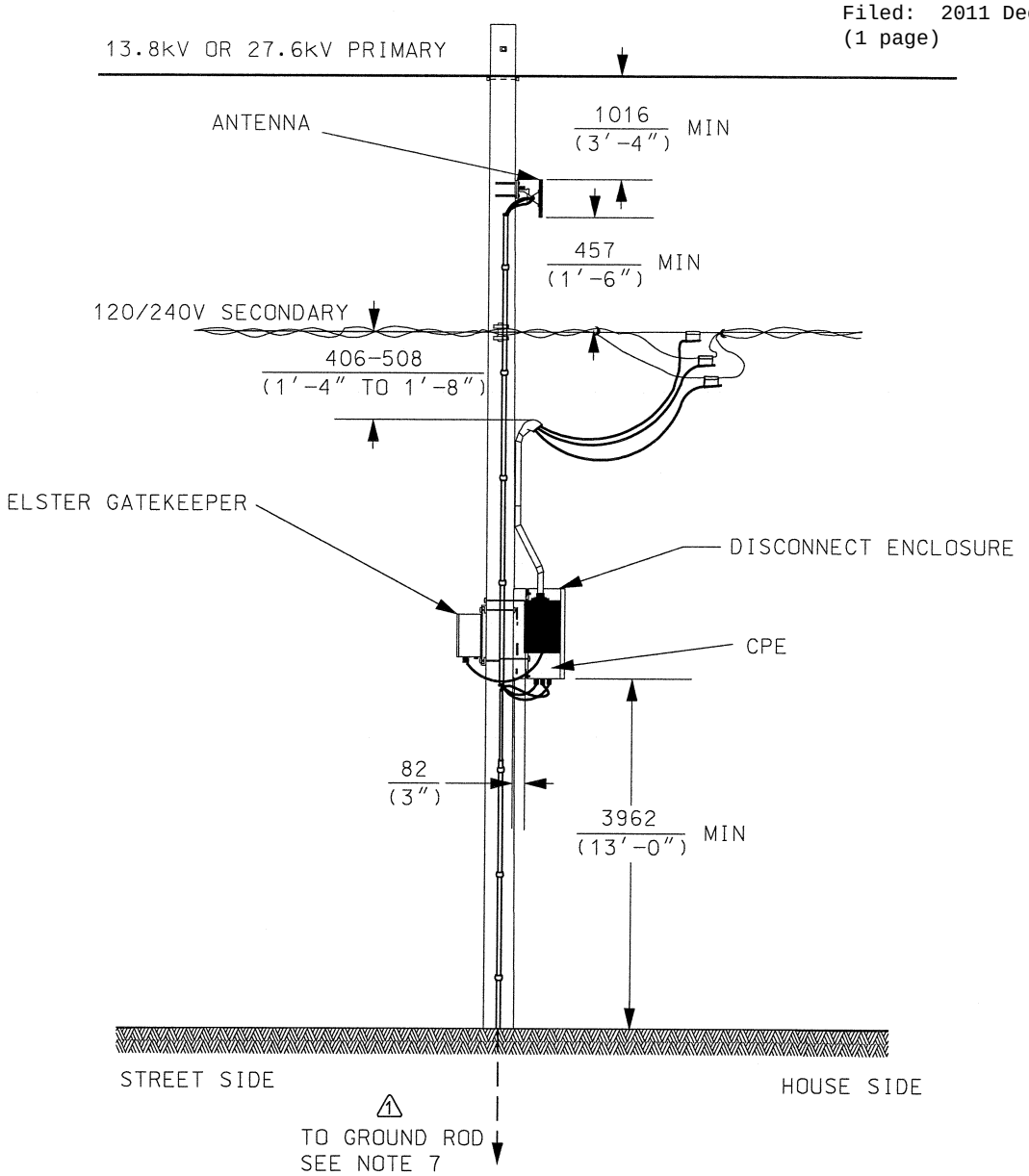
PROPRIETARY INFORMATION

NORTH YORK HYDRO

RTU CABINET DETAILS

DRAWN	T. LANZILLOTTA	CHECKED	
DESIGNED	J. FALUDI	APPROVED	
DATE	21 JUNE 1985	DACSCAN	
ISSUE 3	SHEET 2 OF 2	CD15-7002-220	

ISSUE	UNIT ISSUE	DESCRIPTION	DATE	APPD



1

NOTES:

1. TO BE MOUNTED ON A POLE FREE OF TRANSFORMER(S), SWITCHES, PRIMARY RISERS, STRUT GUY, BOX-STYLE CONSTRUCTION, AND TRAFFIC LIGHTS.
2. POLE MUST HAVE SUFFICIENT SPACE TO MEET ALL CLEARANCE REQUIREMENTS.
3. CPE MUST BE INSTALLED ON HOUSE SIDE OF POLE.
4. AVOID INSTALLING CPE OVER SIDEWALKS.
5. ALL WORK DONE ABOVE SECONDARY MUST BE COMPLETED BY A CPLP OR EQUIVALENTLY QUALIFIED TORONTO HYDRO APPROVED CONTRACTOR.
6. POLES TO BE A MINIMUM CLASS 3 OR CLASS F FOR INSTALLATION OF CPE. VISUAL INSPECTION OF POLES MUST BE CARRIED OUT PRIOR TO CPE INSTALLATION TO ENSURE POLES ARE IN GOOD SOUND CONDITION.
7. REFER TO STANDARD 18-2200 AND 18-2300 FOR GROUNDING DETAILS OF CONCRETE AND WOOD POLES RESPECTIVELY.

*THIS CONSTRUCTION SKETCH IS TO BE USED SOLELY WITHIN THE THESL DISTRIBUTION SYSTEM ONLY

DISTRIBUTION CONSTRUCTION SKETCH 1			WIMAX CPE INSTALLATION DETAILS				
toronto hydro electric system	Approved By: 2011-05-18						
	Drafted By: S.K.	Designed By: C.T.	Original Issue: K.S./J.D. 2010-08-27	Scale: N.T.S	Rev: 1	SKE-25	1/1

RESPONSES TO INTERROGATORIES IN DECISION AND ORDER ON MOTION DATED DECEMBER 9, 2011

INTERROGATORY 3:

Reference(s): Decision and Order on Motion, December 9, 2011, p. 16

"The Board therefore orders THESL to:

(a) Provide an estimate of the percentage of the total number of applications for wireless attachments rejected for (i) administrative; (ii) operational; and (iii) safety reasons;

(b) In the case of those applications for wireless attachments rejections for reasons relating to safety, indicate the specific nature of the safety concern that resulted in rejection."

RESPONSE:

(a) The estimated percentages as requested are as follows:

		2009		2010	
		Number of Permits	**Percentage**	**Number of Permits**	**Percentage**
DAScom	Declined Administrative	16	36	3	12
	Declined Operational	2	5	3	12
	Declined Safety	26	59	19	76
	Total Permits Declined	**44**	**100**	**25**	**100**

(b) Please see the 'Remarks' column in each of the tables for 2009 and 2010 DAScom permits, attached as Attachment 1 to this response. Please note that Arizon Technologies is a third party consultant and was DAScom's agent for the purposes of submitting some (but not all) of the DASCom permit applications.

DAScom Permits 2009

Total Number of Permits Submitted =	234
Number Granted, Conditionally Granted =	184
Number Declined =	44
Number Cancelled =	4
Number Pre Opinion =	2

Customer	Received Date (dd/mm/yy)	Returned Date (dd/mm/yy)	Permit #	Project #	Authorization	Service Address	Remarks	Declined: OEB Requested Category of Administrative, Operational or Safety
ARIZON TECHNOLOGIES	17/09/2009	29/09/2009	P2009-00779	NODE 264	DECLINED	NODE 264; 4 WANLESS CR (WEST SIDE)	POLE # 10 NOT SUITABLE SINGE PHASE SWITCH; SUGGEST POLE #8, #58; # 57; OR # 60	Safety
ARIZON TECHNOLOGIES	09/10/2009	09/11/2009	P2009-00928	NODE 124	DECLINED	NODE 124; 213 BROADWAY AVE	POLE# 21 NOT SUITABLE, SUGGEST POLE SOUTH EAST CORNER OF RAWLINGSON AND BROADWAY (65) OR POLE# 19 ON BROADWAY.	Safety
ARIZON TECHNOLOGIES	16/10/2009	04/11/2009	P2009-00946	NODE 108	DECLINED	NODE 108; 2 CROHAM RD	POLE #2 NOT SUITABLE SINGLE PRIMARY SWITCH	Safety
ARIZON TECHNOLOGIES	27/10/2009	16/11/2009	P2009-00985	NODE 604	DECLINED	NODE 604; FLEMINGTON RD AND RANEE AVE	POLE# 65 NOT SUITABLE, SUGGEST POLE# 66 OPPOSITE POLE 65	Safety
ARIZON TECHNOLOGIES	04/11/2009	01/12/2009	P2009-01022	NODE 116	DECLINED	NODE 116; 129 LOCKSLEY AVE	SINGLE PHASE PRIMARY SWITCH, SUGGEST POLE # 60 OPPOSITE HOUSE # 1060	Safety
ARIZON TECHNOLOGIES	04/11/2009	22/03/2010	P2009-01026	NODE 261	DECLINED	NODE 261; 234 PARK LANE CIRCLE	POLE # 40 NOT SUITABLE SUGGEST POLE # 41	Safety
ARIZON TECHNOLOGIES	18/11/2009	07/12/2009	P2009-01099	NODE 581	DECLINED	NODE 581; 255 THE WESTWAY	POLE # 225 NOT SUITABLE 3 PHASE SWITCHES: SUGGEST NEXT POLE EAST	Safety
ARIZON TECHNOLOGIES	18/11/2009	23/11/2009	P2009-01105	NODE 591	DECLINED	NODE 591; 1201 LEMSFORD RD	POLE# 1 IS NOT SUITABLE, SINGLE PHASE PRIMARY SWITCH. SUGGEST POLE# 3 (NEXT POLE EAST)	Safety
ARIZON TECHNOLOGIES	18/11/2009	05/08/2010	P2009-01110	NODE 247	DECLINED	NODE 247; 2693 BAYVIEW AVE	DENIED, CROSSARM HAS 1 CIRCUIT (THREE PRIMARIES) NOT 2 (6 PRIMARIES AS ON DRAWING). FULL POLE ENGINEERING IS REQUIRED.	Safety
ARIZON TECHNOLOGIES	18/11/2009	27/11/2009	P2009-01125	NODE 617	DECLINED	NODE 617; 406 ELM RD	NOT SUITABLE, SINGLE PHASE PRIMARY SWITCH. SUGGEST POLE #414 OR POLE #100 ELM RD AND FELBRIGG AVE	Safety
ARIZON TECHNOLOGIES	01/12/2009	21/12/2009	P2009-01232	NODE 429	DECLINED	NODE 429; 1543 VICTORIA PARK AVE	THREE PHASE SWITH POLE, SUGGEST POLE 4-189 (SOUTH EAST CORNER OF INTERSECTION) OR POLE 4-132 (2ND POLE NORTH)	Safety
ARIZON TECHNOLOGIES	01/12/2009	08/12/2009	P2009-01235	NODE 426	DECLINED	NODE 426; 1654 O'CONNOR DR	POLE NOT SUITABLE SUGGEST HP 1621 OR SL SOUTH.	Safety
ARIZON TECHNOLOGIES	01/12/2009	24/12/2009	P2009-01236	NODE 416	DECLINED	NODE 416; 7 POLES SOUTH OF EAST PARK BLVD ON MARKHAM RD	SINGLE PHASE PRIMARY SWITCH. SUGGEST STREET LIGHT POLE ON EAST SIDE (79-140) OR NEXT POLE NORTH (P470)	Safety
ARIZON TECHNOLOGIES	01/12/2009	21/12/2009	P2009-01246	NODE 482	DECLINED	NODE 482; 105 BRIMLEY RD	PRIMARY SWITCH POLE, SUGGEST POLE# 55-146 OPPOSITE 105 BRIMLEY	Safety
ARIZON TECHNOLOGIES	01/12/2009	8/20/1010	P2009-01261	NODE 538	DECLINED	NODE 538; 545 DANFORTH RD	TOO CONGESTED, TRAFFIC LIGHT ARM AND POWER FEED	Safety
ARIZON TECHNOLOGIES	04/12/2009	21/05/2010	P2009-01306	NODE 466	DECLINED	NODE 466; 1570 WARDEN AVE	NOT SUITABLE 3 PHASE PRIMAR WITH SWITCH: SUGGEST NEXT POLE NORTH.	Safety
ARIZON TECHNOLOGIES	04/12/2009	24/12/2009	P2009-01307	NODE 469	DECLINED	NODE 469; 1223 WARDEN AVE	THREE PHASE INLINE SWITCHES. SUGGEST NEXT POLE SOUTH (POLE 23-239)	Safety
ARIZON TECHNOLOGIES	04/12/2009	21/12/2009	P2009-01308	NODE 471	DECLINED	NODE 471; 19 BRIAN AVE	ONE PHASE PRIMARY SWITCH POLE, SUGGEST POLE 14-200 (AT 20 BRIAN AVE)	Safety
ARIZON TECHNOLOGIES	04/12/2009	29/09/2010	P2009-01319	09-0015A-N628	DECLINED	3800 KINGSTON RD (NODE 628)	PROPOSED DASCOM EQUIPMENT TOO CLOSE TO HYDRO SECONDARY.	Safety
ARIZON TECHNOLOGIES	04/12/2009	22/09/2010	P2009-01325	NODE 643	DECLINED	NODE 643; 588 MEADOWVALE RD	STREET LIGHT POLE INSTALLED UPON ARRIVAL SOUTH WEST CORNER ON STREET LIGHT POLE. SAFETY CONCERN. HAND HOLE BLOCKED THE TTC BUS STOP; SIGN BLOCKED	Safety
ARIZON TECHNOLOGIES	04/12/2009	29/09/2010	P2009-01330	09-0015A-N665	DECLINED	201 GUILDWOOD PKWY (NODE 665)	INSTALLING EQUIPMENT ON SWITCH POLE NOT ALLOWED.	Safety
ARIZON TECHNOLOGIES	15/12/2009	22/03/2010	P2009-01370	NODE 286	DECLINED	NODE 286; 2405 KIPLING AVE	NOTE TOP OF ANTENNA MUST BE 1 METER FROM SECONDARY.	Safety
ARIZON TECHNOLOGIES	15/12/2009	28/09/2010	P2009-01373	09-0015A-N366	DECLINED	NODE 366; 2851 EGLINTON AVE E	INSTALLING EQUIPMENT ON SWITCH POLE NOT ALLOWED	Safety
ARIZON TECHNOLOGIES	15/12/2009	21/12/2009	P2009-01376	NODE 480	DECLINED	NODE 480; 2495 KINGSTON RD	NOT SUITABLE, THREE PHASE PRIMARY SWITCH. SUGGEST POLE # 46-178 OPPOSITE HOUSE 2567 KINGSTON RD	Safety
ARIZON TECHNOLOGIES	15/12/2009	24/12/2009	P2009-01377	NODE 509	DECLINED	NODE 509; 12 FAIRFAX CRES	PRIMARY SWITCH, SUGGEST POLE # 12-102 AT 4 FAIRFAX CRES	Safety
ARIZON TECHNOLOGIES	15/12/2009	29/07/2010	P2009-01383	NODE 42	DECLINED	NODE 42; 65 HAHN PL	ANTENA MUST BE INSTALLED ONE METER BELOW SECONDARY, DISCONNECT TO BE PLACED AS PER TORONTO HYDRO STANDARD. REDESIGN AND RESUBMIT. FULL POLE ENGINEERING IS REQUIRED.	Safety

DAScom Permits 2010

Total Number of Permits Submitted =	216
Number Granted, Conditionally Granted =	188
Number Declined =	25
Number Cancelled =	3
Number Pre Opinion =	0

Customer	Received Date (dd/mm/yy)	Returned Date (dd/mm/yy)	Permit #	Project #	Authorization	Service Address	Remarks	Declined: OEB Requested Category of Administrative, Operational or Safety
ARIZON TECHNOLOGIES	22/02/2010	26/04/2010	P2010-00037	NODE #127.1	DECLINED	3699 BLOOR STREET W	AS PER LETTER DATED MARCH 12, 2010 FROM JOHN SAIN OF ARIZON TECHNOLOGIES FULL POLE CALCULATIONS MUST BE SUPPLIED PRIOR TO INSTALLATION OF THIS NODE; DISCONNECT TO BE INSTALLED TO TORONTO HYDRO STANDARD.	Safety
ARIZON TECHNOLOGIES	23/02/2010	28/09/2010	P2010-00072	09-0015A-N197	DECLINED	344 BURNHAMTHORPE RD (NODE 197)	DECLINED DUE TO INCORRECT ATTACHMENT PLACED ON THE FIELD SIDE THAT WILL INTERFERE WITH DASCOM BOXES.	Safety
DASCOM	23/02/2010	21/05/2010	P2010-00092	NODE # 298	DECLINED	3932 KEELE ST	POLE HAS SWITCHES ON IT.	Safety
ARIZON TECHNOLOGIES	23/02/2010	20/08/2010	P2010-00109	NODE # 499	DECLINED	3199 DANFORTH AVE (HWY 5)	PRIMARY SWITCH POLE	Safety
ARIZON TECHNOLOGIES	24/02/2010	12/07/2010	P2010-00132	NODE # 242	DECLINED	1019 SHEPPARD AVE E	CAN NOT MOUNT ANTENNA ON THE TOP OF THE POLE. REDESIGN AND RESUBMIT.	Safety
ARIZON TECHNOLOGIES	24/02/2010	29/07/2010	P2010-00139	NODE # 682	DECLINED	92 OTONABEE AVE	THREE PHASE PRIMARY SWITCHES, SUGGEST POLES #89, 95 OR 102.	Safety
ARIZON TECHNOLOGIES	24/02/2010	30/07/2010	P2010-00140	NODE # 461	DECLINED	MARKHAM RD	CAN NOT INSTALL ANTENNA ON TOP OF POLE, MUST BE 1 METER BELOW SECONDARIES. REDESIGN AND RESUBMIT. MISSING FULL POLE ENGINEERING.	Safety
ARIZON TECHNOLOGIES	24/02/2010	20/08/2010	P2010-00142	NODE # 280	DECLINED	121 ROCKFORD RD	SWITCH POLE, SUGGEST POLE # 118	Safety
ARIZON TECHNOLOGIES	24/02/2010	29/07/2010	P2010-00145	NODE # 272	DECLINED	6 HEATHVIEW AVE	POLE NOT SUITABLE, PRIMARY SWITCH. SUGGEST POLES ON EITHER SIDE OF THE REQUIRESTED POLE.	Safety
ARIZON TECHNOLOGIES	24/02/2010	05/08/2010	P2010-00157	NODE # 238	DECLINED	21 LEONA DR	PRIMARY SWITCH POLE	Safety
ARIZON TECHNOLOGIES	24/02/2010	20/08/2010	P2010-00160	NODE # 220	DECLINED	107 HILLCREST AVE	THREE PHASE SWITCHES	Safety
ARIZON TECHNOLOGIES	24/02/2010	29/07/2010	P2010-00167	NODE # 215	DECLINED	27 FINCH AVE W	TWO POLE #25, ONE WITH THREE PHASE SWITCHES AND RISER, ONE WHICH WILL BE REMOVED. SUGGEST POLE OPPOSITE TO POLE #25 (THE ONE WITH SWITCHES) ON THE NORTH SIDE OF FINCH.	Safety
ARIZON TECHNOLOGIES	24/02/2010	05/08/2010	P2010-00174	NODE # 221	DECLINED	171 PARK HOME AVE	PRIMARY SWITCH POLE	Safety
ARIZON TECHNOLOGIES	24/02/2010	30/07/2010	P2010-00179	NODE # 317	DECLINED	2 PONOCA RD	MAKE READY REQUIRED TO REPLACE MAKE SHIFT ARM GUY FROM POLE #155 TO POLE #153.	Safety
ARIZON TECHNOLOGIES	24/02/2010	26/04/2010	P2010-00208	NODE # 1312	DECLINED	234 SHERBOURNE ST	CLEARANCE TO BUILDING NOT MET.	Safety
ARIZON TECHNOLOGIES	24/02/2010	06/04/2010	P2010-00209	NODE # 1279	DECLINED	37 SHERBOURNE ST	NOTE ANTENNA IS DOES NOT MEET 1 METER SEPERATION FOR TH SECONDARY; ALSO TOO CLOSE TO BUILDING. SUGGEST POLE 3 54 ON THE WEST SIDE.	Safety
DASCOM	26/03/2010	06/08/2010	P2010-00349	NODE # 519	DECLINED	493 PAPE AVE	NOT SUITABLE DUE TO FLASHING BEACON AND PEDESTRIAN SIGN.	Safety
DASCOM	26/03/2010	29/07/2010	P2010-00353	NODE # 102	DECLINED	467 SILVERTHORN AVE	SINGLE PHASE SWITCH, SUGGEST NEXT POLE SOUTH ALONG SILVERTHORN AVE	Safety
DASCOM	26/03/2010	29/07/2010	P2010-00363	NODE # 52	DECLINED	427 KING ST E	POLE # 12 (NOT SUITABLE, THREE PHASE INLINE SWITCHES. RECOMMEND POLE #18 3 POLES NORTH)	Safety