Appendix E – Volume 4 Manufacturers Supplied Equipment Information

Operation, Maintenance and Monitoring Manual

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

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Section 7

Section 7-W

Interface Module

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FIELD-SIDE SERVICE BEGINS HERE

Allen-Bradley's interface modules connect your control devices and field devices.

Available with either 20- or 40- pin flat cable connectors, these modules are well-suited for 16- and 32-point 1746, 1756, 1769, and 1771 programmable controller I/O modules. In addition, limited solutions are also available for the base I/O of all 1764 MicroLogix 1500 and 40 I/O versions of the 1762 MicroLogix 1200 packaged controllers. IFMs come with one, two, or three field-side terminals per I/O point, optional LEDs, or fuse clips, and mount easily on a standard DIN #3 rail.

A select group of 1492 modules have field Removable Terminal Blocks (RTBs) to speed initial assembly or module replacement.

24 VDC Inputs
MOD # 1492-IFM20D24A-2
CABLE # 1492-CABLE025B

120 VAC Inputs
MOD # 1492-IFM20D120A-2

Keyed connector and locking tabs provide easy and secure interface cable installation.[1]

CABLE # 1492-CABLE010A
1492-CABLE025A

Blown fuse indicator for fused option modules.[4]

Three terminals minimum for analog I/O and shield.

UL component recognized, CSA and FM certified.[2]

Optional field-side status LEDs identify the on/off condition of input devices or programmable controller output circuits, simplifying troubleshooting.

Standard Modules

Standard modules provide one field-side wiring terminal per input or output point as well as enough terminals for the I/O module power connections. They are well suited for applications where the I/O device commons are terminated in the field or remotely from the I/O module panel.

Standard IFMs are available as feed-through or with field-side LEDs.

Analog I/O Modules

1492 analog modules (AIFM) are available in I/O feed-through or fused input versions to help protect your expensive analog sensors. Each analog channel has 3 terminals (minimum) for analog I/O connections and shield. The fused inputs have 5 terminals for field and power connections and blown fused diagnostic LEDs to speed troubleshooting. A specialty Resistance Temperature Detector (RTD) module which provides individual isolation is available for all PLC platforms. In addition, a thermocouple module is available for the 1756 ControlLogix thermocouple input.

LED Interface Modules

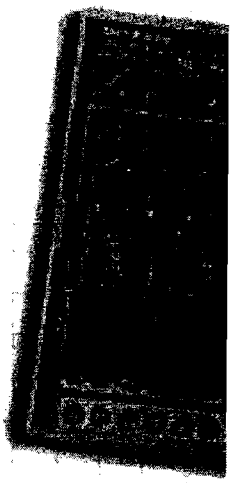
LEDs are available on standard, extra terminal, and sensor interface modules.

When used in conjunction with the logic-side programmable controller LEDs, field-side interface modules LEDs can help determine if a problem resides within the I/O module or is field-device related.

[1] Feature applies to all 1492 Interface Modules
[2] Relay modules are not FM rated
[3] Resistive Load
[4] Plexiglass cover provides finger-safe feature

Relay Output Modules

Do you want to get some high current output from your high density, typically low current, PLC output module? The 1492 relay output modules (type XIM) provide 8 to 16 field-replaceable relays with coil side diagnostic LEDs and optional fused contacts. By using 8 or 16 relay expansion modules, expansion to 32 relays is possible to match your particular PLC output module. Coil voltages are available in 24Vdc or 120Vac. Relay contacts are Form C, 240V, and rated to 10 Amps per point or 12 Amps per adjacent pair.



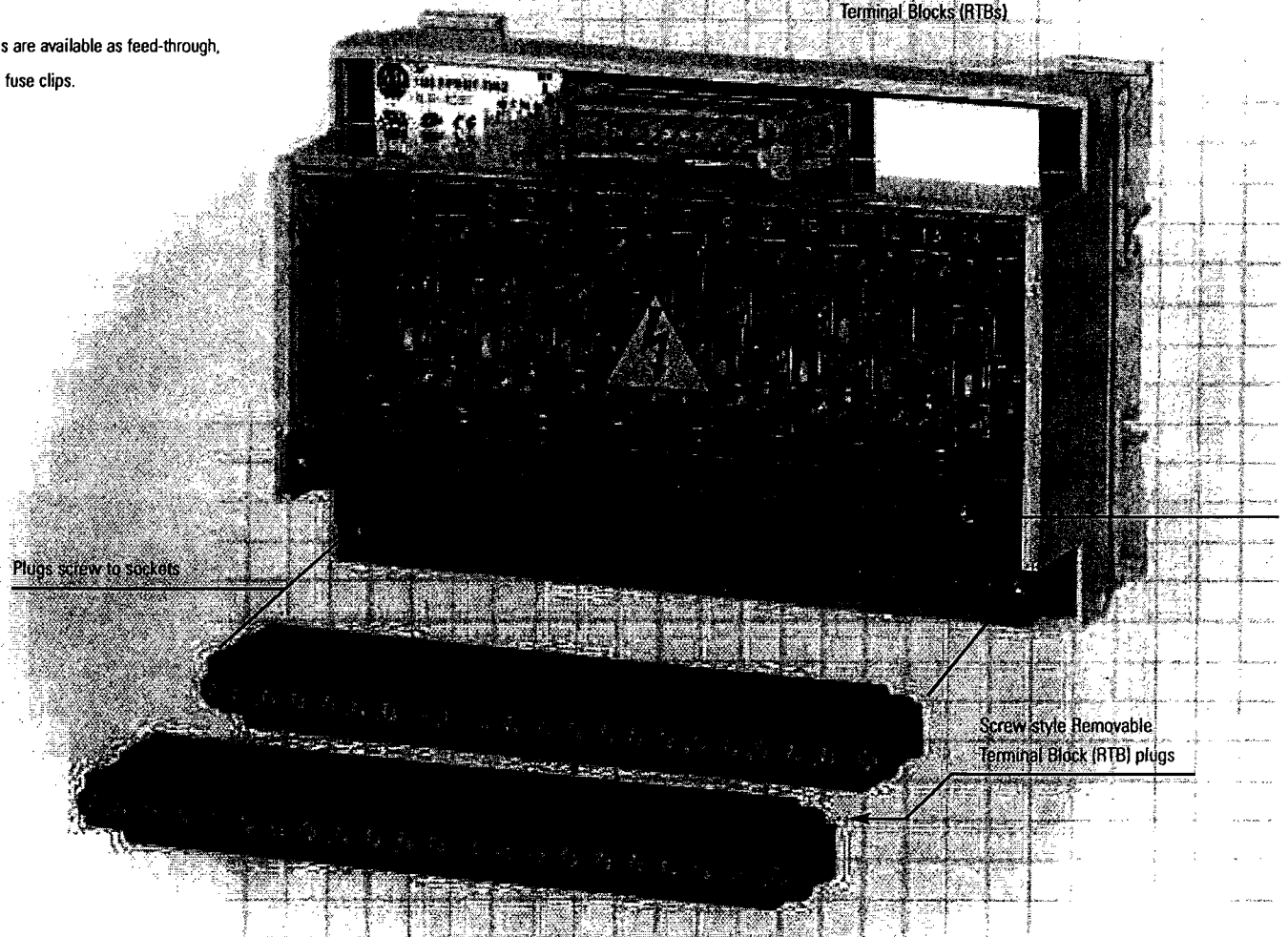
Extra Terminal Modules

Extra terminal modules provide two terminals per input or output point. The extra row of terminals, commoned together in groups, serves as a power bus for field-device commons. When your I/O devices terminate within the same panel as the I/O modules, these are the interface modules for you.

Modules with Removable Terminal Blocks (RTB)

To further simplify initial module installation and replacement a select group of discrete, relay and analog modules have RTB's. These are currently available in screw style (e.g. 1492-RTB20N where N = Screw style) and beginning in March 2006, push-in style (e.g. 1492-RTB20P where P = Push-in style) plugs. Plugs must be ordered separately. Refer to selection tables for details.

Extra terminal IFMs are available as feed-through, with LEDs, or with fuse clips.



RELAY MODULE

Coilside LED diagnostic indication.

Relays are field replaceable and rated to 10A3 per point or 12A per adjacent pair.

Finger safe fuse holder allows easy fuse replacement.

RTB socket assembly

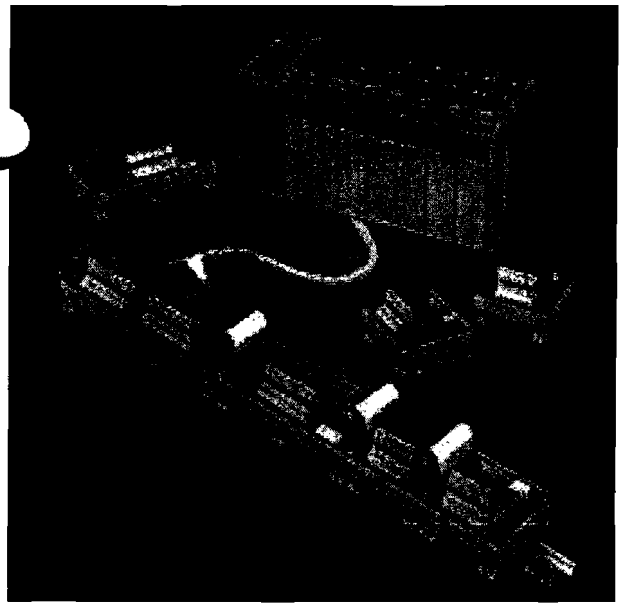
Sensor Modules

Sensor modules provide three terminals per input point. The extra rows, commoned together in groups of 18, serve as power busses for 3-wire sensors devices.

Sensor IFMs are available as feed-through or field-side LEDs.

Fusible Interface Modules

Fuse clips are available on the extra terminal modules to provide a convenient method of adding overcurrent protection into your programmable controller output device wiring. The optional 24V AC/DC or 120V AC blown-fuse indicators reduce the amount of time it takes to locate and replace a blown fuse on the interface module.



1492 IN PANEL WIRING SYSTEMS FOR SLC 500 (1746 I/O)

To correctly interface a 1746 I/O module to a 1492 IFM (discrete), AIFM (analog) or XIM interposing relay) wiring system module, follow the following guidelines:

- Find the appropriate table based on the 1746 I/O module of interest
- Find the column for the 1746 I/O module
- Follow the column down to determine which wiring system module (e.g. 1492-IFM20F module with fixed terminal block or 1492-RIFM20F module with removable terminal block socket assembly) is compatible with the 1746 I/O module, as indicated by a letter code. NOTE: the letter code designates the compatible 1492 cable (e.g. 1492-CABLE***E = discrete or 1492-ACABLE***R = analog)
- The *** is a variable between 001 and 999 to indicate the cable length in meters, where 001 = 00.1 meters and 999 = 99.9 meters

For greater details regarding 1492 wiring system modules, cables and product selection refer to A-B publication: 1492-TD008C-EN-P

SLC 500 8-POINT ISOLATED AND 16-POINT DIGITAL 1746 I/O MODULES

Catalog # for Wiring System with Fixed Terminal Block	Catalog # for Wiring System Module with RTB Socket Assembly (RTB separately (Footnote 1-3))	IFM Description	I/O Module catalog #																	
			1746-IA16	1746-IB16	1746-IC16	1746-IG16	1746-IH16	1746-IM16	1746-IN16	1746-ITB16	1746-ITV16	1746-IV16	1746-OA16	1746-OB16	1746-OB16E	1746-OBP16	1746-OG16	1746-OV16	1746-OVP16	1746-OW16	1746-OX8
1492-IFM20F	1492-RIFM20F [1]	Feed-through Standard 264Vac/dc Max.	A	B	B	E	B	A	B	B	B	B	C	E	E	E	E	E	E	D	D
1492-IFM20FN	1492-RIFM20FN [2]	Feed-through Narrow standard 132Vac/dc Max.	A	B	B	E	B		B	B	B	B	G	E	E	E	E	E	E	N	N
1492-IFM20F-2	R1492-RIFM20F-2 [1]	Feed-through w/Extra terminals (2 per I/O) 264Vac/dc Max	A	B	B	E	B	A	B	B	B	B	C	E	E	E	E	E	E	D	
1492-IFM20F-3		Feed-through for 3-wire sensor type input devices 132Vac/dc	A	B	B	E	B		B	B	B	B									
1492-IFM20D24		Standard w/24Vac/dc Diagnostic LEDs		B					B	B	B	B		E	E	E		E	E	D	
1492-IFM20D24N		Narrow standard w/24Vac/dc Diagnostic LEDs		B					B	B	B	B		E	E	E				N	
1492-IFM20D120		Standard w/120Vac/dc Diagnostic LEDs	A				B						C							D	
1492-IFM20D120N		Narrow standard w/120Vac Diagnostic LEDs	A										G							N	
1492-IFM20D24-2		24Vac/dc Diagnostic LEDs & extra terminals for outputs												E	E	E		E	E	D	
1492-IFM20D24A-2		24Vac/dc Diagnostic LEDs & extra terminals for inputs		B					B	B	B	B									
1492-IFM20DS24-4		Indiv. isolated w/ 24/48Vac/dc Diagnostic LEDs & 4 terminals/output																			S
1492-IFM20D120-2		120Vac Diagnostic LEDs & extra terminals for outputs											C							D	
1492-IFM20D120A-2		120Vac Diagnostic LEDs & extra terminals for inputs	A																		
1492-IFM20DS120-4		Indiv. isolated w/120Vac Diagnostic LEDs w/4 terminals/output																			S
1492-IFM20D24-3		3-wire sensor w/24Vac/dc Diagnostic LEDs		B					B	B	B	B									
1492-IFM20D240-2		240Vac Diagnostic LEDs & extra terminals for outputs											C							D	
1492-IFM20D240A-2		240Vac Diagnostic LEDs & extra terminals for inputs						A													
1492-IFM20F-F-2	1492-RIFM20F-F-2 [1]	Fused 120Vac/dc w/Extra terminals for outputs											C	E	E	E		E	E	D	
1492-IFM20F-F24-2	1492-RIFM20F-F24-2 [1]	Fused w/Extra terminals & 24Vac/dc BF LED indicators												E	E	E		E	E	D	
1492-IFM20F-F24A-2	1492-RIFM20F-F24A-2 [1]	Fused w/extra terminals & 24Vac/dc BF LED indicators		B					B	B								E	E		
1492-IFM20F-F120-2	1492-RIFM20F-F120-2 [1]	Fused w/extra terminals & 120Vac/dc BF LED indicators											C							D	
1492-IFM20F-F120A-2	1492-RIFM20F-F120A-2 [1]	Fused w/extra terminals & 120Vac/dc BF LED indicators	A				B														
1492-IFM20F-F240-2		Fused w/extra terminals & 240Vac/dc BF LED indicators											C							D	
1492-IFM20F-FS-2		Fused 120Vac/dc Indiv. isolated w/extra terminals for outputs																			S
1492-IFM20F-FS24-2		Fused indiv. isolated w/extra terminals/output & 24Vac/dc BF indicators																			S
1492-IFM20F-FS24A-4		Two 4-pt isolated groups fused w/4 terminals/input & 24Vac/dc BF indicators																			
1492-IFM20F-FS120-2		Fused indiv isolated w/extra terminals/output & 120Vac/dc BF indicators																			S
1492-IFM20F-FS120-4		Fused indiv. isolated w/4 terminals/output & 120Vac/dc BF indicators																			S
1492-IFM20F-FS120A-4		Two 4-pt isolated groups w/4 terminals/input & 120Vac/dc BF indicators																			
1492-IFM20F-FS240-4		Fused indiv. isolated w/4 terminals/output & 240Vac/dc BF indicators																			S
1492-XIM2024-8R		20-pin master w/eight 24Vdc relays & coil side diagnostic LEDs												E	E	E					
1492-XIM2024-16R		20-pin master w/sixteen 24Vdc relays & coil side diagnostic LEDs												E	E	E					
1492-XIM2024-16RF		20-pin Fused master w/sixteen 24Vdc relays & coil side diagnostic LEDs												E	E	E					
1492-XIM20120-8R		20-pin master with eight 120Vac relay & coil side diagnostic LEDs											CR								
1492-XIM20120-16R		20-pin master with sixteen 120Vac relays & coil side diagnostic LEDs											CR								
1492-XIM20120-16RF		20-pin Fused master w/sixteen 120Vac relays & coil side diagnostic LEDs											CR								
1492-XIM24-8R		Expander w/eight 24Vdc relays & coil side diagnostic LEDs												5	5	5					
1492-XIM120-8R	1492-RXIM24-8R [3]	Expander w/eight 120Vac relays & coil side diagnostic LEDs											5								
1492-XIMF-F24-2		8-ch. Fused expander w/24Vdc blown fuse indicators												5	5	5					
1492-XIMF-F120-2		8-ch. Fused expander w/120Vac blown fuse indicators											5								
1492-XIMF-2		Expander w/eight feed-through channels											5	5	5	5					

[1] Compatible removable terminal block plug 1492-RTB20N, N = Screw Style and P = Push Style
[2] Compatible removable terminal block plug 1492-RTB10N, N = Screw Style and P = Push Style
[3] Compatible removable terminal block plug 1492-RTB12N, N = Screw Style and P = Push Style

P - style available March 2006

5: Can have up to one expansion module depending on master (total 16 points or less)

SLC 500 32-POINT DIGITAL 1746 I/O MODULES

Catalog # for Wiring System with Fixed Terminal Block	Catalog # for Wiring System Module with RTB socket assembly ordered separately (Footnote 1-5)	1746-IFM Description	I/O Module catalog #				
			1746-IB32	1746-IV32	1746-OB32	1746-OB32E	1746-OV32
1492-IFM40F	1492-RIFM40F [1]	Feed-through Standard 132Vac/dc Max.	H	H	H	H	H
1492-IFM40F-2	1492-RIFM40F-2 [1]	Feed-through Extra terminals 132Vac/dc Max.	H	H	H	H	H
1492-IFM40F-3		Feed-through for 3-wire sensor type input devices 60Vac/dc Max.	H	H			
1492-IFM40D24	1492-RIFM40D24 [1]	Standard with 24Vac/dc Diagnostic LEDs	H	H	H	H	H
1492-IFM40D24-2		24Vac/dc Diagnostic LEDs w/extra terminals for outputs			H	H	H
1492-IFM40D24A-2	1492-RIFM40D24A-2 [1]	24Vac/dc Diagnostic LEDs w/extra terminals for inputs	H	H			
1492-IFM40DS24-4		Indiv. isolated w/24/48Vac/dc Diagnostic LEDs w4 terminals/output					
1492-IFM40DS24A-4		Indiv isolated w/24Vac/dc Diagnostic LEDs w4 terminals/input					
1492-IFM40D120-2		120Vac Diagnostic LEDs & extra terminals for outputs					
1492-IFM40D120A-2		120Vac Diagnostic LEDs w/extra terminals for inputs					
1492-IFM40D24-3		3-wire sensor with 24Vac/dc LEDs	H	H			
1492-IFM40DS120-4		Indiv. isolated with 120Vac Diagnostic LEDs and 4 terminals/output					
1492-IFM40DS120A-4		Indiv. isolated with 120Vac LEDs & 4 terminals/input					
1492-IFM40DS240A-4		Indiv. isolated w/240Vac Diagnostic LEDs & 4 terminals/input					
1492-IFM40F-F-2		Fused 120Vac/dc w/extra terminals for outputs			H	H	H
1492-IFM40F-F24-2	1492-RIFM40F-F24-2 [1]	Fused w/24Vac/dc BF indicators & extra terminals for outputs			H	H	H
1492-IFM40F-F120-2		Fused w/120Vac/dc BF indicators & extra terminals for outputs					
1492-IFM40F-FS-2		Fused Indiv. isolated w/extra terminals for 120Vac/dc outputs					
1492-IFM40F-FS24-2		Fused Indiv. isolated w/extra terminals & 24Vac/dc BF indicators					
1492-IFM40F-FS24-4		Fused Indiv. isolated w/24Vac/dc BF indicators & 4 terminals/output					
1492-IFM40F-FS-4		Fused Indiv. isolated 240Vac/dc w/4 terminals/output					
1492-IFM40F-FS120-2	1492-RIFM40F-FS120-2 [1]	Fused Indiv. isolated w/extra terminals & 120Vac/dc BF indicators					
1492-IFM40F-FS120-4	1492-RIFM40F-FS120-4 [2]	Fused Indiv isolated w/120Vac/dc BF indicators & 4 terminals/output					
1492-IFM40F-FS240-4		Fused Indiv isolated w/240Vac/dc BF indicators & 4 terminals/output					
1492-IFM40F-FS24A-4		Fused Indiv. isolated w/24Vac/dc BF indicators & 4 terminals/input					
1492-IFM40F-FSA-4		Fused Indiv. isolated 120Vac/dc w/4 terminals/input					
1492-IFM40F-FS120A-4	1492-RIFM40F-FS120A-4 [2]	Fused Indiv. isolated w/120Vac/dc BF indicators & 4 terminals/input					
1492-IFM40F-FS240A-4		Fused Indiv. isolated w/240Vac/dc BF indicators & 4 terminals/input					
1492-XIM4024-8R		40-pin master with eight (8) 24Vdc relays & coil side diagnostic LEDs			H	H	
1492-XIM4024-16R	*1492-RXIM4024-16R [4]	40-pin master w/sixteen (16) 24Vdc relays & coil side diagnostic LEDs			H	H	
1492-XIM4024-16RF		40-pin Fused master w/sixteen (16) 24Vdc relays & coil side diagnostic LEDs			H	H	
92-XIM24-8R	*1492-RXIM24-8R [3]	Expander w/eight (8) 24Vdc relays & coil side diagnostic LEDs			6	6	
2-XIM24-16RF		Fused Expander w/sixteen (16) 24Vdc relays & coil side diagnostic LEDs			7	7	
1492-XIM120-8R		Expander w/eight (8) 120Vac relays & coil side diagnostic LEDs					
1492-XIMF-F24-2		Fused 8-channel expander with 24Vdc blown fuse indicators			6	6	
1492-XIMF-F120-2		Fused 8-channel expander with 120Vac blown fuse indicators					
1492-XIMF-2		Expander with eight feed-through channels			6	6	

[1] Compatible removable terminal block plug 1492-RTB20N, N = Screw Style and P = Push Style
[2] Compatible removable terminal block plug 1492-RTB17N, N = Screw Style and P = Push Style
[3] Compatible removable terminal block plug 1492-RTB12N, N = Screw Style and P = Push Style
[4] Compatible removable terminal block plug 1492-RTB14N, N = Screw Style and P = Push Style

P - style available March 2006

6: Can have 2 or 3 expansion modules depending on master (32 point max.)
7: One 1492-XIM 14-16RF to be used with on 1492-XIM 4024-16R or 1492-XIM 4024-16RF master (32 point max.)

SLC 500 1746 ANALOG I/O MODULES

Catalog # for Wiring System with Fixed Terminal Block	Catalog # for Wiring System Module with RTB socket assembly ordered separately (Footnote 1-3)	1746-IFM Description	I/O Module catalog #												
			1746-FIO4I	1746-FIO4V	1746-NI4	1746-NI8	1746-NI16I	1746-NI16V	1746-NIO4I	1746-NIO4V	1746-NO4I	1746-NO8I	1746-NO4V	1746-NO8V	1746-NR4	1746-QS
1492-AIFM4-3	1492-RAIFM4-3 [1]	Feed-through 4-channel input, output or 2in/2out combo w/3 terminals/chnl	L	L	A				L	L	B		B			
1492-AIFM6S-3	1492-RAIFM6S-3 [2]	Feed-through 6-channel isolated w/3 to 4 terminals/chnl													D	
1492-AIFM8-3	1492-RAIFM8-3 [3]	Feed-through 8-channel input or output w/3 terminals/chnl				C	A46	A46				R		R		
1492-AIFM6TC-3		6-channel thermocouple w/3 terminals/chnl														
1492-AIFM4I-F-5		Fused 4-channel input w/24Vdc BF indicators, test points & 5 terminals/chnl			A											
1492-AIFM4C-F-5		Fused 2-chnl input, 2-chnl output w/24Vdc BF indicators, test points & 5 terminals/input, 3/output	L	L					L	L						
1492-AIFM8-F-5		Fused 8-channel input w/24Vdc BF indicators and 5 terminals/chnl				C										
1492-AIFM16-F-3		Fused 16-channel input w/24Vdc BF indicators and 3 terminals/chnl					A46	A46								
2-AIFM16-F-5		Fused 16-channel input w/24Vdc BF indicators and 5 terminals/chnl														
2-AIFMQS		Fused 4-chnl input, 4-chnl output w/8 fuses & 24Vdc BF indicators														Q

[1] Compatible removable terminal block plug 1492-RTB8N, N = Screw Style and P = Push Style
[2] Compatible removable terminal block plug 1492-RTB12N, N = Screw Style and P = Push Style
[3] Compatible removable terminal block plug 1492-RTB16N, N = Screw Style and P = Push Style

P - style available March 2006

Extra Terminal Interface Modules
Modules d'interface pour bornes supplémentaires
Schnittstellenmodule mit zusätzlichen Anschlußklemmen
Moduli di interfaccia con terminali supplementari
Módulos de interface con terminal adicional

(Cat 1492-IFM20F-2, -RIFM20F-2, -IFM20D24-2, -IFM20D24A-2, -IFM20D120-2, -IFM20D120A-2, -IFM20D240-2, -IFM20D240A-2, -IFM40F-2, -RIFM40F-2, -IFM40D24-2, -IFM40D24A-2, -RIFM40D24A-2, -IFM40D120-2, -IFM40D120A-2)

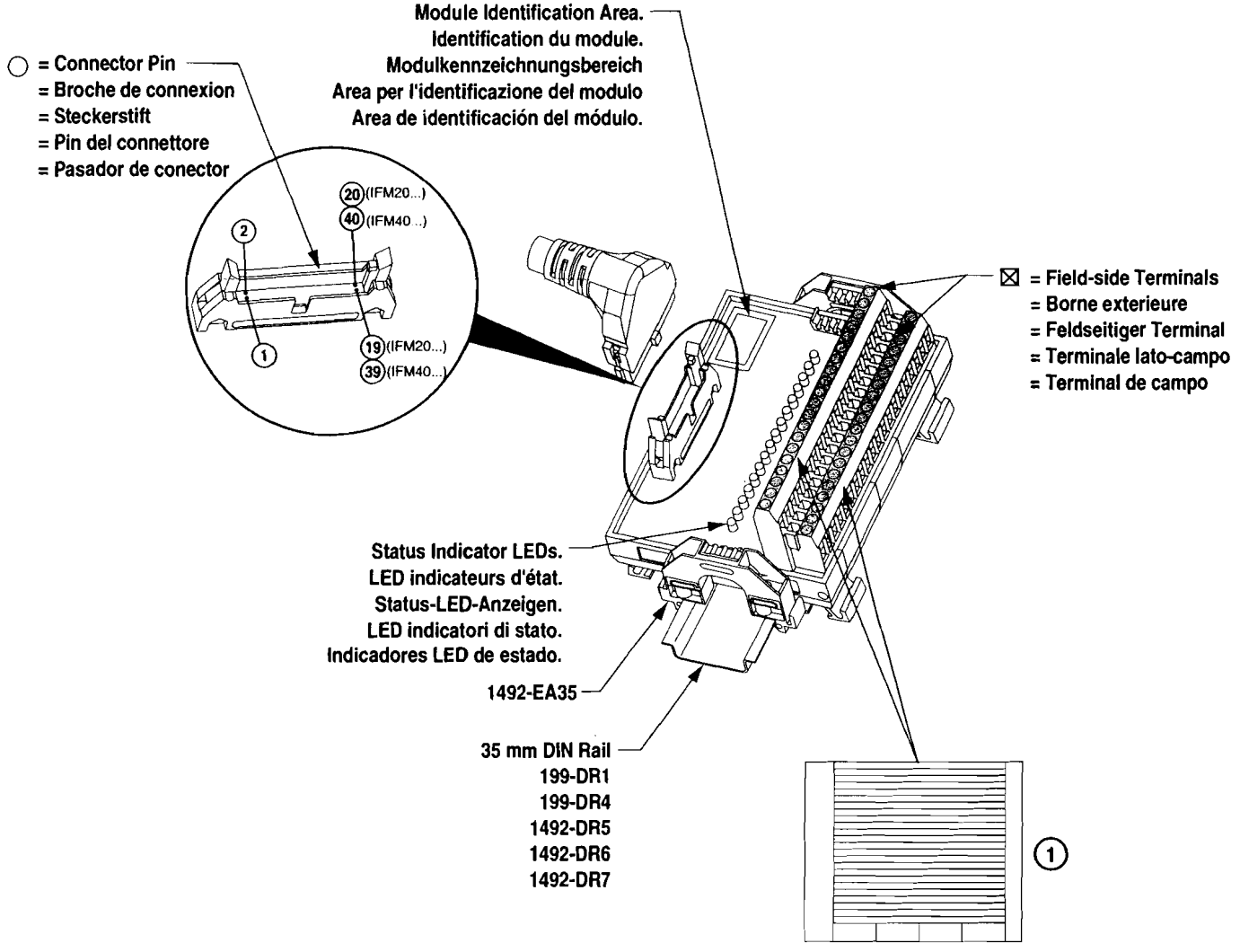
ATTENTION: To prevent electrical shock, disconnect from power source before installing or servicing. FM Class 1, Div.2 requires device installation in a tool-accessible enclosure compliant with ANSI/ISA S82.

ATTENTION: Avant le montage et la mise en service, couper l'alimentation secteur pour éviter toutes décharges. FM Classe 1, Div. 2 nécessite l'installation de l'équipement dans une armoire accessible aux interventions, conforme à ANSI/ISA S82.

ACHTUNG: Vor Installations- oder Servicearbeiten Strom-versorgung unterbrechen, um Elektroschocks zu vermeiden. FM-Klasse 1, Gruppe 2 erfordert die Installation des Gerätes in einem Gehäuse, das für Werkzeuge zugänglich ist und den Anforderungen gemäß ANSI/ISA S82 entspricht.

ATTENZIONE: Per prevenire infortuni, togliere tensione prima dell'installazione o manutenzione. FM Classe 1, Divisione 2 richiede l'installazione del dispositivo in un alloggiamento con capacità di accesso per strumenti conforme allo standard ANSI/ISA S82.

ATENCION: Desconéctese de la corriente eléctrica, antes de la instalación o del servicio, a fin de impedir sacudidas eléctricas. El requisito de FM (Factory Mutual) Clase 1, Div. 2, establece que el dispositivo debe instalarse en un envolvente que permita la introducción y uso de herramientas y cumpla con la norma ANSI/ISA S82.

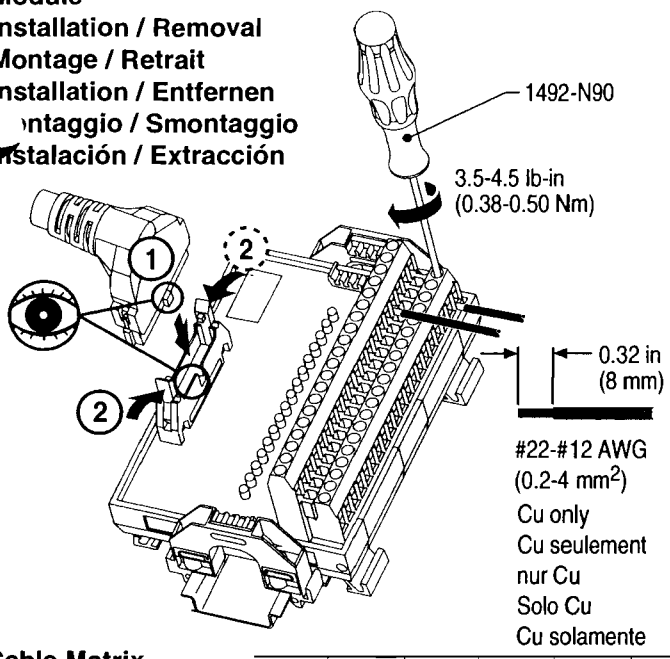


(1) **Adhesive Label Card. Provides I/O terminal wiring identification.**
Carte étiquette adhésive. Identifie le câblage des bornes et les étiquettes des LED.
Aufklebbare Etiketten zur Kennzeichnung der Klemmenverdrahtung und LED-Anzeigen.
Scheda etichette adesive. Fornisce l'identificazione del cablaggio dei terminali e le etichette LED.
Tarjeta de etiquetas adhesivas. Proporciona identificación de cableado del terminal y etiquetas para los indicadores LED.

40063-258-01 (17)
Printed in U.S.A.

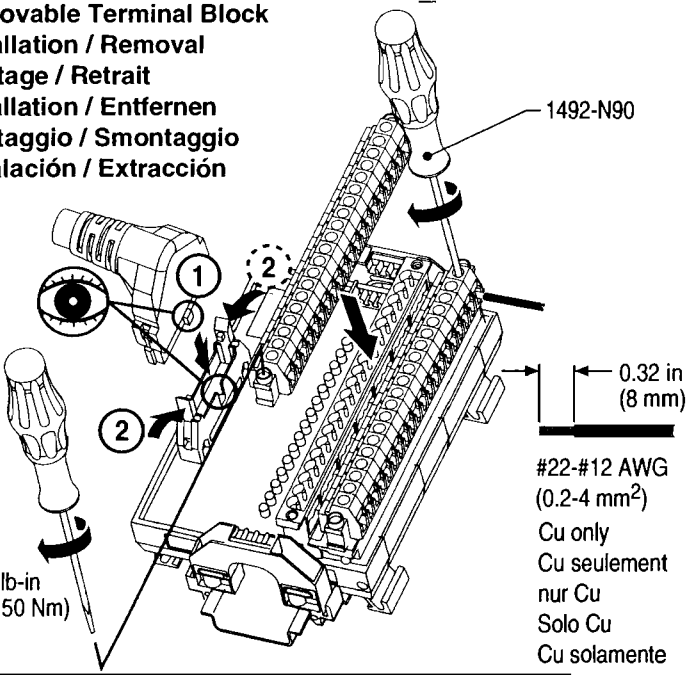
1492-IFM_ or 1492-RIFM_

Module
Installation / Removal
Montage / Retrait
Installation / Entfernen
ıntaggio / Smontaggio
nstalación / Extracción



1492-RIFM_

Removable Terminal Block
Installation / Removal
Montage / Retrait
Installation / Entfernen
Montaggio / Smontaggio
Instalación / Extracción



Cable Matrix
Matrice des câbles
Kabelmatrix
Matrice cavi
Matriz de cables

I/O Module Module E/S E/A-Modul Modulo I/O Módulo de E/S	1492 -IFM20F-2 -RIFM20F-2②	1492 -IFM20D24-2	1492 -IFM20D24A-2	1492 -IFM20D120-2	1492 -IFM20D120A-2	1492 -IFM20D240-2	1492 -IFM20D240A-2
1746-IA16	-CABLE①A				-CABLE①A		
1746-IB16	-CABLE①B		-CABLE①B				
1746-IC16	-CABLE①B						
1746-IG16	-CABLE①E						
1746-IH16	-CABLE①B						
1746-IM16	-CABLE①A						-CABLE①A
1746-IN16	-CABLE①B		-CABLE①B				
1746-ITB16	-CABLE①B		-CABLE①B				
1746-ITV16	-CABLE①B		-CABLE①B				
1746-IV16	-CABLE①B		-CABLE①B				
1746-OA16	-CABLE①C			-CABLE①C		-CABLE①C	
1746-OB16	-CABLE①E	-CABLE①E					
1746-OB16E	-CABLE①E	-CABLE①E					
1746-OBP16	-CABLE①E	-CABLE①E					
1746-OG16	-CABLE①E						
1746-OV16	-CABLE①E	-CABLE①E					
1746-OVP16	-CABLE①E	-CABLE①E					
1746-OW16	-CABLE①D	-CABLE①D		-CABLE①D		-CABLE①D	
1756-IA8D TC-IDX081	-CABLE①U -HWCAB①U				-CABLE①U -HWCAB①U		
1756-IA16 TC-IDA161	-CABLE①X -HWCAB①X				-CABLE①X -HWCAB①X		
1756-IB16 TC-IDD161	-CABLE①X -HWCAB①X		-CABLE①X -HWCAB①X				
1756-IC16 TC-IDE161	-CABLE①X -HWCAB①X						
1756-IN16	-CABLE①X		-CABLE①X				
1756-IV16	-CABLE①X		-CABLE①X				
1756-OA8 TC-ODC081	-CABLE①U -HWCAB①U						
1756-OA8D TC-ODX081	-CABLE①U -HWCAB①U						
1756-OA8E	-CABLE①U						
1756-OA16 TC-ODA161	-CABLE①X -HWCAB①X			-CABLE①X -HWCAB①X			
1756-OB8 TC-ODD081	-CABLE①U -HWCAB①U						
1756-OB16E TC-ODD161	-CABLE①X -HWCAB①X	-CABLE①X -HWCAB①X					
1756-OV16E	-CABLE①X	-CABLE①X					
1756-OC8 TC-ODE061	-CABLE①U -HWCAB①U						
1756-ON8	-CABLE①U						
1769-IA16	-CAB①A69				-CAB①A69		
1769-IM12	-CAB①G69						-CAB①G69
1769-IQ16	-CAB①B69		-CAB①B69				
1769-IQ16F	-CAB①B69		-CAB①B69				
1769-OA8	-CAB①C69						
1769-OB16	-CAB①E69	-CAB①E69					
1769-OV16	-CAB①E69	-CAB①E69					
1769-OW8	-CAB①E69						
1769-OA16	-CAB①H69			-CAB①H69		-CAB①H69	
1769-OW16	-CAB①H69	-CAB①H69		-CAB①H69		-CAB①H69	
1771-IAD	-CABLE①F				-CABLE①F		
1771-IBD	-CABLE①F		-CABLE①F				
1771-ICD	-CABLE①F		-CABLE①F				
1771-IGD	-CABLE①F						
1771-IMD	-CABLE①F						-CABLE①F
1771-IND	-CABLE①F		-CABLE①F				
1771-OAD	-CABLE①F -CABLE①FF	-CABLE①F -CABLE①FF		-CABLE①F -CABLE①FF			
1771-OBD	-CABLE①F -CABLE①FF	-CABLE①F -CABLE①FF					
1771-OGD	-CABLE①F						
1771-OMD	-CABLE①F					-CABLE①F	
1771-OND	-CABLE①F -CABLE①FF	-CABLE①F -CABLE①FF					
(OUT) 1764-24AWA	-CAB①C64						
(OUT) 1764-24BWA	-CAB①C64						
(OUT) 1764-28BXB	-CAB①F64						
(IN) 1764-24AWA	-CAB①A64						
(IN) 1764-24BWA	-CAB①A64						
(IN) 1764-28BXB	-CAB①B64						

I/O Module Module E/S E/A-Modul Modulo I/O Módulo de E/S	1492 -IFM40F-2 -RIFM40F-2②	1492 -IFM40D24-2	1492 -IFM40D24A-2 -RIFM40D24A-2②	1492 -IFM40D120-2	1492 -IFM40D120A-2
1746-IB32	-CABLE①H		-CABLE①H		
1746-IV32	-CABLE①H		-CABLE①H		
1746-OB32	-CABLE①H	-CABLE①H			
1746-OB32E	-CABLE①H	-CABLE①H			
1746-OV32	-CABLE①H	-CABLE①H			
1756-IB16D TC-IDX161	-CABLE①Y -HWCAB①Y				
1756-IB32 TC-IDD321	-CABLE①Z -HWCAB①Z		-CABLE①Z -HWCAB①Z		
1756-IV32	-CABLE①Z		-CABLE①Z		
1756-OB16D TC-ODX161	-CABLE①Y -HWCAB①Y				
1756-IA32	-CABLE①Z				-CABLE①Z
1756-OB32	-CABLE①Z	-CABLE①Z			
TC-ODD321	-HWCAB①Z	-HWCAB①Z			
1756-OV32E	-CABLE①Z	-CABLE①Z			
1769-IQ32	-CABLE①J69		-CABLE①J69		
1769-OB32	-CABLE①K69	-CABLE①K69			
1771-IAN	-CABLE①J				-CABLE①J
1771-IBN	-CABLE①J		-CABLE①J		
1771-IVN	-CABLE①K	-CABLE①K			
1771-OAN	-CABLE①L			-CABLE①L	
1771-OBN	-CABLE①L	-CABLE①L			
1771-OVN	-CABLE①L	-CABLE①L			
1771-OW16	-CABLE①R				
1771-OWN	-CABLE①L	-CABLE①L		-CABLE①L	
1771-OWNA	-CABLE①L	-CABLE①L		-CABLE①L	
(OUT) 1762-L40AWA	-CAB①B62				
(OUT) 1762-L40BWA	-CAB①B62				
(OUT) 1762-L40BXB	-CAB①B62				
(IN) 1762-L40AWA	-CAB①A62				
(IN) 1762-L40BWA	-CAB①A62				
(IN) 1762-L40BXB	-CAB①A62				

① Cables are available in 0.5m, 1.0m, 2.5m and 5.0m lengths (005=0.5m, 010=1.0m, 025 = 2.5m, 050=5.0m). Custom length cables also available. Contact local Sales Office for more information.

Câbles disponibles en 0,5m, 1,0m, 2,5m et 5,0m de longueur (005=0,5m; 010=1,0m; 025=2,5m; 050=5,0m). Câbles sur mesure à la demande. Contactez le bureau le plus proche.

Verfügbare Kabellängen 0,5m, 1,0m, 2,5m und 5,0m (005=0,5m; 010=1,0m; 025=2,5m; 050=5,0m). Anwenderspezifizifische Längen stehen ebenfalls zur Verfügung. Kontaktieren Sie bitte Ihr lokales Vertriebsbüro für weitere Informationen.

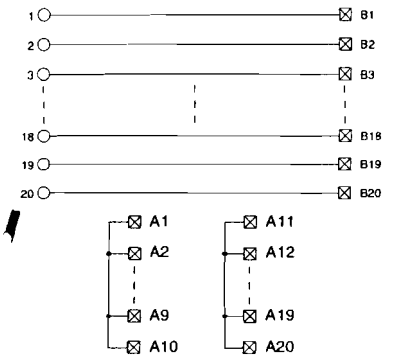
I cavi sono disponibili in lunghezze di 0,5m, 1,0m, 2,5m e 5,0m (005=0,5m; 010=1,0m; 025=2,5m; 050=5,0m). Sono disponibili anche cavi su misura. Per ulteriori informazioni, contattare l'ufficio vendite locale.

Cables disponibles en longitudes de 0,5m, 1,0m, 2,5m, 5,0m (005=0,5m; 010=1,0m; 025=2,5m; 050=5,0m). Hay disponibles cables de varias longitudes. Para más información comuníquese con la oficina de ventas.

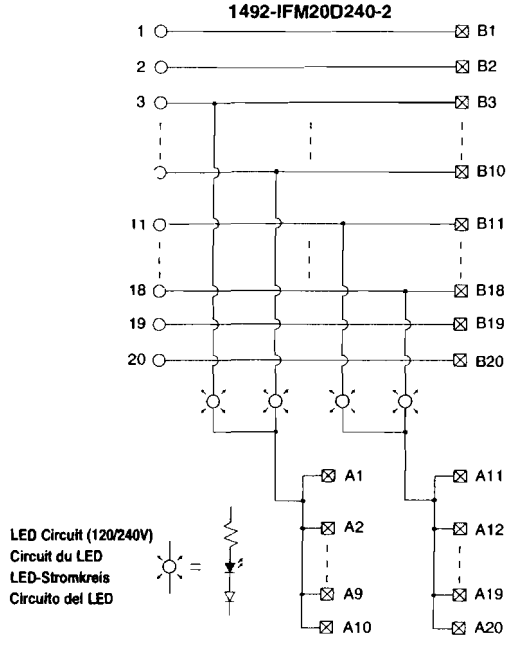
② Supports Removable Terminal Block (RTB) plug. Compatible screw style plug, 1492-RTB20N (pkg. qty. 2). Compatible push-in style plug 1492-RTB20P (pkg. qty. 2). Order plugs separately.

Pinout
Brochage
Anschlußbelegung
Disposizione dei piedini
Esquema de pins

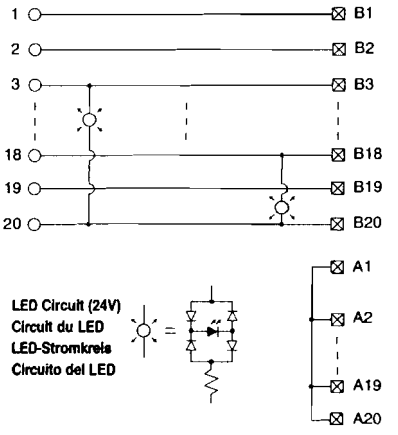
1492-IFM20F-2
1492-RIFM20F-2



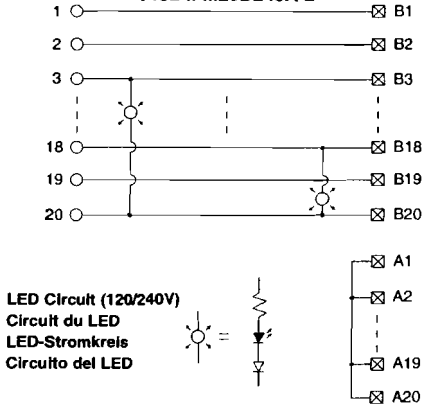
1492-IFM20D120-2
1492-IFM20D240-2



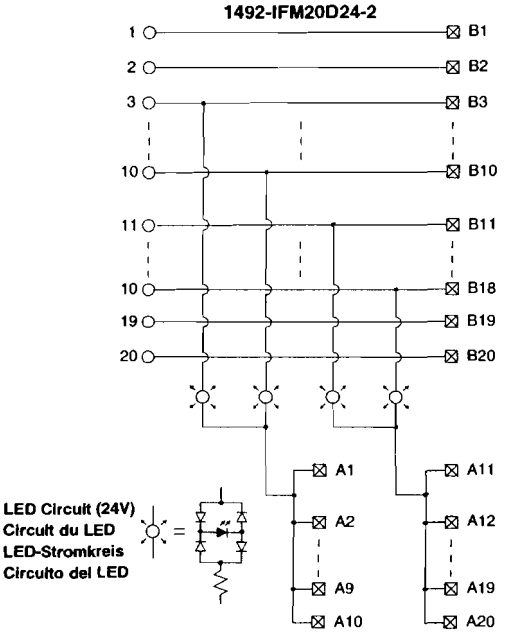
1492-IFM20D24A-2



1492-IFM20D120A-2
1492-IFM20D240A-2

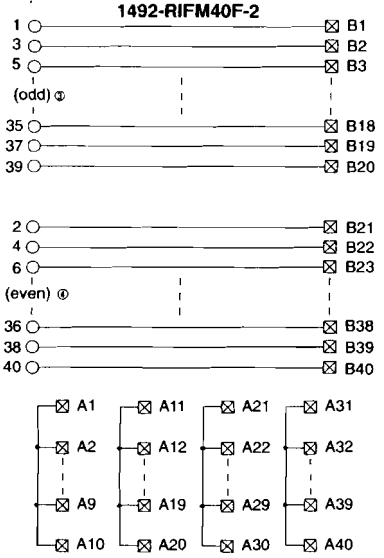


1492-IFM20D24-2

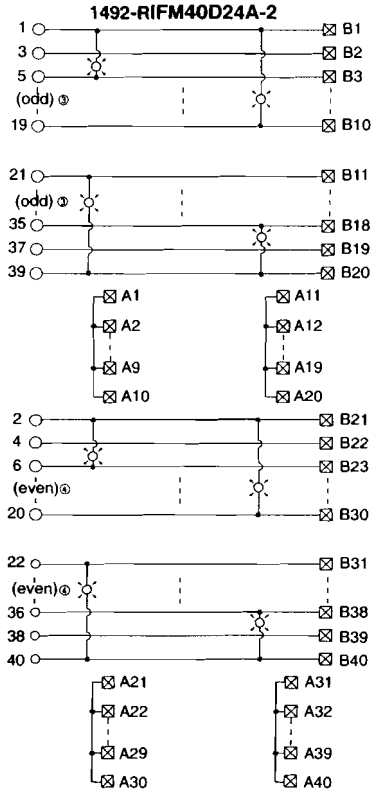


Pinout
Brochage
Anschlußbelegung
Disposizione dei piedini
Esquema de pins

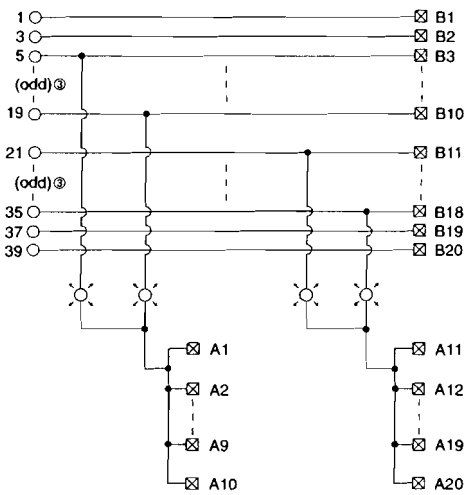
1492-IFM40F-2
1492-RIFM40F-2

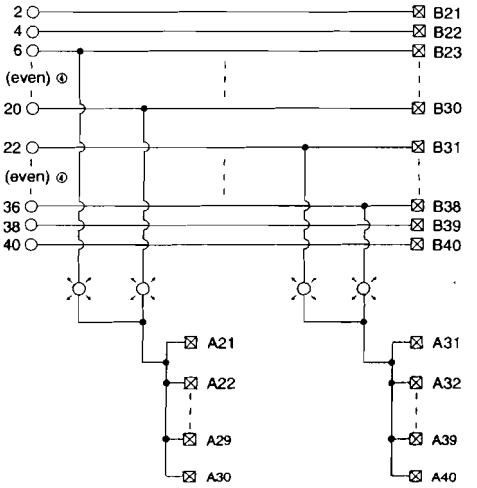


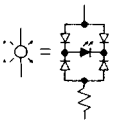
1492-IFM40D24A-2
1492-RIFM40D24A-2



1492-IFM40D24-2







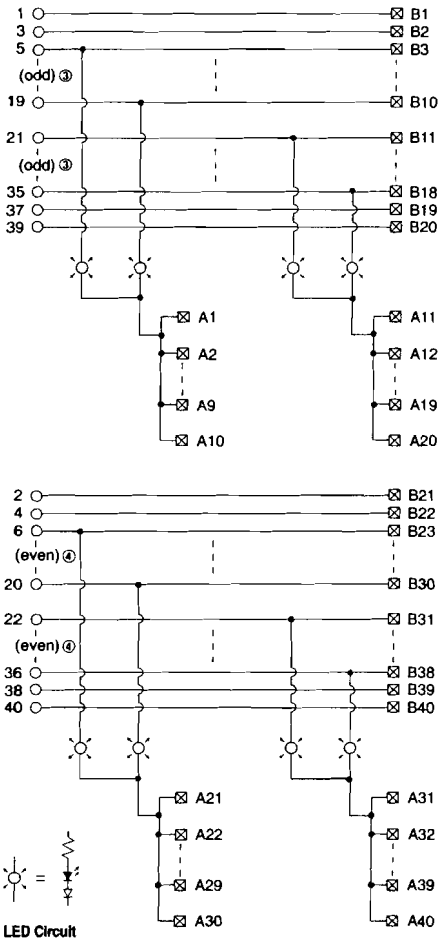
LED Circuit
Circuit du LED
LED-Stromkreis
Circuito del LED

③ Odd
Impair
Ungerade
Dispari
Impar

④ Even
Pair
Gerade
Pari
Par

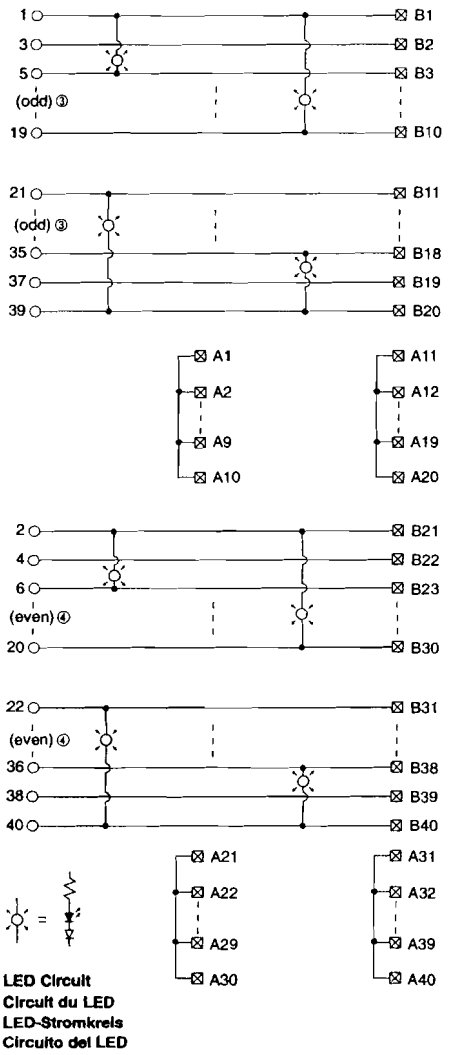
Pinout
Brochage
Anschlußbelegung
Disposizione dei piedini
Esquema de pins

1492-IFM40D120-2



LED Circuit
Circuit du LED
LED-Stromkreis
Circuito del LED

1492-IFM40D120A-2



LED Circuit
Circuit du LED
LED-Stromkreis
Circuito del LED

③ **Odd**
Impair
Ungerade
Dispari
Impar

④ **Even**
Pair
Gerade
Pari
Par

Wiring
Câblage
Verdrahtung
Cablaggio
Cableado

Important: Wiring diagrams are online at **www.ab.com/raise.**
Important: Les schémas et sont disponibles en ligne à l'adresse **www.ab.com/raise.**
Wichtig: Die Schaltpläne finden und unter der Internet-Adresse **www.ab.com/raise.**
Importante: Gli schemi di cablaggio sono illustrati, oppure online all'indirizzo **www.ab.com/raise.**
Importante: Los diagramas de conexiones están en y se encuentran en-línea en **www.ab.com/raise.**

Specifications Technische Daten Especificaciones Spécifications Specifiche

Catalog No. Référence Bestell-Nr. N. Catalogo Referencia	Voltage Range Tension Spannung Tensione Voltaje	Current/Circuit Courant/Circuit Strom/Schaltkreis Corrente/circuito Intensidad/circuito	Current/Module Courant/Module Strom/Modul Corrente/modulo Intensidad/módulo	Indicator Circuit Current Courant circuit voyants Strom, Anzeigeschaltkreis Corrente circuito indicatori Intensidad del circuito de indicadores	Operating Temperature Range Plage températures de fonctionnement Betriebstemperaturbereich Limiti temperatura di funzionamento Rango de temperatura de funcionamient
1492-IFM20F-2	0-264 VAC/DC	2 Amps	12 Amps	N/A	0° C - 60° C
1492-RIFM20F-2	0-264 VAC/DC			N/A	
1492-IFM20D24-2	10-30 VAC/DC			2.0mA	
1492-IFM20D24A-2	10-30 VAC/DC			2.0mA	
1492-IFM20D120-2	85-132 VAC			2.5mA	
1492-IFM20D120A-2	85-132 VAC			2.5mA	
1492-IFM20D240-2	168-264VAC			2.5mA	
1492-IFM20D240A-2	168-264VAC			2.5mA	
1492-IFM40F-2	0-132 VAC/DC			N/A	
1492-RIFM40F-2	0-132 VAC/DC			N/A	
1492-IFM40D24-2	10-30 VAC/DC			2.0mA	
1492-IFM40D24A-2	10-30 VAC/DC			2.0mA	
1492-RIFM40D24A-2	10-30 VAC/DC			2.0mA	
1492-IFM40D120-2	85-132 VAC			2.5mA	
1492-IFM40D120A-2	85-132 VAC			2.5mA	
Ratings when used with 1764-24AWA, and 1764-24BWA outputs. (For inputs use 2 Amps current per circuit.)					
1492-IFM20F-2 1492-RIFM20F-2	0-264 VAC 10-125 VDC	Out 0 - 3, 2 Amps Out 4 - 11, 1 Amp	12 Amps	NA	0°C - 60° C
Ratings when used with 1764-28BXB outputs. (For inputs use 2 Amps current per circuit.)					
1492-IFM20F-2 1492-RIFM20F-2	0-264 VAC 10-125 VDC 24 VDC	Out 0 - 1, 2 Amps Out 8 - 11, 1 Amp Out 2 - 7, 0.5 Amps	12 Amps	NA	0°C - 60° C
Ratings when used with 1762-L40AWA, and 1762-L40BWA outputs. (For inputs use 2 Amps current per circuit.)					
1492-IFM40F-2 1492-RIFM40F-2	0-264 VAC 10-125 VDC	Out 0 - 3, 2 Amps Out 4 - 15, 1 Amp	12 Amps	NA	0°C - 60° C
Ratings when used with 1762-L40BXB outputs. (For inputs use 2 Amps current per circuit.)					
1492-IFM40F-2	0-264 VAC 10-125 VDC 24 VDC	Out 0, 1, 10, 11, 2 Amps Out 12 - 15, 1 Amp Out 2 - 9, 0.5 Amps	12 Amps	NA	0°C - 60° C

Catalog No. Référence Bestell-Nr. N. Catalogo Referencia	Maximum Recurring Peak Voltage ② Tension de crele réurrente maximale Maximale periodische Hochstspannung Tensione massima di cresta ricorrente Voltaje de cresta iterativo máximo	Humidity Humidité Feuchtigkeit Humedad Umidità	Approx.Weight	Dimensions Dimensions Abmessungen Dimensioni Dimensiones	Standards
1492-IFM20F-2	600 Vp②	5 - 95%	.67 lbs. (305 g.)	4.33 in. (110 mm) W 3.27 in. (83 mm) D 2.78 in (70.5 mm) H	UR (File: E113724, Guide No. NRAQ2 CSA (File: LR1234, Class 321107 CE: Compliant for all applicable directives FM Class 1 Div 2 Groups A, B, C and D Temperature Rating T6 = 60°C (J.I. 3000590, all except relay modules)
1492-RIFM20F-2					
1492-IFM20D24-2					
1492-IFM20D24A-2					
1492-IFM20D120-2					
1492-IFM20D120A-2					
1492-IFM20D240-2					
1492-IFM20D240A-2					
1492-IFM40F-2			1.15 lb. (522 g.)	8.27 in. (210 mm) W 3.27 in. (83 mm) D 2.78 in (70.5 mm) H	
1492-RIFM40F-2					
1492-IFM40D24-2					
1492-IFM40D24A-2					
1492-RIFM40D24A-2					
1492-IFM40D120-2					
1492-IFM40D120A-2					

② For transients > 600 Vp use a UL recognized suppression device rated at 2.5 kV withstand.
Pour des transitoires > 600 Vp utilisez un dispositif de suppression certifié UL à 2,5 kV nominal de tenue.
Für Einschaltstöße > 600 Vp verwenden Sie einen UL anerkannten Entstörer, der bewertet wurde bei 2,5 kV standzuhalten.
Per transitori > 600 Vp usare dispositivo di soppressione riconosciuto da UL capace di sopportare 2,5 kV.
Para transitorios > 600 Vp use un dispositivo de supresión reconocido UL clasificado con 2,5 kV.

SURGE SUPPRESSION follow the literature recommendations of the PLC module being used.
La section **SUPPRESSION DES SURTENSIONS** se trouve à la suite de la littérature qui contient les recommandations relatives au module PLC utilisé.
ÜBERSPANNUNGSSCHUTZ Bitte beachten Sie die Dokumentationsempfehlungen für das jeweils benutzte SPS-Modul.
Per la **SOPPRESSIONE DEI PICCHI TEMPORANEI**, seguire le istruzioni riportate nella documentazione in dotazione al Modulo PLC utilizzato.
SUPRESIÓN DE SOBRETENSIÓN, siga las recomendaciones indicadas en la documentación del módulo PLC respectivo.

Reference Publications: Refer to 1770-4.1 and appropriate PLC I/O module installation manual.

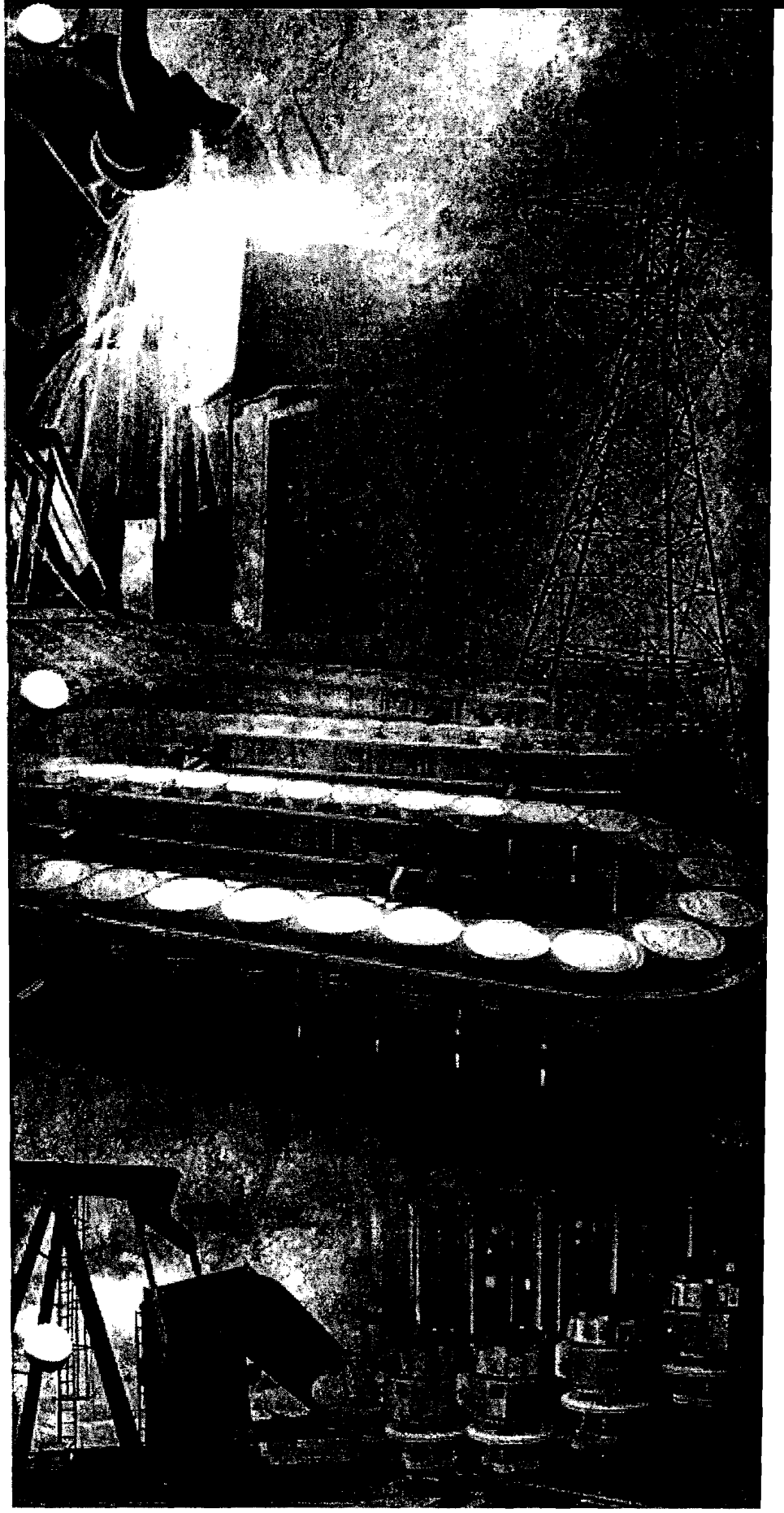
40063-258-01 (17)
Printed in U.S.A.

Rockwell Automation

Section 7-X

Industrial Non-Display Computer

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction



Allen-Bradley

VersaView Industrial Non-Display Computers

200R, 700R, 1400R

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.ab.com/manuals/gi) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc. is prohibited.

Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • identify a hazard • avoid a hazard • recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

Table of Contents

Chapter 4

Replace System Components

Chapter 5

System Troubleshooting

Chapter 6

Maintenance

Appendix A - Specifications

Appendix B - Upgrade to a New BIOS

Index

Read this preface to familiarize yourself with the rest of the manual. The preface covers:

- Who should use this manual
- Purpose of this manual
- Contents of this manual
- Manual conventions
- Additional resources

Who Should Use This Manual

Use this manual if you are responsible for installing, using, or troubleshooting the VersaView Non-Display Industrial Computers:

Catalog Number	Series
6155R-NP2KH	C
6155R-NPXPH	C
6155R-NS2KH	C
6155R-NSXPH	C
6155R-NPXPHACP	C
6183R-NCACP	C
6155R-7P2KH	A
6155R-7PXPH	A
6155R-7S2KH	B
6155R-7SXPH	B
6155R-14P2KH	A
6155R-14PXPH	A
6155R-14S2KH	B
6155R-14SXPH	B

Purpose of This Manual

This manual is a user guide for the VersaView Non-Display Industrial Computers. It gives an overview of the system and describes procedures to:

- Install the computers
- Make computer connections
- Configure the computers
- Troubleshoot the computers

Contents of This Manual

Chapter	Title	Contents
	Preface	Describes the purpose, background, and scope of this manual. Also specifies the intended audience.
1	System Features	Provides an overview of the computers including product options, operating systems, features, accessories, and parts list.
2	Installation	Explains how to install a computer on a machine, wall, DIN rail, or rack. Also explains how to connect a keyboard or mouse, power, and to a network.
3	Operation	Provides operating guidelines and explains how to boot the system, reset the system, and use the Universal Serial Bus (USB) ports.
4	Replace System Components	Describes how to remove the cover, install add-in cards, replace memory modules, connect an external drive, replace the hard drive, and load a memory card.
5	System Troubleshooting	Describes common operating problems, the probable causes, and recommended corrective actions. Also includes hardware diagnostics, troubleshooting procedures and checklists.
6	Maintenance	Provides routine maintenance procedures to replace the battery, fan filter, and how to ship the product.
Appendix A	Product Specifications	
Appendix B	Upgrade to a New BIOS	

Manual Conventions

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps.

Additional Resources

For additional information on the VersaView Non-Display Computers, refer to the following publications:

Publication	Publication Number
User Manual	6155R-UM001
Cloning Utility	6000-TD001

These publications are on the VersaView Accessories/Cloning CD, which ships with your computer. You can also download electronic versions of these publications from the Rockwell Automation website:

http://www.rockwellautomation.com/literature

For Thin Manager Client Modules or software support for the Thin or Thick Client computers, refer to the support link on the ACP website www.acpthinclient.com.

Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors, and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen-Bradley representative for:

- Sales and Order Support
- Product Technical Training
- Warranty Support
- Support Service Agreements

Technical Product Assistance

Before you contact Rockwell Automation for technical assistance, we suggest you please review the troubleshooting information contained in this publication first. If the problem persists, call your local Rockwell Automation representative or contact Rockwell Automation in one of the following ways:

Phone	United States/Canada	1.440.646.5800
	Outside United States/Canada	You can access the phone number for your country via the Internet: 1. Go to http://www.rockwellautomation.com 2. Click on Technical Support links to find 'Phone Support'. 3. Follow the appropriate Technical Support links to find 'Phone Support'.
Internet	⇒	1. Go to http://www.rockwellautomation.com 2. Click on Technical Support.

System Features

Chapter Objectives

This chapter provides an overview of the computer and covers:

- Operating systems
- Product options
- accessories and replacement parts
- Features
- Parts list

Computer Overview

The VersaView Non-Display Computers run factory operations from small visual interface and maintenance applications to large control and information applications. Combine the 200R, 700R or 1400R computer with any VersaView monitor to complete your system.

The computers are available with Windows 2000 or Windows XP operating systems, and offer standard or performance features. Plus, an ACP enabled Thin Client/Thick Client option is available for the 200R model.

All of the computers come standard with Ethernet and serial ports.

Operating Systems

The computers ship with one of the following operating systems:

- Windows 2000
- Windows XP

Computers with the Windows XP operating system ship with a default factory image stored in a recovery partition on the hard drive. You can restore this image at any time in the event of system problems using the Cloning Utility. This utility is on the System Accessories/Cloning CD, which is shipped with each computer.

Computers with the Windows 2000 operating system are not shipped with a default factory image in a recovery partition on the hard drive in accordance with the Microsoft Direct License. If the system becomes unstable, you will not be able to recover a factory image unless you first create one. To create the original factory image, you must use the Cloning Utility to clone a system image of your computer immediately at the first system startup. Refer to the Cloning Utility documentation for instructions.

Product Options

The table summarizes the product options available for the VersaView Non-Display Computers.

Catalog Number	Performance	Operating System
6155R-NP2KH	Performance	Windows 2000
6155R-NS2KH	Standard	
6155R-NPXPH	Performance	Windows XP
6155R-NSXPH	Standard	
6155R-NPXPHACP	ACP Thick Client	Windows XP
6183R-NCACP	ACP Thin Client	N/A
6155R-7P2KH	Performance	Windows 2000
6155R-7S2KH	Standard	
6155R-7PXPH	Performance	Windows XP
6155R-7SXPH	Standard	
6155R-14P2KH	Performance	Windows 2000
6155R-14S2KH	Standard	
6155R-14PXPH	Performance	Windows XP
6155R-14SXPH	Standard	

Accessories and Replacement Parts

You can view a current list of accessories at the Rockwell Automation Allen-Bradley website:

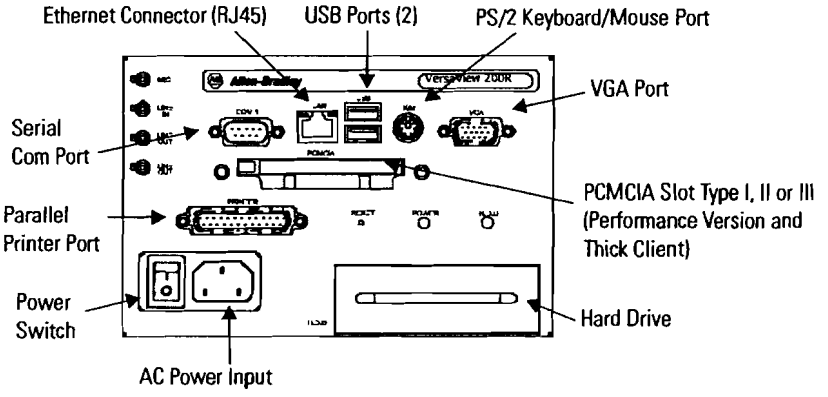
http://www.ab.com/versaview

Features

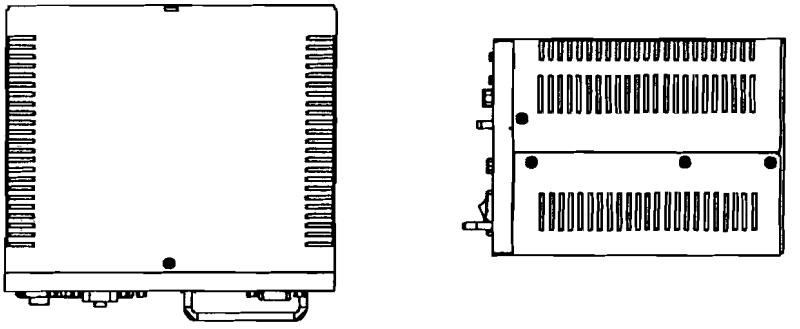
The illustrations show the features of each computer.

200R Computer

Front View

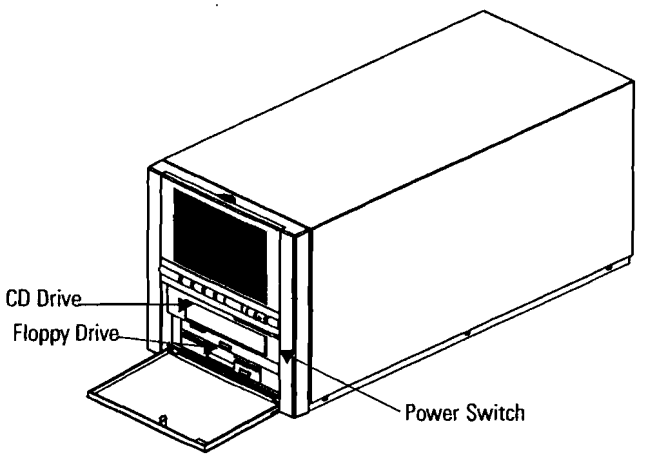


Top and Side Views

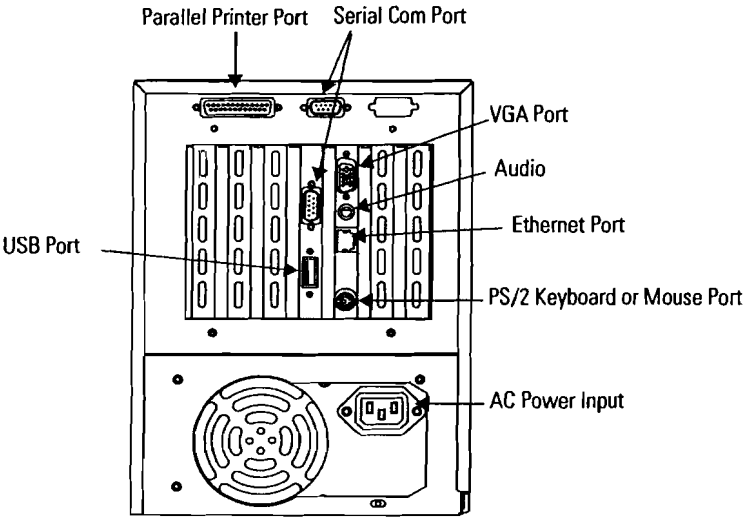


700R Computer

Front View

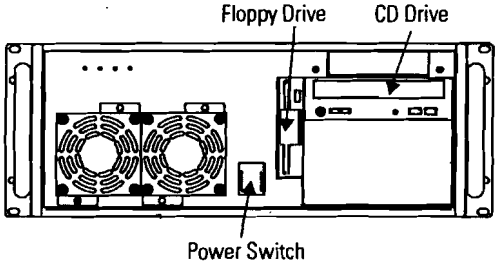


Back View

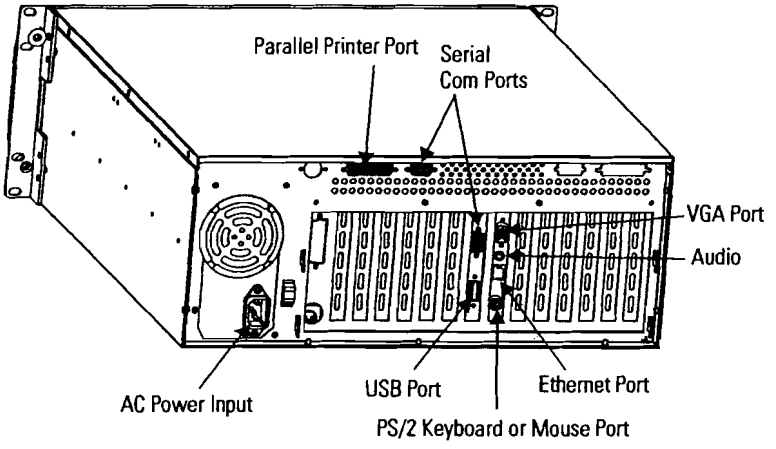


1400R Computer

Front View



Back View



Before You Begin

Before unpacking the product, inspect the shipping carton for damage. If damage is visible, immediately contact the shipper and request assistance. Otherwise, proceed with unpacking.

Keep the original packing material in case you need to return the product for repair or transport it to another location. Use both the inner and outer packing cartons to ensure adequate protection for a unit returned for service.

Parts List

The computers ship with:

- VersaView System Accessories/Cloning CD - 6155R computers
- VersaView Operating System Rebuild CD - 6155R computers
- VersaView 6186, 6183 & 6189 Accessories CD - 6183R Thin Client computer
- Installation instructions
- AC power cord
- PS/2 adapter cable to connect both a keyboard and a mouse
- Mounting hardware

Installation

Chapter Objectives

This chapter shows how to install your computer on a machine, wall, DIN rail, or rack, and how to make computer connections.

Review each mounting type and the product dimensions before installation.

European Union Compliance

This product meets the European Union Directive requirements when installed within the European Union or EEA regions and have the CE mark. A copy of the Declaration of Conformity is available at the Rockwell Automation / Allen-Bradley website: www.ab.com/certification.

ATTENTION

This product is intended to operate in an industrial or control room environment, which utilizes some form of power isolation from the public low voltage mains. Some computer configurations may not comply with the EN 61000-3-2 Harmonic Emissions standard as specified by the EMC Directive of the European Union. Obtain permission from the local power authority before connecting any computer configuration that draws more than 75 watts of AC power directly from the public mains.

ATTENTION

To comply with EN 55024 and EN 61000-6-2, the Ethernet port LAN cable must be less than 30 m (98.42 ft) long, and it must only be used indoors (i.e., not exit the building at any point). All other I/O cables must be less than 3 m (9.842 ft), and must only be used indoors.

Environment and Enclosure Information

Review the information on enclosures and environments before installing the product.

ATTENTION

Environment and Enclosure

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as 'open type' equipment. UL Recognized equipment must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. UL listed equipment does not need to be mounted inside another enclosure. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

Required Tools

- #2 Phillips screwdriver
- Drill motor and drill bit

Mounting Hardware

Description	Quantity	Used For	Applies to
Mounting Brackets	2	Wall or machine mounting	VersaView 200R VersaView 700R
Mounting Screws	8	Wall, machine, DIN rail, or rackslide mounting	VersaView 700R
	12		VersaView 200R VersaView 1400R
Rack Handles	2	Rack mounting	VersaView 1400R
DIN Rail Bracket	1	DIN rail mounting	VersaView 200R

Mounting Clearances

Review the product dimensions to make sure you allow adequate clearance on the sides and rear of the computer for adequate ventilation and cable connections. You must also be able to remove the covers if you want to install or remove peripheral components.

Install the Computer

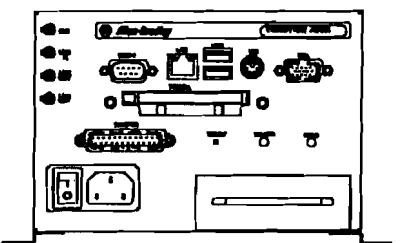
There are various ways to install the computer:

- Machine mount (200R and 700R)
- Wall mount (200R)
- DIN rail mount (200R)
- Rack mount (1400R)

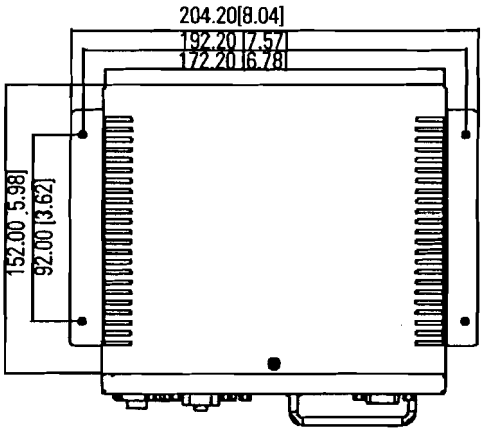
Mount the Computer on a Machine

You can mount the VersaView 200R and 700R computers on a shelf inside a machine using mounting brackets. The brackets secure the computer to the shelf.

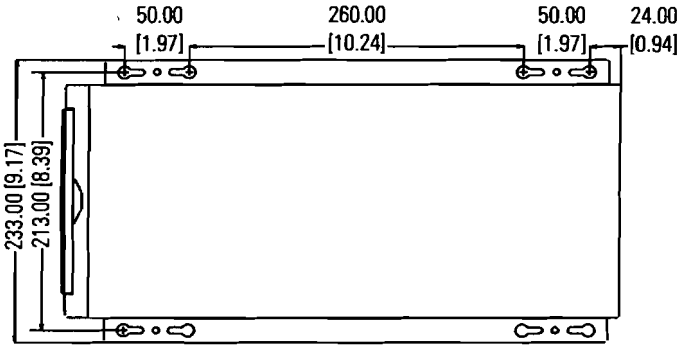
1. Attach the two mounting brackets to the bottom of the computer using four screws.



2. Drill holes in the shelf that correspond to holes in the mounting brackets:
   - The 200R requires four holes.
   - The 700R requires eight holes.



VersaView 200R



VersaView 700R

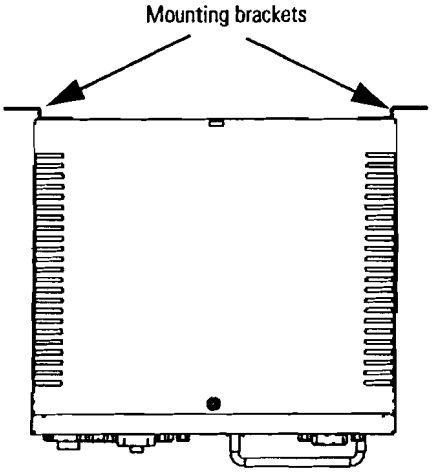
3. Place the computer on the shelf and align the holes in the mounting brackets with the holes in the shelf.

4. Insert the remaining screws through the mounting bracket into the shelf and tighten.

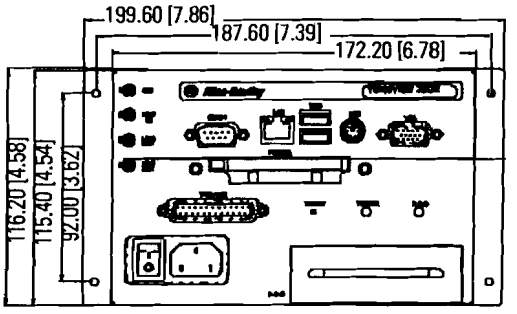
Mount the Computer on a Wall

You can mount the VersaView 200R computer on a wall inside a machine using mounting brackets. The brackets secure the computer to the wall.

1. Attach the two mounting brackets to the rear of the 200R computer using four of the provided screws.



2. Drill four holes in the wall on which the VersaView 200R is to be mounted, that correspond to the holes in the mounting brackets.



3. Place the computer on the wall and align the holes in the mounting brackets with the holes in the wall.

TIP Support the computer with a shelf or other means, to make installation at the appropriate height easier.

4. Insert the remaining screws through the mounting bracket into the wall and tighten.

Mount the Computer on a DIN Rail

You can mount the VersaView 200R computer on a DIN rail.

IMPORTANT Do not mount the computer on a DIN rail in high shock and vibration environments.

1. Snap the DIN rail bracket onto the back side of the computer.
2. Use four screws, the longest screws provided, to fasten the DIN rail bracket.
3. Mount the computer on a DIN rail.

Mount the Computer on a Rack

You can install the VersaView 1400R computer in a rack cabinet that conforms to EIA standards for equipment with 483 mm (19 in) wide panels. The cabinet must accommodate the computer's height and depth, and also provide rear clearance for cables and air flow. A cabinet with a depth of 610 mm (24 in) is sufficient.

The computer must be supported by rack slides or fastened to a shelf. The four flanges of the computer are only intended to horizontally secure the unit to the front mounting rails of the rack cabinet.

1. Review the product dimensions to confirm that there is adequate space behind the cabinet for cables and air flow.
2. Install the rackslides inside the rack cabinet.
3. Attach the rack slides to the computer. Align the rack slides to the corresponding slides inside the cabinet.
4. Insert the computer in the rack cabinet from the front of the cabinet.

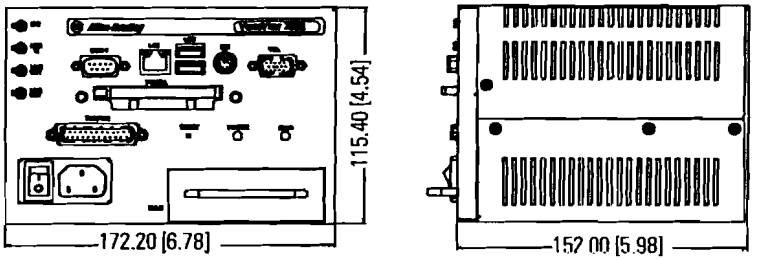
TIP Support the computer with a shelf or other means, to make installation at the appropriate height easier.

5. Fasten the two rack handles to the front of unit using the included screws.
6. Horizontally secure the computer to the front mounting rails of the rack cabinet with the included screws.

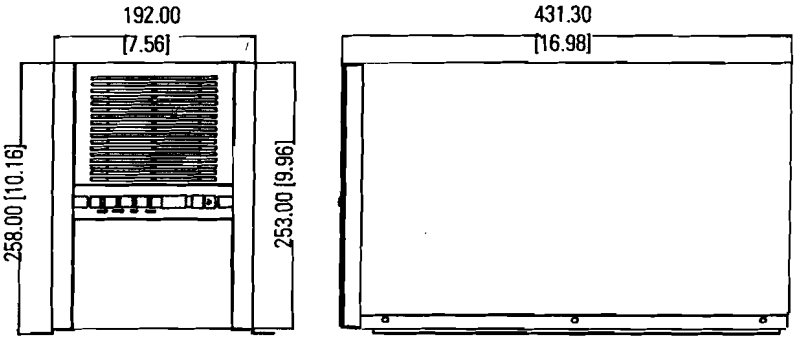
Product Dimensions

The illustrations show product dimensions in mm (in).

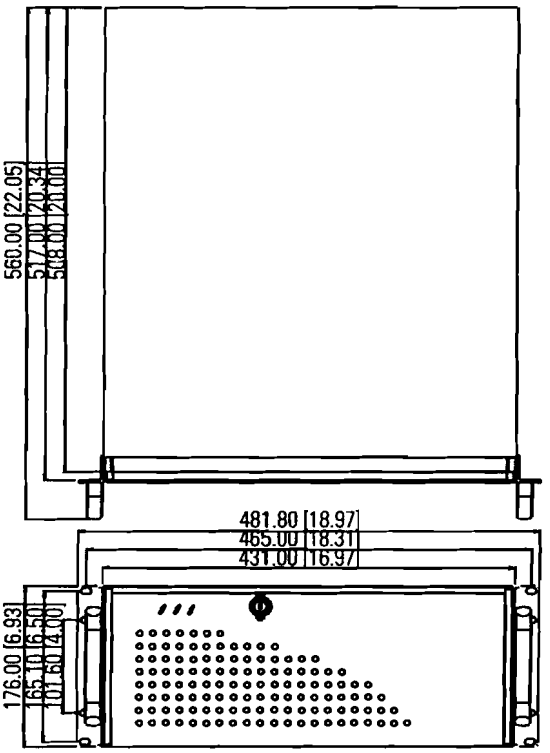
VersaView 200R Industrial Computer Dimensions



VersaView 700R Industrial Computer Dimensions

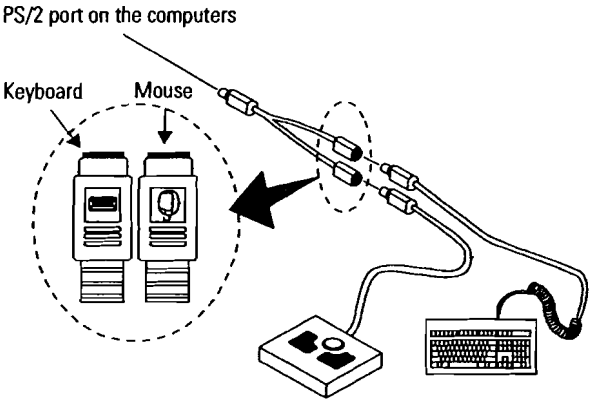


VersaView 1400R Industrial Computer Dimensions



Connect the Keyboard and Mouse

You can plug either a keyboard or mouse into the PS/2 port on the computer. You can connect the two devices simultaneously using the PS/2 adapter cable that is shipped with the computer.



Connect the Power

A standard IEC 320 power cord provides power to the computer. The power supply input accepts 120/240V ac. The power supply is autoswitching.

Operate the computer in an industrial or control room environment, which uses some form of power isolation from the public low voltage mains.

ATTENTION

Connect the AC power cord to a power source with an earth ground to prevent electrical shock. Failure to follow this warning could result in electrical shock.

The computer circuit should have its own disconnect. Use an Uninterruptible Power Source (UPS) to protect against unexpected power failure or power surges.

Always shut down the operating system before removing power to minimize performance degradation and operating system failures.

Connect to the Network

The computer connects to the Ethernet network using CAT5 or CAT5E twisted pair Ethernet cabling with RJ45 connectors.

IMPORTANT

To prevent performance degradation of Ethernet communications, do not subject the computer or cables to extreme radiated or conducted high-frequency noise.

Proper cable routing and power conditioning is required to ensure reliable Ethernet communications in industrial environments. Rockwell Automation recommends that you route all Ethernet cabling through dedicated metal conduits. Installing ferrite bead filters at the cable ends may also improve reliability.

Operation

Chapter Objective

This chapter covers:

- Operating guidelines
- Booting the system
- Resetting the system
- Universal Serial Bus (USB) ports
- ACP Thin or Thick Client

Operating Guidelines

Follow these operating guidelines for your computer:

- Avoid turning the system on and off frequently.
- Never turn the system off when the hard drive indicator light is illuminated. This is not applicable to 6183R Thin Client computers.
- Always use the proper power down procedures as required by your operating system, such as the Shut Down command in Microsoft Windows. This is not applicable to the 6183R Thin Client computers.
- Do not operate the computer with the covers removed. An electrical shock hazard exists. Removing the covers will disrupt air flow and may result in overheating. All covers are required to maintain EMI shield.

ATTENTION

After shutting the system off, do not move the computer, or turn it back on again, until the hard drive comes to a complete stop, which takes about 30 seconds. This is not applicable to 6183R Thin Client computers.

If you are using an external monitor, turn on the monitor first.

Boot the System

Apply power to the computer. The computer performs a Power On Self Test (POST). The processor board, memory, keyboard, and certain peripheral devices are tested.

Use a monitor if you want to view the progress of the POST and initialization of accessory devices. The monitor displays the startup dialogs for the operating system that is installed, or a Windows session from the server for Thin and Thick Client.

If your system does not boot up, or you notice other problems, refer to the System Troubleshooting chapter.

Reset the System

To reset the computer, press Ctrl+Alt+Delete on an attached keyboard and follow the operating system instructions.

After resetting, the computer begins the Power On Self Test (POST). During a reset, the computer:

- Clears RAM
- Starts the POST
- Initializes peripheral devices, such as drives and printers
- Loads the operating system (if installed), or starts a Windows Session

Universal Serial Bus (USB) Ports

The Universal Serial Bus (USB) is an external bus standard that supports data transfer rates of 12 Mbps (12 million bits per second).

You can connect multiple peripheral devices to the USB ports such as a mouse, modem, and keyboard. USB also supports Plug-and-Play installation and hot plugging. For Thin or Thick Client Windows Sessions, only use USB devices that are supported by ACP. Refer to the ACP website www.acpthinclient.com for information and support.

For information on installing or using USB, refer to the documentation for your USB peripheral device.

TIP Many USB devices only work with Windows XP or Windows 2000 because these operating systems have native USB drivers. Make sure the selected USB peripheral has software drivers available for your target operating system.

ACP Thin or Thick Client

For Thin Manager Client Modules or software support for the Thin or Thick Client computers, refer to the support link on the ACP website www.acpthinclient.com.

Replace System Components

Chapter Objectives

This chapter provides procedures to:

- Remove the cover
- Install add-in cards
- Replace the hard disk drive
- Connect an external drive
- Replace memory modules
- Load a PCMCIA memory card

Accessories and Replacement Parts

You can view a current list of accessories at the Rockwell Automation Allen-Bradley website:

http://www.ab.com/versaview

Safety Precautions

The computers contain line voltages. Disconnect all power to the computer before you install or remove system components.

ATTENTION

Disconnect power from the computer before removing components. Failure to disconnect power could result in severe electrical shock and/or damage the computer.

Electrostatic Discharge (ESD)

ATTENTION

Electrostatic Discharge (ESD) can damage the computer and components. Make sure you work in a static-safe environment and wear a grounding strap whenever handling circuit boards, power supply, memory modules or other internal components.

Remove the Cover

To maintain, install, or upgrade computer components, you must first remove the cover.

ATTENTION

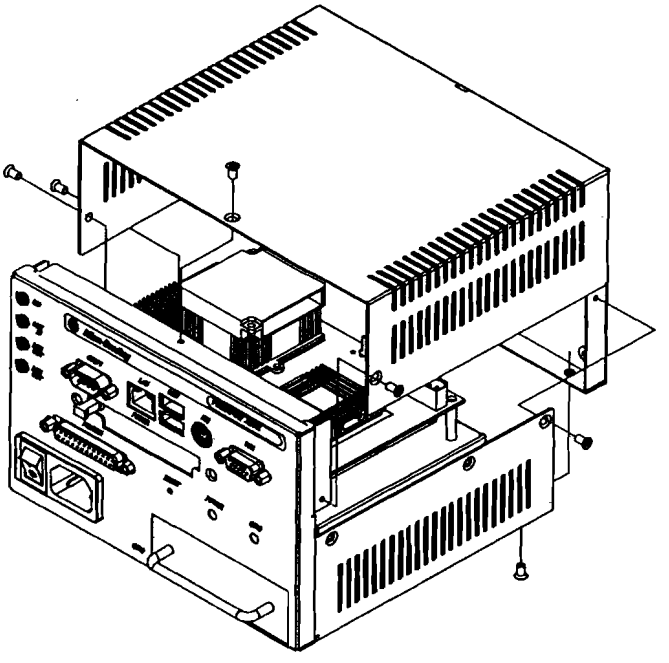
Failure to follow proper safety precautions could result in severe electrical shock and/or damage to the computer.

Required Tools

#2 Phillips screwdriver

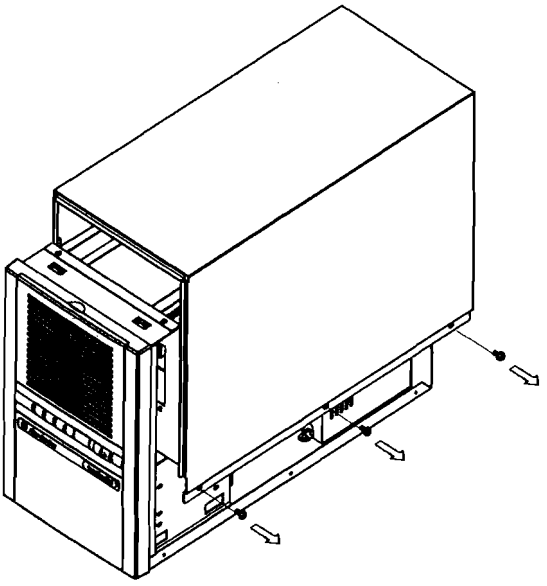
Remove the Cover on the 200R

1. Disconnect power from the computer.
2. Remove the top screw, two screws on each side, and two bottom screws.
3. Remove the top plate.



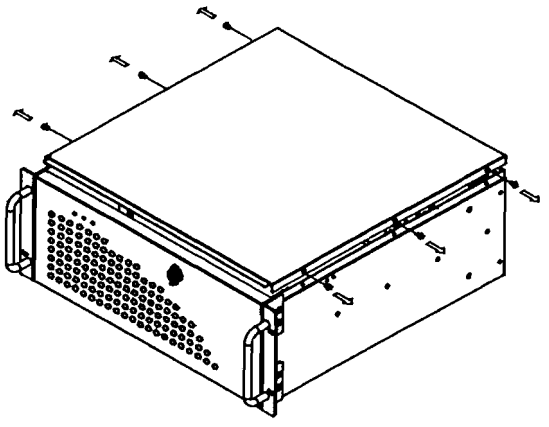
Remove the Cover on the 700R

1. Disconnect power from the computer.
2. Remove the three screws on each side.
3. Remove the top plate.



Remove the Cover on the 1400R

1. Disconnect power from the computer.
2. Remove the three screws on each side.
3. Remove the top plate by moving it back, then up.



Install Add-In Cards

You can install PCI or ISA add-in cards to the 700R and 1400R computers.

ATTENTION

Failure to follow proper safety precautions could result in severe electrical shock and/or damage to the computer.

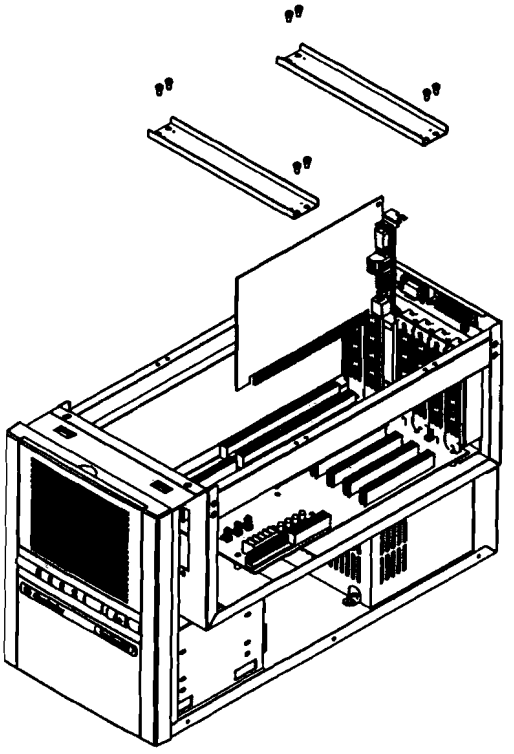
ATTENTION

Add-in cards are sensitive to ESD and require careful handling. Hold cards only by the edges. Do not touch connectors, components, or circuits. After removing a card, place it on a flat, static-free surface, component side up. Do not slide the card over any surface.

Required Tools

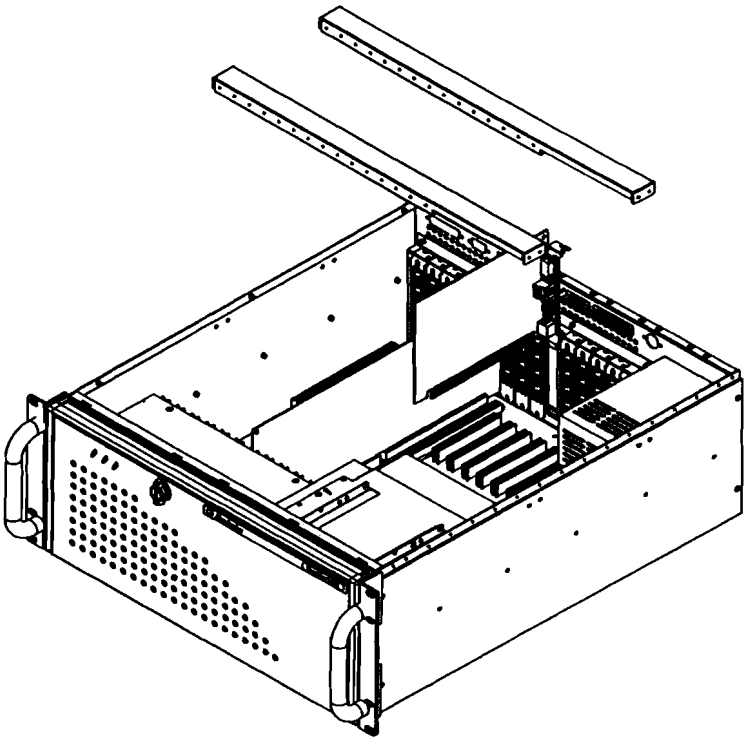
#2 Phillips screwdriver

Install Add-in Cards to the 700R



1. Disconnect power from the computer.
2. Remove the top cover.
3. Remove the four screws in each hold-down bar.
4. Remove the hold-down bars.
5. Remove the screw and blank orb from the selected slot.
6. Gently, but firmly, install the add-in card into the appropriate expansion slot and screw in the orb.
7. Replace the two top hold-down bars and four screws in each bar.
8. Replace the top cover.

Install Add-in Cards to the 1400R



1. Disconnect power from the computer.
2. Remove the top cover.
3. Remove the four screws on each hold-down bar.
4. Remove the hold-down bars.
5. Remove the screw and blank orb from the selected slot.
6. Gently, but firmly, install the add-in card into the appropriate expansion slot and screw in the orb.
7. For low profile cards, loosely attach a padded hold-down finger to the hold-down bar.
8. Replace the two top hold-down bars and four screws in each bar.
9. Position and tighten the hold-down finger, if appropriate.
10. Replace the top cover.

Replace the Hard Disk Drive

Follow these precautions when working with the hard disk drive.

- Do not touch internal components.
- Always handle the hard disk drive by its metal frame.
- Store the hard disk drive in an anti-static bag when it is not installed.
- Never remove or install a hard disk drive with the power on.

ATTENTION

Failure to follow proper safety precautions could result in severe electrical shock and/or damage to the computer.

ATTENTION

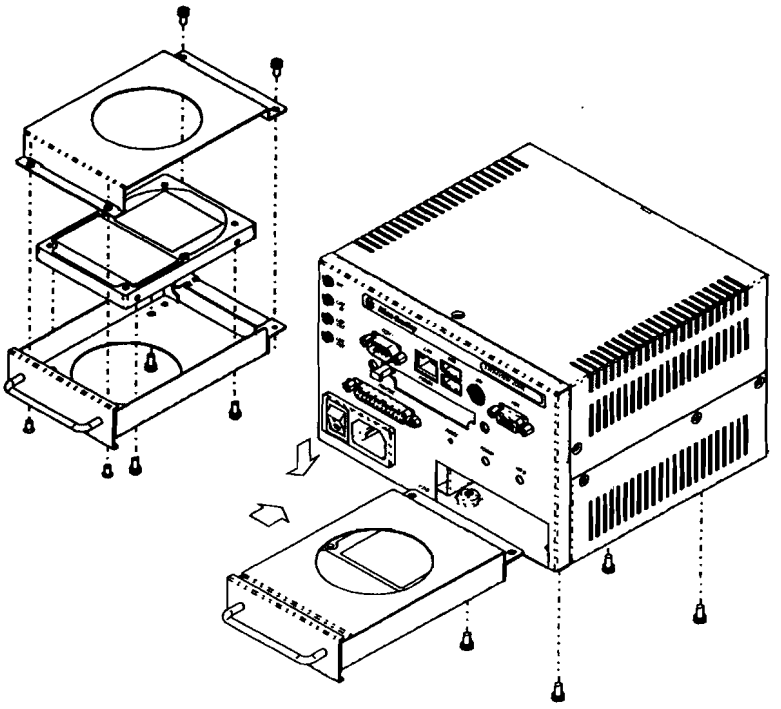
Electrostatic Discharge (ESD) can damage the computer and components. Make sure you work in a static-safe environment and wear a grounding strap whenever handling circuit boards, power supply, memory modules or other internal components.

ATTENTION

Mechanical shock can damage a hard drive. Do not drop or bump the drive.

Remove the Hard Disk Drive on the 200R

1. Disconnect power from the computer.
2. Remove the four screws from the bottom of the enclosure that secure the hard disk drive assembly.
3. Pull the handle to slide the hard disk drive carrier out of the enclosure.
4. Disconnect the ribbon cable from the hard disk drive.
5. Remove the screws that hold the hard disk drive carrier together.
6. Open the hard disk drive top bracket.
7. Lift the hard disk drive out of the carrier.



Install the Hard Disk Drive on the 200R

1. Place the hard disk drive bracket on top of the hard drive and secure it to the carrier with screws.
2. Connect the ribbon cable to the hard disk drive.
3. Gently slide the hard disk drive assembly into the slot.
4. Secure the hard drive carrier by fastening the four screws to the bottom of the enclosure.

Connect an External Drive

Observe these precautions when you connect an external drive:

- Always handle the media by its case.
- Avoid touching the cable connectors.
- Remove disks before disconnecting power to the drive.
- Do not expose the external drive to severe shock or temperature.
- Operate the external drive only on a flat surface.
- Do not move the external drive while it is operating.

Sample External Drives

Examples of external drives are:

- Lacie 1.44 MB USB floppy drive. (Model number 706018) (www.lacie.com)
- Lite-On External USB Slim CDRW/DVD-ROM Combo Drive (Model number LSC-24081MX) (www.liteonit.com.tw)

Connect External Drive to the Computer

1. Turn on power to the computer.
2. Connect the AC plug for the external drive to a power source.
3. Connect the drive to the USB port on the computer.
4. Follow the manufacturer's instructions to load any required software drivers and to configure the computer to operate with the external drive.

Add or Remove the Memory Modules

The CPU board in the 700R and 1400R computers has two 168-pin sockets. Each socket supports a single or double-sided 3.3V Dual In-Line Memory Module (DIMM). Use the Allen-Bradley DIMM module in the table for memory replacement or expansion.

Memory Module	Cat. No.
512 MB DIMM Memory Module	6189V-DIMM512

TIP It is recommended that you use only qualified Allen-Bradley parts.

Guidelines for Replacing Memory

ATTENTION ESD can damage the computer and components. Make sure you work in a static-safe environment and wear a grounding strap whenever handling circuit boards, power supply, memory modules or other internal components.

Follow these guidelines when adding memory to the 700R or 1400R CPU board:

- Use only a standard, 168-pin unbuffered DIMM that conforms to both PC-133, and Serial Presence Detect (SPD) compliance industry standards.
- Use only Synchronous Dynamic Random Access Memory (SDRAM) type DIMMs.
- BIOS automatically detects memory size and type.
- Use only gold-plated lead DIMMs.
- Always handle the memory cards by the ends, not by the memory module contacts.
- Store memory in a sealed, anti-static bag when it is not installed.
- Never install or remove memory with the power on.

Add or Remove Memory

1. Disconnect the power from the 700R or 1400R computer.
2. Remove the top cover.
3. Remove any retaining brackets blocking access to the memory module.

   The DIMM sockets are near the top of the CPU board.
4. Remove the existing memory modules from the CPU card by clipping the cable tie, and pressing outward on the retaining latches.
5. To install a new DIMM, hold the module only by the edges as you remove it from its anti-static package.
6. Position the DIMM so that the small notches in the bottom edge of the DIMM align with the notches in the DIMM socket on the CPU card. The retaining latches should be fully disengaged, or open, when you install a DIMM.
7. Press down firmly, and uniformly, on the DIMM to seat it in the socket.

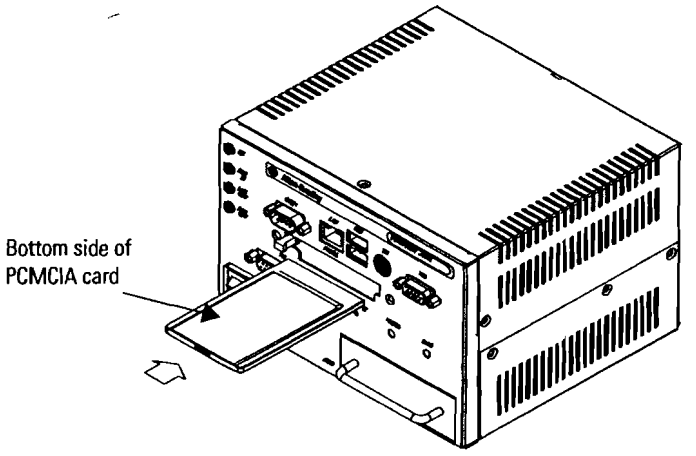
   The latches must engage in the DIMM slot to secure the DIMM.
8. Replace the tie wrap around the DIMM and latches to fully secure the DIMM.
9. Replace the top cover.

Use a PCMCIA Card

The VersaView 200R has a slot for a PCMCIA card.

Install a Memory Card

1. Locate the PCMCIA card slot on the front of the terminal.



2. Insert the card with the top of the card facing down into the card slot until firmly seated.

ATTENTION

Do not force the card into the slot. Forcing the card into the slot may damage the connector pins.

Remove a Memory Card

1. Press the eject button to the left of the card slot. When the button pops out, press it again to release the card.
2. Remove the card from the slot.

System Troubleshooting

Chapter Objectives

This chapter describes the common operating problems, the probable causes, and recommended corrective actions. It includes:

- Troubleshooting procedure
- Troubleshooting checklists

Troubleshooting Procedure

To identify and isolate a problem, perform this procedure when a problem occurs:

1. Shut down the computer's operating system using the appropriate method for your operating system.
2. Disconnect the power to the computer.
3. Disconnect peripheral devices such as a printer or external drive.
4. Connect the keyboard and mouse, if used.
5. Check the video connections if using an external monitor.
6. If the system normally boots from the hard drive, make sure a disk is not in the floppy drive.
7. Connect power to the computer.

   On powerup, monitor the Power On Self Test (POST). One of three events will occur:

   - The computer completes the bootup process.
   - An error message displays to indicate a non-fatal fault. You may have to acknowledge the message before the bootup process continues.
   - The bootup process terminates if a fatal error occurs.

8. If the system boots up, isolate the problem by connecting peripheral devices one at a time until the problem occurs. If the problem is with a specific software package, or driver, re-install the software.

9. If the problem is not related specifically to a software installation or peripheral device, refer to the troubleshooting checklists.

Troubleshooting Check Lists

Use the following checklists to test or verify items.

If you are having problems during bootup:

- Are all connections secure?
- Are the device drivers installed?
- Are the jumpers on any add-in boards correctly positioned?
- If booting from a hard drive, is the hard drive formatted and set up in the BIOS?
- Is the RAM memory properly installed? You may want to re-install it to ensure a good connection.
- If booting from a hard drive, is the IDE cable from the hard drive properly connected? You may want to check if the system will boot from a floppy disk.
- Is BIOS properly configured? Select 'Load Optimal Default' in the CMOS setup procedure. This restores the BIOS settings to the original factory settings.

If there is a problem after bootup:

- If you are running a software package, reinstall the software.
- If the problem is intermittent, you may have a loose connection. Check all connections including any ISA/PCI cards. Check that the memory module is fully installed.
- Does your system have a computer virus? Run anti-virus software.
- Select 'Load Optimal Default' in the CMOS setup procedure. This will restore the BIOS settings to the original factory settings.
- Although the computers have a regulated and protected power supply, a transient voltage in the power line or peripheral cable may cause a flickering display, unexpected reboots, or a locked up system. If so, exit the application and start over.
- Is the IDE cable from the hard drive properly connected? You may want to check if the system will boot from a floppy drive.
- Is the system overheating? Verify that the chassis fan is working.

- Check the alarm light on the 700R or 1400R computer. The light indicates one of three failures that may require service.
  - The CPU fan is not operating at the correct speed.
  - The CPU temperature is elevated beyond its rating.
  - One of the power supply voltages is outside its specified range.

  If the alarm light remains on, the computer should be returned for service.

If there is a problem running new software:

- Does the software have a hardware requirement that is not present?
- Are you using an authorized copy of the software? Some copies of software will not work without proper activation.
- Did the software install correctly? Reinstall the software.
- Are you following the software's instructions? Refer to the software vendor's user manual.
- For the Thin and Thick Client computers, refer to the support link on the ACP website www.acpthinclient.com.

If there is a problem with an add-in card:

- Is the card installed and configured correctly? Check the jumper and other configuration settings.
- Are cables incorrectly installed?
- If the card uses a dedicated interrupt you may need to 'reserve' that interrupt in the CMOS setup PCI/PNP menu.

If incorrect characters are displayed or are distorted:

- Are the display contrast and brightness controls properly adjusted? Refer to the operating system containing the video driver for setup functions.
- Is the monitor compatible with the selected video mode?

If characters are not displayed on an external monitor:

- Is the monitor functioning properly? Verify the monitor function by operating it with another computer.
- Is the video cable properly installed?
- Check that selected character color is not the same as the background color.
- Is the video driver properly installed?
- Reboot the computer with the external monitor connected and powered on.

Maintenance

Chapter Objectives

This chapter provides information on how to:

- Replace the battery
- Replace the fan filter
- Ship or transport the computer

Replace the Battery

The computer contains a lithium battery to maintain CMOS settings and the real-time clock. The battery is in a battery holder on the computer's CPU board. Replace this battery as needed with a Panasonic battery, part number CR2032, or equivalent.

WARNING

To avoid the danger of explosion, only replace the battery with part number CR2032 or a recommended equivalent. Dispose of used batteries according to the manufacturer's instructions.

The battery life depends on the amount of on-time (time computer is powered on) per week. The table lists the estimated life of the battery.

On-Time	Expected Battery Life
0 hours/week	4 years
40 hours/week	5.5 years
80 hours/week	7 years

Replace the Fan Filter

Replace the fan filters every 6 to 12 months. The replacement schedule depends on the environment. The more severe the environment, the more often you need to replace the filter.

Ship or Transport the Product

If you need to ship the product via common carrier or otherwise transport it to another location, you must first uninstall the product and place it in its original packing material.

ATTENTION

Do not ship or transport the product when it is installed in a machine, panel or rack. Doing so may cause damage to the product. You must uninstall the product and place in its original packing material before shipping. Rockwell Automation is not responsible for damage incurred to a product that is shipped or transported while installed in a machine, panel or rack.

Specifications

VersaView Industrial Non-Display Computers Specifications

Specification	Value
System	
Display Description	Requires External Monitor
Processor Type Standard Models 200R 700R 1400R Performance Models 200R 700R 1400R	 VIA C3 Pentium 4 Celeron Pentium 4 Celeron VIA C3 Pentium 4 Pentium 4
Expansion Slot Description 200R 700R 1400R	 1 PCMCIA Slot (Type 1, 2, 3 Cards) on Performance units Half-length: 3 PCI slots, Full-length: 2 ISA slots, 1 Compact Flash Connector (internal) Half-length: 3 PCI, 2 ISA slots, Full-length: 4 PCI, 3 ISA slots, 1 Compact Flash Connector (internal)
RAM Standard Performance	 256 MB 512 MB
Hard Drive 200R 700R 1400R	 40 GB (No HDD on 6183R-NCACP) 80 GB 80 GB
Removable Media Standard Models 200R 700R 1400R Performance Models 200R 700R 1400R	 - 3.5 in Floppy Drive, Slim CD-ROM Drive 3.5 in Floppy Drive, CD-ROM Drive - 3.5 in Floppy Drive, Slim DVD-ROM / CD-RW Drive 3.5 in Floppy Drive, DVD-ROM / CD-RW Drive
I/O 200R 700R, 1400R	 1 Serial port, 1 PS/2 port (keyboard/mouse), 1 Parallel port, 10/100 Mbps Ethernet Port, 1 VGA Port, 2 USB 1.1 ports, Audio Line In/Line Out & Microphone 2 Serial ports, 1 PS/2 port (keyboard/mouse), 1 Parallel port, 1 Ethernet Port 10/100 Mbps, 1 VGA Port, 1 USB 1.1 port, Audio Out
Operating System	Windows XP, Windows 2000
Thin Client Option	ACP Enabled Thin/Thick Client options (200R only)

Specification	Value
Electrical	
Input Voltage, AC	90...264V ac, autoranging
Line Frequency	47...63 Hz
Power Consumption, AC 200R 700R 1400R	 30 W (0.5 A @ 100 Vrms, 0.28 A @ 240 Vrms) 130 VA (1.3 A @ 100 Vrms, 0.54 A @ 240 Vrms) 150 VA (1.5 A @ 100 Vrms, 0.63 A @ 240 Vrms)
Mechanical	
Weight 200R 700R 1400R	 2.1 kg (4.7 lb) 10.8 kg (23.7 lb) 17.4 kg (38.3 lb)
Dimensions (HxWxD) 200R 700R 1400R	 115 x 172 x 152 mm (4.54 x 6.78 x 5.98 in) 258 x 192 x 431 mm (10.16 x 7.56 x 16.98 in) 176 x 482 x 560 mm (6.93 x 18.97 x 22.05 in)

Environmental

Specification	Value
Operating Temperature	0...50 °C (32...122 °F)
Storage Temperature	-20...60 °C (-4...140 °F)
Relative Humidity	10...90% non-condensing
Shock, Operating	15 g (1/2 sine, 11 ms)
Shock, Non-Operating	30 g (1/2 sine, 11 ms)
Vibration, Operating	0.006 in. p-p, 10...57 Hz 1 g peak, 57...500 Hz
Vibration, Non-operating	0.012 in. p-p, 10...57 Hz 2 g peak (57...500 Hz)
Enclosure Ratings	NEMA Type 1

Certifications

Certifications
UL 60950 recognized component, c-UL 950 recognized component, or UL/c-UL listed when marked
CE marked for all applicative directives LVD (73/23/EEC) EMC (89/336/EEC)
C-Tick

Upgrade to a New Bios

Introduction

If a new BIOS is released to enhance the performance of your computer, or to correct a defect, you can download the BIOS and update your computer. Download the BIOS from the Rockwell Automation Allen-Bradley website www.ab.com.

BIOS Update Procedure

1. Download the BIOS from http://www.ab.com/versaview.

   Locate BIOS under Support Services>Drivers.

2. Load a blank disk in the floppy drive of your computer.

   For the 200R computer, connect an external floppy drive.

3. Launch the BIOS copy application by double-clicking on the executable file that you downloaded in step 1.

   The application will copy the BIOS loader to the disk.

4. Boot the computer using the floppy disk created in step 3.

5. Follow the directions that display on the computer screen to properly update the BIOS.

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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Section 7-Y

Remote Access Dial-in Ethernet Modem

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Rockwell Automation

9300-RADES

Remote Access Dial-In Ethernet Modem

Technical Reference Manual

Doc#

Contacting Rockwell Automation	Technical Support Contact Information found at: http://support.rockwellautomation.com/contactinformation/
Web Support	Remote Access Website: http://support.rockwellautomation.com/modem/modem_Main.asp Rockwell Automation Knowledgebase: http://support.rockwellautomation.com/knowledgebase/ Submit Online Support Request: http://support.rockwellautomation.com/supportrequests/ Access My Support: http://support.rockwellautomation.com/mysupport.asp Download Latest Rockwell Software product updates: http://support.rockwellautomation.com/webupdates/ Download Firmware Updates: http://support.rockwellautomation.com/controlflash/ Manuals Online: http://www.ab.com/manuals/
On-Site Support	Emergency Service in the US call (all hours): 1-800-800-0522 Emergency Service outside the US (all hours): Contact your local sales office. * Learn more about emergency/scheduled callout at: http://support.rockwellautomation.com/SupportPrograms/default.asp
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*for sales office nearest you visit http://rockwellautomation.com and click on the locations link.

Important Disclaimers

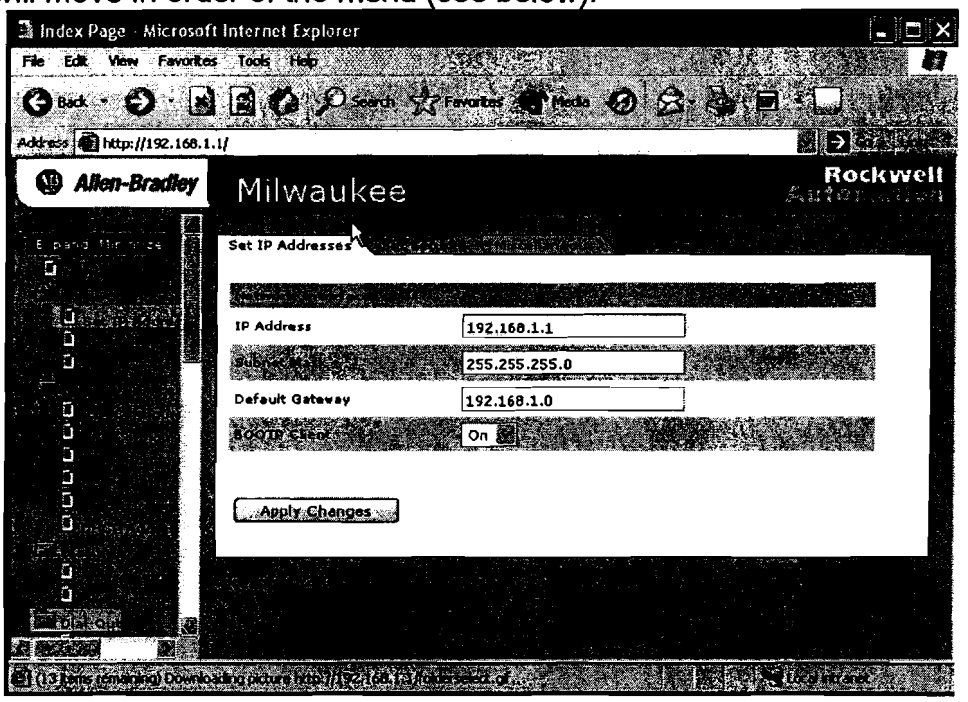
Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Contents

About the Documentation

This documentation will cover the management interface of the 9300-RADES. We will move in order of the menu (see below).



Chapter 1 covers all items under the "Basic Configuration" option and provides information about the management interface. Chapter 2 covers all items found under "Network Services Setup" and so on. The "Quick Start Guide", which is embedded in the 9300-RADES, will cover the Windows setup and basic use of the product. Therefore, we will not cover those topics with this document. The Quick Start Guide can be found under resources, on the Home page of the product. The Quick Start Guide can also be downloaded from:
http://support.rockwellautomation.com/Ethernet_Modem/emodem_downloads.asp
The 9300-RADES Website is located at:
http://support.rockwellautomation.com/Ethernet_modem/emodem_main.asp

It contains:

- Sample applications
- AutoCAD Drawings
- Latest firmware
- Documentation
- Brochure

- Specification (environmental, and compliance info)
- Ordering information
- Demo line information (try out the product by dialing into our sample network)

IMPORTANT

This manual assumes that the user is familiar with all procedures in the Quick Start guide. If you have not already done so, please read through the Quick Start Guide before referencing this publication.

A word about terminology:
This device has two different types of connections. An Ethernet connection is a connection to the switch board of the device with Ethernet cable or over the Ethernet network. The modem connection is the remote connection established with Windows Dial-Up Networking. Please keep this in mind when reading this document to avoid confusion.

The following Documents can be found at www.ietf.org. The Internet Engineering Task Force produces the following documents:

RFC: (Request for Comments) public documents on many networking topics and protocols.

STD: Internet Standards Documents

BCP: Best Current Practices Documents

FYI: Informational Documents

These documents will be occasionally referenced throughout this manual.

1 Basic Configuration

This Chapter covers:

- Management interface information
- The Home page

All items under the "Basic Configuration" menu option

- Setting the IP address
- Setting the security
- Miscellaneous
- Setup

Accessing the management interface

Before the management interface can be accessed, a connection (Ethernet or Modem) must be established with the 9300-RADES. (see the Quickstart guide for further instruction)

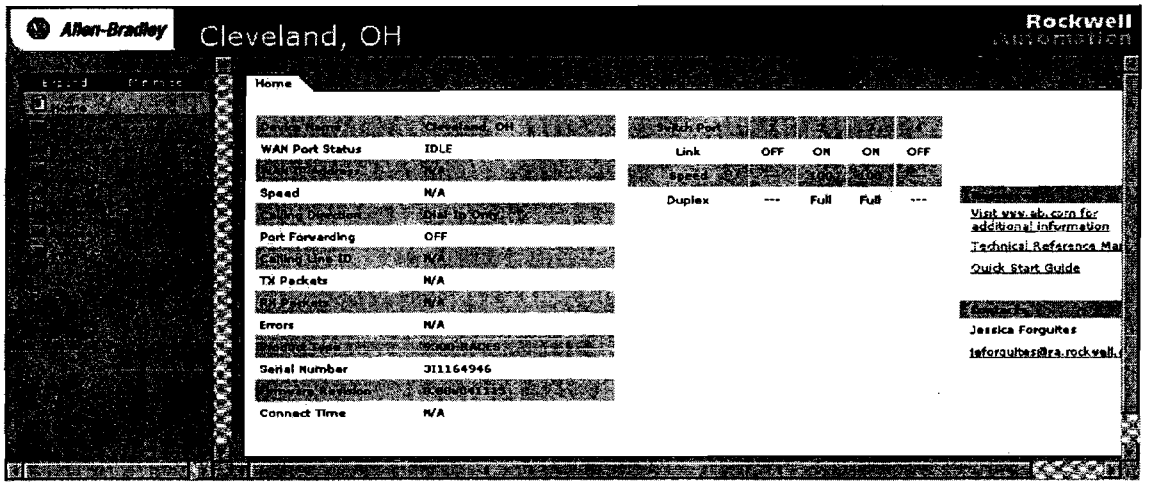
Once the connection (Ethernet or Modem) is established, open your web browser.

1. Type http://XXX.XXX.XXX.XXX into the address bar and hit Enter. Replace the X's with your 9300-RADES IP address.
2. Username is left Empty and the password is ZYPCOM

If the Web Browser won't open:

1. verify the IP address of the 9300-RADES (192.168.1.1 by default)
2. verify your connection setup (see Quick Start for further guidance)
3. verify that the 9300-RADES has power
4. verify that the is cable connected (do you see a green or yellow LED lit on the Ethernet port.
5. verify that a proxy server is not preventing you from accessing the 9300-RADES

9300-RADES Home Page



Name:
Possible values are: user programmable
Default value is: Milwaukee, WI
Identifies the unit (see Basic Configuration, Miscellaneous for instructions on changing the unit's name

WAN Port Status:
Possible values: ON-LINE, IDLE, NEGOTIATING, AUTHENTICATING, ANSWERING
The WAN (Wide Area Network) Port is the modem connection. If the Modem is online the Status will be ON-LINE. While the modem is off-line the Status will be IDLE.

WAN IP address:
The connection IP address is configured by the Dial-in client (Windows connection). Instructions on setting up your Windows connection can be found in the "Quick Start Guide". When a connection is established, the 9300-RADES reads the IP address assigned by the client and reports it here. Will read N/A when no modem connection is established

Speed:
Possible values are: N/A, 1200-56000 bps
Default Value: modem will try 56000 V90 first
This shows the speed of our dial-up connection. 33600 is the maximum speed attainable between two analog modems. The modem will check the integrity of the phone line to calculate which speed it can maintain reliably. Connections to ISP's can be made at speeds up to 56,000 bps.

Calling Direction:
Possible values are: Disabled, Dial-in only, Dial-out only, both
Default Value is: Dial-in only
This value is changed under Dial-In>Calling Direction
In addition to dialing into the modem to browse your devices, the modem can also dial out to another modem. For example, a computer connected to the 9300-RADES can dial into an ISP provider (ex. AOL) to browse the internet. (see chapter 4 for more details on this feature)

Port Forwarding:
Possible Values are: ON, OFF
Default Value is: OFF
Used only when Dialing out is enabled. It tells the user that NAT (Network Address Translation) is enabled. We will discuss NAT further in Chapter 2 of this publication.

Calling Line ID:
This will read N/A when connected, unless the phone line has caller ID enabled and the user has not dialed in anonymously. The value will always be N/A when no one is connected. Displays the phone number of the caller that is dialed into the 9300-RADES

TX packets:
The number of packets transmitted over the phone line. Will be N/A when no one is using the modem

RX packets:
The number of packets received over the phone line. Will be N/A when the modem is not being used

Errors:
The number of packets received with errors. The checksum of the packet does not match the checksum computed upon receipt of the packet.

Connect Time:
The timer starts when a connection is established to the modem. Will read N/A if no connection is established.

Product Type:
The part number of the device, should always be 9300-RADES

Serial Number:
Unique to every unit ex. 3A1138111

Firmware Revision:
Check our website to make sure you are up to date.
http://support.rockwellautomation.com/modem

The Web-Browser Interface

We have recently added web browser capability to this product. This allows the user to manage the modem through a web browser interface opened with Internet Explorer. All modems can be upgraded to include this feature, for instructions on upgrading the modem see Appendix A.

How to tell if you currently have the web browser interface:
Establish a telnet connection with the modem and check the firmware revision. If the web browser capability is in your modem the firmware revision number will be followed by a web browser revision number. For example:

Firmware revision: 0.88 (This does not have the web browser capability you will have to upgrade the modem to get it)

Firmware revision: 0.88w040822 (This does have the web browser capability and no upgrade is needed to use it)

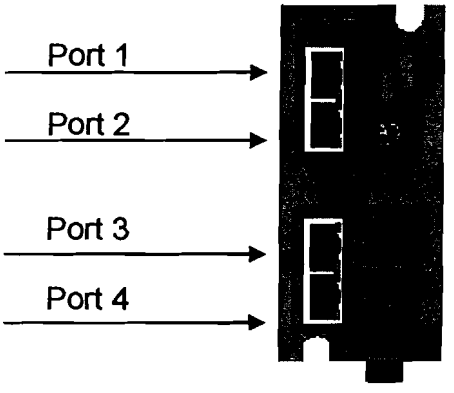
To connect to the modem using telnet:

1. Establish an Ethernet or Modem connection with the 9300-RADES
2. Click on Start then Run
3. Type telnet xxx.xxx.xxx.xxx replace x's with the 9300-RADES IP address and click OK.
4. The password is ZYPCOM

The 9300-RADES can be configured using the web browser or telnet. Both interfaces offer the same capability.

The Switch Port Section:

Switch Port:



Link:
Possible Values: ON, OFF
On if a device is connected to the port and has power
Speed:
Possible Values: 10 (green LED), 100 (orange LED)
Duplex:
Possible Values: Full, Half

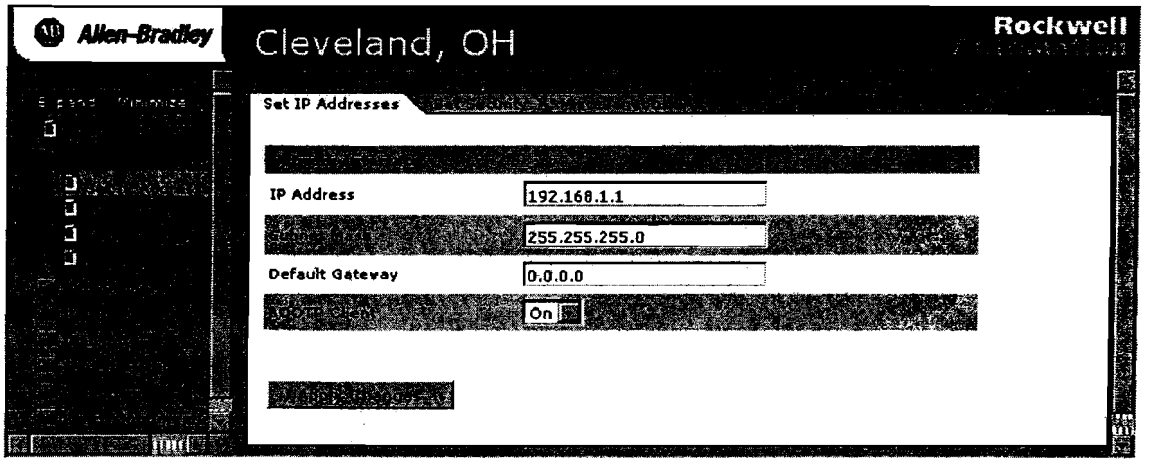
The Resources section:

Provides Links to our website and this manual (you will have to be connected to the Internet for these links to function). The Quick Start Guide Link is also found in this section, but does not require an Internet connection because it is embedded in the product.

Set IP address

Changing your IP address will probably be necessary to install the 9300-RADES into your Ethernet network. Follow the following steps to change the IP address.

1. Find an available IP address on your subnet
2. Establish a connection with the 9300-RADES (pg. 8)
3. Click on the "Basic Configuration" Folder
4. Click "Set IP address"
5. Your screen should appear as follows:



6. Enter your new IP address
7. If needed, change the subnet mask and Gateway
8. Click "Apply Changes"
9. Once IP and subnet are changed, power MUST be cycled to load the new address

THE MODEM WILL NOT LOAD THE NEW IP, AND SUBNET ADDRESS UNTIL POWER IS CYCLED

Power can be cycled remotely through the management interface by:

1. Click "Diagnostics" folder
2. Click "Controller Restart" (Note: This restarts the modem only, this will not restart the PLC and all communications will be interrupted)

Setting IP address with Bootp:

The modem comes with Bootp client on by default. To assign and address simply put the RADES on a network with a Bootp Server, and cycle power to the 9300-RADES. It will attempt to get an IP address several times from the server, before timing out and sticking with 192.168.1.1

Set Security

We recommend changing the Administrator password before the unit is placed in service. We will discuss changing the Client Authentication passwords in a future section, in this section we are discussing the password for the management interface (HTTP session) and the ftp interface (used to upgrade the firmware). Change your Administrative username and password as follows:

1. Click "Basic Configuration" Folder
2. Click "Set Security"
3. Change the username and password (see appendix B for recommendations)
4. Cycle power to the unit to load the new username and password

The Administrative password applies to Telnet, FTP, and the Web Browser Interface. THIS IS NOT THE DIAL IN PASSWORD. The Dial In password is set up under Dial IN (See Chapter 3).

THE MODEM WILL NOT LOAD THE NEW SETTINGS UNTIL POWER IS CYCLED

Note:
This does not change your password for the modem connection (Window's Dial-Up networking). This username and password are used to establish an FTP, HTTP or Telnet session only.

Another option under the set security menu allows the user to disable telnet security. This is not recommended; turning off this feature would allow any user, over the Ethernet or modem connection, to make changes to the configuration of the 9300-RADES.

Miscellaneous

Box Name:

This setting allows you to give your 9300-RADES a name that describes its location or connected devices. This feature is useful when multiple 9300-RADES are installed. It reports this name on the Home Page
To change this setting:

1. Click "Basic Configuration" Folder
2. Click "Miscellaneous"
3. Type the new name in the Text Box and click "Apply Changes"
4. The new name will not be shown on the Home page until you hit the Refresh button on the browser

User Inactivity

This setting allows you to change the length of time the management interface will remain open while inactive. Choose anywhere from 0-99 minutes.
Selecting a value of 0 = feature disabled, the interface will remain open until it is closed.
Default Value: 3 Minutes

Status Refresh

This setting controls the refresh rate of the management interface. Choose anywhere from 0-99 seconds.
Value of 0 = Feature Disabled, will not refresh
Default Value: 5 seconds

The web browser interface also has the ability to enter contact info and a contact email address. This info will appear on the home page of the 9300-RADES

2 Network Services Setup

This Chapter covers:

- RIP Definition and Configuration
- NAT Definition and Configuration
- IGMP Definition and Configuration
- Router Advertisements
- DHCP Definition and Configuration

Definitions

UDP: Defined by RFC 1122, section 4.1: The User Datagram Protocol offers only a minimal transport service. UDP is used by applications that do not require the level of service of TCP or that wish to use communications services (e.g., multicast or broadcast delivery) not available from TCP. An application program running over UDP must deal directly with end-to-end communication problems that a connection-oriented protocol would have handled -- e.g., retransmission for reliable delivery, packetization and reassembly, flow control, congestion avoidance, etc., when these are required.

TCP: Transmittion Control Protocol, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

Router – a.k.a (Gateway), forwards packets, not on the local subnet, to its destination network or another router.

Routing information protocol - Distributes routing information to the routers within an autonomous system. Most common of the IGPs (interior gateway protocols), bases its routing decisions on the number of hops that it will take to get to the target IP-addressed network. This protocol prevents the user from having to manually update the routing table. Defined by STD 34, RFC 1058 and updated by RFC 1388

DNS- (Domain Name Server) Translates domain names into IP addresses, for example www.example.com may translate to 192.168.100.100
DHCP- (Dynamic Host Configuration Protocol) Commonly used on office networks, Scarce IP address space is efficiently used because IP addresses are "leased" to clients for a limited time. This lease concept facilitates the recycling of addresses, which is the heart of DHCP.

Bootp- (Bootstrap Protocol) Commonly used with AB Ethernet products, defined by RFC 951, BOOTP protocol is used by a client machine to locate its IP address and network mask.
Domain- A group of computers and devices on a network that are controlled as a unit with common rules and procedures
NAT- A Network Address Translator (NAT) is an IP router defined in RFC 1631 that can translate IP addresses and TCP/UDP port numbers of packets as they are being forwarded.
PAT- (Port Address Translation) translates private hosts to a public address.

RIP Definition and Configuration

RIP Definition

Router – a.k.a (Gateway), forwards packets, not on the local subnet, to its destination network or another router.
Routing information protocol - Distributes routing information to the routers within an autonomous system. Most common of the IGPs (interior gateway protocols), bases its routing decisions on the number of hops that it will take to get to the target IP-addressed network. This protocol prevents the user from having to manually update the routing table. Defined by STD 34, RFC 1058 and updated by RFC 1388

RIP Configuration

For most applications, these settings should not be modified from default. For routing diagnostics see Chapter 6

RIP Direction

Default: Talk and Listen – sends updated routing table to other routers and receives routing updates from other routers.
Other options: Talk Only – sends updates only, Listen Only – receives updates only, None – Does not send or receive updates.
Applies to the Ethernet connections of the 9300-RADES

RIP Version

Default: RIP2: follows the updated standard defined by STD 34, RFC 1388
Other options: RIP1: follows the original standard defined by STD 34, RFC 1058
Applies to the Ethernet connections of the 9300-RADES

RIP PPP direction

Default: None
Other Options: Talk and Listen, Talk only, Listen only, None
Applies to the modem connection of the 9300-RADES

RIP PPP Version
Default: RIP2
Other Options: RIP1
Applies to the modem connection of the 9300-RADES

NAT Definition and Configuration

NAT Definition

A Network Address Translator (NAT) is an IP router defined in RFC 1631 that can translate IP addresses and TCP/UDP port numbers of packets as they are being forwarded. Consider a small business network with multiple computers connecting to the Internet. A small business would normally have to obtain an Internet Service Provider (ISP)–allocated public IP address for each computer on their network. With NAT, however, the small business can use private addressing (as described in RFC 1597) and have the NAT map its private addresses to a single or to multiple public IP addresses as allocated by its ISP.

For example, if a small business is using the 10.0.0.0 private network for its intranet and has been granted the public IP address of 198.200.200.1 by its ISP, NAT maps (using static or dynamic mappings) all private IP addresses being used on network 10.0.0.0 to the public IP address of 198.200.200.1.

When a private user on the small business intranet connects to an Internet resource, the user's IP stack creates an IP packet with the following values set in the IP and TCP or UDP headers **(bold text indicates the fields changed by the 9300-RADES):**

- Destination IP Address: Internet resource IP address
- Source IP Address: **Private IP address**
- Destination Port: Internet resource TCP or UDP port
- Source Port: **Source application TCP or UDP port**

The source host or another router forwards this IP packet to the NAT, which translates the addresses of the outgoing packet as follows **(bold text indicates the fields changed by the 9300-RADES):**

- Destination IP Address: Internet resource IP address
- Source IP Address: **ISP-allocated public address**
- Destination Port: Internet resource TCP or UDP port
- Source Port: **Remapped source application TCP or UDP port**

When trying to reach a host on a private network (behind a NAT router) NAT is used to forward to the private host. NAT will translate the packet and forward to the appropriate host on the intranet. Translation occurs as follows (**bold text indicates fields changed by the 9300-RADES):**

- Destination IP Address: **ISP-allocated public address**
- Source IP Address: Internet resource IP address
- Destination Port: **Remapped source application TCP or UDP port**
- Source Port: Internet resource TCP or UDP port

NAT maps and translates the addresses and forwards the packet to the intranet client, it contains the following addressing information **(bold text indicates the fields changed by the 9300-RADES):**

- Destination IP Address: **Private IP address**
- Source IP Address: Internet resource IP address
- Destination Port: **Source application TCP or UDP port**
- Source Port: Internet resource TCP or UDP port

For outgoing packets, the source IP address and TCP/UDP port numbers are mapped to a public source IP address and a possibly changed TCP/UDP port number. For incoming packets, the destination IP address and TCP/UDP port numbers are mapped to the private IP address and original TCP/UDP port number.

Advantages of NAT

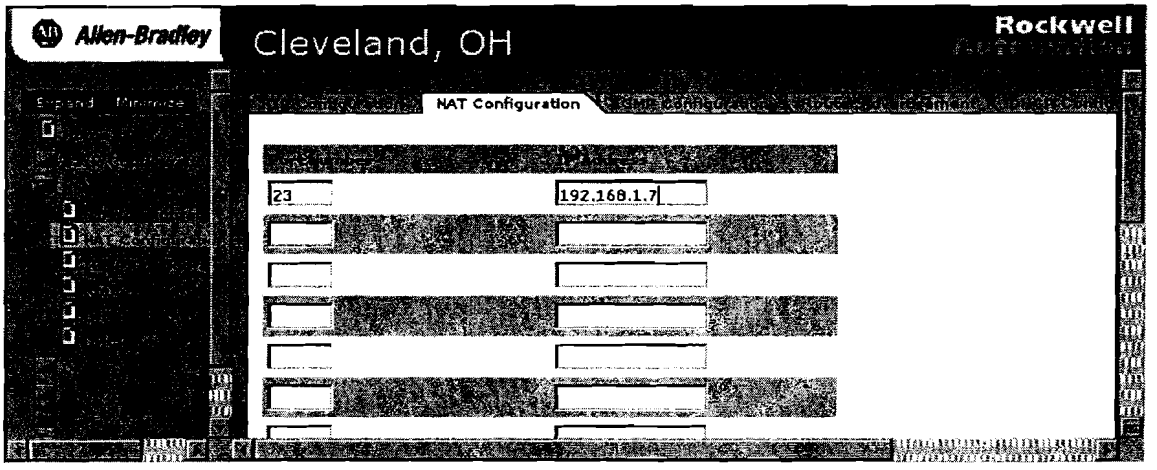
NAT provides security because private addresses are never available to the public. All that can be seen on the web is the public IP address assigned by the ISP provider.

NAT eliminates the need for multiple public IP addresses. There are a limited number of IP addresses and with the number of people on the internet, not everyone can have their own. NAT allows all computers connected to a router to use the same public address, thus conserving addresses.

NAT Configuration

NAT is configured dynamically in our product. To view the configuration, select NETWORK SERVICES SETUP>NAT CONFIGURATION, you will see the NAT table displayed. NAT configuration can be manually edited, however this is not

encouraged and can disrupt communications. When editing manually, the user is required to enter the port number for translation referred to as PAT (port address translation). The table below shows that the server (computer) at address 192.168.1.7 handles all requests coming onto the private network over the telnet port (port 23).



Router Advertisements

Default Value: Off

The 9300-RADES has routing capability; if this capability is needed advertisements may need to be turned on. Selecting on allows the 9300-RADES to advertise its presence, various link parameters, and various Internet parameters. Routers advertise either periodically, or in response to a router solicitation message. Router advertisements contain prefixes that are used for on-link determination or address configuration, a suggested hop limit value, and so on. This setting will not be used for most applications of the 9300-RADES.

IGMP Definition and Configuration

IGMP Definition

The 9300-RADES includes a feature called IGMP snooping. IGMP snooping will sort multicasting devices into groups. This will limit the multicast packets received by hosts that do not need the info, thus making the network more efficient and deterministic.

IGMP Configuration

IGMP is configured by enabling it and setting the version and query period. The 9300-RADES supports version 1 and version 2 IGMP, determine which one your devices are using and make the appropriate selection. The Query period determines how often your network is queried for Group information, the hosts on your network will respond with their group information. To see your multicast groups, the IGMP report can be found under "Diagnostics".

DHCP Definition and Configuration

The 9300-RADES functions as a DHCP/BOOTP server. This is not to be confused with BOOTP/DHCP client which allows the 9300-RADES to receive and address from a DHCP/BOOTP server.

DHCP Definition

BOOTP (Bootstrap protocol)

Commonly used with AB Ethernet products, defined by RFC 951, BOOTP protocol is used by a client machine to locate its IP address and network mask. Bootp ties the IP address to the MAC hardware address; therefore Bootp will always assign the same address to the same Hardware.

DHCP (Dynamic Host Configuration Protocol)

Commonly used on office networks, Scarce IP address space is efficiently used because IP addresses are "leased" to clients for a limited time. This lease concept facilitates the recycling of addresses, which is the heart of DHCP.

DHCP/BOOTP Configuration

It is important to keep this feature shut off if this device is on a larger IT controlled network. Company networks already have DHCP servers in place to service the computers on the network with IP addresses. This device may conflict with the existing DHCP servers on the network and prevent them from handing out addresses.

The 9300-RADES has the ability to serve IP addresses to 32 nodes. We set up the 9300-RADES as follows:

1. Establish a Connection with the 9300-RADES (pg. 8)
2. Select NETWORK SERVICES SETUP>DHCP CONFIGURATION
3. Enable DHCP Server by setting to "ON" (Will be off by default)
4. Select your subnet and gateway addresses for the network
5. Select the primary and secondary DNS servers. (9300-RADES has DNS capability therefore its address can be listed under the primary address if you do not have another DNS server already established on the network)
6. The domain name should be filled out if the 9300-RADES resides on a domain
7. Next we assign a pool of address for the 9300-RADES to pick from.
8. Dynamic bootp should be enabled to answer bootp requests
9. Lease time only comes into play with DHCP requests, therefore will usually be irrelevant. Bootp will set this value to 49710 days because it will always want the same address
10. Cycle power for the changes to take effect

Most applications with PLCs will not require the DNS, Domain name, and lease time fields to be changed. If this does not apply to your network, leave these fields at their default value.

3 Dial-In Configuration

This Chapter covers:

- Dial-in access settings
- Dial–in user configuration

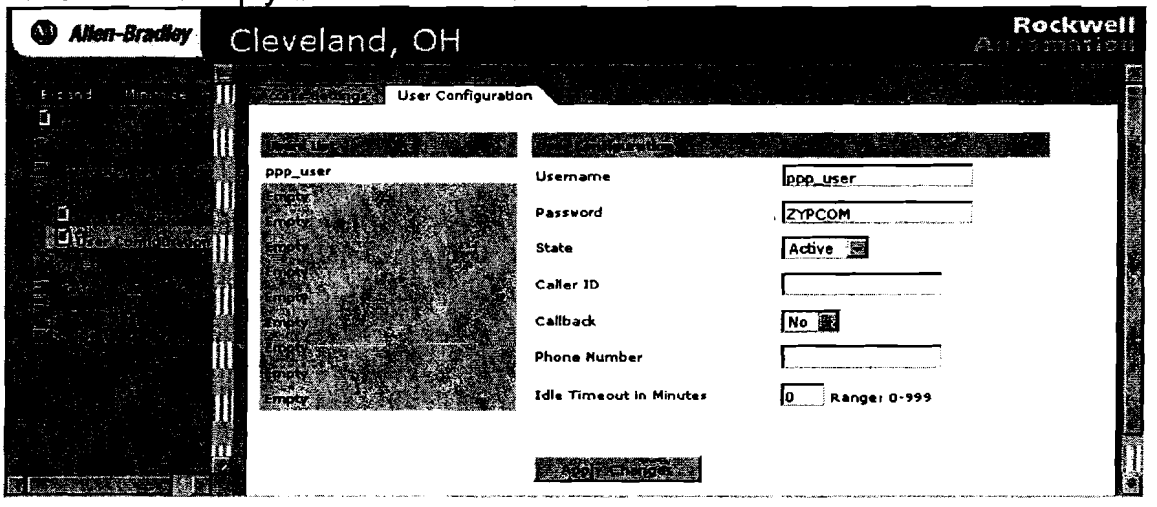
Dial-in user configuration

The 9300-RADES supports up to 10 different user accounts. The default account of: ppp_user, ZYPCOM, should be changed for security reasons. See Appendix B for password and username rules.

Adding an account:

To add an account, follow these steps:

1. access the management interface
2. click on Dial in from the Home page
3. click on User Configuration
4. Select an empty user Account and click on it.



5. Enter the user account information
   username: username for the account
   state: Unused or active (Must be changed to active for account to work)
   password: password for the account
   caller ID: Caller ID must also be enabled under Access Settings
   callback: Callback will call back the user at a pre-determined number to allow access.

Phone number: This is the number called when callback is activated, if this field is left blank, the user will be prompted for the phone number when attempting to dial in.

Idle Timout in Minutes: The connection will automatically disconnect if there is no activity for this amount of time. A value of 0 will leave the connection open until disconnected by the user

6. Once the information is entered, click Apply Changes
7. IMPORTANT: The new account will not be active until the 9300-RADES is restarted
8. Select Diagnostics>Controller Restart to restart remotely

Deleting an account:

1. Access the management interface
2. Click Dial In from the Main Menu
3. Click User configuration
4. Select the account you wish to delete
5. Change the State from Active to Unused

Deleting all user accounts:

1. Carefully remove the plastic clip from the back of the unit.
2. Inside of the slot on the right, you will see a yellow button.
3. Hold in the button with a small screwdriver for 3 seconds.
4. While continuing to hold the button, cycle power to the unit.
5. Continue to hold the button until the LEDs begin to move in a circular pattern
6. The modem is now reset back to default.

Access Settings

Calling Direction

Default Value: Dial-In only
Possible Values: Disabled, Dial-in only, Dial-out only, Both Directions
This modem also has routing capability. When the 9300-RADES receives an off network TCP/IP packet, it has the ability to route it to another location over the phone line. To use this capability Dial-out will have to be enabled here.

Authentication Type/ PAP, CHAP

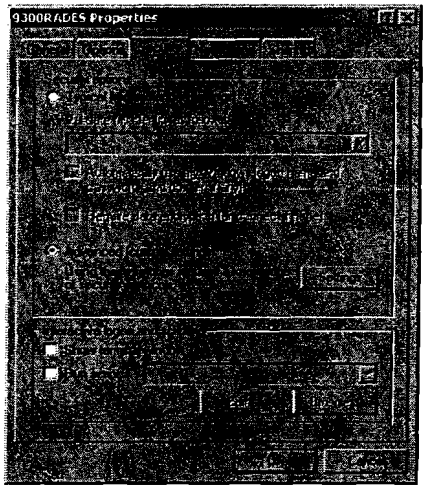
Default Value: CHAP/PAP
Possible Values: None, CHAP/PAP, CHAP only, PAP only

PAP only:
Password authentication protocol authenticates username and password. The client (Windows Dial Up Networking) sends the server (9300-RADES) a username and password when connecting.

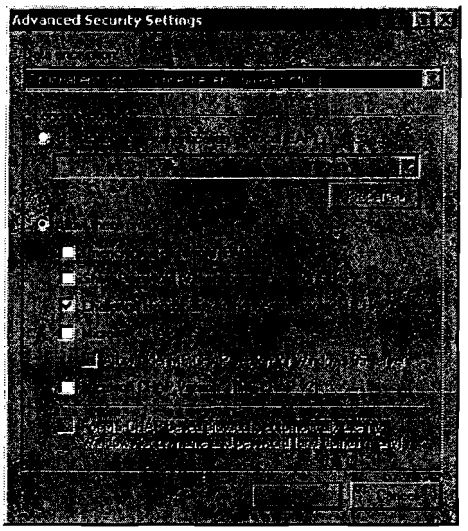
CHAP only:
CHAP Challenge Handshake Authentication Protocol can be used for establishing the PPP link. Using CHAP implements extra security on the negotiation of the username and password. CHAP uses MD5 (Message Digest 5) to hash the password to a unique packet (that cannot be undone) often called a "secret". Upon negotiation, the client (Dial in User w/CHAP turned on) sends the "secret" to the server (9300-RADES) to prove that we (the client) know the password, without having to send it across the wire.

Setting up your Dial UP connection to use CHAP authentication:

1. Click START/SETTINGS/NETWORK AND DIAL-UP CONNECTIONS
2. Click MAKE NEW CONNECTION
3. Follow the directions and click FINISH to create your connection's icon.
4. Right-Click on the connection that was just created.
5. Enter your username and password and click PROPERTIES
6. Click on the Security TAB.
7. Select the ADVANCED radio button and click SETTINGS



8. Select the ALLOW THESE PROTOCOLS radio button and check CHAP and click OK



9. Click on the NETWORKING tab and follow the directions from the quick start guide to finish the configuration.

The connection now has the additional security offered by CHAP authentication

None:
No Authentication used, NOT RECOMMENDED

CHAP/PAP:
The 9300-RADES will first attempt to authenticate with CHAP, if authentication fails, it will attempt to authenticate with PAP.

Remote IP address Supplier

Another part of the negotiation process is the negotiation of WAN IP address. The WAN IP address is used by Windows to route TCP/IP packets over the Dial-UP connection. This address is assigned by the Client (Windows Dial-Up Networking). See the Quick Start Guide for further instruction.

Changing IP address Supplier:
The IP address supplier can be changed to the RADES modem. This would simplify the configuration of Windows Dial-up networking. To make this change:

1. Connect to the Management interface
2. Click Dial-In and Select Access Settings
3. Change Remote IP Address Supplier to Z90e router
4. You will now have the option to set the PPP remote IP
5. Select an available IP address on the network for the PPP remote IP

6. Once this is done, your dial up connection's TCP/IP properties will need to be changed to "obtain an IP address automatically"

Compression

Default: Both
Possible Choices: Both, Frame, Header Only, Off
This refers to PPP protocol compression.

Routing on PPP

Default: Unnumbered Link
Possible Values: Unnumbered Link, Full Route

Unnumbered Link:
A simple way to route packets over the PPP link. When it is selected the 9300-RADES will automatically consume its IP address and its IP address plus 1 to route Ethernet packets successfully over the phone line. For Example, a default unit will use 192.168.1.1 and 192.168.1.2 when a modem connection is active.

Full Route:
When Full Route is selected the user has the capability of selecting the IP and IP mask used to route. The 9300-RADES will not automatically use the RADES IP plus 1 as done with unnumbered link, it will use the available address entered by the user in the PPP Local IP address and MASK fields.

4 Dial-Out Configuration

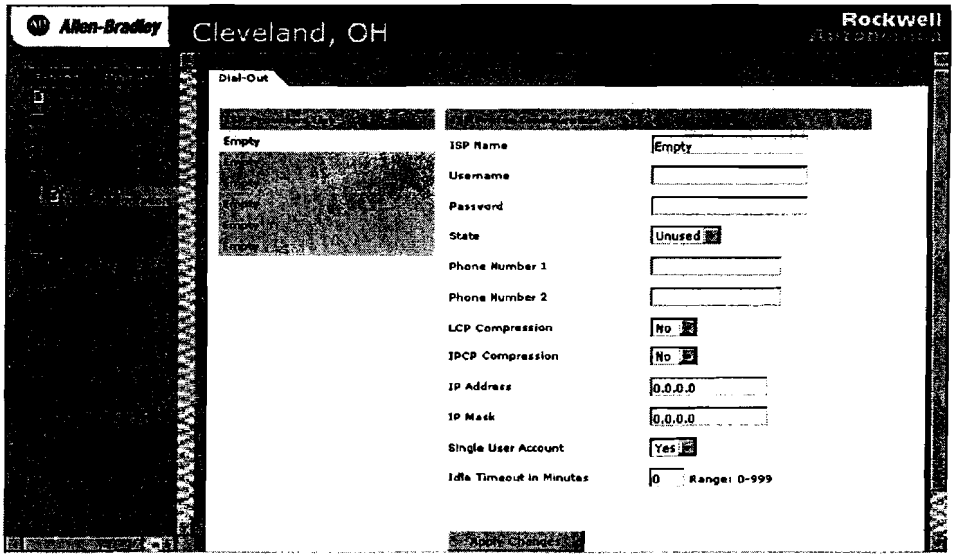
This Chapter covers:

- ISP profile Configuration
- Sending an ENET MSG over a Dial-Up connection

This Chapter only applies if using the routing feature of the 9300-RADES. By Default this feature is disabled.

ISP Profile Configuration

The routing feature allows TCP/IP packets to be routed to another network. For the modem to do this, it has to dial that network and log in.



ISP name: Name associated with that Dial-UP account. Ex. AOL, or MSN
State: Active or Unused
Phone1 Number: Tries this number first when attempting the connection
Phone2 Number: Alternate number. Will try if the first number fails
Username: username for the remote account
Password: password for the remote account
LCP Compression: Link Control Protocol, Compression
IPCP Compression: Internet Protocol, Control Protocol
IP address and Mask: Must be an available address on the remote Network. IMPORTANT- If using an ISP provider Like AOL your IP and Mask will be assigned by the

remote server, therefore, these fields should be blank.

Single User Account: Single or Multiple user account

Idle Timeout: When the account is inactive for this amount of time, the connection will terminate. Value of zero turns off this feature

Sending an ENET MSG over a Dial-Up connection

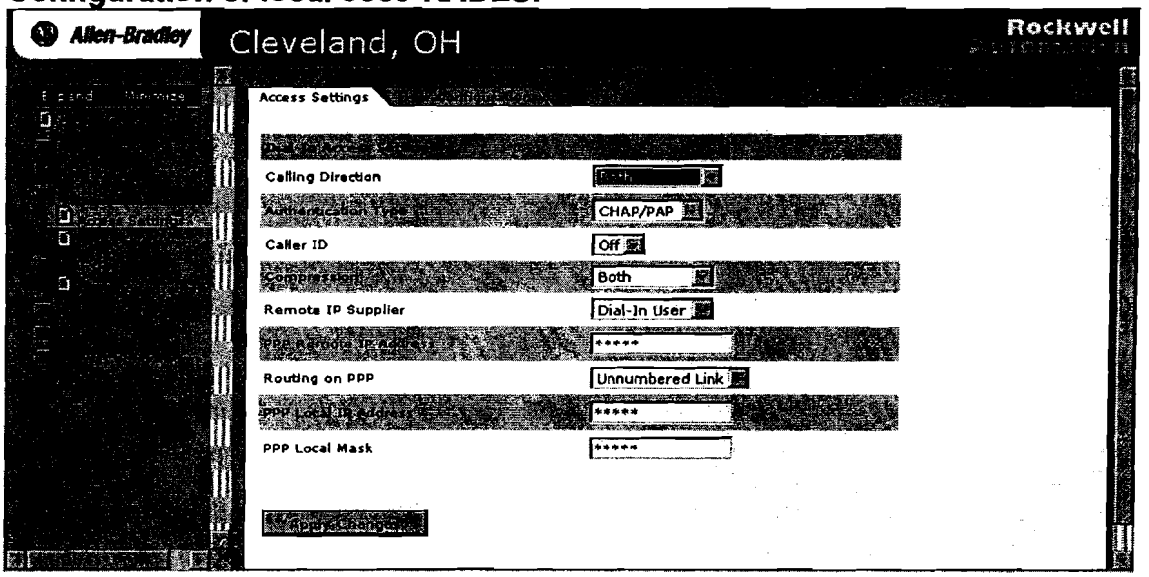
The 9300-RADES has routing capability. When it receives an Ethernet packet that does not belong on its local network, it routes it to another via the phone line. This example, uses:

2- 9300-RADES Modems
2- SLC 5/05 Processors on 2 remote networks

On the local End:
9300-RADES Modem 192.168.1.1/255.255.255.0
(enable Dial Out capability and enter Dial Out Profile)

Configuration of SLC:
1747-L552 SLC 5/05 192.168.1.8/255.255.255.0, gateway 192.168.1.1 (RADES IP address), Sending a MSG to a 1747-l552 at 100.100.101.16/255.255.255.0 through another Ethernet Modem at 100.100.101.17.

Configuration of local 9300-RADES:



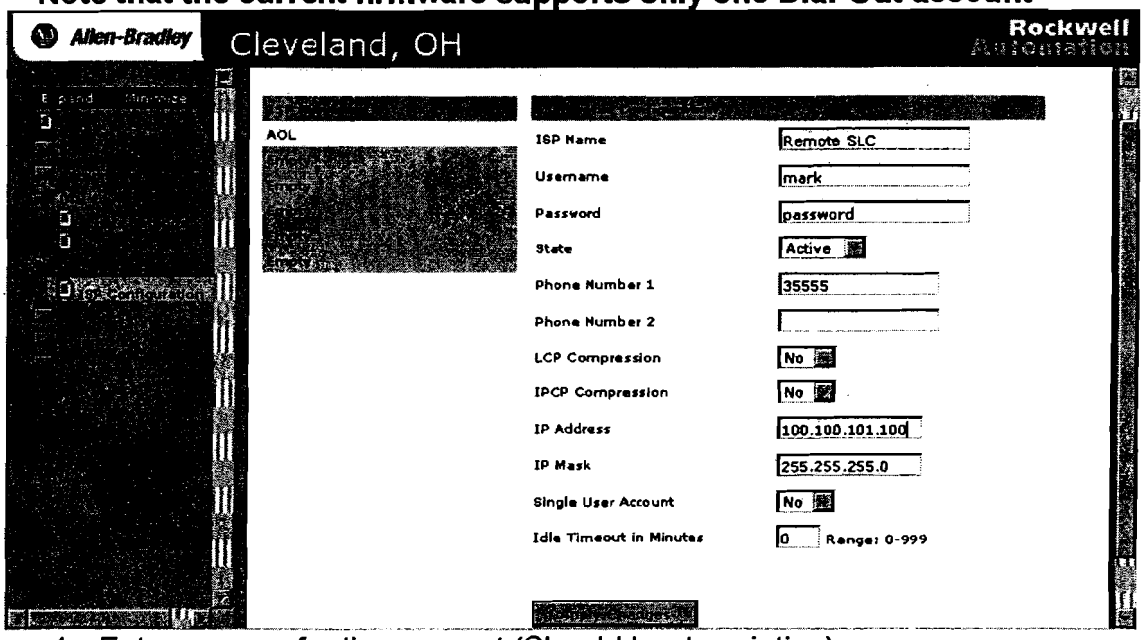
Default calling direction is Dial In only. This must be changed to both. (select Dial-In>Calling Direction>Both Directions)

Power must be cycled on the modem for the changes to take effect

Create a Dial Out account that will connect to the remote 9300-RADES at 100.100.101.17.

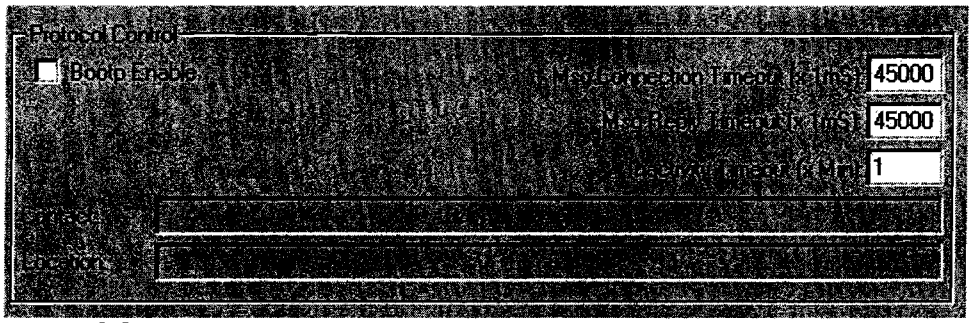
Click Dial Out from the Home Page.

*** Note that the current firmware supports only one Dial-Out account**

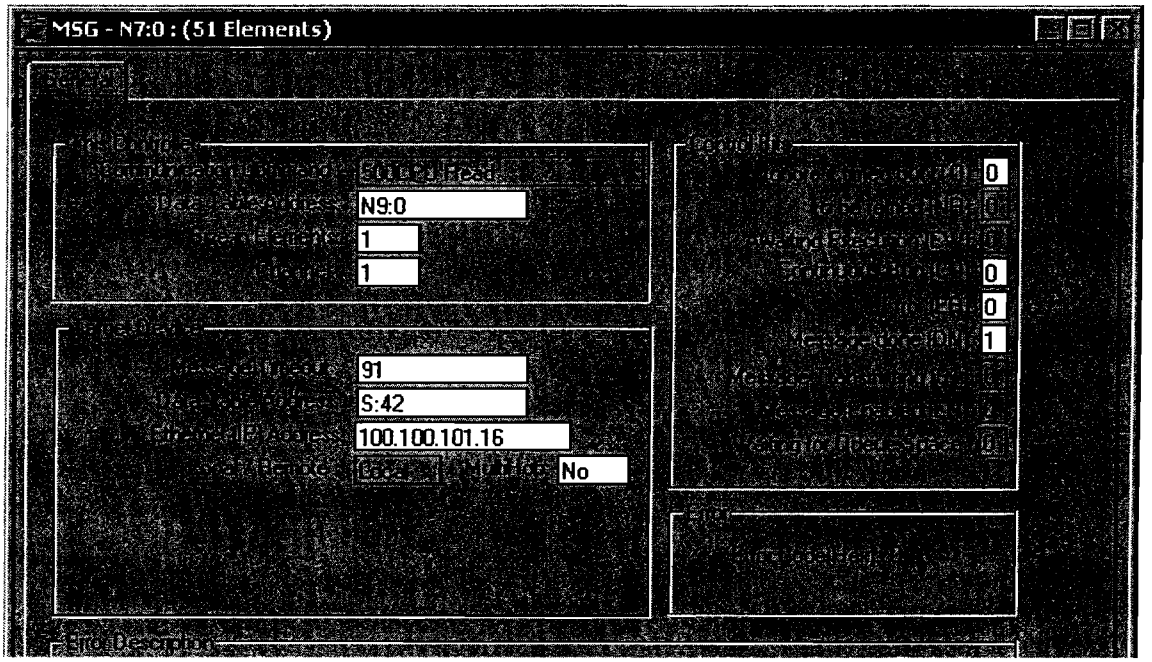


1. Enter a name for the account (Should be descriptive)
2. Change the state to active
3. Enter the phone number of the remote 9300-RADES
4. LCP and IPCP compression should be left at NO
5. Your connection will need an IP address and MASK on the remote network.
   *this step doesn't always apply. When connecting with an ISP provider (like AOL) the remote server usually assigns this address. When this is the case, leave these fields blank.
6. Click Apply Changes and Cycle Power to the unit to activate the account. Your 9300-RADES is now ready to call. Now your processor needs to be configured.

LOCAL SLC Channel and MSG configuration:
The local processor needs to be on the same network as the local modem. In the example the local SLC is @ 192.168.1.8/255.255.255.0. The gateway address **MUST** be the address of the local 9300-RADES (in the example 192.168.1.1). We must also increase the channel msg timeout and reply timeout to 45 seconds. The channel timeout must also be changed from 30 minutes to 1 minute to allow the modem to hang up once the msg is sent (see below)

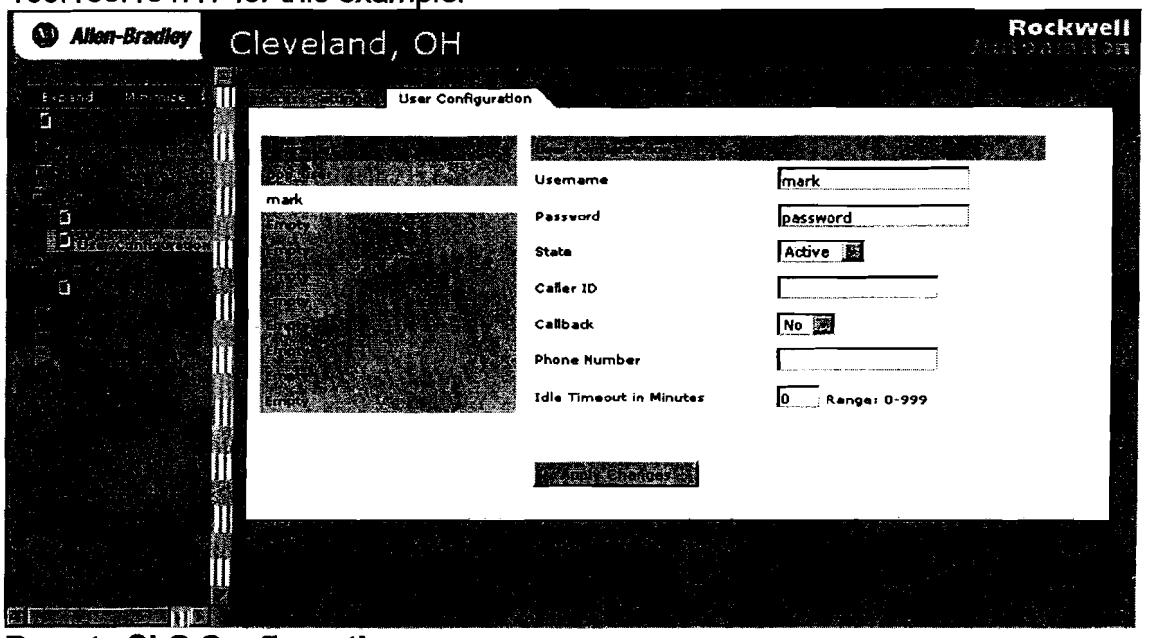


The MSG configuration for this example looks like this:



note that local is selected.

Remote RADES configuration:
The remote RADES must be set up to authenticate the phone call from the local RADES. Click Dial-In>User Configuration, Select an unused Dial-In Profile, fill in the appropriate username and password, make sure to change the state to active.
(in this example username: mark and password: password to match the Dial-Out profile of the local modem) The IP address will need to be changed to 100.100.101.17 for this example.



Remote SLC Configuration:
The remote SLC's channel configuration of this example will require an IP address of: 100.100.101.16/255.255.255.0/100.100.101.17

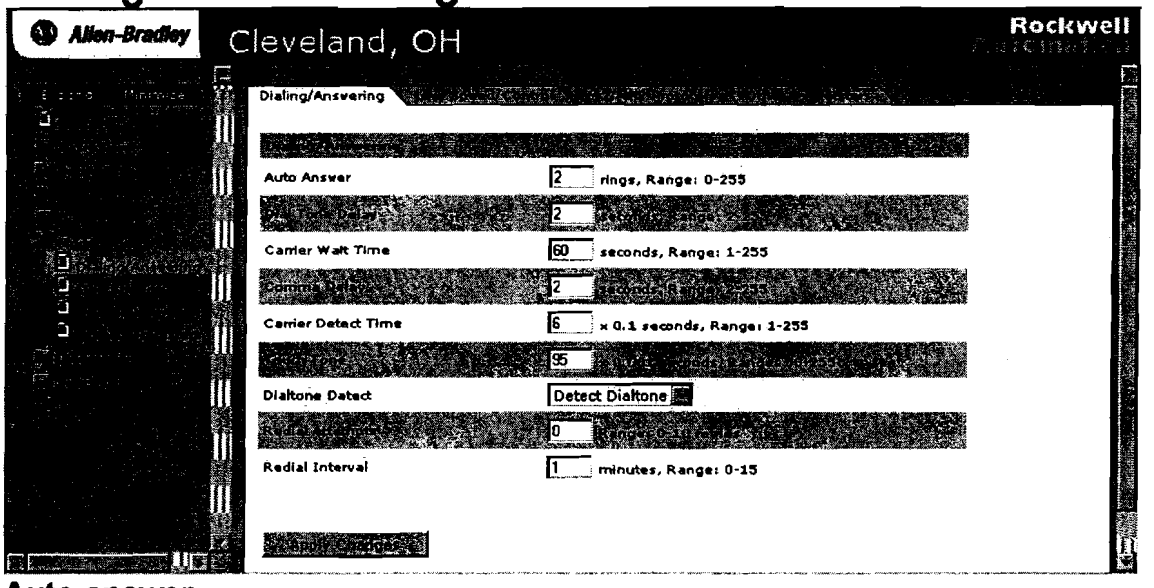
What Happens:
When the MSG instruction is fired, the packet for 100.100.101.16 is sent to the gateway because 100.100.101.16 is not on the same network with 192.168.1.8 (address of the local SLC). Once the 9300-RADES (192.168.1.1) receives the packet is dials the Dial Out account and sends the packet to the remote 9300-RADES (100.100.101.17), which forwards it to the remote SLC (100.100.101.16) which responds back through the same channel. Once the connection is not active for 1 minute it is terminated by the local 9300-RADES. (The Idle timeout must be set to 30 seconds and the channel timeout to 1 minute for this to happen. By default, the 9300-RADES is set to hang up after 4 minutes of inactivity)

5 Modem Setup

This Chapter covers:

- Dialing/Answering
- Line Speed/Control
- V42/MNP Protocols
- Other S-Registers

Dialing and Answering



Auto-answer
Default: 2, (modem answers in 2 rings)
Controls the S0 register of the modem, number of rings the modem needs to see before the answer sequence begins

Dial-tone Delay
Default: 2, (2 seconds)
Controls the S6 register of the modem, Determines how long the modem will wait after going off hook before dialing

CXR wait time
Default: 60, (60 seconds)
Controls the S7 register of the modem, Controls the length of negotiation time allowed when the modem is establishing a connection, Should be at least 60 seconds for international calls

Comma delay
Default: 2, (2 seconds)
Controls the S8 register of the modem, Determines the length of a pause when a (,) is inserted into the dial string.

Carrier detect
Default: 6, (.6 seconds)
Controls the S9 register of the modem, the modem must see the carrier signal for this length of time before the signal is considered valid

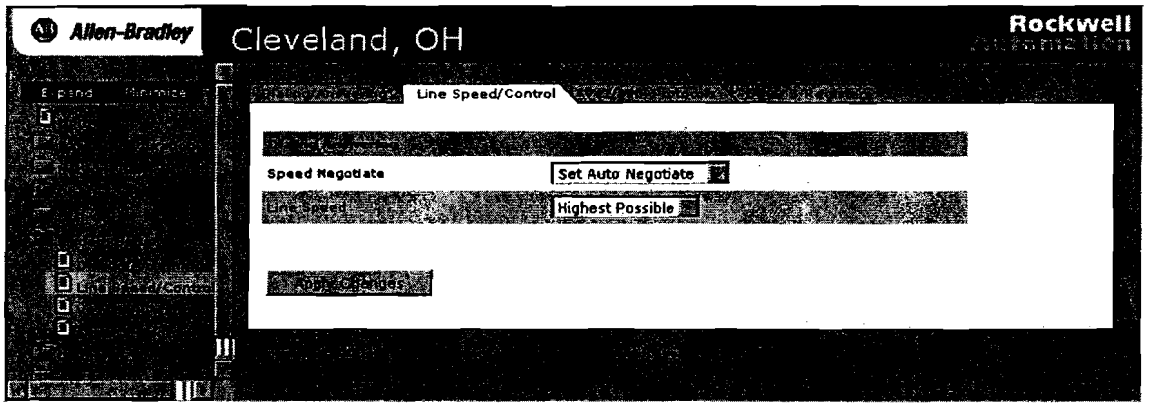
Touch tone
Default: 95, (.095 seconds) phone company standard
Controls the S11 register of the modem, controls the length of time that the tones are transmitted by the modem when dialing an outgoing call.

Dial-tone detect
Default: Yes, X4, Detects busy tone, dial tone, and connect xxxx messages
This is used to configure the modem to ignore Dial tone. Changing the value to No tells the modem to ignore Dial tone.

Redial attempts
Default: 0
Controls the S41 register of the modem, number of times the modem will attempt to redial a telephone number when the connection is not made. Used in conjunction with the S53 register

Redial interval
Default: 1 (1 minute)
Controls the S53 register of the modem, interval between retries

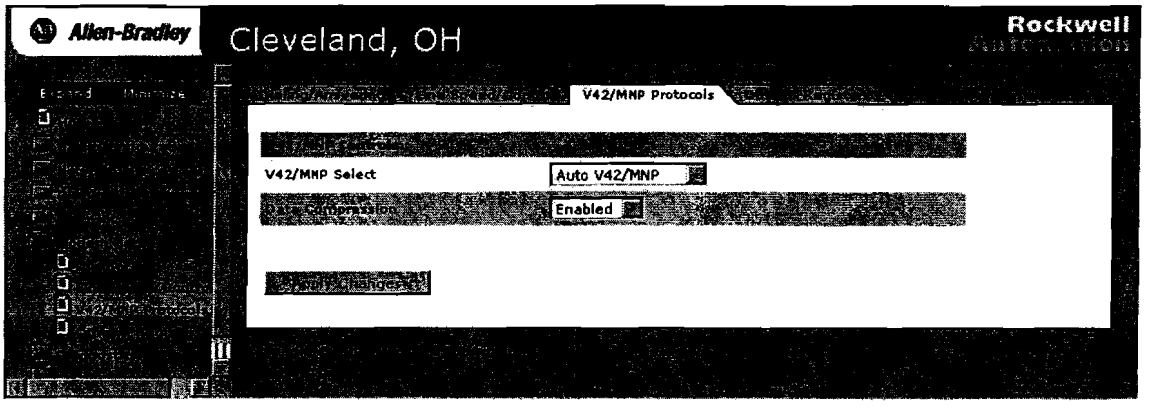
Line Speed/Control



Speed Negotiate
Default: 1 (modem determines maximum line rate)
Works in conjunction with line speed

Line Speed
Default: 0 (auto-negotiate line speed)
Controls the S37 register of the modem
Transmits data over the phone line at this rate.

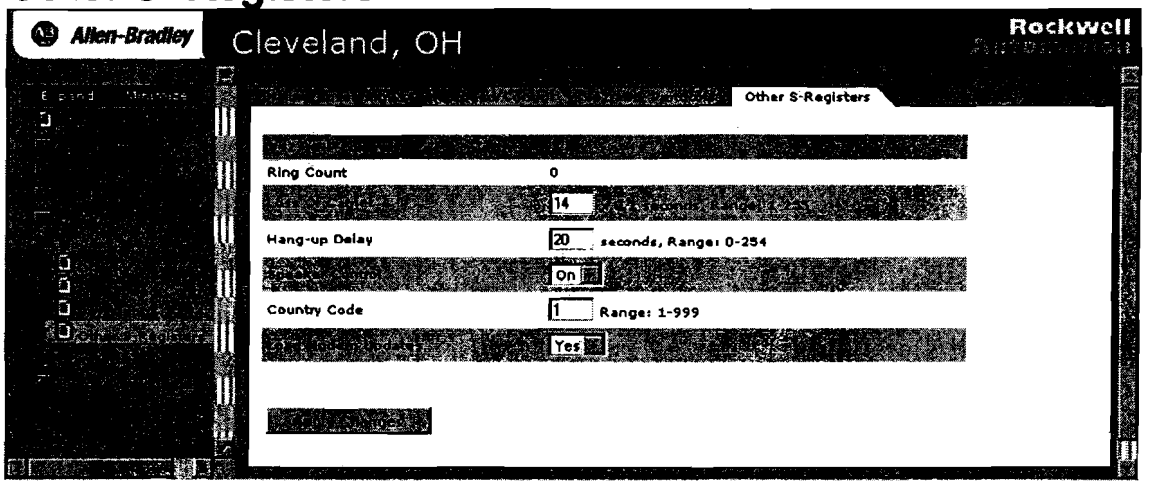
V42/MNP Protocols



V42/MNP select
Default: 7 (auto-detects data mode)

Data Compression
Default: 1 (Data compression enabled)
Allows a 4:1 compression ratio

Other S- Registers



Ring Count

Non-writeable register
Counts the number of rings the modem sees on an incoming call. When S1 matches S0 (Auto-answer register) the modem answers the call.

Loss of Carrier

Default: 14 (tenths of a second or 1.4 seconds)
Should be set to at least 50 for cellular connections
Amount of time the modem must wait after losing carrier from the remote modem before disconnecting.

Hang-up Delay

Default: 20 seconds
Delay allows the modem to empty its receive buffers after receiving the hang up command

Speaker control

Default: On
Controls Modem Speaker

Country Codes

Default: 1 (USA phone settings)
Controls S98 register, See appendix C for more settings

Load Modem Updates

Default: On
When powering up, the modem will apply enhancements to the DSP chip.
Delays power up sequence

6 Diagnostics

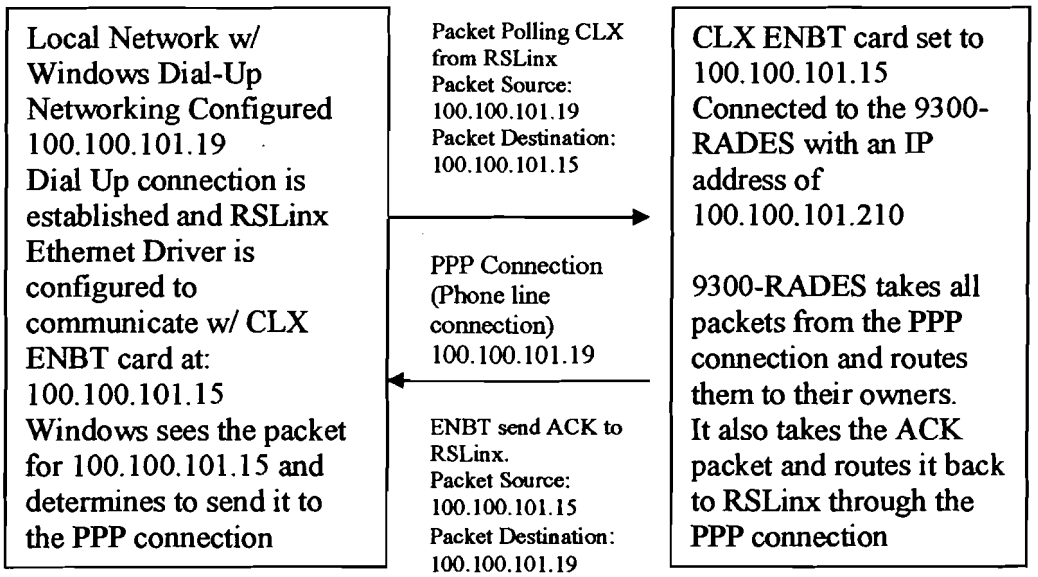
This Chapter covers:

- Displaying routing table
- Displaying switch counters
- IGMP report
- MAC address report
- Phone line Diagnostics
- Dial ISP testing
- Hang Up ISP testing
- Controller Restart
- Alarm Setup

Displaying Routing Table

PPP Connection Example

The PPP connection with Microsoft Windows Dial Up networking, gives RSLinx the illusion that the CLX is on the same Ethernet network. Windows handles routing its traffic through the PPP tunnel to the remote network on the other end of the phone line.



Routing table from the example application above

Dest	Mask	IF	NextHop	Cost	Type	Owner	Age
100.100.101.19	255.255.255.255	3(ppp0)	0.0.0.0	0	direct		static
100.100.101.0	255.255.255.0	2(eth0)	0.0.0.0	0	direct	local	153
127.0.0.0	255.0.0.0	1(lo)	0.0.0.0	0	direct	local	153

Some routers require manual entry of the routing table. This is not the case with the 9300-RADES. The 9300-RADES uses RIP protocol to dynamically create the routing table and send the routing information to other hosts on the network.

The first line of 100.100.101.19/255.255.255.255 tells the modem to send only packets w/ destination address of 100.100.101.19 to the PPP connection.
The second line of 100.100.101.0/255.255.255.0 tells the 9300-RADES to send all packets for 100.100.101 network to the switch board to be routed.
The third line deals with the universal IP loop-back

Displaying Switch Counters

This option will give you various counts from the switch. All counters are displayed in Hex.
Octet = 8 bits.

TX counters

Tx Octet Count
Total of transmitted good octets from the selected port
Tx Drop Pkts Count
Packet is not acknowledged by the receiving host
Tx BroadcastPkts Count
Number of good packets sent w/ destination of everyone. Receivers are unspecified
Tx MulticastPkts Count
Packets sent to members of multicast group. One terminal to many hosts
Tx UnicastPkts Count
In contrast with multicast, consist of one terminal transmitting to one host
Tx Collisions Count
Two terminals transmit packets at the same time causing them to collide
Tx SingleCollision Count
Packet collides with one other terminal's transmitted packet
Tx MultipleCollision Count
Packet collides with more than one terminals' transmitted packets
Tx DeferredTransmit Count
Number of packets delayed because the network is busy (Higher the number the less deterministic your network)
Tx LateCollision Count
Collision is detected later than the 512 bits into the packet transmittion
Tx ExcessiveCollision Count
Packets not transmitted because the packet experienced 16 failed attempts
Tx FrameInDisc Count
Network Device is not acting in compliance with a flow control request
Tx PausePkts Count
Pause frames sent by this port

RX counters

Rx Octets
Total good octets received on selected port
Rx Undersize Pkts
Good packets that are under 64 octets long
Rx Pause Pkts
Pause packets received by this port

Pkts64 Octets
Data packets = 512 bits
Pkts65to127 Octets
Data packets = 520-1016 bits
Pkts128to255 Octet
Data packets = 1024-2040 bits
Pkts256to511 Octet
Data packets = 2048-4088 bits
Pkts512to1023 Octet
Data packets = 4096-8184 bits
Pkts1024to1522 Octet
Data packets = 8192-12176 bits
RxOversize Pkts
Packets over 12176 bits or 1523-1536 Octets
RxJabbers Pkts
Packets longer than 1522 Octets, and have an error
RxAlignment Errors
Packets between 64 and 1522 octets, and have an error
RxFCS Errors
Packets received (between 64-1522 octets) with FCS (frame check sequence) not matching
RXGoodPkts
Octets received with no errors
RxDrop Pkts
Packets dropped due to lack of resources (bandwidth, input buffer)
RxUnicast Pkts
Unicast packet received (only 1 receiving host)
RxMulticast Pkts
Multicast packets received (many receiving hosts)
RxBroadcast Pkts
Received by all hosts on the network
RxSAChanges
Number of times the Source address of a good packet has changed value. A count greater than 1 indicates a repeater based network
RxFragments
Packets received less than 64 octets
RxExcessSizeDisc
Packets received greater than 1536 octets and discarded due to excessive length.
RxSymbolError
Invalid data symbol detected

IGMP Report

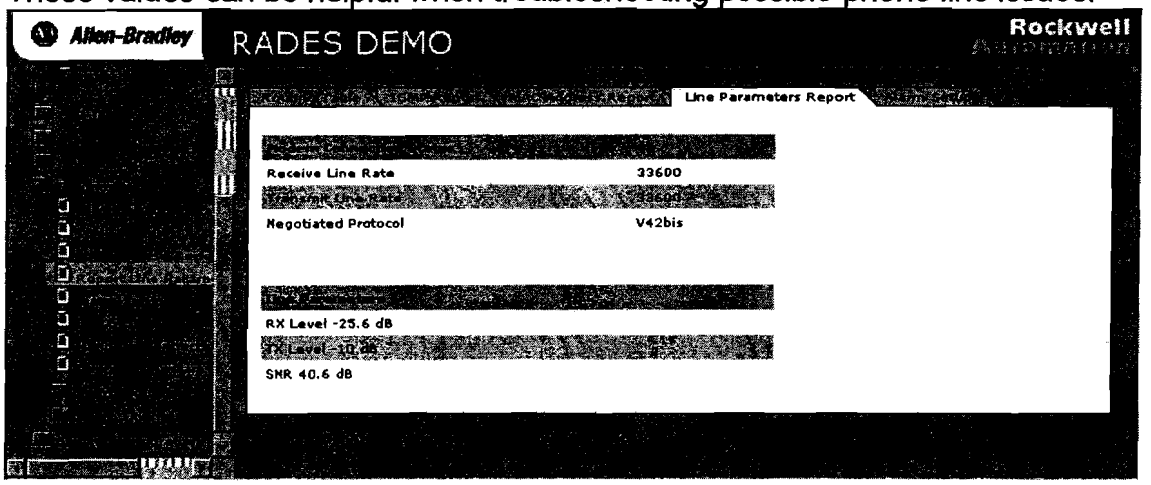
IGMP protocol adds a group number to a transmitted packet. Only hosts in that IGMP group will receive the packet. IGMP protocol prevents a multicast packet from behaving like a broadcast (transmitted to all network hosts). The switch assumes the task of forming a table of IGMP groups and hosts belonging to those groups. The table can be displayed by selecting Diagnostics>IGMP report

MAC Address Report

All Ethernet equipment has a MAC address (hardware address). These can be displayed by selecting Diagnostics>MAC address report. A pool of MAC addresses are assigned to each Ethernet product manufacturer. For example, Allen Bradley Ethernet equipment MAC addresses usually begin with 00:00:BC.

Phone line Diagnostics

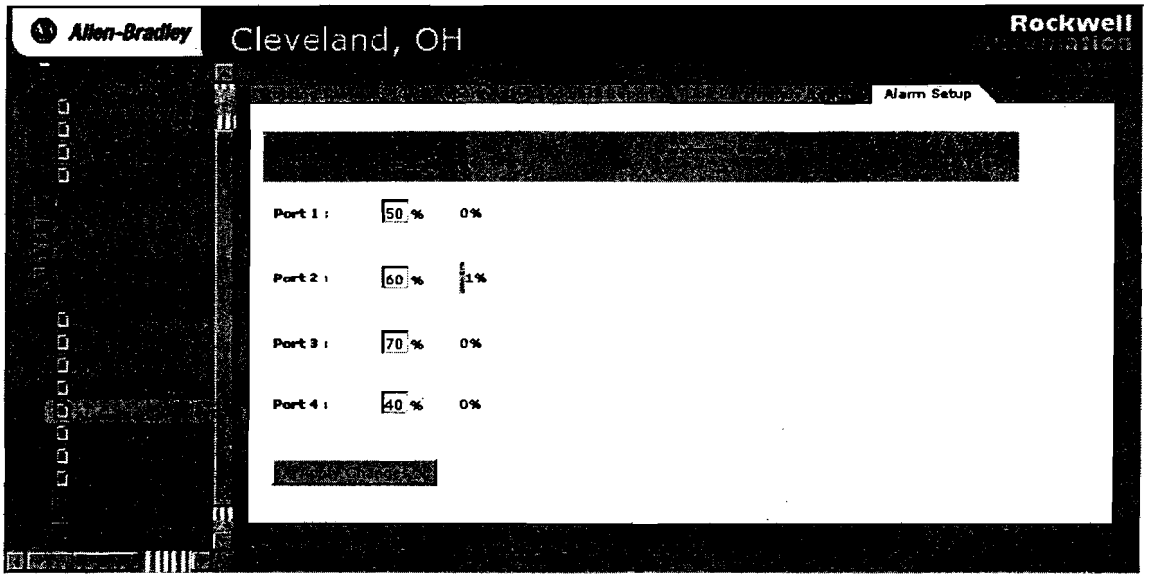
These values can be helpful when troubleshooting possible phone line issues.



Receive Line Rate:
Modem above is receiving data at 33600 bps
Transmit Line Rate:
Modem is transmitting data at 33600 bps
Negotiated Protocol:
Both modems are using this protocol to send and receive data
RX Level:
Calculate dB loss on the phone line by subtracting from -10dB. In the example above, the line has 15.6 dB loss, problems will begin at about 40-45 dB loss.
TX Level:
FCC standards dictate transmit level to be -10 dB for permissive connections
SNR:
Signal to noise ratio, used by the modems to calculate the most reliable phone line rate. This number decreases with the reliability of the phone line.

Alarm Setup

Alarm setup is used to see the bandwidth on each port; the bar will turn red when the bandwidth is out of range.



Dial ISP Testing

If a Dial Out account is enabled, selecting this option will force an outgoing connection to be made.

Hang Up Connection

To force the modem to hang up its connection

Controller Restart

This selection will restart the modem. It is useful when making configuration changes over the phone line. The modem must always be restarted for any changes to take effect.

7 Switch Management

This Chapter covers:

- Port Configuration
- Mirror Configuration
- VLAN setup
- QoS setup
- Display Counters

Port Configuration

This device auto-negotiates most of its settings to ease the configuration process. However, these settings can be manually set by using this menu option.

TX/RX
Default: Both
Choices: None, TX, RX, Both
Controls communications on the selected port

Negotiation
Default: Auto
Choices: None, Auto
Turn off auto-negotiation here

Rate
Auto-negotiates 10 or 100 based on connected device. Must be manually selected if the negotiation parameter is changed to none

Duplex mode
Auto-negotiates half or full based on connected device. Must be manually selected if the negotiation parameter is changed to none

Flow Control
Default: On
Prevents port buffers from over filling

Port Mirroring
Default: Disabled
Allows traffic on one port, to be copied and sent (mirrored) to another port to allow an Ethernet sniffer to capture it.

Quality of Service
Default: Disabled
When enabled, the switch can prioritize packet delivery to a certain port or MAC address.

IGMP snooping
Default: Disabled
When enabled, it sorts Multicast packets into their groups and delivers them to the appropriate group.

Mirror Configuration

In this section we configure the rules or filters for our port mirroring.
Filters can be configured to only capture packets from certain devices (MAC addresses). We can also filter to capture packet with a certain destination address.

Setting Up Ports:

Default: None
Choices: IN, OUT, BOTH, NONE
In: mirror incoming traffic, Out: mirror outgoing traffic,
Both: Capture both directions, Capt: capture mirrored traffic
The above selections are port based.

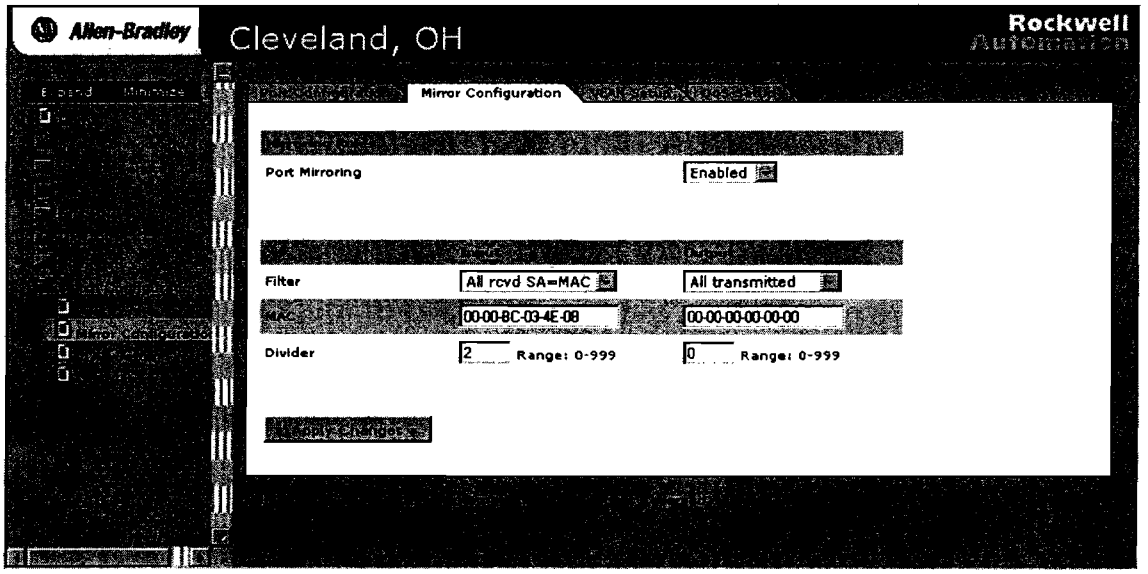
Setting Up Filter:

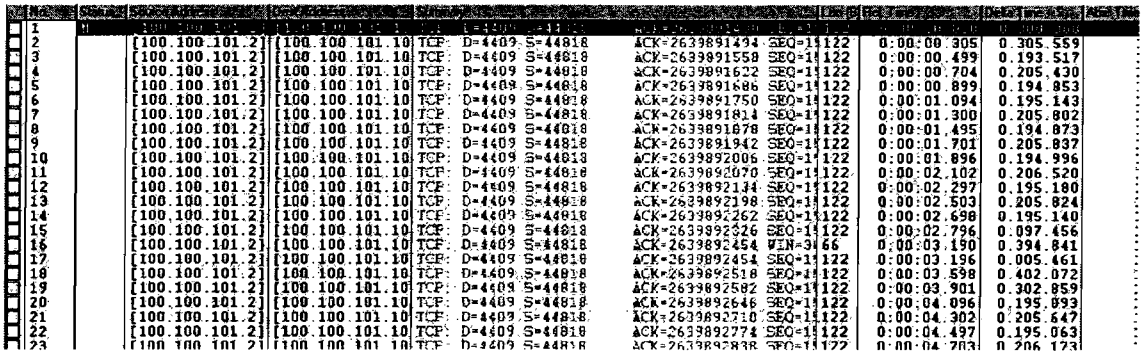
Two filters need to be configured, the Input (Ingress Mirror Filter) and the Output (Egress Mirror Filter)
Default: All Transmitted
Choices: All Transmitted, All Transmitted frames with Destination Address equal to the MAC address field, All Received frames with Source Address equal to the MAC address field

Setting Up Divider:

The Divider allows further filtering

Example: Port 4 is set up to CAPT, Port 3's incoming frames
The Input Filter is set to capture traffic with Source Address 00:00:BC:03:4E:08
Input Divider is set to 2, to capture **every other** frame **coming to port 3** with **Source address of 00:00:BC:03:4E:08**, this MAC address belongs to IP address 100.100.101.2.





1									
2	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891494	SEQ=1	0:00:00.305	0.305.559
3	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891558	SEQ=1	0:00:00.499	0.193.517
4	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891622	SEQ=1	0:00:00.704	0.205.430
5	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891686	SEQ=1	0:00:00.899	0.194.853
6	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891750	SEQ=1	0:00:01.094	0.195.143
7	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891814	SEQ=1	0:00:01.300	0.205.802
8	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891878	SEQ=1	0:00:01.495	0.194.873
9	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639891942	SEQ=1	0:00:01.701	0.205.837
10	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892006	SEQ=1	0:00:01.896	0.194.996
11	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892070	SEQ=1	0:00:02.102	0.206.520
12	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892134	SEQ=1	0:00:02.297	0.195.180
13	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892198	SEQ=1	0:00:02.503	0.205.824
14	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892262	SEQ=1	0:00:02.698	0.195.140
15	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892326	SEQ=1	0:00:02.796	0.097.456
16	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892454	WIN=3	0:00:03.190	0.394.841
17	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892454	SEQ=1	0:00:03.196	0.005.461
18	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892518	SEQ=1	0:00:03.598	0.402.072
19	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892582	SEQ=1	0:00:03.901	0.302.859
20	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892646	SEQ=1	0:00:04.096	0.195.093
21	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892710	SEQ=1	0:00:04.302	0.205.647
22	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892774	SEQ=1	0:00:04.497	0.195.063
23	[100.100.101.2]	[100.100.101.10]	TCP	D=4409	S=44818	ACK=2639892838	SEQ=1	0:00:04.703	0.206.173

Once the Mirror configuration is complete, you can then look at the packets with Ethernet Sniffer Software.

Important Note: Port Mirroring and IGMP snooping are mutually exclusive. When Port Mirroring is enabled IGMP snooping is disabled. Port mirroring is a diagnostic tool; this feature should be disabled while running production.

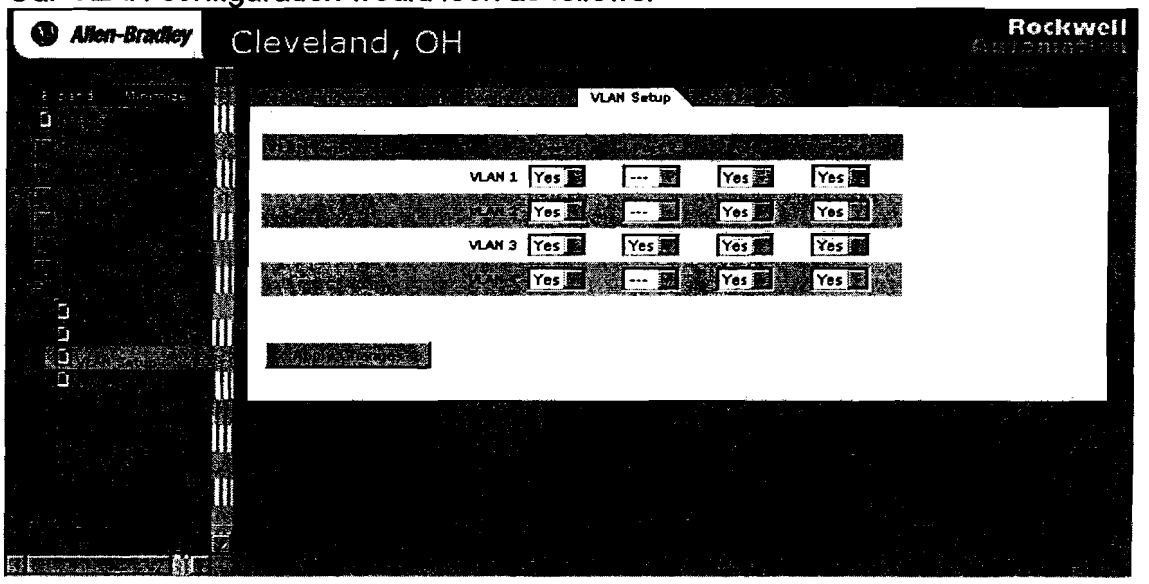
VLAN setup

Used when network bandwidth becomes critical.
VLAN can be used to eliminate traffic caused by Multicast and Broadcast Ethernet traffic. With this feature, we can partition the switches' ports into different private domains.

For each received packet the switch resolves the destination address and determines the appropriate port. The VLAN configuration is then checked to see if the destination address is configured to receive traffic from the source port.

Example:
Flex IO is connected to port 2 on the RADES, the IO is communicating with a ControlLogix on port 3. **We only want the ControlLogix on port 3** to receive traffic from the Flex IO on port 2. VLAN can be used to prevent other devices on the network from receiving packets from the Flex IO.

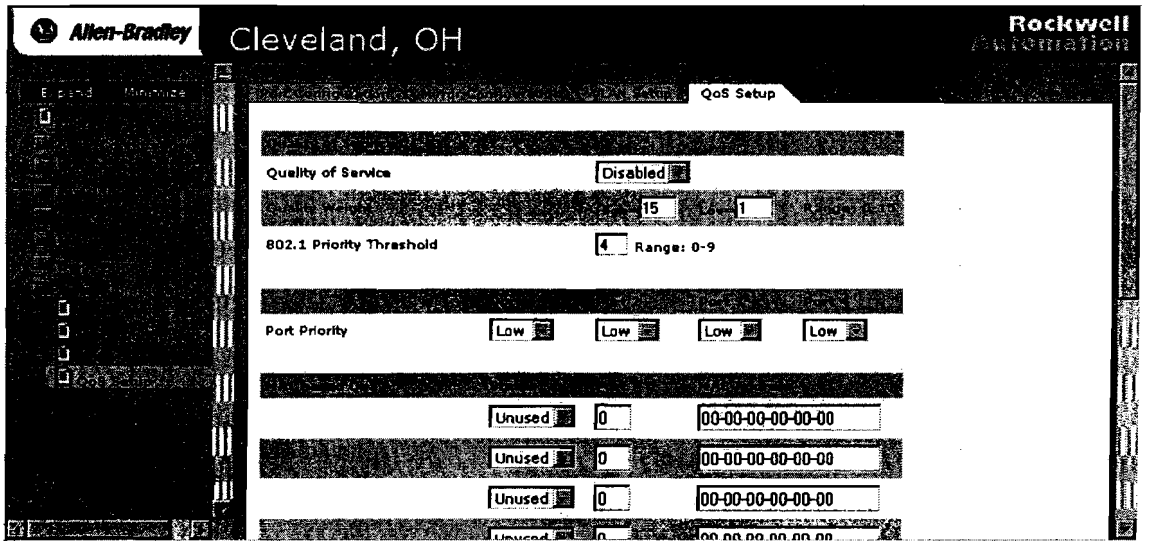
Our VLAN configuration would look as follows:



The Ingress Port (Source Port) 2 Will only Transmit to Egress Port (Destination Port) 3

QoS setup

QoS (Quality of service) allows the classification of Ethernet traffic into "high" and "low" priority queues. High priority packets will be forwarded to their destination address before a low priority packet. Packets can be classified as high or low by: MAC address, 802.1p priority tag, and or port ID.



Port based priority

When changed to Yes, the incoming traffic for that port is considered High Priority.

High/Low Quality weight

Establishes algorithm for switching between High and low priority Queues. The default value of 15/1 will send 15 blocks of High priority traffic then send 1 block of low priority traffic.

MAC based priority

Incoming packets are cross referenced with the MAC based QoS list, and put into the high priority queue if the destination address is on the list.

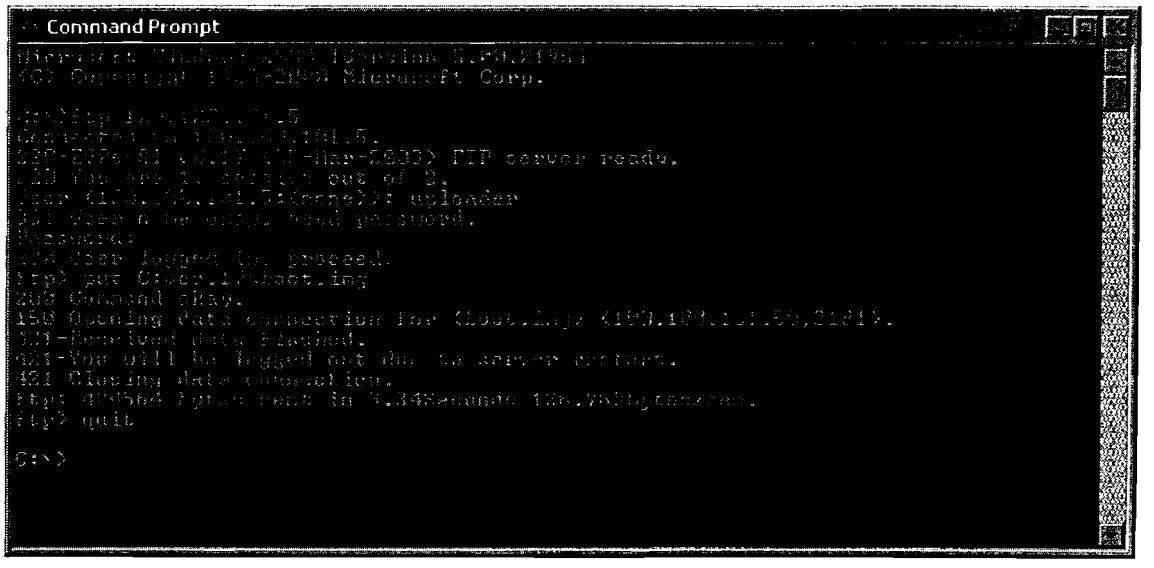
802.1P priority

Each incoming packet is examined for a valid 802.1p priority tag. If present, the packet will be put in the high priority queue if the priority tag exceeds the QoS Priority Threshold.

A Upgrading 9300-RADES Firmware

WARNING:

The modem will cycle power automatically at the end of the flash procedure. Any switching activity will be temporarily interrupted.



1. Open a Command window.

2. Type FTP then the IP address of the modem. Default is 192.168.1.1. The address we are using in the example picture is 100.100.101.5.

3. Once an FTP connection has been established you will have to enter a username and password. The default values are:

   Username is: uploader (lowercase)

   Password is: ZYPCOM (uppercase)

4. Now we have an FTP prompt (ftp>) and we can issue standard FTP commands. We will use the PUT command to send our firmware file to the modem. Type: put (File Path)\(File Name). Omit the parenthesis. In the example picture we have put the file named "boot.img" into a folder named "ver.17" which resides in the root of the C: drive.
   The flash code must be on the hard drive. It will not work from a floppy

5. The modem will flash itself and the connection will automatically close. Use the "quit" command to exit ftp mode and then close the command window.

6. Wait about 60 seconds, then re-establish you ftp connection, then run the put command for the webdata.img and qsdata.img files. Power will not cycle when these files are done loading. These files upgrade the web server file and the embedded Quick Start file.

Flashing the unit does not overwrite your IP address or password.

B Username and Password Rules

Characters allowed in phone number fields:
'0', '1', '2', '3', '4', '5', '6', '7', '8', '9','P', 'T', ',', '-', 'R', 'W', '!', '@', ';', ' '

Username and Password characters:
'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M','N',
'O', 'P', 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z','a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm','n','o', 'p', 'q',
'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z',
'0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '-', '.', ',', ' '

Other rules:
Username: from 0-20 characters long (spaces count as a character)
Password: from 0-20 characters long (spaces count as a character)

C Country Codes

Table 22. Country Code Setting

COUNTRY	CODE	COUNTRY	CODE
Algeria	213	Mexico	52
Argentina	54	Morocco	212
Australia	61	Netherlands	31
Austria	43	New_Zealand	64
Bahrain	973	Norway	47
Belgium	32	Oman	968
Bolivia	591	Panama	507
Brazil	55	Peru	51
Chile	56	Philippines	63
China	86	Poland	48
Colombia	57	Portugal	351
Costa_Rica	506	Puerto_Rico	999
Cyprus	357	Qatar	974
Czechoslovakia	42	Reset†	911
Denmark	45	Russia	7
Ecuador	593	Saudi_Arabia	966
Egypt	20	Singapore	65
Finland	358	Slovakia	428
France	33	Slovenia	386
Germany	49	South_Africa	27
Greece	30	Spain	34
Guatemala	502	Sweden	46
Hong_Kong	852	Switzerland	41
Hungary	36	Syria	963
India	91	Taiwan	886
Indonesia	62	Thailand	66
Ireland	353	Trinidad	868
Israel	972	Turkey	90
Italy	39	Tunisia	216
Japan	81	UAE	971
Jordan	962	UK	44
Korea	82	Uruguay	598
Kuwait	965	USA/Canada	1
Lebanon	961	Venezuela	58
Malaysia	60	Yemen	967

D Factory Reset

Factory Reset

Factory Reset is accomplished with a small button located on the back of the unit. To access it you will need to carefully remove the plastic Din rail clip by gently lifting the tab in the center with a screwdriver and sliding the clip upward. We have two levels of reset:

What you will need:

1. a small screwdriver
2. the AC adaptor included with the 9300-RADES

Resetting IP address only:

To reset the IP address only:

1. With power applied, Push the reset button with a small screwdriver
2. Hold button in until the LEDs light in a circular pattern
3. Cycle power to complete the IP reset

Your IP address will default to 192.168.1.1

Changing all settings back to default:

To reset all settings to factory default:

1. Remove power
2. Push the reset button with a small screwdriver.
3. Apply power using the AC adapter while continuing to hold the reset button
4. Hold the button in until the LEDs light in a circular pattern
5. Cycle power to complete the reset

Section 7-Z

Ethernet Switch

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Cisco Systems

Data Sheet

Cisco Catalyst **2940** Series Switches

MOD# 2940-8TF

The Cisco® Catalyst® 2940 Series switches are small, standalone, managed switches with eight Fast Ethernet ports and a single integrated Fast Ethernet or Gigabit Ethernet uplink. The switches are designed to be used outside the wiring closet in the end-user workspace, and feature a durable metal shell, no fan for silent operation, easy wall or under-the-desk mounting, a security lock slot to prevent theft, and an available cable guard to secure the Ethernet cables and switch.

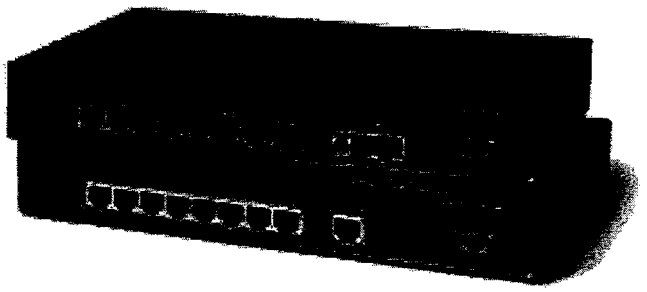
The Cisco Catalyst 2940 Series is extremely easy to set up and configure via Cisco Express Setup, a simple Web-Based setup utility. For more advanced configuration and ongoing management, the Cisco Catalyst 2940 Series has a console port and supports remote management protocols such as Telnet, Simple Network Management Protocol (SNMP), as well as the Cisco Cluster Management Suite (CMS), which is a free Java-enabled Web-based monitoring and configuration tool that comes embedded in the switch and can manage up to 16 switches at once. Combine this with the rich functionality of Cisco IOS® Software, and these switches provide comprehensive functionality and manageability for classrooms, conference rooms, or other very small workgroup environments.

The Cisco Catalyst 2940 Series is supported by a limited lifetime warranty and free software updates for life to keep the switch current with new standards and technologies. In summary, the Cisco Catalyst 2940 Series switches provide the lowest total cost of ownership in their product class with their durable design, simple installation and management, and award-winning Cisco support.

Configurations

- Cisco Catalyst 2940-8TT:
  - Eight 10/100 ports
  - One 10/100/1000BASE-T port
- Cisco Catalyst 2940-8TF:
  - Eight 10/100 ports
  - One 100BASE-FX port and One 1000BASE-X Small Form-factor Pluggable (SFP) slot (only one active port at a time)

Figure 1
Cisco Catalyst 2940 Series Switches



Accessory

- Cisco Catalyst 2940 Series Cable Guard
  - Helps prevent switch theft as well as prevent tampering or removal of Ethernet cables

Designed for the End-User Environment

The Cisco Catalyst 2940 switches are designed to be used beyond the wiring closet in the end-user environment. The following features make the switches ideal for classrooms, conference rooms, or very small workgroup environments:

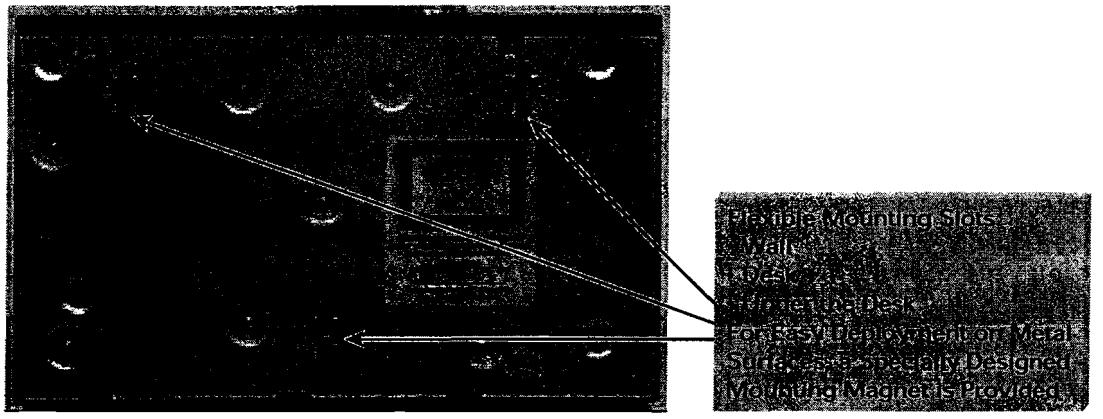
Small form factor: Only 10.6 in. long and 6.4 in. deep, this switch fits unobtrusively into tight areas or small cabinets. By using a right-angle power cord, the space required is even further reduced (see Figure 5 for size comparison to an electrical outlet).

Durability: An all-metal shell ensures that this switch will not get damaged from incidental blows from furniture or other hardware, as well as mitigates the impact of vandals.

Silent operation: By employing passive cooling instead of a fan or blower, this switch is completely silent and does not disrupt quite workspaces.

Flexible mounting capabilities: The switches can be mounted on a wall, on top of or under a desk or table, or on other surfaces using the mounting slots and the supplied screws (see Figure 2). In addition, for easy deployment on metal surfaces not suited for screws, a magnet is included as an additional mounting option. An internal power supply further enhances mounting flexibility because the power cord is not burdened with a large, heavy power brick.

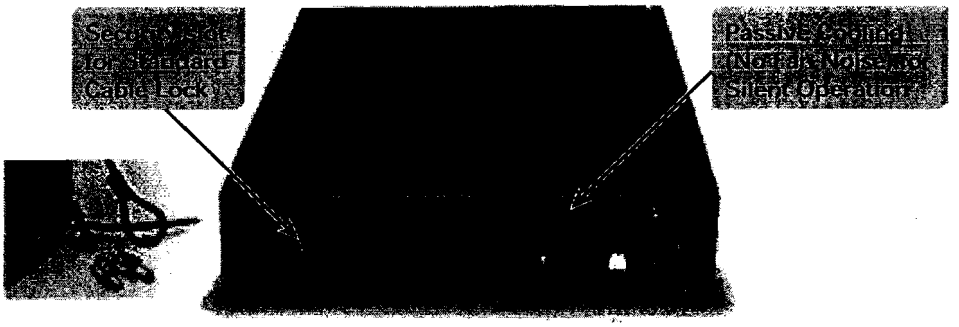
Figure 2
Underside Mounting Slots



Physical Security

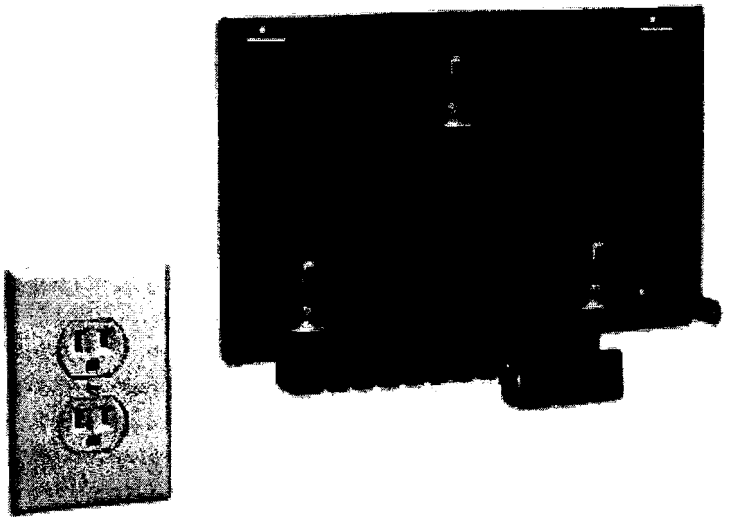
A security lock slot located on each side of the switch can be used with a standard cable lock[1] to prevent theft (see Figure 3).

Figure 3
Security Lock Slot and Cable Lock



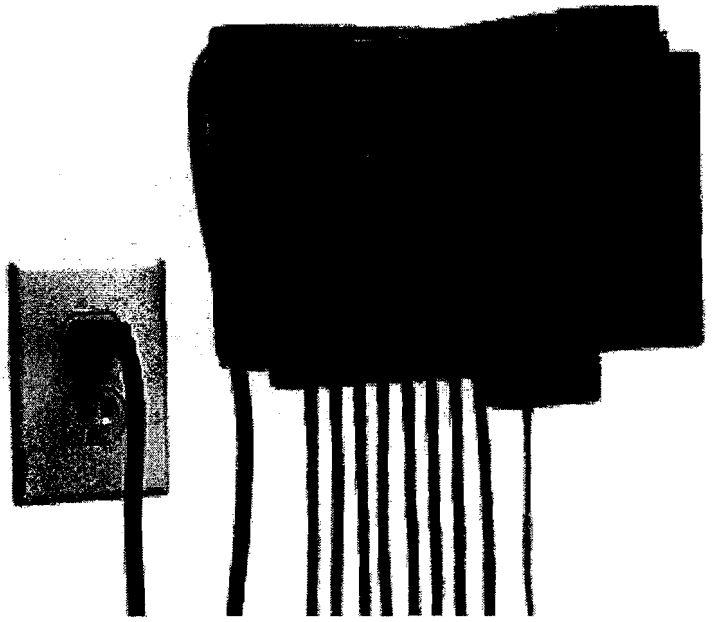
In addition, the Cisco Catalyst 2940 Series Cable Guard is available to provide extra security against theft as well as protect the Ethernet cables from tampering or removal (see Figures 4 and 5).

Figure 4
Cable Guard for Cisco Catalyst 2940 Series



1. Cable lock not provided by Cisco.

Figure 5
Wall-Mounted Switch Using Cable Guard[2]



Low Total Cost of Ownership

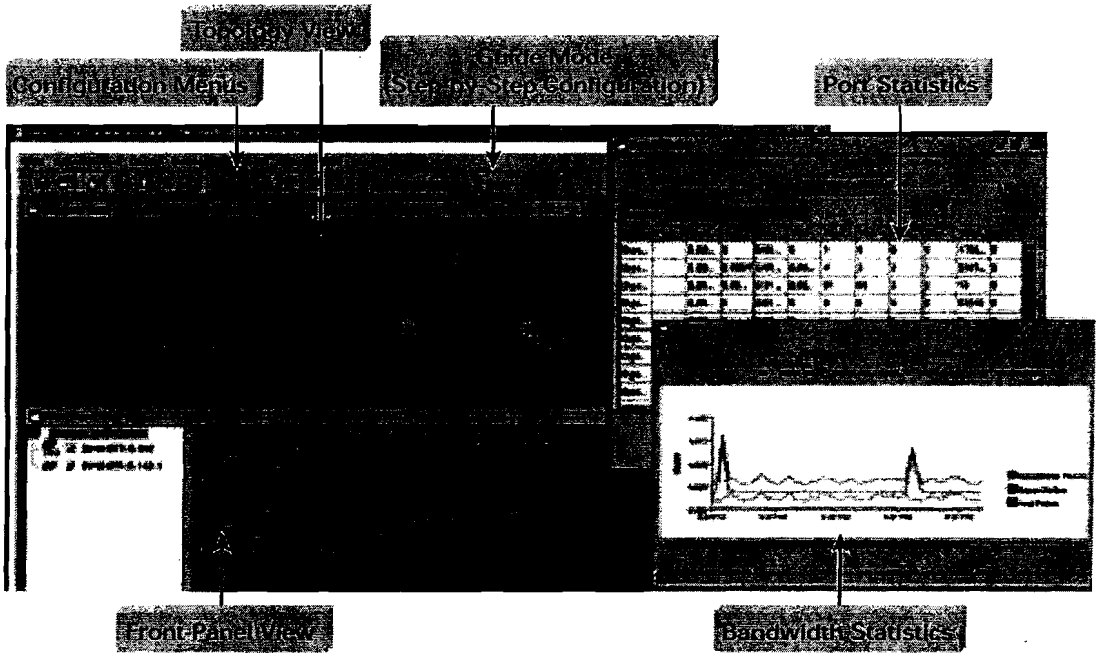
The Cisco Catalyst 2940 Series delivers a low total cost of ownership (TCO) within its product class by excelling in three key areas: manageability, ease of deployment, and investment protection.

Manageability

Manageability is critical for customers who are concerned with user productivity, as it allows them to proactively troubleshoot connectivity or performance issues. Typically, unmanaged switches require network administrators to physically inspect the switch when problems arise and do not provide troubleshooting tools or network statistics. In stark contrast, the Cisco Catalyst 2940 Series has robust SNMP Management Information Base (MIB) support and is fully manageable by the CiscoWorks suite of network management tools. In addition, the Cisco Cluster Management Suite is a free, Java-enabled, Web-based tool that is embedded in the Cisco Catalyst 2940 switches and provides advanced configuration and monitoring functionality for up to 16 switches at once in a very easy-to-use interface (see Figure 6). Most importantly, the Cisco Catalyst 2940 runs the same Cisco IOS Software with which so many network administrators are already familiar, thus reducing training and operating costs.

2. Please note that the switch can be wall-mounted without the cable guard using the underside mounting slots depicted in Figure 2. However, the switch and cables will not be secured as they are in Figure 5.

Figure 6
Cisco Cluster Management Suite—Embedded in the Cisco Catalyst 2940 Series

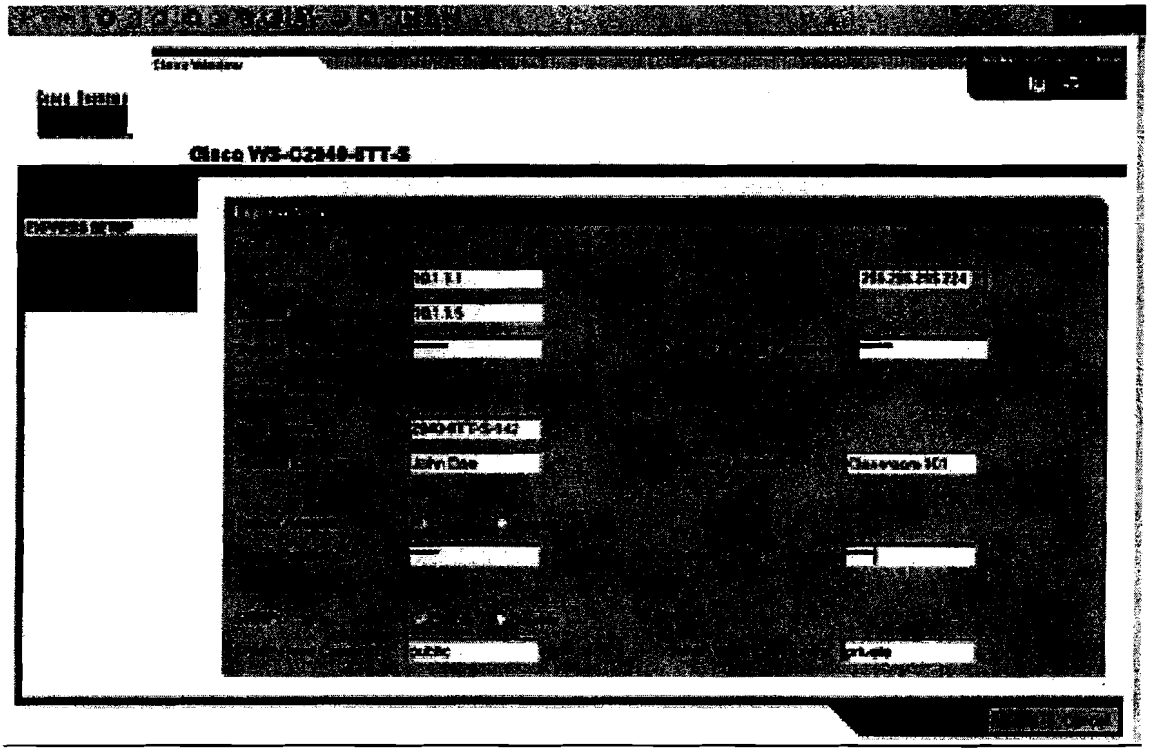


Ease of Deployment

Although the switch will operate without any configuration, a basic configuration will allow the switch to be managed remotely, giving network administrators the ability to change configurations, and also to monitor and troubleshoot the switch. This configuration can be achieved in several manners.

For automated configuration, the switch will first look for a Dynamic Host Configuration Protocol (DHCP) server to download an IP address and initial configuration when it boots up. For manual configuration, the Cisco Express Setup provides a simple Web page that allows even novice users to configure a basic setup (see Figure 7). After which, Cisco Express Setup can be disabled to ensure switch management security and the embedded Web-based Cluster Management Suite can be used to configure support for more advanced features.

Figure 7
Cisco Express Setup



3 Steps to Getting Started:

- Press the mode button 2 secs during bootup to go into Express Setup* mode
- Connect the PC to any Ethernet port
- Fill in Web page above and Save. Then connect the switch to the network!

*Can be disabled for security reasons

Investment Protection—Switches Designed to Outlive Your Deployment Horizon

In contrast to low-end unmanaged switches that often have high failure rates and do not stay current with new technologies, the Cisco Catalyst 2940 Series switches are built to last. A durable all-metal shell, an exceptionally high mean time between failure (MTBF) of over 70 years, and a Limited Lifetime Warranty, help ensure that this switch will outlast your anticipated deployment timeframe.

Just as important are the three to four free major software updates per year for the life of the switch. This allows customers to benefit from new functionality as networking standards and technology evolves over the years.

Finally, the switches provide a smooth migration to Gigabit Ethernet uplinks for those customers who have not yet upgraded their Fast Ethernet uplinks. The 2940-8TT provides an autosensing 10/100/1000BASE-T port for use as a Fast Ethernet or Gigabit Ethernet uplink over copper. Meanwhile, the 2940-8TF provides fiber optic uplink connectivity via an integrated 100BASE-FX Fast Ethernet port, as well as a 1000BASE-X Gigabit SFP slot that supports Cisco's 1000BASE-SX, 1000BASE-LX, and 1000BASE-T (future) SFPs.

Rich IOS Functionality

The Cisco Catalyst 2940 Series supports a Cisco IOS Software feature set that is nearly identical to that offered in the Standard Image Cisco Catalyst 2950 Series switches. This functionality provides:

- Support for network edge security to prevent unauthorized users
- Quality-of-service capabilities for basic data, video, and voice applications
- High-availability features to ensure user productivity
- Full network management support.

More details about the Cisco IOS functions are described below in Table 1. Currently, the only difference from the Cisco Catalyst 2950 Standard Image is that the 2940 Series supports only four virtual LANs (VLANs) and four Spanning Tree Protocol (STP) instances.

Product Specifications

Table 1 Product Features and Benefits

Feature	Benefit
Ease of Use and Ease of Deployment	
• Autoconfiguration	• Switch automatically downloads configuration file using Dynamic Host Configuration Protocol (DHCP).
• Autosensing	• Each non-SFP port detects the speed of the attached device and automatically configures the port for 10-, 100-, or 1000-Mbps operation, easing switch deployment in mixed 10, 100, and 1000BASE-T environments.
• Autonegotiating	• Each non-SFP port automatically selects half- or full-duplex transmission mode to optimize bandwidth.
• Dynamic Trunking Protocol (DTP)	• Switch ports automatically configure as trunks if connected to a trunk port on another switch or router.
• Port Aggregation Protocol (PAgP) and Link Aggregation Control Protocol (LACP)	• Switch ports automatically configure as Cisco Fast EtherChannel® groups or IEEE 802.3ad groups when there are multiple links to another switch, router, or server.
• DHCP Relay	• Allows a DHCP relay agent to broadcast DHCP requests to the network DHCP server.
• Default configuration	• The switch can be connected to the network and can forward traffic with no configuration.
• Auto-MDIX (media-dependent interface crossed-over) (Future)	• All ports automatically adjust transmit and receive pairs depending on cable type (cross-over or straight-through) connected.
• Express Setup	• Web browser utility allows simple switch set up so that even novices can perform a basic configuration.

Table 1 Product Features and Benefits

Feature	Benefit
Availability/Scalability	
Superior Redundancy for Fault Backup	
• IEEE 802.1D Spanning Tree Protocol	• Ensures loop-free networks simplifies network configuration and improves fault tolerance.
• PortFast	• Transitions a port directly to forwarding state after linkup, allowing users to connect to the network in 2–3 seconds, rather than waiting ~50 seconds for spanning tree to resolve.
• UniDirectional Link Detection (UDLD) and Aggressive UDLD	• Unidirectional links automatically detected and disabled to avoid problems such as spanning tree loops; Aggressive Mode automatically retries the link periodically to see if it has returned to bidirectional.
• Switchport Autorecovery	• Automatically attempts to re-enable a link that is disabled due to a network error (also known as "errdisable recovery").
• BPDU Guard	• Shuts down Spanning-Tree Protocol PortFast-enabled interfaces when Bridge Protocol Data Units (BPDUs) are received to avoid accidental topology loops.
• Spanning Tree Root Guard (STRG)	• Prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
• UplinkFast/BackboneFast	• Ensure quick fail-over recovery enhancing overall network stability and reliability.
Bandwidth Availability	
• Per-port broadcast, multicast, and unicast storm control	• Prevents faulty end stations from degrading overall systems performance.
• Per VLAN Spanning Tree Plus (PVST+)	• Allows for Layer 2 load sharing on redundant links to utilize the full capacity of a redundant design.
• VLAN Trunking Protocol (VTP) pruning	• Limits bandwidth consumption on VTP trunks by limiting broadcast traffic only to trunk links required to reach the destination devices.
• Internet Group Management Protocol (IGMP) Snooping	• Provides bandwidth-intensive multicast traffic to only the requestors, rather than flooding all ports. Support for IGMP version 1 and 2.
• IGMP immediate-leave processing	• Faster than normal multicast leave processing, this prunes out unnecessary multicast traffic immediately after a leave request.
• Multicast VLAN Registration (MVR)	• Allows multicast streams in a single networkwide multicast VLAN while subscribers remain in separate VLANs for bandwidth and security reasons.
Quality of Service/Control	
Advanced Quality of Service	
• Honor 802.1p class of service (CoS)	• Ability to prioritize traffic and put it in different queues.
• Mark/override 802.1P CoS per port	• Network administrator can enforce QoS policies, and prevent users from abusing QoS settings.
• 4 egress queues per port	• Enables network traffic to be put into 4 different queues, depending on the CoS priority.
• Weighted Round Robin (WRR) scheduling	• High priority queues can be allocated more time to send traffic. However, WRR also ensures lower priority queues are not neglected.
• Strict Priority scheduling	• Guarantees that the highest-priority packets are serviced ahead of all other traffic. Particularly useful for time-sensitive applications like voice over IP.

Table 1 Product Features and Benefits

Feature	Benefit
Security	
Network Management Security	
• VLAN1 minimization	• Allows VLAN1 to be disabled on any individual VLAN trunk link.
• TACACS+ and RADIUS Authentication	• Terminal Access Controller Access Control System Plus (TACACS+) and Remote Authentication Dial-In User Service (RADIUS) authentication enable centralized control of switch administration and management.
• Multilevel management levels	• Allows for 15 levels of switch management authorization, ranging from read-only to full read/write capabilities.
Network Edge Security	
• IEEE 802.1x	• Allows dynamic, port-based security, providing user authentication.
• Voice VLAN 802.1x bypass	• Permits an IP phone to access the voice VLAN irrespective of the authorized or unauthorized state of the port.
• Private VLAN Edge	• Provides security and isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.
• SPAN for IDS	• Bidirectional data support on the Switched Port Analyzer (SPAN) port allows Cisco Secure Intrusion Detection System (IDS) to take action when an intruder is detected.
• MAC address notification	• Allows administrators to be notified of users added to or removed from the network. Good for tracking location of users or stolen laptops.
• Port security	• Secures the access to an access or trunk port based on MAC address. After a specific timeframe, the aging feature removes the MAC address from the switch to allow another device to connect to the same port.
• Autotrusted boundary	• Ability to trust the QoS priority settings if an IP phone is present and to disable the trust setting in the event that the IP phone is removed, thereby preventing a malicious user from overriding prioritization policies in the network.
• IGMP filtering	• Provides multicast authentication by filtering out non-subscribers and limits the number of concurrent multicast streams available per port.
• Dynamic VLAN Assignment	• Using VLAN Membership Policy Server (VMPS) client functionality, ports can be assigned to VLANs based on the MAC address connected to the port or a user login (using the CiscoWorks User Registration Tool).

Table 1 Product Features and Benefits

Feature	Benefit
Manageability	
Superior Manageability	
• SNMPv1/2/3 (non-crypto) and robust MIB support	• Enables full management of switches via standard network management tools.
• Cisco IOS CLI	• Provides common user interface and command set with all Cisco routers and Cisco Catalyst desktop switches, minimizing training costs.
• Telnet and console access	• Telnet provides comprehensive remote in-band management, while console port enables out-of-band management.
• Service Assurance Agent (SAA)	• Facilitates service-level management by providing network response time measurements.
• 802.1q VLANs	• Up to 4 802.1Q VLANs per switch, as well as 1005 VLAN IDs. Any port can be a VLAN trunk port.
• Voice VLAN	• Simplifies IP telephony installations by keeping voice traffic on a separate VLAN for easier administration and troubleshooting.
• VTP	• Propogates VLAN and trunk configuration across all switches in the network.
• Remote Monitoring (RMON)	• For enhanced traffic management, monitoring, and analysis, the Embedded Remote Monitoring (RMON) software agent supports 4 RMON groups (history, statistics, alarms, and events). All 9 RMON groups are supported when using SPAN to mirror traffic to an RMON probe or network analyzer.
• Layer 2 Traceroute	• Eases troubleshooting by identifying the physical path that a packet takes from source to destination.
• Switch Port Analyzer (SPAN) port	• Mirrors traffic from a port or group of ports to a single destination port, where a network analyzer or RMON probe can be connected. 1 SPAN session only.
• Trivial File Transfer Protocol (TFTP)	• Reduces the cost of administering software upgrades by downloading from a centralized server.
• Network Time Protocol (NTP)	• Provides an accurate and consistent timestamp to all intranet switches.
• Multifunction LEDs per port	• For port up/down status; half-duplex and full-duplex mode; and 10BASE-T, 100BASE-TX, and 1000BASE-T indication.
• Switch-level Status LEDs	• Provides easy visual indication of system integrity status.

Table 1 Product Features and Benefits

Feature	Benefit
Cluster Management Suite	
Web-based Management	
• Supports up to 16 switches with single IP address	• Provides an easy-to-use, Web-based management interface through a standard Web browser. Simplifies management and saves time, without the limitation of being physically located in the same wiring closet.
• 1-click software upgrade	• Entire cluster of Cisco Catalyst 2940 switches can be upgraded at once.
• Configuration cloning	• Enables rapid deployment of networks.
• Guide Mode	• Makes it easy to configure powerful advanced features by providing step-by-step instructions.
• Context-sensitive Help	• Saves time by providing help on the feature currently being used.
• Topology map	• Provides a view of up to 16 switches interconnected and their up/down status, and link speeds and settings.
• Front panel view	• Provides a front panel view of up to 16 switches and their up/down status of ports. Also can be used to select ports across all the switches to be configured simultaneously.
• Multidevice and multiport configuration	• Saves time and resources.
• Cisco Aironet® Wireless Access Point Management	• Web-based management for Aironet devices can be launched by clicking the relevant icon in the topology map.
• User-personalized interface	• Customize polling intervals, table views, and other settings within Cisco CMS Software and retains these settings.
• Alarm notification	• Automated e-mail notification of network errors and alarm thresholds.
CiscoWorks Support	
• Supported by CiscoWorks LAN Management Solution (LMS), Access Control Server (ACS), Small Network Management Solution (SNMS), and CiscoWorks for Windows	• CiscoWorks network-management software provides management capabilities on a per-port and per-switch basis, providing a common management interface for all Cisco routers, switches, hubs, and other Cisco devices. The CiscoWorks tools save time and reduce human errors.
• Cisco Discovery Protocol (CDP) v1, v2	• Enable a CiscoWorks network-management station to automatically discover and map switches.

Table 2 Hardware Specifications

Description	Specification
Performance	• 3.6 Gbps maximum forwarding bandwidth • 2.7 Mpps wire-speed forwarding rate (based on 64-byte packets) • 16 MB DRAM and 8 MB Flash memory • Configurable up to 8000 MAC addresses • Configurable up to 255 multicast groups • Configurable maximum transmission unit (MTU) of up to 1500 bytes • 4 802.1Q VLANs • 1005 VLAN IDs
100BASE-FX fiber-port power levels	Optical transmitter wavelength: 1300 nm (nanometer) Optical receiver sensitivity for 50/125-micron cabling: -33.5 to -11.8 dBm (decibel milliwatt) Optical receiver sensitivity for 62.5/125-micron cabling: -33.5 to -11.8 dBm Optical transmitter power for 50/125-micron cabling: -23.5 to -14 dBm Optical transmitter power for 62.5/125-micron cabling: -20 to -14 dBm
Connectors and cabling	• 10BASE-T ports: RJ-45 connectors; 2-pair Category 3, 4, or 5 unshielded twisted-pair (UTP) cabling • 100BASE-TX ports: RJ-45 connectors; 2-pair Category 5 UTP cabling • 1000BASE-T ports: RJ-45; 2-pair Category 5 UTP cabling • 100BASE-FX ports: MT-RJ connectors, 50/125 or 62.5/125 micron multimode fiber-optic cabling • 1000BASE-SX, -LX/LH, -T SFP-based port: LC fiber connectors, single-mode or multimode fiber, and RJ-45 connector for copper • Management console port: Use RJ-45-to-DB9 cable for PC connections
Power connectors	• The internal power supply is an autoranging unit, supporting input voltages between 100 and 240 volts alternating current (VAC) • Use the supplied AC power cord to connect the AC power connector to an AC power outlet
Indicators	• Per-port status LEDs: link integrity, disabled, activity, speed, and full-duplex indications • System-status LED
Dimensions	(H x W x D) 1.55 x 10.6 x 6.42 in. (3.94 x 26.92 x 16.3 cm)
Weight	3 lb (1.36 kg)
Environmental Ranges	• Operating temperature 32 to 113 F (0 to 45 C) • Storage temperature -13 to 158 F (-25 to 70 C) • Operating humidity 10 to 85% (noncondensing) • Operating altitude up to 10,000 ft (3000 m) • Storage altitude up to 15,000 ft (4570 m)
Acoustic Noise	International Organization for Standardization (ISO) 7779: bystander position operating to an ambient temperature of 30 C: 0 decibels (dB)
Telco CLEI Code	• 2940-8TF: CNMEG00ARA • 2940-8TT: CNMEH00ARA

Table 2 Hardware Specifications

Description	Specification
Mean Time Between Failure (MTBF)—Predicted	• 2940-8TF: 636,000 hrs (73 yrs) • 2940-8TT: 771,000 hrs (88 yrs)
Warranty	• Limited lifetime warranty

Table 3 Power Specifications

Description	Specification
Power Consumption	15W (maximum) 50 Btus per hour
AC input voltage/frequency	100 to 240 VAC (autoranging), 50 to 60 Hz

Table 4 Management and Standards Support

Description	Specification
Management Information Bases (MIBs)	BRIDGE-MIB.my ENTITY-MIB.my CISCO-2900-MIB.my CISCO-CDP-MIB.my CISCO-CONFIG-MAN-MIB.my CISCO-IMAGE-MIB.my CISCO-MEMORY-POOL-MIB.my CISCO-PING-MIB.my CISCO-PRODUCTS-MIB.my CISCO-TCP-MIB.my IF-MIB (RFC 1573) OLD-CISCO-CHASSIS-MIB.my OLD-CISCO-CPU-MIB.my OLD-CISCO-INTERFACES-MIB.my OLD-CISCO-IP-MIB.my OLD-CISCO-MEMORY-MIB.my OLD-CISCO-SYSTEM-MIB.my OLD-CISCO-TCP-MIB.my OLD-CISCO-TS-MIB.my RFC1213-MIB (MIB-II) RFC1398-MIB (ETHERNET-MIB) RMON-MIB (RFC 1757)- 4 Groups SNMPv2-MIB.my TCP-MIB.my UDP-MIB.my CISCO-VLAN-MEMBERSHIP-MIB.my CISCO-SMI.my CISCO-TC.my CISCO-VTP-MIB.my IANAifType-MIB.my

Table 4 Management and Standards Support

Description	Specification
Management Information Bases (MIBs)	RS-232-MIB.my SNMPv2-SMI.my SNMPv2-TC.myCISCO-STP-EXTENSIONS-MIB.my CISCO-CLUSTER-MIB.my CISCO-FLASH-MIB.my CISCO-PROCESS-MIB.my CISCO-MAC-NOTIFICATION-MIB.my CISCO-PAGP-MIB.my CISCO-IGMP-FILTER-MIB CISCO-RTTMON-MIB CISCO-BULK-FILE-MIB CISCO-CONFIG-COPY-MIB CISCO-ENVMON-MIB CISCO-FTP-CLIENT-MIB CISCO-SYSLOG-MIB CISCO-STACKMAKER-MIB CISCO-PORT-SECURITY-MIB.my
Standards	IEEE 802.1x IEEE 802.3ad IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports IEEE 802.1D Spanning-Tree Protocol IEEE 802.1p CoS Prioritization IEEE 802.1Q VLAN IEEE 802.3 10BASE-T specification IEEE 802.3u 100BASE-TX specification IEEE 802.3ab 1000BASE-T specification IEEE 802.3z 1000BASE-X specification 1000BASE-SX 1000BASE-LX/LH RMON I and II standards SNMPv1, SNMPv2c, SNMPv3 (non-crypto)

Table 5 Compliance

Safety certifications	• UL to UL 60950, Third Edition • C-UL to CAN/CSA C22.2 No. 60950-00, Third Edition • TUV/GS to EN 60950:2000 • CB to IEC 60950 with all country deviations • NOM to NOM-019-SCFI • CE Marking

Table 5 Compliance

Electromagnetic Compatability	• FCC Part 15 Class A • EN 55022: 1998 (CISPR22) • EN 55024: 1998 (CISPR24) • VCCI Class A • AS/NZS 3548 Class A • CE • CNS 13438 Class A • MIC

Service and Support

Cisco Systems® is committed to minimizing total cost of ownership (TCO). Cisco offers a portfolio of Technical Support Services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in the table below are available as part of the Cisco Desktop Switching Service and Support solution, and are available directly from Cisco and through resellers.

Table 6 Service and Support Products, Features, and Benefits

Service and Support	Features	Benefits
Advanced Services		
Cisco Total Implementation Solutions (TIS), available direct from Cisco Cisco Packaged TIS, available through resellers	• Project management • Site survey, configuration, and deployment • Installation, test, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplements existing staff • Ensures functions meet needs • Mitigates risk
Technical Support Services		
Cisco SMARTnet™ and SMARTnet Onsite, available direct from Cisco Cisco Packaged SMARTnet, available through resellers	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance replacement of hardware parts	• Enables proactive or expedited issue resolution • Lowers TCO by taking advantage of Cisco expertise and knowledge • Minimizes network downtime

Table 7 Ordering Information

Product Number	Product Description
WS-C2940-8TF-S	• 8 Ethernet 10/100 ports + 1 Ethernet 100BASE-FX + 1 1000BASE-X SFP port (1 uplink active at a time) • Wall-mountable, standalone, managed switch
WS-C2940-8TT-S	• 8 Ethernet 10/100 ports + 1 Ethernet 10/100/1000BASE-T • Wall-mountable, standalone, managed switch
CABLEGUARD-C2940=	• Cable Guard for the Cisco Catalyst 2940 Series Switches secures switch and prevents tampering with Ethernet cable jacks

Table 8 Compatible Small Form-Factor Pluggable (SFP) Transceivers for the Cisco Catalyst 2940-8TF Switch

Product Number	Product Description
GLC-LH-SM=	1000BASE-LX/LH Gigabit Ethernet SFP, LC connector, LH transceiver
GLC-SX-MM=	1000BASE-SX Gigabit Ethernet SFP, LC connector, SX transceiver

Table 9 Compatible Fiber Patch Cables for the Cisco Catalyst 2940-8TF Switch MT-RJ Connectors

Product Number	Product Description
CAB-MTRJ-SC-MM-1M=	1-meter, MT-RJ-to-SC multimode cable
CAB-MTRJ-ST-MM-1M=	1-meter, MT-RJ-to-ST multimode cable
CAB-MTRJ-SC-MM-3M=	3-meter, MT-RJ-to-SC multimode cable
CAB-MTRJ-ST-MM-3M=	3-meter, MT-RJ-to-ST multimode cable
CAB-MTRJ-SC-MM-5M=	5-meter, MT-RJ-to-SC multimode cable
CAB-MTRJ-ST-MM-5M=	5-meter, MT-RJ-to-ST multimode cable

For more information about Cisco products, contact:

- United States and Canada: (toll free) 800 553-NETS (6387)
- Europe: 32 2 778 4242
- Australia: 612 9935 4107
- Other: 408 526-7209
- World Wide Web URL:

  http://www.cisco.com

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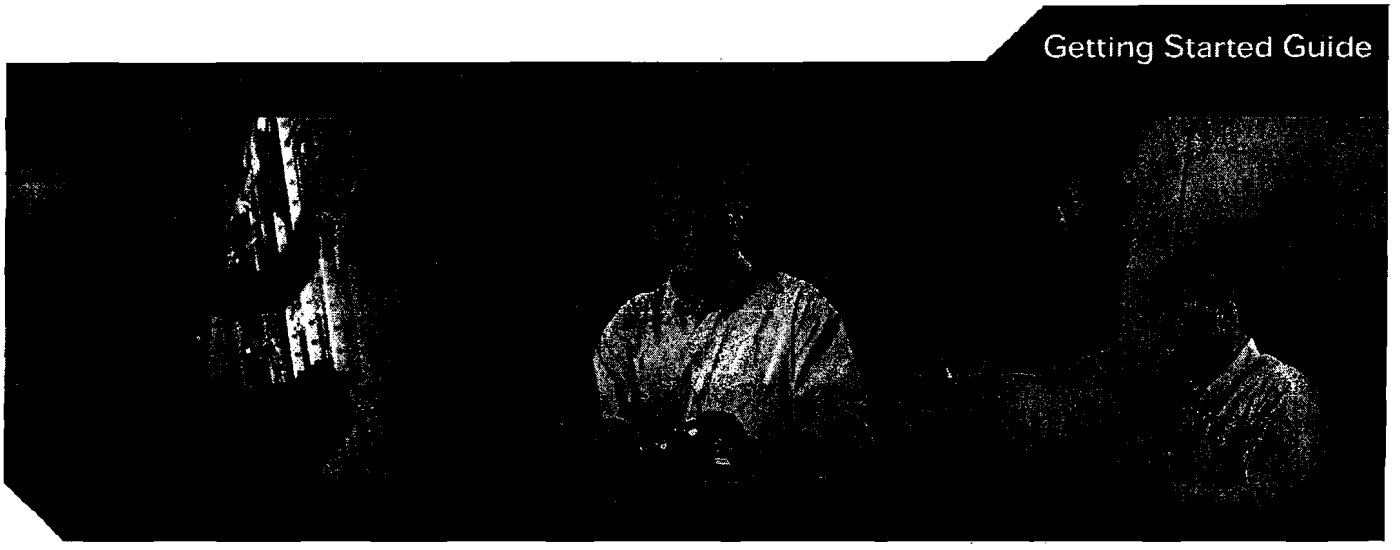


Catalyst 2940 Switch Getting Started Guide

INCLUDING LICENSE AND WARRANTY

1 About this Guide

This guide provides instructions on how to use Express Setup to initially configure your Catalyst switch. Also covered are switch management options, basic installation procedures, port and module connections, and troubleshooting help.

For additional installation and configuration information, and technical specifications, refer to the Catalyst 2940 documentation on Cisco.com. For system requirements, important notes, limitations, open and resolved bugs, and last-minute documentation updates, see the release notes, also on Cisco.com.

When using the online publications, refer to the documents that match the Cisco IOS software version running on the switch. The software version is on the Cisco IOS label on the switch rear panel.

You can order printed copies of the manuals from the Cisco.com sites and from the telephone numbers listed in the "Obtaining Documentation" section on page 18.

For translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information for the Catalyst 2940 Switch* that accompanies this guide.

2 Taking Out What You Need

Follow these steps:

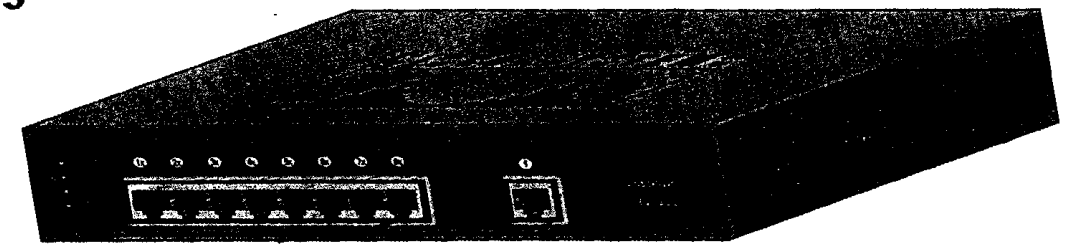
1. Unpack and remove the switch and the accessory kit from the shipping box.
2. Return the packing material to the shipping container, and save it for future use.
3. Verify that you have received the items shown on page 3. If any item is missing or damaged, contact your Cisco representative or reseller for instructions. Some switch models might include additional items that are not shown on page 3.

Equipment That You Supply to Run Express Setup

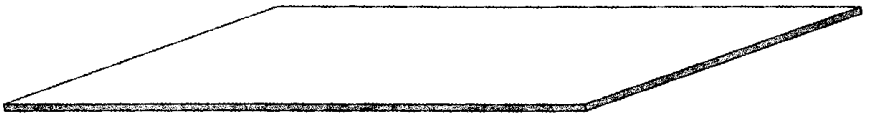
You need to supply this equipment to run Express Setup:

- PC
- Ethernet (Category 5) straight-through cable (as shown)

Shipping Box Contents

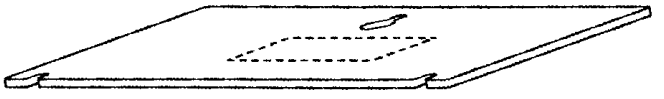


Catalyst 2940 switch

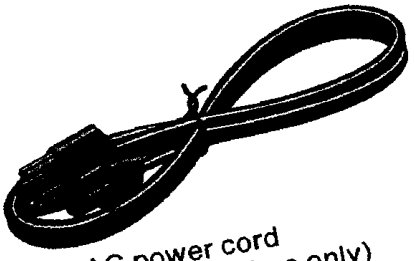


Mounting magnet

Console cable

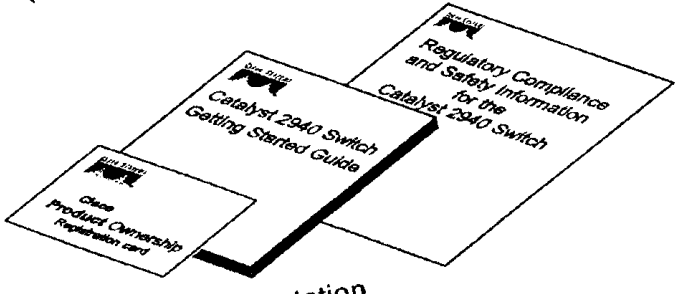


Screw template

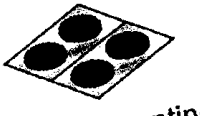


AC power cord
(AC-powered switches only)

Three number-8
Phillips pan-head screws



Documentation



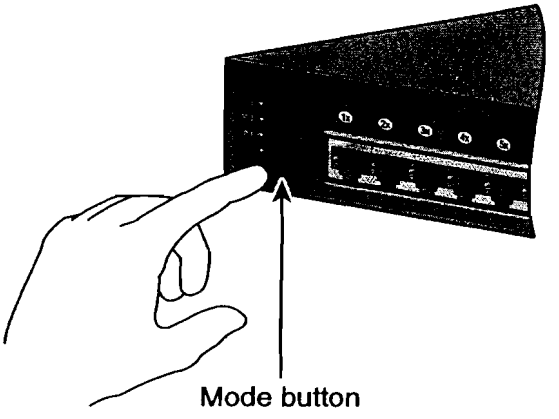
Four rubber mounting feet

3 Running Express Setup

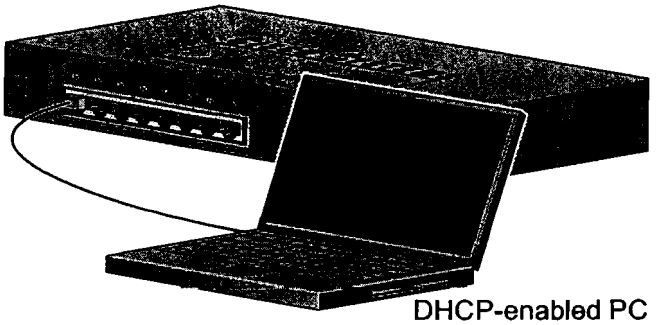
When you first set up the switch, you should use Express Setup to enter the initial IP information. This enables the switch to connect to local routers and the Internet. You can then access the switch through the IP address for further configuration.

To run Express Setup:

Step 1	Verify that no devices are connected to the switch, because during Express Setup, the switch acts as a DHCP server. If your PC has a static IP address, before you begin you should change your PC settings to temporarily use DHCP.
Step 2	Connect the AC power cord to the switch and to a grounded AC outlet. The power-on self-test (POST) begins. During POST, the LEDs blink while a series of tests verify that the switch functions properly.
Step 3	Wait for the switch to complete POST. It might take several minutes for the switch to complete POST.
Step 4	Verify that POST has completed by confirming that the SYST and STAT LEDs are green.
Step 5	Press and hold the Mode button for 3 seconds. When all of the LEDs above the Mode button turn green, release the Mode button. If the LEDs above the Mode button begin to blink after you press the button, release it. Blinking LEDs mean that the switch has already been configured and cannot go into Express Setup mode. For more information, see the "Resetting the Switch" section on page 16.
Step 6	Verify that the switch is in Express Setup mode by confirming that all LEDs above the Mode button are green.



Step 7 Connect a straight-through Category 5 Ethernet cable (not provided) to any 10/100 or 10/100/1000 Ethernet port on the switch front panel and to the Ethernet port on the PC.

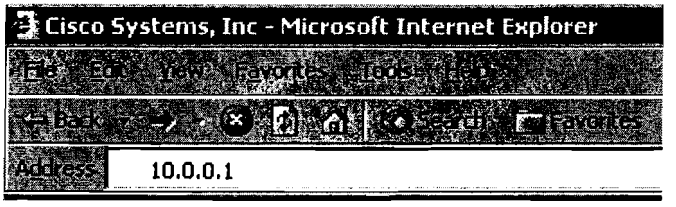


DHCP-enabled PC

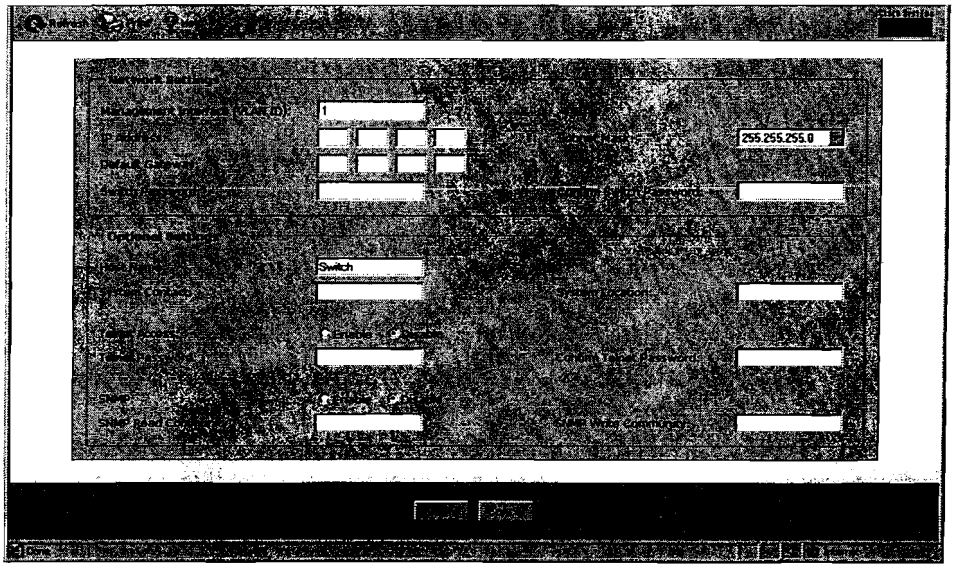
Step 8 Verify that the LEDs on both Ethernet ports are green.

Step 9 Wait 30 seconds.

Step 10 Launch a web browser on your PC. Enter the IP address 10.0.0.1 in the web browser, and press Enter.



Step 11 The Express Setup page appears. If it does not appear, see the "In Case of Difficulty" section on page 15 for help.



Step 12 Enter this information in the Network Settings fields:

- In the Management Interface (VLAN ID) field, the default is 1. Enter a new VLAN ID only if you want to change the management interface through which you manage the switch and to which you assign IP information. The VLAN ID range is 1 to 1001.
- In the IP Address field, enter the IP address of the switch. In the IP Subnet Mask field, click the drop-down arrow, and select an IP Subnet Mask.
- In the Default Gateway field, enter the IP address for the default gateway (router).
- Enter your password in the Switch Password field. The password can be from 1 to 25 alphanumeric characters, can start with a number, is case sensitive, allows embedded spaces, but does not allow spaces at the beginning or end. In the Confirm Switch Password field, enter your password again.

Step 13 (Optional) You can enter the Optional Settings information now or enter it later by using the device manager interface:

- In the Host Name field, enter a name for the switch. The host name is limited to 31 characters; embedded spaces are not allowed.
- In the System Contact field, enter the name of the person responsible for the switch. In the System Location field, enter the wiring closet, floor, or building where the switch is located.
- In the Telnet Access field, click Enable if you are going to use Telnet to manage the switch by using the command-line interface (CLI). If you enable Telnet access, you must enter a Telnet password.
- In the Telnet Password field, enter a password. The Telnet password can be from 1 to 25 alphanumeric characters, is case sensitive, allows embedded spaces, but does not allow spaces at the beginning or end. In the Confirm Telnet Password field, enter the Telnet password again.
- In the SNMP field, click Enable to enable Simple Network Management Protocol (SNMP). Enable SNMP only if you plan to manage switches by using CiscoWorks2000 or another SNMP-based network-management system.

  If you enable SNMP, you must enter a community string in the SNMP Read Community field, the SNMP Write Community field, or both. SNMP community strings authenticate access to MIB objects. Embedded spaces are not allowed in SNMP community strings. When you set the SNMP read community, you can access SNMP information, but cannot modify it. When set the SNMP write community, you can access and modify SNMP information.

Step 14	Click Submit to save your settings, or click Cancel to clear your settings. When you click Submit, the switch is configured and exits Express Setup mode. The PC displays a warning message and then attempts to connect with the new switch IP address. If you configured the switch with an IP address that is in a different subnet from the PC, connectivity between the PC and the switch is lost.
Step 15	Disconnect the switch from the PC, and install the switch in your production network. See the "Managing the Switch" section on page 7 for information about configuring and managing the switch. If you need to rerun Express Setup, see the "Resetting the Switch" section on page 16.

Refreshing the PC IP Address

After you complete Express Setup, you should refresh the PC IP address.

For a dynamically assigned IP address, disconnect the PC from the switch, and reconnect it to the network. The network DHCP server will assign a new IP address to the PC.

For a statically assigned IP address, change it to the previously configured IP address.

4 Managing the Switch

After completing Express Setup and installing the switch in your network, use the device manager or other management options described in this section for further configuration.

Using the Device Manager

The simplest way to manage the switch is by using the device manager that is in the switch memory. This is an easy-to-use web interface that offers quick configuration and monitoring. You can access the device manager from anywhere in your network through a web browser.

Follow these steps:

1. Launch a web browser on your PC or workstation.
2. Enter the switch IP address in the web browser, and press Enter. The device manager page appears.
3. Use the device manager to perform basic switch configuration and monitoring. Refer to the device manager online help for more information.
4. For more advanced configuration, download and run the Cisco Network Assistant described in the next section.

Downloading Cisco Network Assistant

Cisco Network Assistant is a free software program that you download from Cisco.com and run on your PC. Network Assistant offers advanced options for configuring and monitoring multiple devices, including switches, switch clusters, switch stacks, routers, and access points.

Follow these steps:

1. From the device manager page, select Network Assistant.
2. Follow the instructions to download the program to your PC.
3. Use the Network Assistant to configure and monitor multiple switches and devices. Refer to the Network Assistant online help and the getting started guide for more information.

Command-Line Interface

You can enter Cisco IOS commands and parameters through the CLI. Access the CLI either by connecting your PC directly to the switch console port or through a Telnet session from a remote PC or workstation.

Follow these steps:

1. Connect the supplied RJ-45-to DB-9 adapter cable to the standard 9-pin serial port on the PC. Connect the other end of the cable to the console port on the switch.
2. Start a terminal-emulation program on the PC.
3. Configure the PC terminal emulation software for 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.
4. Use the CLI to enter commands to configure the switch. Refer to the software configuration guide and the command reference for more information.

Other Management Options

You can use SNMP management applications such as CiscoWorks Small Network Management Solution (SNMS) and HP OpenView to configure and manage the switch. You also can manage it from an SNMP-compatible workstation that is running platforms such as HP OpenView or SunNet Manager.

The Cisco IE2100 Series Configuration Registrar is a network management device that works with embedded CNS agents in the switch software. You can use IE2100 to automate initial configurations and configuration updates on the switch.

See the "Accessing Help Online" section on page 16 for a list of supporting documentation.

5 Installing the Switch

This section covers switch installation and port connections. For additional installation and cabling information, refer to the *Catalyst 2940 Switch Hardware Installation Guide* on Cisco.com.

You can order an optional cable guard to secure cables to the front of the switch and prevent them from being accidentally removed. To order a cable guard, contact your Cisco representative.

The switch has security slots in the left and right side panels. You can install an optional cable lock, such as the type that is used to secure a laptop computer, to secure either or both sides of the switch. Cable locks are available from most computer accessory suppliers.

Equipment That You Supply

You need this equipment to install the switch:

- Number-2 Phillips screwdriver
- Drill with a #27 drill bit (0.144-inch [3.7 mm])

Before you Begin

When determining where to install the switch, verify that these guidelines are met:

- Airflow around the switch and through the vents is unrestricted.
- Temperature around the switch does not exceed 113°F (45°C).
- Humidity around the switch does not exceed 85 percent.
- Altitude at the installation site is not greater than 10,000 feet (3049 m).
- Clearance to the switch front and rear panels meets these conditions:
  - Front-panel LEDs can be easily read.
  - Access to ports is sufficient for unrestricted cabling.
  - AC power cord can reach from the AC power outlet to the connector on the switch front or rear panel.
- Cabling is away from sources of electrical noise, such as radios, power lines, and fluorescent lighting fixtures.
- For 10/100 ports and the 10/100/1000 port, the cable length from a switch to an attached device cannot exceed 328 feet (100 meters).
- For the 100BASE-FX port, the cable length from a switch to an attached device cannot exceed 6562 feet (2 kilometers).
- For cable lengths for small form-factor pluggable (SFP) modules, refer to the documentation that shipped with the module.

Installation Warning Statements

This section includes the basic installation warning statements.

Warning **To prevent the switch from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 113°F (45°C). To prevent airflow restriction, allow at least 3 inches (7.6 cm) of clearance around the ventilation openings.** Statement 17B

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.** Statement 39

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 148

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning **Class 1 laser product.** Statement 1008

Warning **The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.** Statement 1019

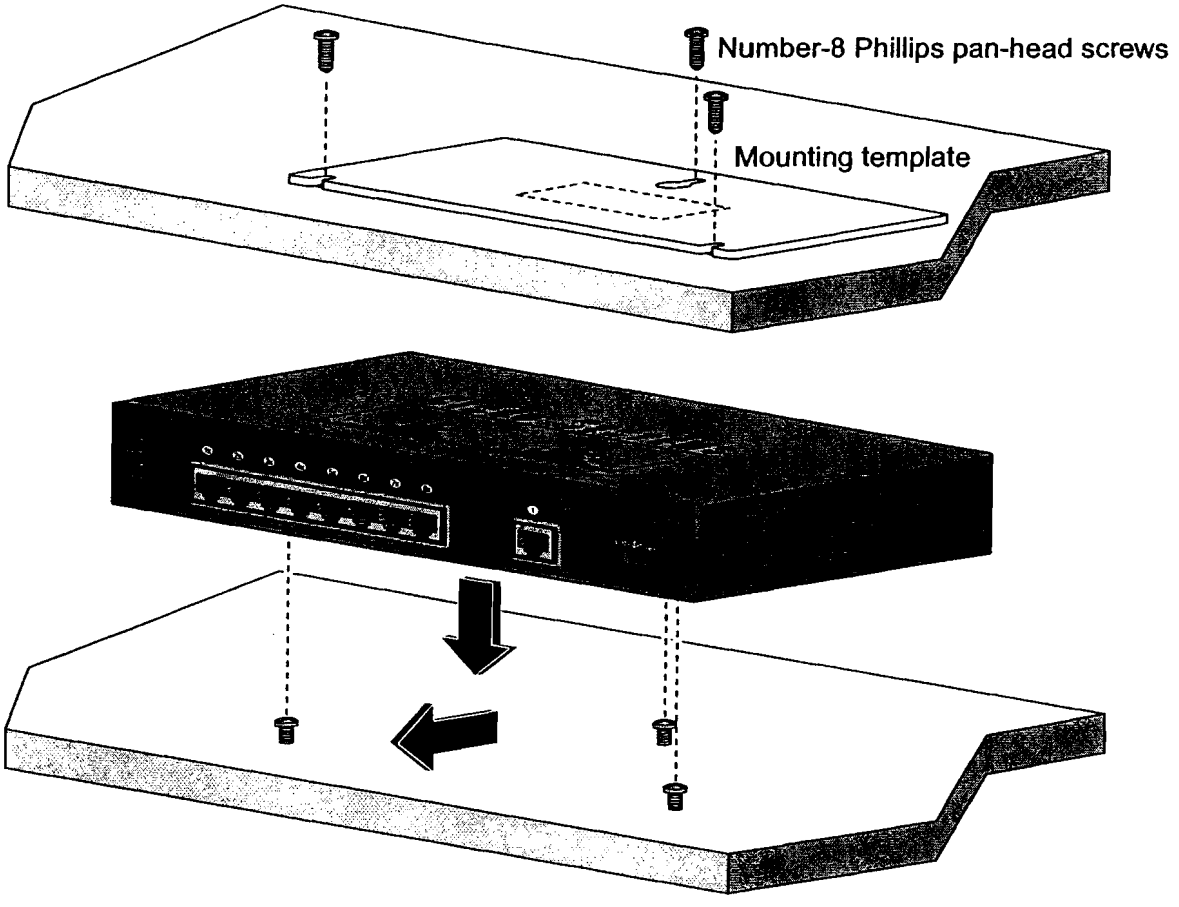
Warning **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Installing the Switch on a Desk or Wall

To place the switch on a desk without using the mounting screws, simply attach the four rubber feet on the bottom panel of the switch. To install the switch on top of a desk, under a desk, or on a wall, use the mounting template and three mounting screws.

Follow these steps:

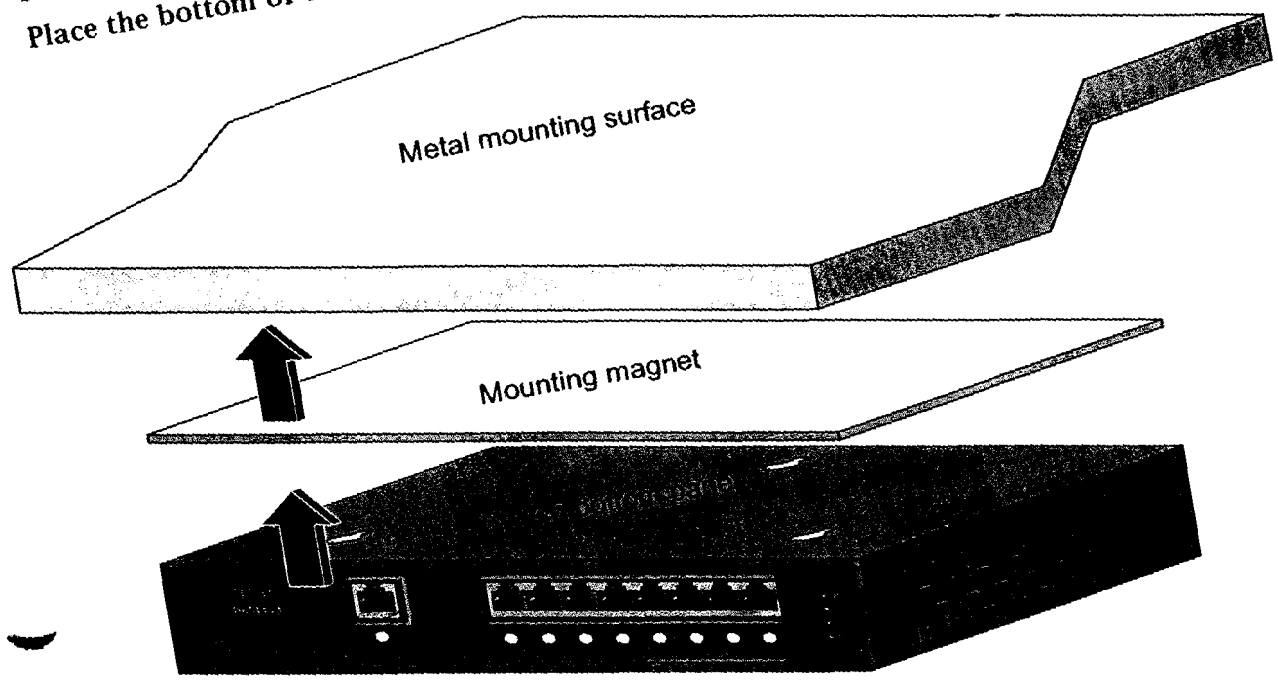
1. Position the screw template on the mounting surface with the two side-by-side slots forward. Peel the adhesive strip off the bottom and attach the template.
2. Use a 0.144-inch (3.7 mm) or a #27 drill bit to drill a 1/2-inch (12.7 mm) hole in the three template screw slot positions.
3. Insert the screws in the slots on the template and tighten until they touch the template. Remove the template from the mounting surface.
4. Place the switch onto the mounting screws, and slide it forward until it locks in place.



Installing the Switch Using the Magnet Mount

Follow these steps:

1. Position the magnetic panel on the mounting surface.
2. Place the bottom of the switch on the magnetic panel.

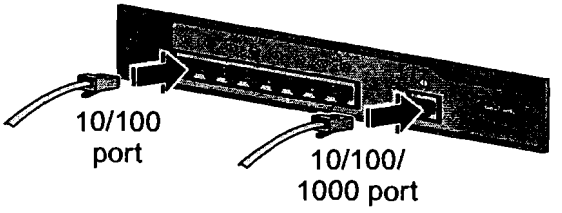


Connecting to the Switch Ports

This section describes how to connect to the fixed switch ports and to the SFP module port. For additional cabling information and a list of supported SFP modules, refer to the hardware installation guide on Cisco.com.

Connect to 10/100 Ports and the 10/100/1000 Port

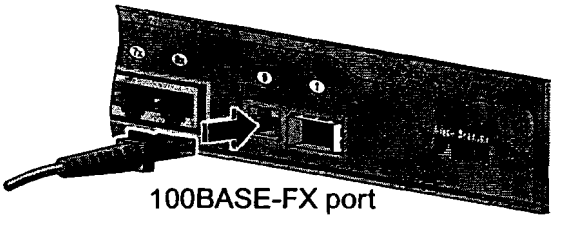
Follow these steps:

Step 1	When you connect to servers, workstations, IP phones, wireless access points, and routers, insert a straight-through, twisted four-pair, Category 5 cable in a switch 10/100 or 10/100/1000 port. Use a crossover, twisted four-pair, Category 5 cable when you connect to other switches, hubs, or repeaters.	
Step 2	Insert the other cable end into an RJ-45 connector on the other device.	

Connect to the 100BASE-FX Port

You can use either the 100BASE-FX port or the SFP module slot, but not both at the same time. By default, the 100BASE-FX port is active if an SFP module is not installed in the switch at startup.

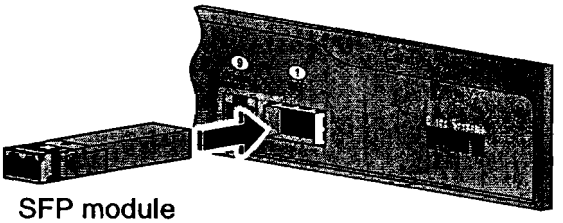
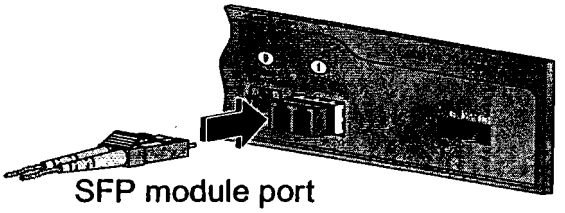
Follow these steps:

Step 1	Remove the dust plugs from the 100BASE-FX port and the rubber caps from the MT-RJ patch cable. Store them for future use.	
Step 2	Insert an appropriate cable into the 100BASE-FX port. Insert the other cable end into an SC port on the other device.	

Install and Connect to SFP Module Port

You can use either the 100BASE-FX port or the SFP module slot, but not both at the same time. By default, the 100BASE-FX port is active if an SFP module is not installed in the switch at startup. If you install an SFP module after the switch has powered on, you must reload the switch to enable the SFP module.

Follow these steps:

Step 1	Grasp the module on the sides, and insert it into the switch slot until you feel the connector snap into place.	 SFP module
Step 2	Insert an appropriate cable into the module port. Insert the other cable end into the other device.	 SFP module port

⚠ **Caution** Removing and installing an SFP module can shorten its useful life. Do not remove and insert SFP modules more often than is absolutely necessary.

After you connect to the switch port, the port LED turns amber while the switch establishes a link. This process takes about 30 seconds, and then the LED turns green when the switch and the target device have an established link. If the LED is off, the target device might not be turned on, there might be a cable problem, or there might be a problem with the adapter installed in the target device. See the "In Case of Difficulty" section on page 15 for information about online assistance.

6 In Case of Difficulty

If you experience difficulty, help is available here and on Cisco.com. This section includes Express Setup troubleshooting, how to reset the switch, how to access help online, and where to find more information.

Troubleshooting Express Setup

If Express Setup does not run, or if the Express Setup page does not appear in your browser:

• Did you verify that POST successfully ran before starting Express Setup?	If not, make sure that only the SYST and STAT LEDs are green before pressing the Mode button to enter the Express Setup mode.
• Did you press the Mode button while the switch was still running POST?	If yes, wait until POST completes. Power cycle the switch. Wait until POST completes. Confirm that the SYST and STAT LEDs are green. Press the Mode button to enter Express Setup mode.
• Did you try to continue without confirming that the switch was in Express Setup mode?	Verify that all LEDs above the Mode button are green. If necessary, press the Mode button to enter Express Setup mode.
• Does your PC have a static IP address?	If yes, before connecting to the switch change your PC settings to temporarily use DHCP.
• Did you connect a crossover cable instead of a straight-through Ethernet cable between a switch port and the Ethernet port of the PC?	If yes, connect a straight-through cable to an Ethernet port on the switch and PC. Wait 30 seconds before entering 10.0.0.1 in the browser.
• Did you connect the Ethernet cable to the console port instead of to a 10/100 or 10/100/1000 Ethernet port on the switch?	If yes, disconnect from the console port. Connect to an Ethernet port on the switch and PC. Wait 30 seconds before entering 10.0.0.1 in the browser.
• Did you wait 30 seconds after connecting the switch and PC before entering the IP address in your browser?	If not, wait 30 seconds, re-enter 10.0.0.1 in the browser, and press Enter.
• Did you enter the wrong address in the browser, or is there an error message?	If yes, re-enter 10.0.0.1 in the browser, and press Enter.

Resetting the Switch

This section describes how to reset the switch by rerunning Express Setup. These are reasons why you might want to reset the switch:

- You installed the switch in your network and cannot connect to it because you assigned the wrong IP address.
- You want to clear all configuration from the switch and assign a new IP address.
- You are trying to enter Express Setup mode and the switch LEDs start blinking when you press the Mode button (which means that the switch is already configured with IP information).

⚠

Caution Resetting the switch deletes the configuration and reboots the switch.

To reset the switch:

- Press and hold the Mode button. The switch LEDs begin blinking after about 2 seconds. Continue holding down the Mode button. The LEDs stop blinking after 8 more seconds, and then the switch reboots.

The switch now behaves like an unconfigured switch. You can enter the switch IP information by using Express Setup as described in the "Running Express Setup" section on page 4.

Accessing Help Online

First look for a solution to your problem in the troubleshooting section of the *Catalyst 2940 Hardware Installation Guide* or the *Catalyst 2940 Software Configuration Guide* on Cisco.com. You can also access the Cisco Technical Support and Documentation website for a list of known hardware problems and extensive troubleshooting documentation, including:

- Factory defaults and password recovery
- Recovery from corrupted or missing software
- Switch port problems
- Network interface cards
- Troubleshooting tools
- Field notices and security advisories

Follow these steps:

1. Open your browser, and go to http://www.cisco.com/.
2. Click Technical Support.
3. Click Product Support > Switches > Catalyst LAN and ATM Switches > 2940 Series Switches > Troubleshooting.
4. Click the subject that addresses the problem that you are experiencing.

For More Information

For more information about the switch, refer to these documents on Cisco.com:

- *Catalyst 2940 Switch Hardware Installation Guide* (not orderable but available on Cisco.com). This guide provides complete hardware descriptions and detailed installation procedures.
- *Regulatory Compliance and Safety Information for the Catalyst 2940 Switch* (order number DOC-7816656). This guide contains agency approvals, compliance information, and translated warning statements.
- *Catalyst 2940 Switch Software Configuration Guide* (order number DOC-7815507=). This guide provides a product overview and detailed descriptions and procedures of the switch software features.
- *Catalyst 2940 Switch Command Reference* (order number DOC-7815505=). This reference provides detailed descriptions of the Cisco IOS commands specifically created or modified for the switch.
- *Catalyst 2940 Switch System Message Guide* (order number DOC-7815524=). This guide provides descriptions of the system messages specifically created or modified for the switch.

7 Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

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Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the Tools & Resources link under Documentation & Tools. Choose Cisco Product Identification Tool from the Alphabetical Index drop-down list, or click the Cisco Product Identification Tool link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting show command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

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For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

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EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

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- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

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9 Cisco Limited Lifetime Hardware Warranty Terms

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1. Launch your browser, and go to this URL:

   http://www.cisco.com/univercd/cc/td/doc/es_inpck/cetrans.htm

   The Warranties and License Agreements page appears.

2. To read the *Cisco Information Packet*, follow these steps:
   a. Click the Information Packet Number field, and make sure that the part number 78-5235-03A0 is highlighted.
   b. Select the language in which you would like to read the document.
   c. Click Go.

      The Cisco Limited Warranty and Software License page from the Information Packet appears.
   d. Read the document online, or click the PDF icon to download and print the document in Adobe Portable Document Format (PDF).

   Note You must have Adobe Acrobat Reader to view and print PDF files. You can download the reader from Adobe's website: http://www.adobe.com

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Complete the information below, and keep it for reference.

Company product purchased from	
Company telephone number	
Product model number	
Product serial number	
Maintenance contract number	

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Section 7-AA

Auto-Dialer

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Verbatim™

Owner's Manual

MOD# 321VPLC-4C-32AB

SINCE 1948

RACO

REMOTE ALARMS AND CONTROLS

Warranty

RACO Manufacturing and Engineering Co. Inc., Emeryville, California warrants this product to be in good working order for a period of five years from date of purchase as a new product. In the event of failure of any part(s) due to defect in material or workmanship occurring within that five year period, RACO will, at it's option repair or replace the product at no charge for parts or labor.

Any alteration of the product without instruction from RACO's Engineering Department will automatically void this warranty. If alterations of the unit are authorized by RACO, please complete the authorization form in the Owners Manual and return the form to RACO to ensure the warranty. Under no circumstances will RACO be responsible for consequential or secondary damages.

The defective product should be returned, insured and freight prepaid, securely packaged to the address listed below. Please include a copy of your sales receipt, the dialers serial number, and a detailed description of the problem you are experiencing.

RACO Manufacturing and Engineering Co. Inc.
Service Department
1400 62nd Street
Emeryville, CA 94608

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1 Overview

1.1 Product Description

The Verbatim™ autodialer functions as a remote alarm monitor, typically monitoring critical facilities which are not staffed 24 hours a day.

The Verbatim autodialer may be factory configured for different input and output configurations. Your Verbatim may have as many as 32 discrete inputs, 16 analog inputs, 8 digital outputs and 96 Remote Channels. The minimum configuration of the Verbatim autodialer monitors 4 internal input channels.

The internal inputs are sometimes called Physical Channels (PCs). PCs monitor user-supplied external sensors such as float switches, limit switches, etc. Sensors connected to discrete inputs are usually dry (non-powered), isolated contacts which close or open to indicate the sensed condition. In most cases, the outputs of logic controllers may be connected directly to Physical Channel inputs without the need for interfacing relays or other signal conditioning.

Remote Channels (RCs) do not directly connect to sensors. RCs monitor PLC I/O and data table locations as defined by the user. RC data is kept current by the Verbatim constantly making queries to PLC data registers over the industrial network connection.

An alarm condition can be indicated by change at a sensor, by new data from a Remote Channel (RC), or by loss of AC power. When an alarm occurs, the Verbatim accesses the standard phone line to which it is connected, dials the appropriate phone numbers and delivers the user's own pre-recorded voice message corresponding to those particular alarm conditions that are currently active.

Dialing continues repeatedly through the entire list of up to 16 programmed phone numbers, until the alarm is acknowledged by touch tone command or by calling the Verbatim autodialer back.

The Verbatim autodialer incorporates many flexible, voice-supported programming and message recording options, to meet a wide range of user requirements. Yet, in most cases, the user may rely on pre-existing default programmed parameters, greatly simplifying programming. Even default voice alarm messages are provided.

Note:

All user programming except access code and voice message recording may be entered, reviewed or changed either from the front panel or from a remote telephone at any time. Thus, installation and programming may easily be done by separate personnel at separate times.

Most programming is entered in the form of 3-digit codes as described in this manual. All user programming, including recorded messages, is maintained in permanent non-volatile memory.

The Verbatim autodialer incorporates extremely thorough and effective electrical surge protection and overall rugged construction, to deliver reliable operation under real-world conditions.

1.2 Manual Description

This manual guides you through the following procedures:

- Location and mounting
- Initial programming
- Configuring Remote Channels to monitor PLCs
- Voice message recording
- Using Your Verbatim autodialer
- Advanced programming

A glossary explaining the terms used in this manual is included the end of the manual, along with a troubleshooting guide, an index, a return authorization form, and FCC notice to users.

Worksheets are provided to document and clarify your programming and message recording steps.

Please take a moment to read, complete, and mail the warranty registration card at the back of this manual.

1.2.2 Conventions

Throughout this manual various icons are used to visually identify information. They are as follows:

- ◆ The solid diamond symbol shows a list of procedures, decisions, or single step tasks.
- The bullet symbol shows a list of items.


The bomb indicates a warning message. The information concerns process that may result in damage to equipment or harm to a person.


The hand indicates a caution message. The information concerns a process that may result in equipment failure.


The pencil indicates general information.


The open diamond pattern indicates one or more exceptions or special considerations for a process.


The phone indicates that you can access the Verbatim autodialer through your phone.

Other icons include button or keys on the Verbatim autodialer front panel.

"items in quotes"	Quotation marks indicate titles of sections and messages.
italic	Italic text indicates items for emphasis, message text, and sample text.
ALL CAPITALS	Capital letters reference the names of keys, lights, and LEDs.
Initial Capital Letters	Capitalization of the first letter of a set of words indicates mode and function types.

2 Installation

This section describes how to install the Verbatim autodialer and how to install a parallel printer to use the Parallel Printer Local Data Logging feature.

2.1 Location and Mounting

Choose a mounting location which is not exposed to condensing humidity or temperatures beyond the limits of 20°-130°F. This location should ideally be within 5 feet of a standard RJ-11 phone jack and a *grounded* 120 VAC power outlet.

1. Mount the Verbatim autodialer on centers of 6" x 11 3/8" using the external mounting ears on the enclosure. #10 or 3/16" bolt sizes are best.
2. Install the NEMA 4X weatherproof outer enclosure, (optional purchase).

   This allows the Verbatim autodialer to be mounted outdoors as long as temperature limits are not violated. It is best to provide at least an overhead shelter to minimize direct precipitation and solar heating effects.
3. Install the heater/thermostat for cold or humid environments, (optional purchase).

   The 120 VAC heater dissipates 75 watts, providing a temperature rise of approximately 30 degrees, or 60 degrees when enclosed in the optional NEMA 4X enclosure.

2.2 Wiring

Refer to the diagram on page 2-3 for an example of the wiring connections.

1. Inspect and remove any foreign materials which might create short circuits.
2. Connect the red (positive) battery lead to the positive terminal on the gel-cell battery.
3. Plug the power cord into a *grounded* 120 VAC *outlet.*

   Or, remove the power cord from the Verbatim autodialer and install well-grounded 120 VAC power to terminal strip TS3, located on the lower right of the main circuit board.

If there are any green grounding wires in place on TS3 originating from plug-in expansion cards, leave those green grounding wires in place on the terminal marked GRN (Green). If the Verbatim autodialer turns on when power is applied, turn it off with the red POWER ON/OFF key.

4. Connect dry (unpowered) contacts to the terminal strip connection points.

   The connection point for basic four-channel units is terminal strip TS1, located on the lower left of the main circuit board. Note that there are four common return terminals marked "C"; any combination of these internally grounded terminals may be used. Terminal strip TS1 may be unplugged for convenience. All terminal points are screw clamp type, eliminating the need for wire termination lugs.

   The contact input wires should ideally be light (18 to 24 gauge) signal wire rather than heavy power wire. This reduces problems of bulk and stiffness.

5. If your unit has 8 or more inputs, the VX32 Channel Expansion Card should be plugged into connector J4.

   If your unit has this card installed, then use TS1 for common return connections only, and connect one side of each contact to the appropriately marked channel input number on the VX32 card. Leave TS1 terminals 1,2,3 and 4 disconnected.

Notes:

- The common *return* side of the contacts will need to be consolidated into not more than four wires coming into the TS1 terminals marked "C".
- Route the wires to the VX32 card so that they do not protrude above the top of the card, other wise they will interfere with the front panel board when the door is closed.
- Terminal strip TS1, and the terminal strips on the VX32 card if any, are not removable terminal blocks. Be sure that the terminal strips do not become unplugged due to wires being stressed when the door is closed.

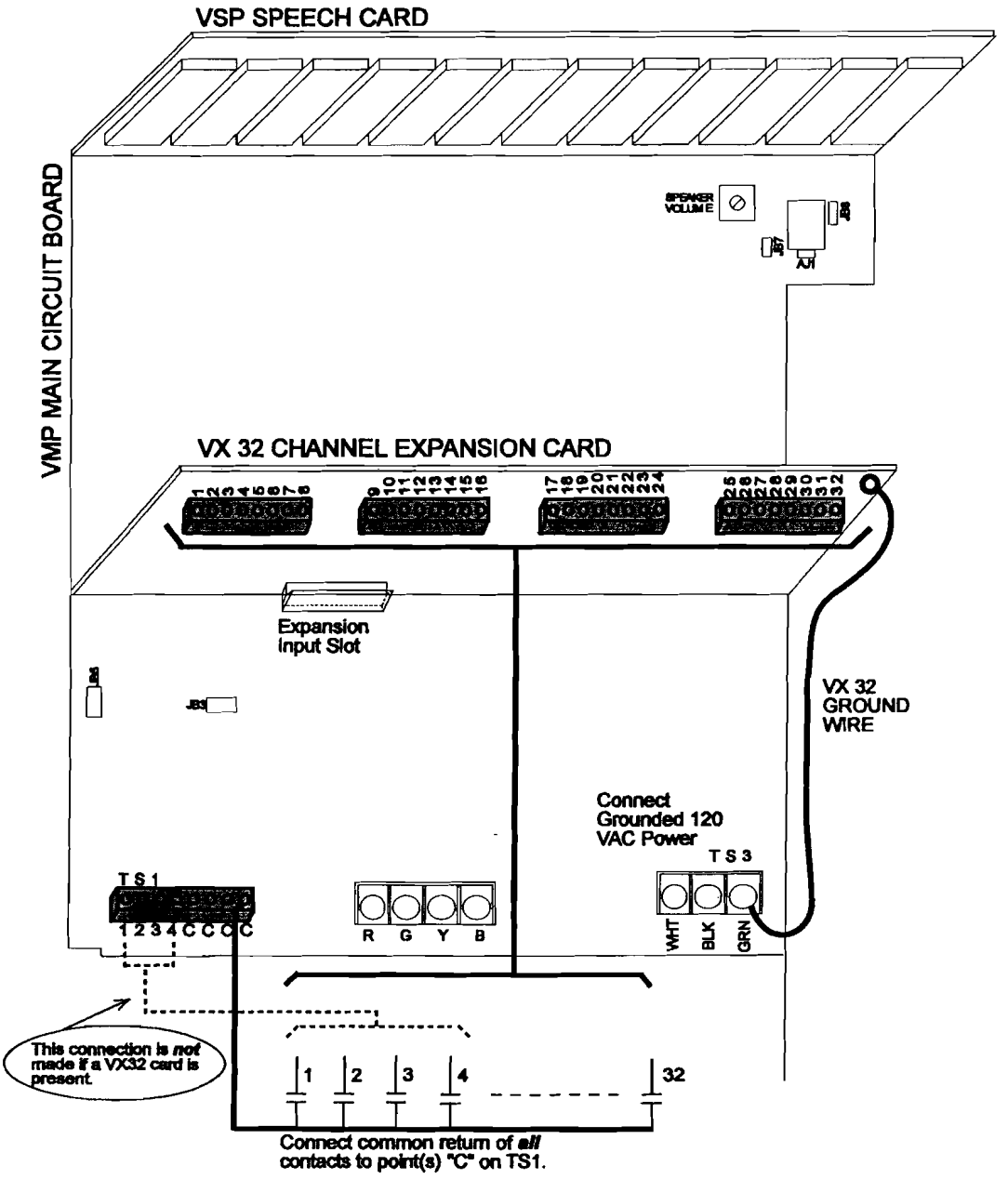
Caution:

NO 120 VAC INPUT CIRCUITS! Please verify that the circuits you connect to these inputs are "dry" (unpowered) and are ***not*** directly connected to 120 VAC power. Connecting such circuits will damage the unit.

Exception:

If your inputs are coming from a logic controller with TTL, CMOS or 5-volt DC logic outputs, direct connection may be made as long as the controller has the same electrical ground as the Verbatim autodialer.

Electrical Connection Diagram For Dry Contact Inputs



The common returns for all inputs are connected to TS1 terminals marked "C". These four "C" terminals are connected together and to electrical ground.

4 Channel Verbatim: Connect one side of each contact to the corresponding numbered terminals on TS1. The other side of each contact connects to the common return (the "C" terminals on TS1).

8 Or More Channel Verbatim: Connect one side of each contact to the corresponding numbered terminals on the VX32 expansion card. Connect the other side of each contact to the common return (the "C" terminals on TS1 of the main board). Note that TS1 terminals 1 through 4 are not used in this case.

2.3 Installing the Parallel Printer

The Verbatim Parallel Printer Local Data Logger feature will print reports on a local printer which is connected via a standard parallel interface. The local printer will automatically print out each action that occurs; e.g., alarms, acknowledgments, programming entries, inquiry calls, etc. You can cause a printout, upon command, at any time. Also, you may program the Verbatim for automatic printout of all input conditions at regular intervals. A time/date stamp will be included with each printed item.

You will need to:

- Connect the parallel printer to the Verbatim front panel using the RACO PPC-1 cable (or equivalent).
- Set the time and date so that each printout will be accompanied by the proper time and date stamp.

2.3.1 Installing the Printer Cable

Note:

If you ordered the Verbatim Parallel Printer Port Adapter Cable from RACO at the time you ordered your Verbatim autodialer it should already be properly installed. (The cable may be ordered from RACO using the part # VPPC-1.) You may also use an identically wired cable from a separate source. If you wish to acquire or fabricate the cable yourself, please refer to the, *"VPPC-1 Serial Cable Connection Diagram,"* in Appendix G.

The front panel circuit board must show a designation of VFP4 or higher. Also, the firmware version for the program chips U3 and U4 (on the main circuit board) must be V2.01 or higher. If your hardware does not conform to these revision levels contact your RACO Sales Representative about getting the proper upgrade modules.

The VPPC-1 cable attaches to the front panel circuit board where the mating pins protrude, just inside the front door of the Verbatim . Orient the connector so the cable's Pin 1 index (a red stripe on the cable or an arrow on the connector) is near the corner of the front panel board. The cable extends out of the Verbatim chassis and overlaps the lower chassis wall at the bottom of the chassis. When the front door of the Verbatim is closed the flat ribbon cable will be safely folded around the lower wall of the Verbatim chassis.

At the other end of the VPPC-1 cable is a standard "Centronics" style 36 pin connector. This 36 pin connector is the proper gender to mate with the data connector on the back of your parallel printer. However, if the printer cannot be located within the three-foot length of the VPPC-1 cable, install a standard

"Centronics" parallel printer extension cable (male on one end, female on the other). The extension cable extends from the end of the VPPC-1 cable to the printer.

Note:

The maximum length of the printer extension cable should be no greater than 10 feet. If you need to extend the printer greater than 10 feet from the Verbatim please consider ordering the RACO Serial Local Data Logger Option. Serial interfaces may be extended to a few hundred feet if necessary. Furthermore, if a serial interface is used together with special "line driver" devices, the printer cable may be extended for thousands of feet.

2.3.2 Load Paper and Place Printer On line

The printer must be properly loaded with paper and be on line in order for the Verbatim to print reports. (Some printers have a button labeled "select" rather than "on line.") If the printer runs out of paper or is taken off line, printing will cease immediately. A limited amount of printout data can be saved in the Verbatim internal print buffer while the printer is off line or out of paper. The size of the Verbatim printer buffer depends on several factors such as which Verbatim options are configured (i.e., analog, RSC, PLC interface, etc.). If the printer is off line or out of paper, printout data is sent to the Verbatim buffer each time it would otherwise be printed on the printer. Once the amount of data sent to the buffer exceeds the size of the buffer, printout items will continue to be copied to the buffer but will begin to overwrite buffered data. The printer buffer "wraps" around and new printout data is copied over the oldest printout data.

It is possible that no data will be lost while your printer is out of paper or off-line if you manage to restore the printer to operation before the Verbatim buffer "wraps." Then as soon as the printer is restored to operation, the Verbatim sends the buffered reports to the printer. (Note that the date/time stamp eventually printed will show the time and date of the event; not the time and date of the printing activity.)

2.3.3 Programming Time and Date

Time and date may be entered or changed with the following programming code entries:

- To check the date:

  `9 4 1 ENTER`

- To set the date:

  9 4 1 MM DD YY DW ENTER

MM is the month (01 for January, etc.), DD is the day of the month (07 for the 7th day of the month, YY is year (93 for 1993) and DW is the day of the week (1 for Sunday, 2 for Monday, etc.) Entry of the DW is optional.

- To check the time:

  9 4 2 ENTER

- To set the time:

  9 4 2 HH MM SS ENTER

HH are the hours in 24 hour format (13 for 1 PM), MM for minutes (don't forget the leading zeros) and SS is the seconds. Entry of SS is optional.

- To clear the time and date back to a default time and re-initializes the real-time clock chip:

  935 7 ENTER

Note:

The preceding operation should only be necessary if the real-time clock chip has been added or replaced in the field.

2.3.4 Printout at Regular Intervals

The Verbatim autodialer may be programmed to automatically log (print on the printer) all input conditions at regular intervals, by entering the following code:

943 XXX.X ENTER

where XXX.X is the desired printing interval in hours, from 0.1 to 999.9 The first such printout will occur when the period elapses, rather than immediately upon programming.

- To check the presently programmed printing interval enter the following code:

  943 ENTER

- To turn off the regular interval printing function enter the following code:

  943 0 ENTER

- To immediately print a record of all current user programming enter the following code:

  944 ENTER

2.3.5 Turning Off the System With a Printer

Some parallel printers tend to "leak" electrical current through the parallel interface into the Verbatim when it is powered off, resulting in the Verbatim not remaining turned off. It is possible that a few seconds after powering off the Verbatim it will turn itself back on again. To remedy this condition simply turn off the printer whenever turning off the Verbatim .

3 Programming and Testing

3.1 Starting Up and Clearing the Unit

Basic set-up and testing of the Verbatim involves:

- Program at least one phone number.
- Program the input channels to reflect alarm conditions.
- Test the alarm conditions to be sure witing and programming are correct.
- Record voice messages, trip delays and other programming as desired.

All programming operations must be done with the unit in the Program mode.

1. To put the Verbatim autodialer in the Program mode, press PROGRAM.
   Program mode is indicated by the lighted PROGRAM LED.

Note:

Before you begin programming the Verbatim for your monitoring application it is best to first clear the unit's memory of any old programming. This step also ensures that memory corruption, which might have occurred during shipment or due to anomalous power distrubances, will be wiped away. See Step 2 below.

Caution:

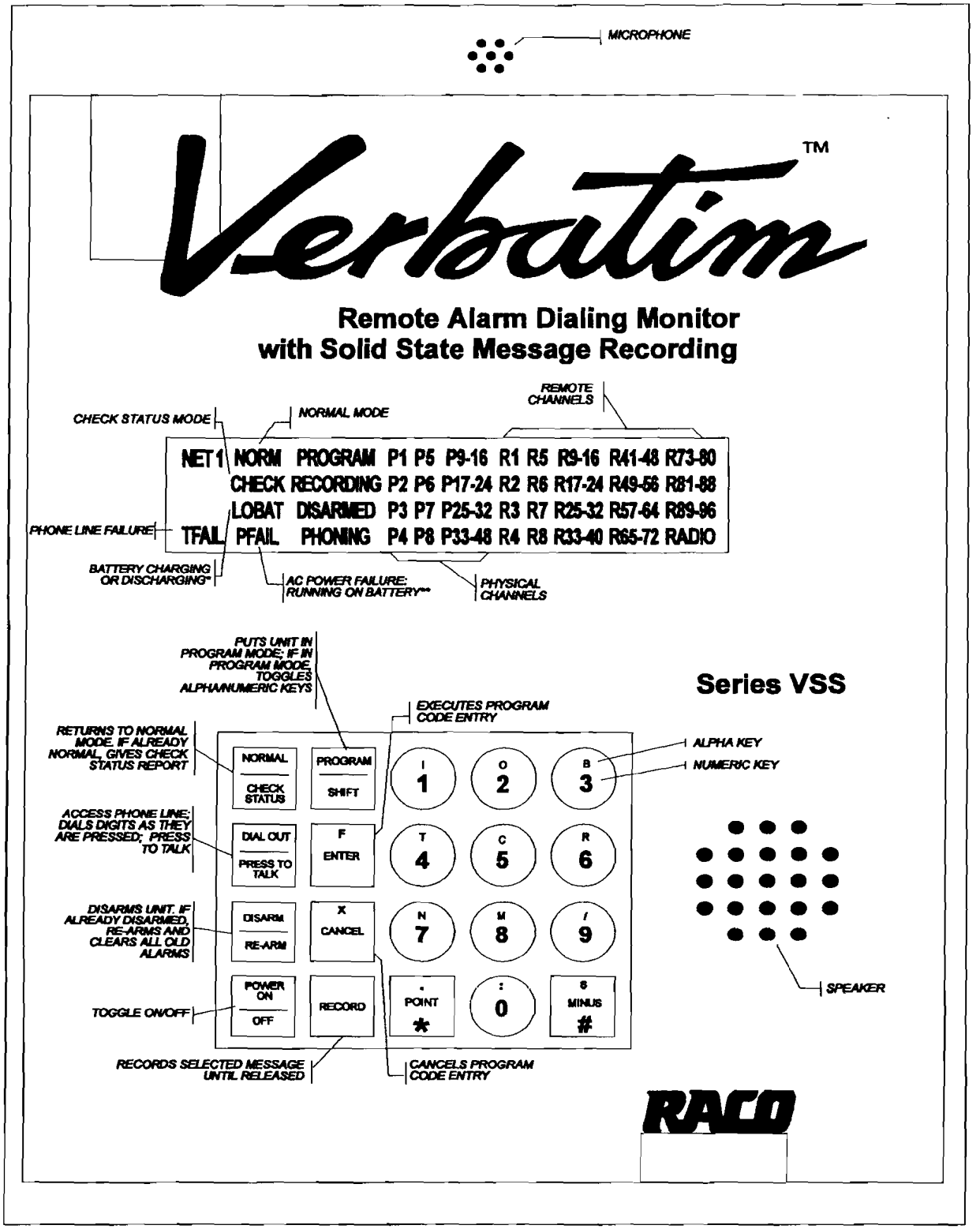
The following step erases all user programming including recorded messages so normally it is done only at initial start-up.

2. To clear the system memory, press:
   `9 35 9 ENTER`
   If you make an error in code entry, press CANCEL and start again.

Exceptions:

If you have powered up your Verbatim without connecting a live telephone line to the unit you may observe that the TFAIL indicator is on. This indicates that the unit is checking for the presence of a telephone connection and attempting to determine the line configuration. If you are planning to program your unit without a live telephone connection you may wish to disable the Telephone Line Fault Detection (Phone Fault) feature by pressing `9 17 0 ENTER`
See Section 6.2.6 for information on temporarily disabling this feature.

Front Panel Keys and Indicators Diagram



*** A discharged battery may take up to a day to fully charge. Meanwhile, light may remain on.**

**** During AC power failure, all illuminated LED's will flash to conserve battery power.**

3.2 Programming Phone Numbers

Refer to Programming Worksheet A (See Appendix J). You are encouraged to write down the phone numbers you want to program, along with a person's name for each phone number.

- To program the first dial-out phone number, press:

  `7 01 (then the complete phone number) ENTER`

  For example, to program 1 (510) 658-6713 as the first phone number, press:

  `7 01 1 5 1 0 6 5 8 6 7 1 3 ENTER`

- To program a second phone number:

  Use code 7 02 instead of 7 01, progressing to a maximum of code 7 16 for the 16th phone number.

Each number may be up to 60 digits in length. Be sure to include any necessary area codes or "1" prefixes.

Exceptions:

- To use touch tone dialing, press:

  `9 01 1 ENTER`

- To go back to standard pulse dialing, press:

  `9 01 0 ENTER`

- To insert delays between dialed digits.

  Press the MINUS key once for each additional delay desired in the phone number programming process. Default delay is one second.

- Refer to Section 6. "Advanced Programming," for specialized programming such as *grouping* phone numbers with input channels, *Call Progress Monitoring* phone fault detection, etc., or to establish and use a *call forward* phone number, etc.

3.3 Programming Input Channels

Your Verbatim autodialer needs to know whether its input channels are to be *normally closed* (alarm on Open Circuit), or *normally open* (alarm on Closed Circuit).

All contact inputs are initially set normally closed (i.e. they will alarm on Open Circuit). This is the default setting and, therefore, any open circuits, including any inputs left disconnected during installation, will appear as alarms until the inputs are programmed.

- To automatically program the inputs:

  Make sure all inputs are in their normal (non-alarm) state. Then press:

  `5 0 0 ENTER`

The Verbatim autodialer automatically examines all inputs and programs them to alarm on the opposite input state from their present status. This code 500 does not affect any channels that have been programmed for Disabled Channels, Status Only, Run Time Meter, or Pulse Totalizer function.

Exceptions

In most cases, no further programming of contact inputs is necessary. However, the following configuration options are available:

- To set any input to be disabled and never be annunciated, press:

  `5 ZZ 0 ENTER`

  where ZZ is the 2 digit channel number you are programming. Be sure to always use a leading 0 for channels 1 through 9 to keep the channel number a two-digit entry.

- To set an individual contact input for normally closed operation (i.e. to alarm on Open Circuit), press:

  `5 ZZ 1 ENTER`

- To set an individual contact input channel for normally open operation (i.e. to alarm on Closed Circuit), press:

  `5 ZZ 2 ENTER`

- To set inputs to report status only, program each individual channel as follows:

  `5 ZZ 3 ENTER`

  This setup never causes an alarm to dial out.

- To set contact inputs for the run-time meter function, program each channel as follows:

  `5 ZZ 4 ENTER`

See Section 6.2.3, "Channel Programming (Configuring)." This setup never causes an alarm to dial out but reports the total accumulated hours that the input contact is closed.

- To set any of your contact inputs for the Pulse Totalizer function, see Section 6.2.3, "Channel Programming (Configuring)."

3.4 Initial Testing

Perform the following steps to ensure that your Verbatim autodialer is properly installed.

1. First, temporarily disarm the unit by pressing:

   DISARM/RE-ARM until the DISARM LED is flashing. This prevents the unit from dialing out.

2. Next, physically trip each sensing device in turn (manipulate float switches, relays, etc.).

   Verify that the corresponding input channel LED lights at the front panel, and then restore all sensors to their normal state.

3. Now press DISARM/RE-ARM. This will clear out the channel input LEDs and restore the unit to a ready condition.
4. To test the phone line connection, with the unit's phone cord plugged into its phone jack, temporarily remove the AC power cord to the unit.

   The PFAIL LED will illuminate. At this point all illuminated LEDs will flash on and off in order to conserve battery power. Since the unit is not disarmed this time, after a 0.1 minute Alarm Trip Delay the PHONING light will illuminate and the unit will access the phone line and will begin dialing the first phone number.

   The unit will recite its station ID and power failure messages. You may converse with the person answering by pressing and releasing DIALOUT/ PRESS TO TALK. Press this key again when you wish to speak, and release this key to listen. This action will suspend message recital. In this case, when the conversation is done, you should end the call by pressing NORMAL. Ordinarily the alarm call would end automatically.

5. Now press DISARM/RE-ARM twice.

   This step disarms and then rearms the unit clearing all acknowledged alarms. This clearing also occurs automatically after the Alarm Reset Time has elapsed (default value 1 hour). See Section 5.6, "Alarm Reset Time-out After Acknowledgment."

6. Your Verbatim autodialer is now able to operate, having at least one dialout phone number programmed and having its input channels configured.

   However, you may wish to record your own voice messages (see the next section) or perform special advanced programming items (see Section 6, "Advanced Programming") before referring to Section 5, "Using Your Verbatim autodialer."

4 Recording Voice Messages

This chapter describes how to record your own voice messages. Messages may be recorded for the Station ID and for the Alarm and Normal condition for every channel in your Verbatim autodialer.

Note:

Be sure to complete the programming of the input channels as described in the previous chapter before recording any messages.

Using Default Messages Instead of Recording Your Own.

Recording messages is an optional step. Your Verbatim autodialer comes with built-in default normal and alarm messages for all channels. Recording voice messages can be postponed until you have become more familiar with your unit. You may even choose to record or re-record your own messages from a remote telephone at any time.

Using default messages for selected channels or for the Normal condition of channels is an excellent way to conserve speech memory for certain important and lengthy alarm messages.

Types of Default Messages

- Discrete (i.e. digital, contact) physical channel inputs:

  "Channel N Normal" and "Channel N Alarm."

- Discrete remote channel inputs:

  "Remote Channel N Normal" and "Remote Channel N Alarm."

- Discrete Status-only or Run-time meter physical channel inputs:

  "Channel N is ON" when input circuit is closed, and "Channel N is OFF" when input circuit is open.

- Discrete Status-only remote channel inputs:

  "Remote Channel N is ONE" or "Remote Channel N is ZERO."

- Analog (integer) physical or remote channel inputs:

  ["Channel N, present reading is ..."] followed by the recited analog value.

- Station ID message:

  "ID Number N."

There is also a default Network ID message. See Appendix F for details.

4.1 Planning Messages

Worksheet C in Appendix J is provided to assist you with this. Please use the Worksheet! Not only will you then have a written record of your messages for future reference, you will also then be prepared to record your messages with the greatest ease and efficiency.

In general, two different messages are used for each input channel:
One message for the Normal Condition, and another for the Alarm (fault) Condition.

When you have written down the messages that you want to record, you are ready to verify/extend your recording time.

❖ ***Exceptions:***

- Status-only or Run-time Metering Channels. See Section 6.2.3, "Channel Programming (Configuring)."

  To record your own messages for these specially configured channels rather than relying on the default "Channel N is ON" or "Channel N is OFF" messages:

  - Plan a message for the Closed Circuit condition and another message for the Open Circuit condition for each channel.

  For Run-time channels, the unit will add a report of the run-time in hours, using built-in speech, after the Closed or Open Circuit message.

- Pulse Totalizer Channels

  See Section 6.2.3, "Channel Programming (Configuring)," for special guidance in planning Pulse Totalizer messages.

4.2 Managing Available Speech Memory

The table below shows the total available message recording time for units with differing total number of channels. The available message recording time may be extended in two ways. First, you may explicitly change the recording rate from the default Rate 1 to Rates 2, 3, or 4 (See Section 6). Secondly, you may automatically extend the message recording time by using the Autoextend™ feature described in this section.

Unit type	Initial recording time (at Rate 1):	Extendable to: (Rate 2, 3 or 4)
4-8	26 sec	40, 54 or 79 sec
16-32	104 sec	160, 216 or 318 sec
33-40 chan. unit	130 sec	200, 270 or 399 sec
41-48 chan. unit	156 sec	240, 324 or 476 sec
49-56 chan. unit	182 sec	280, 378 or 555 sec
57 or more	208 sec	320, 432 or 624 sec

4.2.1 Verifying/Extending Recording Time

Initially, the unit is set for the fastest memory use rate ("Rate 1"), giving the highest fidelity sound recording. If you are sure that your messages take less than the "initial" time shown above for your unit (14 seconds total for a 4-channel unit), go to Section 4.3, "Record Your Messages." You may also verify your unit's current rate setting and corresponding total message recording time by pressing:

```
9 1 1 ENTER.
```

If, after performing this step, you think you may need more recording time perform the Autoextend™ step described next. The Autoextend™ feature will automatically extend the available recording time, selecting the optimum recording rate (speech memory rate) to give you the highest possible recording sound quality for your length of recording.

Warning:

The following step will erase any existing recorded messages.

To use the Autoextend™ feature to extend recording time, have your message Worksheet handy as you press:

```
9 1 2 ENTER
```

The Verbatim autodialer will prompt you to immediately begin reciting your entire list of messages at the sound of the beep, one after another, at the same speed that you will want to later record them.

During this time, the Verbatim autodialer will *not* be recording your spoken messages. Instead, it will be timing you.

When you have finished reciting (not recording) the last message, immediately press ENTER.

Over the phone, press ZERO to start the timing, and ZERO again to end the timing. See Section 5.7, "Programming by Phone."

Based on how long your message recital took, the Autoextend feature will automatically calculate which recording rate is optimum for your length of recording time, and will then automatically select that rate. It will tell you how many seconds your message took, and how much total recording time it has now given you.

4.3 Record Your Messages

First, minimize any background sounds. Then proceed as follows:

- Have your message Worksheet in front of you and be prepared to recite the first Alarm (fault) Condition message in a loud clear voice within about 6 to 12 inches of the microphone located at the top of the front panel. Press:

  `1 ZZ ENTER`

  where ZZ is the appropriate 2-digit channel number, such as 01 for channel 1. Be sure to use leading zeroes, in order to keep ZZ a 2-digit entry. Use 00 for the Station ID message.

The voice specifically identifies the message you are about to record, and then prompts you to press the RECORD key and hold it just for the duration of your spoken message. Note that the RECORDING light comes on during recording.

Over the phone, since there is no RECORD key, the voice will prompt you to press ZERO to begin recording, and press ZERO again to stop recording. See Section 5.7, "Programming by Phone."

The Verbatim autodialer will immediately play back the message you have just recorded, allowing you to determine if you need to re-record it louder, softer or more clearly, etc.

Experiment with different volume levels to get the best message clarity. If there is too much background noise at the Verbatim autodialer site, record your messages over the phone.

Always stop the recording promptly to avoid wasting recording time.

- To record an alternate "Normal Condition" message for channel ZZ, press:

  `2 ZZ ENTER`

  and follow the same procedure as above.

- To review both existing messages for channel ZZ, press:

  `3 ZZ ENTER`

  The Verbatim autodialer will replay both existing messages for channel ZZ. This will include any default messages remaining in use.

Exceptions:

- For any channels programmed for "Status Only" or for Run Time Meter function, use code 1 ZZ for the Open Circuit message, and 2 ZZ for the Closed Circuit message.
- If you run out of recording time, you will hear the message "No more message time." See Section 4.2 above to re-establish total available recording time. You may elect to shorten some messages, or rely more on selected default messages, or you may Autoextend the available recording time. Then, re-record all messages.
- If you wish to extend the available time for a specific message while leaving the other messages unaffected, enter the code for recording that message, but add an extra digit 1 through 4, before pressing ENTER.

  The digit 1 (Rate 1) gives the shortest time and the best sound quality, while 4 (Rate 4) gives the longest time with poorest sound quality.

- If you wish to reinstate a default message, enter the code for recording that message, and an extra POINT before pressing ENTER. For example:

  `1 ZZ POINT ENTER`

- If you wish to use the default Station ID message but with a different ID number in place of the "one", press:

  `9 1 4 N ENTER`

  where N is the desired ID number which may be up to 16 digits long. Some users program the Verbatim autodialer's own phone number as its ID number.

- If you want to set a specific recording rate rather than letting Autoextend do it, press:

  `9 1 3 N ENTER`

  where N is the desired recording rate 1, 2, 3 or 4.

- You will then need to re-record any messages that were previously recorded at a different rate.

5 Using Your Verbatim Autodialer

5.1 Placing Inquiry Calls to the Verbatim Autodialer

You may call the Verbatim autodialer at any time from any phone. The unit will wait the programmed number of rings before answering and then will begin a full status report. The status report starts with the Station ID Message, followed by any special warning messages (e.g.: no phone numbers programmed, or the unit is disarmed, etc.), and concludes with the listing of the status of each channel input.

If there are no alarm conditions on any channel, then the Verbatim autodialer will say "All channels normal" just prior to beginning the complete channel status report.

If there are channels with unacknowledged alarms conditions prior to the call, placing a call to the unit will result in the acknowledgement of these alarms. The Verbatim autodialer will say "Alarm is acknowledged" immediately after reciting the Station ID message.

Exception:

The Call in Acknowledge Mode command (Code 925) may be used to set the Verbatim so that calls *to* the unit will not automatically acknowledge alarms.

The channel status report will be recited the programmed number of message repeats (default is 3 times). Between each recital the Verbatim autodialer will issue a prompting beep and then wait a few seconds for you to optionally enter a special Command Tone. See Section 5.7, "Programming by Phone." After all message repeats, if you have not entered a tone, the unit will say "Goodbye" and terminate the call.

See Section 6.2, "Programming Operations."

5.2 CHECK STATUS Inquiry at Panel

When the NORM LED is lit, you may hear a report of current conditions by pressing the NORMAL/CHECK STATUS key. You may cut this report short by again pressing the NORMAL/CHECK STATUS key.

5.3 Receiving Alarm Calls

When any input condition violates the programmed alarm criteria for an interval longer than the Alarm Trip Delay for that input (See Section 6.2.6), the unit goes into an Unacknowledged Alarm state. The unit begins dialing the first of up to 16 programmed phone numbers. See Section 6.1, "Program Codes," about optional Alarm Call Grouping if you want the numbers dialed to depend on which channel is in alarm. Whenever there is an Unacknowledged Alarm the corresponding channel alarm LED begins flashing.

The voice messages follow the same format as an inquiry call, including the prompting beep, except the channels having no alarm activity are not included in the alarm report. If there is no acknowledgment, the Verbatim autodialer will replay the message for the programmed number of repeats (default is 3) and then will say, "Goodbye," before terminating the call.

See Appendix I for information on alternate annunciator state models. Annunciator state models support various Return To Normal (RTN) calling sequences.

Phrases Appended to Alarm Messages

(user recorded or default)

These appending phrases will continue to be included in any status reports until the Alarm Reset time expires for that channel.

ALERT
Any channel with an input violation which has not been present longer than the Alarm Trip Delay for that channel will have its status message appended with the word "Alert."

NOW NORMAL
If the violation which originally caused the alarm has gone away the phrase "Now Normal" will be appeneded to the alarm status message.

ACKNOWLEDGED
Any channel which was in an unacknowledged alarm state but became acknowledged will have its status message appended with the word "Acknowledged."

NOW NORMAL, ACKNOWLEDGED
Any channel which is both acknowledged and whose input voilation has gone away will have its status messages appended with the phrase "Now Normal, Acknowledged."

Note:

When the autodialer goes into alarm, it dials each phone number in sequence until it receives an acknowledgement. The alarm may be acknowledged after the warble tone by pressing a touch tone "9"; by calling the unit back after it says, "goodbye," or by pressing NORMAL on the front panel. After acknowledgement, the dialer will not call out again on that channel until it is reset. This is usually done automatically after a set period of time called the *Alarm Reset Time*, which allows the person who acknowledged the alarm time to go fix the source of the problem without further callouts from the dialer. After the reset time, the unit is automatically reset, and any alarms present at that time will cause a dial out.

Exception:

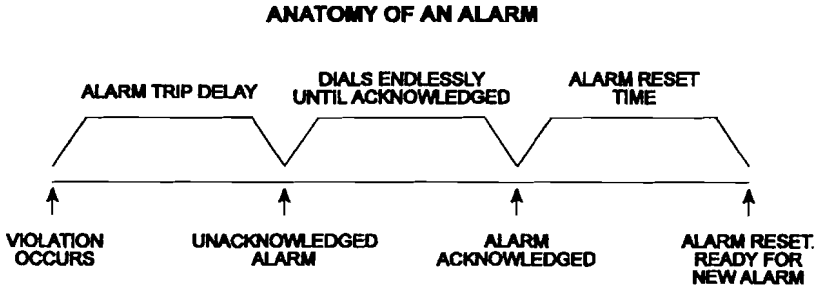
Power Failure alarms only cause two spoken messages: *1)* When power has been off for longer than the Power Failure Trip Delay, "Power is Off" is reported. *2)* When power has been off and is later restored the message "Power is On" is reported.

5.4 Continued Dialing in the Absence of Acknowledgment

The Verbatim autodialer will then wait for the programmed Time Between Alarm Calls (default 2 minutes; See Section 6.2.12, "Miscellaneous Programming Tips," to change default time), during which you may call the Verbatim autodialer back to acknowledge the alarm. If no acknowledgment is received at the end of this period, the next phone number will be dialed. The process will be repeated indefinitely, repeatedly going through all the designated phone numbers, until acknowledgment is received.

Exception:

If you want further calling terminated when channels return to normal you may so program the unit by using the "Set Return to Normal" command (Code 923). See Appendix K.



5.5 Acknowledging the Alarm Call

To acknowledge the alarm during the alarm call wait to hear the prompting "warble" tone then enter a touch tone '9' (Also 1, 2, 4, or 0 will acknowledge in this situation). The Verbatim autodialer will say "Alarm is acknowledged, Goodbye" and terminate the call. See Section 5.7, "Programming by Phone," for additional ways of acknowledging an alarm without ending the call.

Alternative methods of Acknowledging:

Wait for the alarm call to end then place a call to unit.

At the front panel press NORMAL, PROGRAM, DISARM, or DIALOUT .

Upon acknowledgment, the channel LED changes from flashing to steady illumination.

At the end of the Alarm Reset period the channel alarm LED turns off, the Acknowledged Alarm status is cleared for that particular channel input, and it is again ready to go into Unacknowledged Alarm whenever a violation occurs at that input. In particular, if a violation has not been removed (prior to timeout), dialing begins immediately upon the Alarm Reset period timeout. To reactivate the alarm before the alarm reset timeout period is over, re-arm the alarm.

5.6 Alarm Reset Timeout After Acknowledgment

As shown in the figure, "Anatomy of an Alarm," p. 5-3, when an acknowledgment is received, the Verbatim autodialer begins timing out the Alarm Reset Time, (default 1 hour).

Further calling on behalf of that channel is suspended, regardless of further activity at that particular input during this period. If new alarms occur on other channels during this period, the unit will go back into the Unacknowledged Alarm state and dial the first appropriate phone number, with dialing continuing until a new acknowledgment is received.

5.7 Programming by Phone

During any phone call (inquiry call or alarm call), at the end of each round of messages, the prompting warble tone is issued. If you press a Command Tone "1" at the sound of the warble tone, the Verbatim autodialer will prompt you to enter a program code. (Or, if you have established a Security Access Code, you will first be prompted for this code).

To enter programming codes over the phone:

- Enter a touch tone "1" after the warble tone.
- Enter the program code followed by # #.
- Enter an additional # # when you are ready to hang up.

You may enter codes for most of the programming operations described in this manual except reading or changing the optional security access code. See Section 6 for more information about the 910 Security Access feature.

Since some of the front panel keys are not found on a touch tone keypad, some special conventions apply for over-the-phone programming:

In Place Of:	Enter:
CANCEL	* *
ENTER	# #
POINT	*
MINUS	#

- ◆ To enter the Program Mode press "1" after the warble tone.
- ◆ To end a phone call after programming:

  Press # # without a prior digit entry.

  The Verbatim autodialer will then issue a prompting beep which is another opportunity to enter a "1" if you didn't want to end the call. It will then say "Goodbye" and end the call.

Exception:

Over the phone, you may not program more than one consecutive dialing delay, because # # (two in a row) is interpreted as ENTER when programming. However, you may extend this delay using code 928. See *Program Code Table* p. 6-9.

- ◆ If you initially enter a Command Tone "2" in place of the "1", you will be in a special Program Review Mode, which allows you the safety of checking any of the programming items or messages, without the possibility of altering any of them.
- ◆ If you initially enter a Command Tone "3" in place of the "1", you will hear a report of each channel that has any acknowledged or unacknowledged alarm condition.
- ◆ If you initially enter a Command Tone "4" in place of the "1", you will hear a listing of all programmed phone numbers, plus any other basic programming items that you have altered from their default values. This is particularly useful in diagnosing operating problems.

- If you initially enter a Command Tone "8" in place of the "1", the unit will not be acknowledged and will immediately say "goodbye" and end the phone call.
- If you initially enter a Command Tone of "0, 5, 6, 7, or 9," in place of the "1", the alarms will acknowledge an alarm and the unit will immediately say "goodbye" and end the phone call.

Note:

Command tones "1, 2, 3, and 4" will acknowledge all alarms, even those not in their Alarm Call Group (ACG). See Section 6.2.13. Command tones "0, 5, 6, 7, and 9" will acknowledge only alarms in their ACG. Command tone "8" will not acknowledge any alarms, but will give the status of all alarms.

5.8 Dialing Out and Conversing Through the Verbatim Autodialer

At the panel, starting in the Normal Mode, press the DIALOUT/PRESS TO TALK key. Next press the digits of the phone number you want to dial. Each digit you press will be dialed as you press it. You will then hear the sound of the ringing.

When you hear the phone answered, press and hold the same DIALOUT/ PRESS TO TALK key as you speak to the person on the line, and release the key to listen. Continue the conversation in this manner.

- To end the call press NORMAL. If the DIALOUT/PRESS TO TALK key is not pressed for more than 2 minutes (or as previously set), the Verbatim autodialer will automatically end the call.
- To automatically re-dial a number that was previously manually entered by this method, press DIALOUT/ PRESS TO TALK as before, then press ENTER rather than entering digits manually.

If you are at the panel when a phone call is in progress, you may suspend the message report and converse with the person on the other end by pressing the DIALOUT/PRESS TO TALK key as described above. There will be no additional dialing, since connection has already been established. To end the call, press NORMAL.

6 Advanced Programming

6.1 Program Codes

This chapter provides the Program Codes table which summarizes the wide variety of available programming operations, along with a description and comments. Additional information may be found in referenced notes below as well as in the referenced sections elsewhere in the manual.

When the overall programming is cleared out at initial start-up, all programming is automatically set to factory default values as shown in the table. Most of these default values are quite suitable for most users and only selected items may need to be programmed to different values.

- To read the existing programmed settings:

  Enter a code and then ENTER without any intervening value. This reads the existing programmed setting without changing it.

- To clear a program:

  Enter POINT ***after the code*** and before ENTER. This clears the program item, or returns it to its default value.

In the Program Codes table, several forms of numeric value entries are shown:

Value	Definition
V	A value of one or more digits which may include a decimal point or minus. Examples: .5, 2.8, 300.6, 60.
N	One or more digits giving a whole number; no decimal points allowed. Examples: 1, 5, 20.
DN	A two-digit Designation Number for phone numbers (01 for first number, 02 for second, etc.).
1/0	Used to turn a function ON (1) or OFF (0).
ZZ	2-digit channel number (use ZZ=00 for ID message).

6.1.1 Notes for Programming Code Table:

Refer to these numbered items under the "Notes" column in the following *Programming Code Table.*

1. ZZ = 2 digit channel number. Use ZZ=00 for Station ID message.
2. For any channels you have programmed as "Status Only" or "Run Time Meter", use code 1 ZZ for the Open Circuit message, use code 2 ZZ for the Closed Circuit Message. See Section 6.2, "Programming Operations," for message information for any Pulse Totalizer channels.
3. DN (Designation Number) is 01 for first dialout phone number, 02 for second number, etc. DN = 00 for special "callback" phone number. Use MINUS to insert any needed delays between digits. Each such delay is 1 second unless extended using code 928.
4. Actual power failure trip delay may be a fraction of a second longer than programmed value, due to power supply discharge time which varies with the number of option boards.

Caution:

5. If Alarm Reset Function is turned OFF, acknowledged alarms will NEVER RE-ARM, preventing further alarm calls after acknowledgment for each channel.
6. Speaker always operates during front panel programming, even if programmed to be off.
7. Cannot be read or changed over the phone.
8. Does not change channels that have been configured for "Status Only," "Run Time Meter," or "Pulse Totalizer."

Caution:

9. High Speed Dialing setting may not work reliably with some telephone company exchanges.
10. Add POINT to restore default message.
11. To pre-set a Run Time value, include the value before ENTER.
12. Maximum value that can be entered is 4,294,967,294.
13. Omits all mention of disabled channel. Restore by setting for Normally Closed, Normally Open, etc.

Programming Code Table (Page 1 of 8)

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
Channel Status Reading					
0ZZ	Reads status of channel ZZ				6.2.1
0ZZ0	Reads actual open/closed circuit status directly				6.2.1
Message Recording and Reviewing					
100	Records Station ID message			1, 2, 10	4.3, 6.2.2
1ZZ	Records channel ZZ alarm message			1, 2, 10	4.3, 6.2.2
2ZZ	Records channel ZZ normal message			1, 2, 10	4.3, 6.2.2
3ZZ	Reviews channel ZZ both messages ZZ=00 for Station ID msg			1	4, 4.3, 6.2.2
911	Reads current record rate and available record time				4.2
912	Autoextend: sets optimum record rate for recited msg				4.2
913 N	Sets recording rate	Rate 1	Rate 1-4		4.3
914 N	Inserts N in place of 1 in canned station ID message	Station 1	1-16 digits		4.3
Channel Programming (Configuration)					
500	Sets current status as normal for all channels				3.3, 6.2.3
500 N	Sets all inputs to config parameter N	normally closed	0/1/2/3 0 = disarmed 1 = normally closed (default) 2 = normally open 3 = no alarm		3.3, 6.2.3
5ZZ	Reads alarm criteria for channel ZZ	1			6.2.3
5ZZ 0	Disables channel ZZ			13	3.3, 6.2.3
5ZZ 1	Sets chan ZZ normally closed			1	3.3, 6.2.3
5ZZ 2	Sets chan ZZ normally open			1	3.3, 6.2.3
5ZZ 3	Sets chan ZZ for no alarm (status report only)			1	3.3, 6.2.3
5ZZ 4	Sets chan ZZ for run time meter operation			1	3.3, 6.2.4
5ZZ 4 V	Preset starting value	0.0 hrs	0.0-99,999.9 hrs	1	6.2.4
5ZZ 7 N	Pulse totalizer: ACTIVATES with starting value N			12, 2	6.2.5
5ZZ 8 N	Pulse totalizer: sets scale factor N			12	6.2.5
5ZZ 6 N	Pulse totalizer: sets alarm setpoint N with starting value N			12	6.2.5

Programming Code (Page 2 of 8)

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
Alarm Trip Delays					
600	Reads power failure alarm trip delay				6.2.6
600 V	Sets power failure alarm trip delay to V	0.1 min	0.1-999.9 min		6.2.6
6ZZ	Reads chan ZZ alarm trip delay				6.2.6
6ZZ V	Sets chan ZZ individual alarm trip delay to V	2 sec	0.1-9999.9 sec	1	6.2.6
6ZZ POINT	Returns chan ZZ individual alarm trip delay to default	2 sec		1	6.2.6
902 V	Sets global (all channels) alarm trip delay to V seconds	2 sec	0.1-9999.9 sec		6.2.6
902 POINT	Returns global (all channels) alarm trip delay to default	2 sec			6.2.6
Phone Numbers and Pulse/Tone Dialing					
700	Reads special "callback" phone number			See Code 924	6.2.18
700 N	Sets special "callback" phone # to N		1 - 60 digits		6.2.18
7DN	Reads phone number DN		01 - 16 DN = 01-16		3.2, 6.2.7
7DN N	Sets phone number DN to N phone #		1 - 60 digits N can = up to 60 digits	3	3.2, 6.2.7
7DN POINT	Clears out phone number DN				3.2, 6.2.7
900 0/1	Read/Set Call Progress Monitoring	0 (OFF)	0/1 0 = OFF 1 = ON		6.2.12
901 0/1/2	Sets dialing mode	Pulse mode	0/1/2 0 = pulse 1 = tone 2 = high speed	9	6.2.7
903 V	Sets time between callouts to V	2 min	0.1-99.9 min		6.2.18
906 N	Sets ring answer delay to N N = whole number	1 ring	1 - 20 rings		6.2.18
908 0/1	Sets Autocall ON/OFF	OFF	0/1 0 = OFF 1 = ON		6.2.18
909 V	Sets Autocall interval to V	24 hrs	0.1-99.9 hrs		6.2.18
916 N	Set Automatic Phone Fault Detect frequency	24 hrs	0.1 - 24 hrs	916 POINT resets to default	6.2.10
917 0/1/2/3	Set Phone Fault and Auto Tone-Pulse	3	0/1/2/3 0 = Phone Fault OFF/Auto Tone-Pulse OFF 1 = Phone Fault ON/Auto Tone-Pulse OFF 2 = Phone Fault OFF/Auto Tone-Pulse ON 3 = Phone Fault ON/Auto Tone-Pulse ON		6.2.10
918	CPM Ring Count	10 rings	5 - 20 rings		6.2.12
928 N	Extends length of inserted dialing delays to N sec	1 sec	1 - 10 sec		6.2.7

Programming Code (Page 3 of 8)

Code	Description & Comments	Default	Range/Values	Notes *See p. 6-2*	Section
Alarm Call Grouping					
5ZZ 9	Reads channel ZZ alarm call grouping linkage			1	6.2.13
5ZZ 9 DN	Links channel ZZ to phone numbers DN.	Calls all phone #s	01 - 16 DN = 01-16	1	6.2.13
5ZZ 9 POINT	Clears channel ZZ alarm call grouping linkage.			1	6.2.13
Alarm Ready Scheduling					
935 7	Initializes real-time clock chip on install to 1/6/92 2				2.3, 6.2.19, 7.9
941 MMDDYYD	Sets date	01/06/92 2	01/01/94 - 12/13/20 D *(Day Code)* is optional: 1 = Sunday 2 = Monday 3 = Tuesday 4 = Wednesday 5 = Thursday 6 = Friday 7 = Saturday		2.3, 7.9
942 HHMMSS	Sets time	08:00:00	00:00-23:59:59 (military-24-hour-clock)		2.3, 7.9
961	Read weekday rearm/disarm times				7.9
961 RRRR DDDD	Sets weekday rearm/disarm times	1700, 0800		RRRR=rearm time, DDDD=disarm time (military-24-hour-clock)	7.9
962	Reads weekend rearm/disarm times				7.9
962 RRRR DDDD	Sets weekend rearm/disarm times	1700, 0800		RRRR=rearm time, DDDD=disarm time (military-24-hour clock)	7.9
963	Reads weekend rearm/disarm day of week				7.9
963 R D	Sets weekend rearm/disarm day of week	Friday, Monday	R = rearm day D = disarm day		7.9
964	Reads holiday rearm date				7.9
964 MMDDYY	Sets holiday rearm date	12/24/90	Today - 12/31/20 MM = month DD = day YY = year		7.9
965	Reads holiday disarm date				7.9
965 MMDDYY	Sets holiday disarm date	12/24/90	The day after the holiday rearm date (see Code 964) - 12/31/20		7.9

Programming Code (Page 4 of 8)

Code	Description & Comments	Default	Range/Values	Notes	Section
				See p. 6-2	
Alarm Ready Scheduling . . . *Continued from p. 6-5*					
966	Reads alarm ready schedule control number				7.9
966 N	Sets alarm ready schedule control number	0	N control 0-7 0 = OFF 1 = Weekday 2 = Weekend 3 = Weekday and Weekend 4 = Holiday 5 = Weekday and Holiday 6 = Weekend and Holiday 7 = Weekday, Weekend and Holiday		7.9
Local Data Logging Programming Codes					
935 7	Initialize real-time clock chip on install to 1/6/92 2				2.3, 6.2.19, 7.9
941 MMDDYYD	Sets date.	01/06/92 2	01/01/94-12/31/20 D *(Day Code)* is optional: 1 = Sunday 2 = Monday 3 = Tuesday 4 = Wednesday 5 = Thursday 6 = Friday 7 = Saturday		2.3, 7.9
942 HHMMSS	Sets time	08:00:00	00:00-23:59:59 (military-24-hour clock)		2.3, 7.9
943 V	Sets regular interval local printing	OFF	0 = OFF .1 - 999.9 hrs		2.3, 7.9
944	Prints all current programming immediately				2.3, 7.9
Analog Input Programming					
5 ZZ 1 X.XX	Sets low signal input value				B.1.5
5 XX 1 POINT	Sets low signal input value to real world point				B.1.5
5 ZZ 2 X.XX	Sets low signal input spoken value				B.1.5
5 ZZ 3 X.XX	Sets high signal input value				B.1.5
5 ZZ 3 POINT	Sets high signal input value to real world point				B.1.5
5 ZZ 4 X.XX	Sets high signal input spoken value				B.1.5

Programming Code (Page 5 of 8)

Code	Description & Comments	Default	Range/Values	Notes See p. 6-2	Section
Analog Input Programming . . . *Continued from p. 6-6*					
5 ZZ 5 X.XX	Sets low setpoint alarm value				B.1.5
5 ZZ 6 X.XX	Sets high setpoint alarm value				B.1.5
5 ZZ 7	Sets analog input signal type	0	0/1/2 0 = 4-20 ma signal 1 = 0-1 VDC signal 2 = RACO TS-705A		B.1.3
Remote Supervisory Control					
For all items in this section: N = output number, Range = 01, 02, 03, 04, 05, 06, 07, 08					
95 N	Reads RSC output #N ON/OFF condition			14	C.1.3
95 N 0	Turns RSC output #N OFF				C.1.3
95 N 1	Turns RSC output #N OFF				C.1.3
95 N 2 V	Turns RSC output #N ON for V seconds only	1 sec	1 - 99,999 sec		C.1.3
95 N 3 V	Turns RSC output #N OFF for V seconds only	1 sec	1 - 99,999 sec		C.1.3
9500	Reports ON/OFF status of all outputs				C.1.3
9500 0	Turns OFF all outputs				C.1.3
9500 1	Turns ON all outputs				C.1.3
9500 8 V	Establish default pulse duration in minutes (When using 95 N 2 or 95 N 3)				C.1.3
9500 9 V	Establish default pulse duration in seconds (When using 95 N 2 or 95 N 3)				H.2.3
Data Acquisition/Central Data Logging					
919 V	Sets quick intercall time	60 sec	35-999 sec		E.2
981 V	Return To Normal (RTN) calling	0	0/1/2/3/4/5	See Code 923	E.1, K.4
982 0/1/2	Acknowledgment calls to central station	0	0/1/2 0 = 1 1 = ON 2 = resets all alarm acknowledgment call status		E.3
983 0/1	Modem Automatic Speed Select	1	0/1 0 = OFF 1 = ON		E.4

Programming Code (Page 6 of 8)

Code	Description & Comments	Default	Range/Values	Notes	Section
				See p. 6-2	
Data Acquisition/Central Data Logging . . . *Continued from p. 6-7*					
984 0/1	Modem High/Low speed selection	1	0/1 0 = 300 1 = 1200		E.5
985 N	Data call attempts	3	1 - 10		E.6
986 0/1	Sets answer mode	0	0/1 0 = Data-to-Voice 1 = Voice Only		E.7
987 N	Data/Voice autocall calls	0	0/1/2 0 = Autocalls to Central Station only 1 = Autocalls to personnel numbers only 2 = Autocalls to all numbers		E.8
Miscellaneous Programming Items					
902 V	Sets global (all channels) alarm trip delay to V	2 sec	0.1-9999.9 sec		6.2.6
904 V	Sets alarm reset time to V	1 hour	0.1-99.9 hr		5.6, 6.2.18
905	Clears all acknowledged alarms and clears reset timers				6.2.18
907 N	Sets number of alarm message repeats to N N = whole number	3 repeats	1-20 repeats		5.3, 6.2.18
910 N	Establishes a security access code N	None	0-8 digits	7	6.2.18
920 V	Power failure trip delay (duplicates function of code 600)	0.1 min	0.1-999.9 min	4	6.2.6
921 0/1	Sets power failure alarm	ON	0/1 0 = off 1 = on		6.2.6
922 0/1	Sets alarm reset timers	ON	0/1 0 = off 1 = on	5	6.2.18
923	Annunciator Sequence	1	1-4 Values: 1 = M-1designations 2 = A-1-4 designations 3 = A-1 designations 4 = A-1-4 variant	See also Code 981	K.4
924	Initiates test callback to phone # 00			unit must be ARMED	6.2.18
925 0/1	Turns on/off alarm acknowledgment on call-in to dialer.	ON	0/1 0 = OFF 1 = ON		
926 V	Sets delay before return to normal (Exit Delay) to V	2 min	1-99.9 min	Nonrecurring Function	6.2.18

Programming Code (Page 7 of 8)

Code	Description & Comments	Default	Range/Values	Notes See p. 6-2	Section
Miscellaneous Programming Items . . . *Continued from p. 6-8*					
927 0/1	Sets intercall delay parameter	0	0/1 Values: 0 = Normal operation of intercall delay. 1 = If new Unacknowledged alarms occur during the intercall delay period, the unit will begin a new dialout immediately. The unit will dial the next phone number in the dialing sequence. It will not start over at the top of the list.	** Firmware version 2.01+ only**	
928 N	Extends length of inserted dialing delays to N sec	1 sec	1-10 sec		5.7, 6.2.7
930 0/1	Sets arm or disarm unit for alarm callouts	armed	0/1 0 = disarms 1 = arms unit		6.2.18
932	Invokes one-time 15-second listening period	OFF			6.2.18
933 0/1	Sets local microphone ON or OFF	OFF	0/1 0 = OFF 1 = ON		6.2.18
934 0/1	Sets speaker ON or OFF	ON	0/1 1 = ON 0 = OFF	6	6.2.18
Clear Out Operations					
935 0	Clears out phone numbers; sets all delays to defaults				6.2.19
935 1	Clears out phone numbers only				6.2.19
935 2	Clears out all alarm call grouping linkage				6.2.19
935 3	Sets the following delays to their factory default values: 902, 903, 904, 920, 921, 926, 928			921 sets power failure alarm ON	6.2.19
935 4	Clears all user recorded messages				6.2.19
935 5	Clears all programming except messages			does not clear 913, 930, 941, 942	6.2.19
935 6	Clears all totalizers to 0 (not to preset) reading				6.2.19
935 7	Clears real-time clock chip (reinitialize)				2.3, 6.2.19, 8.9
935 9	Total clearout: Erases all programming & messages			does not clear 941, 942	3.1, 6.2.19
Diagnostic Readouts					
940	Reads all 4 diagnostic counts (add 0 to clear all 4)				6.2.20
940 1	Reads call in count (add 0 to clear)				6.2.20
940 2	Reads dial out count (add 0 to clear)				6.2.20
940 3	Reads acknowledged alarm count (add 0 to clear)				6.2.20
940 4	Reads power failure alarm count (add 0 to clear)				6.2.20

Programming Code (Page 8 of 8)

Code	*Description & Comments*	*Default*	*Range/Values*	*Notes* *See p. 6-2*	*Section*
Local Alarm/Line Seizure					
960 0	Read local alarm relay/line seizure				H.8
960 00/01	Set local alarm relay/line seizure 00 = local alarm relay 01 = line seizure	00	00/01		H.8

6.2 Programming Operations

The following descriptions show the relevant program codes in parenthesis, and are organized according to their appearance in the preceding Program Codes table located in Section 6.1, "Program Codes."

Refer also to Section 5, "Using Your Verbatim Autodialer," for a description of over-the-phone programming.

6.2.1 Channel Status Reading

Code	Function	Description
0 ZZ	Read Status of Channel ZZ	Plays the message that corresponds to the present input condition of Channel ZZ.
0 ZZ 0	Read Open/Closed Circuit Status Directly	Says "Channel ZZ is closed" if channel ZZ input is presently Closed Circuit, or "Channel ZZ is open" if the input is Open Circuit. Useful in troubleshooting, especially at setup time.

Note:

If a channel is disabled, its status will never be mentioned.

6.2.2 Message Recording and Reviewing

Be sure to refer to Section 4, "Record Voice Messages," for important details on message recording, including codes 911, 912, 913, and 914.

Code	Function	Description
100	Record Station Message	
1 ZZ	Record Channel ZZ Alarm Message	Used for Open Circuit message for channels programmed for NO ALARM (status only), or for Run Time Meter operation. Also used for a preamble message for channels programmed for Totalizer or Analog function.

2 ZZ	Record Channel ZZ Normal Message	Used for Closed Circuit message for channels programmed for NO ALARM (Status Only) or for Run Time Meter operation. Also used for "units of measure" portion of a message following preamble and digit readings, for channels programmed for Totalizer or Analog function.
3 ZZ	Review Channel ZZ Messages	Use 3 00 to review Station ID message

6.2.3 Channel Programming (Configuring)

Also see Section 3.3, "Programming Input Channels."

Code	Function	Description
500	Set Present Input Status as Normal Condition for All Contact Input Channels	Used at setup time as the most expedient way of programming the Normally Open/Normally Closed configurations ("Alarm Criteria") of contact input channels. Special configurations such as Status Only, Run Time Meter or Totalizer may then be programmed for specific individual channels. This code does not affect channels already programmed for Status Only, Run Time Meter, or Pulse Totalizer. **APPLIES ONLY TO CONTACT INPUTS.**
500 0	Sets the Alarm Criteria for all contact channels to DISABLED	Used at setup time as the most expedient way of programming all channels to the same alarm criteria. **APPLIES ONLY TO CONTACT INPUTS.**
500 1	Sets the Alarm Criteria for all contact channels to NORMALLY CLOSED	Same as above
500 2	Sets the Alarm Criteria for all contact channels to NORMALLY OPEN	Same as above
500 3	Sets the Alarm Criteria for all contact channels to STATUS ONLY	Same as above
5 ZZ	Read Channel ZZ Programming ("Alarm Criteria")	
5 ZZ 0	Disables Channel from Being Monitored and Reported	
5 ZZ 1	Set Channel ZZ for Normally Closed Operation	An Open Circuit condition will cause an alarm. **APPLIES ONLY TO CONTACT INPUTS.**
5 ZZ 2	Set Channel ZZ for Normally Open Operation	A Closed Circuit condition will cause an alarm. **APPLIES ONLY TO CONTACT INPUTS.**
5 ZZ 3	Set Channel ZZ for No Alarm (Status Only)	**APPLIES ONLY TO CONTACT INPUTS.**

6.2.4 Run Time Meter Programming

You may program any of the ordinary contact (digital or discrete) input channels to accumulate and report the number of hours that their respective input circuits have been closed. Any such channels will never cause an alarm, but on inquiry will recite the channel's Closed Circuit message or the Open Circuit message according to the status of the input, and will then report the accumulated Closed Circuit time (run time) to the tenth of an hour.

- To program channel ZZ for Run Time Meter operation, press:

  `5 ZZ 4 ENTER`

- To preset a starting value, press:

  `5 ZZ 4 V ENTER`

  where V may be any value from 0 to 99,999.9.

- To delete the Run Time Meter programming, you must reprogram the channel for any other type of alarm criteria.

As with channels programmed for NO ALARM (Status Only) operation, the default Open Circuit message is "Channel N is off." To record your own Open Circuit message for channel ZZ, use program code 1 ZZ. The default Closed Circuit message is "Channel N is on." To record your own Closed Circuit message for channel ZZ, use program code 2 ZZ.

6.2.5 Pulse Totalizer Function Programming

The Totalizer function counts the accumulated number of pulses (momentary contact closures) occurring at the contact input for a channel which you have programmed for Totalizer operation. This function is typically used to accumulate the pulse output of rotary flow meters.

An alarm set-point may be programmed to create an alarm call upon reaching a particular total value. Scale and offset factors are programmable, and user-recorded messages may be used.

Any contact input channel may be programmed for the Totalizer function, up to a total of 8 Totalizers. The input pulse rate must not exceed 100 pulses per second, and if the rate is over 50 pulses per second, the pulses must have a 50% duty cycle.

- To program channel ZZ for Totalizer operation, press:

  `5 ZZ 7 ENTER.`

Note:
This function must be done to Activate the Totalizer. It is only possible to program up to 8 contact input channels for Pulse Totalizer. However, any 8 inputs may be used from the full set of contact inputs in your unit.

- To establish a non-zero starting value for the spoken reading, add the desired starting spoken value after the 7 and before ENTER.
- To establish a scale factor (so that a number of pulses will be translated into a single spoken unit count), press:

  `5 ZZ 8 N ENTER`

  where N is the number of pulses corresponding to a single spoken unit count. For example, if a pulse from a flow meter occurs for each 1/10 gallon of water flow, but the desired report is needs to be in thousands of gallons, a value of 10,000 would be used for N. The unit uses the word "percent" in speaking of the scale factor.

The spoken scaled value will "roll over" to zero upon reaching 4,294,967,294 (2^{32}). Values above this should not be entered at the keyboard.

The default message for Totalizer channels is "Channel N Totalizer count is N." User-recorded messages are normally done in two segments. Use program code 1 ZZ to record a preamble message such as "The total water flow reading is". Use program code 2 ZZ to record an ending units-of-measure message such as "thousand gallons". During the report, the unit will insert the digits comprising the actual scaled value. In this example, the resulting complete report would be "The total water flow reading is (spoken value) thousand gallons".

- To establish a Totalizer alarm set-point, press:

  `5 ZZ 6 N ENTER.`

When the scaled value reaches N, the unit will go into Unacknowledged Alarm and begin dialing. After the initial alarm has occured, a new alarm will not occur until the user has reset the criteria. You may program a value of zero for N to cancel any previously programmed Totalizer alarm set-point for channel ZZ.

- To clear out all Totalizer readings to zero in one step, press:

  `9 3 5 6 ENTER.`

6.2.6 Alarm Trip Delays

The Alarm Trip Delay is the length of time after a violation occurs before the unit goes into Unacknowledged Alarm and begins dialing. The default value is 2 seconds for all inputs and 0.1 minute (6 seconds) for power failure. During this time, if a status is read, the message will be the ALARM message, with the extra word "alert" appended. If the violation is corrected before the Alarm Trip Delay times out, no alarm or dialout will occur.

There are two ways to change this Alarm Trip Delay: global (common for all channels except power failure) programming, and individual programming for each channel and power failure.

- To program a new global Alarm Trip Delay, press:

  `9 0 2 V ENTER`

  where V is a value consisting of 1 to 4 digits, between .1 and 9999.9 seconds. For example, possible entries include .1, 5, 5.1, and 600.1 (seconds).

- If you wish to program a new Alarm Trip Delay for an individual ZZ channel, press:

  `6 ZZ V ENTER`

- To set a different Power Failure Trip Delay, press:

  `6 00 V ENTER` (code 920 does the same thing)

- To turn off the Power Failure Alarm function, press:

  `9 2 1 0 ENTER`

- To turn on the Power Failure Alarm function, press:

  `9 2 1 1 ENTER`

Note:

The global code 902 overrides any previously set individual channel Alarm Trip Delays. Therefore, if you wish to establish a different global Alarm Delay and also program selected inputs for still different individual trip delays, perform the global programming first, and then any individual trip delay programming.

The default trip delay is 2 seconds for the contact channels and 6 seconds (.1 hour) for power failure. If you are getting a lot of "nuisance" alarms, with a call saying, "alarm now normal," you might think about setting the alarm trip delay up a bit. A good example of this would be the power fail trip delay. In some areas of the country, it is very common to have short periods of power failure -- ten seconds or less. These may not be of particular concern, so setting the power fail trip delay to .2 or .3 hours could save unnecessary phone calls.

Caution:

When leaving program mode all timers for unacknowledged alarms and violations will be reset.

6.2.7 Phone Numbers and Pulse/Tone Dialing

Also see the section 6.2.13, "Alarm Call Grouping," and Section 3.1, "Starting Up and Clearing the Unit."

Note:

DN is the 2-digit Designation Number: 01 for the first phone number, 02 for the second number, up to 16 for the 16th phone number.

Refer to Programming Worksheet A. Write down each phone number you wish to program, along with a person's name, for future reference.

- To program the first phone number to be dialed on alarm, press:

  `7 01 (then the complete phone number) ENTER.`

- To program the second phone number to be dialed on alarm:

  Use code 7 02 in place of 7 01, progressing to a maximum of code 7 16 for a 16th phone number.

Each phone number may be up to 60 digits in length. Be sure to include any necessary area codes or "1" prefixes.

- To erase phone number DN, press:

  `7 DN POINT ENTER.`

- If you need Touch Tone dialing, press:

  `9 01 1 ENTER.`

- For high speed dialing, press:

  `9 01 2 ENTER.`

Caution:

"High speed dialing" may not work reliably with some older telephone company exchanges.

- To switch back to pulse dialing, press:

  `9 01 0 ENTER`

- To insert delays between dialed digits (e.g. after a leading "9" in PBX systems), in the programming process, press the MINUS key once for each one-second delay desired. To extend the length of each delay beyond 1 second, press:

  `9 28 N ENTER`

  where N is the number of seconds of delay desired for each delay invoked with the MINUS key.

6.2.8 Enhanced Telephone Interface Features

The Enhanced Telephone Interface features give the user additional power to solve unusual telephone system interface problems and to provide more reliable and efficient notification of alarms.

The Enhanced Telephone Interface Features include the following functions:

- 60 Digit Phone Numbers
  - For all 16 telephone numbers and the call-back number.
- Telephone Line Fault Detection (Phone Fault)
  - Tests phone line at regular programmed interval
  - Flashes TFAIL LED on dialer front panel upon failure
  - Logs Phone Faults and phone line restoration to Local Printer
- Automatic Selection of Tone versus Pulse Dialing
  - Tests for tone capability upon first power up without user intervention
  - May be overridden for PBXs with "non-standard" dialtones
- Call Progress Monitoring (CPM)
  - Detects busy and ringing signals
  - Waits until phone is answered to annunciate voice reports
  - Abandons call if busy or no answer and quickly tries next number
- Numeric Pager Support
  - Designate Pager only numbers - no voice annunciation
  - Insert pager system terminator characters such as '#' or '*'
  - Insert DTMF A, B, C & D tones in phone number strings for unique IDs
- PBX Support
  - Ignore "non-standard" PBX dialtones
  - Insert "wait for outside line" dialtone into phone number strings

The Enhanced Telephone Interface Features are included on Verbatims with a mainboard Revision of VMP-5a and above and firmware revisions 2.09 and above ONLY.

Contact your RACO Representative about upgrading if the Enchanced Telephone Interface is required.

6.2.9 60 Digit Phone Numbers

Telephone numbers may be as long as 60 digits. This allows, for instance, the Verbatim autodialer to make calls using long distance companies which require entry of access codes. Even with many digits occupied by long distance numbers and access codes there will still be sufficient digits remaining for calls to pager systems requiring complex sequences of terminators, ID numbers, time delays, tone detects, etc.

6.2.10 Telephone Line Fault Detection (Phone Fault)

The Phone Fault Detection feature tests the telephone line whenever the unit needs to make a phone call and at a regular programmable time interval (as long as there are phone numbers programmed).

Phone Fault is turned ON by default but may be disabled if so desired. Also, the Phone Fault Detection interval is user programmable.

Phone Fault shares a user code with the Automatic Tone/Pulse Selection capability. The basic user command is code 917. Entering code 917 with no parameter will cause a recitation of the current settings for Phone Fault and Automatic Tone/Pulse Selection.

The following parameters may be entered:

- Turns OFF BOTH Phone Fault Detect and Auto. Tone/Pulse Select

  `9 1 7 0`

- Turns ON Phone Fault Detect, turns OFF Auto. Tone/Pulse Select

  `9 1 7 1`

- Turns OFF phone fault detect, turns ON Auto. Tone/Pulse Select

  `9 1 7 2`

- Turns ON BOTH Phone Fault Detect and Auto. Tone/Pulse Select (default)

  `9 1 7 3`

Note:

The factory default setting for code 917 is parameter 3, BOTH Phone Fault Detect and Auto. Tone/Pulse Select ON.

The command code 916 is used to set the Automatic Phone Fault Detection interval. This time interval can range from 0.1 hour to 24 hours. The factory default setting is 24 hours. Enter the command 916 followed by a value from 0.1 to 24.0 to program the Phone Fault Detection interval.

- For example, to set the Phone Fault Detection interval to 0.3 hour., enter:
  `916 0.3`

Whenever a Phone Fault is first detected, a Local Data Logger (LDL) message will be sent to the printer with date and time stamp. Additionally, the Phone Fault LED, labeled TFAIL, will begin to blink.

If a Phone Fault is detected at the beginning of an outgoing phone call the TFAIL LED will flash and the unit will return to the NORMAL state. Then, while still in the NORMAL state, the unit will continually check the telephone line every 30 seconds for restoration of the telephone service.

When telephone service is restored, a message will be sent to the Local Data Logger's printer and the TFAIL LED will go from flashing to solid ON. The Verbatim autodialer will then resume making any pending phone calls. The TFAIL LED will remain ON until a voice message about the Phone Fault is communicated via the phone or to an operator at the front panel by pressing the CHECK STATUS button. The TFAIL LED and pending voice annunciation of the Phone Fault condition may also be cleared at the front panel by pressing the DISARM/RE-ARM button twice.

No Phone Fault Detection will be performed if there are no phone numbers programmed. If the unit needs to make an alarm call when there is a Phone Fault the numbered channel LEDs will blink continuously even though the unit is in the NORMAL state. This unusual condition will only be seen while there is a Phone Fault and the unit is constantly testing for the return of telephone service.

6.2.11 Automatic Tone/Pulse Selection

When Automatic Tone/Pulse Selection is ON the Verbatim autodialer will test for the ability to use tone dialing. This test will be performed only once, one minute after the unit is powered on or is reset. Automatic Tone/Pulse Selection enables the installer to not be concerned about whether the telephone line supports tone dialing.

Automatic Tone/Pulse Selection shares a user code with Phone Fault Detection. The basic user command is code 917. Entering code 917 with no parameter will cause a recitation of the current settings for Phone Fault and Automatic Tone/ Pulse Selection. The following parameters may be entered:

- Turns OFF BOTH Phone Fault Detect and Auto. Tone/Pulse Select
  `9 1 7 0`
- Turns ON Phone Fault Detect, turns OFF Auto. Tone/Pulse Select
  `9 1 7 1`

- Turns OFF phone fault detect, turns ON Auto. Tone/Pulse Select

  9 1 7 2

- Turns ON BOTH Phone Fault Detect and Auto. Tone/Pulse Select (default)

  9 1 7 3

Note:

The factory default setting for code 917 is parameter 3, BOTH Phone Fault Detect and Auto. Tone/Pulse Select ON.

Setting Automatic Tone/Pulse Selection ON when it was previously OFF will cause the Verbatim autodialer to perform the test for Tone/Pulse Selection even though it has been longer than one minute since the unit was last powered on or reset.

After powering the unit on, Automatic Tone/Pulse Selection may be temporarily suspended by any front panel activity. Automatic Tone/Pulse Selection will then be resumed one minute after the front panel activity has ceased.

No Tone/Pulse Selection will be done while the unit is being programmed over the phone or if there are not phone numbers programmed.

6.2.12 Call Progress Monitoring (CPM)

Call Progress Monitoring (CPM) operates by listening for the presence or absence of busy and ringing signals. These are the same signals you hear after you dial a phone number. Proper operation of CPM requires that the busy and ringing signals are composed of standard Call Progress frequencies.

The possibility exists that CPM may not function properly because the CPM tones on a particular phone system are not standard.

Unlike other equipment with Call Progress Monitoring, CPM on the Verbatim autodialer does not include detection for the dial tone at the beginning of the dialout session. However, dialtone detection is an integral part of Phone Fault Detection. This allows CPM to be operational even when the Verbatim autodialer is installed inside of a PBX phone system which has a non-standard dialtone.

CPM is intended to detect the following phone line states:

- phone line is busy - both subscriber and trunk busy signals are detected
- non-existent phone number
- phone unanswered - still ringing
- phone answered - ringing stopped

When CPM determines that a call is not complete, an appropriate report will be sent to the local printer.

Reasons for a non-completed call:

- CPM determines the line is busy
- CPM does not detect cessation of ringing before end of programmed CPM ring count
- CPM does not detect either busy signal or valid ring signals

Reason for a completed Call:

- CPM detects at least one ring followed by cessation of ringing

If a call is not completed, the Verbatim autodialer will disconnect the call and enter the intercall delay state. At the end of the intercall delay, the next programmed telephone number will be dialed.

When a call is not completed, the intercall delay will always be shortened to 30 seconds. This CPM altered intercall delay is fixed at 30 seconds and is not affected by the user-programmed intercall delay. The normal programmable intercall delay will apply only to the delay between completed calls.

Call Progress Monitoring for firmaware version 2.09 is set to ON by factory default. If CPM is OFF the Verbatim will deliver voice messages without regard to any ringing or busy signals. This unit will simply dial the number, then after a short delay, start annunciating voice reports.

As noted above, dialtone detection is actually a part of the Phone Fault Detection feature. It is possible to have CPM turned OFF and Phone Fault Detect turned ON. In this case, the unit will test for a dialtone but not for busy or ringing signals.

Use code 900 to read or set CPM programming. Use code 900 followed by a 1 or 0 parameter to program CPM ON (1) or OFF (0).

The CPM ring count is the number of rings Verbatim autodialer will wait for an answer before considering the call to be incomplete. Use code 918 to read or set the number of CPM rings. The factory default is 10 rings and the user may program any number of rings from 5 to 20.

- For example, to program the CPM ring count to 10 rings, enter:

  `918 10 then ENTER`

6.2.13 Alarm Call Grouping

This is a programming step that "links" selected channels to selected dialout phone numbers, so that when a given channel goes into alarm, only the phone numbers "linked" to that channel will be dialed. Ordinarily, an alarm on any channel will cause dialing of the entire list of phone numbers.

Alarm Call Grouping is typically done when certain channels are associated with a specific category of personnel, such as electrical, plumbing, security, etc. However, Power Failure to the Verbatim autodialer causes dialing of all phone numbers. If you need to limit Power Failure alarm calls to selected numbers:

1. Turn off the regular Power Failure alarm function using code 9 2 1 0, (described below)
2. Then connect an unused input channel for power failure monitoring, using the contacts of a relay.

To program for Alarm Call Grouping:

1. Enter your phone number. It is important to first write in your entire list of phone numbers on Programming Worksheet A in Appendix J.

Note:

There is a 2-digit "Designation Number" on the Worksheet associated with each phone number (01 for the first number, etc.). This number corresponds with the 3-digit program code for entering phone numbers (701 for the first number, etc.).

2. Group them by using code `5 ZZ 9 DN`. Begin by filling in Programming Worksheet B in Appendix J.

   Refer to the filled-in examples for guidance. The right-hand column will now contain the actual program code strings which you should now enter, terminating each string entry with the ENTER key.

   For example, to link channel 1 to the second and fifth phone numbers, following the filled-in example, you would press:

   ```
   5 01 9 02 05 ENTER
   ```

3. Phone numbers will always be dialed in ascending order of the 2-digit Designation Numbers, regardless of their order in your program code entry. Note that an alarm on any channel that is not "linked" with a program code entry will cause dialing of the entire list of phone numbers.
   - To read the linkage programming on channel ZZ, press:

     ```
     5 ZZ 9 ENTER
     ```

- To "un-link" channel ZZ so that it again calls all phone numbers, press:

  5 ZZ 9 POINT ENTER

- To undo all existing linkage on all channels, press:

  9 35 2 ENTER

6.2.14 Alarm Ready Scheduling

Refer to Section 7, "Using the Alarm Ready Schedule Feature," for use and application information. See also Appendix E , "Data Acquisition/Central Data Logging."

6.2.15 Local Data Logging Programming Codes

Refer to Chapter 2, "Installation," for use and application information.

6.2.16 Analog Input Programming

Refer to Appendices B, C and D, "Analog Signal Input," "Remote Supervisory Control Output," and "Printer Options," for use and application information.

6.2.17 Remote Supervisory Control

Refer to Appendices B, C and D, "Analog Signal Input," "Remote Supervisory Control Output," and "Printer Options," for use and application information. See also Appendix E, "Data Acquisition/Central Data Logging."

6.2.18 Data Acquisition/Central Data Logging

Refer to Appendix E, "Data Acquisition/Central Data Logging."

6.2.19 Miscellaneous Programming Tips

(903) Time Between Alarm Call Outs

This is the length of time after ending one alarm call-out and before beginning the next call-out. Default value is 2 minutes; range is 0.1 to 99.9 minutes.

- To program a different number of minutes V, press:

  9 03 V ENTER

(904, 922) Alarm Reset Time

This is the length of time after acknowledgment before a given channel (or Power Failure) is automatically reset to a clear condition, ready to act on a new alarm condition. Refer to the diagram "Anatomy of an Alarm" in Section 5, "Using Your Verbatim Autodialer," for a depiction of the various events involved in association with the Alarm Reset Time. Default value is 1 hour; range is 0.1 to 99.9 hours.

- To program a different number of hours V, press:

  `9 04 V ENTER`

- To turn the Alarm Reset Timer function off, press:

  `9 22 0 ENTER`

Caution:

You should not turn the alarm reset timer function off under normal circumstances because once a given channel's alarm has been acknowledged, it would never again cause an alarm call out.

- To turn the Alarm Reset Timer function on again, press:

  `9 22 1 ENTER`

(905) Clear All Acknowledged Alarms and Alarm Reset Timers

Especially during setup and testing, it is useful to be able to re-trip an alarm after it has previously been tripped and acknowledged, without having to wait for the Alarm Reset Time to expire.

- To perform this clear out, press:

  `9 0 5 ENTER`

At the panel, the same result may be more easily obtained by pressing DISARM/RE-ARM to disarm the unit, then pressing it again to rearm the unit.

(906) Ring Answer Delay

Represents the number of rings required when calling the Verbatim unit, before the unit will answer. A long ring delay might be programmed if you wish personnel to have the opportunity to answer a regular telephone on the same line, before the Verbatim autodialer would answer. Default value is 1 ring; range is 1 to 20 rings.

- To program a different number of rings N, press:

  `9 06 N ENTER`

(907) Number of Alarm Message Repeats

Represents the total number of times each message or set of messages is spoken during each alarm call out. Normally a value of 3 repeats (strictly speaking, the alarm message plus 2 repeats) should be programmed. The reason for this is that there needs to be adequate message recital time to allow adequate time to answer the phone call and hear at least one complete set of messages. Default value is 3 repeats; range is 1 to 20 repeats.

- To program a different number of repeats N, press:

  `9 07 N ENTER`

(908) Autocall Test Function

The Autocall Test Function causes the unit to place test calls at regular intervals for the purpose of ongoing verification of Verbatim autodialer and phone line functioning. Calls are placed only once for each interval, to each regular phone number programmed (7 01 through 7 16). The exception being the acknowledgement of a test call, where additional calls will not be placed for that time interval. Each call gives the station ID message and a statement that this is a test call, plus a report of all inputs.

- To turn this function on, press:

  `9 08 1 ENTER`

- To turn it off, press:

  `9 08 0 ENTER`

The first series of calls begins as soon as the Autocall Test Function is turned on. Therefore, if you want the unit to call at 5 PM each day, you will need to turn this function on at that time. The default interval is 24 hours; range is 0.1 to 99.9 hours.

- To program a different interval V, press:

  `9 09 V ENTER`

Note:

If the Verbatim autodialer is in the disarmed mode, call-outs/autocalls will not be made.

(910) Security Access Code

Once you establish a Security Access Code, unauthorized personnel are prevented from altering your programming or messages over the phone without first entering the Access Code. This does not affect programming access at the panel.

- To establish an Access Code N of up to 8 digits, press:

  `9 10 N ENTER (at the panel)`

Once established, whenever you press a Command Tone 1 at the prompting beep, the unit first prompts you to enter the Access Code before allowing you to perform programming or message recording operations. You may still read existing programming without using the Access Code by pressing a Command Tone 2 at the prompting beep. However, the Access Code itself cannot be read over the phone.

- To delete the Security Access Code so that no code is required in order to perform over the phone programming, press:

  `9 1 0 POINT ENTER (at the panel) ONLY`

(921, 930) Power Failure Alarm Function ON/OFF; DISARM/RE-ARM All Alarms

- To turn off the Power Failure Alarm function, press:

  `9 21 0 ENTER`

- To turn the Power Failure Alarm function on again, press:

  `9 21 1 ENTER`

- To disarm the unit, preventing any alarm call outs, press:

  `9 30 0 ENTER`

- To rearm the unit, press:

  `9 30 1 ENTER`

At the front panel, the same result is more easily obtained by using the DISARM/RE-ARM key.

(700, 924) Callback/Callforward

This feature causes the unit to dial a special "zeroth" phone number on command. This is typically initiated over the phone, causing the unit to call back to the person who invoked the command, in order to verify the ability of the unit to successfully dial out. The unit gives a status report of all channels as part of this call.

- To program this special callback number, press:

  `7 00 (then the complete phone number) ENTER`

- To initiate the actual dialing, press:

  `9 2 4 ENTER`

If you have executed this command over the phone, the unit will advise you that it will be calling the callback number in 15 seconds. Then it will end the current call in preparation for placing the callback call. If you have executed this command at the front panel, the dialing will occur immediately.

Note:

If the Verbatim autodialer is in the disarmed mode, call-outs/autocalls will not be made.

(926) Delay Before Return to Normal (Exit Delay)

Sometimes it is desirable to prepare the unit for the ability to detect violations and dial out, but with an "exit delay" that allows the user time to exit or remove temporarily existing alarm violations before the unit becomes active.

To set delay before Return to Normal:

1. Press:

   `9 26 V ENTER`

   where V is the desired delay in minutes (range 1.0 to 99.9 minutes).

2. Then press DISARM/RE-ARM if necessary to extinguish the flashing DISARMED legend light. However, do not press NORMAL, but instead leave the unit in PROGRAM mode, with the PROGRAM light illuminated. The unit cannot go into alarm while in PROGRAM mode.

When the delay period times out, the unit will automatically return to NORMAL mode and will then be ready to act on any alarm violations that occur after that time. This code must be re-entered each time you wish an exit delay, since the delay value automatically returns to the default value of 2 minutes upon timeout.

The 2 minute default value provides protection against the possibility that someone might walk away leaving the unit in PROGRAM mode, or perhaps hang up the phone after performing over-the-phone programming without properly ending the call.

(932, 933, 934) Microphone and Speaker Operation

If you enable the front panel microphone using program code 933 as described below, the microphone will be automatically activated for a 15 second listening period at the end of each alarm or inquiry call, allowing you to hear the sounds near the unit from a remote telephone.

An additional warble tone is issued at the end of this listening period, allowing you to postpone tone acknowledgment until after the listening period.

- To turn this function on, press:

  `9 33 1 ENTER`

- To turn this function off, press:

  `9 33 0 ENTER`

If you have turned the microphone on, as above, then during any phone call, you may also invoke a one-time listening period by entering Remote Program Mode (press 1 at the warble tone) and then entering 9 3 2 # #.

- To turn off the speaker so that neither alarm call or inquiry call activity is heard at the unit, press:

  `9 34 0 ENTER`

The speaker will still be heard when operating keys at the front panel.

- To turn the speaker on again, press:

  `9 34 1 ENTER`

Note:

The speaker volume may be adjusted via the trimpot marked SPKR VOL shown on the Electrical Connection Diagram. See Section A.1, "Adjusting Internal Speaker Volume.

6.2.20 Program Clear Out Operations

The following list of program codes provides a flexible variety of operations to conveniently clear selected programming items in order to allow for a fresh start.

Code	Function
935 0	Clears out phone numbers; sets all delays to default.
935 1	Clears out phone numbers only.
935 2	Clears out all alarm call grouping linkage.
935 3	Sets the following delays to their factory default values: 902, 903, 904, 920, 921, 926, 928 (921 sets power failure alarm ON)
935 4	Clears all user recorded messages.
935 5	Clears all programming except messages. (Does not clear 913, 930, 941, and 942)
935 6	Clears all Totalizer counts to zero.
935 7	Clears and initializes clock.
935 9	Total clear out (Does not clear 941 and 942).

Caution:

Code 9 35 9 erases all programming and messages.

6.2.21 (940) Diagnostic Readouts

To assist in analyzing the way the unit is operating, the following list of diagnostic count codes is provided.

Code	Function
940	Reads all 4 diagnostic counts (add 0 to clear all 4)
940 1	Reads Call In Count (add 0 to clear)
940 2	Reads Dial Out Count (add 0 to clear)
940 3	Reads Acknowledged Alarm Count (add 0 to clear)
940 4	Reads Power Failure Alarm Count (add 0 to clear)
940 0	To Clear all Counts

7 Using the Alarm Ready Schedule Feature

7.1 Definition

An Alarm Ready Schedule is defined as an interval of time during which the Verbatim autodialer is ARMED and "Ready" to respond to alarm conditions. Alarm Ready Schedules can be automatically started according to times and dates entered by the operator. An Alarm Ready Schedule commences with the Verbatim autodialer becoming REARMED. (If the Verbatim autodialer was previously not DISARMED then the schedule will still be commenced at that time.) Once the Alarm Ready Schedule has commenced the Verbatim autodialer will continue in an ARMED state until the end of the Alarm Ready Schedule, at which time the Verbatim autodialer will be automatically DISARMED. Once an Alarm Ready Schedule has commenced it is said to be "active."

There are three steps to programming for Alarm Ready Scheduling:

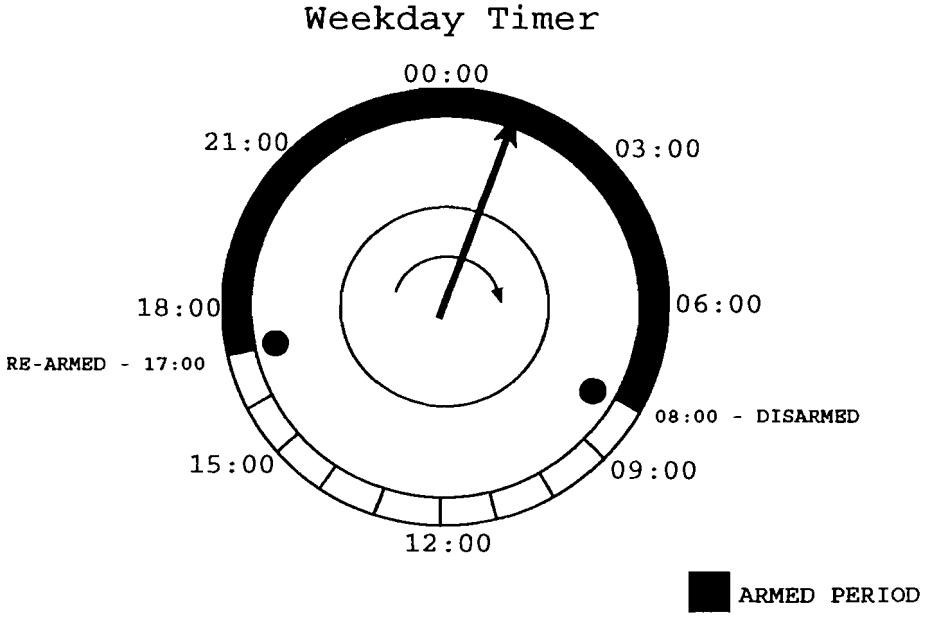
- Date and time setting
- Enter alarm start and stop times
- Enable the Alarm Ready Scheduling feature using code `966 N`.

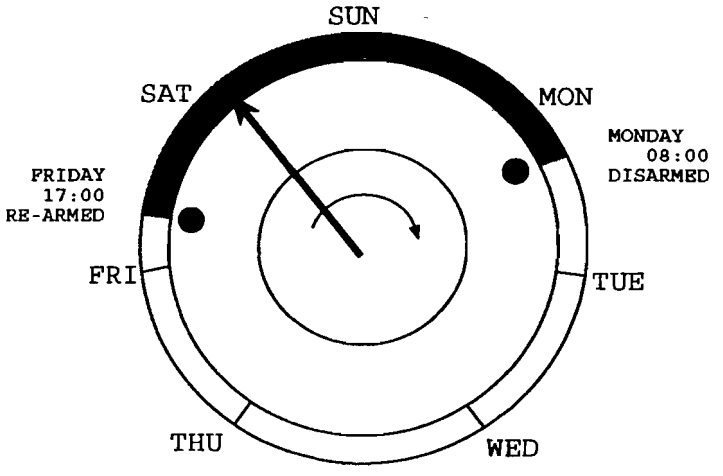
7.2 General Descriptions

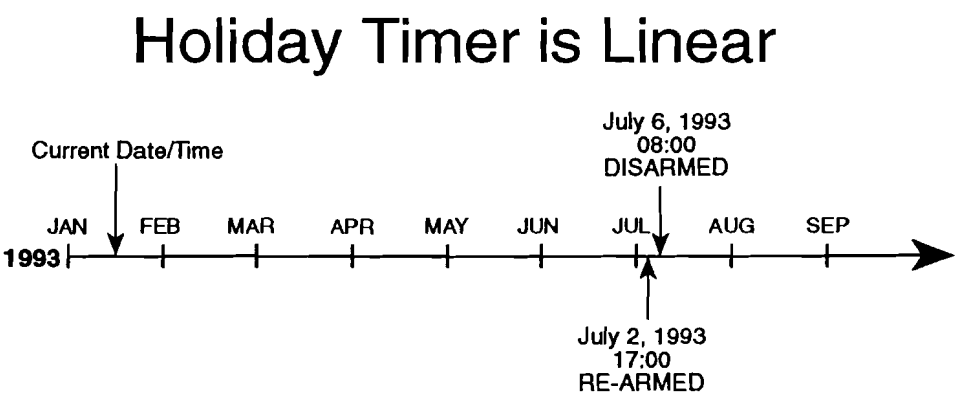
Alarm Ready Schedules can be viewed as really nothing more than an automated way of pressing the REARM/DISARM button. Therefore, if an alarm occurs while the Verbatim autodialer is DISARMED, no dial-outs will be made and the alarm will be automatically acknowledged. Correspondingly, if there is an acknowledged alarm when the Verbatim autodialer becomes REARMED and the input violation is still present then the Verbatim autodialer will begin calling after the trip delay has elapsed.

If the Verbatim autodialer is doing a sequence of alarm calls or Autocall calls at the time when an Alarm Ready Schedule should change the Verbatim autodialer's REARM/DISARM state the change will be delayed until after the end of the calling sequence.

Alarm Ready Schedules can be temporarily overridden by the operator pressing the REARM/DISARM button. However, if the REARM/DISARM button is pressed during an active Alarm Ready Schedule the schedule still remains active. If the operator DISARMs the Verbatim autodialer in the middle of an Alarm Ready Schedule the schedule will actually continue to it's ending time. It will then deactivate itself and attempt to DISARM the Verbatim autodialer just as if the Verbatim autodialer was still ARMED. If the operator DISARMs the Verbatim autodialer in the middle of an active Alarm Ready Schedule, then REARMs the Verbatim autodialer once again before the end of the Alarm Ready Schedule the schedule will remain active until its ending time. The schedule will then be deactivated and the Verbatim autodialer will be DISARMED.







7.3 Alarm Ready Schedule Modes

There are three possible Alarm Ready Schedules modes: Weekday, Weekend & Holiday. Any combination of these three possible schedules may be enabled at one time, however, the Verbatim may only become REARMED or DISARMED by one mode at a time. See Section 7.7, "Alarm Ready Schedule Priorities." For example, you may have both weekday & weekend schedules enabled at the same time or you may have all three enabled at the same time. When the Verbatim becomes DISARMED or REARMED by an Alarm Ready Schedule it will verbally announce which mode caused the REARM/DISARM action. The Alarm Ready Schedule modes are as follows:

Mode	Schedule
Mode 1	Weekday Schedule
Mode 2	Weekend Schedule
Mode 3	Holiday Schedule

For example, if there was a weekday schedule enabled to REARM the Verbatim at 1700 daily, when the weekday schedule became active the Verbatim would say, "REARMED for mode 1". Also, when there is a local printer connected to the Verbatim , the mode of the Alarm Ready Schedule causing the REARM/DISARM (WEEKDAY, WEEKEND, or HOLIDAY) will be printed along with the current time.

7.4 Weekday Schedule Mode 1

The weekday schedule will REARM the Verbatim autodialer daily at the programmed weekday REARM time and DISARM the Verbatim autodialer daily at the programmed DISARM time. If no weekend schedule is enabled (via the Alarm Ready Control Number settings) then the weekday schedule applies everyday, Monday through Sunday. As noted below, the weekend schedule is overridden by the weekend and holiday schedules.

7.5 Weekend Schedule Mode 2

If programmed, the weekend schedule operates once a week. The weekend schedule is set by factory default to be Friday through Monday. If the defaults are used the Verbatim autodialer could be REARMED every Friday afternoon at 1700 and DISARMED again every Monday morning at 0800. The weekend schedule could be changed from the defaults, for example, so that the Verbatim autodialer would be REARMED on Saturday and DISARMED on Monday (for organizations with 6 day work-weeks).

When the weekend schedule is enabled the weekday schedule will be overridden. In other words, there would be no DISARMING of the unit at 0800 Saturday morning.

By default, the weekend REARM/DISARM times are set to be the same as the weekday REARM/DISARM times. However, non-default weekend REARM/DISARM times may be entered if the operator so chooses.

Therefore, if personnel regularly leave early on Fridays then the REARM time could be set to 1500 instead of the usual 1700.

7.6 Holiday Schedule Mode 3

The Holiday schedule is a one-shot, non-recurring schedule which overrides all of the other schedules.

The Holiday schedule will be set by factory default to some Holiday period in the past (such as last Christmas).

Note:

For the Holiday schedule only, the exact date is entered including the year. Once, the Holiday schedule has been run it is complete and finished until a new schedule, for some date in the future, is entered.

To use the Holiday Alarm Ready Schedule, the operator must enter the REARM date (month/date/year) and DISARM date (month/date/year).

For the time-of-day, the Holiday Alarm Ready Schedule always uses the Weekend REARM/DISARM times.

7.7 Alarm Ready Schedule Priorities

There is a priority among the Alarm Ready Schedules. The Holiday Alarm Ready Schedule has the highest priority, then comes the weekend schedule and finally the weekday schedule.

If all three Alarm Ready Schedules are to be active, a Holiday schedule will always start at it's scheduled time & date regardless of the state of the other schedules. When the Holiday schedule is over then the other schedules will resume.

Likewise, the Weekend Alarm Ready Schedule has priority over the Weekday Alarm Ready Schedule. The weekend schedule will always start at its programmed day-of-week and time regardless of the state of the weekday schedule. When the weekend schedule is over then the weekday schedule will resume.

7.8 Programming Alarm Ready Schedule Parameters

The following section explains the Verbatim autodialer codes to be used for programming Alarm Ready Schedules and the Alarm Ready Schedule Control Numbers. Alarm Ready Schedule parameters may be entered either at the front panel or over the phone.

There are some restrictions which must be remembered when entering DISARM/REARM times and ALARM READY SCHEDULE CONTROL NUMBERS.

1. When entering new schedule times, the REARM time must be later than the time the operator is programming the schedule. However, it may not be possible to "jump" into a schedule when exiting the programming mode. For example, if the current time is 1700 hours and the operator enters a weekday schedule to REARM daily at 1630 and DISARM daily at 0730, this new schedule would not start until the following day at 1630 hours.

   Conversely, assume that the current time is 1700 hours and that the operator goes into PROGRAM mode and enters a new weekday schedule to REARM at 1705 and DISARM at 0800. At this time, the operator can either return to NORMAL mode or continue in PROGRAM mode and do other programming. Even though it may be after 1705 when finally returning to the NORMAL mode, the weekday schedule will still begin (or have begun) at 1705 hours.

2. You cannot enter any holiday date values which will cause the holiday REARM or DISARM date and time to be earlier than the current date and time. As explained below, the holiday schedule uses the weekend times for the time-of-day of the holiday REARM and DISARM.
3. It's useful to understand that the Verbatim autodialer's internal count-down timers used for REARM/DISARM times are re-calculated as a result of the operator making certain Alarm Ready Schedule programming changes. Anytime a new REARM or DISARM date/time is entered, a calculation is made to determine the next REARM and DISARM for that particular schedule.

   Also, when the ALARM READY SCHEDULE CONTROL NUMBER is changed all REARM and DISARM date/times are re-calculated. Further, whenever the current date or time is set or changed by the operator, all REARM and DISARM date/times will be re-calculated.

7.9 Starting the Real-Time Clock Chip, Time and Date Setting

Use Program Code 935 7 ENTER to start the real time clock chip. This needs to be done only once at the time of the installation of the chip.

Time and date may be set or corrected with the following programming code entries:

- To check the date:

  `941 ENTER`

- To set the date:

  `941 MM DD YY D ENTER`

MM is the month (03 for March); DD is the date (07 for the 7th day of the month); YY is the year (89 for 1989); and D is the day of the week (1 for Sunday; 2 for Monday, etc.). Entry of D is optional.

- To check the time:

  `942 ENTER`

- To set the time:

  `942 HH MM SS ENTER`

HH are the hours in military time (13 for 1 PM); MM are the MM (09 for 9 minutes); and SS are the seconds. Entry of SS is optional.

- To clear the time and date back to 00:00:00 on 01/01/89:

  `935 7 ENTER`

7.10 Setting Alarm Start & Stop Times

CODE 961

READ WEEKDAY REARM & DISARM TIME (defaults: 1700 & 0800) Press 9 6 1 then ENTER to hear the Weekday REARM & DISARM times recited. Times will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKDAY REARM & DISARM TIME Press 9 6 1 plus REARM & DISARM time. For example, 961 1600 0700 then ENTER to set REARM time to 1600 (4:00 P.M.) & DISARM time to 0700 (7:00 A.M.) The user is allowed to enter just the REARM time, i.e.; 961 1600 (enter). But, if the user wants to change the DISARM time then both the REARM & DISARM times must be entered.

CODE 962

READ WEEKEND REARM & DISARM TIME (defaults: 1700 & 0800) Press 9 6 2 then (enter) to hear the Weekend REARM & DISARM times recited. Times will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKEND REARM & DISARM TIME Press 9 6 2 plus REARM & DISARM time then ENTER, for example, 962 1500 0700 then ENTER to set REARM time to 3:00 P.M. & DISARM time to 7:00 A.M. The user is allowed to enter just the REARM time, i.e.; 962 1500 ENTER. But, if the user wants to change the DISARM time, then both the REARM & DISARM times must be entered.

CODE 963:

READ WEEKEND REARM & DISARM DAY-OF-WEEK (defaults: Fri. & Mon.) - Press 9 6 3 then ENTER to hear the Weekend REARM & DISARM day-of-week (d-o-w) recited as a number from 1 to 7. Note: Sunday = 1, Monday = 2, etc. Day-of-week will not be altered and new REARM & DISARM values will not be calculated.

SET WEEKEND REARM & DISARM DAY-OF-WEEK Press 9 6 3 plus REARM & DISARM d-o-w then ENTER. For example, 963 6 1 then ENTER to set the weekend REARM day-of-week to Friday & REARM day-of-week to Sunday. The user is allowed to change only the REARM d-o-w if so desired, e.g.; 963 7 ENTER to set the REARM d-o-w to Saturday. But, if the user wants to change the DISARM d-o-w then both the REARM d-o-w & DISARM d-o-w must be entered.

CODE 964:

READ HOLIDAY REARM DATE (default: 12/24/95) Press 9 6 4 then ENTER to hear the Holiday REARM date recited. The Holiday REARM will not be altered.

SET HOLIDAY REARM DATE Press 9 6 4 plus REARM date. For example, enter 964 12 24 95 ENTER to set holiday REARM date to December 24, 1995. The new REARM date can not be before today's date.

Note:

The day-of-week date cannot be entered for a Holiday schedule.

CODE 965:

READ HOLIDAY DISARM DATE (default: 12/26/95) Press 9 6 5 then ENTER to hear the Holiday DISARM date recited. The Holiday DISARM will not be altered.

SET HOLIDAY DISARM DATE Press 9 6 5 plus REARM date. For Example, enter 965 12 26 95 ENTER to set holiday DISARM date to December 26, 1995. The new DISARM date can not be before today's date.

Note:

The day-of-week date cannot be entered for a Holiday schedule.

7.11 Enabling the Alarm Ready Schedule Feature

CODE 966

READ ALARM READY SCHEDULE CONTROL NUMBER (default: 0) Press 9 6 6 then (enter) to hear the Alarm Ready Schedule Control Number recited. The Control number will not be altered and new REARM & DISARM values will not be calculated.

ALARM READY SCHEDULE CONTROL NUMBER HAS THE FOLLOWING MEANING:

0 OFF No Alarm Ready Schedules executed. Also used to reset all active Alarm Ready Schedules.

1 Only the Weekday Alarm Ready Schedule will be active. (Daily: Monday-Sunday) Default: REARMED everyday 1700 & DISARMED everyday 0800.

2 Only Weekend Alarm Ready Schedule will be active. Default: REARM every Friday 1700 & DISARM every Monday 0800.

3 Both Weekday & Weekend Alarm Ready Schedules will be active. Default: REARM daily at 1700 Monday-Thursday & DISARM daily at 0800 Tuesday-Friday. REARM Friday at 1700 & DISARM Monday at 0800.

4 Only Holiday Alarm Ready Schedule will be activated. Default: REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990

5 Both Holiday & Weekday Alarm Ready Schedules will be activated. Default: REARM daily at 1700 & DISARM daily at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.

6 Both Holiday & Weekend Alarm Ready Schedules will be activated. Default: REARM every Friday at 1700 then DISARM every Monday at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.

7 Holiday, Weekend & Weekday Alarm Ready Schedules will be activated. Default: REARM daily at 1700 Monday-Thursday then DISARM daily at 0800 Tuesday-Fri. REARM every Friday at 1700 then DISARM every Monday at 0800. REARM at 1700 December 24, 1990 then DISARM at 0800 December 26, 1990.

Note:

Whenever a new Alarm Ready Schedule Control Number is entered all REARM & DISARM values will be recalculated. Any active Alarm Ready Schedules will be halted and the Verbatim autodialer will be left in which ever REARM/DISARM state it was last in.

7.12 Factory Defaults

Activity	Schedule
Weekday REARM time	1700
Weekday DISARM time	0800
Weekend REARM day-of-week	Friday
Weekend DISARM day-of-week	Monday
Weekend REARM time	1700
Weekend DISARM time	0800
Holiday REARM date	12/24/90
Holiday DISARM date	12/26/90
Holiday REARM time	always same as Weekend REARM time
Holiday DISARM time	always same as Weekend DISARMtime
Alarm Ready Control Number	0 (all schedules disabled)

Note:

Both Weekend times are initially the same as their respective Weekday times, but can be reprogrammed.

7.13 Weekday and Weekend Alarm Ready Schedule Programming Example

For the following example assume that personnel are present at a plant being monitored by the Verbatim autodialer during normal business hours, Monday through Friday, 7 A.M. to 4 P.M. Assume further that there is someone at the plant every Saturday from 7 A.M. until 12 Noon and that the personnel would be aware of any alarm conditions at the plant and would not want the Verbatim autodialer to be making calls to phone numbers in its phone number list.

In this example, the Verbatim autodialer should be:

- REARMED every weekday evening at 1600
- DISARMED every weekday morning at 0700
- REARMED every Saturday at 1200 noon
- Stay in the ARMED state until it is DISARMED every Monday at 0700

For the example, use the following steps:

1. Verify that the current time is one of the times when the Verbatim autodialer is DISARMED, i.e.; during normal workday hours. It is important that the time be the current time, since any Alarm Ready Schedule begins with the Verbatim autodialer becoming REARMED and ends with the Verbatim autodialer becoming DISARMED.

   If a user were to set up a repeating Alarm Ready Schedule (weekday or weekend) during the time the Verbatim autodialer was to be ARMED, the programmed schedule would not actually begin until the next time that schedule was to take effect. For example, if the current time was 1630 and a weekday schedule was being programmed, that weekday schedule would not actually start until the next day at 1600.
2. Press the PROGRAM key to put the Verbatim autodialer into the program mode.
3. Set the current date and time: (if not already set)
   a. Enter CODE "941 MM DD YY d" followed by ENTER

      Where:

      MM = 2 digits for month, DD = 2 digits for date,

      YY = 2 digits for year, and d = 1 digit for day-of-week.

b. Enter CODE "942 HH MM SS" followed by ENTER

Where:

HH = 2 digits for hours, MM = 2 digits for minutes,

SS = 2 digits for seconds.

4. Set the Weekday REARM/DISARM times:

   Enter CODE "961 1600 0700" followed by ENTER to set the REARM time to 1600 and the DISARM time to 0700.

5. Set the Weekend REARM/DISARM times:

   Enter CODE "962 1200 0700" followed by ENTER to set the weekend REARM time to 1200 and the weekend DISARM time to 0700.

6. Set the Weekend REARM/DISARM day-of-week:

   Enter CODE "963 7 2" followed by ENTER to set the weekend REARM day-of-week to Saturday and the Weekend DISARM day-of-week to Monday.

7. Enable both the Weekday and Weekend Alarm Ready Schedules:

   Enter CODE "966 3" followed by ENTER to set the Alarm Ready Schedule Control Number to 3 to enable both the Weekday and the Weekend Alarm Ready Schedules.

Note:

If the Verbatim autodialer is configured with a local printer, a summary of all of the REARM and DISARM times will be printed.

8. Return to the Normal mode and make sure the Verbatim autodialer is DISARMED.

8 Maintenance, Testing, and Battery Replacement

Regular testing is the main element of a maintenance program for ongoing Verbatim autodialer reliability. The test should include interrupting AC power to the Verbatim autodialer for at least 4 hours to verify the gel cell battery maintains Verbatim autodialer operation for that time. You may wish to disconnect the phone cord to avoid nuisance calls during the test period.

Note:

The LOBAT light on the Verbatim activates whenever the charge or discharge current for the rechargeable battery exceeds a certain level. If the battery is not fully charged (as following installation or following a power failure) then the charging current will activate the light. If the battery is currently being discharged (as during a power failure) the light will be activated. The LOBAT light does not necessarily warn of a battery wearing out. It should be considered a secondary indication of battery and charger activity.

The gel cell battery is much like a car battery. That is, at the end of its life when called on to deliver power, it discharges very quickly without prior warning. The best protection is to replace the battery every 3 years regardless of any test results.

The battery is a *Power Sonic PS 640, 4 AH 6 volts*

You may order a replacement battery from RACO at the address below:

RACO Manufacturing and Engineering Co.
1400 62nd Street
Emeryville, CA 94608

Or from:

Power Sonic, Redwood City, CA; (415) 364-5001

See Section 9.2, "Phone Support Procedures," and Section 9.3, "Returning Parts to the Factory," for more information.

9 Troubleshooting Tips

9.1 What's The Problem?

Unit is dead: no lights or voice.

If the unit will not respond to the ON/OFF key, verify that the battery is connected. Verify that there is 120 volts AC between the WHITE and BLACK wire terminals on TS3. Verify that the fuse (1/4 amp slow blow) is not blown.

Unit seems OK but will neither answer nor dial out on phone line.

This assumes that you hear a voice report at the panel when you press CHECK STATUS. With the NORMAL light lit, test the phone line by pressing DIALOUT. The PHONING light should light and you should hear a dial tone.

If you do not hear a dial tone, open the door of the unit and verify that relay K1 is correctly seated in its socket, with its indentation mark facing downward. Check the phone line and its connection with a DC voltmeter and/or a separate telephone handset. Verify the presence of about 50 volts DC between the RED and GREEN conductors on phone line terminal strip TS2. This voltage will drop to just a few volts when the Verbatim autodialer or other connected phone device goes off hook (PHONING light lit).

If you do hear the dial tone after pressing DIALOUT, press the digits of a valid phone number. You should hear the loud clicks of relay K1 (for pulse dialing) or else the tones of tone dialing, as you press each digit. The dial tone should cease after you have entered the first digit. Continue until you have dialed the complete phone number. You should now hear the sound of ringing and someone answering at the other end. End the call by pressing NORMAL.

Unit answers incoming calls, and also goes into alarm when it should and attempts to dial out, but does not reach dialed number.

First, verify whether the unit is actually attempting to dial out, as evidenced by pulse dialing clicks or tone dialing sounds followed by message recital. If not, then see the separate problem below, "Unit does not go into alarm when it should".

If your unit has previously been programmed for Automatic Tone/Pulse select (via code 917 2 or 917 3) and has been left connected to a phone line for several minutes, then you can assume that the correct dialing mode for your phone line has already been selected. Again, refer below to "Unit does not go into alarm when it should."

If Automatic Tone/Pulse select is programmed OFF (via code 917 0 or 917 1) and you hear the clicks or tone dialing sounds, but the dial tone does not cease, perhaps your phone system requires the opposite mode of dialing (pulse vs tone) from its presently set mode. Read the present mode by pressing PROGRAM 9 0 1 ENTER. Then set the opposite by entering 9 0 1 1 (to change to tone dialing), or 9 0 1 0 (to change to pulse dialing). Then press NORMAL and repeat the manual DIALOUT procedure as described above.

Verify that you have programmed complete phone numbers including any area codes or "1" prefixes that might be required to complete the call.

Consider whether your phone system requires a prefix such as 9 to be dialed, followed by a delay period (to access an outside phone line) before dialing out. If so, see Section 3.2, "Programming Phone Numbers."

Unit dials out, but will not answer incoming calls.

Check programmed ring delay by pressing PROGRAM 9 0 6 ENTER. If it is set for a number larger than one, the Verbatim autodialer is not supposed to answer until the corresponding number of rings has been received. Try setting it back to 1 using code 9 0 6 1 ENTER. If the unit still will not answer incoming calls but is able to dial out, try plugging a regular telephone into the same phone jack in place of the Verbatim autodialer and see if it rings. If the problem is not the phone line, try temporarily connecting test point C to test point D on the main circuit board, for a period of about 5 seconds and see if it "answers" with the PHONING light and a voice report, then call the factory for advice.

Unit will not go into alarm when it should.

This is usually the result of incomplete understanding of how the Verbatim autodialer manages alarms.

For the Verbatim autodialer to go into Unacknowledged Alarm and Dial Out, a violation must be continuously present for the Alarm Trip Delay time. At least one phone number must be programmed. The unit must not be in the DISARMED state. And, the channel that has the violation must not already be in an acknowledged alarm state, since acknowledged alarm status for a given channel (including power failure) precludes further activity on that channel until that status is cleared. Refer to Section 5, "Using Your Verbatim autodialer," for a discussion of how the unit manages alarms.

To clear the acknowledged alarm status of all channels including power failure, starting with the NORMAL light lit, press DISARM/RE-ARM to get the flashing DISARMED indication, then press it again to re-arm the unit with all acknowledged alarm statuses cleared. Now any violations lasting longer than the Alarm Trip Delay will cause unacknowledged alarms and dialing.

Unacknowledged alarm status is indicated by the corresponding channel number flashing. Acknowledged alarm status is indicated by the same light remaining on continuously without flashing.

If you don't observe this, press PROGRAM and then press 7 0 1 ENTER to check your first phone number. Press 9 0 2 to check the Global (overall) Alarm Trip Delay. For the specific channel ZZ (2 digits) that you are attempting to create an alarm on, also press 6 ZZ to check for any longer Individual Alarm Trip Delay setting.

Check the Normally Open/Normally Closed alarm criteria programming for this channel by pressing 5 ZZ. Make sure it is not set for No Alarm or for Run Time Meter, since these settings would not allow an alarm. Now, for example, if the channel is configured Normally Open, you will want to temporarily provide a Closed Circuit at its input to trip the alarm. You can directly read and verify the Open/Closed status you are applying by pressing 0 ZZ 0. You may also use a DC voltmeter to trace your circuit connections. With the Verbatim autodialer turned on, an Open Circuit to a channel contact input reads 5 volts DC with respect to the "C" terminals or electrical ground. A Closed Circuit reads zero volts.

Unit keeps calling when it should not.

Be sure that the initial alarm call is in fact being acknowledged. The unit will specifically state "alarm is acknowledged" at the moment you successfully acknowledge the call. The unit will accept a tone acknowledge only following the prompting warble beep.

Also, be sure that the alarm violation has been corrected. Otherwise, even if the alarm is acknowledged, when the Alarm Reset period times out, dialing will begin again.

Write down exactly what the unit recites when it gives the unwanted call. This provides valuable guidance as to the cause and correction of the problem. You may need to lengthen the Alarm Trip Delay in order to minimize nuisance alarms, particularly the power failure Alarm Trip Delay (code 920). If you hear an alarm message with the phrase "now normal" added at the end, it means that the violation occurred long enough to trip the alarm but has returned to normal by the time you are hearing the report. In the case of power failure, if the power has been restored by the time the message is being heard, the message will be "Power is on". The fact that power is mentioned at all lets you know that there has been a power failure lasting longer than the power failure Alarm Trip Delay. Power will continue to be mentioned in any phone call or front panel status check, until the Alarm Reset time expires.

Unit is continuously "locked" in on state, or is behaving erratically.

Environmental factors such as lightning or power surges may have caused program lockup. With the unit turned on, use a screwdriver blade to momentarily connect the two pins on Jumper Block JB5 (see diagram Appendix H, p. H-26).

If this does not return the unit to normal operation, next try jumping the 2 pins on JB3. This latter step will erase all user programming and recorded messages, so all user programming and messages will need to be re-entered.

9.2 Phone Support Procedures

Make sure you have the following before you call:

- Serial #: Found inside front panel. If you are not at the unit, call the unit up and enter program code 968. This will give you a number that our Customer Support Department can reference.
- Note the unit's symptoms: Exact speech pattern, what it is saying, if it is calling or not. The more specific and accurate you are in describing the symptoms, the quicker the Customer Support Department will be able to diagnose and troubleshoot the problem. In many cases, it may save a return to the factory.

THEN call 1-800-449-4539 for Customer Support.

If the Customer Support determines that the unit needs to be sent to the factory for repair, you will be given a Return Materials Authorization (RMA) number.

9.3 Returning Parts to Factory

Pack all parts well! To avoid extra charges, return any removed chips card guides or daughter boards to the factory at the address below:

RACO Manufacturing and Engineering Co.
1400 62nd Street
Emeryville, CA 94608

Remember to:

- Put return address on package.
- Include a packing slip.
- Have serial # and RMA # handy when you call in for tracking.

A Verbatim Series SFP Autodialer

The following is an instruction supplement for the Verbatim Series SFP autodialer. This supplement describes differences between the Verbatim Series SFP, and the Series VSS.

The Series SFP is a modified Verbatim autodialer which omits the front panel keypad and some of the front panel LED indicators. The primary practical difference between the two models is that the programming for the Series SFP must be done over the phone, whereas programming for the Series VSS may be done over the phone or at the front panel.

The enclosed diagram of the front panel of the Series SFP (p. A-2) replaces the Series VSS diagram on page 2-5 of this manual. A supplemental diagram of the inside view of the front door panel (p. A-3) is also enclosed, showing the location of the ON/OFF switch.

The practical differences to consider in programming and using the Series SFP are explained below.

A.1 Programming the Series SFP from a Remote Telephone

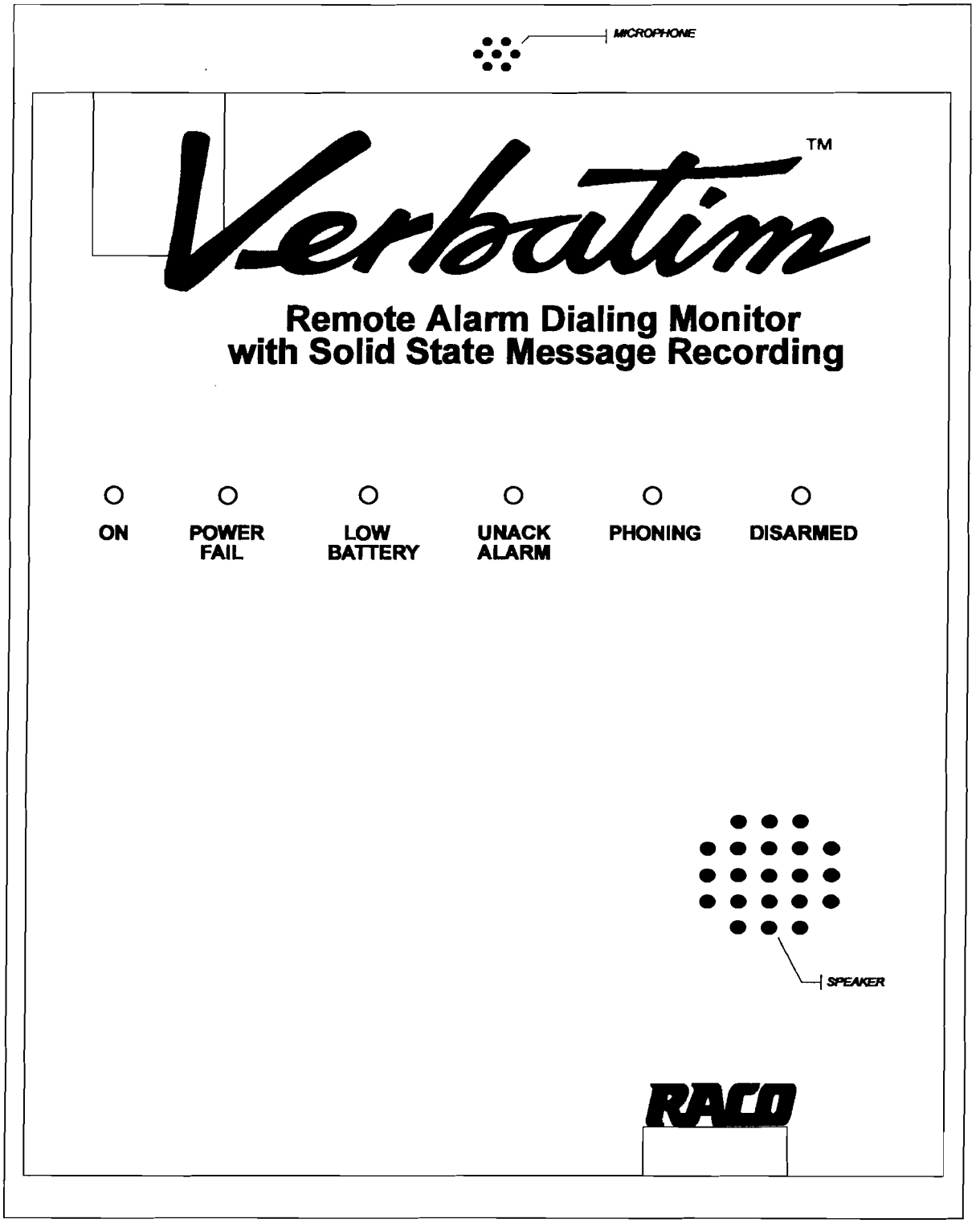
All programming of the Series SFP Verbatim autodialer is done from a remote Touch Tone telephone. This method of programming the product is described in Section 5.7 of this manual, and it is also more briefly referred to at other places in the manual such as Sections 4.2 and 4.3. With the Series SFP, this is the sole applicable means of programming. Therefore an "advance" description of over-the-phone programming follows.

When you call the Verbatim from any Touch Tone telephone, it will answer and begin reciting its message. At the end of each round of messages, you will hear a warble tone. If you press a command tone "1" immediately following this tone, you will the Verbatim autodialer will then be in Program Mode, and you will be prompted to enter a program code.

A chart listing the program codes is located in Section 6.1 of this manual. This section also includes some guidelines for using the program codes, and a more complete description of the programmable items is located in Section 6.2.

Program code entries generally consist of three digits, which may or may not be followed by additional followup values, before you complete the entry by pressing the # key twice. You will hear a spoken confirmation of each numerical tone digit as you issue it. There is no spoken response to the # or * key.

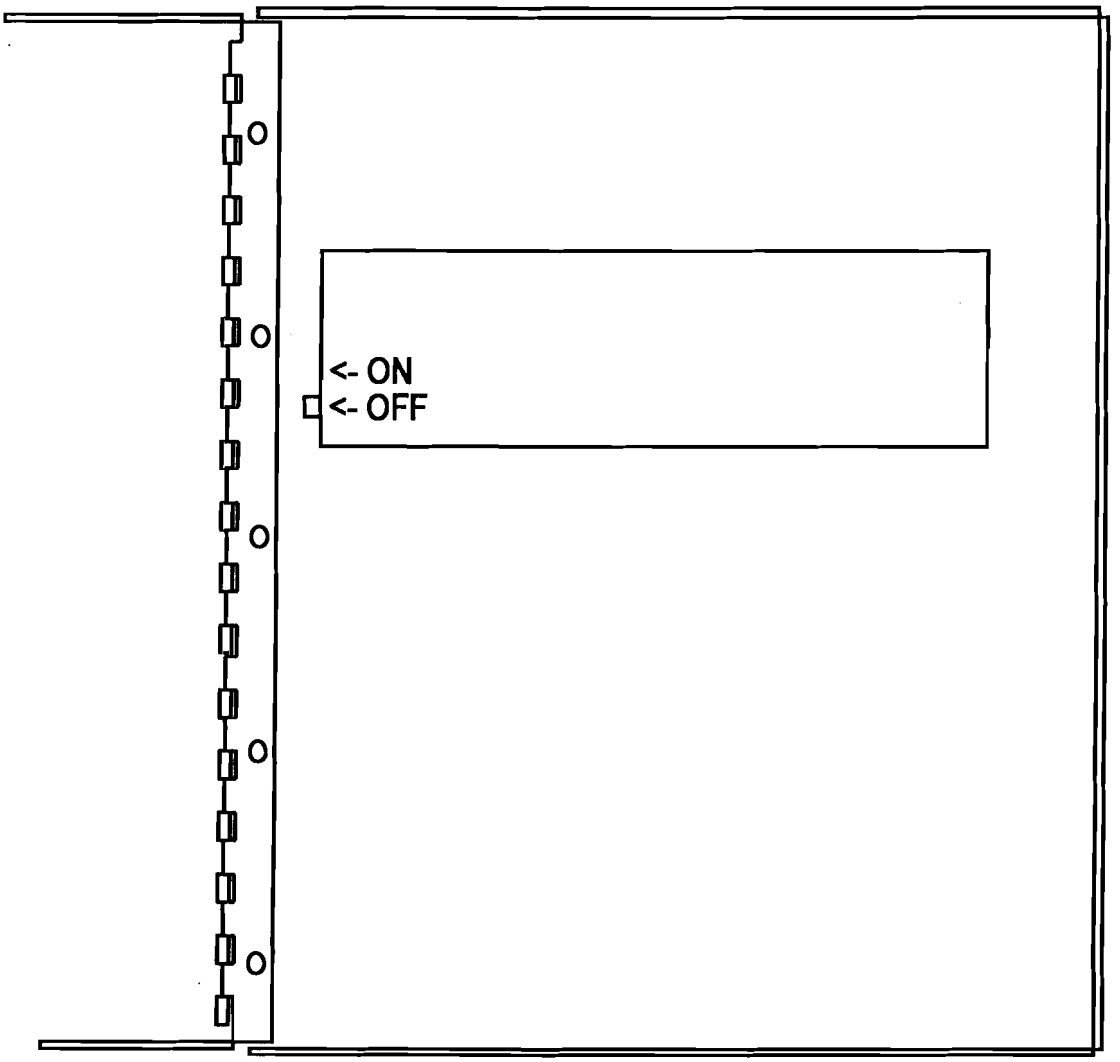
Verbatim Series SFP Front Panel Diagram



*** A discharged battery may take up to a day to fully charge. Meanwhile, light may remain on.**

**** During AC power failure, all illuminated LED's will flash to conserve battery power.**

Verbatim Series SFP Inside Front Panel ON/OFF Switch



Inside view of front panel, showing ON/OFF switch

Note:

The procedure of pressing the # key twice, is to be used in relation to all references throughout this manual to the term, "ENTER."

In general, if you enter just the three tone digits followed by # #, you will hear the present setting or value for that program item. If you include additional values before the # #, the new value will replace the existing setting or value. In either case, the voice report will provide confirmation of the updated program setting or value.

Sometimes there is need to include a decimal point or a minus as part of a value entry. Also, if you make a mistake as you are issuing tone digits, you will want to cancel the entry. The conventions for these functions are as follows:

CANCEL	* *
ENTER	# #
POINT	*
MINUS	#

To end a phone call after programming, press # # without any prior tone digit. The Verbatim autodialer will then issue a prompting warble tone which is an opportunity to re-enter a "1" if you did not really want to end the call. It will then say, "Goodbye," and end the call.

Refer to Section 5.7 for a description of the other command tones that may be used in place of the "1" for special purposes.

A.2 Programming and Testing

The following sections provide a sequential reference to this manual regarding the relevant differences and similarities in instructions for the Verbatim Series SFP.

A.2.1 Resetting (Clearing) the Unit

Caution:

The following step erases all user programming including recorded messages so normally it is done only at initial setup.

Turn the unit on if it is not already on, via the switch at the rear of the front panel door. From a touch tone telephone, place a call to the phone number of the unit, and at the sound of the warble tone, issue a command tone "1" as described above.

To clear the system of all programming, in program mode as described above, issue:

9 3 5 9 # #

As always, if you make an error in issuing tone digits, press * CANCEL and start again.

A.2.2 Programming Phone Numbers

Essentially the same as Section 3.2 in this manual.

A.2.3 Programming Input Channels

Essentially the same as Section 3.3 in this manual.

A.2.4 Initial Testing

Temporarily place all input signal sources into their alarm state, long enough to satisfy the alarm trip delay. The unit will begin dialing the first phone number, perhaps before you have managed to get all the inputs into an alarm indication state. You should hear the a dial tone and then the sound of ringing, and then the sound of someone answering the call. Testing consists in verifying that the call is actually received at the first phone number, and that all the alarm messages are recited.

Your Verbatim Series SFP autodialer is now able to operate, having at least one dialout phone number programmed, and having its input channels configured. However, you may wish to record your own voice messages (Section 4) or perform special advanced programming items (Section 6) before referring to Section 5 on using your programmed Verbatim Autodialer.

A.3 Recording Messages In Your Own Voice

Essentially the same as Section 4 in the Owner's Manual, but following the guidelines for over-the-phone programming and recording.

A.4 Using Your Programmed Verbatim Autodialer

Section 5.7 is largely replaced by the discussion in Section 4 regarding over-the-phone programming, except for discussion of the alternative command codes "2," "3," "4," and "0."

Disregard Section 5.8.

A.5 Remainder of the Manual

All other descriptions in this manual may be followed and applied to the SFP with no practical limitiations.

Note:

The lack of front panel programming has specific impact on some minor aspects of specific programming items, as follows:

- **CODE 910:**

  SECURITY ACCESS CODE No Security Access Code may be programmed since this could only be programmed from the front panel keyboard.

- When a delay between dialing digits is needed (as for pager applications), it will only be possible to insert one delay period, since this is done over the phone by pressing the # key, and if this were pressed more than once in succession it would be interpreted as a Cancel Entry command. Therefore to get the length of delay desired, use 928 to extend the duration of the single delay from its default value of one second, to whatever value is needed.

- **CODE 926:**

  EXIT DELAY FUNCTION The Exit Delay function is not applicable in the absence of the front panel keyboard.

- The Speakerphone/Dialout function is not applicable in the absence of the front panel keyboard.

- There is no Parallel Printer Output.

- The speaker and microphone are present. However the microphone is limited to the function of optionally "listening in" since voice recording must be done via remote telephone.
- The On/Off function is controlled via the slide switch inside the front panel door. See diagram on page A-3 .

A.6 Enhanced Telephone Interface Features

The manual Section entitled, "Enhanced Telephone Interface Features," is generally applicable except that there is no front panel indication for telephone line failure.

B Analog Signal Input

B.1 Analog Connections

Refer to the diagram (page B-10) showing the VAN analog boards for connection of analog inputs. Be sure you follow the indicated positive and negative polarity indications, except in the case of TS705 temperature sensor inputs, for which positive and negative polarity does not matter. Two signal wires are required for each input. The terminal blocks can be unplugged for convenience. Because of the space constraints, it is best to use small gauge wire like telephone wire. If bulkier wire is needed outside the dialer, it is best to install a terminal strip outside the dialer to make the transition from the bulkier wire to the more compact wiring going into the analog input connection points.

Note:

Take care to route the incoming signal wires to one side of the enclosure or the other so that they do not interfere with the front panel circuit board when the unit's door is closed. Also, try to route the analog signal wires away from power wiring to minimize noise pickup.

B.1.1 Programming for Analog Channels

Each analog input will need to be programmed to specify:

1. The analog Input Signal Type (if other than standard 4-20 ma input).
2. The numerical value to be spoken at a corresponding minimum signal level.
3. The numerical value to be spoken at a corresponding maximum signal level. Items 2 and 3 amount to programming the translating scaling factors for each analog input.
4. In many cases you will also want to program high and low setpoint limits for each analog input.
5. You may also elect to replace the generic default voice message with your own recorded messages for any analog channel, as described in section 4.

B.1.2 Assignment of Input Channel Numbers

The unit automatically assigns the lowest channel numbers to whatever number of contact input channels exist on the unit (whether or not you are using them) and the analog channels are assigned channel numbers beginning with the next available number.

For example, the first analog input on a unit with 24 contact inputs and 16 analog inputs would be "channel 25" and the last analog input would be "channel 40". Note that since the unit's maximum LED display capacity is a total of 32 channels, on such a unit the final 8 analog channels would not have corresponding LED status indicators on the front panel. Further, note that on units with remote channels, the LED display may group inputs into a single indicator.

It is important that you have correctly determined the channel number assigned for each analog input channel before performing the following programming steps.

B.1.3 Programming the Input Signal Type

(You may skip this step if you are using 4-20 ma inputs).

The analog inputs are very flexible and can accommodate a variety of Input Signal Types, but the unit needs to know which type each input is being used for a given analog input. Note that in addition to programming the Input Signal Type, the physical component configurations on the VAN plug-in circuit card must match the Signal Type used. Normally this will have been handled in the process of ordering the unit and will not require additional user attention. If there is any doubt about this, refer to the markings on the rear of the VAN circuit board. If there is still any question, refer to the markings you find and also your unit's serial number, when contacting the factory.

- To program the Input Signal Type for input channel ZZ:

  `5 ZZ 7 N ENTER`

  where ZZ is the two-digit channel number, and N is a single digit as follows:

  0 for a 4-to-20 milliamp current loop input. This is the default setting, so if your inputs are 4-20 milliamp current loops, you may skip this step.

  1 for 0 to 1 volt DC signal input. In the case of larger signal levels, such as 0 to 10 volts DC, the hardware input circuitry on the VAN card will have been factory configured to pre-scale the signal to a range within 0 to 1 volt DC, and corresponding special scaling information will be provided to fit the particular application.

2 for a Raco Temperature Sensor input (sensor model TS705A), used to measure temperatures from -20 to +120 degrees F.

3 for additional types of special custom-specified signals.

Summary of Codes for Input Signal Type	
0 (default)	4-20 ma current loop
1	0-1 volt DC
2	Raco temperature sensor
3	Other special inputs

B.1.4 Programming the Scaling and Offset Factors

This set of steps is not necessary for inputs using a Raco Temperature Sensor, since these values will be automatically inserted if the parameter 2 is selected in the above step.

In the above step, accepting the default parameter of 0 for 4-20 milliamp inputs automatically provides for a spoken reading of 0.0 percent for the minimum (4 ma) signal input value, and 100.0 percent for the maximum (20 ma) signal, until you enter different factors.

In most cases, you will want to program the unit to give spoken reports in terms of the actual physical variables being monitored, such as water level in feet, etc. In general, you will need to determine the desired spoken numerical values corresponding to two widely separated (low end and high end) signal input values. Often this will be available from the overall system specifications. In other cases, this will be determined (or revised) based on actual on-the-spot observations. The Verbatim Autodialer offers the unique option of entering this scaling information based either on your particular system specifications (the System Specification method) or else on your real world observations (the Real World Method). Also, scaling information which you may have originally entered based on your system specifications may later be easily "fine tuned" based on real world observation.

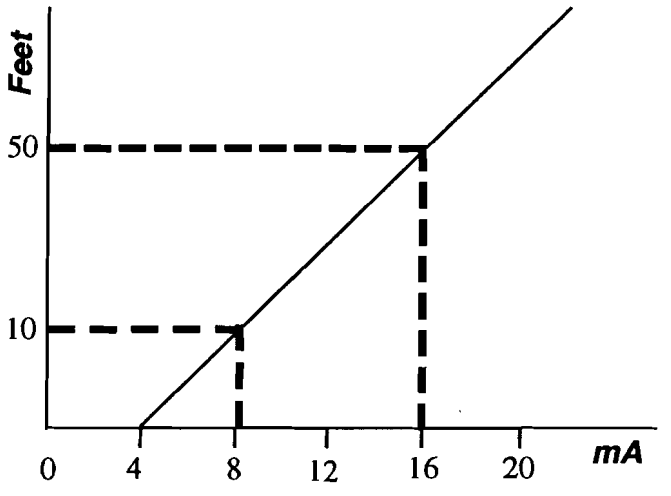
In addition, you may wish to record your own identifying message to replace the default message, as described in the message recording section of the manual.

B.1.5 Additional Perspective on Scaling Factors

Analog Math

It may be useful, in comprehending the process of establishing the scaling factors, to visualize a graph which relates the water level in a tank to the input from a 4-20 ma transducer. To establish the relationship on such a graph, it is necessary to define two separate points, or coordinate pairs ideally at two widely separated points on the graph. For such a linear relationship any point on the "reading" (Y) may be calculated from the formula:

```
y = mx + b
```



where m is the gain and b is the zero crossing point or Input (ma -> offset. The gain may be calculated from: m=(y2-y1)/x2-x1)

where x1, y1 is one coordinate pair on the graph and x2, y2 is the other.

Therefore, when you have chosen to enter non-default coordinates you are in fact setting the gain factor. This gain factor is taken along with the input signal type you have chosen which will define both the gain and offset.

Notice that each of the two points requires two separate coordinate pieces of information to define: the signal level and the corresponding water level. With two such points defined, an entire line or linear equation is defined, so that given any new signal level, we could use the graph to "look up" the corresponding water level. In operation, the Verbatim autodialer measures the signal level presented to it, and then calculates the corresponding physical value, all based on the line or linear equation defined by your entry of the high end and low end scaling information whether done by the System Specification Method or the Real World Method.

Be sure that the correct Input Signal Type setting is entered as described above, because changing the Signal Type setting will overwrite the programming described next.

System Specification Method of Programming Scaling Factors

The following four codes must be entered to invoke scaling:

- For the low-end portion of the data for channel ZZ, enter the following pair of codes:

  `5 ZZ 1 X.XXXX ENTER`

  where X.XXXX is the low input signal value chosen, within the bounds of input signal type.

  `5 ZZ 2 YYYY.YYYY ENTER`

  where YYYY.YYYY is the desired spoken numerical value

- Then to complete the scaling factors for this channel, enter the following pair of codes for the high-end portion of the data:

  `5 ZZ 3 X.XXXX ENTER`

  or

  `5 ZZ 3 POINT ENTER`

  for the high-end signal value

  `5 ZZ 4 YYYY.YYYY`

  for the high-end corresponding spoken value

Note:

For all analog value entries you may enter up to four digits before an optional decimal point, and up to four digits after, but simple entries (such as -20, 3.45, 500, 4, etc.) work as well.

Alternative Real World Method of Programming Scaling Factors

If the system specifications for the scaling factors are not known, or if you wish to adjust a previous entry to reflect real-world as opposed to system specification conditions, wait until the input signal or the physical variable happens to be near the low end of the scale. Enter the following pair of codes:

`5 ZZ 1 POINT ENTER`

which will automatically accept the present moment signal value as the low input signal value, rather than having to enter the value shown as X.XXXX above. Then, enter:

```
5 ZZ 2 YYYY.YYYY ENTER
```

where YYYY.YYYY is the corresponding low-end physical value which you observe in real-world terms.

At another time, when the signal or physical variable is toward the high end of the scale, enter the following pair of codes:

```
5 ZZ 3 POINT ENTER
```

which accepts the present signal level as corresponding to the high-end physical value which you enter as:

```
5 ZZ 4 YYYY.YYYY ENTER
```

Example:

It may already be known from your system's specification that for channel 6, a low-end signal of 4 milliamps corresponds to a desired spoken value of 34.5 feet of tank water level. In such a case, you would use the System Specifications Method to enter:

- for 4 milliamps

  ```
  5 06 1 4 ENTER
  ```

- for a spoken reading of 20.5

  ```
  5 06 2 20.5 ENTER
  ```

- for 20 milliamps

  ```
  5 06 3 20 ENTER
  ```

- for a spoken reading of 34.6

  ```
  5 06 4 34.6 ENTER
  ```

Then, suppose with the system in operation, you observe that the tank level is 31.7 feet, but the Verbatim reports a value of 31.45 feet. The discrepancy will most likely be due to a discrepancy of the sensor's actual output versus the theoretical system specification. Regardless, to correct for it, keeping in mind that the signal is presently near the high end of the scale, you would use the Real-World Method, entering:

- To reference the present signal level

  ```
  5 06 3 POINT ENTER
  ```

- To recalibrate 31.7 as the corresponding spoken value

  ```
  5 06 4 31.7 ENTER
  ```

Continue the example, there might also be a discrepancy toward the low end of the scale. Suppose on another day you observe a tank level of 22.5 feet but the Verbatim report 2293 feet. Since this signal is at the low end of the range, you would enter:

```
5 06 1 POINT ENTER
```

and

```
5 06 2 22.5 ENTER
```

Note:

These Real-World Method adjustments did not require you to measure any actual signal levels!

From that time on, assuming that the sensor maintains its calibration and has a linear output, the spoken value should track the actual value very closely. The Verbatim itself is much more accurate and consistent than almost any sensor available to connect to it. Note that the signal does not need to be exactly at the end of its range (e.g. 4 ma or 20 ma) for these programming steps. However, in general the wider the spread between the signal levels used, the better informed the Verbatim will be to reflect the actual relationship between the sensor's output and the real value being measured.

Note:

While the unit reports with very high accuracy and resolution, you do not need to enter your programming value to the same high degree of accuracy unless you choose to.

For TS705 Temperature Sensor Inputs

Selecting signal type "2" (TS705 sensor) will automatically load scaling factors as describe earlier. However, these automatically loaded scaling factors are not adjustable. If you want to be able to do Real World calibration adjustments for temperature sensor inputs, then instead of selecting sensor type "2", select sensor type "1" (0-1 VDC input) and enter scaling factors as follows:

```
5 ZZ 7 1 ENTER (Selects signal type 1)

5 ZZ 1 .843 ENTER

5 ZZ 2 -19.8 ENTER

5 ZZ 3 .316 ENTER

5 ZZ 4 120.1 ENTER
```

This gives the same scaling factors as would otherwise automatically result from selecting signal type 2, but it allows for subsequent adjustments using the Real-World adjustment method.

B.1.6 Programming High and Low Analog Setpoints

You should first enter the gain, offset and scaling factor programming described above before entering setpoints. Later, if you adjust the factors as described above, you may also need to adjust the setpoints correspondingly. Changing setpoint values after scaling is set could cause changes in the scaling values.

- To program a low limit setpoint for channel ZZ, use code:

  `5 ZZ 5 X.XX ENTER`

Note:

X.XX is the desired setpoint in terms of spoken units, rather than in terms of the signal value. You do not need to enter all four possible leading and trailing digits. Simple entries like 7 and 3.68 work as well.

- To program a high limit setpoint for channel ZZ, use code:

  `5 ZZ 6 X.XX ENTER`

Thereafter, whenever the measured value exceeds the setpoint for a continuous period exceeding the alarm trip delay, the unit will go into unacknowledged alarm and begin dialing to report the specific violation, also reporting the current measured value. As with contact inputs, if the input is no longer in violation at the moment of the report, the phrase "Now Normal" will be appended to that channel's report.

- To check an existing setpoint value, use the above codes but omit the value (X.XX).
- To turn off (completely disable) an unused analog channel so that it will not be included in status report, enter code:

  `5 ZZ 0 ENTER`

  where ZZ is the 2-digit channel number.

- To turn the channel on again, you must enter some high or low setpoint value for that channel.
- To turn off (disable) a high or low analog setpoint, while still leaving the channel able to report readings, enter a setpoint value of -0 for that particular setpoint. If you try to enter a setpoint value outside a wide signal range, the Verbatim will say "Error in number."

Note

The scanning time required by the unit to check all analog readings against established setpoints increases with the number analog channels. With 16 channels, the time can total on the order of one second, and this imposes a limit on how fast the unit can detect analog setpoint violations. Normally, this will not be noticed unless you set Alarm Trip Delays of less than two seconds, and there is no effect on the trip delay for contact channels in any case.

Refer to the following section for recording the corresponding voice messages other than the spoken numerical values.

B.1.7 Summary of Analog Programming Codes

Code	Description
Signal Type:	
5 ZZ 7 N	Select input signal type. 0 is default for 4-20 ma
Scaling:	
5 ZZ 1 X.XX or POINT	Low end signal value
5 ZZ 2 YYYY.YYYY	Corresponding low end spoken value
5 ZZ 3 X.XX or POINT	High end signal value
5 ZZ 4 YYYY.YYYY	Corresponding high end spoken value
Setpoints:	
5 ZZ 5 X.XX	Low alarm limit setpoint
5 ZZ 6 X.XX	High alarm limit setpoint
5 ZZ 5(6) -0	Disable low (high) setpoint
Disable Channel:	
5 ZZ 0	Turn off (disable) channel ZZ

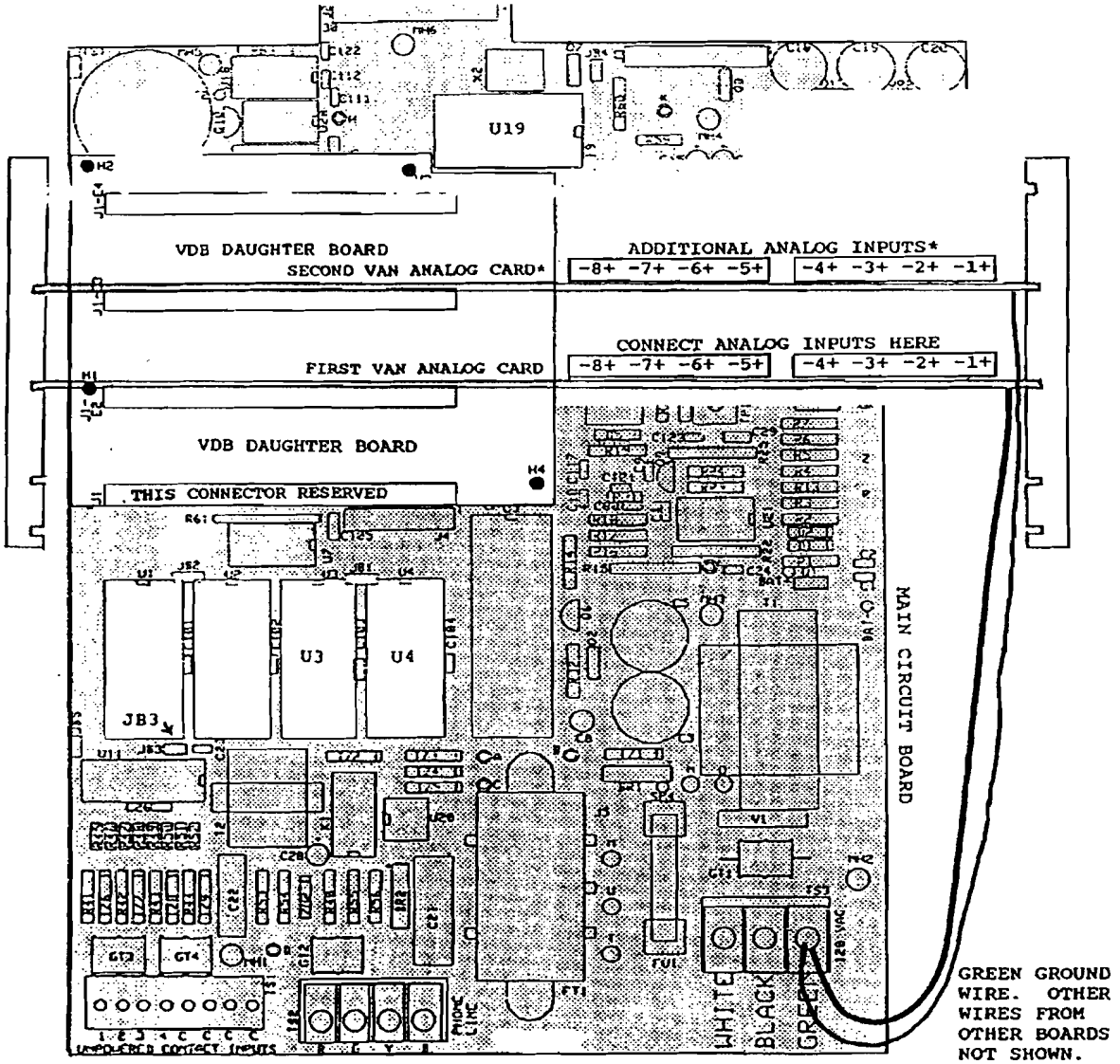
B.1.8 Recording Speech Messages for Analog Channels

This information supplements the basic information in the manual on recording speech messages. Refer to that information before attempting to record any speech messages.

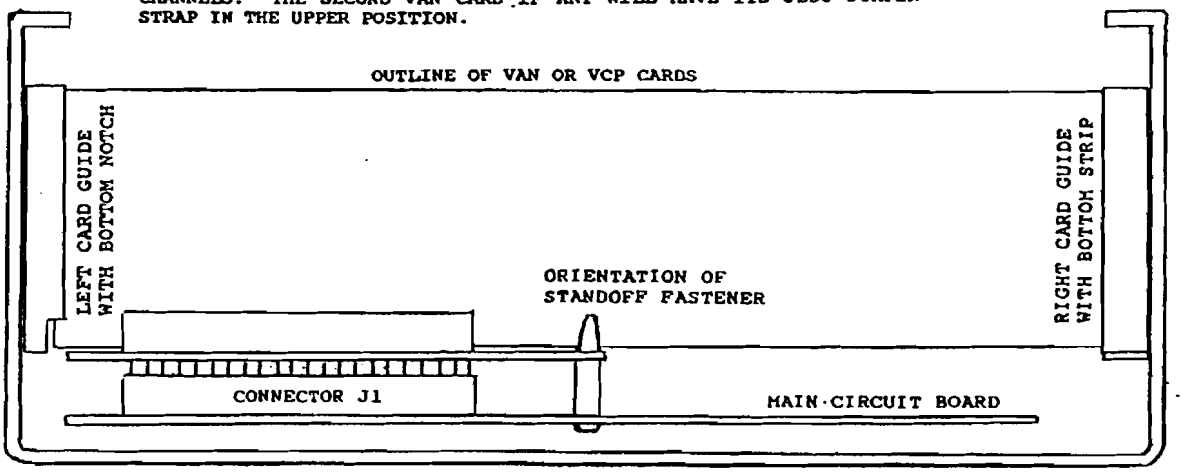
For analog input channels, the default message is "The present channel N reading is ..."

For any analog inputs, in place of the default messages you may plan to record a preamble message of the general form "The total water flow in gallons is" or "the main tank water level in feet is."

Use program code 1 ZZ to record the analog preamble message.



*UNITS EQUIPPED FOR 16 ANALOG CHANNELS WILL REQUIRE 2 VAN CARDS. THE SECOND (UPPER) CARD WILL BE FOR THE HIGHER NUMBERED ANALOG CHANNELS. THE SECOND VAN CARD IF ANY WILL HAVE ITS JB50 JUMPER STRAP IN THE UPPER POSITION.



B.1.9 If Analog Inputs Do Not Work Correctly

Recheck programming settings, especially the Input Signal Type setting. Verify that the polarity of your input connections is correct.

In the case of 4-20 ma input, does the spoken value always reflect a 0 ma signal level? If so, the problem is presumably with the connection or the signal source. Use a DC meter to verify that both sides of the offending input are within 10 VDC of ground. A 4-20 ma current loop input should give a meter reading of about .07 volt per milliamp of current as measured across the two signal input terminals.

Are other instruments included in the same current loop? If they read correctly, temporarily disconnect the input to the Verbatim Autodialer. This should throw the readings of the instruments off scale. If there is no such effect, your wiring is not including the Verbatim autodialer in the loop. Verify that the type of signal source agrees with the physical configuration on the VAN card according to the marking on the back of the card.

B.1.10 Troubleshooting Analog Grounding Problems for Verbatim Analog

The most common analog signal type in use in the Verbatim marketplace is current loops, wherein the signal is a controlled DC current ranging from 4 to 20 milliamperes.

The loop consists of a current transmitter (consisting of a transducer and a supporting power supply which may or may not be packaged into one unit), and one or more receiving devices which measure and respond to the current signal they detect on the loop. The power supply voltage is typically 24 volts DC.

The terms "transducer" and "transmitter" are used interchangeably. The transmitter's job is to ensure that the current level accurately reflects the physical parameter which the transducer is measuring (typically a pressure or liquid level), regardless of what impedance it sees in the loop.

In order to do this, it presents whatever voltage across its terminals is needed to achieve the correct current flow. This voltage must be great enough to accommodate the total resistance in the loop. The typical resistance contribution presented by each receiving device is 250 ohms. However, the DC resistance presented by the Verbatim analog inputs is around 70 ohms (49.9 ohm precision resistor plus two 10 ohm surge standoff resistors).

In theory, all elements in the loop are isolated from any connection to electrical ground. This is intended to eliminate concerns about errors in the signal caused by conflicting ground or other conflicting connections.

In practice it is not unusual to have some element of the loop in fact tied to ground or to some other voltage source away from ground -- or if not directly tied, at least limited in its ability to depart from the ground or other voltage. As long as only one element in the loop is so committed, there is no problem since the other elements can freely accommodate as needed.

The Verbatim has its own limitations in this respect. It can only accommodate a departure from ground voltage potential, of 8 volts nominal, before its protective tranzorbs begin to conduct and clamp the signal. Such clamping when in direct conflict with some other voltage commitment in the loop, will not only cause incorrect readings by the Verbatim, but also cause the other elements in the loop to read and respond incorrectly.

This ability to accommodate departures of both sides (positive and negative) or the analog signal input, is called the common mode input voltage range. A truly isolated input would have as much common mode input voltage range as the voltage limitation of the isolation, typically over 1,000 volts.

The reason we do not provide isolated inputs is because it is bulky, and expensive to achieve accurate translation across the isolation barrier. Also, these days there has been a large shift to transformer and capacitive coupling schemes to achieve DC isolation, but these provide almost zero protection against the fast rise time transients induced by lightning. So, we need to be able to troubleshoot when a customer places one of our analog inputs into a current loop where there is another conflicting voltage commitment.

When this problem occurs, the customer will typically report that his loop works but is thrown off when our analog input is placed in the loop. Sometimes the disturbance takes the form of not just altering the DC current but causing parasitic oscillations in the loop. It may not be easily discernible whether the disturbance is or is not taking the form of a parasitic oscillation. Regardless, temporarily ungrounding the dialer or unplugging the analog card, will usually eliminate the disturbance.

The procedure for troubleshooting and correction of this problem is generally as follows: First we need to find out as much as we can about any preexisting, conflicting voltage commitments. To do this, have the customer unplug the card or unground the dialer so that the loop is not disturbed, and then use a voltmeter to check both the AC and the DC voltage readings at each node around the loop, with respect to electrical ground.

We hope there is not much AC signal present. If there is a strong enough AC component on top of the DC voltages, there will be disturbance to the extent that the peak level in the AC waveform exceeds the common mode input limitation of our analog input. In such a case the cause of the AC component of the signal needs to be found and eliminated, if the following procedure does not lead to a good result.

However, it is possible and even likely, that an observed AC signal is merely a "softly" induced hum that holds no sway when it meets any clamping introduced by our analog input. With this in mind, it may be best to defer even taking AC reading until after the DC oriented methods have proven unsuccessful.

With the main focus being the DC voltage readings, we are looking at some point on the loop that is much less than eight volts DC away from ground, and that is where the Verbatim input should be relocated in the loop. Chances are good that the Verbatim had previously been placed at a point on the loop well away from ground potential and that the relocation will end the problem.

An added step that may be useful in addition to the two sets of voltage readings (AC and DC), especially if the voltage readings seem to be erratic, is to have the customer use a jumper wire to temporarily connect some candidate point in the loop to electrical ground, and observe whether the loop is disturbed by this temporary grounding. If it is not, that is a good place to locate our input in the loop. In fact, this approach can be used without taking voltage readings at all. But if it does not work, then we do want the voltage readings in order to best understand what is going on.

Occasionally, something in the loop will cause there to be no available point in the loop that is close to ground potential. In such cases, if this cannot be changed, then the customer will need to install an optical isolator between the loop and our inputs. The customer may be referred to: Action Instruments, San Diego, CA, (619) 279-5726. Isolators cost $300 per loop.

C Remote Supervisory Control Output

C.1 Remote Supervisory Control (VRSC) Output Installation and Operation Instructions

This option allows you to turn connected equipment on and off from any remote Touch Tone telephone, or from an non-Touch Tone telephone with the use of a portable tone generator. Option VRSC-4 provides 4 outputs, VRSC-8 provides 8 outputs. The unit's voice guides and confirms your operations. Advanced features such as programmable length momentary activations are included. Control operations may also be performed from the unit's keyboard.

Connections are normally made by means of optically isolated solid state relays housed in a separate Output Relay Enclosure which requires its own 120 VAC power connection. In some situations, the user may choose to make connections directly to the transition outputs within the main unit.

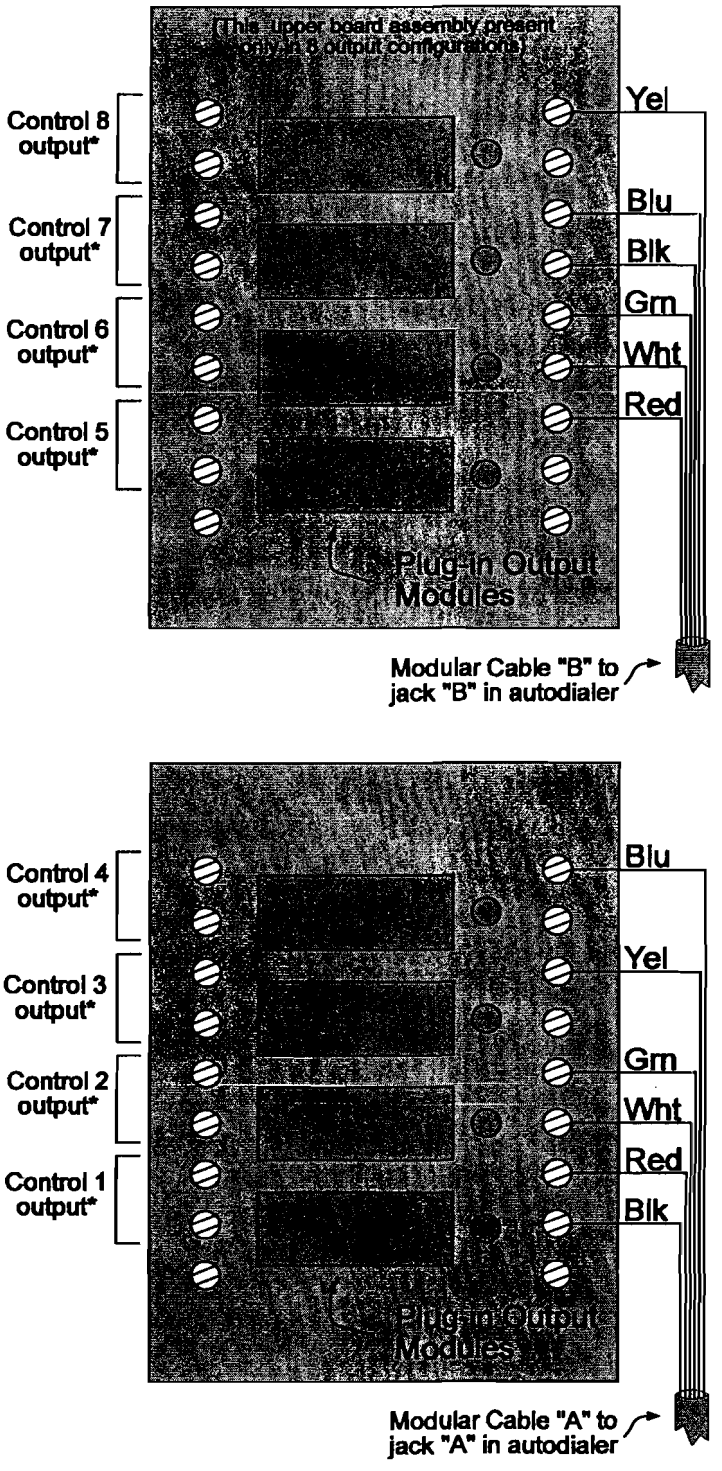
If your unit was not originally equipped with this option, refer to the separate instructions for adding this option.

C.1.1 Mounting and Wiring Connections for Remote Supervisor Control

If you are using the separate Output Relay Enclosure normally supplied with this option, mount the enclosure within 3 feet of the Verbatim Autodialer, and make your output connections to the left hand row of terminal strip points within the separate enclosure, as shown in the diagram of the VRSC Output Relay Enclosure. Be sure that the correct type of plug-in Opto 22 relays are in place. The available types are:

Type	Value
OAC5	12 to 140 VAC, 2 amps
OAC5A	24 to 280 VAC, 2 amps
OAC5A5	120/240 volt AC, Normally Closed
ODC5	5 to 60 VDC, 2 amps
ODC5A	5 to 200 VDC, 2 amps
ORR 5	Reed relay dry contact output

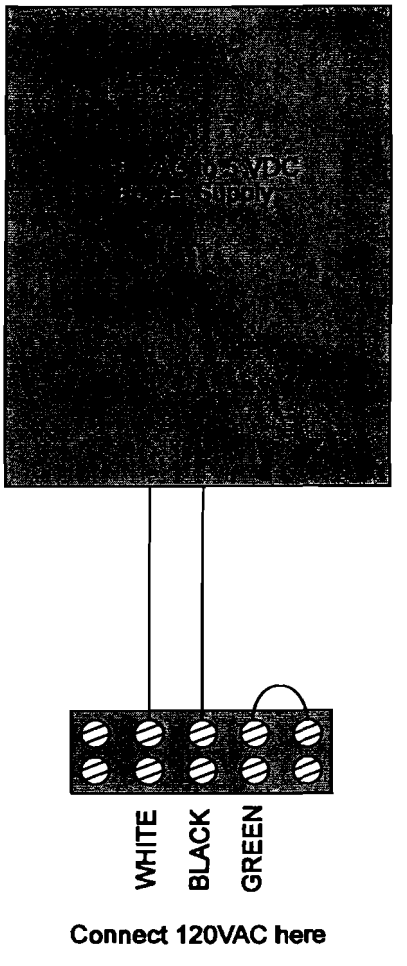
RSC Supervisory Remote Control Output Box Diagram



OUTPUT MODULE TYPES:

OAC5	12 to 140 VAC, 2 amps
OAC5A	24 to 280 VAC, 2 amps
ODC5	5 to 60 VDC, 2 amps
ODC5A	5 to 200 VDC, 0.67 amps
ORR5	Reed Relay Output

* If DC output modules are used, the lower terminal is the positive terminal, for each control output.



Connect 120VAC here

Unless ordered otherwise, type OAC5 is normally provided from the factory. Connect 120 VAC power as shown on this same diagram. Route modular "Cable A" through one of the entrance holes on the bottom of the Verbatim Autodialer, and plug it into J301 (the right-hand jack on the VCP circuit card, see diagram). The 8-output VRSC-8 option also includes a second modular "Cable B", connect this to the adjacent jack J302 on the VCP circuit card. Avoid routing these cables alongside power wiring and route them so that the front panel circuit board does not pinch them when the door is closed.

C.1.2 Optional Direct Connection Without Use of Output Relay Enclosure

The outputs on the VCP circuit card are NPN transistor open collectors capable of switching up to 12 volts DC at up to 500 ma, and thus these outputs may in some cases be connected directly to logic inputs of logic controllers, etc, although external pullup resistors may be required. Consult Raco for details. The color codes for VRSC cables "A" and "B" are:

Cable	Color Code
Cable A	
Common Return	Black
Output # 1	Red
Output # 2	Green
Output # 3	Yellow
Output # 4	Blue
Cable B	
Output # 5	Red
Output # 6	Green
Output # 7	Blue
Output # 8	Yellow

C.1.3 Remote Supervisory Control Operation

- To check the on/off status of output # N, use program code

  `9 5 N ENTER`

  where N is a 2 DIGIT output number (e.g. 01 for output # 1).

- To turn output # N ON, use program code

  `9 5 N 1 ENTER`

- To turn output # N OFF, use program code

  `9 5 N 0 ENTER`

- To turn output # N on for a specific number of seconds, use code

  `9 5 N 2 XXXXX ENTER`

  where XXXXX is the desired number of seconds, from 1 to 99999.

- To turn output # N off for a specific number of seconds, use code

  `9 5 N 3 XXXXX ENTER`

  where XXXXX is the desired number of seconds, from 1 to 99999.

- To establish a default pulse time duration in seconds for a given output N (2 digits), use code

  `9 5 N 9 XXXXX ENTER`

  where XXXXX is 1 to 99999 seconds.

- Alternatively, to establish a default pulse time duration in minutes, for individual output N (2 digits), use code

  `9 5 N 8 XXXX ENTER`

  where XXXX is 1 to 1666 minutes.

  Then you may use code 9 5 N 2 (or 3) without need to enter the digits. The unit will use the pre-stored value for that output's pulse length.

- To hear a report of the on/off status of ALL outputs in one operation, use program code

  `9 5 0 0 ENTER`

- To turn ALL outputs OFF in one operation, use code

  `9 5 0 0 0 ENTER`

- To turn ALL outputs ON in one operation, use code

  `9 5 0 0 1 ENTER`

- To establish a default pulse time duration for ALL outputs in one operation, use code

  `9 5 0 0 8 XXXX (XXXX = 1 to 1666 minutes)`

or

  `9 5 0 0 9 XXXXX (XXXXX = 1 to 99999 seconds)`

Warning:

Because the devices under control would not normally be operational during AC power failures, the Output Relay Enclosure does not include battery backup for the output relays during AC power failures. Upon restoration of AC power, the outputs will return to the state dictated by the Verbatim Autodialer.

When the Verbatim Autodialer itself is first turned on, and at certain other times when a microprocessor reset occurs, all the outputs will be turned ON for a fraction of a second, before assuming the state dictated by the Verbatim Autodialer. In some installations this could cause problems, and in such cases external time delay relays or other measures may be required to prevent unwanted momentary activation of controlled devices.

MM are the minutes (09 for 9 minutes)

SS are the seconds. Entry of SS is optional.

- To clear the time and date back to 00:00:00 on 01/01/89.

```
935 7 ENTER
```

D Printer Options

D.1 Local Data Logger (Local Printer) Option

If your unit was not originally equipped with this option, refer to the separate instructions for installing this option. (See Section 2.3 for LDL parrallel). The local printer will automatically print out each activity that occurs: alarms, acknowledgments, programming entries, inquiry calls, etc.. A time and date stamp will be included with each report. The local printer may be either serial or parallel as discussed below.

D.1.1 Serial Printer Interface

- If your printer was obtained through Raco, it will have been properly configured and tested at the factory...
- If it was purchased independently, refer to the printer's instruction manual to configure it for 9600 baud, 8 data bits, 1 stop bit, and no parity.
- Improper configuration settings will result in "garbage" being printed, or possibly no printing at all.
- The printer must have a "serial" input.
- Printers not specified by or purchased through Raco are not guaranteed to be compatible for this application.
- Connect the DB-25 connector end of a Raco SER-01 cable (the specific type required will depend upon the printer type) to the input connector on the back of the printer.
- Route the small "modular" plug end of this same cable through one of the holes at the bottom of the Verbatim Autodialer, and plug it into modular jack J303 located near the left side of the Verbatim Autodialer, on the vertical VCP circuit card.
- Avoid routing this cable alongside power wiring, and route it so that the front panel circuit board does not pinch it when the door is closed.

D.1.2 Parallel Printer Interface

Some newer models of the VSS Series autodialer have a standard Parallel Printer Interface. This interface is accessed via the parallel printer port located on the inside of the unit front panel door. This printer port is already activated. (See Section F.3)

- To activate this port, attach a RACO VPPC-1 Parallel Printer Cable (or equivalent) to the front panel port and to the parallel port on your printer.

Caution:

Attach the parallel printer cable to the VSS front panel port with the "red striped edge" on the right side. If you connect any other way, you may damage the parallel connection on your printer.

D.1.3 Time and Date Setting

Time and date may be set or corrected with the following programming code entries:

- To check the date

  `941 ENTER`

- To set the date

  `941 MM DD YY D ENTER`

  where:

  MM is the month (03 for March)
  DD is the date (07 for the 7th day of the month)
  YY is the year (89 for 1989)
  D is the day of the week (1 for Sunday, 2 for Monday, etc.). Entry of D is optional.

- To check the time

  `942 ENTER`

- To set the time

  `942 HH MM SS ENTER`

  where:

  HH are the hours in military time (13 for 1 PM)
  MM are the minutes (09 for 9 minutes)
  SS are the seconds. Entry of SS is optional.

- To clear the time and date back to 00:00:00 on 01/01/89.

  `935 7 ENTER`

D.1.4 Printout at Regular Intervals

The unit may also be programmed to automatically log (printout) all input conditions at regular intervals, by entering code:

```
943 XXX.X ENTER
```

XXX.X is the desired printing interval in hours, from 0.1 to 999.9.

The first such printout will occur when the period elapses, rather than immediately upon programming.

- To check programmed printing interval

  ```
  943 ENTER
  ```

- To turn off regular interval printing function

  ```
  943 0 ENTER
  ```

- To printout All User-Entered Programming

  ```
  944 ENTER
  ```

E Data Acquisition/Central Data Logging

The following section describes commands used to configure features of the Data Acquisition/Central Data Logging options. The software is called SCADA.

E.1 Return To Normal (RTN) Calling

You may program the unit to place calls upon an input returning to its normal state. This applies only to channels which have become acknowledged alarms. Return to Normal (RTN) calls may be placed to people, to a SCADA Central Station or to a Central Data Logger (CDL) printer.

- There are three modes of calling for RTN calls:
  Mode 0 = Data only
  Mode 1 = Voice only
  Mode 2 = Data and Voice

Return-to-normal (RTN) calls on units NOT configured for SCADA or CDL will always be mode 1, Voice only. RTN calls on SCADA or CDL configured units may be mode 0, mode 1 or mode 2. If mode 1 is set on SCADA/CDL units then data calls to the SCADA Central Computer or CDL printer will be skipped. (See Appendix K for a discussion of the Return-to-Normal modes of operation.)

- To program Return to Normal Calls, press:

  `981 V`

  Where V is one of the following:
  - 0 = OFF - No return-to-normal calls will be made (Default is OFF)
  - 1 = ON - Return-to-normal calls will be made for channels in the ALARM, ACKNOWLEDGED state whose input returns to normal (non-violation).
  - 2 = used to manually reset all return to normal channel status - does not affect the return-to-normal calling ON/OFF state above or the calling modes below.
  - 3 = Sets return-to-normal mode to mode 0 - makes return to normal calls only in data mode to the SCADA Central Computer or to Central Data Logger Printer Entering this parameter does not affect the RTN ON/OFF state.

- 4 = Sets return-to-normal mode to mode 1 - makes return to normal calls only in voice mode (NO data calls to the SCADA Central Computer or Central Data Logger Printer. Entering this parameter does not affect the RTN ON/OFF state.
- 5 = Sets return-to-normal mode to mode 2 - makes both data and voice calls upon return to normal. Entering this parameter does not affect the RTN ON/OFF state.

E.2 Quick Intercall Delay & SCADA Units Connected to Cellular Phones

This section discusses two different but sometimes interrelating topics regarding SCADA configured autodialer/RTU units. One topic is the different ways in which the intercall delay operates in SCADA units. The other is the ability to interface SCADA units over cellular phones.

Units configured for SCADA operation may place and receive calls via cellular telephones instead of standard dial-up telephone lines. If purchased from RACO, the combination of autodialer/RTU, dial-up adaptor and cellular transceiver is called the CELLULARM™ package.

CELLULARM™ autodialers/RTUs may be used in cases where land lines are not available but cellular service is available in a particular area. CELLULARM™ units function nearly identically to land line based dial-up interfaced units.

Exceptions

The *intercall delay* (time between calls) functions somewhat differently on SCADA units than on non-SCADA units. On SCADA units a shortened intercall delay takes effect under certain circumstances. These circumstances are:

1) There is a fixed, non-adjustable intercall delay of 35 seconds between:
   a) multiple attempts at data calls to the SCADA Central Computer.
   b) the last personnel (voice) number and "wrapping around" to the data number again.
2) The is also a special adjustable quick intercall delay taken only between the progression from data calls to the first personnel (voice) call.

The quick intercall delay is set to 35 seconds by default. The usual intercall delay taken between between one personnel number and the next personnel number is 2.0 minutes by default.

The purpose of the quick intercall delay is for more expedient in transitioning from data calls to voice calls. However, in certain cases the quick intercall delay may actually interfere with attempts to call the autodialer/RTU for acknowledgement. This is especially true for cellular interfaced units.

Cellular phone calls often take substantially more time to connect to the called party. Therefore, on cellular interfaced units you may need to lengthen the quick intercall delay to allow a longer time "window" for acknowledgement calls from the SCADA Central Computer.

- To set the quick intercall time, press:

  `919 V`

  Where V is 35 to 999 secs.
  Default is 60 secs.

Note:

Available ONLY on units with firmware revision between V1.36 to V1.99. Applies only when the autodialer/RTU is advancing to the first voice number. Does NOT apply to data call retries, calls between successive voice numbers or wrap-around from last voice number to data calls again.

E.3 Acknowledgment Calls To The SCADA Central Station

Units configured for SCADA operation may be programmed to make calls to the SCADA Central Computer to report alarms which were acknowledged by personnel. Alarm Acknowledgement which occurs during calls to personnel or when personnel call the unit will prompt a sequence of Acknowledgement calls made to the SCADA Central Computer. The purpose of Acknowledement calls is simply to log the event of alarms being acknowledged by personnel.

- To program the unit for Acknowledgement Calls, press:

  `982 V`

  Where V is one of the following:

  - 0= OFF - (Default)
  - 1= ON - Make Acknowledgment calls
  - 2= resets all alarm acknowledgement call status - inhibits all further attempts for this alarm acknowledgement occurence.

E.4 Modem Automatic Speed Select for SCADA units

Automatic speed selection of 1200 baud or 300 baud may be programmed ON or OFF. When programmed ON, the unit will attempt to make data calls at 1200 baud first. If 1200 baud cannot be automatically negotiated with the SCADA Central Computer's modem, fallback to 300 baud will occur. When programmed OFF, the modem speed will be determined by the 984 command (below).

Exception

In some cases, 1200 baud may not provide reliable data communications due to phone line noise, etc. If necessary, use this command to force the unit's modem to use one specific speed only.

- To program the Automatic Speed Selection, press:

  `983 N`

  Where N is 1 (ON) or 0 (OFF)
  Default is 1

Note:

This command is not applicable to Central Data Logger units.

E.5 Modem High Speed or Low Speed Selection

When the unit is programmed with Automatic Speed Select OFF use this command to fix the modem speed at either 1200 or 300 baud.

- To program the (non-Automatically selected) Modem Speed, press:

  `984 N`

  Where N is 1 (1200) or 0 (300)

Note:

When Automatic Speed Select is set to ON (command 983) this command has no effect on modem speed.

E.6 Number of Data Call Attempts Before Tripping a Communications Alarm

The autodialer can make multiple attempts to communicate in data mode to the SCADA Central Computer or to the Central Data Logger (CDL) printer. When all attempts to establish data communications have failed a Communications Failure Alarm will be tripped. If the unit is able to make voice calls (i.e. more than just the 1st phone number programmed) the Communications Alarm will be announced to personnel along with the usual alarm and status report messages. When a calling sequence is ended, for example by alarms getting acknowledged, the Communications Alarm is cleared.

If the Communications Alarm persists and successful data communications to the SCADA Computer or CDL printer is eventually established a Communications Alarm message will be logged and/or printed. After a Communications Alarm is logged and/or printed it will be cleared.

- To set the number of attempts before tripping a Communications Failure Alarm, press:

  `985 N`

  Where N is 1 to 10
  Default is 3

Note:

If Automatic Speed Select is set ON the unit will actually make twice the programmed number of attempts before tripping a Communications Alarm; N attempts at 1200 baud and N attempts at 300 baud.

E.7 Answer Mode - VOICE ONLY or DATA-TO-VOICE

Most calls made to an autodialer/RTU will be polling calls from the SCADA Central Computer. By default the autodialer/RTU will be expecting a data call and answer with a modem answer tone. This is called DATA-to-VOICE answer mode. Personnel wishing to call an autodialer/RTU to get voice reports can just wait through the modem answer tone for a few seconds for the unit to fall back to voice mode and begin speaking.

The autodialer/RTU may also be programmed for VOICE ONLY answer mode. In VOICE ONLY mode the unit will never answer with a modem answer tone and voice annunciation will begin immediately upon answering.

Programming an autodialer/RTU for VOICE ONLY defeats polling calls from the SCADA Central Computer since the unit will only answer by voice and not assert a modem answer tone. However, VOICE ONLY answer mode does not affect data calls made FROM the RTU to the SCADA Central Computer or CDL Printer.

If your SCADA Central Computer is not operational you may wish to program the answer mode to VOICE ONLY. Customers who purchase the SCADA option for their autodialer/RTUs in advance of installing their SCADA Central Computer should use this programming command to make the unit function as a non-SCADA networked autodialer. In addition to programming the answer mode to VOICE ONLY make sure there is no 1st phone number programmed. (The 1st phone number does data only calls to the SCADA Computer.)

- To program the Answer Mode, press:

  `986 N`

  Where N is 0 (default) for DATA-to-VOICE or 1 for VOICE ONLY

Note:

Does not apply to Central Data Logger (CDL) units. CDL units never receive polling calls and always answer in VOICE ONLY mode. The 1st phone number must be programmed to call the CDL printer.

E.8 DATA/VOICE Autocall Calls for SCADA & Central Data Logger

Autocall calls may function substantially the same in SCADA and Central Data Logger (CDL) units as in standard, non-SCADA units. However, different operating modes of Autocall may be programmed in addition to the usual Autocall functionality.

Exceptions:

- Autocall calls may be restricted to only calling the SCADA Central Computer or CDL printer. Also, Autocall calls may be restricted to calling just the personnel numbers programmed into the unit (i.e. no calls to SCADA Computer of CDL printer). And finally, Autocalls may call both personnel numbers and SCADA Computer or CDL printer numbers.
- Autocall calls made to the SCADA Central Computer or CDL printer result in logging and printing of the Autocall session. No acknowledgement is required or is possible.
- Autocalls calls made to personnel numbers will be standard voice annunciation sessions.

- To program the DATA/VOICE Autocall mode, press:

  `987 N`

  Where N is 0 to 2

  - 0 = (default) Autocall Calls made to SCADA Central Station only
  - 1 = Autocall Calls made to personnel numbers only
  - 2 = autocall Calls made to all numbers

F MODBUS Interface

This section covers the PLC specific functions of the Verbatim autodialer. It is assumed the reader is already familiar with the basic operation of the Verbatim autodialer. If this is not the case, please take the time now to review the previous sections of this manual.

In the discussion that follows, there are many technical terms specific to PLC operation which may be unfamiliar to those not experienced with PLCs. Please refer to the Glossary section for definition of these terms.

F.1 Overview

The Verbatim autodialer allows direct connection to Programmable Logic Controllers (PLCs) via a serial interface or other network connection. No direct connections from PLC output points to the Verbatim input points are required in order to monitor or annunciate for the PLC. Also, in most cases, no changes in the PLC's ladder logic program are required.

In addition, the autodialer allows connection to any non-PLC equipment compatible with supported PLC network protocols. An example of this application is a SCADA or DCS system running software configured with a PLC network protocol driver module. The autodialer does not care if the devices are a real PLC network or a computer mimicking a PLC network. However, master/slave protocols will require the autodialer to assume the role of master.

The Verbatim autodialer may read or write any data register within the PLC network. The data registers accessed by the autodialer may be in a single PLC or may be arbitrarily spread over a number of PLCs on the network.

Obviously, the number of data table locations in even a single PLC may number into the thousands. To relieve the user of having to deal with a huge number of precisely notated data table addresses, the autodialer uses the artifice of Remote Channels (RCs). Simply stated, RCs are nothing more than a kind of speed-dial number like you might set up on your telephone. Once the full number sequence has been entered into memory, a shorter sequence of numbers may be used as an abbreviation for the long sequence stored in memory.

Through the Verbatim autodialer, the user associates the address of a PLC data register to a RC. Thereafter, the RC becomes a shorthand designation for that data register's address. Any register, whether digital, analog, or other miscellaneous type, may be associated with an RC.

Data registers may actually be spread over a network of PLCs. The autodialer does not care if RC #2 is associated with a data register in a different PLC from the data register associated with RC #1. Therefore, when programming the autodialer to associate a PLC data register with a RC, the node number of the PLC may be included in the description for the location of the data register.

Additionally, the amount of User Recorded Speech Memory is increased appropriately for each Remote Channel configuration. These different quantities of memory yield total message recording times consistent with each of the available RC configuration options.

F.2 General Operation

This section describes configuring the Verbatim autodialer to continuously monitor any data register on the PLC network. Additionally, under user command, the autodialer may read and write to any PLC data register. The autodialer will only perform these functions after it has been properly installed, connected to the PLC network, and programmed.

F.2.1 Associating a Remote Channel with a PLC Data Register

In order for the Verbatim autodialer to read, write or continuously monitor a PLC data register the address of the data register must be associated with a Remote Channel (RC). After a data register address has been associated with a RC the Verbatim autodialer then knows where to direct queries for the contents of a data register on the PLC network.

The data register's complete address description is called the ***net address***. See section F.4.2 for information about net address formats.

Once a data register's net address has been associated with a RC, the alarm criteria may then be programmed. Only after an alarm criteria is entered will the PLC data register be scanned continuously by the Verbatim autodialer. When the content of the data register changes to match the alarm criteria, the RC associated with the data register goes into the alarm state.

RCs in the alarm state behave in exactly the same way as Verbatim autodialer internal or "physical" channels.

The Verbatim autodialer may be called at any time to receive an annunciation of the status of channels monitored. PLC registers associated to RCs may be read and written over-the-phone. Additionally, programming activities may be performed via the buttons on the user's phone.

When an operator calls the autodialer, the status of RCs will be reported and the user may reprogram parameters of RCs over-the-phone. When accessing the autodialer over-the-phone, all user functions that could result in the alteration of ANY data register can be made subject to correct entry of an access code.

Alarm criteria, trip delays and alarm call groupings are established in a fashion similar to normal physical channels. RCs associated with PLC discrete data registers support the normally open or closed criteria. RCs associated with PLC analog or integer data registers support high and low set points.

Associating a net address to a RC implicitly establishes the channel as digital or analog. For RCs, the default alarm criteria for both digital and analog channels is 'disarmed'. Attempts to set analog criteria on digital channels, and vice versa will cause an error announcement. If the net address for an RC already configured is re-programmed so that the type (analog or discrete) of data changes, the criteria will automatically be set to 'no alarm'. There is no run-time or totalizer capability for any of the RCs.

At the front panel, the LED channel status display shows all Remote and Physical Channels. Since the count of total Physical and Remote channels is greater than the usual 32 status LEDs, channels are combined into groups so that the status of all channels may be observed.

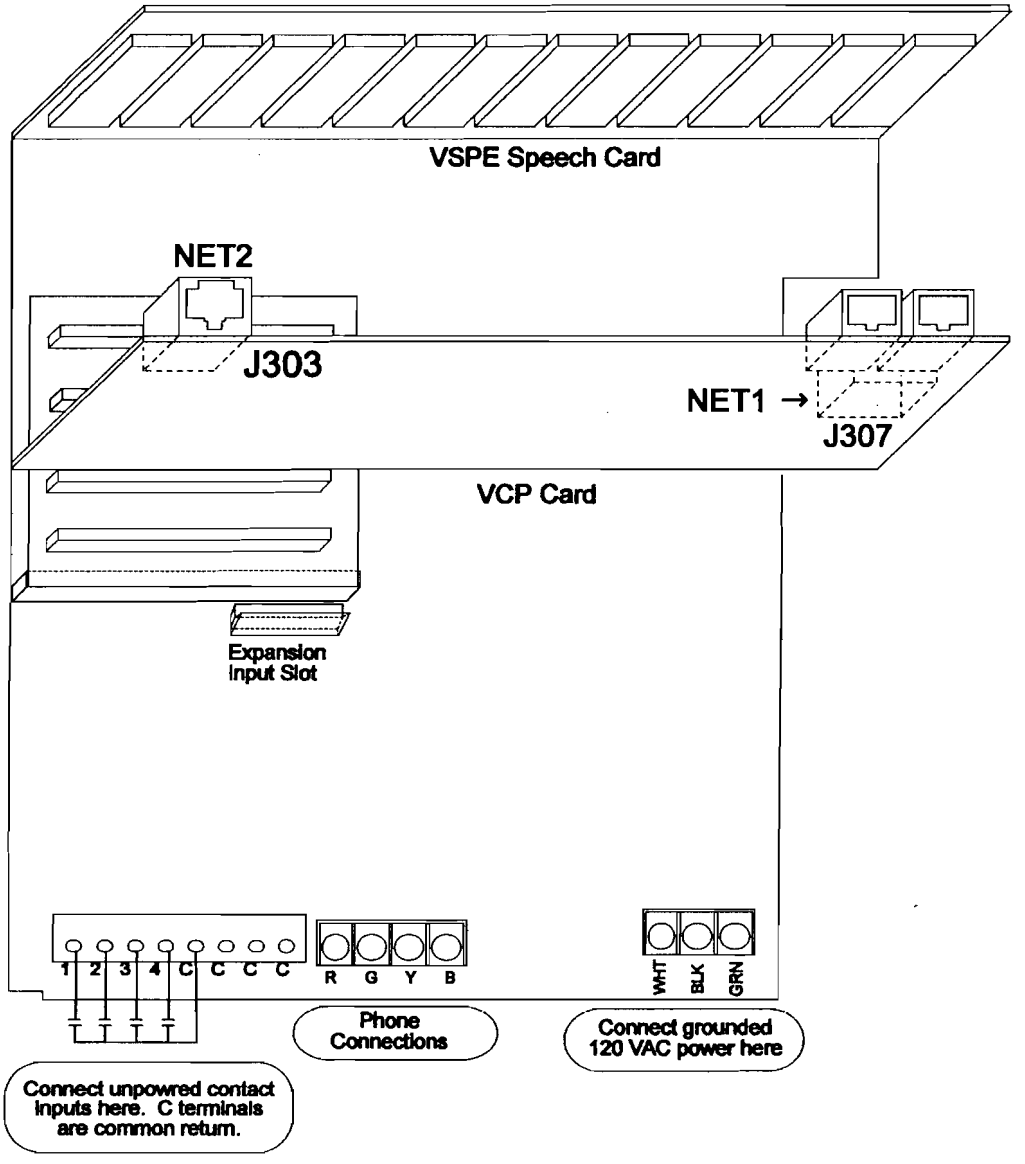
F.3 Connecting to the PLC Network

In most cases, the cable supplied by RACO will already be connected at the Verbatim autodialer end to a modular jack inside the unit. If this is not the case, please refer to the drawings in appendix H.

Note:

Refer to the cable drawings in the appendices to identify your type of PLC network connection.

Electrical Connection Diagram for PLC Network Connection



Cable connections for various PLC network protocols	
NET1	NET2
Modbus	NONE
Modbus	Serial LDL

F.3.1 Before Calling Technical Service Assistance

Programmable Logic Controllers have been used for several decades for process control applications. There is a large body of knowledge germane to using PLCs. RACO assumes that the user needing to monitor a PLC network with the Verbatim autodialer is already familiar with the PLCs being used for the application. It may also be assumed that the user has access to a PLC expert to help accurately identify the addresses of a PLC data register.

Before consulting the RACO Customer Service Department or your local RACO Representative for assistance in installation and configuration, please insure that the PLC details described in the next paragraph are readily available.

The user must have access to the PLC ladder logic program listing and know the location and properties of all data table locations which will be monitored by the Verbatim autodialer. Also the user must be able to determine the basic operating parameters of the PLC communications channel. This means being able to configure the PLC's parameters such as the node address, baud rate, data bits, parity and stop bits. Setting these parameters at the PLC may require the use of a PLC Hand Held Terminal, or a Personal Computer running PLC programming software available from the PLC's manufacturer.

The MODBUS communications protocol is a Verbatim autodialer firmware option and must have been properly configured at the factory. Parameters concerning link, frame and packet-level interfaces are configurable in the field.

F.4 Programming for Remote Channels

F.4.1 Remote Channel Programming Overview

The Remote Channels (RCs) behave fundamentally the same as their physical channel (PC) counterparts. Procedures for programming and recording messages for remote channels are very similar to the procedures described in the previous sections of this manual. There are some differences, however. These differences will be discussed in this section.

In general, all Verbatim autodialer commands that operate on remote channels will begin with the digit '4'. Commands that perform functions similar to non-Remote Channel specific commands use the same key sequence, preceded by the digit '4'.

- For example: to interrogate the alarm status for Physical Channel number 1 1, enter the command:

  `0 1 1 then <ENTER>`

- To interrogate the alarm status for Remote Channel number 1 1 enter the command:

  4 0 1 1 <ENTER>

The existing commands that apply globally to all channels will apply uniformly to the RCs as well. Specifically, these codes are: 900, 902, 904, 917N, 923N, 927N, 930, 935N, 966N, 9403, 9404. The 'CHECK STATUS' function, either from the front panel or over-the-phone, reports channel status for all channels both physical or remote.

The sub-sections that follow itemize all programming key sequences available to the user. A short description of each function is provided, together with longer notes when necessary. If a programming key sequence is not recognized by the Verbatim autodialer, or any parameter is invalid, the Verbatim autodialer simply says "Enter program code".

All commands that use a full network address may omit the network ID and/or the node address, in which case the default values (codes 4910, 4911) will be used. The user should then also omit the '*' delimiter associated with the omitted component. If the user does omit a field then all preceding fields must also be omitted. (See Section F.4.2 for more information on net address formats.)

The RCs on any specific network may be globally inactivated without erasing any of their configuration. An individual RC may be inactivated without erasing the network address by setting the no alarm or disarmed criterion. In this case, it will be necessary to reprogram the criterion in order to re-activate the channel.

F.4.2 Associating a Net Address with a Remote Channel

Note:

Remember that * = POINT when referenced in this manual.

The most important operation in configuring your Verbatim autodialer is associating a data register's net address to a RC. The net address is actually part of the complete command sequence entered by the user when programming the association of a RC and a data register. Consider the following example. Suppose the Verbatim's NET 1 is configured for the Modbus protocol and node 2 on that net is a PLC. To associate RC #01 with the16 bit data register whose address is 40001 you would enter the following command sequence:

4 5 0 1 * 1 * 2 * 40001 * then ENTER.

The first 4 digits from the above example are the programming command for RC association or RC alarm criteria. Thus, the sequence 4 5 0 1 refers to programming for RC #01. The net address portion of this command sequence is the remaining digits plus the '*' used for delimiting. The 16 bit data register has the address of 40001. The PLC's node number is 2 and the Verbatim's NET is 1.

The general net address syntax has the following form:

```
* NET * node * address *
```

where:

NET is NET Number - 0, 1, or 2

Net 0 is Physical Channels

Net 1 is Modbus

Net 2 is serial printer

node is PLC's Node Number

Modbus - 1 to 256

address is Data Register Address - may be numbers. Syntax for the register address is very specific to the PLC brand.

In the previous example, certain simplifications were made. Simplifications in the net address may be made by using programmed defaults. The usual default for the Verbatim's NET number is 1. The default node number may be set to any value allowed by protocol. Therefore, in the previous example, the entry may be simplified further to the following:

```
4 5 0 1 * 40001 * <ENTER>
```

F.5 General MODBUS Requirements

This appendix provides information specific to Modicon's Modbus network. There are sections on PLC data table addressing, net address format, and global data. The paragraphs here describe general requirements and hints.

Modicon PLCs: Be sure that the DEF/MEM switch on compact 984 PLCs is set to 'MEM'. Otherwise, it will be impossible to change network communications parameters from the defaults.

Modbus Networks: All nodes on a Modbus network must use RTU protocol. There can be only one master on the network. The master must be the Verbatim Autodialer.

Use the link-level timer (command 4908) to insert a delay between query/response cycles. This will only be necessary if talking to a slow device.

F.6 PLC Address Format

The table below shows how to address specific objects in Modicon PLCs. 'x' represents a digit in the range 0-9. The Verbatim autodialer User Interface will accept any values for 'xxxx'. If a value is out of range for a particular PLC, that PLC will issue an error diagnostic, which will be passed on to the user. This is to say, the remote PLCs enforce the validity of PLC addresses on their own.

Notes:

- Extended memory access is not currently implemented.
- Inputs may be written by the Verbatim autodialer, but will most likely be overwritten immediately by the PLC when it does its next scan of the ladder logic.
- The PLC memory protect switch will prevent a coil or register from being written.

Addressing Modicon PLC Objects

Address	*Description*
0xxxx	Coil (1-bit Output) number xxxx
1xxxx	Input point (1-bit) number xxxx
3xxxx	Input register (16-bit) number xxxx
4xxxx	Output (holding) register (16-bit) number xxxx

F.7 Potential Effects of Network Communications Failures

Physical channels only go into alarm state when their input matches programmed alarm criteria. Remote channels also support these criteria-based alarms.

It must be remembered however, that the channel data compared against the criteria must first be received from the network being monitored. Since the remote channel's data is being transferred over a network, alarming may be affected by various network failures.

If such a failure occurs, and the data cannot be received, it is no longer possible to reliably compare the channel against the alarm criteria. As a result, the remote channels will enter the alarm state even though their channel data may not have changed. The term "COMALARM" is used to distinguish this sort of alarm scenario from the criteria based alarms.

More precisely, an RC will register a COMALARM whenever the following two conditions are met:

1. The RC is configured with alarmable criteria.
2. All attempts to poll the RC have failed for the COMALARM trip delay period (code 4907).

For status reports, alarm calls, LED indicators and acknowledgments, the COMALARMs are treated in the same way as criteria alarms. They are annunciated in the following manner:

1. The COMALARM message will override any criteria alarm message.
2. The COMALARM message is not user recordable. It always consists of "Remote Channel Number ZZ Communication Failure Code XXX."

The failure code annunciated by the Verbatim autodialer serves as an aid in troubleshooting the network problem causing the failure. They are listed in section F.17.

To further assist in network troubleshooting several diagnostic commands are provided. It is possible to:

1. Perform a complete network self-test.
2. Read the communications status for any RC.
3. Read and reset the COMALARM count for any RC.
4. Read a list of the last 10 COMALARM codes on the network.
5. List all RCs currently in the COMALARM state.
6. List the nodes (PLCs) on the net that have all of their RCs in the COMALARM state.

The Verbatim autodialer provides several other features to help the user with the inevitable complexities of a networked environment. One is the ability to suspend/resume all queries initiated by the Verbatim autodialer without altering any RC programming. The status reports will inform the user when a network is globally disabled in this fashion.

Another diagnostic tool is the front panel Network Status Indicator LED for each network. Each LED is like a channel which monitors the overall health of each network. This is accomplished by accumulating all the COMALARM codes into a single value. The value is compared against a threshold. See code 492 in Section F.16 for details.

If the threshold is exceeded, then the LED will blink and status reports will annunciate the current value of the network status code. If the network has been globally disabled the LED is off. Otherwise the LED is steadily ON, indicating the network is operating within programmed parameters. See Section F.17.

The Verbatim autodialer keeps a count of the threshold violations. Programming commands are available to announce and reset these counts. It is also possible to announce the current value of the status code and set the threshold to any severity level. See section F.16 for details.

F.7.1 Abbreviations and Typographic Conventions

In the following sub-sections, the verbal response expected from the Verbatim autodialer will be given following the program code that the user is to enter for each programmable function. This verbal response will be differentiated by being in italics in the following way: *Remote Channel Number TEN, Alarm, Acknowledged.* The following table describes the abbreviations used in the code listings and elsewhere in this document:

Code Listing Abbreviations

Code	*Description*
ZZ	Any two-digit remote channel number, from 01 to 96, depending on the hardware configuration.
yy	Same as above
N	An integer from 0 to 65535, or as specifically noted.
net	The network ID: 1 to 5
node	The node address, as appropriate for a given network.
addr	The PLC address, as appropriate for the given PLC. (Details on specific PLCs and protocols are found in the appendices.)
DN	A two-digit code indicating a specific phone number.
V	An arbitrary floating point number of the form: 1.23. If 3 or more digits to the right of the decimal point, V is truncated to the nearest .005.
*	Same as 'point' key
#	Same as 'minus' key

F.8 Remote Channel Status, Reading, and Writing

4 0 ZZ

Function — Read alarm status of Remote Channel ZZ. (See code 49402 for Network Alarm Status)

Response — *remote channel <ZZ> <alarm status>*

If ZZ=00 in the following two commands, then the command applies to the net address specified by the most recent 4500* command. In that case, the "remote channel ZZ" responses are replaced with the explicit net address.

*4 0 ZZ **

Function — directly read PLC address associated with Channel ZZ

Response *remote channel <ZZ> is <N>* or
remote channel <ZZ> communications error <code>

*4 0 ZZ * N*

Function write value N to PLC address associated with channel ZZ
Response *remote channel <ZZ> set to <N>* or
remote channel <ZZ>communications error <code>

Notes:

- This command will execute without any "are you sure?" checking. Users must make sure the address and value being written will not create an unsafe condition.
- Writing a value greater than 1 to a digital or net address will result in the value 1 being written.

F.9 Remote Channel Message Recording and Reviewing

4 1 00 net

Function Record network ID message for specified net. Append a '*' to the command to return to default network ID message.
Response whatever was recorded or the default message: *NET <net>*

Notes:

- For the following 2 commands, N is optional. If present, it must be in range 1-4 and sets the recording rate for that particular message. User Messages for the remote channels are used in the same way as user messages for the physical channels.
- For analog channels, the alarm message is always the default: "<high> <low> set-point exceeded". The user messages form a preamble and epilogue for the data value recitation during alarm messages. The default epilogue for remote channels is null.

4 1 ZZ N

Function Record channel ZZ alarm/preamble message. *N*, if present, specifies the recording rate to use. If *N* is not present, the default recording rate is used. Append command with a '*' or '0' to return to default alarm message
Response whatever was recorded or the default message: *remote channel <ZZ> alarm*

4 2 ZZ N

Function Record channel ZZ normal/epilogue message. *N*, if present, specifies the recording rate to use. If *N* is not present, the default recording rate is used. Append command with a '*' or '0' to return to default normal message.

	Response	whatever was recorded. The default message for discrete channels is: *remote channel <ZZ> normal* . The default message for analog channels is silence (no epilogue).
4 3 ZZ		
	Function	Review both messages for channel ZZ. If ZZ is 00 then all network ID messages are reviewed.
	Response	whatever was recorded or the default messages.

F.10 Remote Channel Configuration

Commands in the series "4 5 ZZ," are used for Remote Channels as follows:

- Associate a PLC net address to a Verbatim Remote Channel. This step tells the Verbatim autodialer where on the PLC network to look for the point to be monitored.
- Establish the alarm criteria for a Remote Channel. This step tells the Verbatim autodialer what constitutes an alarm condition in the monitored PLC point.
- Link a Remote Channel to a phone number or group of phone numbers. When an alarm occurs in the monitored PLC point only the phone numbers linked to the Remote Channel will be called. (By default, all phone numbers will be called.)

Note that you must first assign a net address to a Remote Channel before any alarm criteria may be configured.

F.10.1 Assigning PLC Net Addresses to Remote Channels

Command "45ZZ" associates a remote channel with a network address and, as such, is essential for activating an RC. When issued, this command will cause the Verbatim autodialer to immediately access the specified network address. Any communications errors at this point will generate the message: *communication error code <diagnostic>*. Any command in this section will support ZZ=00.

If the data type (analog, discrete) of the new address is incompatible with the existing alarm criteria, then the NOALARM criteria will replace them. Otherwise, the existing criteria are untouched. The Verbatim will announce this action. Any links to other RCs are always preserved.

Notes:

See section F.4.2 for an overview of net addresses.

*4 5 ZZ **

Function — Read the network address which is currently associated with RC number ZZ.

Response — *remote channel <ZZ> NET <net> NODE <node> ADDRESS <addr>* or *communication error code <diagnostic>*

*4 5 ZZ * net *node *addr **

Function — Associate RC <ZZ> with specified network address. Does not alter any other parameters.

Response — *remote channel <ZZ> NET <net> NODE <node> ADDRESS <addr>* or *communication error code <diagnostic>*

F.10.2 Remote Channel Alarm Criteria

4 5 00

Function — The criteria for all "eligible" RCs are set so that the channel is normal in its current state. An RC is NOT eligible if any of the following conditions apply:

- Channel's net address type is analog or floating point
- Channel has NOALARM criteria already configured
- Channel is already the destination channel in a linked pair

Response — *present input condition is programmed to be normal for all remote channels*

4 5 ZZ

Function — Read alarm criteria for channel ZZ

Response — *remote channel <ZZ> <criteria> or remote channel <ZZ> no net address programmed*

4 5 ZZ 0

Function — Disarms <ZZ> (i.e. eliminates all status reporting for the channel). All other configuration information is preserved.

Response — *remote channel <ZZ> disarmed*

4 5 ZZ 1

Function — Set channel number ZZ alarm criteria to normally 1.

Response — *remote channel <ZZ> normally 1*

4 5 ZZ 2

Function — Set channel number ZZ alarm criteria to normally 0.

Response — *remote channel <ZZ> normally 0*

4 5 ZZ 3

Function — Set channel number ZZ alarm criteria to no alarm. The channel is still listed in all status reports.

Response — *no alarm condition for remote channel <ZZ>*

4 5 ZZ 4

Function — Set channel number ZZ to NETERR mode — alarm if and only if a communications alarm occurs.

Response — *remote channel <ZZ> alarm on communication failurec.*

4 5 ZZ 5 N

Function — Set channel number ZZ analog low alarm set point to N. Use N = -0 to clear. Omit N to read current set point value.

Response — *remote channel <ZZ> low set point is <N>*

4 5 ZZ 6 N

Function — Set channel number ZZ analog high alarm set point to N. Use N = -0 to clear. Omit N to read current set point value.

Response — *remote channel <ZZ> high set point is <N>*

F.10.3 Linking Remote Channels to Phone Numbers

4 5 ZZ 9

Function — Read RC number ZZ alarm call grouping linkage.

Response — *remote channel <ZZ> calls <list>*

4 5 ZZ 9 DN

Function — Link RC number ZZ to phone number list DN

Response — *remote channel <ZZ> calls <list>*

*4 5 ZZ 9 **

Function — Clear all RC number ZZ phone number linkages

Response — *remote channel <ZZ> calls all phone numbers*

Note:

Linking Remote Channels to phone numbers is different than linking one Remote Channel to another Remote Channel. The latter is discussed in section F.12.

F.11 Alarm Trip Delays

The alarm trip delay commands here apply only to criteria violations. See code 4907 for the COMALARM trip delay. See codes 4921 and 4922 for network alarming.

4 6 ZZ

Function — Reads channel number ZZ alarm trip delay.

Response — *remote channel <ZZ> alarm trip delay is <v> seconds*

*4 6 ZZ **

Function — Sets channel number ZZ alarm trip delay to 2.0 seconds.

Response — *remote channel <ZZ> alarm trip delay is 2.0 seconds*

4 6 ZZ V

Function — Sets RCZZ individual alarm trip delay to V.

Response — *remote channel <ZZ> alarm trip delay is <V> seconds*

F.12 RC Linking/Network Bridging

The commands detailed in this section allow data to be passed between any two remote channels. Applications include passing data between nodes on compatible and incompatible networks, updating status registers in DCS systems, or exporting the Verbatim physical I/O to remote nodes. One channel acts as a data "source" and the second as a data "destination". Data is read from the source channel's net address and then written to the destination channel's net address once per scan loop. The destination and source are said to be "linked".

F.12.1 Linking Modes

The linking functions can work in one of two modes. In Data Link mode, the data read from the source is written directly to the destination. In the absence of communication problems, each destination channel is updated with a frequency equal to the Verbatim scan time. If there is a communications problem reading data from the source, then nothing is written to the destination.

In Alarm Link mode, the source channel data is first interpreted against the configured alarm criteria. If any alarm condition exists at the SRC channel, then a 1 is written to the DST. Otherwise, 0 is written. Any communications problem reading from the source will be reflected.

For both modes, the reads and writes are attempted once per scan loop. Any required protocol conversions are handled automatically. Any problems getting data for or writing data to the destination will appear as communications errors on the source or destination RCs. The data read or written is subject to RC initialization and the worst-case scan loop latencies. See Section F.7 for details.

F.12.2 Commands & Limitations

The commands below establish the channel linkage configurations. There are several rules and restrictions as follows:

1. Both the source and destination RCs must already be configured with net addresses. If this is not the case, then an error message is given. The net address for either channel in a linked pair may be reconfigured at any time, without altering the link.
2. If the RC specified as source is already configured as destination for any other linked pair, then an error message is given. Similarly, if the RC specified as destination is already configured as source for any other linked pair, an error message is given. This prevents "chaining" of linked pairs.

3. If the RC specified as destination is already configured as the destination for another source, then the new configuration supersedes the old one. No error message is given. This prevents the configuration of multiple sources for a single destination. The user must take care that distinct destination channels do not have identical net addresses. Multiple destinations for a single source are allowed.
4. If either the source or destination RC are "DISARMED", then its criteria will be reset to "NETERR". This alteration will be announced. All other existing criteria are accepted without alteration. Once a link is configured, any attempt to DISARM either the source or destination results in an error message. All other criteria modifications are allowed. Note however that it rarely makes sense to have destination criteria of anything other than "NETERR" or "NOALARM".
5. The linking of channels with different data types is allowed. For example, it is OK to have a discrete source linked to an analog destination. Special data conversion rules apply and are presented in the table below.

Conversion Rules

Source	*Dest.*	*Destination Value*
16 or 32 bit	1 bit	0 if source is 0, otherwise 1
1 bit	16 bit	0 if source is 0, otherwise 1
1 bit	32 bit	0.0 if source is 0, otherwise 1.0
16 bit	32 bit	floating point number with integer value equal to the source value
32 bit	16 bit	garbage: least significant 16 bits of the source value, however encoded

6. If the destination channel is read-only (i.e. a PLC input register) then a COMALARM will result.

*4 7 ZZ * YY*

Function — Establishes an alarm mode link with RC ZZ as the source channel and YY as the destination channel. Channel ZZ's alarm status will be written to YY's net address once per scan loop. A 1 is written if any alarm exists, otherwise zero.

Response — *remote channel ZZ alarm link to remote channel YY* or, *remote channel (ZZ,YY) not programmed*, if no net address, or, *remote channel (ZZ,YY) already linked*, if multiple sources, or link chain would result.

*4 7 ZZ * YY **

Function — Establishes a data mode link with RC ZZ as the source channel and YY as the destination. The value from ZZ's net address is written to YY's net address once per scan loop.

Response *remote channel ZZ data link to remote channel YY* or, *remote channel (ZZ,YY) not programmed*, if no net address, or, *remote channel (ZZ,YY) already linked*, if a link chain would result.

The commands listed below report or clear existing link configurations. When a link is cleared, the net address and criteria for both channels are untouched. Operation of the source channel is unchanged. In fact, the only change is that the destination channel will no longer write any data to the remote address. Rather, it begins to read the remote address and will alarm according to the existing criteria, just like the source or any other remote channel.

4 7 ZZ

Function Reports all linked channel pairs using ZZ as either source or destination channel. If ZZ is 00, then the set of all linked channel pairs is listed.

Response *remote channel <ZZ,XX> <data,alarm> link to remote channel <YY,ZZ>*

4 7 ZZ-0

Function Clears all linked channel pairs using ZZ as either source or destination channel. If ZZ is 00, then the set of all linked channel pairs is cleared.

Response *remote channel ZZ link to remote channel YY is cleared* or, *remote channel ZZ is not linked*, if no such link existed, or, *all remote channel links cleared*, if ZZ is 00.

*4 7 ZZ * YY-0*

Function Clear specific link using ZZ as source and YY as destination.

Response *remote channel ZZ <data,alarm> link to remote channel YY is cleared.* or, *no link*, if such a link does not exist.

F.13 Communications Parameters

All commands in this section allow the 'net' parameter to be omitted, in which case the default network is used. If either 'net' or the default net (see code 4910) is 0, the command has no effect. If the '*' is omitted, then the current setting is spoken. If '*' is present and 'N' omitted, then the parameter is set to it's default. If 'N' is present, then '*' must precede it.

If the protocol currently configured on any specific net forbids alteration of a parameter, then the command is ignored and the "Enter program code" message is announced. The defaults for each parameter are also network dependent.

4 9 00 net

Function Announces the current setting of all applicable parameters.

Response See all codes below

*4 9 00 net **

Function — Resets all applicable parameters to their factory default.
Response — See all codes below

F.13.1 Serial Port Parameters

*4 9 01 net * N*

Function — Read/set baud rate for net to N. If present, N must be: 50, 75, 110, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 57600. Any other values are ignored.
Response — *<net ID message> baud rate is <N> .*

*4 9 02 net * N*

Function — Read/set data bits for net to N. If present, N must be one of: 5, 6, 7, or 8. Any other values will be ignored.
Response — *<net ID message> data bits are <N>*

*4 9 03 net * N*

Function — Read/set stop bits for net to N. N must be 1 or 2. Any other values will be ignored.
Response — *<net ID message> stop bit is <N>*

*4 9 04 net * N*

Function — Read/set parity for net. If present, N=0 is NO parity, N=1 sets ODD parity and N=2 sets EVEN parity for net, N=3 for SPACE parity, N=4 for MARK parity. Any other values will be ignored.
Response — *<net ID message> parity is <even, odd, space, mark>*

F.13.2 Network Parameters

*4 9 05 net * N*

Function — Read/set local node address for net to N. The allowable range for N is protocol dependent. Illegal values are ignored.
Response — *<net ID message> node number is <N>*

4 9 06 net

Function — Read protocol for network.
Response — *<net ID> protocol is <current protocol>*

F.13.3 Timing Parameters

*4 9 07 net * V*

Function — Reads/sets communications alarm trip delay. Communications errors for all RCs on net must persist continuously for V seconds before a COMALARM violation is registered.
Response — *<net ID> communication alarm trip delay is <V> seconds*

*4 9 08 net * N*

Function — Reads/sets link-level timer. Units are milliseconds. Usage of this timer is protocol dependent and described in the appendices. In general, this parameter is the maximum time the Verbatim will wait for the response from a communications co-processor or interface module.

Response — *<net ID> link limit time is <N> mseconds*

*4 9 09 net * N*

Function — Reads/sets application-level timer. Units are milliseconds. This value is the maximum amount of time the Verbatim will wait for another node to respond to any command.

Response — *<net ID> message limit time is <N> mseconds*

F.14 Miscellaneous

*4 9 **

Function — Repeats the previous command which began with a '4'. It is possible to add key strokes after the * and before enter, subject to limit of 65 total keystrokes. The added key strokes are not concatenated for subsequent 49* commands.

Response — appropriate to actual command resulting

In the following, N may be omitted, in which case the current value is only announced, not altered. The values apply to all commands expecting a net or node value to be specified. They allow fewer keystrokes to be used when programming net addresses and other commands.

4 9 10 N

Function — Read/set default net number to N. N must be 0-5, consistent with the hardware options.

Response — *Default net address network is N*

4 9 11 N

Function — Read/set default node number to N. Allowable values for N are protocol dependent.

Response — *Default net address node is <N>*

F.15 Clear-Out Operations

*4 9 3 * net*

Function — Globally disables/enables RC polling on the specified network. Acts as a toggle, so two consecutive entries cancel each other out. No RC programming is erased.

Response — *<net ID> communication is (off, on)*

4 9 35 4

Function — Clears all RC user recorded messages.

Response *All remote Channel messages cleared*

4 9 35 5

Function Clears all RC configuration data: network addresses, criteria, links.

Response *All remote channels reset*

4 9 35 8

Function Clears out all communications failure codes and counts.

Response *Communication error count overall reset*

4 9 35 9

Function Does all the 4935 functions. NOTE, ONLY the RC configuration is affected.

Response *Verbatim RC programming requires Firmware Revision*

F.16 Diagnostic Readouts

In the following, N may be omitted, in which case the current value is only announced, not altered.

4 9 2 <net>

Function Reads current value for Network Failure threshold. The LED indicator will blink and a Network Failure Alarm will register when this value is exceeded.

Response *<net ID> network status alert setpoint is <N>*

4 9 2 <net> <<N>>*

Function Sets current value for Network Failure threshold. Use N=200 to disable the network failure indicator.

Range for N 0-200

Default 0

Response *<net ID> network status alert setpoint is <N>*

*4 9 30 * net*

Function Perform a diagnostic self-test on specified network. Depending on protocol and LDL configuration, diagnostic counters may be printed and/or reset.

Response *<net ID> communication test is <normal, errcode>*

4 9 40

Function Read all 4940x diagnostic info for all networks.

Response See error/diagnostic code list in section F.17.

Note:

In the following, 'net' may be omitted, in which case the information for the default network is annunciated.

*4 9 40 * net*

Function Read all 4940 diagnostic info for <net>

Response see commands below

4 9 40 1

Function — Read time to complete RC table scan
Response — *scan time is <time> seconds*

4 9 40 2 net

Function — Read network status code for specified network
Response — *<net ID > network status code is <code>*

4 9 40 3 net

Function — Read network alert count.
Response — *<net ID > network alert count is <count>*

4 9 40 4 net

Function — List all the node addresses whose RCs are currently experiencing communication failure.
Response — *<net ID > communication failure at node(s) <list>*

4 9 40 5 net

Function — List all RCs on net currently having communications failure.
Response — *<net ID > remote channel(s) now in communication alarm are <list>*

Note:

49405 does not report criteria-tripped alarms. The check status command (4 0 ZZ) checks all alarm conditions, communication or otherwise.

4 9 40 6 net

Function — Read diagnostic codes for last 10 network problems. Append -0 to clear the history stack.
Response — *recorded error numbers are code <n>...*

4 9 41 ZZ

Function — Read current communications status for channel number ZZ. Status reported is result of latest scan loop poll, not the communications alarm status (see 40zz)..
Response — *remote channel <ZZ> communication alarm code is <diag code>*

*4 9 41 ZZ **

Function — Read count of communication alarms for RC ZZ (add -0 to clear)
Response — *remote channel <ZZ> communication alarm count is <count>*

4 9 42 net

Function — Read list of disarmed (see code 45ZZ0) RCs
Response — *<net ID> remote channels now disarmed are <list>*

4 9 43

Function — Read list of uninitialized RCs.
Response — *remote channel(s) not programmed are <list>*

Continued on next page . . .

4 9 44

Function	Read list of all RCs not using the default criterion.
Response	*remote channels armed are <list>*

4 9 45 ZZ

Function	Reports net address, criterion, setpoints, links, and alarm status for channel number ZZ.
Response	See commands 45zz*, 45zz, 47zz*, 4941zz

F.17 Status, Diagnostic & Error Code Listing

This section lists all network status, diagnostic and communications error codes likely to be of use for customer troubleshooting. Other codes may be reported in rare instances, and information about their interpretation may be obtained from RACO customer support.

F.17.1 Network Status Codes

The Network Status code reflects the overall health of all devices connected to a specific net. The values for these codes are used both for programming the alert threshold and in reporting the current status. Whenever a specific network's status code exceeds the alert threshold the network status LED will blink and an alert message is included in all reports. There is a distinct LED and status code and threshold for each net.

The table below lists the values and interpretation for the Network Status codes and thresholds.

0	No error. All RCs and scanned nodes are operating within scan timing parameters.
1-96	Some RCs are in communications failure and have not been successfully scanned for the COMALARM trip delay period. The number of such failed RCs is equal to the code value.
101-196	Some nodes on the net have quit responding to scanning. The number of such failed nodes is computed by subtracting 100 from the code. All RCs on those nodes are in COMALARM.
200	The scan of all nodes on the network is failing.

F.17.2 Diagnostic & Communications Error Codes

The diagnostic and communications error codes are registered whenever the scan for a particular RC fails. When such an event occurs, the code is pushed onto the diagnostic history stack (see code 49406) and copied into the RC status word (see code 4941zz). These may be interrogated at any time.

If the problem occurs during selftesting or configuration, the code is reported immediately. During normal scanning, the problem must continue for the COMALARM trip delay period before a communications alarm for that RC is triggered. The report for that alarm will then mention the code. The network status code is then updated appropriately. See table on next page.

The table below lists the values and interpretations for the most common error situations. Note that some codes are derived directly from standard error codes supported by specific protocols. The documentation for those products is then necessary for interpretation.

0	no error condition detected
352	specified net is invalid
354	protocol doesn't support the net address format
356	request timed out with no feedback
357	node address is invalid for selected protocol
359	node/driver incompatible with address mode
360	miscellaneous error parsing address string
361	some field was duplicated in address string
362	file type specifier in address string not supported
363	couldn't parse file number field in address string
364	couldn't map the I/O slot specified in address string
365	couldn't parse element field in address string
366	couldn't parse subelement field in address string
367	couldn't parse bit field in address string
368	too many routing nodes specified in address string
369	some routing node has illegal syntax
370	transaction aborted at user request
390	source channel data not available for RC link
410	no traffic received from the net
430	timeout with no recognizable response
431	timeout with no response at all
501	transaction took too long to transmit
601- 608	AEG/MODICON exception codes. That code can be determined by subtracting 600 from this code.

Refer to F.5, "General Modbus Reauirements," for details.

Continued on next page . . .

700	device has not been opened
705	DUART not present
710	net not configured with PLC-type protocol
715	bad serial io configuration parameter
725	background noise on network substrate
730	another modbus master already active
731	mbplus peer in monitor-on-line state
732	mbplus peer never getting token
735	diagnostic loopback test failed
750	a remote node has same node address
755	could not find any nodes on network
1540	NAK count limit exceeded for transmit msg
1541	ENQ count limit exceeded for transmit msg
1561	timeout waiting for response to command
2278	RAM allocation failed
2279	hardware failed self-test at warmstart
2280	cannot access net hardware

PLC Programming Code Table (Page 1 of 4)

Code	Description	Default	Range	Section
Remote Channel Status, Reading and Writing to PLC Data Register				
40ZZ	Read alarm status of Remote Channel ZZ		ZZ=0 to 96	F.8
40ZZ*	Read data register associated with RC ZZ		ZZ=0 to 96	F.8
40ZZ*N	Write value N to data register associated with RC ZZ		ZZ=0 to 96, N=0 to 65535	F.8
Remote Channel Message Recording and Reviewing				
4100 net	Record network ID message		net=1 to 5	F.9
41ZZ N	Record Remote Channel ZZ ALARM/PREAMBLE message at recording rate N (N is optional)	See Code 913	ZZ=1 to 96, N=1 to 4	F.9
42ZZ N	Record Remote Channel ZZ NORMAL/EPILOGUE message at recording rate N (N is optional)	See Code 913	ZZ=1 to 96, N=1 to 4	F.9
43ZZ	Review both Remote Channel ZZ messages (ZZ=0 for network ID messages)		ZZ=1 to 96	F.9
Remote Channel Programming (Configuration)				
4500	Sets current status as NORMAL for all RCs			F.10.2
45ZZ	Reads alarm criteria for RC ZZ		ZZ=1 to 96	F.10.2
45ZZ * net *node *addr *	Associate RC ZZ with specified network address		ZZ=1 to 96	F.10.1
45ZZ *	Read back the net address (net/node/addr) assoc. with RC ZZ		ZZ=1 to 96	F.10.1
45ZZ0	Disables Remote Channel ZZ		ZZ=1 to 96	F.10.2
45ZZ1	Sets alarm criteria to NORMALLY 1		ZZ=1 to 96	F.10.2
45ZZ2	Sets alarm criteria to NORMALLY 0		ZZ=1 to 96	F.10.2
45ZZ3	Sets alarm criteria to NO ALARM Status reporting only		ZZ=1 to 96	F.10.2
45ZZ4	Sets alarm criteria to NETERR mode		ZZ=1 to 96	F.10.2
45ZZ5 N	Sets analog low setpoint to N		ZZ=1 to 96, N=0 to 65535	F.10.2
45ZZ6 N	Sets analog high setpoint to N		ZZ=1 to 96, N=0 to 65535	F.10.2

PLC Programming Code Table (Page 2 of 4)

Code	Description	Default	Range	Section
Alarm Call Grouping				
45ZZ 9	Reads RC ZZ alarm call grouping linkage			F.10.3
45ZZ 9 DN	Links RC ZZ to phone numbers DN			F.10.3
45ZZ 9 *	Clears all RC ZZ alarm call linkages.			F.10.3
Alarm Trip Delays				
46ZZ	Reads Remote Channel ZZ alarm trip delay			F.11
46ZZ V	Set RC ZZ individual alarm trip delay to V	none	.1 - 9999.9 sec	F.11
46ZZ *	Resets RC ZZ individual alarm trip delay back to default of 2.0 sec.			
Remote Channel Linking/Network Bridging				
47ZZ * YY	Establish Alarm Link. ZZ source, YYdestination			F.12
47ZZ * YY *	Establish Data Link. ZZ source, YYdestination			F.12
47ZZ	Report all linked channel pairs using ZZ as source or destination. If ZZ=0 reports all linked channel pairs.			F.12
47ZZ -0	Clears all linked pairs using ZZ as source ordestination If ZZ=0 clears all linked channel pairs.			F.12
47ZZ * YY -0	Clear Specific Link using ZZ as source and YY as dest.			F.12
Serial Communications Parameters				
Note: See Code 4910 for default value for "net" in all of the following				
4900 net	Announces the current settings of all serial parameters for "net"			F.13
4900 net *	Resets all serial parameters for "net" to their factory defaults		See Below	F.13
4901 net *N	Read/Set baud rate for net to N	9600	50-57600	F.13.1
4902 net *N	Read/Set data bits for net to N	8	7 or 8	F.13.1
4903 net *N	Read/Set stop bits for net to N	1	1 or 2	F.13.1

PLC Programming Code Table (Page 3 of 4)

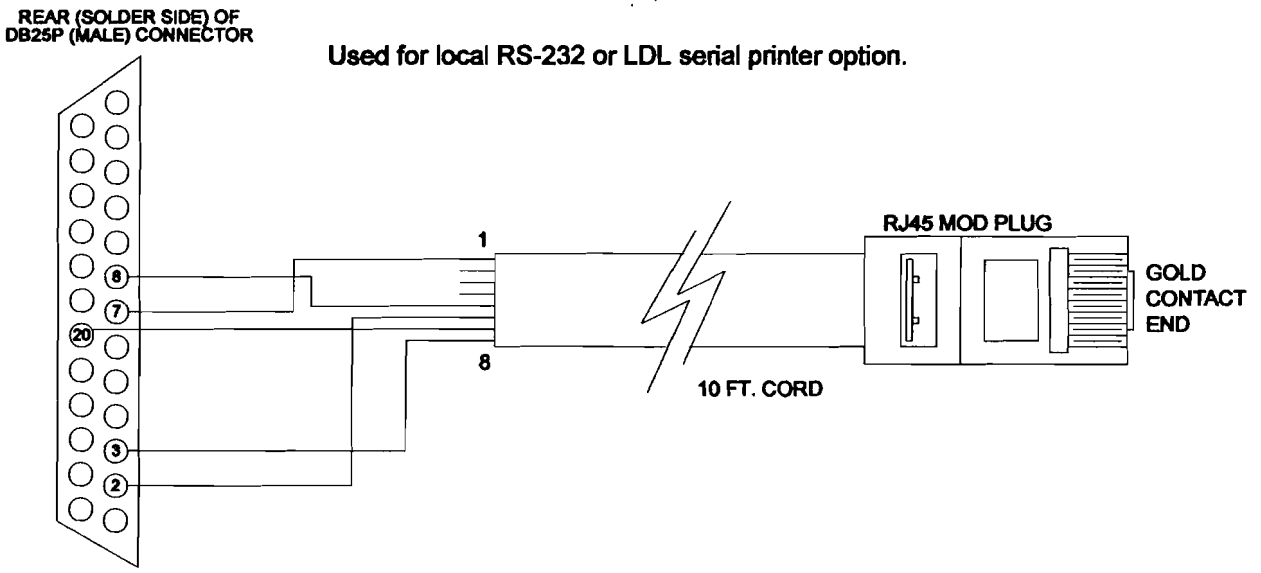
Code	Description	Default	Range	Section
Serial Communications Parameters . . . *Continued from p. F-26*				
Note: See Code 4910 for default value for "net" in all of the following				
4904 net *N	Read/Set parity for net	protocol dependent	odd, even, none	F.13.1
4905 net *N	Read/Set local node address for net to N	1	1-256	F.13.2
4906 net	Read protocol type for net N	Factory Configured	Not user settable	F.13.2
4907 net *N	Read/Set COMALARM Trip Delay	30 sec.	N=0.1-999.9 sec.	F.13.3
4908 net * V	Read/Set link-level timer.	Protocol Specific	V is in msec.	F.13.3
4909 net * V	Read/Set applications-level Timer	Protocol Specific	V is in msec.	F.13.3
49 50	Reads/Sets all protocol	varies	See applicable notes	F.13.4,
Miscellaneous				
49 *	Repeat the previous command which began with a '4'			F.14
4910 N	Read/Set default net to N	1	1 to 5	F.14
4911 N	Read/Set default node to N	1	protocol dependent	F.14
Clearout Operations				
493 *net	Globally disables/enables network communications		Acts as toggle	F.15
4935 4	Clears all RC user recorded speed messages			F.15
4935 5	Clears all RC net addresses and criteria			F.15
4935 8	Clears out all communications failure codes and counts			F.15
Diagnostic Readouts				
Note: See Code 4910 for default value for "net" in all of the following				
49 2 net	Reads current Network Failure threshold for net			F.16
49 2 net *N	Set Network Failure threshold to N		0 - 200	F.16
49 30 *net	Perform diagnostic self-test on specified net			F.16
49 40	Reads all 4940 X diagnostic for all networks			F.16
49 40 *net	Reads all diagnostic information for net			F.16

PLC Programming Code Table (Page 4 of 4)

Code	Description	Default	Range	Section
Diagnostic Readouts . . . *Continued from p. F-27*				
Note: See Code 4910 for default value for "net" in all of the following				
49 40 1	Reads time to complete RC table scan			F.16
49 40 2 net	Reads communications alert status for net			F.16
49 40 3 net	Reads communications alert count for net (Append with 0 to clear count)			F.16
49 40 4 net	Reads all node address whose RCs have current communications failure			F.16
49 40 5 net	Reads all RCs on net currently having communications failure			F.16
49 40 6 net	Reads diagnostic codes for last 10 network problems			F.16
49 41 ZZ	Reads communicatons status for RC ZZ			F.16
49 41 ZZ*	Reads count of COMALARMS for RC ZZ			F.16
49 42 net	Reads list of disarmed (code 45ZZ0) RCs			F.16
49 43	Reads list of uninitialized RCs			F.16
49 44	Reads list of all RCs not using the default alarm criteria			F.16
49 45 ZZ	Reports net address, alarm criteria, setpoints, links and alarm status for RC ZZ			F.16

G Cabling Diagrams

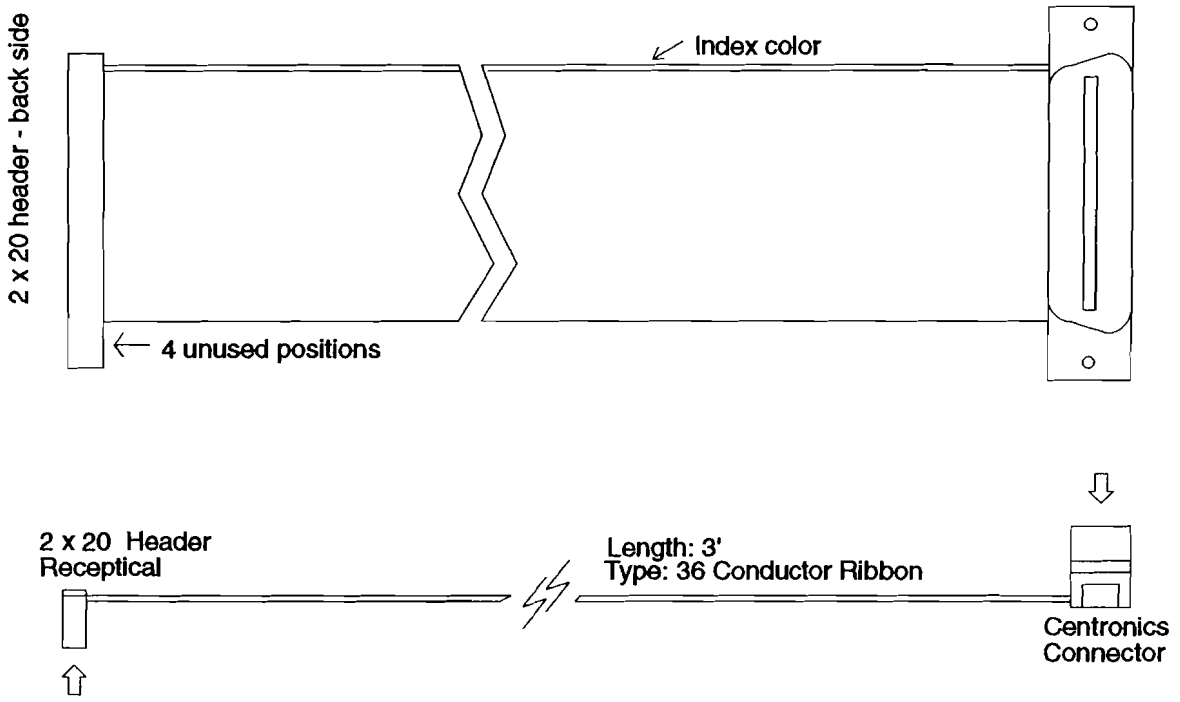
G.1 RACO VSER-01 Serial Cable Connection Diagram



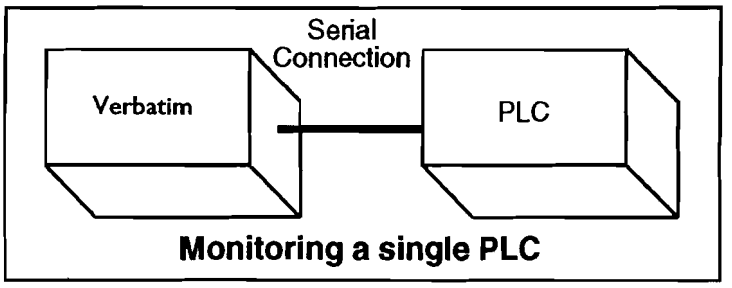
25 Pin Connector Pin-Out		
2	RXD	Data to VB
3	TXD	Data from VB
7	SGND	Signal Ground
8	DCD	Carrier Detect - Handshake Out (not used)
20	DTR	Data Terminal Ready - Handshake In (not used)

G.2 RACO VPPC-1 Parallel Cable Connection Diagram

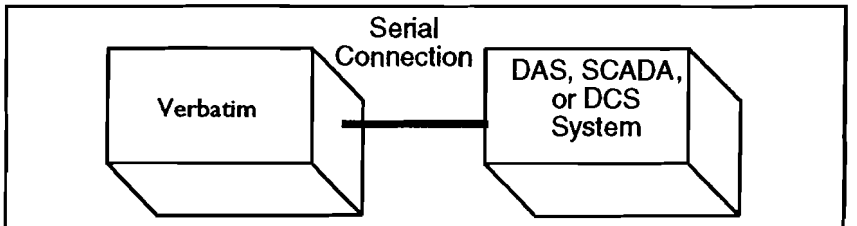
Used for LDL parallel printer option



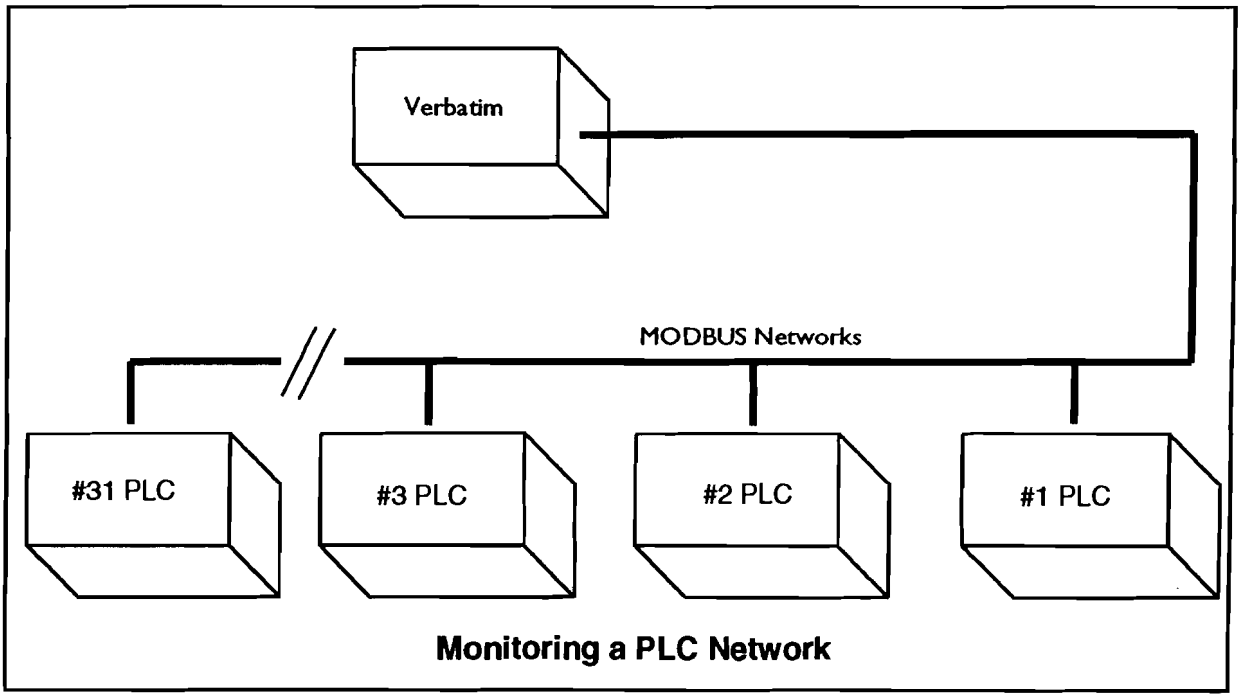
G.3 Verbatim PLC Network Connections Diagram



Monitoring a single PLC



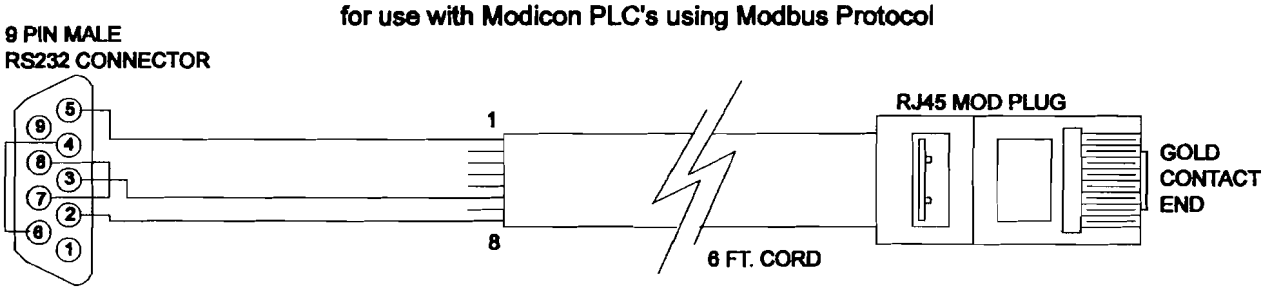
Monitoring a system with compatible device interface



Monitoring a PLC Network

G.4 RACO VMB-2 Serial Cable Connection Diagram

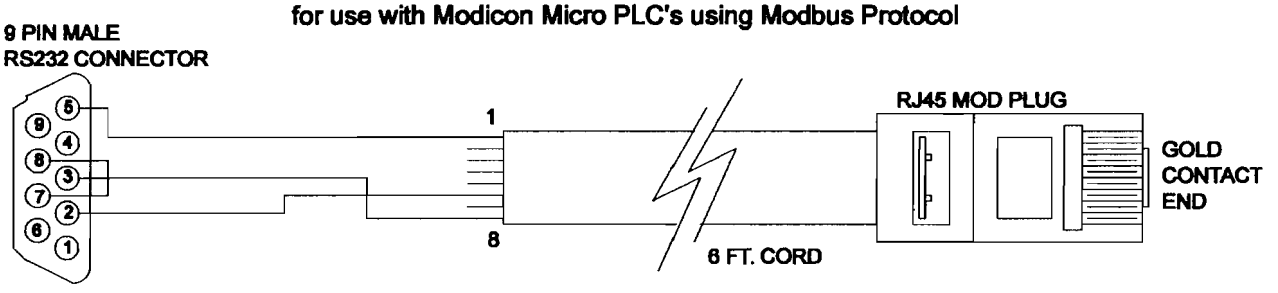
for use with Modicon PLC's using Modbus Protocol



9 Pin Connector Pin-Out		
2	TXD	Data from Verbatim
3	RXD	Data to Verbatim
4	DSR	Data Set Ready - Jumpered to DTR at 9 pin conn. only
5	SGND	Signal Ground
6	DTR	Data Terminal Ready - Jumpered to DSR at 9 pin conn. only
7	RTS	Request to Send - Jumpered to CTS at 9 pin conn. only
8	CTS	Clear To Send - Jumpered to RTS at 9 pin conn. only

G.5 RACO VMBM-1 Serial Cable Connection Diagram

for use with Modicon Micro PLC's using Modbus Protocol



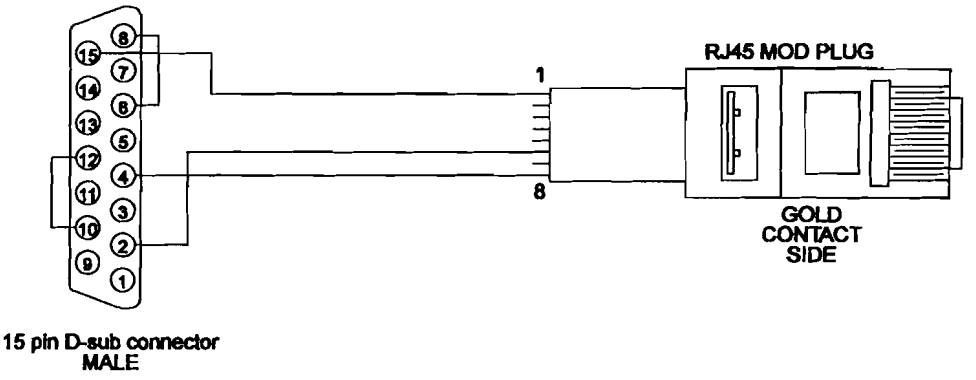
9 Pin Connector Pin-Out		
2	RXD	Data to Verbatim
3	TXD	Data from Verbatim
5	SGND	Signal Ground
7	RTS	Request to Send - Jumpered to CTS at 9 pin conn. only
8	CTS	Clear To Send - Jumpered to RTS at 9 pin conn. only

Note:

Connection to Modicon Micro PLC requires use of Modicon Cable Part Number 110XCA28201, 110XCA28202, or 110XCA28203 plus adaptor 110XCA20300. This combination of cable plus adaptor mates with above RACO cable. The Modicon cable is a flat, eight wire cable with RJ-45 male connectors on each end. The Modicon adaptor is an RJ-45 female to D-sub 9 Pin female adaptor.

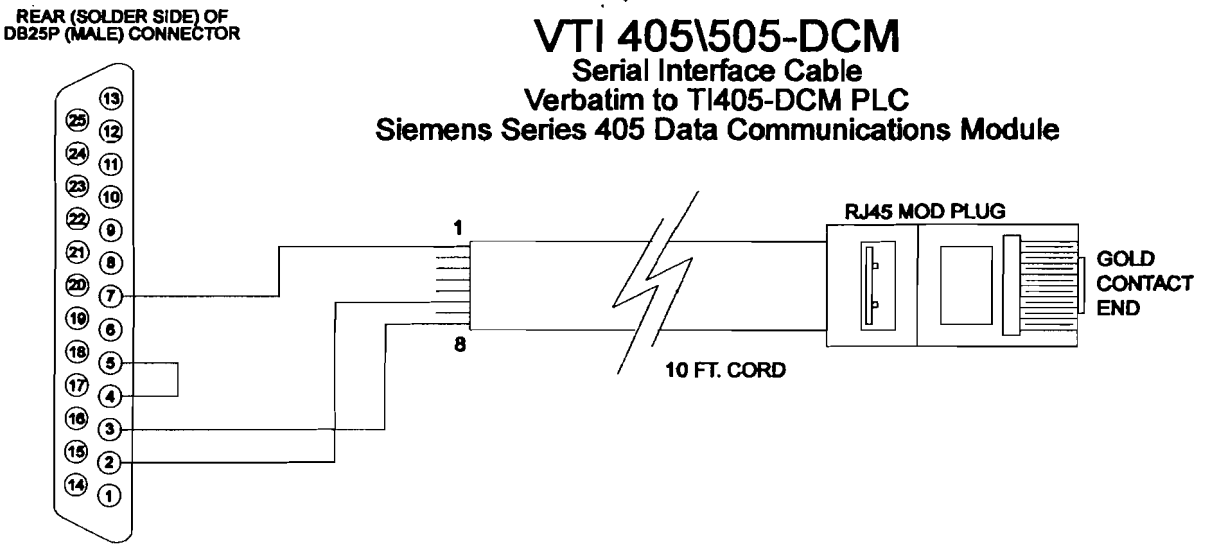
G.6 RACO VBB-1 Serial Cable Connection Diagram

for use with Bristol Babcock DPC 3330 or 3335



15 Pin Connector Pin-Out		
2	RXD	Data to Verbatim
4	TXD	Data from Verbatim
6	JUMP	Jumpered to pin 8
8	JUMP	Jumpered to pin 6
10	JUMP	Jumpered to pin 12
12	JUMP	Jumpered to pin 10
15	SGND	Signal Ground

G.7 VTI 405/505-DCM Serial Cable Connection Diagram



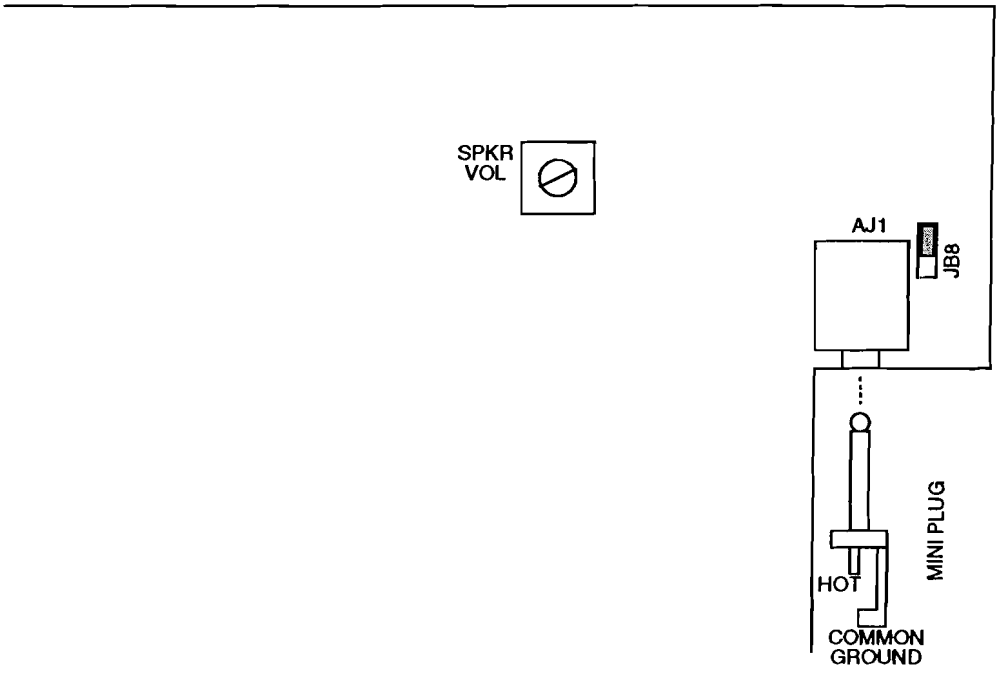
25 Pin Connector Pin-Out		
2	RXD	Data to VB
3	TXD	Data from VB
7	SGND	Signal Ground

H Verbatim Floobydust

H.1 Adjusting Internal Speaker Volume

Speaker volume may be adjusted via the trimpot marked SPKR VOL located in the upper right hand area of the main circuit board.

This trimpot also adjusts the level of the audio signal that can be obtained via jack AJ1. However, sensitive audio systems may require an additional signal level attenuator in order to prevent overloading.



H.2 External Speaker Connections

An audio output suitable for driving an external speaker of 4 to 16 ohms impedance, headphones, or other audio system, is available via jack AJ1, located in the upper right hand area of the main circuit board. This jack must be configured to deliver audio signal output by placing a jumper shunt across the upper pair of pins on the three-pin header JB8, located next to AJ1.

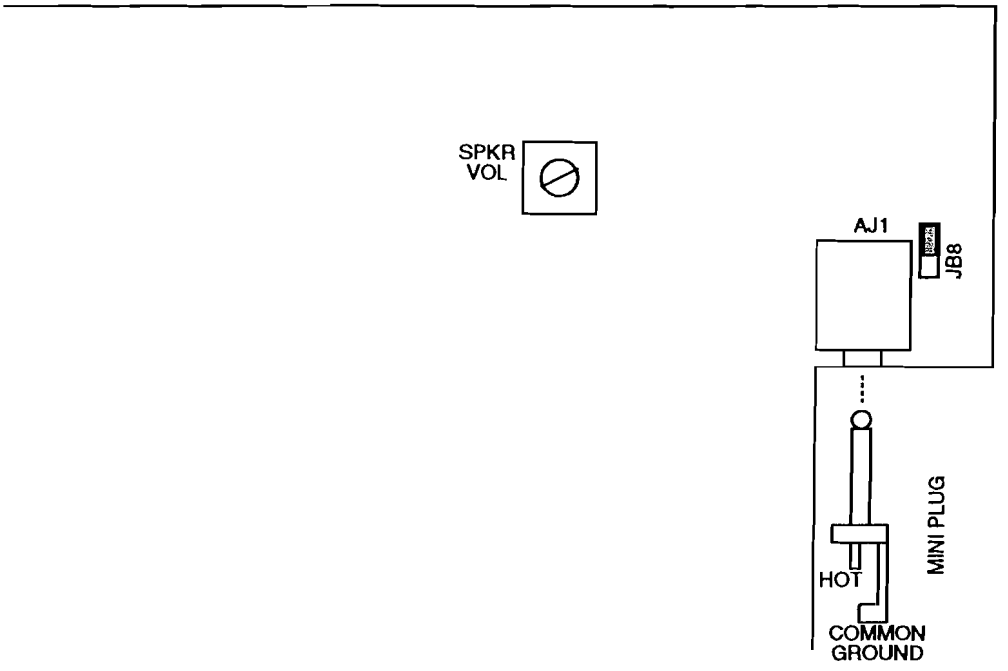
Note that AJ1 is a dual purpose jack which may be used either for audio output or DC power input, but not for both simultaneously.

To make connection with AJ1, use a standard single-circuit "MINI" plug. The tip end will be the audio signal; the shell will be ground.

The output signal has a nominal impedance of 8 ohms and a nominal average amplitude of 1 volt RMS, when the audio level trimpot, described below, is set to full clockwise position.

H.2.1 Specifications for Audio Output from Jack AJ1

Nominal output impedance	8 ohms
Nominal average output amplitude with 8 ohm load	1 VRMS



H.3 Alternative Power Sources

As an alternative to the 120 VAC input, an external DC power source can be used. The DC power source should have a current capacity of at least 500 ma DC and a voltage from 8 to 14 VDC. Actual current consumption will be approximately 250 ma standby and 375 ma while phoning and speaking, plus whatever current is required to charge the internal 6 volt, 4 AH gel-cell battery. This supplemental charging current will be roughly 25 ma when the battery is already fully charged, and up to 200 ma if the battery is being recharged after a discharge. Option cards such as analog, remote supervisory control etc. will also moderately increase the current being drawn.

DC power should be connected via a standard single-circuit "MINI" plug, inserted into jack AJ1 located in the upper right hand corner of the main circuit board. This jack must be configured to accept DC power input by placing a jumper shunt across the lower pair of pins on the three-pin header JB8, located next to AJ1. **The positive (plus) side of the power source must go to the end "tip" of the plug; reversing this polarity can damage the product.**

Note:

Note that AJ1 is a dual purpose jack which may be used either for audio output or DC power input, but not for both simultaneously. Note also that the AC power fuse FU1 is bypassed with this configuration. It should be removed to avoid confusion.

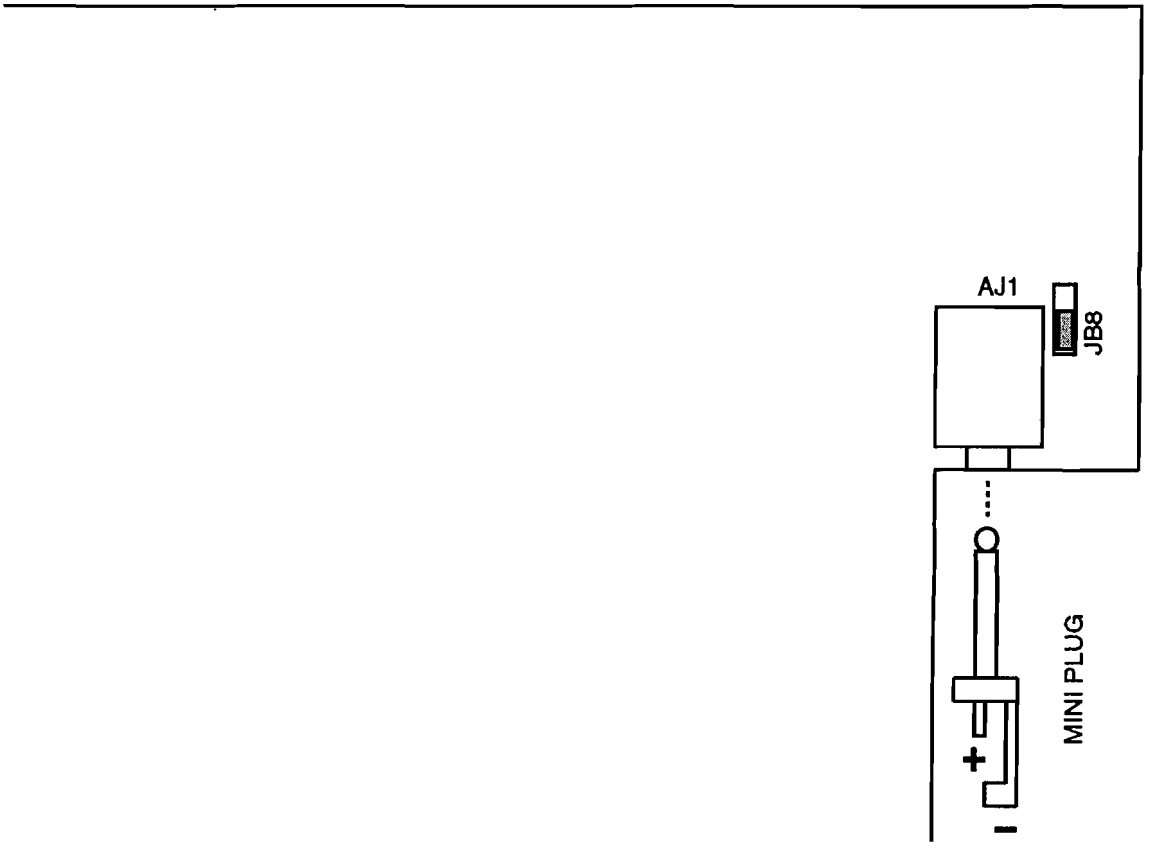
The front panel ON/OFF control will operate as with standard 120 VAC power input. If the external power source is interrupted, the unit will switch to gel cell battery power and go into power failure alarm.

The Verbatim autodialer is capable of being powered by other types of power source, including 240 VAC, on special order. Contact factory for details.

H.3.1 Standard DC Power Power Specifications

Input voltage range	8-14 VDC
Recommended minimum current capacity	500 ma DC
VSS-4C-32 current drawn, less battery, standby	275 ma
VSS-4C-32, less battery, phoning/talking	400 ma
Added current to maintain charged battery	25 ma
Added current to charge discharged battery	200 ma

DC Power Connection Diagram



H.4 Speech Recording Times

The following is a table of available speech recording times on Verbatim autodialer.

To find the available amount of speech recording time, first determine the total number of channels on the unit, then find the corresponding row indicating the number of seconds of speech recording time at the various recording rates.

Example: A VSS-4C-32, has a total of 36 channels (4 contact and 32 plc channels). Therefore the available recording times are 130, 200, 270 or 399 seconds, depending upon which recording rate is selected by the user.

Total# OF Channels	# OF RAM CHIPS	# OF Seconds @ Rate1	# OF Seconds @ Rate2	# OF Seconds @ Rate3	# OF Seconds @ Rate4
1-8	1	26	40	54	79
9-16	2	52	80	108	159
17-24	3	78	120	162	237
25-32	4	104	160	216	318
33-40	5	130	200	270	399
41-48	6	156	240	324	476
49-56	7	182	280	378	555
57 UP	8	208	320	432	624

The above table indicates the recording times that are shipped standard. However on special order, the available recording time can be increased to correspond with any row in the table.

H.5 PBX Support

Interfacing the Verbatim to PBX or PABX phone systems can occasionally present problems. Some PBXs have a non-standard dialtone. Additionally, in many PBXs, you must first press a special key, like a '9' to get an outside line. After pressing the '9' there may be a short delay followed by the dialtone for the outside line.

By turning OFF Phone Fault Detection you can avoid problems with non-standard dialtones from your PBX system. Then Phone Fault Detect will not falsely indicate a telephone line interruption.

Even with Phone Fault Detect OFF you can still accomplish dialtone detection on outside lines. Simply add the Tone Detect key sequence to the phone number string after the '9' or other digit to request an outside line.

H.5.1 Cautionary Notes About Interfacing to PBXs

Must Be an Analog Line

Some PBX systems are either partially or entirely digital. That is, voice and signaling information is converted to a digital representation. Voice information arriving at the PBX from the outside is converted from analog to digital. Voice information leaving the PBX to the outside is converted from digital to analog. Phone sets within a digital system may be interfaced by digital signals only. In such systems it may be difficult, but usually not impossible, to obtain a "standard" analog phone line to use in interfacing devices such as a Verbatim . It may be necessary to contact the vendor of your PBX system for information on addition of analog lines.

Lines Can Cause Damage

Caution is advised. Some telephone lines within digital PBXs present voltages which can be dangerous to RACO's equipment. If you are attempting to interface a Verbatim inside of a PBX it would be a good practice to have the phone line you intend to use checked for "unusual" voltages and signals.

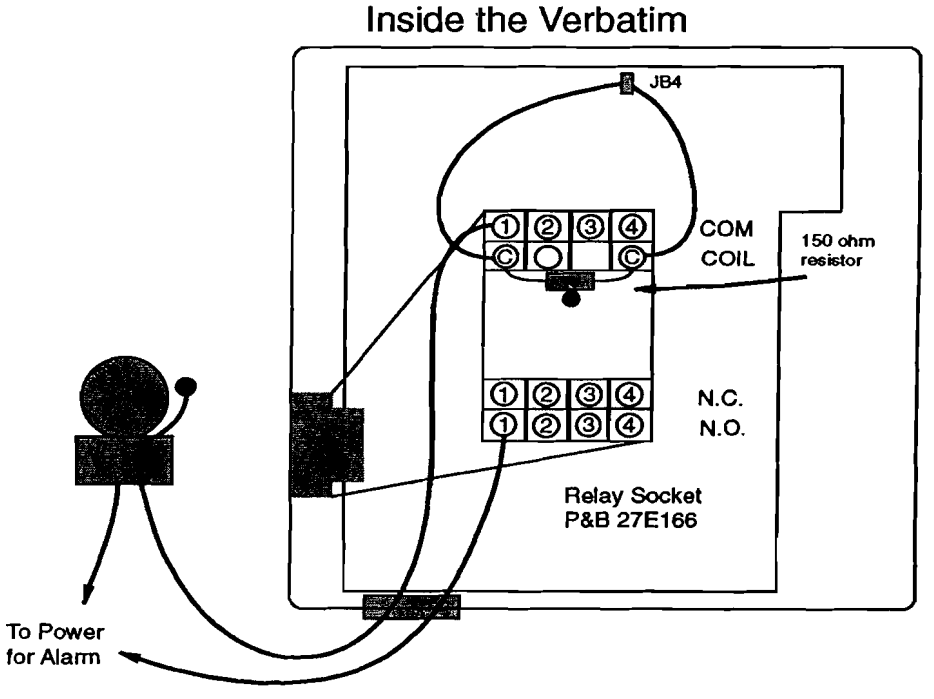
With few exceptions, if you can get a standard telephone set to word on a PBX line then you will be able to make the Verbatim work as well.

H.6 Local Alarm Relay Option

The Verbatim provides a 5 volt output that is turned on whenever the unit goes into alarm. This is available at JB4, located at the top center of the main board. Use a molex style 2 pin connector to plug onto the JB4 pins. This output can activate a sensitive (500 ohm +) relay such as a Potter & Brumfield KHU-17D11-6). Connect a 150 ohm,1/4 watt resistor across the relay coil. The Potter & Brumfield relay plugs into a socket (#27E166) which is shown in the accompanying figures. Note that it has four separate circuits in SPDT form. This relay may be used for local alarm, line seizure, or both.

H.6.1 Local Alarm Relay Configuration

1. Wire the relay coil as described in the introduction.
2. Wire the local alarm to one of the four circuits of the relay. In the illustration, the numbers refer to the four separate circuits, and C refers to the coil terminals.
3. Note that the Verbatim does not provide the power for the alarm, it functions only as a switch.
4. The program code for Local Alarm Relay configuration is
   960 00 ENTER
   which is the factory default.



H.7 Line Seizure Option

Line Seizure is a feature that ensures that the dialer will seize the phone line when it goes into alarm, cutting off any phones, FAX, or answering machines that may be on line at the time (these are called the *downstream* phones, as they are *downstream* from the Verbatim). The unit waits two seconds to allow a dial tone to come up, then dials out. These phones will remain cut off until the alarm is acknowledged.

The Verbatim provides a 5 volt output that is turned on whenever the unit goes into alarm. This is available at JB4, located at the top center of the main board. Use a molex style 2 pin connector to plug onto the JB4 pins. This output can activate a sensitive (500 ohm +) relay such as a Potter & Brumfield KHU-17D11-6. Connect a 150 ohm, 1/4 watt resistor across the relay coil. The Potter & Brumfield relay plugs into a socket (#27E166) which is shown in the accompanying figures. Note that it has four separate circuits in SPDT form. This relay may be used for local alarm, line seizure, or both.

The phone jack must be an RJ-31X, which is available from the phone company or a phone supply outlet. In operation, the Verbatim plugs into the RJ-31X jack and makes contact with the middle four pins, which are the standard red, green, yellow and black wires.

Note that you may combine the Local Alarm Relay with Line Seizure feature simply by using one of the spare circuits (3 or 4) for the local alarm. It breaks the downstream connections, thereby seizing the line, then waits two seconds to allow a dial tone to come up, then dials out.

H.7.1 Line Seizure Installation

1. Wire the relay coil as described in the introduction.
2. Wire the four terminals of the telephone input terminal strip to the relay a follows (please refer to accompanying figures):

Terminal Strip	Relay
R	COM circuit #2
G	COM circuit #1
Y	N.C. circuit #1
B	N.C. circuit #2

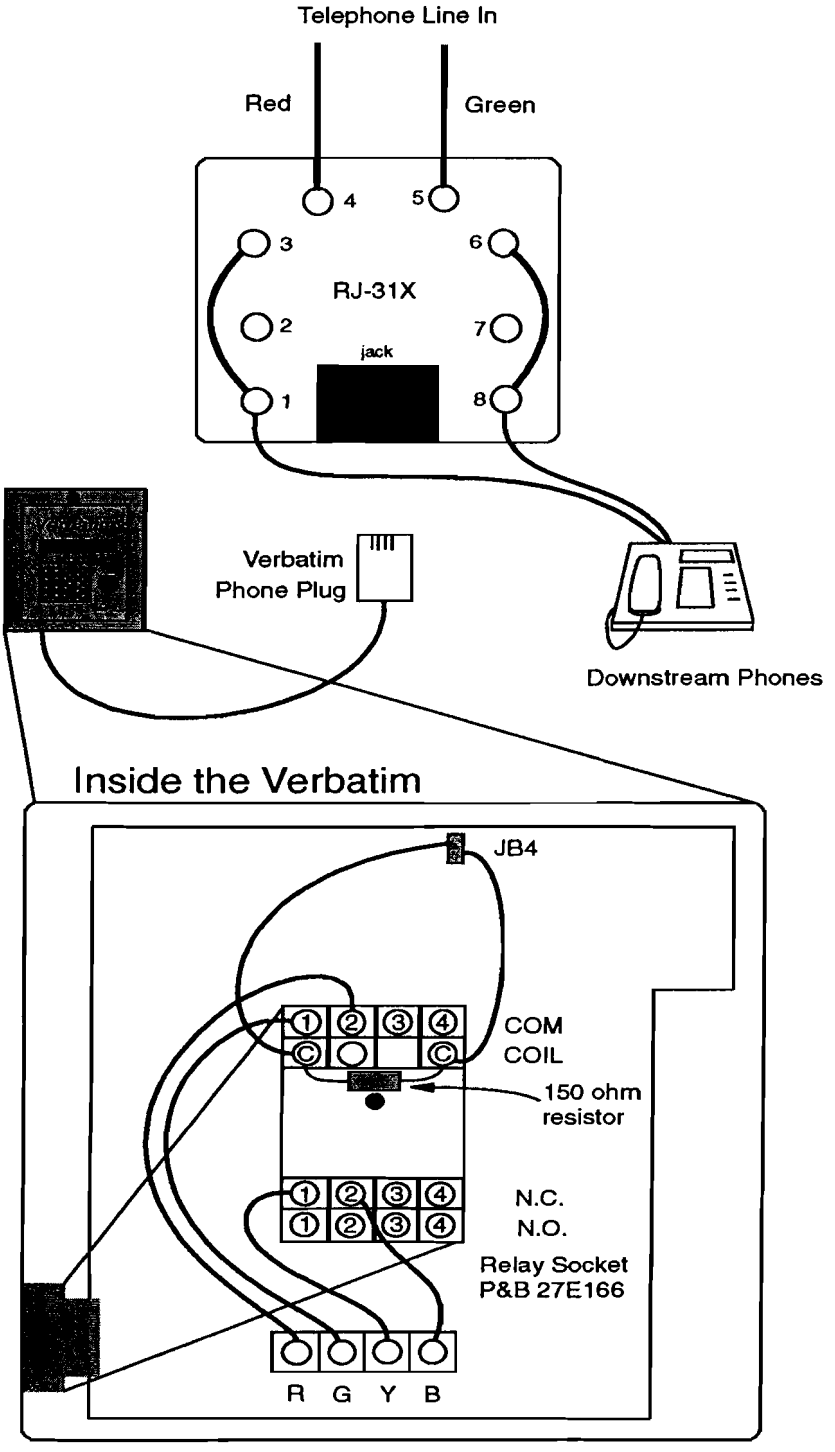
3. Wire the special RJ-31X line seizure jack as follows (refer to the accompanying figures):

   Connect a jumper wire from terminals 1 to 3 and a second jumper wire from terminals 6 to 8.

   Connect the incoming telephone line red wire to terminal 4 and the green wire to terminal 5.

   Connect the downstream extension phones to terminals 1 and 8.
4. Plug the Verbatim into the RJ-31X socket.
5. Program the Verbatim with code:
   `960 01 ENTER`
   This is the code for Line Seizure configuration of the Local Alarm Relay.

Wiring the RJ-31X Line Seizure Jack Diagram



H.8 Heater / Thermostat Option

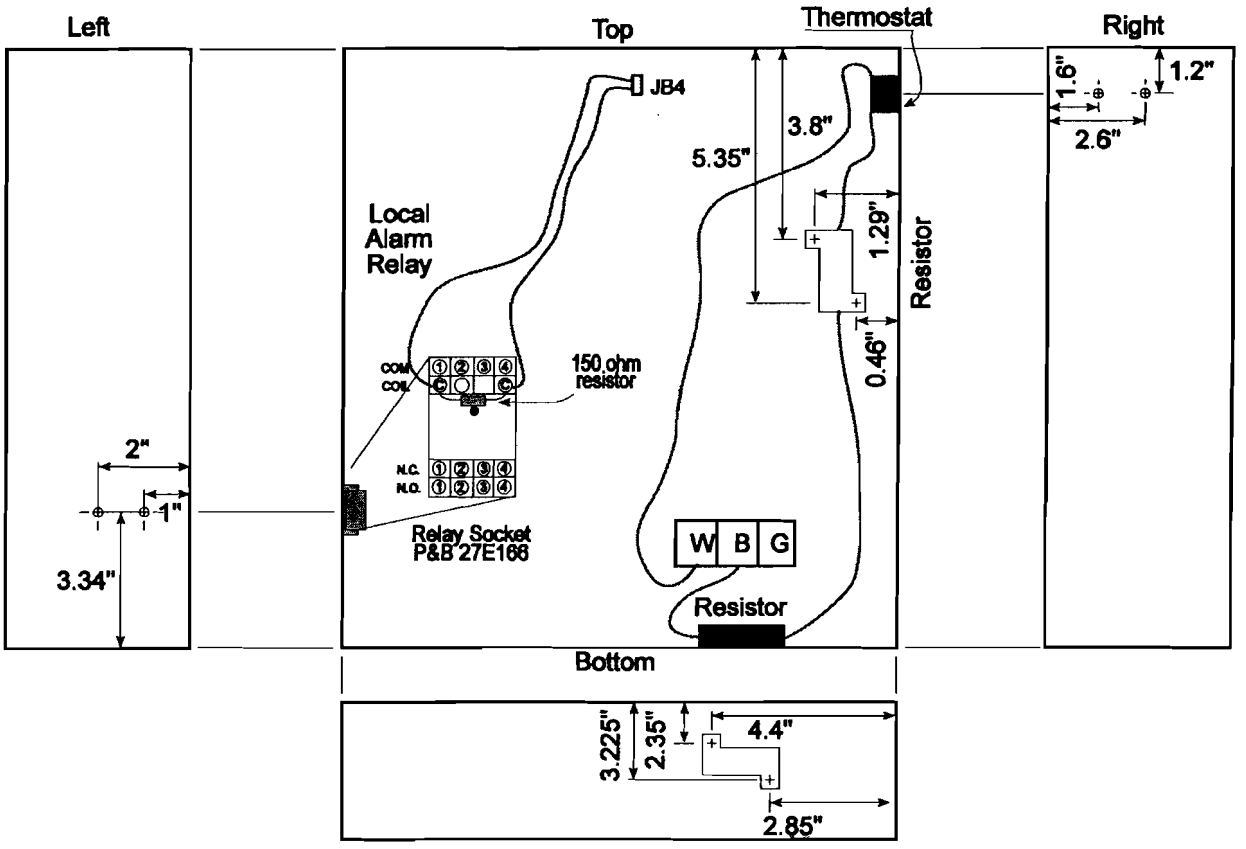
The heater/thermostat option is intended to provide warming of the product when it is exposed to particularly cold ambient temperatures.

The thermostat applies 120 VAC power to two chassis-mounted resistors, when it senses temperatures below approximately 40 degrees F. The resistors dissipate a combined 75 watts of power. The amount of temperature elevation above ambient temperature that this provides depends on the thermal insulation of the enclosure and "heat sinking" into the surface which the unit is mounted to. The unit's aluminum enclosure provides relatively little thermal insulation by itself. However if RACO's fiberglass NEMA 4X enclosure option is used, a temperature elevation of about 75 degrees is provided.

If the unit is to be powered by something other than 120 VAC and you need a heater/thermostat, consult factory.

Heater/Thermostat Option	
Power source required	120 VAC
Power dissipated when activated	75 watts
Nominal activation temperature	40 deg F
Nominal heat rise in fiberglass NEMA 4X enclosure	75 deg F

Heater/Thermostat Mounting and Wiring Diagram



H.9 Connecting to a Radio Transmitter

If you have a radio transmitter that can provides for external connection of an audio signal input and also for connection of an external contact closure to key on the transmitter, you may connect it to the Verbatim autodialer. However you should also consider the alternative of using RACO's CELLULARM cellular phone system, which provides a superior means of signalling where regular land line phone service is not available.

Note that the radio operation described below is not compatible with installation of the Telephone Line Seizure option.

To obtain the contact closure used to key on the transmitter, it is necessary to solder some special connections on the back of the main circuit board. **This step is not necessary if your unit has been supplied from the factory with the RF Interface option.**

First, disconnect the gel cell battery and remove all AC power connections. Remove any option cards. Then carefully remove the speech card located at the top of the unit, via its two mounting screws. Be careful to retain the plastic spacers located behind these screws, for use when replacing this speech card. Flex the card slightly to clear the two mounting pegs and pull the card straight outward.

Remove the main circuit board by removing the six 6-32 mounting screws. You may also wish to unplug the contact input terminal strips and the ribbon cable which leads to the front panel. Solder a pair of jumper wires to the back of the board as indicated in the Jumper Wires for RF Link Diagram. This step connects the auxiliary contacts of off-hook relay K1, to the Y and B terminals of telephone terminal strip TS2.

Re-assemble the unit and restore any connections which were removed. Be sure that the ribbon cable's connector is accurately and firmly seated.

Connect the Y and B terminals on TS2, to the external keying input of your transmitter. The transmitter will now be keyed on whenever the off-hook relay is activated.

The method of audio connection depends on whether the product is to be connected to a regular phone line in addition to the radio transmitter. If a sensitive microphone input is used, additional attenuation may be required to avoid overloading the audio input.

If phone line operation is required in addition to radio operation, establish the audio connection into the transmitter via jack AJ1, as described in the section on EXTERNAL SPEAKER CONNECTIONS.

If no phone line operation is required, you may instead remove the phone cord and obtain an isolated 600 ohm, line-level audio signal at the TIP and RING terminals of TS2.

In operation, the transmitter will be keyed on whenever the off-hook relay is activated -- i.e. whenever the product is attempting to place or answer a phone call. Thus, if an ordinary phone line is also used, all phone activity will also be transmitted.

If no phone line is used, it will still be necessary to program a "dummy" phone number consisting of a single digit "1", using program code 7 0 1 1. Also, program for touch tone dialing using program code 9 0 1 1. When the unit goes into alarm, it will activate the off-hook relay and therefore the transmitter. Then it will issue the single digit tone, and a few seconds later it will begin the speech message, continuing as it would for a regular phone call. The number of message repeats may be altered if desired, using program code 907.

If a phone line is also used, program the appropriate phone numbers as you would ordinarily do. All phone calls will also be transmitted by radio. If you desire to have selected "calls" go out only over the air and not to any real phone number, program the single "dummy" phone number as described above. This single digit will silence the dial tone which would otherwise be broadcast along with the speech message.

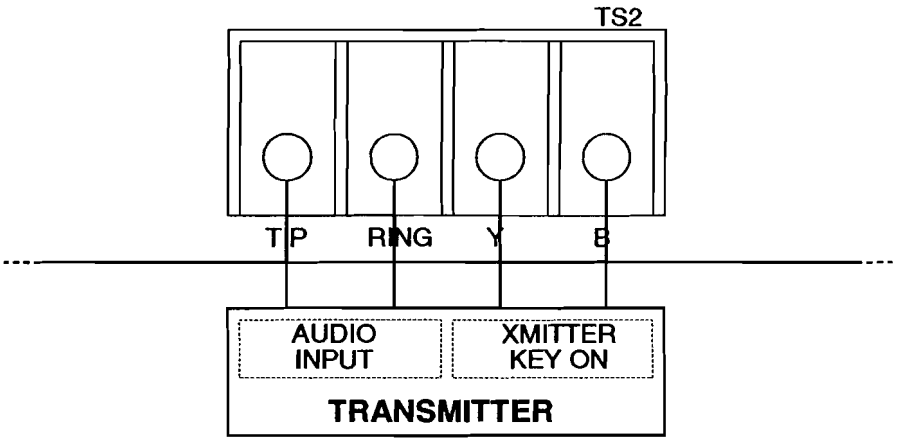
Alarm calls will continue until acknowledged, unless the unit is programmed to cease calling when the alarm violation ceases, using program code 9 2 3 2.

In order to acknowledge alarms, it will be necessary to phone the unit back (if a phone line connection is also being used), or else press one of the keys on the front panel.

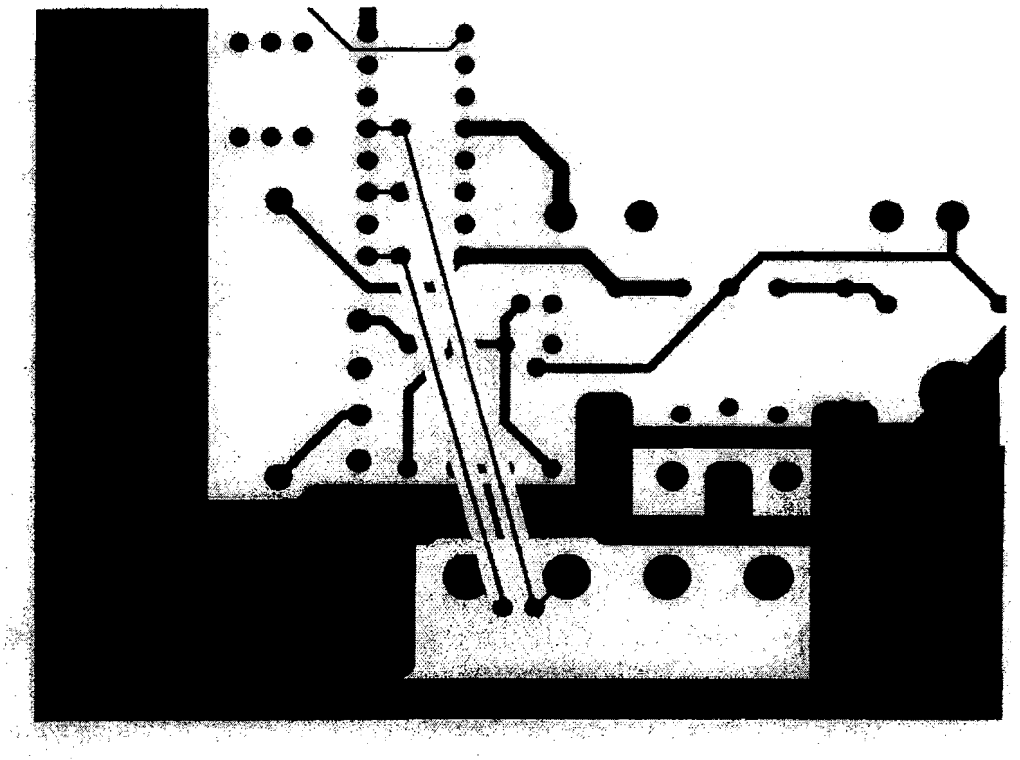
If a two-way transceiver is available which includes some kind of tone signalling and detection feature that results in momentary closure of a local relay contact at the autodialer locations, this contact may be used to place inquiry calls to the unit and also to acknowledge alarms, by radio. Contact factory for details.

Note that it will not be possible to perform remote programming of the unit with these radio connections.
A CELLULARM cellular system eliminates all such contraints.

TS2 Connection Diagram



Jumper Wires For RF Link Diagram



H.10 Calling a Pager

H.10.1 Introduction

It has become fairly common to have the autodialer call a pager system with an alarm call. The dialer is well equipped to handle many of the current pager protocols, and an overall understanding of the sequence of events will make the required programming go smoother.

Typically, a call to the pager is placed. After a short period (usually 5-12 seconds), the pager answers then gives a beep or a short burst of beeps. This is the signal to begin entering the number you want to be received and displayed by the beeper. When the information is complete, the pager terminal will hang up.

Note:

RACO strongly recommends that you program other personnel phone numbers at the appropriate place in the dialing list. This is to insure that if for some reason the pager system cannot be activated, you will get a timely warning from your autodialer.

H.10.2 General Programming Considerations

In most cases, the entire pager calling sequence is handled within the dialing string of the Verbatim. That is, it is all part of the phone number. The unit will handle up to 60 digits, including any timing delays you insert. The dialer must be programmed for touch tone dialing (program code 9011), as a pager terminal will not recognize pulse dialing.

Numeric Pager Support

Support for Numeric Pagers is comprised of a number of Verbatim autodialer features:

- Ability to add delays into a phone number string

  Often needed to pause after dialing the pager system's digits and emitting the caller's ID digits in the phone string.

- Ability to add DTMF # (or DTMF*) into a phone number string

  Often needed as a terminator character to inform the paging system that the last digit has been entered.

- Ability to add a pause for tone detect anywhere in the phone number string

  Sometimes used to detect the paging system's beep(s) heard after it answers.

- Ability to defeat voice annunciation for a specific phone number

  Often just dialing the pager system and emitting a DTMF ID sequence is sufficient for that phone call. Voice reports only delay the calling of subsequent numbers.

- Ability to add DTMF A, B, C, and D tones to phone number string

  These DTMF characters don't appear on standard telephones and may be used to differentiate automation equipment from humans calling the paging system.

Except for simple delays, entry of these additional digits into a phone number string requires a two key sequence. For example, to enter a '#' character into a phone number string, either at the front panel or over the phone, press the '*' key followed by the 8 key. This two key sequence will enter the single '#' character into phone number string.

The complete list of special digits is as follows:

Desired Result	User Enters	Voice Speaks
DTMF 'A' in phone string	*1	A
DTMF 'B' in phone string	*2	B
DTMF 'C' in phone string	*3	C
DTMF 'D' in phone string	*4	D
No voice annunciation for this number	*5	PHONE
Pause for tone detect	*6	TONE
DTMF '*' in phone string	*7	STAR
DTMF '#' in phone string	*8	POUND

Case 1: Simplest Case Pager

The simplest case is when you only have to call the pager and can hang up as soon as it answers, with no information being passed to the pager except that someone called. If you have only one dialer (and no one else uses the number!) you assume that any call from the pager is a Verbatim alarm call, and proceed from there. Of course, if you had two possible callers, you wouldn't know which one had called.

Example:

Set the first phone number to call the pager, the second phone number to call the plant foreman. Program 701 9 *6 1 713 235 3456 ENTER. (here, 701 signifies the first phone number, 9 to get an outside line, *6 to get an outside line dial tone, 1 713 235 3456 our hypothetical long distance call to a pager, and ENTER to complete the phone number). Program 702 9 *6 548 7632 ENTER (this is the second phone number, to call the foreman in case the pager call doesn't get through).

Case 2: Passing a Phone Number to a Pager

Some pager systems will allow the caller to enter a phone number (or other ID number), which is then relayed on to the beeper. When the person with the beeper gets the call, he will know immediately from the number which dialer has called. This is a good system if you are using multiple dialers, or have other pager calls in addition to autodialers.

Example:

Consider the following example of initiating a call to a paging system. We will assume here we don't have to dial 9 to get an outside line for this example. The paging terminal phone number is entered, followed by a CPM wait *6 to wait for the pager to beep. After that, an ID number is entered. Often the ID number is simply the phone number at the Verbatim autodialer site.
A # terminator *8 is inserted. Finally, the characters *5 are added to designate this phone session as a pager call and not a voice annunciation. Entry of additional delay digits may be required for proper timing of the pager call session.

The phone number string for this example with the first phone number calling a pager, is:

```
701 2352456 *6 5481234 *8 *5
```

Program 702 548 7632 ENTER (this is the second phone number, to call the foreman in case the pager call doesn't get through).

Exception:

With some pager systems, Call Progress Monitoring (CPM) on may cause a delay that will not allow the pager message to be transmitted in the time allowed. If this is the case with your paging system, either have CPM in the default off state or, if you want CPM on, time delays can be used in the place of *6 pause for tone detect. The critical task here is to time the delay from the last digit dialed until the pager beeps. The delay time needed can be determined by using a stopwatch or a clock with a second hand. You want to time this delay to the nearest second, then add 1 second to be sure. Consult the diagram on page H-20 to see the time line of events, then program the dialer.

Example 1:

Delays are added by pressing the MINUS # key on the front panel. Each delay is normally 1 second, but can be programmed (using 928 N) to be any length from 1 to 10 seconds.

We made each delay 2 seconds long by programming code 928 to be 2 seconds for each delay used: program 928 2 ENTER. We then called the pager, and determined timed the delay between the last digit dialed and the pager beep was 6 seconds.

We programmed our pager phone number: 701 6586713 ### 18007226999 *8 *5, where # are delays inserted.

Example 2:

In this example we will enter an ID number before entering a phone number into the pager. The pager phone number is 1 713 2352456. The ID number is 7711. The dialer is at 5481234. Calling the pager by hand from the dialer site, we find the following:

- dial pager
- wait for pager to answer (6 seconds)
- pager beep
- enter ID (7711)
- wait for new pager prompt (2 seconds)
- enter dialer phone number (5481234)
- hang up

  The phone number to enter will look something like:

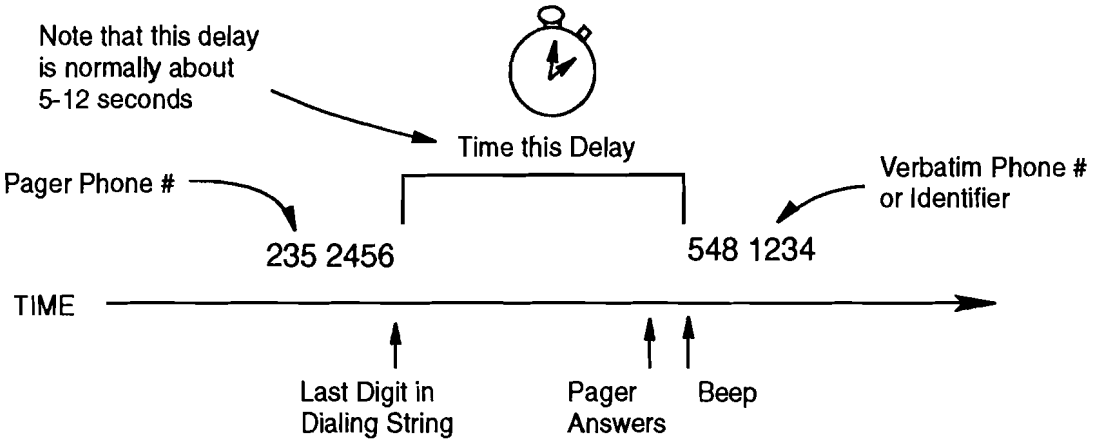
  1 713 235 2456 (delay 1) 7711 (delay 2) 548 1234
- In our example we programmed Phone #1:

  701 1 713 235 2456 ### 7711 # 548 1234 ENTER

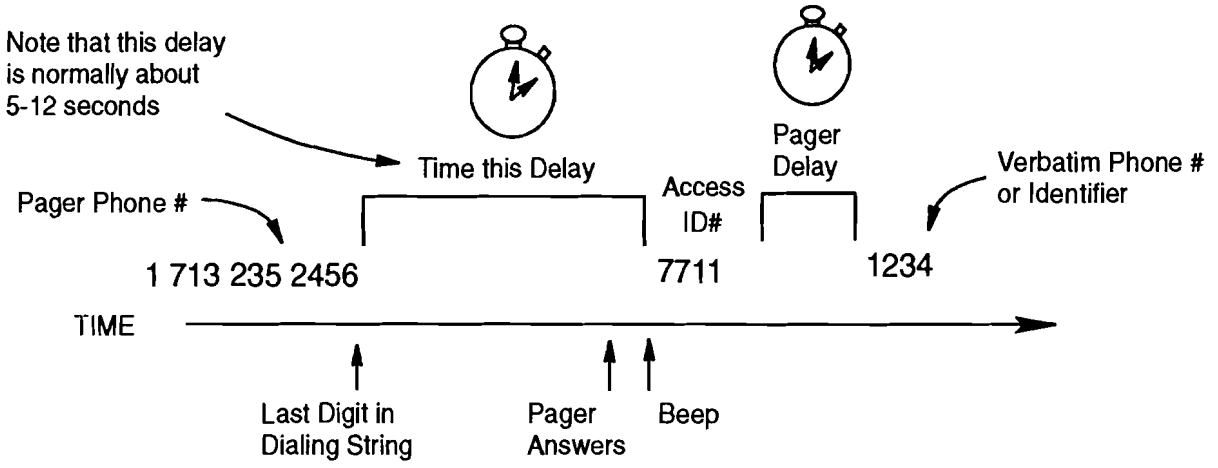
  (Remember that each # represents a 3 second delay).
- and Phone #2:

  702 548 7632 ENTER (our foreman again)

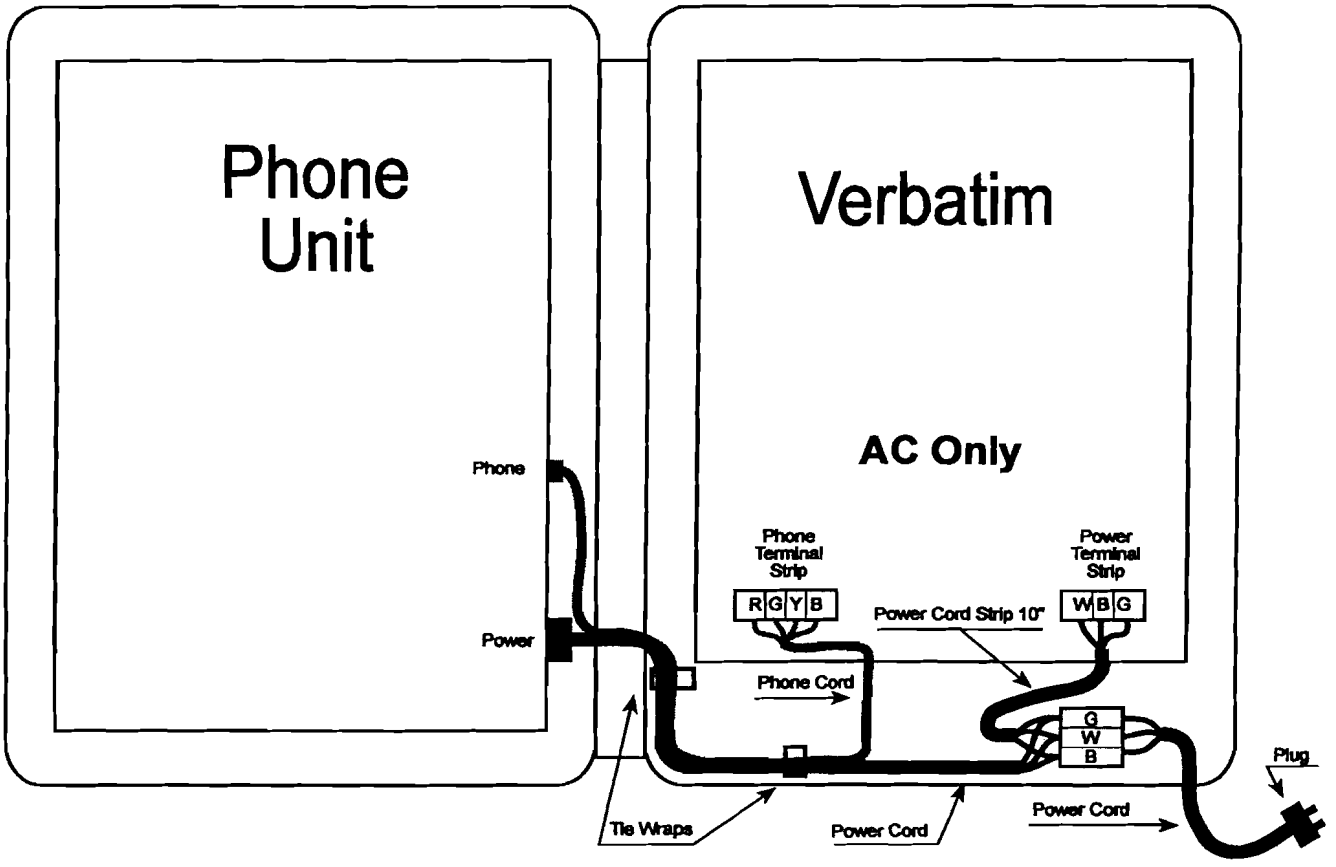
Case 2: Pager Calling Sequence Using Delays (Example 1)



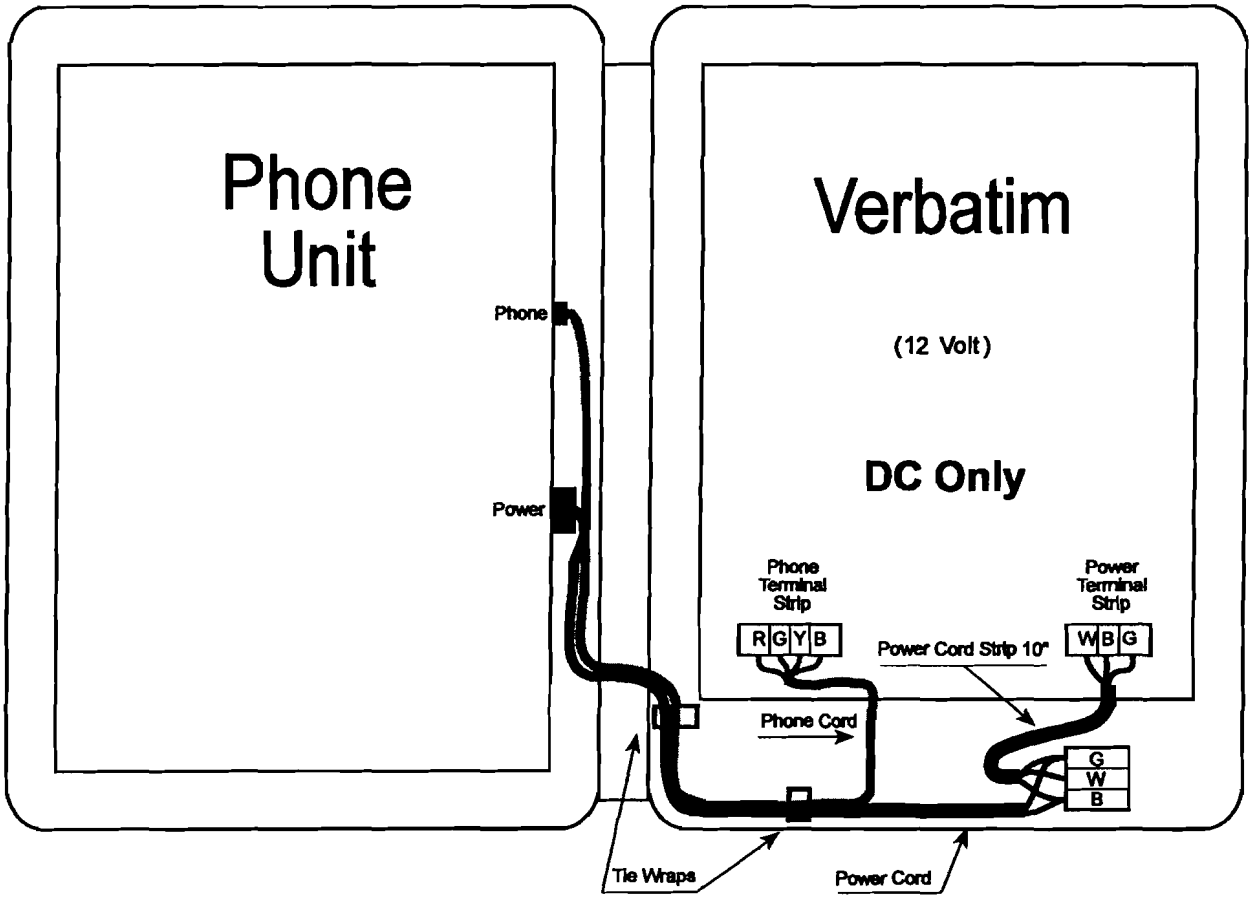
Case 2: Pager Calling Sequence Using Delays (Example 2)



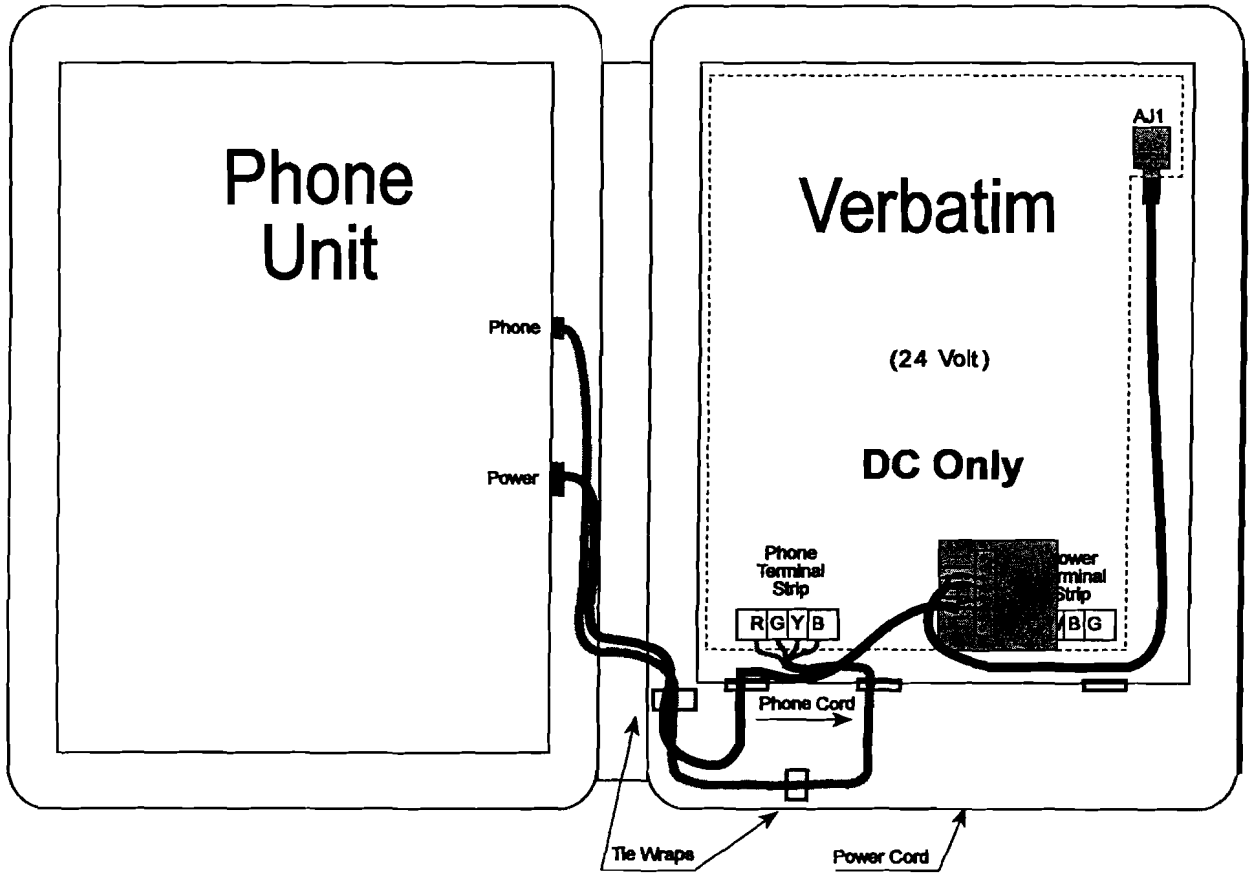
Cellularm Cellular Communications Diagram (AC Only)



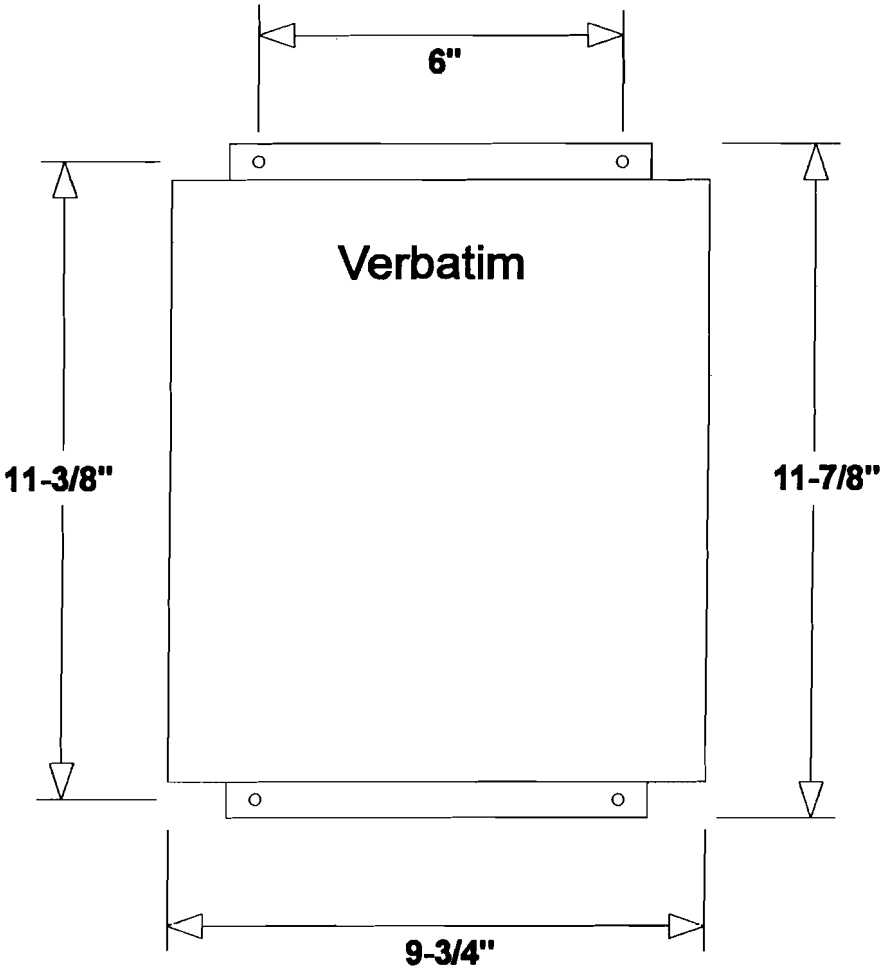
'ularm Cellular Communications Diagram (12V DC Only)



ellularm Cellular Communications Diagram (24V DC Only)

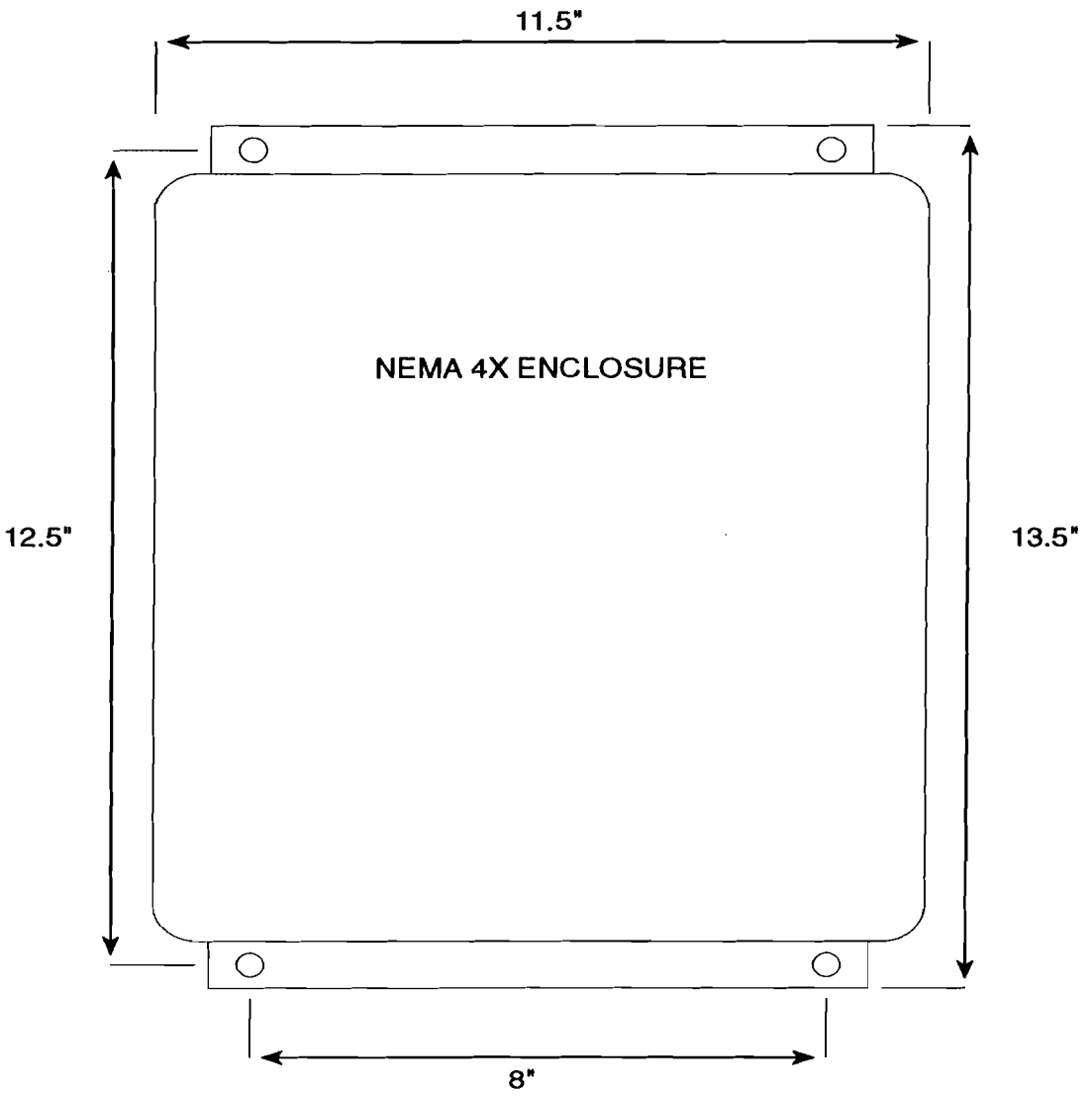


Verbatim Enclosure Diagram



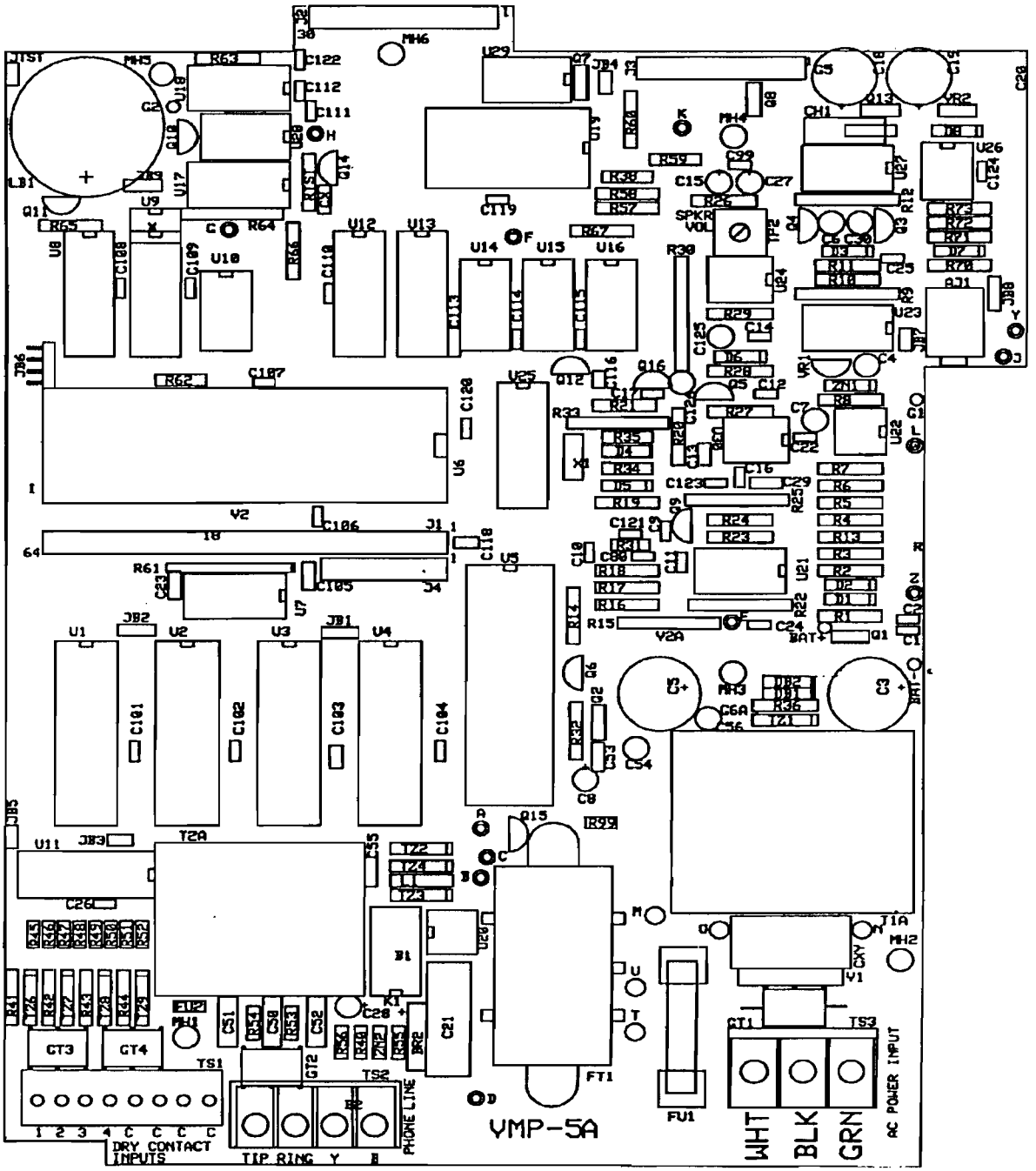
RECTANGULAR MOUNTING CENTERS: 6" W x 11-3/8" H
OVERALL DIMENSIONS: 9-3/4" W x 11 7/8" H x 5" D

NEMA 4X Enclosure Diagram

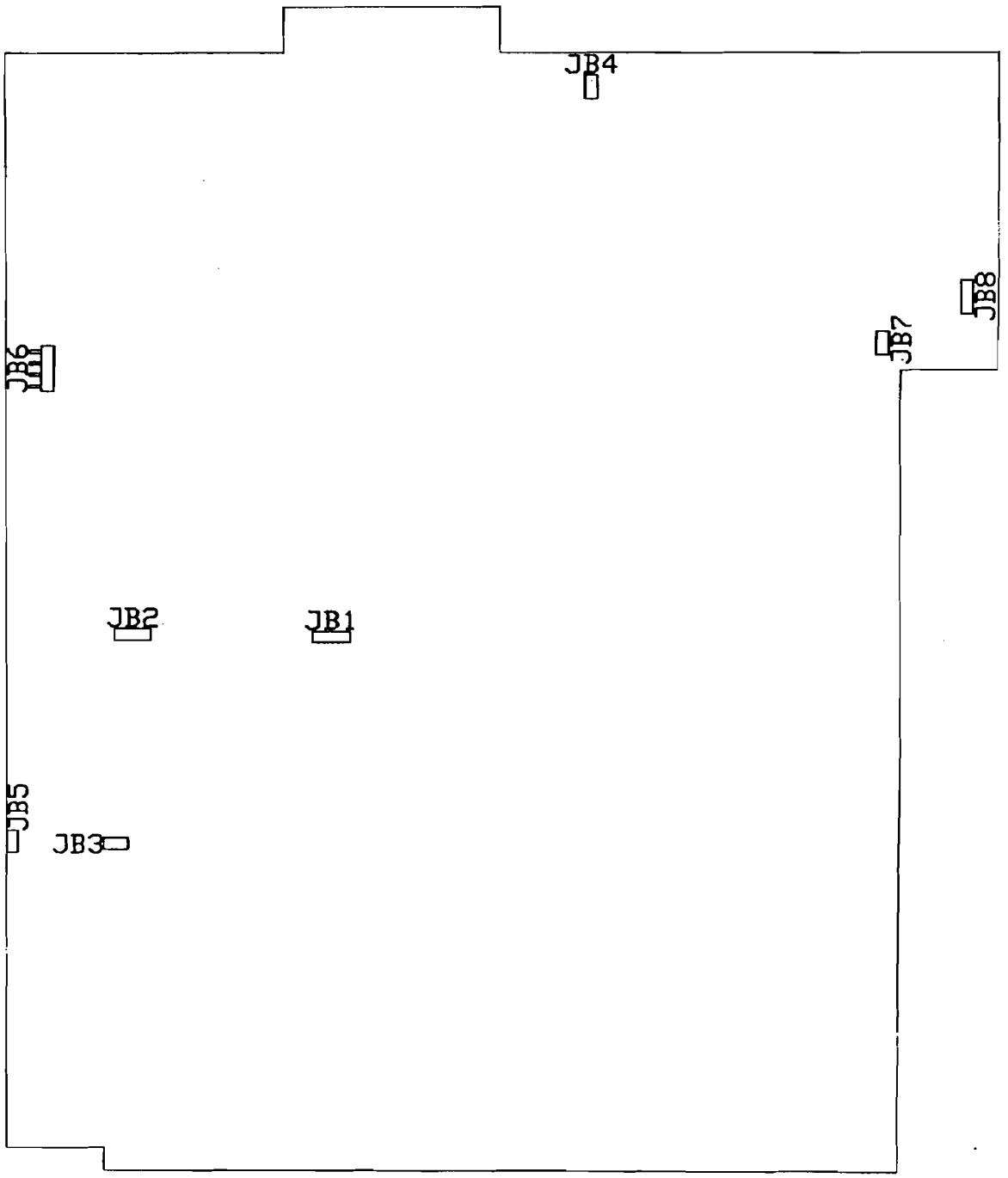


RECTANGULAR MOUNTING CENTERS: 8" W x 12.5" H
OVERALL DIMENSIONS 11.5" W x 13.5" H x 5.5" D

Motherboard Component Diagram



Jumper Block Diagram



H.11 Jumper Configurations

Main Board VMP-5A

- JB1 - configures sockets U3 and U4 for the size of EPROM chip used.
  Placement of shorting block:
  - left hand two pins- 2 meg EPROMs (for future use)
  - right hand two pins- 1meg and 512k EPROMs (factory default)

- JB2 - configures sockets U1 and U2 for the size of RAM chip used.
  Placement of shorting block:
  - left hand two pins- 1 meg or 256k RAMs (factory default)
  - right hand two pins- 2 meg RAMs (for future use)

- JB3 - RESET. Short these two pins together for about 2 seconds (a screwdriver works fine) to clear the programming back to factory defaults.

- JB4 - Local Alarm Relay/ Line Seizure Relay output. Upper pin is ground, lower pin supplies 5vdc on alarm to activate the relay.

- JB5 - SYSTEM RESET. Short these two pins together for about two seconds to reset the system hardware.

- JB6 - factory use only

- JB7 - factory use only

- JB8 - configures jack AJ-1 to be either an audio output jack or a 12vdc power input jack.
  Placement of shorting block:
  - upper two pins makes AJ-1 an audio output jack, for using an external speaker or connecting to another audio system.
  - lower two pins makes AJ-1 a 12vdc power input jack for powering the unit from an external source.

- JB9 - factory use only

Speech Board VSPE-2

- JB101 - position of jumper varies with the firmware version
  Placement of shorting block:
  - left hand two pins if the firmware version is 2.00 or higher. Speech RAM is to be placed in the board beginning with U103 then U104 and so on up to 8 RAM chips.
  - right hand two pins if the firmware version is 1.36 or below. A maximum of two speech RAM may be used. If using just one RAM chip, it goes in socket U104. A second one if used can go in U105 (U103 is skipped).

1 Verbatim™ Series VSS Autodialer Specification

1.1 Description & Phone Number Dialing

The autodialer shall be a solid state component capable of dialing up to 16 phone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone DTMF dialing are user programmable via the system's keyboard or Touch Tone phone. Further, the autodialer shall be capable of connecting, via a single serial interface cable, to a variety of Programmable Logic Controllers (PLCs), Distributed Control Systems (DCSs) & SCADA systems. Serial interfacing methods shall incorporate commonly used standard industrial network protocols such as Modicon, Inc. Modbus RTU

1.2 Solid State Voice Message Recording and Playback

The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid state circuitry with no mechanical tape mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel.

1.2.1 User Field Recorded Messages

The user may record and re-record his own voice messages, for each input channel and for the Station ID.

1. *There shall be no limit on the length of any particular message*, within the overall available message recording time, which shall be 409 seconds for 36 total channel units and 624 seconds for 57 total or more channel units.
2. The unit shall allow selective recording of *both Normal and Alarm advisory messages* for each input channel.
3. The unit shall provide for *automatic setting of the optimum speech memory usage rate* for the total set of messages recorded, in order to achieve optimum recording sound quality.
4. Circuit board switches or jumper straps shall not be acceptable means of manipulating message length or recording rates.

I.2.2 Permanent Resident Non-Recorded Messages

Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own.

I.3 Local & Remote Programming Capabilities

The user may optionally elect to alter the following parameters from their standard normal default values via keyboard entry or remotely from any Touch Tone phone.

Capability	Setting/Description
Alarm Call Grouping	On alarm, system shall selectively call the correct phone numbers according to the current alarm(s).
Alarm response delay	.1 to 9999.9 seconds.
Delay between alarm call outs	.1 to 99.9 minutes.
Alarm reset time:	0.1 to 99 hours or "NO RESET".
Incoming ring response (answer) delay	1 to 20 rings.
Input alarm criteria	Each channel shall be independently configured for "Normally Closed," "Normally Open," "No Alarm," or "Disabled."
Autocall Test	When enabled, the unit shall place a single round of test calls, both at the time this function is enabled and also at regular subsequent intervals until this function is disabled at the keyboard.
Run Time Meter	Selected physical channel inputs shall accumulate and report the number of hours that its input contacts have been closed.
Remote system microphone activation.	
Remote and local arming and disarming of system.	
Pulse Totalizer Function.	Selected physical input channels shall be capable of counting pulses of up to 100Hz. at 50% duty cycle.

I.4 Nonvolatile Program Memory Retention

User-entered programming and voice messages shall be kept intact even during power failures or when all power is removed for up to ten years.

I.5 Acknowledgment

Acknowledgment of an alarm phone call is to be accomplished by pressing a Touch Tone® "9" as the alarm call is being received, and/or by returning a phone call to the unit after having received an alarm call.

I.6 Remote (PLC) Channel Monitoring Function

The unit shall continuously scan all properly configured Remote Channels. The unit shall monitor remote channels which physically reside in other industrial equipment interfaced to the Verbatim via the serial interface. The unit shall be capable of interfacing to at least two PLC networks simultaneously. The unit shall be capable of monitoring any PLC data register regardless of register type, whether digital, analog, input, output or status point. Alarm criteria shall be settable according data register type. For digital remote channels, alarm criteria shall be settable for normally '0' or normally '1'. For analog remote channels, both a high setpoint and a low setpoint alarm criteria shall be settable. Violation of alarm criteria at any remote channel shall cause the unit to go into alarm state and begin dial-outs. All remote channel alarm criteria shall be settable either at the front panel of the unit of over the telephone using touch-tone commands. The unit shall be capable of writing data to any PLC data register to which writing data is a legal operation. The unit shall monitor any failure of the active serial communications channels. Upon failure of any communications channel the unit shall enter the alarm state and begin dial-outs. The unit shall be capable of transferring data between one remote channel on one serial communications network and another remote channel on a second serial communications network. The unit shall also be capable of transferring data between remote channels on a serial communications network and physical channels within the unit. The unit shall be optionally upgradable to incorporate provision for 32, 64 or 96 total remote channels.

I.7 Input Monitoring Function

The unit shall continuously monitor the presence of AC power and the status of four contact closure inputs. Unit shall optionally be field upgradeable to incorporate a total of 8, 16, 24, or 32 dry contact inputs. AC power failure, or violation of the alarm criteria at any input, shall cause the unit to go into alarm status and begin dial-outs. Unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about Normally Open versus Normally Closed inputs. Further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently "Open Circuit" or "Closed Circuit," without disturbing any message programming. Each input channel shall also be independently programmable, *without need to manipulate circuit board switches or jumpers*, as Normally Open or Normally Closed, or for No Alarm (Status Only), or for Pulse Totalizing, or for Run Time Metering.

I.8 Run Time Meter Inputs

Any dry contact input can be programmed to accumulate and report the number of hours their respective input circuits have been closed. Any such channels will never cause an alarm, but on inquiry will recite the channel's message according to the status of the input and then report the closed circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 99,999.9 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of 8 Run Time Meters may be programmed.

I.9 Pulse Totalizer Inputs

Any dry contact input can be programmed to accumulate the number of pulses (momentary contact closures) occurring at the input. The maximum input pulse rate must not exceed 100 pulses per second, and if the rate is over 50 pulses per second, the pulses must have a 50% duty cycle. The user shall be able to program an initial starting value and a scale factor for each pulse totalizer input. The pulse totalizer input shall cause an alarm call upon reaching a user defined alarm setpoint.

I.10 Alarm Message

Upon initiating an alarm phone call, the system is to "speak" only those channels that are currently in "alarm status".

I.11 Communications Protocol

The unit shall interface to standard networks commonly used in industrial installations. The unit shall be capable of network communications using the Modbus RTU protocol.

I.12 Diagnostics

The unit shall include user commands to execute diagnostics of the PLC network to determine the health of the network. The unit shall inform the user of the length of scan time for the set of all configured remote channels. The unit shall provide a complete verbal report of all programmable functions and their programmed values on command form any remote Touch Tone phone.

I.13 Speakerphone

The unit shall be capable of dialing any phone number on command and function as a speakerphone.

I.14 Inquiry Message and Function

Inquiry phone calls can be made directly to the unit at any time from any telephone, locally or long distance, for a complete status report of all variables being monitored, including power status.

I.15 Power Battery Backup

Normal power shall be 105-135 VAC, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 13 continuous hours in the event of AC power failure. A shorter backup time shall not be acceptable. The built-in charger shall be precision voltage controlled, not a "trickle charger," in order to minimize recharge time and maximize battery life available.

I.16 Phone Line

The autodialer is to use a standard rotary pulse or Touch Tone "dial-up" phone line (direct leased line not to be required) and is to be F.C.C. approved. Connection to the telephone is through a 4-pin modular jack (RJ-11).

the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

I.17 Local Data Logging

The system shall include a parallel printer interface for local data logging. The local printer will automatically print out, with date and time stamp, each activity that occurs; alarms, acknowledgements, programming entries, inquiry calls, etc.. For the purpose of easy program review the user shall be able to printout on demand all user entered programming.

I.18 Public Address Broadcast

The standard dialer shall provide a mini phone jack for optional connection to a local public address system. If connected to the PA system the dialer shall broadcast all alarm messages over the PA system and the telephone simultaneously.

I.19 Integral Surge Protection

All power, phone line, dry contact, and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, category B (6,000 volts open circuit/ 3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each such line. Protectors mounted external to the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

I.20 Warranty

The dialer shall be covered by a five (5) year warranty covering parts and labor performed at the Factory.

I.21 Modular Upgrades

The system shall include expansion connectors to accommodate field upgrades for additional internal dry contact inputs, remote supervisory control outputs, and internal analog inputs, CDL, SCADA.

I.22 Additional Features: Sealed Switches, LED Indicators, Alarm Disable Warning, TalkThrough

All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate: Normal Operation, Program Mode, Phone Call in Progress, Status for each channel, AC Power Present, AC Power Failure, and Low, Discharging or Recharging Battery. On any Inquiry telephone call or On Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in the "alarm disable" mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote phone to listen to local sounds and have a two-way conversation with personnel at the dialer.

I.23 Special Order Items

The following options shall be available on specific order:

a) 4, 12, 20, or 28 extra contact channels (8,16,24, or 32 respectively, total.)

b) 32, 64, 96 remote channels

c) 1, 4, 8, or 16 analog channels.

d) Remote supervisory control (4 or 8 outputs).

e) Cellular telephone communications.

f) Radio communications interface.

g) NEMA 4X (sealed) enclosure.

h) Thermostatically controlled heater.

Specifications subject to change without notice.

J Worksheets

Worksheet A Programming

Part 1: Phone Number Programming

2-Digit Phone Number Designation	Use Program Code	Phone Number (Including any necessary prefixes or area codes)	Person
01 (First)	701		
02 (Second)	702		
03 (Third)	703		
04 (Fourth)	704		
05 (Fifth)	705		
06 (Sixth)	706		
07 (Seventh)	707		
08 (Eighth)	708		
09 (Ninth)	709		
10 (Tenth)	710		
11 (Eleventh)	711		
12 (Twelfth)	712		
13 (Thirteenth)	713		
14 (Fourteenth)	714		
15 (Fifteenth)	715		
16 (Sixteenth)	716		

Part 2: Optional Programing

Record of any optional programming to alter selected parameters from their normal default values. *(Sample highlighted)*

Program Code	Parameter Description	Default Value	Write In Any Altered Values YouProgram
902	*Alarm Trip Delay*	*2 seconds*	*40 seconds*

Worksheet B Alarm Call Grouping Programming

Purpose: To "link" certain input channels to call only selected phone numbers.
See Section 6.2.13

Part 1: Group Description Naming

As an organizational step, write in a Group Description Name (Electrical, Security, etc.) for each of your phone number groups, and the two-digit designation number of the phone numbers you want included in each group. Refer to the filled-in example below. This should be done only after you have already entered your entire list of up to 16 phone numbers on Worksheet A. (*Sample highlighted*)

Group Description (Electrical, etc.)	2-Digit Phone # Designation (Taken from Worksheet A)
Main Group	*01, 04, 05, 06*
Electrical	*03, 04*
Security	*02, 05*

Worksheet B Alarm Call Grouping Programming Cont. . .

Part 2: Linking Channels To Groups

For each input channel that you wish to have "linked" to one of your groups, write in your chosen Group Description Name (Electrical, etc.), and the corresponding set of 2-digit Phone Number Designations which you established above. Finally, write in these same sets of 2-digit codes, without the separating commas, to the right of the printed program code (501, etc.). This establishes the complete program code to enter for each channel that you want "linked" to call only a selected group of phone numbers. (*Sample highlighted*)

The filled-in sample, below, is for an 8-channel unit. Three groups were established, and 5 of the channels were linked to a group. The remaining 3 channels were not linked to any group, and therefore, those 3 "unlinked" channels would dial the entire list of phone numbers in regular order.

Note:

Any channels that you do not enter such a program code for, will cause dialing of the entire list of phone numbers, when that channel goes into alarm.

Channel	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01	Security	02, 05	501, 0205
02	Security	02, 05	502, 0205
03	Electrical	03, 04	503, 0304
04	Maintenance	01, 04, 05, 01	504, 0104, 0501
05			505
06	Electrical	03, 04	506, 0304
07			507
08			508

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 1 of 6)

Internal Input Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01			*501 9*
02			*502 9*
03			*503 9*
04			*504 9*
05			*505 9*
06			*506 9*
07			*507 9*
08			*508 9*
09			*509 9*
10			*510 9*
11			*511 9*
12			*512 9*
13			*513 9*
14			*514 9*
15			*515 9*
16			*516 9*
17			*517 9*
18			*518 9*
19			*519 9*
20			*520 9*
21			*521 9*
22			*522 9*
23			*523 9*
24			*524 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 2 of 6)

Internal Input Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
25			*525 9*
26			*526 9*
27			*527 9*
28			*528 9*
29			*529 9*
30			*530 9*
31			*531 9*
32			*532 9*
33			*533 9*
34			*534 9*
35			*535 9*
36			*536 9*
37			*537 9*
38			*538 9*
39			*539 9*
40			*540 9*
41			*541 9*
42			*542 9*
43			*543 9*
44			*544 9*
45			*545 9*
46			*546 9*
47			*547 9*
48			*548 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 3 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
01			*4501 9*
02			*4502 9*
03			*4503 9*
04			*4504 9*
05			*4505 9*
06			*4506 9*
07			*4507 9*
08			*4508 9*
09			*4509 9*
10			*4510 9*
11			*4511 9*
12			*4512 9*
13			*4513 9*
14			*4514 9*
15			*4515 9*
16			*4516 9*
17			*4517 9*
18			*4518 9*
19			*4519 9*
20			*4520 9*
21			*4521 9*
22			*4522 9*
23			*4523 9*
24			*4524 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 4 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
25			*4525 9*
26			*4526 9*
27			*4527 9*
28			*4528 9*
29			*4529 9*
30			*4530 9*
31			*4531 9*
32			*4532 9*
33			*4533 9*
34			*4534 9*
35			*4535 9*
36			*4536 9*
37			*4537 9*
38			*4538 9*
39			*4539 9*
40			*4540 9*
41			*4541 9*
42			*4542 9*
43			*4543 9*
44			*4544 9*
45			*4545 9*
46			*4546 9*
47			*4547 9*
48			*4548 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 5 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
49			*4549 9*
50			*4550 9*
51			*4551 9*
52			*4552 9*
53			*4553 9*
54			*4554 9*
55			*4555 9*
56			*4556 9*
57			*4557 9*
58			*4558 9*
59			*4559 9*
60			*4560 9*
61			*4561 9*
62			*4562 9*
63			*4563 9*
64			*4564 9*
65			*4565 9*
66			*4566 9*
67			*4567 9*
68			*4568 9*
69			*4569 9*
70			*4570 9*
71			*4571 9*
72			*4572 9*

Worksheet B Alarm Call Grouping Programming Cont. . .

(Page 6 of 6)

Remote Channels	Linked to Group	Corresp. Phone # Desig's Est. Above	Program Code to Enter
73			*4573 9*
74			*4574 9*
75			*4575 9*
76			*4576 9*
77			*4577 9*
78			*4578 9*
79			*4579 9*
80			*4580 9*
81			*4581 9*
82			*4582 9*
83			*4583 9*
84			*4584 9*
85			*4585 9*
86			*4586 9*
87			*4587 9*
88			*4588 9*
89			*4589 9*
90			*4590 9*
91			*4591 9*
92			*4592 9*
93			*4593 9*
94			*4594 9*
95			*4595 9*
96			*4596 9*

Worksheet C Message Planning & Recording *(Page 1 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Station ID	***100***		
Ch 01 Alarm	***101***		
Ch 01 Normal	***201***		
Ch 02 Alarm	***102***		
Ch 02 Normal	***202***		
Ch 03 Alarm	***103***		
Ch 03 Normal	***203***		
Ch 04 Alarm	***104***		
Ch 04 Normal	***204***		
Ch 05 Alarm	***105***		
Ch 05 Normal	***205***		
Ch 06 Alarm	***106***		
Ch 06 Normal	***206***		
Ch 07 Alarm	***107***		
Ch 07 Normal	***207***		
Ch 08 Alarm	***108***		
Ch 08 Normal	***208***		
Ch 09 Alarm	***109***		
Ch 09 Normal	***209***		
Ch 10 Alarm	***110***		
Ch 10 Normal	***210***		
Ch 11 Alarm	***111***		
Ch 11 Normal	***211***		
Ch 12 Alarm	***112***		
Ch 12 Normal	***212***		
Ch 13 Alarm	***113***		
Ch 13 Normal	***213***		
Ch 14 Alarm	***114***		
Ch 14 Normal	***214***		

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Worksheet C Message Planning & Recording *(Page 2 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 15 Alarm	*115*		
Ch 15 Normal	*??*		
Ch 16 Alarm	*116*		
Ch 16 Normal	*??*		
Ch 17 Alarm	*117*		
Ch 17 Normal	*??*		
Ch 18 Alarm	*118*		
Ch 18 Normal	*??*		
Ch 19 Alarm	*119*		
Ch 19 Normal	*??*		
Ch 20 Alarm	*120*		
Ch 20 Normal	*??*		
Ch 21 Alarm	*121*		
Ch 21 Normal	*??*		
Ch 22 Alarm	*122*		
Ch 22 Normal	*??*		
Ch 23 Alarm	*123*		
Ch 23 Normal	*??*		
Ch 24 Alarm	*124*		
Ch 24 Normal	*??*		
Ch 25 Alarm	*125*		
Ch 25 Normal	*??*		
Ch 26 Alarm	*126*		
Ch 26 Normal	*??*		
Ch 27 Alarm	*127*		
Ch 27 Normal	*??*		
Ch 28 Alarm	*128*		
Ch 28 Normal	*??*		

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Worksheet C Message Planning & Recording *(Page 3 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 29 Alarm	*129*		
Ch 29 Normal	*229*		
Ch 30 Alarm	*130*		
Ch 30 Normal	*230*		
Ch 31 Alarm	*131*		
Ch 31 Normal	*231*		
Ch 32 Alarm	*132*		
Ch 32 Normal	*232*		
Ch 33 Alarm	*133*		
Ch 33 Normal	*233*		
Ch 34 Alarm	*134*		
Ch 34 Normal	*234*		
Ch 35 Alarm	*135*		
Ch 35 Normal	*235*		
Ch 36 Alarm	*136*		
Ch 36 Normal	*236*		
Ch 37 Alarm	*137*		
Ch 37 Normal	*237*		
Ch 38 Alarm	*138*		
Ch 38 Normal	*238*		
Ch 39 Alarm	*139*		
Ch 39 Normal	*239*		
Ch 40 Alarm	*140*		
Ch 40 Normal	*240*		
Ch 41 Alarm	*141*		
Ch 41 Normal	*241*		
Ch 42 Alarm	*142*		
Ch 42 Normal	*242*		

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Worksheet C Message Planning & Recording *(Page 4 of 11)*

Input Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 43 Alarm	*143*		
Ch 43 Normal	*243*		
Ch 44 Alarm	*144*		
Ch 44 Normal	*244*		
Ch 45 Alarm	*145*		
Ch 45 Normal	*245*		
Ch 46 Alarm	*146*		
Ch 46 Normal	*246*		
Ch 47 Alarm	*147*		
Ch 47 Normal	*247*		
Ch 48 Alarm	*148*		
Ch 48 Normal	*248*		
Remote Channel Message Designation	**Program Code**	**Message Content**	**Approx. Length**
NET 1 ID	*41001*		
Ch 01 Alarm	*4101*		
Ch 01 Normal	*4201*		
Ch 02 Alarm	*4102*		
Ch 02 Normal	*4202*		
Ch 03 Alarm	*4103*		
Ch 03 Normal	*4203*		
Ch 04 Alarm	*4104*		
Ch 04 Normal	*4204*		

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Worksheet C Message Planning & Recording *(Page 5 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 05 Alarm	***4105***		
Ch 05 Notify	***4205***		
Ch 06 Alarm	***4106***		
Ch 06 Notify	***4206***		
Ch 07 Alarm	***4107***		
Ch 07 Notify	***4207***		
Ch 08 Alarm	***4108***		
Ch 08 Notify	***4208***		
Ch 09 Alarm	***4109***		
Ch 09 Notify	***4209***		
Ch 10 Alarm	***4110***		
Ch 10 Notify	***4210***		
Ch 11 Alarm	***4111***		
Ch 11 Notify	***4211***		
Ch 12 Alarm	***4112***		
Ch 12 Notify	***4212***		
Ch 13 Alarm	***4113***		
Ch 13 Notify	***4213***		
Ch 14 Alarm	***4114***		
Ch 14 Notify	***4214***		
Ch 15 Alarm	***4115***		
Ch 15 Notify	***4215***		
Ch 16 Alarm	***4116***		
Ch 16 Notify	***4216***		
Ch 17 Alarm	***4117***		
Ch 17 Notify	***4217***		

Total estimated recorded message length in seconds, this page _____

Worksheet C Message Planning & Recording *(Page 6 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 18 Alarm	*4118*		
Ch 18 Normal	*4218*		
Ch 19 Alarm	*4119*		
Ch 19 Normal	*4219*		
Ch 20 Alarm	*4120*		
Ch 20 Normal	*4220*		
Ch 21 Alarm	*4121*		
Ch 21 Normal	*4221*		
Ch 22 Alarm	*4122*		
Ch 22 Normal	*4222*		
Ch 23 Alarm	*4123*		
Ch 23 Normal	*4223*		
Ch 24 Alarm	*4124*		
Ch 24 Normal	*4224*		
Ch 25 Alarm	*4125*		
Ch 25 Normal	*4225*		
Ch 26 Alarm	*4126*		
Ch 26 Normal	*4226*		
Ch 27 Alarm	*4127*		
Ch 27 Normal	*4227*		
Ch 28 Alarm	*4128*		
Ch 28 Normal	*4228*		
Ch 29 Alarm	*4129*		
Ch 29 Normal	*4229*		
Ch 30 Alarm	*4130*		
Ch 30 Normal	*4230*		

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Worksheet C Message Planning & Recording *(Page 7 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 31 Alarm	*4131*		
Ch 31 Normal	*4231*		
Ch 32 Alarm	*4132*		
Ch 32 Normal	*4232*		
Ch 33 Alarm	*4133*		
Ch 33 Normal	*4233*		
Ch 34 Alarm	*4134*		
Ch 34 Normal	*4234*		
Ch 35 Alarm	*4135*		
Ch 35 Normal	*4235*		
Ch 36 Alarm	*4136*		
Ch 36 Normal	*4236*		
Ch 37 Alarm	*4137*		
Ch 37 Normal	*4237*		
Ch 38 Alarm	*4138*		
Ch 38 Normal	*4238*		
Ch 39 Alarm	*4139*		
Ch 39 Normal	*4239*		
Ch 40 Alarm	*4140*		
Ch 40 Normal	*4240*		
Ch 41 Alarm	*4141*		
Ch 41 Normal	*4241*		
Ch 42 Alarm	*4142*		
Ch 42 Normal	*4242*		
Ch 43 Alarm	*4143*		
Ch 43 Normal	*4243*		
Ch 44 Alarm	*4144*		
Ch 44 Normal	*4244*		
Ch 45 Alarm	*4145*		
Ch 45 Normal	*4245*		

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Worksheet C Message Planning & Recording *(Page 8 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 46 Alarm	***4146***		
Ch 46 Normal	***4246***		
Ch 47 Alarm	***4147***		
Ch 47 Normal	***4247***		
Ch 48 Alarm	***4148***		
Ch 48 Normal	***4248***		
Ch 49 Alarm	***4149***		
Ch 49 Normal	***4249***		
Ch 50 Alarm	***4150***		
Ch 50 Normal	***4250***		
Ch 51 Alarm	***4151***		
Ch 51 Normal	***4251***		
Ch 52 Alarm	***4152***		
Ch 52 Normal	***4252***		
Ch 53 Alarm	***4153***		
Ch 53 Normal	***4253***		
Ch 54 Alarm	***4154***		
Ch 54 Normal	***4254***		
Ch 55 Alarm	***4155***		
Ch 55 Normal	***4255***		
Ch 56 Alarm	***4156***		
Ch 56 Normal	***4256***		
Ch 57 Alarm	***4157***		
Ch 57 Normal	***4257***		
Ch 58 Alarm	***4158***		
Ch 58 Normal	***4258***		

Total estimated recorded message length in seconds, this page _____

Worksheet C Message Planning & Recording *(Page 9 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 59 Alarm	***4159***		
[illegible]	[illegible]		
Ch 60 Alarm	***4160***		
[illegible]	[illegible]		
Ch 61 Alarm	***4161***		
[illegible]	[illegible]		
Ch 62 Alarm	***4162***		
[illegible]	[illegible]		
Ch 63 Alarm	***4163***		
[illegible]	[illegible]		
Ch 64 Alarm	***4164***		
[illegible]	[illegible]		
Ch 65 Alarm	***4165***		
[illegible]	[illegible]		
Ch 66 Alarm	***4166***		
[illegible]	[illegible]		
Ch 67 Alarm	***4167***		
[illegible]	[illegible]		
Ch 68 Alarm	***4168***		
[illegible]	[illegible]		
Ch 69 Alarm	***4169***		
[illegible]	[illegible]		
Ch 70 Alarm	***4170***		
[illegible]	[illegible]		
Ch 71 Alarm	***4171***		
[illegible]	[illegible]		

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Worksheet C Message Planning & Recording *(Page 10 of 11)*

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 72 Alarm	***4172***		
Ch 72 Normal	***4272***		
Ch 73 Alarm	***4173***		
Ch 73 Normal	***4273***		
Ch 74 Alarm	***4174***		
Ch 74 Normal	***4274***		
Ch 75 Alarm	***4175***		
Ch 75 Normal	***4275***		
Ch 76 Alarm	***4176***		
Ch 76 Normal	***4276***		
Ch 77 Alarm	***4177***		
Ch 77 Normal	***4277***		
Ch 78 Alarm	***4178***		
Ch 78 Normal	***4278***		
Ch 79 Alarm	***4179***		
Ch 79 Normal	***4279***		
Ch 80 Alarm	***4180***		
Ch 80 Normal	***4280***		
Ch 81 Alarm	***4181***		
Ch 81 Normal	***4281***		
Ch 82 Alarm	***4182***		
Ch 82 Normal	***4282***		
Ch 83 Alarm	***4183***		
Ch 83 Normal	***4283***		
Ch 84 Alarm	***4184***		
Ch 84 Normal	***4284***		

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Worksheet C Message Planning & Recording (Page 11 of 11)

Remote Channel Message Designation	Program Code	Message Content	Approx. Length
Ch 85 Alarm	*4185*		
Ch85Verbal	*4185*		
Ch 86Alarm	*4186*		
Ch86Verbal	*4186*		
Ch 87 Alarm	*4187*		
Ch87Verbal	*4187*		
Ch 88 Alarm	*4188*		
Ch88Verbal	*4188*		
Ch 89 Alarm	*4189*		
Ch89Verbal	*4189*		
Ch 90 Alarm	*4190*		
Ch90Verbal	*4190*		
Ch 91 Alarm	*4191*		
Ch91Verbal	*4191*		
Ch 92 Alarm	*4192*		
Ch92Verbal	*4192*		
Ch 93 Alarm	*4193*		
Ch93Verbal	*4193*		
Ch 94 Alarm	*4194*		
Ch94Verbal	*4194*		
Ch 95 Alarm	*4195*		
Ch95Verbal	*4195*		
Ch 96 Alarm	*4196*		
Ch96Verbal	*4196*		

Total estimated recorded message length in seconds, this page _____

See next page to complete calculations

Worksheet C Message Planning & Recording Calculations:

Total estimated recorded message length in seconds, page 11 of 11 _____
Total estimated recorded message length in seconds, page 10 of 11 _____
Total estimated recorded message length in seconds, page 9 of 11 _____
Total estimated recorded message length in seconds, page 8 of 11 _____
Total estimated recorded message length in seconds, page 7 of 11 _____
Total estimated recorded message length in seconds, page 6 of 11 _____
Total estimated recorded message length in seconds, page 5 of 11 _____
Total estimated recorded message length in seconds, page 4 of 11 _____
Total estimated recorded message length in seconds, page 3 of 11 _____
Total estimated recorded message length in seconds, page 2 of 11 _____
Total estimated recorded message length in seconds, page 1 of 11 _____

Total estimated recorded message length in seconds, **all** pages _____
See Code 912 for alternate method of timing spoken messages.

Note:

For any channels that you have programmed for Status Report Only or for Run Time Metering, the message to be spoken on Open Circuit input is recorded with the Program Code ordinarily used for the Alarm Message; the message to be spoken on Closed Circuit input is recorded with the program code ordinarily used for the Normal Message.

K Annunciator Sequences and Options

This appendix discusses Verbatim operations in the context of the *ANSI/ISA-S18.1 Annunciator Sequences and Specifications* standard. It also describes the options available for configuring the Verbatim to support a variety of sequence models. This information will be useful for users needing calling sequences different from the one discussed in Section 5.

Note that the ANSI specification uses slightly different terminology from that used here and elsewhere in this manual. Hopefully, this won't cause much confusion.

One concept central to this discussion is that of *channel state*. At any given time every armed channel is in one of the following 5 states: *normal, alarm, acknowledged alarm, return to normal (RTN), acknowledged RTN*. The precise meaning of these terms will be clarified later on.

The term *annunciator state* is used here to describe the actions and indications of the Verbatim . These include LED illumination,voice reporting and status logging.

An *annunciator sequence* consists of specifying how transitions between the channel states occur and how they impact the annunciator state. The Verbatim supports three distinct types of annunciator sequences. These are each discussed in the subsections below. The next several paragraphs discuss the properties they all share in common.

The normal, alarm and RTN states are determined by comparing the channel's value with the criteria settings. A transition into these states requires that the condition persist for a time period referred to as the *alarm trip delay*. This provides hysteresis, or debouncing between the real-world signals and the channel state.

The two acknowledged states are determined by operator actions. Unacknowledged alarms and RTNs transit to the acknowledged states by pressing keys on the front panel or entering DTMF tones over the phone.

The Verbatim gives visual indications for the state of each channel or group of channels. If normal, the LED is OFF. When alarmed, the LED is blinking. When acknowledged the LED is steady ON. The visual indications for the RTN states are sequence dependent, and described later.

Audible indications for the channel states are also given. These take the form of voice reports either from the speaker or over the phone. These reports may be requested at any time by pressing the CHECK STATUS key, or phoning the unit.

Whenever any channel is in the unacknowledged alarm or RTN state, the Verbatim will solicit acknowledgment by phoning personel. The calling sequence itself is determined by the alarm call grouping and alarm ready scheduling configuration.

All audible indications can be silenced by pressing the ARM/DISARM key on the front panel. This action will also always acknowledge all unacknowledged conditions. Also, all annunciator state transitions and actions are suspended whenever the box is in program mode. Channel state transitions will still occur.

The annunciator state may at any time be completely reset by pressing the ARM/DISARM key twice. This action will also reset the state of each channel.

In terms of *ANSI/ISA-S18.1*, there is one more property that all Verbatim annunciator sequences share: there is no support for the *first out* sequence designations (**F1, F2, F3**). Groups of alarms and RTNs are always registered, reported and reset without regard to which one tripped out first.

K.1 Standard Annunciator Sequence (Manual Reset)

This section describes the default annunciator sequence used by the Verbatim . It is a minor variant of the *ANSI/ISA-S18.1* designation **M-1** (Manual Reset with silence pushbutton). It may be configured by entering code **923 1** in program mode.

Operations in this sequence are detailed in Section 5. Briefly, channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. The transition from acknowledged back to normal happens upon manual reset or expiration of the alarm reset timer. The RTN states are omitted from the sequence.

The annunciator states include only those visual and audible indications described above. Also, the annunciator sequence follows the transitions described there too.

This sequence differs from the vanilla **M-1** designation in two ways. The first involves the operation of the automatic reset timer. The true **M-1** sequence is obtained by turning the alarm reset timers off (code **922**). The second distinction involves configurations where no phone numbers are programmed. Here the transition from alarm to acknowledged happens automatically and immediately. There are never any audible or visual indications of the unacknowledged state. This sequence has ANSI designation **M-1-5-6**.

K.2 Clear On Return To Normal (Automatic Reset)

This section describes annunciator sequence options that are variants of the ANSI designation **A-1** (automatic reset with silence pushbutton). The main distinction of these from the **M-1** sequence is that the alarm state is automatically reset when the channel enters the RTN state. The Verbatim sequences in this category differ amongst themselves mainly in when this RTN transition is allowed to occur.

The basic **A-1** sequence is obtained by executing code **923 3**. Channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. If no phone numbers are configured, then this transition happens automatically and immediately (**A-1-5-6**). Otherwise, operator action is required. The transition from acknowledged back to normal happens via manual reset or expiration of the alarm reset timer. It also happens whenever the criteria violation for an acknowledged alarm returns to normal.

Designation **A-1-4** is obtained by code **923 2**. This sequence differs from **A-1** only in that the unacknowledged alarms are not locked in. All visual and audible indications are automatically reset whenever the criteria violations return to normal for the trip delay period.

A minor variant of **A-1-4** is obtained by code **923 4**. Here, the indications for an acknowledged alarm will not be reset until it has been reported once, regardless of RTN status. Unacknowledged alarms will be reset completely without any lock-in whatsoever.

The implementation of these **A**-designates involves one wrinkle. The check for RTN condition is not performed continuously, but rather only at specific times. Hence, changes that happen in the midst of a report may not be reflected in the annunciator state until some time later.

K.3 Report Return To Normal (Ringback)

This section describes the annunciator sequence option that provides explicit indications of RTN conditions. This is a variant of the **R-1-8** designation (ringback with silence pushbutton and common ringback audible). There are two differences between **R** and **M** or **A** designations. First is that the RTN state can be entered only from the acknowledged alarm state. **M** has no notion of RTN at all, and **A** allows the transition at any time. Second is that **R** locks in RTN states until acknowledged, whereas **A** immediately resets.

A variant of the **R-1-8** sequence is obtained by executing code **981 1**. Channel states transit from normal to alarm when criteria violations persist for the trip delay. The alarm state is then locked in until acknowledgment is made. If no phone numbers are configured, then this transition happens automatically and immediately (**R-1-5-6**). Otherwise, operator action is required.

The transition from acknowledged alarm to unacknowledged RTN is made whenever the criteria violation goes away for the trip delay period. The RTN state is then locked in until acknowledged. RTN acknowledgment is made in the same fashion as alarm acknowledgments. The channel states are reset either manually or by expiration of the reset timer. The reset timer begins running when the original alarm condition is acknowledged. This means that if a sufficiently long interval exists between acknowledgment of the alarm and the RTN, then the reset will happen immediately.

The main differences between this variant and the standard **R-1-8** sequence are as follows. First, there is no registration of momentary alarms once the RTN state is entered. Once the RTN state is acknowledged, no further calls will be triggered until the channel is reset. This is to say transitions in the channel state may continue, but will not be reflected in the annunciator state. Still, all reports will reflect the current state of the channels. Second, there is no visual indication for the RTN states. The LEDs will continue to reflect the acknowledged alarm status. Third, the silence pushbutton stops all flashing LED indications. Fourth, there is the automatic reset timer.

Unlike the implementation for the **A** designations, RTN conditions are checked continuously for all channels. So long as any unacknowledged alarm or RTN condition exists, the Verbatim will be making calls. Alarm conditions have priority. Hence, if an alarm is one call group and an RTN is in another, no calls will be placed to the RTN group until the alarm is acknowledged.

If the trigger for a call is an RTN, then the report will explicitly mention this before reporting the status of all channels in the group. An RTN report mentions RTN conditions only. Any acknowledgment while in RTN calling state acknowledges RTN conditions only. In contrast, any operator acknowledgment during an alarm call will also acknowledge all RTNs. But, the alarm reports do mention all unacknowledged RTN conditions.

If a new alarm occurs on any channel while in the RTN calling state, a change from RTN to alarm calling will occur as soon as possible. This can happen no sooner than the completion of any report in progress. Such reports may or may not include mention of the new condition depending on whether that channel has already been announced.

K.4 Annunciator Sequence Option Summary

The following paragraphs provide a concise summary of the available annunciator sequence options. The ANSI designator is given, along with the Verbatim configuration code, followed by a short functional description.

M-1: Manual Reset with Silence Pushbutton.
Code (923 1)

Alarm states are registered directly from configured criteria without regard for return to normal conditions. Alarm states are locked in and dialer will continue to call until acknowledged. Acknowledged alarms are reset via automatic timer. Total dialer reset andsilence via arm/disarm key.

M-1-5-6: Manual Reset with Silence Pushbutton, No Flashing, and No Audible.
Code (923 1) - with no phone numbers programmed

Same as **M-1**, except the alarm state is immediately converted to acknowledged state.

A-1: Automatic Reset with Silence Pushbutton.
Code (923 3)

Same as **M-1** except the acknowledged alarm state will be cleared if the channel returns to normal. The check for this transition occurs only when all alarms have been acknowledged.

A-1-5-6: Automatic Reset with Silence Pushbutton, No Flashing, and No Audible.
Code (923 3) - with no phone numbers programmed.

Same as **A-1**, except the alarm state is immediately converted to the acknowledged state.

A-1-4: Automatic Reset with Silence Pushbutton and No Lock-in.
Code (923 2)

Same as **M-1** except BOTH the acknowledged and unacknowledged alarm states will be cleared if the channel returns to normal. The check for this transition occurs only in between alarm calls.

A-1-4 variant: Automatic Reset with Silence Pushbutton, No Lock-in, and Single Acknowledge Report.
Code (923 4)

Same as **A-1-4** except the clearing for the acknowledged alarm can't happen until after a single report has been made.

R-1-8: Ringback with Silence Pushbutton and Common Ringback Audible. *Code (981 1)*

Alarm and Return to normal states are registered from criteria and locked-in. Dialer will continue to call until all alarm and RTN states are acknowledged. Acknowledged alarms and RTNS are reset via automatic timer. Total dialer reset and silence via arm/disarm key.

R-1-5-6: Ringback with Silence Pushbutton, No Flashing, and No Audible. *Code (981 1) - with no phone numbers programmed.*

Same as **R-1-8** except all unacknowledged alarm and RTN states are immediately converted to the acknowledged state.

Glossary

ACCESS CODE See Security Access Code.

ACKNOWLEDGMENT The act of advising the Verbatim autodialer that its alarm message has been heard. This is done either by pressing a touch tone 9 at the prompting beep, or by calling the unit back after the alarm call has ended. Once acknowledged, further activity on that particular channel will not cause further dialing until the expiration of the Alarm Reset Time. See Section 5.1, "Placing Inquiry Calls to the Verbatim autodialer," and Section 5.5, "Acknowledging the Alarm Call."

ALARM CALL GROUPING Special programming established to cause specific input channels to cause dialing of only selected phone numbers. Used to provide separate alarm functions according to category of personnel, such as maintenance, security, plumbing, etc. See Section 6.1, "Program Codes."

ALARM CONDITION For contact input channels, the Alarm Condition is the Open or Closed circuit condition opposite to that which was established as the Normal Condition for that channel. For example, for a channel programmed as Normally Open, the Alarm Condition would be Closed Circuit. Also see Violation. See Sections 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls."

ALARM CRITERIA The chosen determination of what will constitute an alarm condition (violation) for a given channel. See Normally Closed.

ALARM READY SCHEDULING A program setting which causes the Verbatim autodialer automatically disarm for certain time periods. This function prevents the product from sending alarm telephone calls during periods when personnel are stationed at the site and are able to deal with the problem directly.

ALARM RESET TIME The period of time, beginning at the moment an alarm is acknowledged, during which alarm dialing on behalf of that specific channel is suspended regardless of further activity of its input circuit. At the end of this period, the Acknowledged Alarm status is cleared for that channel. See Section 5.6, "Alarm Reset Timeout After Acknowledgment" and Section 6, "Advanced Programming."

ALARM TRIP DELAY The time required for an input violation to remain in violation before the unit trips into the Unacknowledged Alarm state. See Section 6, "Advanced Programming."

ANALOG Analog signals have variable values of current or voltage, with the specific value generally representing some physical parameter such as water level or pressure. The most common type of analog signal is a 4-20 milliampere current loop, with a transmitter (transducer and associated power supply) governing the current in a loop. This current is detected by one or more receiving devices in the loop, such as an optional analog input channel on a Verbatim autodialer.

AUTOCALL A special test calling function. When Autocall is turned on, the unit places test calls at regular intervals to provide ongoing assurance of Verbatim autodialer and phone line operation. See Section 6, "Advanced Programming."

AUTODIALER A device which constantly monitors a set of inputs from various external sensors, and places outgoing alarm calls when there is an alarm condition. It also allows inquiry calls.

AUTOEXTEND A unique feature on the Verbatim autodialer which automatically extends the available message recording time as required, selecting the optimum speech memory rate for the user's voice message recording. See Section 4.2.1, "Verifying/Extending Recording Time."

CALL BACK See Call Forward.

CALL FORWARD The unit may be commanded from the panel or over the phone, to place a call to a specific phone number. This is called Call Forwarding. If the number called is that of the person commanding the call from a remote telephone, then it is termed Call Back. This is typically done for test purposes. See Section 5.8, "Dialing Out and Conversing Through the Verbatim autodialer," and Section 6, "Advanced Programming."

CALL OUT The action of the Verbatim autodialer placing calls to outside personnel or facilities.

CDL (Central Data Logger) The combination of a modem, a serial interfaced printer and a special Raco-built interface box is called a Central Data Logger (CDL). A Raco autodialer/RTU may be configured to call and log data to the CDL printer. CDL RTUs first call the CDL printer to log alarm and status information then proceed on to calling personnel by voice.

CLOSED CIRCUIT CONDITION One of two possible states of a contact closure input circuit. Closed Circuit is the condition in which the contacts complete the electrical circuit connection. Open Circuit is the opposite condition, in which the contacts do not complete the electrical circuit connection. The Open Circuit condition is electrically equivalent to having no connection to the input circuit. A Closed Circuit input will measure zero volts DC from the input connection to the common connection point. An Open Circuit input will measure 5 volts DC. The Open or Closed Circuit status may

also be read without a voltmeter, by use of Program Code 0 ZZ 0, where ZZ is the 2-digit channel number. See Section 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls".

COMMON The combined electrical return connection point for all contact closure inputs. One side of all contact inputs are connected to Common. Physically, this Common connection point is any of the 4 terminals marked C on terminal strip TS1. The circuit board internally connects Common to the AC ground (GREEN) terminal on terminal strip TS3. See Section 2, "Installation."

DEFAULT Programming values which are built into the unit and remain in effect until the user alters them. Also, permanently available speech messages which are utilized when the user has not recorded his own messages.

DELAY BETWEEN DIGITS In some applications, an extra waiting time is needed between dialed digits. For example in some PBX systems, a 9 must be dialed, followed by a waiting time of several seconds before the main phone number may be dialed. See Section 3.2, "Programming Phone Numbers," Appendix F, "MODBUS Interface," and Section 6, "Advanced Programming."

DESIGNATION NUMBER The two-digit "order number" of a phone number in the overall set of phone numbers programmed. For example, the designation number for the third phone number is 03. See Programming Worksheet A. See Section 3.2, "Programming Phone Numbers," 6.1, "Program Codes," and 6.2, "Programming Operations."

DIALER See autodialer.

DRY Description of a sensor contact circuit that is not connected to any power source.

EXIT DELAY A delay period after a user arms the unit, before the unit will actually accept new alarms. Used to allow user to exit a protected entrance without tripping the unit into alarm. See Section 6, "Advanced Programming."

GLOBAL Essentially "over all" or "universal". Programming that simultaneously sets the same value for all channels, but excluding the Power Failure Alarm function.

GROUPING See Alarm Call Grouping.

ID MESSAGE See Station ID Message.

INQUIRY CALL A call placed by personnel to the Verbatim autodialer. See Section 5.1, "Placing Inquiry Calls to the Verbatim autodialer."

LED A lighted legend indicator on the front panel.

LINK See Alarm Call Grouping.

MEMORY USE RATE See Speech Memory Rate.

MODEM A device which allows digital data (as opposed to voice) to be transmitted between two sites, usually via public telephone lines. In the case of a Verbatim autodialer equipped with the CDL or SCADA option, a modem is built into the option card so that no external modem is required.

NETWORK The physical and higher level protocols for a specific vendor's PLC data communications. The Verbatim can support a maximum of 3 networks simultaneously. The actual number of networks and type of protocol are hardware options.

NETWORK ADDRESS The concatenation of the network ID, node, and PLC address. It is sometimes symbolized by '/net/node/addr' where net is the network ID, node is the node address, and addr is the PLC address. The network address suffices to uniquely identify any data object which the Verbatim can access.

NETWORK ID A voice message identifying a specific network. By default, the message is "Verbatim Net X", where 'X' is a number from 0 to 5. Custom messages, such as "Building 320 LAN" may be recorded. See 'NETWORK' entries below for more details.

NETWORK 0 Refers to the discrete, analog, and RSC points internal to the VSS.

NETWORK 1 Refers to devices connected to the 'NET1' port on the serial communications card. Protocols may vary.

NETWORK 2 Refers to devices connected to the 'NET2' port on the serial communications card. Protocols may vary.

NETWORK 3 Refers to devices connected to the MBPLUS port on the MBPLUS communications coprocessing card.

NETWORK 4 Refers to devices connected to the Parallel port.

NETWORK 5 Refers to devices connected to the Modem port on the serial communications card.

NODE The address of a specific PLC on the network. Each PLC is already configured with a unique integer as its node address. The Verbatim must also be given a unique number as its node address on each network to which it interfaces. The network ID and node together suffice to uniquely identify any PLC.

NORMAL CONDITION For contact closure inputs, the Normal Condition is that condition (open or Closed Circuit) which normally exists. The opposite condition would create an alarm. See Section 3.3, "Programming Input Channels" and 5.3, "Receiving Alarm Calls."

NORMALLY CLOSED Describes a monitored "contact type" input signal circuit, for which the normal, non-alarm state is associated with the circuit being closed (i.e. a completed connection being established between the two conductors of the input circuit). An alarm condition causes the circuit to be opened (broken), which the Verbatim autodialer would detect and begin placing alarm calls. This requires that this input be programmed as Normally Closed on the Verbatim autodialer.

NORMALLY OPEN Opposite of a Normally Closed circuit. The input signal is open in the normal, non-alarm state and closes when an alarm occurs. This requires that this input be programmed as Normally Open on the Verbatim autodialer, which is the default setting for a contact type input.

NON-VOLATILE MEMORY When AC power fails, the unit continues to operate for several hours on its internal Gel Cell battery. When this battery is near discharge, the unit automatically turns itself off. However all the user's programming and all user recorded messages are kept intact by Non-volatile Memory for up to ten years, so when power is later restored, no reprogramming or message recording will be required.

OPEN CIRCUIT CONDITION See Closed Circuit Condition.

PHYSICAL CHANNEL OR PC Internal inputs are sometimes call Physical Channels (PCs). PCs monitor user-supplied external sensors such as float switches, limit switches, etc. In most cases, the outputs of logic controllers may be connected directly to Physical Channel inputs without the need for interfacing relays or other signal conditioning. The normal Verbatim inputs, as distinguished from the RCs when necessary. The semantics are such that all RCs on network 0 are PCs.

PLC ADDRESS The data table location of an object within a specific PLC's internal memory. The format of the PLC address is vendor dependent. For network 0, the PLC address is the physical channel number.

POWER FAILURE The disappearance of 120 VAC power to the unit. The unit will continue to operate under power failure until its internal Gel Cell battery is discharged.

PULSE TOTALIZER The totalizer function accumulates a continuing count of the number of cycles of a train of pulses presented to the input. The pulses may be in the form of an open and closed circuit, or they may be in the form of a 5-volt logic signal.

RECORDING RATE In the process of digitally recording the user's voice messages into speech memory, the message is recorded into memory at one of four possible rates. The faster this rate of memory usage, the higher the recording fidelity. However, this results in less total available recording time than at slower rates. Rate 1 is the fastest rate giving the best sound quality. The Auto-

extend feature automatically selects the optimum rate to allow adequate recording time for the user's own set of messages at the best possible sound fidelity. See Section 4.2.1, "Verifying/Extending Recording Time," and Section 4.3, "Record Your Messages."

REMOTE CHANNEL OR RC A Verbatim I/O point whose value mirrors the value at some network address. Each active RC is associated with one and only one network address. The RC number can be viewed both as a 'speed dial' abbreviation for the lengthy network address and as a 'virtual' I/O point that supports alarm criteria. Different RCs can refer to the same network address. All data objects referenced by any RC are either 1 or 16 bits in length. 1-bit objects are termed "discrete" or "digital" points. 16-bit objects are sometimes termed "analog" points even though the data may actually be a discrete counter or timer. The type of object is implicit in the RC's network address. This is to say, any RC can be either discrete or analog.

Analog RCs are NEVER scaled to engineering units within the Verbatim Gateway. They can only have decimal integer values in the range 0 to 65535. Any desired must be done within the PLCs program. Floating point, hexa-decimal, and octal data formats are not supported.

REPEATS The number of times a series of messages (including Station ID message) is spoken when an alarm call is placed. As used here, this number includes the first recital of the messages. For example, 3 repeats means 3 times total, not 4. See Section 5.3, "Receiving Alarm Calls" and Section 6.1, "Program Codes."

RING ANSWER DELAY The number of rings required before the Verbatim autodialer will answer an inquiry call. See Section 5.3, "Receiving Alarm Calls," and 6.1, "Program Codes."

RTU (Remote Telemetry Unit) A monitoring device, interfaced to a communications medium, whose mission is to communicate conditions at a remote or inaccessible site. RTUs are usually polled by a central computer on some schedule or interval. Additionally, RTUs may request polling to report any exceptions such as alarms or other events which require the attention of the central computer or its operators. When a Raco Verbatim autodialer is configured with the asynchronous communications module it is known as an RTU. The Verbatim RTU does not loose any of the basic features of the Verbatim autodialer. In addition, the Verbatim RTU is capable of receiving polling calls from the Raco SCADA Central Computer. Furthermore, alarms may be communicated to the Raco SCADA Central Computer or to a Raco Central Data Logger (CDL) printer.

RUN TIME METER A feature which, when turned on, accumulates the total number of hours that an input channel is in the Closed Circuit condition. Typically used to monitor equipment operation time, particularly alternating pump systems. See Section 3.3, "Programming Input Channels," and Section 6, "Advanced Programming."

SCALE FACTOR A translation factor which may optionally be entered in conjunction with the Pulse Totalizer function. The spoken Totalizer reading will be the actual number of pulses accumulated, divided the programmed scale factor. See Section 6, "Advanced Programming."

SECURITY ACCESS CODE A code optionally programmed by the user at the front panel. Once programmed, this code is required in order to perform any program operations over the phone. See Section 5.7, "Programming by Phone," and Section 6, "Advanced Programming."

SPEECH MEMORY RATE See Recording Rate.

STATION ID MESSAGE A message which is always included in all phone calls to or from the unit, intended to identify the unit. The default Station ID Message is "ID number is 1". See Section 4.1, "Planning Messages" and 4.3, "Record Your Messages."

TIME BETWEEN ALARM CALLS With the unit in Unacknowledged Alarm status, the waiting time from the time the unit terminates a given alarm call, until the time when the unit again accesses the phone line to place the next call. During this interval (default 2 minutes), personnel may call the unit back, which will acknowledge the alarm and suspend further calling. See Section 5.4, "Continued Dialing in the Absence of Acknowledgment," and Section 6, "Advanced Programming."

VIOLATION For contact closure inputs, a violation (also called Alarm Condition) is the Open or Closed Circuit condition which is opposite the condition which has been programmed as Normal for that channel. For example, if a given input channel is programmed for Normally Open operation, then a Closed Circuit is a violation for that input. If the violation persists for the Alarm Trip Delay time, the unit will go into Unacknowledged Alarm state and begin placing alarm calls. See Section 3.3, "Programming Input Channels, " 5.3, "Receiving Alarm Calls," and 5.6, "Alarm Rest Timeout After Acknowledgment."

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FCC Notice to Users

1. You must notify your telephone utility as follows:
    a. Intention to install an FCC Part 68-registered device.
    b. The FCC registration number: HKS-23J06304-AL-R
    c. The ringer equivalence number: 0.3A
    d. When the device is disconnected from the telco network and will not be reconnected.
2. These units may not be used on party lines.
3. The telco has the right to make changes in their network which may affect the operation of your unit, provided adequate notice is given to you in advance to permit continued correct operation.
4. In the event of operational problems, disconnect your unit by removing the modular plug from the modular telephone jack. To test the phone line, temporarily plug a working rotary-dial telephone into the jack normally used by the Verbatim. If the substitute telephone works correctly, your Verbatim has a problem and should be returned for repairs (in or out of warranty). If the substitute telephone does not work correctly, notify the telco that they have a problem and request prompt repair service (at no cost to the user).
5. The user may not under any circumstances (in or out of warranty) attempt any service or repairs on the Verbatim. It must be returned to RACO for all repairs.

Warranty Registration Card

KEEP THIS FOR YOUR RECORDS

Important:

Within 14 days of purchase, please complete this Warranty Registration. Detach the top portion, fold in half and drop in the mail. Postage is paid if mailed in the U.S. Otherwise, please return to:

RACO Manufacturing and Engineering Co. Inc.
Service Department
1400 62nd Street
Emeryville, California 94608

Detach here before mailing

Model	**VERBATIM**
Serial number	
Date of Purchase	
Name	
Title/position	
Company/Organization	
Division/Department	
Address	
Telephone	
Dealer's Name	
Address	

Response Card

The following additional information will assist us in our continuing efforts to provide you with products that meet your specific requirements.

Please send me more information on the following quality products from RACO Manufacturing:

1. This Autodialer is used in:

   _ wastewater __ gas pipeline
   _ cold storage __ chemical manufacture
   _ energy generation __ agriculture
   _ remote equipment _____ other

2. It uses the following types of transducers:

   _ pressure __ temperature
   _ electrical detection __ gas (all types)
   _ intrusion __ flow
   _ float level _____ other

3. I first became aware of this Autodialer from:

   _ dealer showroom __ colleague
   _ Central Data Logging __ trade show
   _ professional association __ magazine inquiry
   _ _____ other.

4. I read the following publication(s) regularly:

   _____
   _____
   _____

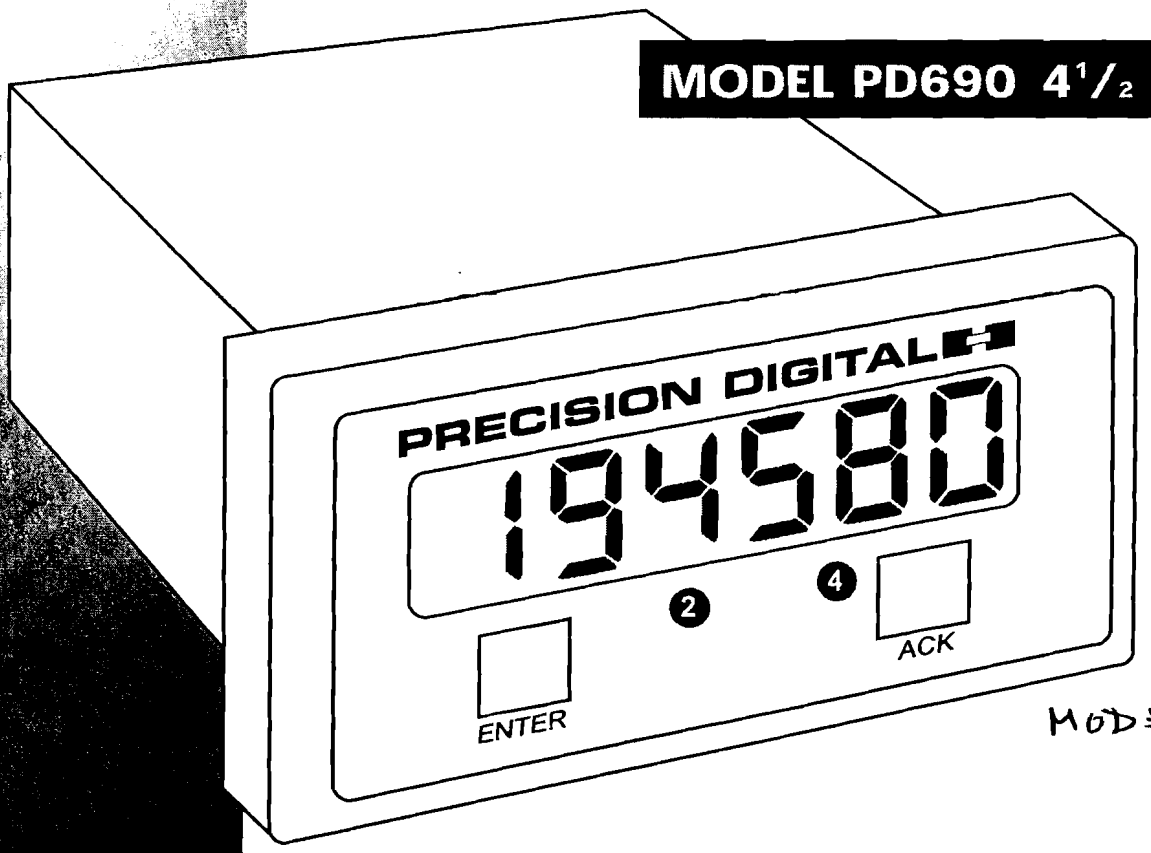
Section 7-BB

Recovery Well Process Meter

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

UNIVERSAL PROCESS METER

MODEL PD690 4 1/2 DIGIT



MOD# PD-6903-N

- 4-20 mA, 1-5 V, 0-5 V, or 0-10 V Field Selectable Inputs
- 4 1/2 Digits + Extra Zero Display
- Easy Single Button Scaling (SBS)
- Stand Alone Scaling (SAS)
- Calibration and Programming Lockout
- 11-Point Linearization
- Square Root Extraction
- Type 4X, NEMA 4X Front Panel
- Isolated 24 V Transmitter Power Supply
- 4 Visual Alarm Points with LED Status Indication
- 2 or 4 Relays + 4-20 mA Output Options
- Green Display Available

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GENERAL FEATURES

The Model PD690 puts the power of microprocessor technology to work in a high performance, easy to use, industrial grade digital process meter with the features customers want:

- Single Button Scaling
- Isolated 24 V Transmitter Power Supply
- Type 4X, NEMA 4X Front Panel
- Steady, Accurate 4½ Digit + Extra Zero Display
- Linearization with Square Root Extraction
- Powerful Options

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Single Button Scaling (SBS) Makes Setup a Snap

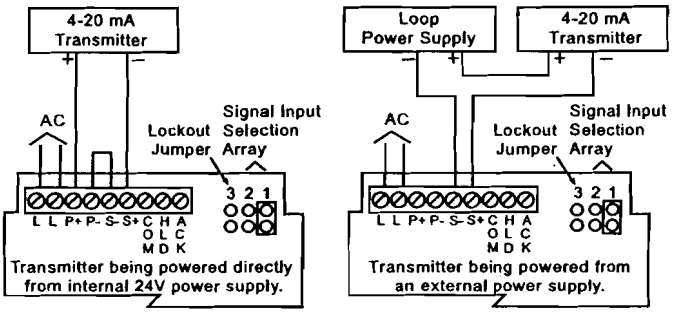
Single Button Scaling means the PD690 can be completely programmed using only one button. And you only do one thing with that one button: press it once when the meter displays what you want. For example, press the **ENTER** button to initiate automatic scan of the various programming routines: SCALE, dEC Pt, ALAr5, outPut, and no Pt5. To enter one of these routines, press the **ENTER** button as the routine name is displayed. Once in the routine, press the **ENTER** button when the meter reads the desired value. It's that simple!

Stand Alone Scaling (SAS) for Quick Setup

The PD690 may be calibrated using an external signal source such as a calibrator or scaled using the internal source with the Stand Alone Scaling feature. With Stand Alone Scaling, a 4-20 mA input can be scaled for any display range without applying a signal. No calibrator is necessary to program the unit for a desired display range. Simply select Internal Calibration mode and set desired display for the 4 mA and 20 mA values. To scale inputs such as 0-5 V, 1-5 V, or 0-10 V without applying a signal it is necessary to first complete an Initial Calibration.

Simplify Loops with PD690 24 V Transmitter Power Supply

The PD690 is ideal for loops that consist of a transmitter and a digital display because the PD690 provides the 24 V to power the transmitter. This standard feature saves time and money by simplifying wiring and eliminating the cost of an external power supply. In addition, the isolated power supply can be used to power 3 and 4 wire transducers with either current or voltage output.



Type 4X, NEMA 4X Front Panel Protection for Hostile Environments

Wet, dirty and dusty environment don't bother the PD690 Type 4X, NEMA 4X front panel so it can be installed in almost any panel in the plant. That means plant operators can have the important process information right where they need it most, on the shop floor. And the Type 4X, NEMA 4X front panel does not restrict access to the setup buttons.

Big Bright Steady Display for Big Numbers

The PD690 4½ digit plus extra zero display is great for displaying big numbers; like the volume in a 100,000 gallon tank. And the PD690 large display does not sacrifice stability for resolution. Even when displaying large numbers, the PD690 display is steady and quick responding. Operators will appreciate being able to display process variables with such stability and resolution and they'll have confidence in the smooth, steady display.

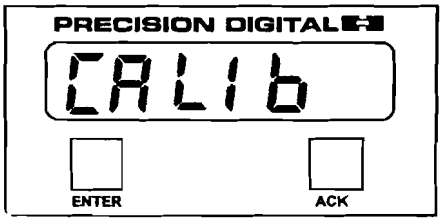
4 Visual Alarm Points Standard

The PD690 comes with 4 visual independent alarms. Each alarm is easily programmed for high or low set point and 0-100% deadband. Front panel LEDs indicate alarm status and assist in set point/reset point programming. Options are available for 2 and 4 relays.

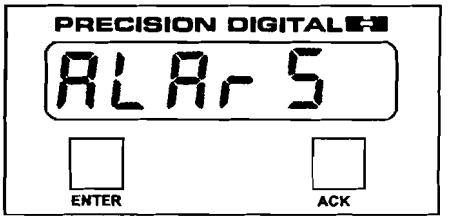
Alarm/Relay Programming

Pressing the ENTER button when the display reads ALAr5 initiates a scan of the alarm set and reset points. First, the display flashes Alarm #1 Set Point and indicates this by lighting up the #1 LED and the "S"

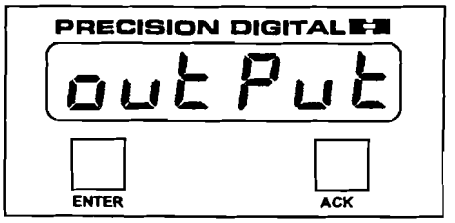
(continued on next page)



To Calibrate: Press **ENTER** when meter reads CAL Ib.

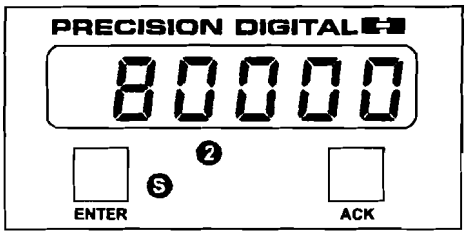


To Program Alarms: Press **ENTER** when meter reads ALAr5.

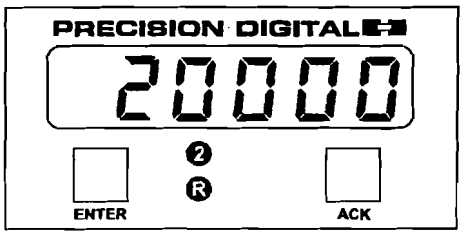


To Program 4-20 mA Output: Press **ENTER** when meter reads outPut.

LED. This Set Point may be changed using the ENTER button. Next the display flashes Alarm #1 Reset Point and indicates this by lighting up the #1 LED and the "R" LED. This Reset Point may also be changed using the ENTER button. The remaining Set and Reset Points are programmed in a similar fashion.



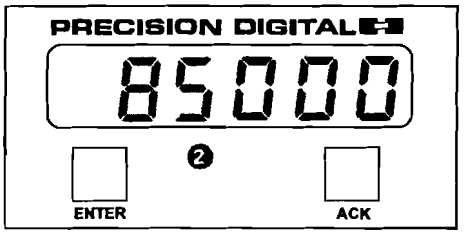
PD690 Alarm #2 Set Point is adjusted to 80000.



PD690 Alarm #2 Reset Point is adjusted to 20000.

Alarm Status Indication

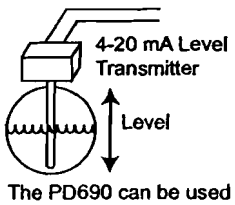
When an alarm occurs, an LED will illuminate to indicate which alarm has tripped. This LED will stay illuminated until the meter returns to the non-alarm state.



PD690 indicating that Alarm #2 is in alarm condition.

Linearization Feature

The linearization feature has two modes of operation. The 11-point user calibration will display non-linear signals like volume in a round horizontal tank by allowing the user to input up to 11 calibration points and corresponding displays. The square root extraction feature displays flow rate by extracting the square root of a signal from a differential pressure transmitter. This feature also has a user selectable low flow cutoff feature to give a reading of zero when the flow rate drops below a user-set point.



The PD690 can be used to display volume in a round horizontal tank.

The PD690 can display flow rate by extracting the square root of a signal from a differential pressure transmitter.

OPTIONS

The PD690's wide array of options satisfy even the most demanding applications. And, unlike many competitors, there are no restrictions on the combination of options a meter can have! A fully loaded Model PD690-3-18 has a 24 V transmitter power supply (standard), NEMA 4X front panel (standard), 11-point linearization (standard), 4 relays, and isolated 4-20 mA output.

Relay Options

The PD690 is available with 2 or 4 relays. The SPDT relays are rated 2 Amp at 250 VAC and can be programmed for automatic or automatic plus manual reset. The relays can also be programmed for 0-100% deadband.

Isolated 4-20 mA Output Option

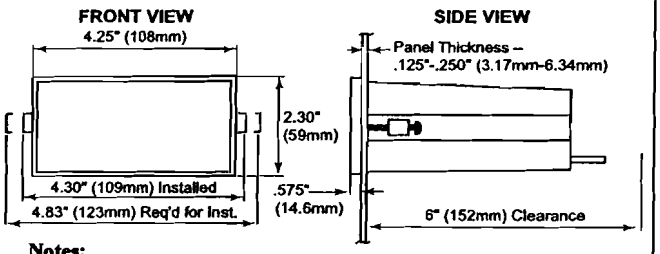
The PD690 can be equipped with an isolated 4-20 mA output signal option that can be programmed to produce a 4-20 mA output for virtually any input. The 4-20 mA output signal can be powered either by the internal or an external power supply. If the internal power supply is used for the 4-20 mA output, it is not available to power the transmitter input. The 4-20 mA output provides 500 VDC or peak AC, input-to-output or input/output-to-power isolation.

Option Card Pin-Outs

	Pin:	Function:	
J1	1	Transmitter +	PD175
	2	Transmitter -	
J2	1	Relay #1 Common	PD176, PD178
	2	Relay #1 NC	
	3	Relay #1 NO	
	4	Relay #2 Common	PD174, PD178
	5	Relay #2 NC	
	6	Relay #2 NO	
J3	1	Relay #3 Common	PD177, PD178
	2	Relay #3 NC	
	3	Relay #3 NO	
	4	Relay #4 Common	
	5	Relay #4 NC	
	6	Relay #4 NO	

Notes:
1. Alarm acknowledgement terminals (ACK and COM) are located on the meter main board.
2. In the alarm condition, the NC contact is connected to common in the fail-safe mode.

Mounting Dimensions



Notes:
1. Panel cutout required: 1.772" x 3.622" (45 mm x 92 mm) 1/8 DIN
2. Panel thickness: 0.125" - 0.250" (3.17 mm - 6.34 mm)
3. Clearance: allow 6 inches (152 mm) behind the panel
4. Weight: 16 oz (454g)

PRECISION DIGITAL — MODEL PD690 UNIVERSAL PROCESS METER

SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

General

INPUTS: Field selectable, 4-20 mA, 0-5 V, 1-5 V, 0-10 V.
DISPLAY: Bright, Large, 0.56" (14.2mm) high efficiency red or green LED. 4½ digits + extra zero; ± 19999(0), (0) may be switched on to display 199,990. Lead zeros blanked.
FRONT PANEL: Type 4X, NEMA 4X, panel gasket provided.
CALIBRATION: May be calibrated using internal calibration (I-CAL) or by applying an external calibration signal (E-CAL). To scale inputs such as 0-5 V, 1-5 V, or 0-10 V without applying a signal it is necessary to first complete an Initial Calibration.
CALIBRATION RANGE: 4 mA (1 V) input may be set to display anywhere in range of meter. 20 mA (5 V) may be set anywhere above or below 4 mA input.
NON-VOLATILE MEMORY: All programming values are stored in non-volatile memory for ten years if power is lost.
LOCKOUT: Jumper 3 at rear of instrument restricts modification of calibration values.
LOOP POWER: (AC powered units only) Isolated 24 VDC ± 5% at 20 mA regulated. Maximum loop resistance of 1200 Ω. Available for either signal input or 4-20 mA output option, but not both.
HOLD READING: Connect terminals HLD and COM.
ACCURACY: ± 0.05% of calibrated span ± one count.
INPUT IMPEDANCE: Voltage ranges, greater than 300 KΩ; Current range, 100 Ω.
POWER: AC power: 115 VAC ± 10%, 50/60 Hz, 10 VA.
230 VAC ± 10%, 50/60 Hz, 10 VA.
DC power: 18-36 VDC, 6 watts max.
ISOLATION: AC power: 1500 VAC; DC power: 500 VDC.
NORMAL MODE REJECTION: 64 dB at 50/60 Hz.
ENVIRONMENTAL: Operational ambient temperature range: 0 to 60°C. Storage temperature range: -40 to + 85°C.
Relative humidity: 0 to 90% non-condensing.
ENCLOSURE: 1/8 DIN, high impact plastic, UL 94V-0, color: black.
CONNECTIONS: Removable screw terminal block.
ALARM POINTS: 4, any combination of high or low alarms.
ALARM STATUS INDICATION: Front Panel LED.
ALARM DEADBAND: 0-100%, user selectable.
UL FILE NUMBER: E160849; 508 Industrial Control Equipment
WARRANTY: 1 year parts and labor
EXTENDED WARRANTY: Warranty may be extended an additional 12 months by returning the Product Registration Form within 2 months from date of purchase. Go to **www.predig.com** for online registration.

Relays

RATING: 2 or 4 SPDT (form C); rated 2 Amp @ 30 VDC or 2 Amp @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads
RESET: User Select.
1. Automatically plus manually (via user supplied switch or front panel ACK button).
2. Automatically when the input passes the reset point.
FAIL-SAFE OPERATION: The relay coils are energized in the non-alarm condition. In the case of a power failure, the relays will go to the alarm state, (NC contact is connected to common). Fail-safe operation may be disabled with internal jumper.
AUTO INITIALIZATION: When power is applied to the meter, the relays will always reflect the state of the input to the meter.
DEADBAND: 0-100%, user selectable.

Isolated 4-20 mA Output Signal

CALIBRATION RANGE: Anywhere in range of meter, 501 count minimum span.
OUTPUT LOOP RESISTANCE:

	Loop Resistance	
Power supply	**minimum**	**maximum**
24 VDC	10 Ω	600 Ω
35 VDC (external)	600 Ω	1000 Ω

ISOLATION: 500 VDC or peak AC, input-to-output or input/output-to-power.
ACCURACY: ± 0.1% F.S., ± .004 mA
EXTERNAL LOOP POWER SUPPLY: 35 V Maximum.
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ORDERING INFORMATION — Model PD690

115 VAC	230 VAC	24 VDC	Description	Option Card**
PD690-3-N*	PD690-4-N	PD690-2-N	No Options	
PD690-3-14*	PD690-4-14	PD690-2-14	2 Relays	PD174
PD690-3-15*	PD690-4-15	PD690-2-15	4-20 mA Output	PD175
PD690-3-16*	PD690-4-16	PD690-2-16	2 Relays + 4-20 mA Output	PD176
PD690-3-17*	PD690-4-17	PD690-2-17	4 Relays	PD177
PD690-3-18*	PD690-4-18	PD690-2-18	4 Relays + 4-20 mA Output	PD178

Notes:
*Quick Shipment Product, shipped within 2 working days.

**Part numbers for Option Cards when purchased separately.

G may be added after second field in the part number to call out meters with a green display for an additional charge; example: PD690-3G-14.

YOUR LOCAL DISTRIBUTOR IS:

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LDS690 Rev A 02/02

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www.predig.com

DIGITAL PANEL METERS

Model PD690 Universal Process Meter

Instruction Manual

- Easy **S**ingle **B**utton **S**caling **(SBS)**
- 4-20 mA, 0-5 V, or 0-10 V Field Selectable Inputs
- 24 V Transmitter Power Supply Standard
- Scale Without a Calibrator
- Calibrate with a Signal Source
- Steady, Accurate Display to ± 199,990
- 11-Point Linearization for Non-Linear Inputs
- Square Root Extraction with Low-Flow Cutoff
- 4½ Digit + Extra Zero
- NEMA 4X, IP65 Front Panel
- 2 or 4 Relays + 4-20 mA Output Options
- 115 VAC, 230 VAC, or 24 VDC Power Options
- Lockout Feature
- Non-Volatile Memory, No Battery Needed

PRECISION DIGITAL CORPORATION
19 Strathmore Road • Natick MA 01760 USA
Tel 800-610-5239 • Fax 508-655-8990

PRECISION DIGITAL

www.predig.com

INTRODUCTION

This meter is a high performance, easy to use, industrial-grade microprocessor-based digital process meter. It accepts all the standard process signals: 4-20 mA, 1-5V, 0-5V and 0-10V and displays these signals in engineering units on a 4½ digit display. The display includes an extra zero, which may be used to handle numbers up to 199,990. The meter also provides 24 VDC to power the transmitter. Options include 2 or 4 relays and an Isolated 4-20 mA Transmitter Output.

Typical Applications

Level:
- Sump Pump Control
- Water Tank Level
- Round Horizontal Tank Volume Measurement
- Well Draw-down
- Lift Station Control

Flow:
- Square Root Extraction from a DP Transmitter

Pressure:
- Compound Pressure
- High Pressure Alarms

Ordering Information

115 VAC Model	230 VAC Model	24 VDC Model	Options Installed	Option Card*
PD690-3-N	PD690-4-N	PD690-2-N	No Options	
PD690-3-14	PD690-4-14	PD690-2-14	2 Relays	PD174
PD690-3-15	PD690-4-15	PD690-2-15	4-20mA Out	PD175
PD690-3-16	PD690-4-16	PD690-2-16	2 Relays + 4-20 mA Out	PD176
PD690-3-17	PD690-4-17	PD690-2-17	4 Relays	PD177
PD690-3-18	PD690-4-18	PD690-2-18	4 Relays + 4-20 mA Out	PD178

Ordering example: PD690-3G-14, process meter powered from 115 VAC (-3) with 2 relays (-14).

*Part numbers for Option Cards when purchased separately

Safety Notice

CAUTION: Read complete instructions prior to installation and operation of the Meter.

WARNING: Risk of electric shock.

Observe all safety regulations. Electrical wiring should be performed in accordance with all applicable national, state and local codes to prevent damage to the Meter and ensure personnel safety.

Do not use this meter to directly drive heavy equipment such as pumps, motors, valves, etc.

It is recommended to use this meter in a fail-safe system that accommodates the possibility of meter failure or power failure.

WARNING

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

AVERTISSEMENT

Les pièces à l'intérieur du boîtier portent des tensions dangereuses. Seules des personnes qualifiées et bien entrainées devraient entreprondre l'ótalonnage et la maintenance.

DISCLAIMER

The information contained in this document is subject to change without notice. Precision Digital makes no representations or warranties with respect to the contents hereof, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose.

SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C

Basic Meter

INPUTS	Field selectable: 4-20 mA, 0-20 mA, 0-5 V, 1-5 V, 0-10 V.
DISPLAY	Bright, large, 0.56" (14.2mm) high efficiency red LEDs. 4½ digits + extra zero may be switched on to display +/- 19,999(0). Leading zeros blanked.
DECIMAL POINT	Decimal point may be placed in any of the following positions. 1.9999, 19.999,199.99, 1999.9, 19999 or 199990 with extra zero.
CALIBRATION RANGE	4 mA (1 V) input may be set anywhere in range of the meter. 20 mA (5 V) may be set anywhere in range of the meter above or below 4 mA input. An Error message will appear if Input 1 signal and Input 2 signal are too close together. **Input Range:** — **Minimum Difference Between Input 1 & Input 2:** 0-5 V — 0.16 V 0-10 V — 0.32 V 4-20 mA — 1.60 mA
INPUT IMPEDANCE	Voltage ranges, greater than 300 KΩ; current ranges, 100-120 Ω.
LOOP POWER	(AC powered meters only), Isolated 24 VDC ± 5% @ 20 mA regulated. Maximum loop resistance is 1200 Ω. Available for either signal input or 4-20 mA output, but not both.
HOLD READING	Connect terminals H and CM
ACCURACY	±0.05% of calibrated span, ±1 count.
SQUARE ROOT EXTRACTION	±0.1% F.S. ± 1 count from 10-100% of flow.
LOW FLOW CUTOFF	Any input below the Low-Flow Cutoff point will result in a display of zero. May be set from 1 count to 100% of full scale, user selectable.

11-POINT LINEARIZATION	**Input Range**	**Minimum Span Between Inputs**
	4-20 mA	(1.6 mA / (Number of points –1))
	0-5 V	(0.16 V / (Number of points -1))
	0-10 V	(0.32 V / (Number of points -1))

e.g. Minimum span for an 11-point, 4-20 mA calibration is 0.16 mA between inputs.

ALARM POINTS	Four, any combination of high or low alarms.
ALARM POINT DEADBAND	0-100% of full scale, user selectable.
ALARM STATUS INDICATION	Front panel LED.
LOCKOUT	Jumper J3 restricts modification of calibration values.
NON-VOLATILE MEMORY	All programming values are stored in non-volatile memory for a minimum of ten years if power is lost. No battery needed.
NORMAL MODE REJECTION	64 dB at 50/60 Hz
POWER	AC power, 115 or 230 VAC ±10%, 50/60 Hz, 10 VA. DC Power, 18-36 VDC; 6 watts maximum.
ENCLOSURE	1/8 DIN, High Impact plastic, UL 94V-0
FRONT PANEL	Type 4X, NEMA 4X, Panel Gasket provided
ENVIRONMENTAL	Operational ambient temperature range: 0 to +60°C. Storage temperature range: -40 to +85°C. Relative humidity: 0 to 90% non-condensing.
WEIGHT	19.7 oz (559 g) (including options)
CONNECTIONS	Removable screw terminal blocks (provided) accept 22 to 12 AWG wire.
WARRANTY	2 years parts & labor.
EXTENDED WARRANTY	1 or 2 years, refer to the Price List for details.
UL FILE NUMBER	E160849; 508 Industrial Control Equipment
Options	
Relays	
RATING	2 or 4 SPDT (form C); rated 2 Amp @ 30 VDC or 2 Amp @ 250 VAC resistive load; 1/14 HP @ 125 / 250 VAC for inductive loads.

RESET	User Select: 1. Automatically when input passes reset point. 2. Automatically + Manually (via user supplied switch or front panel ACK button). Manual reset resets all manually resetable relays.
DEADBAND	0-100% of full scale, user selectable.
HIGH OR LOW ALARM	User may program any alarm for a high or low trip point.
FAIL-SAFE OPERATION	Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state. Fail-Safe operation may be disabled, by removing jumper J2 located on the Options Board.
AUTO INITIALIZATION	When power is applied to the meter, relays will always reflect the state of the input to the meter.

Isolated 4-20 mA Transmitter Output

CALIBRATION RANGE	The transmitter output can be calibrated so that a 4 mA output is produced for any number displayed by the meter. The 20 mA output may correspond to any number that is at least 501 counts greater or smaller than the number corresponding to 4 mA. (Ex. 4 mA = 0, 20 mA = 501) If the span between 4 and 20 mA is less than 501 counts, an error message will appear.
EQUIPMENT NEEDED	The 4-20 mA output is calibrated without the use of a calibrator. No equipment needed.
OUTPUT LOOP-POWER	(AC powered meters only), Isolated 24 VDC ± 5% @ 20 mA regulated. Maximum loop resistance is 1200 Ω. Available for either signal input or 4-20 mA output, but not both.
ACCURACY	± 0.1% F.S., ± 0.004 mA.
ISOLATION	500 VDC or peak AC, input-to-output or input/output-to-power line.
EXTERNAL LOOP-POWER SUPPLY	35 VDC max.

OUTPUT LOOP RESISTANCE	**Power supply**	**Min. loop resistance**	**Max loop resistance**
	24 VDC	10 Ω	600 Ω
	35 VDC (external)	600 Ω	1000 Ω

Display Messages and Functions

The following table describes the various messages displayed by the meter during programming and operation:

Display	Parameter	Description/Comments
E-CAL	Select External Calibration	Set meter for calibration using an external calibration source.
I-CAL	Select Internal Calibration	Set meter for calibration (scaling) using Internal calibration source.
CAL Ib	Perform External Calibration	Calibrate meter using an external calibration source.
SCALE	Perform Internal Calibration (scaling)	Calibrate meter (scale) using internal calibration source. (Signal source not required).
InPt 1	Input 1	Set Input 1 calibration value.
dSPY 1	Display 1	Set Display 1 calibration value.
InPt 2	Input 2	Set Input 2 calibration value.
dSPY 2	Display 2	Set Display 2 calibration value.
dECPt	Decimal Point	Set decimal point or light up extra "0".
no. PtS	Number of Points	Set meter for 2 to 11 calibration points.
L or S	Linear or Square	Set meter for Linear or Square Root calibration/scaling.
CutoFF	Low-Flow Cutoff	Set meter to display zero below programmed cutoff point.
ALArS	Alarms	Program alarm/relay set and reset points.
outPut	Output	Set 4-20 mA output values.
19999	Overrange	Indicates input signal exceeds full-scale range of meter.
- 19999	Underrange	Indicates input signal is below the negative range of meter.
Error	Error	Indicates calibration was not successful.

SETUP AND PROGRAMMING

Power, Signal, External Functions & Options Connections

Disconnect power to the meter before making any connections.

Do not connect power or earth ground to any unused or CM terminals.

Observe polarity for DC powered Meters. Applying voltage with reverse polarity may damage the instrument.

Connecting 230 VAC to a meter specified to accept 115 VAC or connecting AC power to a meter specified to accept DC power will result in damage to the instrument as well as endanger personnel. Keep primary wires separated from signal cables.

Notice:

- Primary voltages must not be accessible to the user.
- Primary wires must be installed in accordance to the applicable standards.

Terminals Designation

Terminal	Description
L, L	AC input power
V+, V-	DC input power
P+, P-	24 VDC output power
S+, S-	Input signal
AK	External relay acknowledge

Terminal	Description
H	Hold reading
CM	Common (return) for AK and H
+, -	4-20 mA output
1-6	Relay 1-4

Overview

The following field wiring connections are made to removable screw terminal blocks supplied with the meter:

Power, Signal Input, Acknowledge and Hold

Options: Relays & 4-20 mA Output

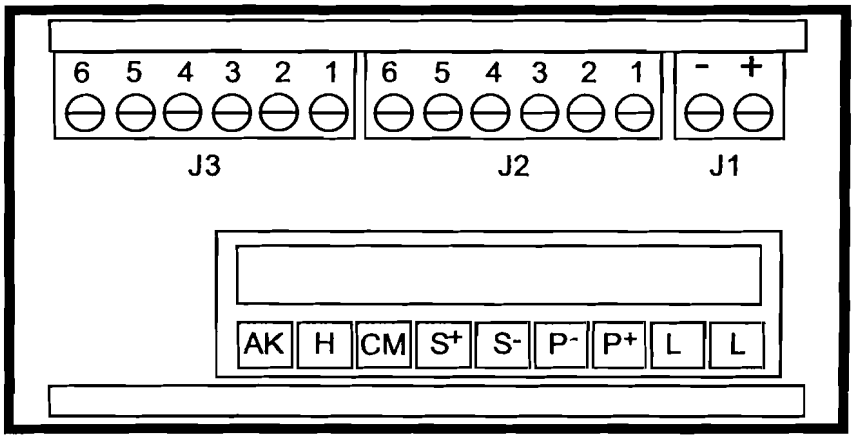


Figure 1: Rear View of Meter (Connectors)

Label	Main Board (Lower)	Wire Size
None	Power	12-18
None	Signal, Acknowledge, Hold	12-22
	Options Board (Upper)	
J1	4-20 mA Output	12-22
J2	Relays 1 & 2; NC, NO, Common	12-22
J3	Relays 3 & 4; NC, NO, Common	12-22

Wiring Instructions

1. All field connections to be made with either solid or stranded insulated wire. Strip length = ¼" (7 mm). Tighten all screw terminals to 4.5 lb-in (0.5 Nm). Do not pre-treat wire with solder.
2. Terminals connected to line voltage (e.g. L, RELAY 1-4): Use AWG # 12-18 copper wire, 600 volt, 60°C or 60/75°C. Connect only one wire to each terminal.
3. Terminals not connected to line voltage (e.g. AK, H, CM, S+, S-, P+, P-, V+, V-, OUTPUT): Use AWG #12-22 wire. If using AWG #20 or smaller wire, up to two wires may be connected to each terminal. If using AWG #18 or larger wire, only one wire may be connected to each terminal.

AC Powered Meters (Power, Signal, External Functions)

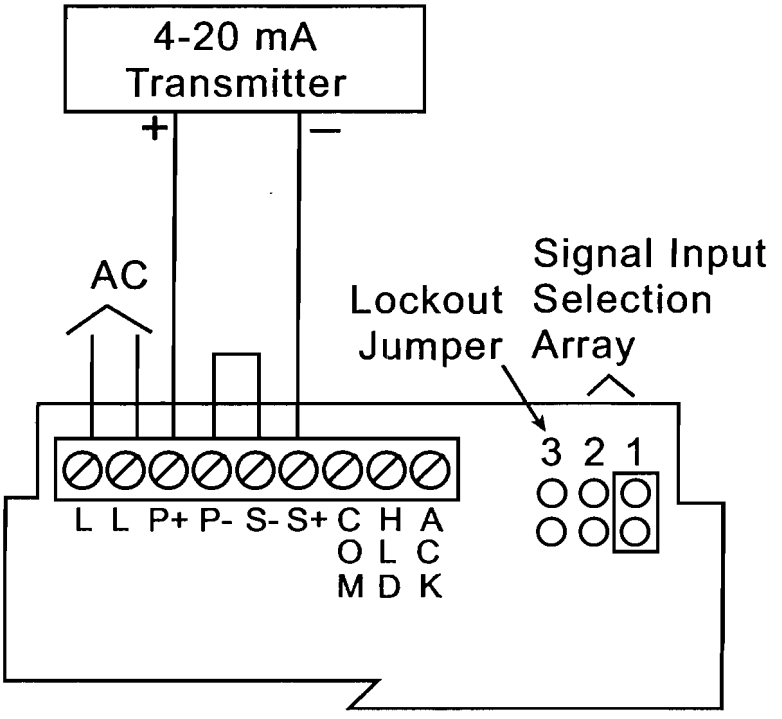


Figure 2: Transmitter Powered from Meter

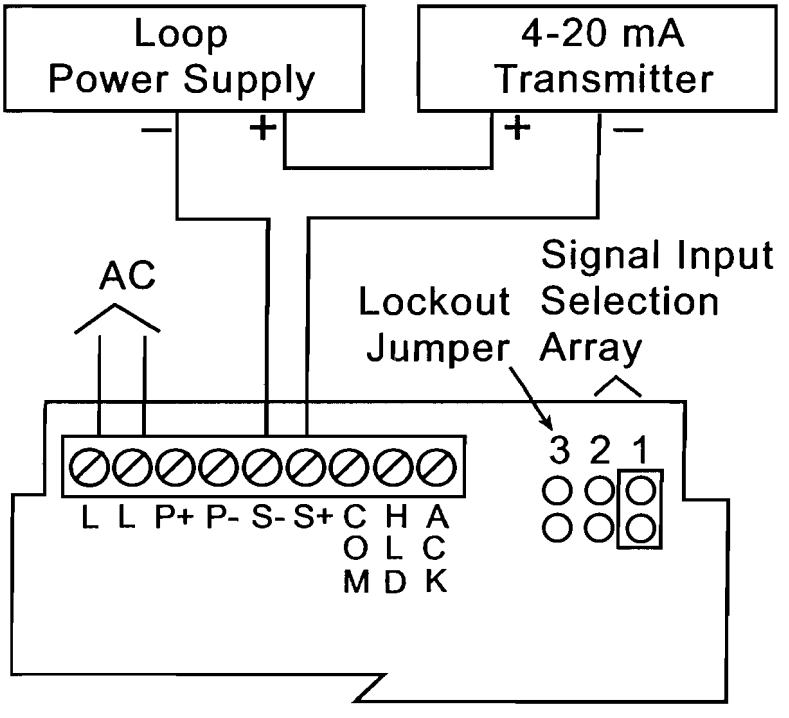


Figure 3: Transmitter Powered from External Power Supply

AC Powered Meters (Continued)

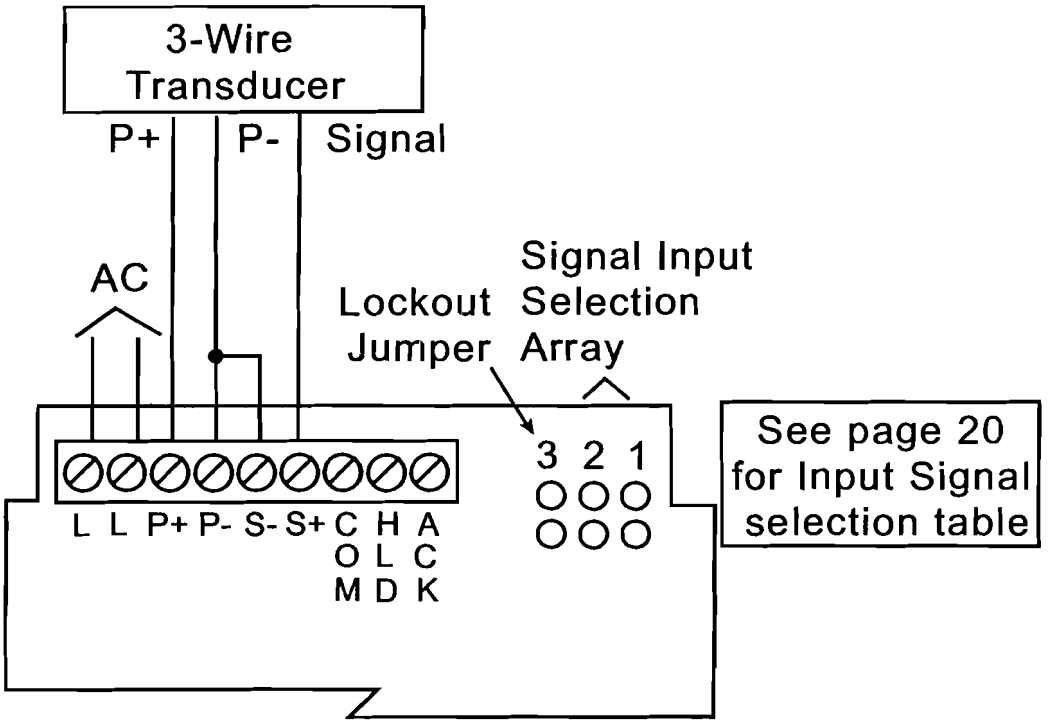


Figure 4: Three-Wire Transducer Powered from Meter

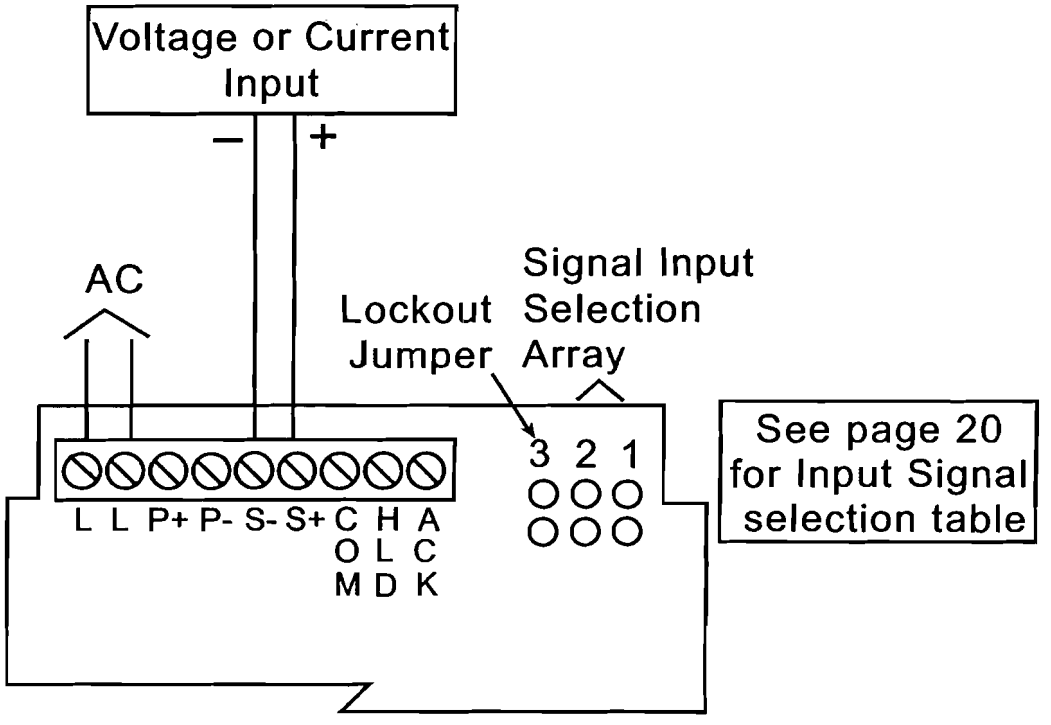


Figure 5: Voltage or Self-Powered 4-20 mA Input

DC Powered Meters (Power, Signal, External Functions)

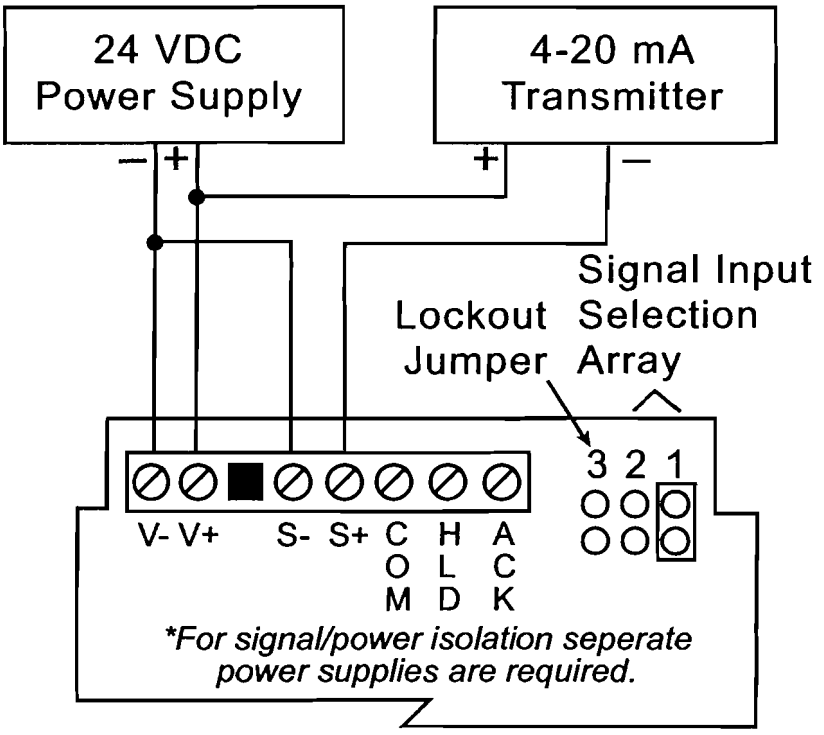


Figure 6: Transmitter and Meter Powered from Same DC Power Supply

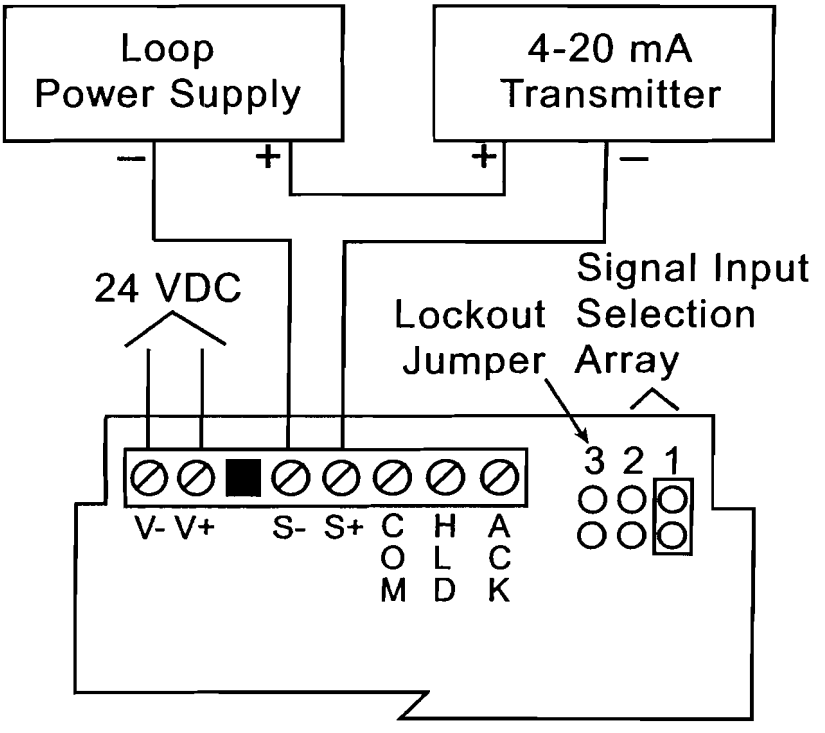


Figure 7: Transmitter and Meter Powered from Separate DC Power Supplies

Relays & 4-20 mA Output

Depending on the model number, the Options Board may contain two or four relays and an Isolated 4-20 mA Transmitter Output. Relay connections are made to removable screw terminal connectors located at J2 and J3 on the Options Board. Connections for the Isolated 4-20 mA Transmitter Output are made to J1 on the Options Board.

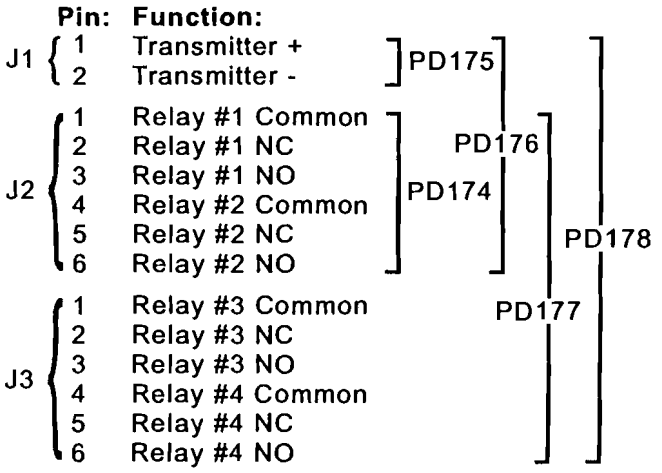


Figure 8: Option Card Pinouts

Notes:

1. Alarm acknowledgement terminals (ACK and COM) are located on the meter main board.
2. In the alarm condition, the NC contact is connected to common in the fail safe mode.

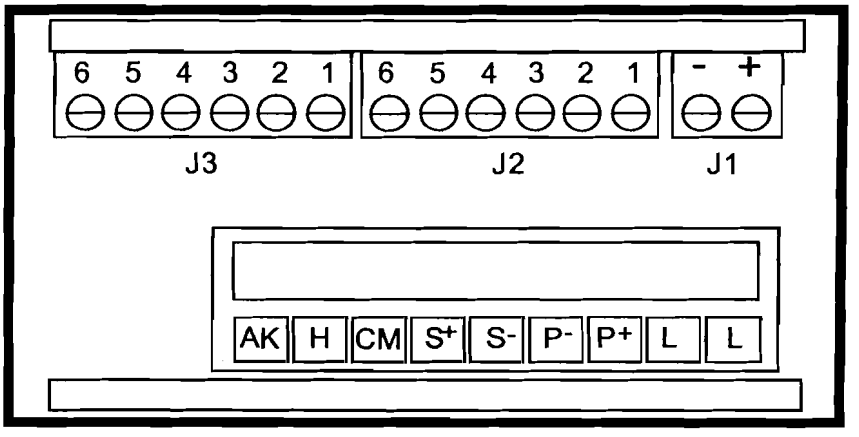


Figure 9: Rear View of Meter (Connectors)

4-20 mA Output

The 4-20 mA output from the meter can either be powered from the meter's internal transmitter power supply, (if it is not being used to power the input loop), or by an external power supply as the following diagrams illustrate:

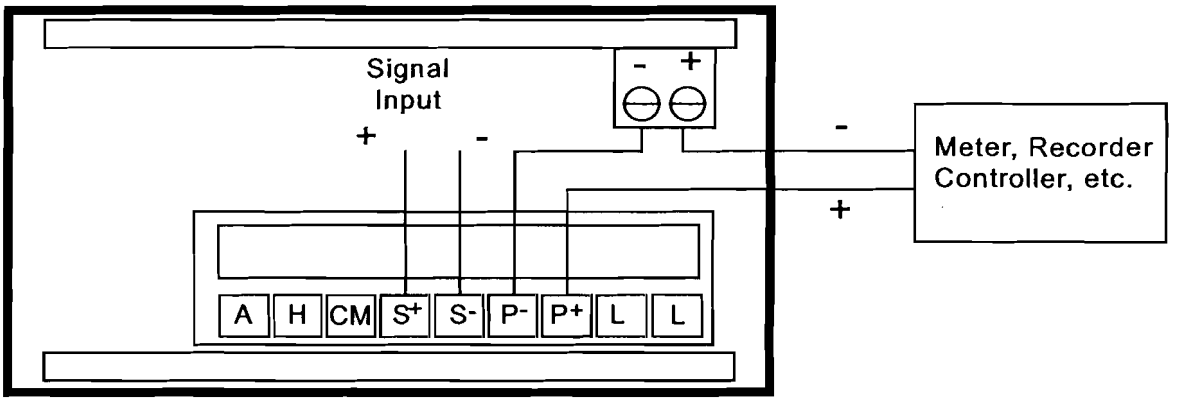


Figure 10: Meter Powering 4-20 mA Output Loop

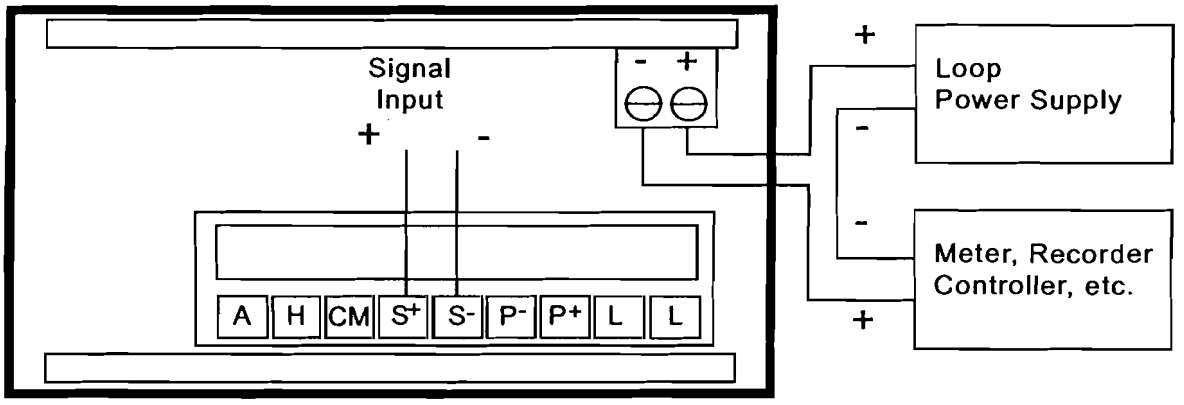


Figure 11: External Power Supply Powering 4-20 mA Output Loop

If the output loop is powered by an external supply, the loop power supply must be turned on before the meter is turned on. Otherwise, the output loop signal may be incorrect.

Programming

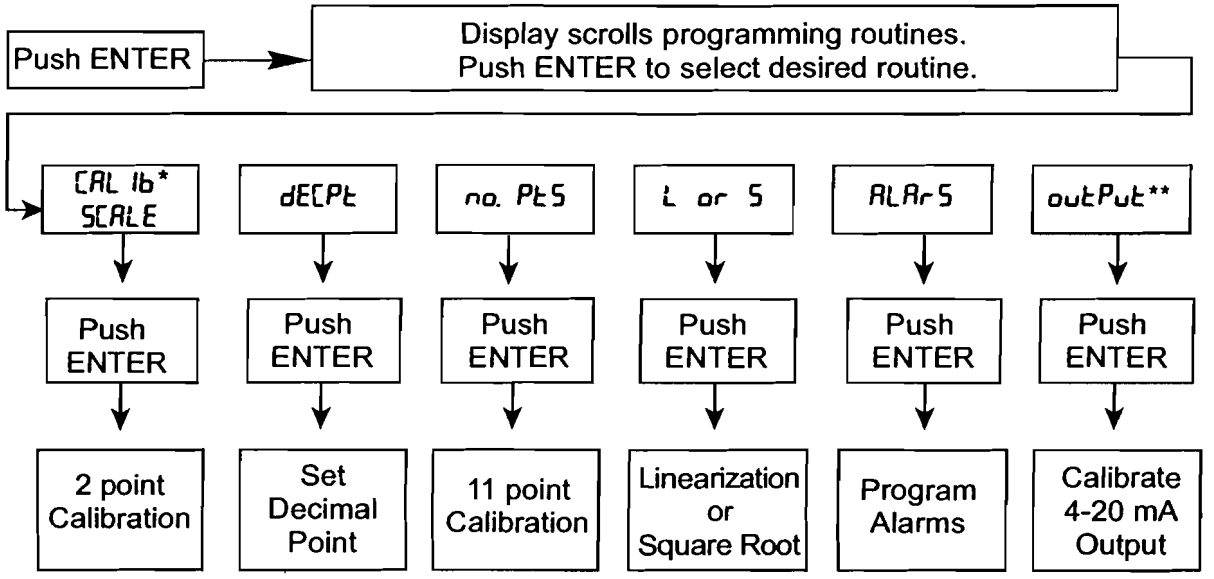
Overview

The meter is programmed using the **ENTER** button and three jumper arrays. The **ENTER** button controls the meter's ***S***ingle ***B***utton ***S***caling ***(SBS)*** feature that allows the meter to be completely programmed using just one button. The jumper arrays are used for programming the input signal, lockout, relays acknowledge enable and relays fail-safe operation.

Single Button Scaling (SBS)

Single ***B***utton ***S***caling is a technique that allows the meter to be completely programmed using just the **ENTER** button. The general method behind ***(SBS)*** is to push **ENTER** when the meter reads the desired value. This value may be a menu title, the entire display or just a single digit. If the meter is not reading the desired value wait and the value will change. When the meter finally reads the desired display push **ENTER** to accept it.

When the meter is first powered up, it will read a random number. Pushing **ENTER** will cause the meter to scroll through the following menu titles (if the Lockout Jumper is not installed):

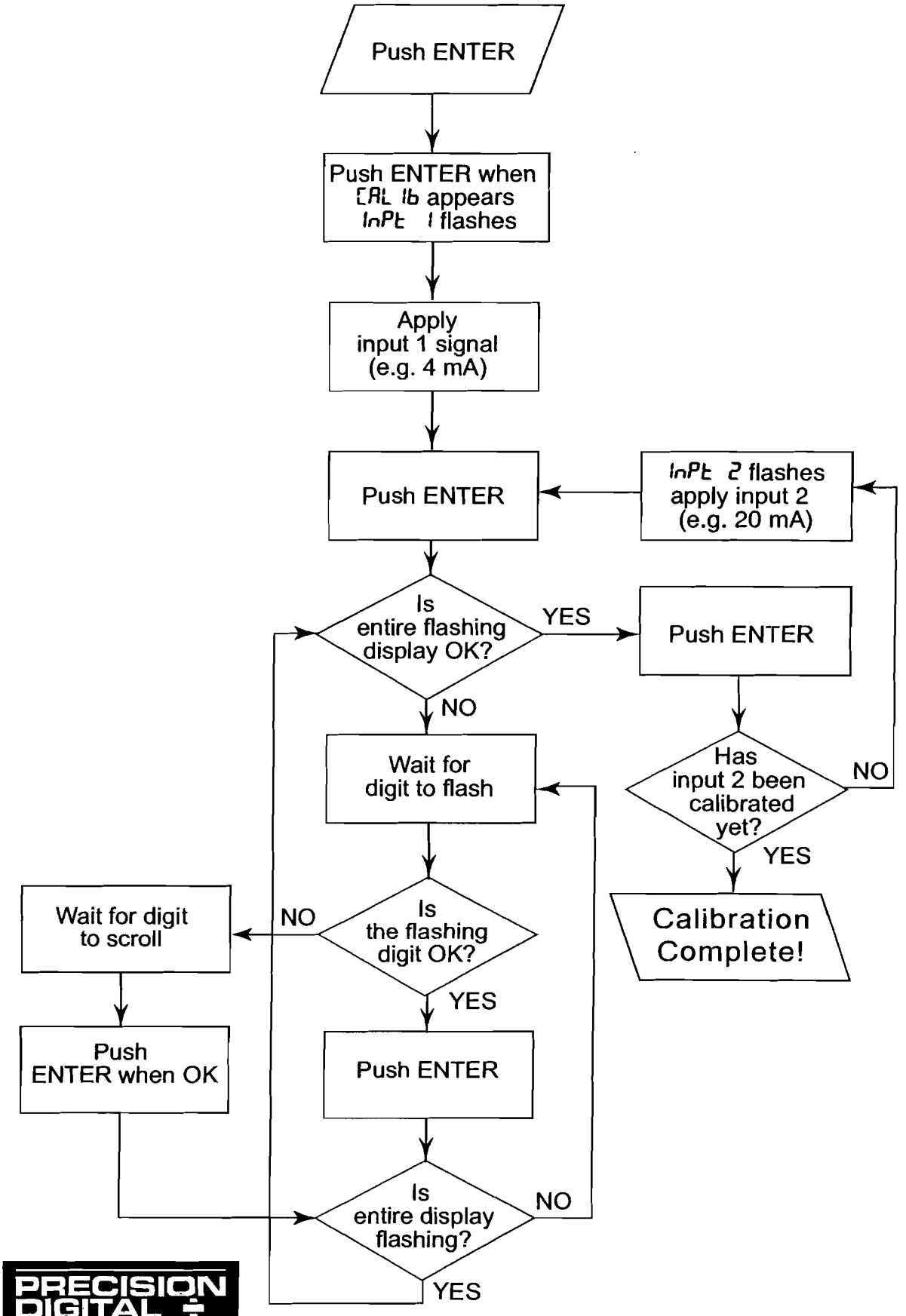


* CAL Ib appears if E-CAL is selected
SCALE appears if I-CAL is selected

** Only appears if 4-20 mA output is installed

Figure 12: Menu Scroll (with Lockout Jumper Removed)

Figure 13: Two-point External Calibration Flow Chart



Five Basic Digit/Display-setting Instructions

Rather than repeat the ***S**ingle **B**utton **S**caling **(SBS)*** technique for every function it is used in, it will be detailed here and the user can refer to it when necessary.

The ***S**ingle **B**utton **S**caling* technique is used to program all the meter's functions that require numbers to be entered. For instance, calibration and scaling values, Low-Flow Cutoff values, alarm set and reset points, 4 and 20 mA output values are set using ***(SBS).***

1. If the flashing display is OK, push **ENTER** before it stops flashing to accept it. (Whenever a new value is to be programmed or Most Significant Digit has been accepted the entire display flashes, if this is the desired value, press **ENTER** before it stops flashing to accept it.)
2. If the flashing display is not OK, (or if **ENTER** was not pushed in time to accept it), wait for Least Significant Digit (LSD) to flash.
3. If a flashing digit is OK, push **ENTER** before it starts to scroll to accept it.
4. If a flashing digit is not OK, (or if **ENTER** was not pushed in time to accept it), wait for the digit to scroll and push **ENTER** when OK.
5. Digits will scroll until **ENTER** is pushed. When a digit is accepted by pushing **ENTER**, the next digit to the left flashes.

Basic Meter Programming

Overview

There are four steps for programming the basic meter functions:

1. Select Input
2. Perform Initial Calibration if Needed
3. Select Calibration Method
4. Calibrate or Scale the Meter

Programmed Parameter Values

To simplify programming, the user should write down the desired programming values prior to attempting to program the meter. The form located at the back of this manual provides a convenient method to record the user settings.

Select Input Signal

The meter can be programmed to accept current or voltage input using the Signal Input Selection Array. This jumper array is located at the rear of the instrument, next to the screw terminal block. Remove jumper J3 (if installed) to disable Lockout feature.

Input Signal	Jumper J1	Jumper J2
1-5, 0-5V	OFF	OFF
0-10 V	OFF	ON
4-20,0-20 mA	ON	OFF

Table 1: Signal Input Selection Array

Initial Calibration with External Source (If Needed)

Initial calibration is required only when the I-CAL feature is to be used with an input other than the default input of 4-20 mA. For best results, allow the meter to warm up for at least 30 minutes.

1. Program the Signal Input Selection Array for desired input per Table 1 above.
2. Apply power with **ENTER** and **ACK** buttons pushed. Release when display stops flashing.
3. The meter scrolls through the choices **20, 5,** and **10.** Which corresponds to input signals of 4-20 mA, 0-5 V or 1-5 V, and 0-10 V. Push **ENTER** when desired value appears.
4. The meter flashes InPt 1. Apply low end signal, (4 mA or 0 V)*, push **ENTER**.
5. The meter flashes InPt 2. Apply high end signal, (20 mA, 5 V, 10 V), push **ENTER**.
6. This completes the Initial Calibration and initializes INPUT 1 and INPUT 2 scaling points to 4.000 & 20.000 mA, 0.000 & 5.000 V, or 0.000 & 10.000 V.
7. Refer to I-CAL scaling below for further instructions.

***For 1-5 V input signals, calibrate the meter with input1=0 V, input 2=5 V.**

Select Calibration Method

The meter may be calibrated using an external signal source such as a calibrator (E-CAL), or scaled using the internal source (I-CAL). With I-CAL, a 4-20 mA input can be scaled for any display range without applying a signal. To scale inputs such as 0-5 V, 1-5 V or 0-10 V without applying a signal, it is necessary to first complete an Initial Calibration, *see Initial Calibration with External Source (If Needed) on page 20.*

Scale or Calibrate the Meter

To select a Calibration Method, apply power with **ACK** button pressed.

1. When display stops flashing, release **ACK** button. Display alternates between E-CAL and I-CAL.
2. To calibrate meter with an external source, such as a calibrator, press **ENTER** when E-CAL appears.
3. To scale meter with internal source, press **ENTER** when I-CAL appears.

Select Decimal Point (dECPt)

To program the decimal point or light up the extra "0", push **ENTER**. The meter displays SCALE or CAL Ib, then dECPt. Push **ENTER** when dECPt appears. The meter then reads 199990 with the decimal point changing locations and the extra "0" illuminating. Push **ENTER** when the decimal point is in the desired position; or if the extra "0" is desired; when the extra "0" is displayed.

Select Linear Input (L or S)

The meter can be programmed to either process the input signal in a linear fashion (L) or to take the square root of it (S). To program the meter for a linear input, push **ENTER**. When (L or S) appears, push **ENTER** again. The meter will flash (L or S) alternately. Press **ENTER** when (L) is flashing. After (L) is selected the meter will switch to indication mode and is ready to be calibrated.

Select Number of Calibration Points (no. PtS)

The user may input up to 11 calibration points and corresponding displays to provide custom linearization. To program the number of calibration points, push **ENTER**, when (no. PtS) appears, push **ENTER** again. The meter displays a number from 2 to 11 that represents the number of calibration points. Push **ENTER** when the number equals the desired number of calibration points. As soon as the number of points is programmed, the meter flashes InPt 1 (Indicating it is ready to be calibrated). Refer to Scale Using Internal Calibration (I-CAL), page 22 or Calibrate Using an External Calibrator (E-CAL) on page 23.

General Calibration/Scaling Instructions

Calibration is performed from the front panel using the **ENTER** button. It does not require any tools or disassembly of the meter. A calibrated signal source is required if external calibration (E-CAL) is selected.

For best results, allow meter to warm up for at least 30 minutes.

The calibration input signals must be within the range of the meter and input 2 must be greater than input 1. (However, display for input 2 does not have to be greater than desired display for input 1.)

An Error message will appear if input 1 signal and input 2 signal are too close together:

Input Range:	Minimum Difference Between Input 1 & Input 2:
0-5 V	0.16 V
0-10 V	0.32 V
4-20 mA	1.60 mA

Table 2: Input Range Minimum Spans

Scale Using Internal Calibration (I-CAL)

If I-CAL (Internal Calibration) was selected above in *Select Calibration Method*, the meter can be scaled without applying an input. Desired values can be programmed using the *Five Basic Digit/Display-setting Instructions* described on page 19. See Figure 13: *Two-point External Calibration Flow Chart* on page 18.

1. Push **ENTER**, when SCALE appears push **ENTER** again.
2. InPt 1 flashes. Push **ENTER** and program desired value for input 1.
3. dSPY 1 flashes. Push **ENTER** and program desired value for display 1.
4. InPt 2 flashes. Push **ENTER** and program desired value for input 2.
5. dSPY 2 flashes. Push **ENTER** and program desired value for display 2.

Calibrate Using an External Calibrator (E-CAL)

If E-CAL (External Calibration) was selected above in *Select Calibration Method,* the meter must be calibrated with an external calibrator. Desired values can be programmed using the *Five Basic Digit/Display-setting Instructions* described on page 19. *See Figure 13: Two-point External Calibration Flow Chart* on page 18.

1. Push **ENTER**, when CAL lb appears push **ENTER** again.
2. InPt 1 flashes. Apply input 1 signal (e.g. 4mA, 1V, etc.) then push **ENTER,** Program desired display for input 1.
3. InPt 2 flashes. Apply input 2 signal (e.g. 20 mA, 10 V, etc.) then push **ENTER**. Program desired display for input 2.

Calibration Error (Error)

A meter display of Error during calibration indicates that the calibration process was not successful and the meter needs to be recalibrated.

1. The Error message will appear if input 1 signal and input 2 signal are too close together, see Table 2 on page 22.
2. The Error message will appear if input 1 signal is inadvertently also applied for input 2 calibration, or **ENTER** is pushed before applying input 2.

Programming Confirmation

The values that have been programmed can be quickly checked to make sure they are the desired values. To do this, apply the desired signal for each point and check the display.

Select Square Root Extraction (L or S)

With the square root extraction function activated, the meter takes the square root of the input signal (the output from a differential pressure transmitter) and displays flow rate. The square root extraction feature is calibrated using the same ***S***ingle ***B***utton ***S***caling technique that is used for two-point linear calibration. Calibration involves setting only three points: the zero flow rate (usually zero), the high flow rate and the Low-Flow Cutoff point.

To program the meter for square root extraction, push **ENTER**. When (L or S) appears, push **ENTER** again. The meter will flash (L or S) alternately. Push **ENTER** when (S) is flashing. After (S) has been selected the meter will switch to indication mode and is ready to be calibrated.

Program Low-Flow Cutoff (CUtoFF)

Low-Flow Cutoff allows the meter to be programmed so that the often unsteady output from a differential pressure transmitter at Low-Flow rates always displays zero on the meter.

Example: If Low-Flow Cutoff is set at 12, any rate less than 12 will be displayed as "0".

To program Low-Flow Cutoff:

1. Push **ENTER**, when CutoFF appears push **ENTER** again.
2. Set Low-Flow Cutoff per *Five Basic Digit/Display-setting Instructions* on page 19.

Notes:
1. To disable Low-Flow Cutoff, program cutoff value to zero.
2. Low-Flow Cutoff is only available when using Square Root Extraction.

Round Horizontal Tank Calibration Table

The following tables can be used to calibrate the meter for displaying volume in a round horizontal tank. The right-most column in each table gives an example of actual calibration points for a 500-gallon tank.

Number of Points: 10
Maximum Error: 0.3% Full Scale

Calib. Point	Input (mA)	Display: (% Volume)	Display: (Example) (500 Gallon Tank)
1	4.0	0.00	0.0
2	4.8	1.80	9.0
3	6.0	7.20	36.0
4	7.2	14.20	71.0
5	9.2	28.10	140.5
6	14.8	71.80	359.0
7	16.8	85.80	429.0
8	18.0	92.80	464.0
9	19.2	98.10	490.5
10	20.0	100.00	500.0

Number of Points: 8
Maximum Error: 0.5% Full Scale

Calib. Point	Input (mA)	Display: (% Volume)	Display: (Example) (500 Gallon Tank)
1	4.0	0.00	0.0
2	4.8	1.90	9.5
3	6.4	9.50	47.5
4	8.4	22.40	112.0
5	15.6	77.70	388.5
6	17.7	90.50	452.5
7	19.2	98.10	490.5
8	20.0	100.00	500.0

Table 3: Round Horizontal Tank Calibration Points

Isolated 4-20 mA Transmitter Output Programming (outPut)

The Isolated 4-20 mA Transmitter Output option can be programmed without a calibrator. This option can be calibrated so that a 4 mA output is produced for any number displayed by the meter. The 20 mA output may be programmed to correspond to any number that is at least 501 counts greater or smaller than the number corresponding to 4 mA. (Ex. 4 mA = 0, 20 mA = 501 or -501) If the span between 4 and 20 mA is less than 501 counts, an Error message will appear and the previously programmed values will be retained in memory until a new set of values is accepted.

Setting 4 mA Output Value

1. Push **ENTER**, when outPut appears push **ENTER** again.
2. All digits flash for 3 seconds, a green LED labeled "4" illuminates indicating the flashing display is the value at which the meter will produce a 4 mA output. Program desired value per *Five Basic Digit/Display-setting Instructions* on page 19.

Setting 20 mA Output Value

1. When **ENTER** is pushed to complete the programming for 4 mA output, the green LED labeled "20" illuminates indicating the flashing display is the value at which the meter will produce a 20 mA output.
2. Program desired value per *Five Basic Digit/Display-setting Instructions* on page 19.
3. An Error message will be displayed if the 4-20 mA output span is smaller than 501 counts.

Programming Confirmation

The values that have been programmed to produce the 4 & 20 mA outputs can be quickly checked to make sure they are the desired values. To do this, enter the outPut routine by pushing **ENTER** and then pushing **ENTER** again when outPut appears.

The green "4" LED illuminates indicating the meter is displaying the value at which it will produce a 4 mA output. Confirm that this is the desired value. Push **ENTER** (within 3 seconds) before the entire display stops flashing and the green "20" LED illuminates indicating the meter is displaying the value at which it will produce a 20 mA output. Confirm that this is the desired value. Push **ENTER** (within 3 seconds) before the entire display stops flashing and the meter returns to indication mode.

Alarm Programming

Overview

The meter is equipped with four alarm points as a standard feature. Each alarm may be programmed for either a high or low alarm and for 0-100% deadband. Front panel LEDs indicate alarm status.

Options for two or four relays are available.

To program a high alarm, program the set point above the reset point. To program a low alarm, program the set point below the reset point. To program the alarm deadband, set the reset point above or below the set point by an amount equal to the desired deadband value.

Example: Alarm 2 is a high alarm that trips at 1500 and has a deadband of 100. Alarm 2 set point is set at 1500 and its reset point at 1400.

Setting Alarm Set & Reset Points (ALAr5)

Alarm Set and Reset points are programmed using the *Five Basic Digit/Display-setting Instructions* described on page 19.

1. Push **ENTER** and when ALAr5 appears, push **ENTER** again. This starts a scan of the four alarm set & reset points. The scan sequence begins with a flashing display of alarm #1 set point. The "1" LED and "S" LED below the display are illuminated to indicate the meter is flashing alarm #1 set point value. Program the desired value for alarm #1 set point using the *Five Basic Digit/Display-setting Instructions* described on page 19.
2. After Alarm #1 set point has been programmed, the meter displays Alarm #1 reset point, as indicated by the "1" LED and "R" LED below the display. Program the desired value for alarm #1 reset point using the *Five Basic Digit/Display-setting Instructions* described on page 19.
3. Program the remaining alarm set and reset points in a similar fashion.
4. When alarm programming is complete the meter will display the process input signal and the front panel LEDs will indicate alarm status.

Programming Confirmation

To verify that the alarm set and reset points have been programmed as desired, push **ENTER**, and push **ENTER** again when ALAr5 appears. Before the display stops flashing #1 set point value, push **ENTER** again to advance the display to #1 reset point. Continue skipping through the remaining alarm set and reset points. To alter an alarm point value, wait for the first digit to flash and program the desired value using the *Five Basic Digit/Display-setting Instructions* on page 19.

Alarm Operation

When the meter detects an alarm, a front panel LED illuminates to indicate which alarm point has tripped. This LED will stay illuminated until the meter display passes through the reset point.

Set Relays for Fail-Safe Operation

In the fail-safe mode, the relay coils are *energized* and the Normally Open (NO) contacts are connected to the Common (C) contacts under normal operation. During an alarm condition the relay coils are *de-energized* and the Normally Closed (NC) contacts are connected to the Common (C) contacts. During a power failure the relay contacts reflect an alarm condition.

Removing jumper JP6 disables the fail-safe operation. Jumper JP6 is located on the Display Board, see Figure 14 on page 29. If fail-safe mode is disabled, the operation of the relay contacts is opposite to the one described in the previous paragraph.

Alarm Acknowledgment

The ACK button on the front panel resets the optional relays only and has no effect on the alarm status LEDs.

Automatic & Manual Reset Programming

There are two ways to reset the relays:

1. Automatically when the signal passes through the reset point.
2. Automatically + manually via the front panel ACK button, or a user supplied momentary Normally Open push-button across terminals AK and CM at the rear of the instrument. That is, a relay may be manually reset prior to the signal passing through the reset point or it will automatically reset when the signal passes through the reset point.

A manual reset will reset all relays that are programmed for automatic + manual reset.

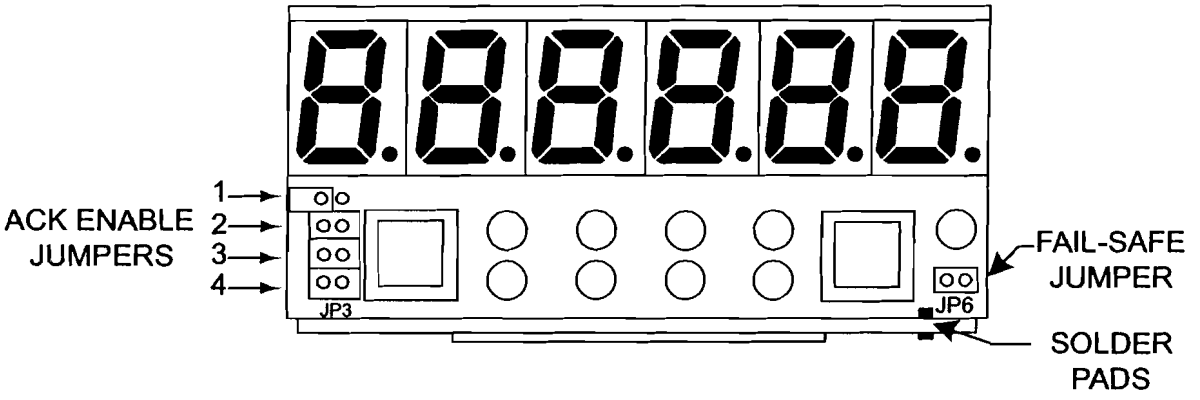


Figure 14: Relay Reset & Fail-Safe Jumpers

An array of jumpers located behind the front panel on the Display Board is used to program each relay for either automatic or automatic + manual reset. Refer to page 32 for front panel removal instructions. The top jumper is used for relay 1, the next for relay 2, etc. A relay will automatically reset if no jumper is installed. A relay will automatically reset, plus can be manually reset, if a jumper is installed over its respective pins.

Example Above: Relay 1 is programmed for automatic reset; Relays 2, 3, & 4 are programmed for automatic + manual reset.

Lockout Jumper

Once the meter has been completely programmed, a lockout jumper can be installed to restrict further modification to the meter. This jumper is located at the rear of the instrument and is labeled J3. When **ENTER** is pushed with the lockout jumper in place, only ALArS and oUtPUt routines are displayed. These routines may be entered to view their settings, but the settings may not be altered.

SWITCHING INDUCTIVE LOADS

The meter has the ability to suppress electrical noise generated by switching inductive loads. However, installing Resistor Capacitor (RC) Networks improves this performance and prolongs the life of the meter's relay contacts. This suppression can be obtained with RC networks assembled by the user or purchased as a complete assembly. Refer to the following circuits for RC network assembly and installation:

AC & DC Loads

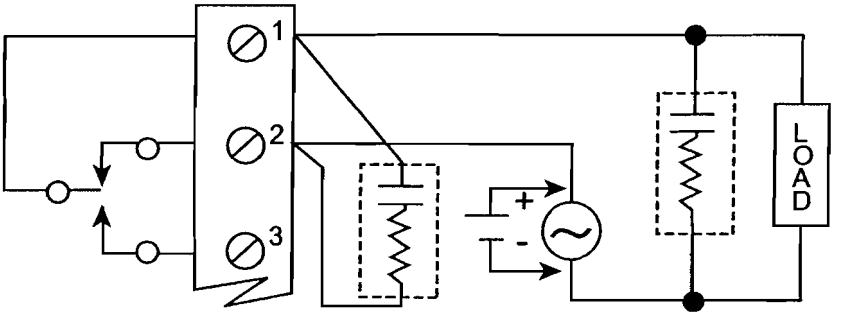


Figure 15: AC & DC Loads

Choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts
C: 0.5 to 1 µF for each 1 A through closed contacts

Notes:

1. Use capacitors rated for 240 VAC.
2. Snubbers may affect load release time of solenoid loads, check to confirm proper operation.
3. Install the RC network right at the meter's relay screw terminals. An RC network may also be installed across the load.

Low Voltage DC Loads

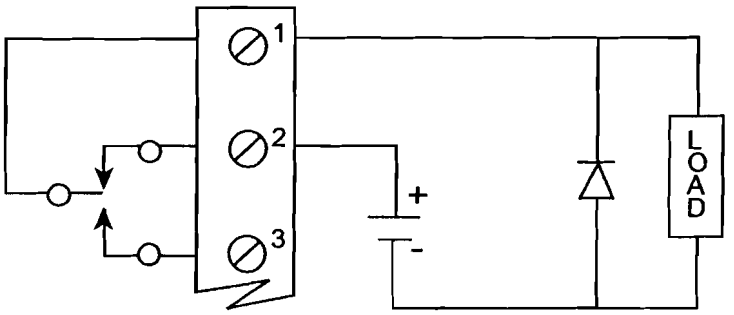


Figure 16: Low Voltage DC Loads

Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

RC Networks Available from Precision Digital

RC Networks are available from Precision Digital and should be applied to each relay contact that switches an inductive load. Part number PDX6901.

RESET METER TO FACTORY DEFAULTS

To reset the meter to the factory defaults:

1. Remove the snap-off front cover, see page 32.
2. Using a pair of needle-nose pliers, short out the solder pads located on the top and bottom of the Main Board, to the right of the ACK button below JP6 (see Figure 14 on page 29), until the display shows "rESEt".
3. Press the **ENTER** button. The meter starts scrolling the menus.
4. Press the **ACK** button, at any time, to exit the menu scroll.

OPTIONS CARD REMOVAL & INSTALLATION

Meter options are installed at the factory. It is **NOT** necessary to remove the circuit boards from the case to disable the relays' fail-safe operation. The fail-safe jumper is located on the Display Board, see Figure 14 on page 29. Refer to the following instructions and illustrations to remove the snap-off cover and the circuit boards from the case.

Disconnect power prior to performing the following operations.

The meter's snap-off cover is held in place by 6 latches that snap into notches on the snap-off cover. To remove the snap-off cover from the meter, grasp it firmly on its top and bottom edges and pull it forward. The latch plate remains around the meter's case.

To remove the circuit boards from the case:

1. Unscrew the retaining screws holding the circuit boards to the case.
2. Remove the screw terminal connectors at the rear of the meter.
3. Push the boards through the case by applying pressure to the circuit boards at the rear of the meter. Apply pressure evenly to both boards.
4. Do not apply pressure to the vertical display board.

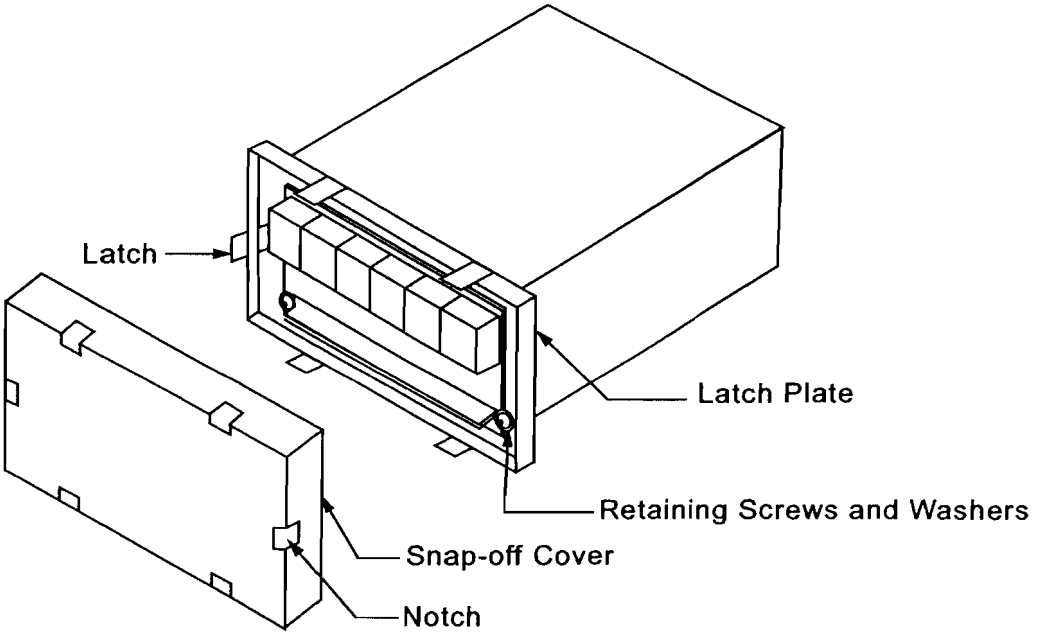


Figure 17: Front Cover Removal

5. To avoid electric shock, re-install the circuit boards in the case prior to applying power.

All programming and calibrating can be performed with the circuit boards installed in the case.

To re-install the meter in its case:

1. Fold the Options Board over the Main Board, grasp both boards so the Main Board is on the bottom and the two Boards are separated by about an inch.
2. Insert the two boards together into the case. Be sure both the top and bottom boards engage the rails, which hold them in place.
3. Do not press on the Display Board when seating the assembly in the case.
4. Install washers and retaining screws in 4 corners of meter and install front cover.

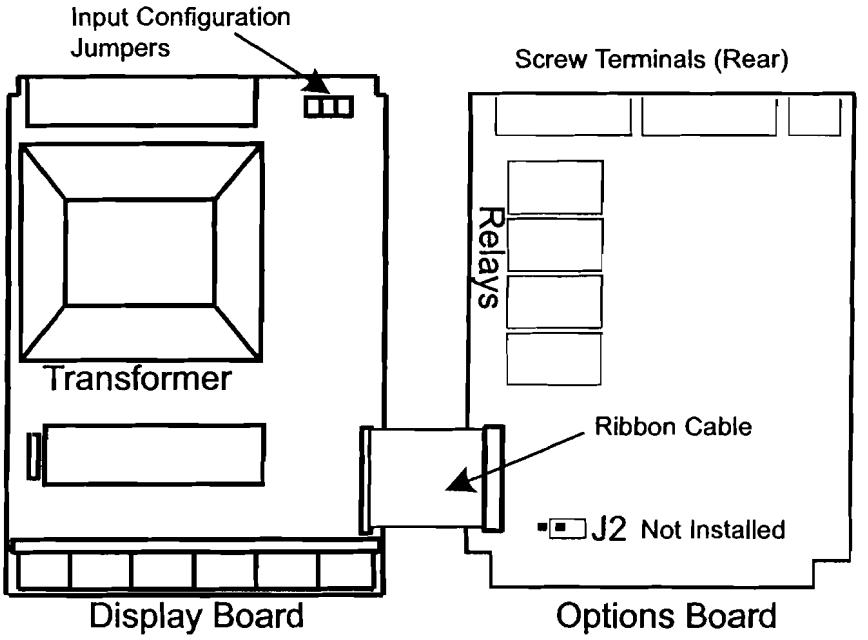


Figure 18: Option Card Installation

MOUNTING DIMENSIONS

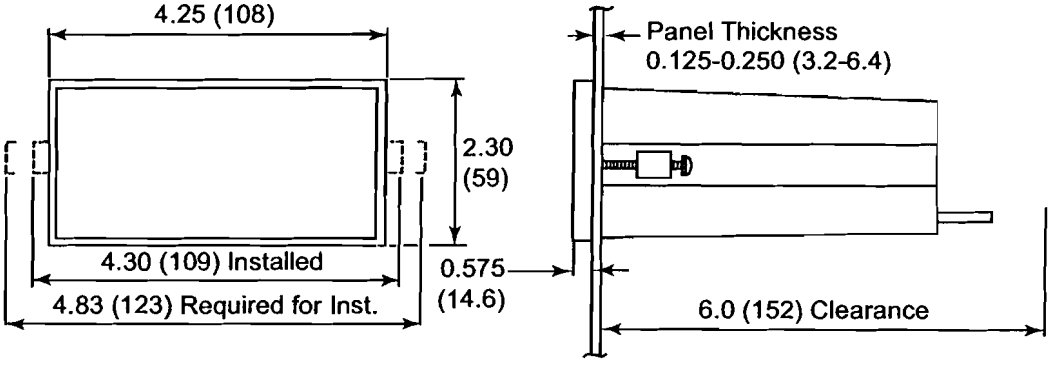


Figure 19: Mounting Dimensions

Notes:

1. Panel cutout required: 1.772" X 3.622" (45 mm x 92 mm) 1/8 DIN
2. Panel thickness: 0.125" - 0.250" (3.17 mm - 6.34 mm)
3. Clearance: allow 6 inches (152 mm) behind the panel

PROGRAMMED PARAMETER SETTINGS

Use the following table to record how your meter is programmed:

Input

☐ 4-20 mA ☐ 0-5 V ☐ 1-5 V ☐ 0-10 V

☐ Linear or ☐ Square Root Extraction

Number of Calibration Points _____

Low-Flow Cutoff Value _____

Calibration Point Values

Input 1 set point _____	display 1 _____
Input 2 set point _____	display 2 _____
Input 3 set point _____	display 3 _____
Input 4 set point _____	display 4 _____
Input 5 set point _____	display 5 _____
Input 6 set point _____	display 6 _____
Input 7 set point _____	display 7 _____
Input 8 set point _____	display 8 _____
Input 9 set point _____	display 9 _____
Input 10 set point _____	display 10 _____
Input 11 set point _____	display 11 _____

Alarms

Alarm 1 set point _____	reset point _____
Alarm 2 set point _____	reset point _____
Alarm 3 set point _____	reset point _____
Alarm 4 set point _____	reset point _____

4-20 mA Output Option

4 mA display value _____

20 mA display value _____

Model Number: PD690 _____ Serial Number: _____

OTHER PRECISION DIGITAL PRODUCTS

MODEL	DESCRIPTION
PD118	MINIMUX® 8 Point Scanner
PD141AFO	VIGILANTE® four Point Annunciator with First-Out
PD202-253	Digital Pressure Gauges
PD602	Dart Low-Cost 1/8 DIN Process Meter
PD644	Javelin D High-Voltage DC Panel Meter
PD650	2.3" LED NEMA 4X Large Display Process Meter
PD655	1.0" LED NEMA 4X Large Display Process Meter
PD656	0.8" LED Exp-Proof Large Display Process Meter
PD660	Low-Cost NEMA 4X Loop Powered Meter
PD661	Low-Cost Exp-Proof Loop Powered Meter (FM & CSA)
PD673	4½ Digit Loop Powered 1/8 DIN Meter
PD675	4½ Digit Loop Powered NEMA 4X Meter (FM & CSA)
PD677	4½ Digit Loop Powered Exp-Proof Meter
PD685	3½ Digit Loop Powered NEMA 4X Meter (GeneralPurpose)
PD686	3½ Digit Loop Powered NEMA 4X Meter (FM & CSA)
PD687	3½ Digit Loop Powered Exp-Proof Meter (FM & CSA)
PD691	1/8 DIN Strain Gauge & mV Input Meter (UL Listed)
PD692	1/8 DIN Analog Input Flow Rate/Totalizer (UL Listed)
PD693	1/8 DIN Pulse Input Flow Rate/Totalizer (UL Listed)
PD696	1/8 DIN Loop Powered Flow Rate/Totalizer
PD697	NEMA 4X Loop Powered Flow Rate/Totalizer
PD698	Exp-Proof Loop Powered Flow Rate/Totalizer (FM & CSA)
PD740	Javelin TTC & RTD Temperature Meter (Low-Cost)
PD750	TC & RTD Temperature Meter (UL Listed)
PD751-752	10 Ω Cu & 120 Ω Ni RTD Temperature Meters (UL Listed)
PD755	1.0" LED NEMA 4X Large Display Temperature Meter
PD756	0.8" LED Exp-Proof Large Display Temperature Meter
PD757	2.3" LED NEMA 4X Large Display Temperature Meter
PD765	Trident Process & Temperature Meter (UL Listed)
PD865	Snooper Modbus Serial Input Meter
PD940-981	ConsoliDator® Multi-Channel Controllers

How to Contact Precision Digital

- For Technical Support please
  call: (800) 610-5239 or (508) 655-7300
  fax: (508) 655-8990
  e-mail: support@predig.com

- For Sales Support or to place an order please
  call: (800) 343-1001 or (508) 655-7300
  fax: (508) 655-8990
  e-mail: sales@predig.com

- For Extended Warranty, Setup & Calibration Services please visit
  www.predig.com

- For an online version of this instruction manual please visit
  www.predig.com

PRECISION DIGITAL CORPORATION
19 Strathmore Road • Natick MA 01760 USA
Tel 800-610-5239 • Fax 508-655-8990

LIM690 Rev F
10/05

Section 7-CC

Fiber Optical Cable Enclosure Panel

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

PRODUCT DATA SHEET

CUBE-iT PLUS™ CABINET SYSTEM

KEY FEATURES

- Swing-out cabinet body enables easy access to the rear of installed equipment.
- Rear panel is pre-punched with knockouts for 1/2", 3/4", 2-1/2" and 3" conduit, and has interior cable tie points and attachment points for accessory rack-mount brackets.
- Cabinet body includes one pair of adjustable depth 19" EIA threaded equipment mounting rails.
- Cabinet body is vented. Vents will accept an accessory fan.
- Front door has rounded edges and corners and is available solid or with a tinted window.
- The front door and the rear panel lock to provide equipment security.

APPLICATIONS

- Store and secure communications equipment — a horizontal cross connect or a consolidation point — within a telecommunications room or a public space.

USE WITH

- 45° Mounting Bracket for CUBE-iT PLUS
- 90° Mounting Bracket for CUBE-iT PLUS
- Termination Block Panel for CUBE-iT PLUS
- Vertical Mounting Bracket for CUBE-iT PLUS
- Fan Kit for CUBE-iT PLUS
- Power Strip for CUBE-iT PLUS
- Light for CUBE-iT PLUS
- Rubber Foot Kit for CUBE-iT PLUS
- Horizontal Wire Management Bar for CUBE-iT PLUS
- Vertical Cable Manager for CUBE-iT PLUS

RELATED ACCESSORIES

- Universal Horizontal Cable Managers
- Double-Sided Universal Horizontal Cable Managers
- Saf-T-Grip® Reusable Cable Management Straps
- Combination Pan Head, Pilot Point, Mounting Screws

CUBE-iT PLUS™ Cabinet System is a series of wall-mounted and floor-supported telecommunications enclosures designed to secure communications equipment for a cross connect. CUBE-iT PLUS Cabinets are copper and fiber ready and feature easy access to the front or the rear of the cabinet.

The cabinet design delivers exceptional strength and rigidity. The cabinet can be attached to the wall to swing open from the right or left. The open and close motion is smooth and the hasp used to secure the cabinet body to the rear panel assists in drawing the body components together during the locking action. Additionally, the door may be attached to open from the right or left. Door and rear panel are keyed alike.

The 5" deep rear panel provides a space for terminating cables. The rear panel is pre-punched along the top and bottom with conduit knockouts allowing communications and power cables to be securely routed into the cabinet. Grommets are included to protect cables when conduit is not used. The interior of the rear panel has tie points for cables and attachment points for accessory equipment mounting brackets.

The main cabinet body includes a pair of adjustable depth 19" EIA threaded equipment mounting rails that can be used to support interconnect equipment and/or active components. The sides of the cabinet body are vented and will accept an accessory fan kit to increase air changes in the cabinet. The front door can be solid or have a tinted window. The edges of the front door are rounded to protect passers-by.

CUBE-iT PLUS Cabinets are available in five heights, 18 sizes. There are two basic cabinet styles. The 24" high, 36" high and 48" high cabinets attach directly to the wall, are UL Listed, and are available in four depths and support 200 pounds of equipment. The 60" high and 72" high cabinets attach directly to the wall and are floor-supported by a wheeled base under the main cabinet body (adds approximately 6" to overall height). The 60" and 72" high cabinets are available in three depths and support 1,000 pounds of equipment.

See inside for product selection. Contact CPI for configuration assistance.

CHATSWORTH PRODUCTS, INC. Mod# 11840-724

800-834-4969
techsupport@chatsworth.com
www.chatsworth.com

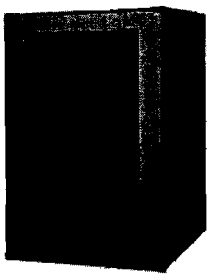
SPECIFICATIONS

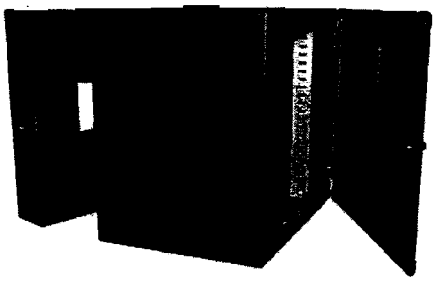
24", 36" 48" High CUBE-iT PLUS

- Wall-mount enclosure with lockable front door and swing-out rear access to equipment
- Patented hinge design allows the installer to remove the rear panel for easier installation on the wall
- For indoor use only, in environmentally controlled areas; may not be used outdoors, in harsh environments, or in air-handling spaces
- Available sizes:
  Heights: 24", 36", 48"
  Widths: 24" (19" EIA rack-mount)
  Depths: 13", 18", 24", 30"
- Usable interior space:
  Heights: 12 RMU, 18 RMU, 26 RMU
  Widths: 19" EIA rack-mount
  Depths: refer to dimensions, at right
- Cable access:
  (4) 1/2" or 3/4" knockouts, 2 top/2 bottom
  (8) 2-1/2" or 3" knockouts, 4 top/4 bottom
  (4) Edge-protection grommets are included for 3" knockouts
- Cable fill:
  Refer to TIA-569-B and NEC for conduit fills
  Estimated cable pass through at 3" knock-through edge-protection grommet:

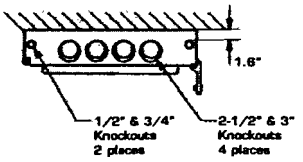
Cat 6 (.224" OD)	Cat 6 (.275" OD)
62	40

- Equipment support:
  1 pair L-shaped equipment mounting rails in the main cabinet body
  - 19"W, EIA-310-D complaint
  - Universal hole pattern, 5/8"-5/8"-1/2" vertical hole spacing
  - Threaded #12-24 equipment mounting holes
  - Depth-adjustable (bolted in place)
  5"D rear panel punched to accept accessory equipment mounting brackets, see dimensions at right, accessories on back page
  Includes 50 each #12-24 equipment mounting screws
- Vertical cable management:
  Cable lacing points on the side of equipment mounting rails
- Load capacity:
  200 pounds of equipment, open or closed
- Certifications:
  EIA-310-D compliant
  UL Listed, NWIN with UL60950
- Material:
  Steel sheet cabinet body, rear panel and door
  Door window is bronze acrylic sheet
  Equipment mounting rails are aluminum sheet
- Construction:
  Riveted & Bolted
- Finish:
  Epoxy-polyester hybrid powder coat paint
  Black or computer white

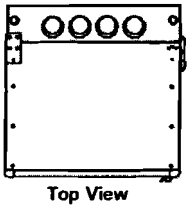




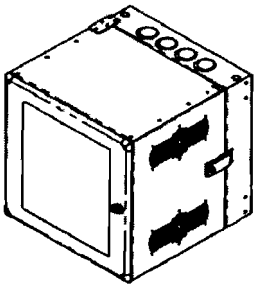
DIMENSIONS

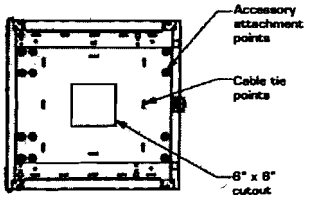


Rear Panel View (Top/Bottom Detail)

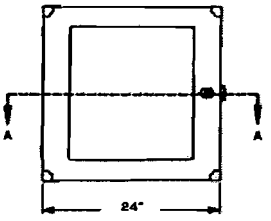


Top View

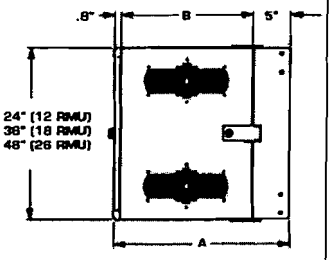




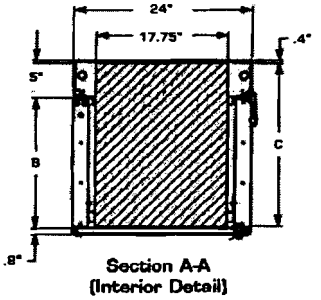
Rear Panel View (Interior Detail)



Front View



Side View



Section A-A (Interior Detail)

Depth A	B	C
13"	7.2"	11.8"
18"	12.2"	16.8"
24"	18.2"	22.8"
30"	24.2"	28.8"

ORDERING INFORMATION

24", 36", 48" High CUBE-iT PLUS Cabinets

- Attaches to the wall with included installation hardware
- Supports 200 pounds of equipment

24" High CUBE-iT PLUS Cabinets				
Part Number & Color		Door Style	Depth	Shipping Weight
White	Black			
13265-224	13265-724	Solid	13"	70 lb
13275-224	13275-724	Tinted	13"	67 lb
11890-224	11890-724	Solid	18"	78 lb
11901-224	11901-724	Tinted	18"	75 lb
11840-224	11840-724	Solid	24"	87 lb
11900-224	11900-724	Tinted	24"	84 lb
11996-224	11996-724	Solid	30"	97 lb
12419-224	12419-724	Tinted	30"	94 lb
Extra Mounting Rails, 1 Pair				
12787-524	L-shaped, threaded, 12 RMU			3 lb
Floor-Mount Foot Kit				
13483-001	Foot Kit, 24"D & 30"D Cabinets Only			2 lb

36" High CUBE-iT PLUS Cabinets				
Part Number & Color		Door Style	Depth	Shipping Weight
White	Black			
13265-236	13265-736	Solid	13"	89 lb
13275-236	13275-736	Tinted	13"	83 lb
11890-236	11890-736	Solid	18"	99 lb
11901-236	11901-736	Tinted	18"	93 lb
11840-236	11840-736	Solid	24"	111 lb
11900-236	11900-736	Tinted	24"	105 lb
11996-236	11996-736	Solid	30"	124 lb
12419-236	12419-736	Tinted	30"	118 lb
Extra Mounting Rails, 1 Pair				
12787-536	L-shaped, threaded, 18 RMU			4 lb
Floor-Mount Foot Kit				
13483-001	Foot Kit, 24"D & 30"D Cabinets Only			2 lb

48" High CUBE-iT PLUS Cabinets				
Part Number & Color		Door Style	Depth	Shipping Weight
White	Black			
13265-248	13265-748	Solid	13"	108 lb
13275-248	13275-748	Tinted	13"	101 lb
11890-248	11890-748	Solid	18"	121 lb
11901-248	11901-748	Tinted	18"	114 lb
11840-248	11840-748	Solid	24"	135 lb
11900-248	11900-748	Tinted	24"	128 lb
11996-248	11996-748	Solid	30"	151 lb
12419-248	12419-748	Tinted	30"	143 lb
Extra Mounting Rails, 1 Pair				
12787-548	L-shaped, threaded, 26 RMU			5 lb
Floor-Mount Foot Kit				
13483-001	Foot Kit, 24"D & 30"D Cabinets Only			2 lb

Note: Floor-Mount Foot Kit allows the front door and rear panel of the cabinet to open when it is placed on the floor, a shelf or table surface (not attached to a wall). Attaches under the 24"D or 30"D cabinets only.

Note: Refer to page 2 for details on these cabinets.

60", 72" High CUBE-iT PLUS Cabinets

- Attaches to the wall with included installation hardware
- Cabinet body is supported by a wheeled base (adds 6" to height)
- Supports 1,000 pounds of equipment

60" High CUBE-iT PLUS Cabinets				
Part Number & Color		Door Style	Depth	Shipping Weight
White	Black			
13491-260	13491-760	Solid	18"	201 lb
13494-260	13494-760	Tinted	18"	192 lb
13492-260	13492-760	Solid	24"	221 lb
13495-260	13495-760	Tinted	24"	212 lb
13493-260	13493-760	Solid	30"	246 lb
13496-260	13496-760	Tinted	30"	236 lb
Extra Mounting Rails, 1 Pair				
13276-260	13276-760	L-shaped, 33 RMU		12 lb

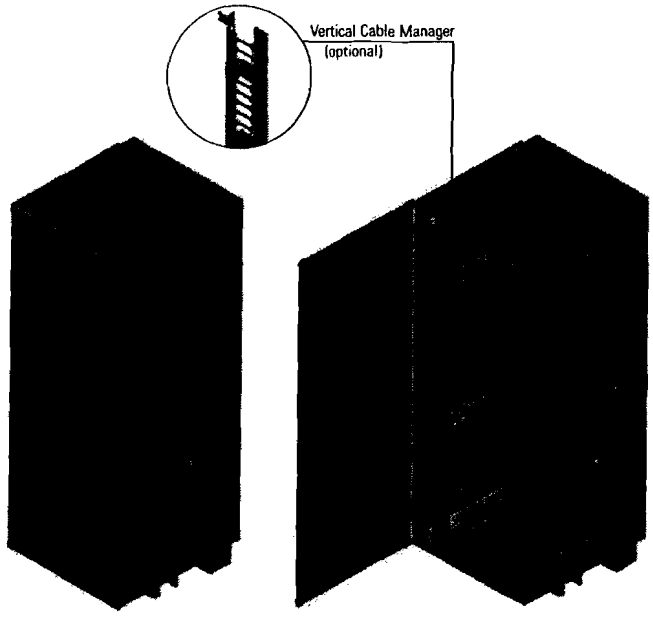
72" High CUBE-iT PLUS Cabinets				
Part Number & Color		Door Style	Depth	Shipping Weight
White	Black			
13491-272	13491-772	Solid	18"	224 lb
13494-272	13494-772	Tinted	18"	212 lb
13492-272	13492-772	Solid	24"	247 lb
13495-272	13495-772	Tinted	24"	235 lb
13493-272	13493-772	Solid	30"	274 lb
13496-272	13496-772	Tinted	30"	262 lb
Extra Mounting Rails, 1 Pair				
13276-272	13276-772	L-shaped, 40 RMU		14 lb

Vertical Cable Manager

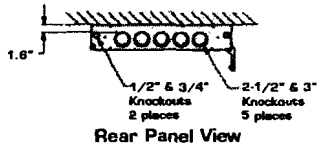
- Use in 60"H and 72"H cabinets only
- Openings align with RMU spaces; fingers manage patch cords
- 2.7"W x 5"D usable interior space
- Adjusts front-to-rear within the cabinet
- Managers must be installed before rack-mount equipment

Vertical Cable Manager		
Part Number	Description	Shipping Weight
13485-760	Cable Manager for 60"H Cabinet, Black	9 lb
13485-772	Cable Manager for 72"H Cabinet, Black	10 lb

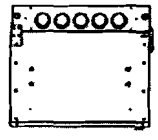
Note: Refer to page 4 for details on these cabinets.



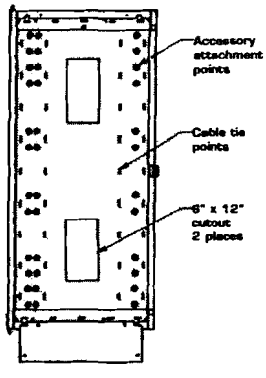
DIMENSIONS



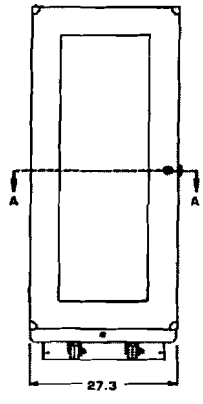
Rear Panel View
(Top/Bottom Detail)



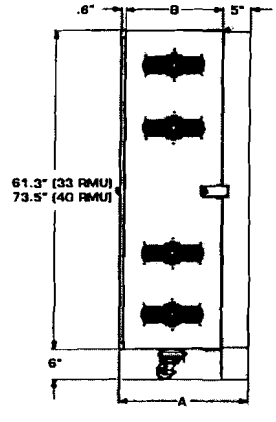
Top View



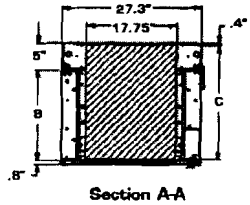
Rear Panel View
(Interior Detail)



Front View



Side View



Section A-A
(Interior Detail)

A	B	C
18"	12.2"	16.8"
24"	18.2"	22.8"
30"	24.2"	28.8"

SPECIFICATIONS

60", 72" High CUBE-iT PLUS Cabinets

- Wall-mounted, floor-supported enclosure with lockable front door and swing-out rear access to equipment — the cabinet body is supported on the floor by an attached wheeled base
- For indoor use only, in environmentally controlled areas; may not be used outdoors, in harsh environments, or in air-handling spaces
- Available sizes:
  Heights: 60", 72"
  Widths: 27.3" (19" EIA rack-mount)
  Depths: 18", 24", 30"
  Wheeled base adds approximately 6" to height
- Usable interior space:
  Heights: 33 RMU, 40 RMU
  Widths: 19" EIA rack-mount
  Depths: refer to dimensions, at left
- Cable access:
  (4) 1/2" or 3/4" knockouts, 2 top/2 bottom
  (10) 2-1/2" or 3" knockouts, 5 top/5 bottom
  (5) Edge-protection grommets are included for 3" knockouts
- Cable fill limits:
  Refer to TIA-569-B and NEC for conduit fills
  Estimated cable pass through at 3"knockout through edge-protection grommet:

Cat 5e (.226" OD)	Cat 6 (.275" OD)
62	40

- Vertical cable management:
  Integrated cable management space on both sides of the cabinet
  Support two vertical cable managers (sold as accessories) per side in 24"D and 30"D cabinets and one cable manager for 18"D cabinets
- Equipment support:
  1 pair C-shaped, 3"D equipment mounting channels in the main cabinet body
  - Front and rear equipment mounting
  - 19"W, EIA-310-D compliant
  - Universal hole pattern, 5/8"-5/8"-1/2" vertical hole spacing
  - Threaded #12-24 equipment mounting holes
  - RMU marked and numbered equipment mounting rails
  - Depth-adjustable (sliding, on support)
  - Marked support for easy vertical and depth alignment
  5" deep rear panel punched to accept accessory equipment mounting brackets, see dimensions at left, accessories on back page
  Includes 50 each #12-24 equipment mounting screws
- Load capacity:
  1,000 pounds of equipment, open or closed
- Certifications:
  EIA-310-D compliant
- Material:
  Steel sheet cabinet body, rear panel and door
  Door window is bronze acrylic sheet
  Equipment mounting rails are aluminum extrusion
- Construction:
  Welded, riveted & bolted
- Finish:
  Epoxy-polyester powder coat paint
  Black or computer white

ACCESSORIES

45° Mounting Bracket

- Attaches to rear panel on CUBE-iT PLUS Cabinet
- Creates a 19" EIA x 3 RMU rack-mount space for patch panels

90° Mounting Bracket

- Attaches to rear panel on CUBE-iT PLUS Cabinet
- Creates a 19" EIA x 2 RMU vertical rack-mount space

Vertical Mounting Bracket

- Attaches to the equipment mounting rail in CUBE-iT PLUS Cabinet
- Creates a 19" EIA x 2 RMU or 19" EIA x 3 RMU vertical rack-mount space
- Supports 75 pounds of equipment

Termination Block Panel

- Attaches to rear panel on CUBE-iT PLUS Cabinet
- Supports (6) 110D-style 100-pair blocks or (4) 66-style blocks / H89D brackets

Fan Kit

- Attaches over the vents in the side of CUBE-iT PLUS Cabinet
- Fan draws air into the cabinet, pressurizing the cabinet and forcing warm air out of the side vents
- 115 VAC Fan with 5'L attached power cord and NEMA 5-15 plug
- Optional Fan Kit
- UL Recognized

Power Strip

- Attaches to the bottom, top or side of CUBE-iT PLUS Cabinet
- 115 VAC 15 Amp or 20 Amp, 8 outlets, with 10'L attached power cord and circuit breaker
- Optional surge-protection, select straight or locking plug style
- UL Listed

Note: CPI 20 outlet vertical power strips can be placed in 72"H cabinets. 10 outlet vertical power strips can be placed in 60" and 72"H cabinets

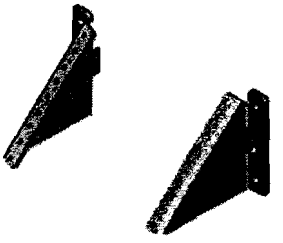
Interior Light

- Attaches to the bottom, top or side of CUBE-iT PLUS Cabinet
- 8 Watt fluorescent light with on/off switch
- 115 VAC with 6' attached power cord and NEMA 5-15P plug
- 1 RMU rack-mount version also available

Horizontal Wire Management Bar

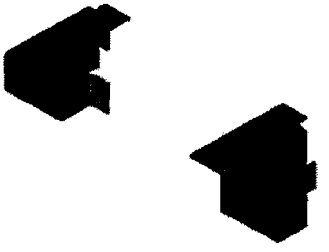
- Attaches to the rear of the equipment mounting rail in CUBE-iT PLUS Cabinet
- Secure premise cables after termination on patch panels
- Includes mounting hardware and 12 cable ties

45° Mounting Bracket



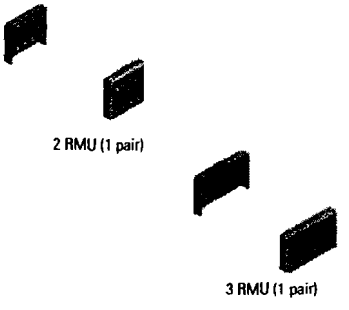
Fan Kit

90° Mounting Bracket



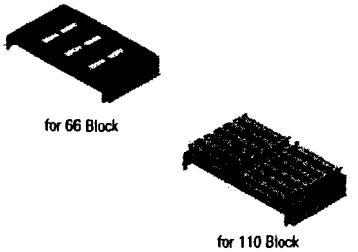
Power Strip

Vertical Mounting Bracket

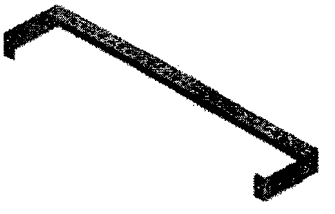


Interior Light

Termination Block Panel



Horizontal Wire Management Bar



ORDERING INFORMATION

45° Mounting Bracket		
Part Number	Description	Shipping Weight
12796-501	3 RMU, Clear	3 lb

90° Mounting Bracket		
Part Number	Description	Shipping Weight
13285-501	2 RMU, Clear	3 lb

Vertical Mounting Bracket		
Part Number	Description	Shipping Weight
13286-501	2 RMU, Clear	3 lb
13286-502	3 RMU, Clear	3 lb

Termination Block Panel		
Part Number	Description	Shipping Weight
13287-501	19"W x 11.5"H, 66 Block, Clear	4 lb
13288-501	19"W x 11.5"H, 110 Block, Clear	4 lb

Fan & Filter Kits		
Part Number	Description	Shipping Weight
12804-701	Fan Kit, 100 CFM	4 lb
12805-201	Filter Kit, White	4 lb
12805-701	Filter Kit, Black	4 lb
12806-001	Filters, Box of 6	1 lb

Power Strips / 15 Amps		
Part Number	Description	Shipping Weight
12820-701	NEMA 5-15P	4 lb
12820-702	NEMA L5-15P	4 lb
12820-703	Surge-Protected, NEMA 5-15P	4 lb
12820-704	Surge-Protected, NEMA L5-15P	4 lb
Power Strips / 20 Amps		
12820-705	NEMA 5-20P	4 lb
12820-706	NEMA L5-20P	4 lb
12820-707	Surge, NEMA 5-20P	4 lb
12820-708	Surge, NEMA L5-20P	4 lb

Interior Light		
Part Number	Description	Shipping Weight
12803-701	Light	3 lb

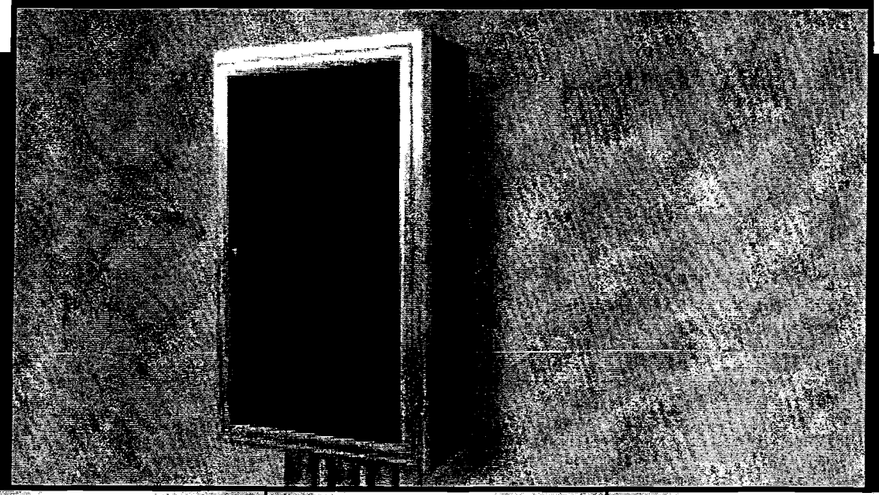
Horizontal Wire Management Bar		
Part Number	Description	Shipping Weight
11837-201	White	2 lb
11837-701	Black	2 lb

Note: Refer to page 5 for details on these accessories.

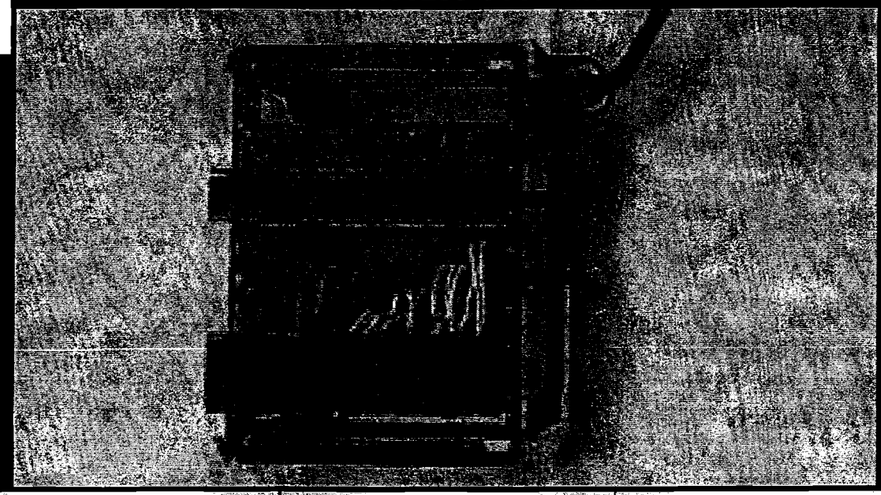
CHATSWORTH PRODUCTS, INC.

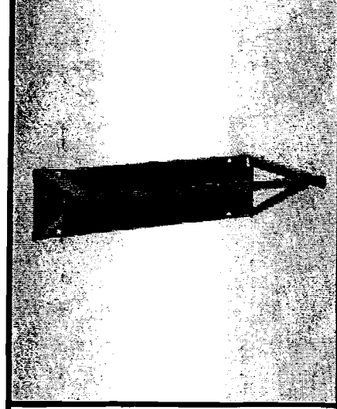
Wall-Mount Products

FIXED MOUNTING SYSTEMS



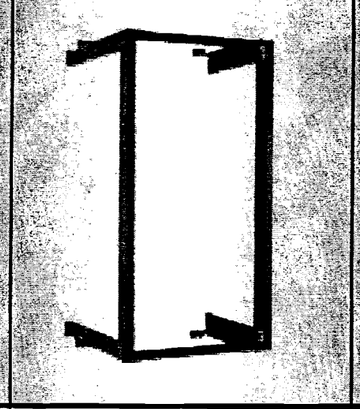
REAR ACCESS SYSTEMS





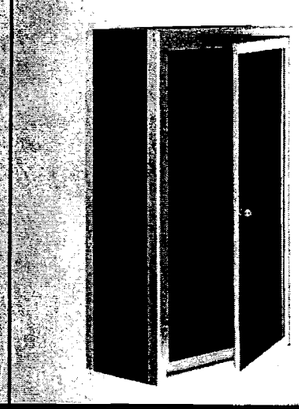
Extra Capacity Wall Bracket

For small networks, provides 6 rack-mount spaces for up to 150 lb of equipment. Equipment attaches to the top of the bracket and hangs parallel to the surface of the wall. Bracket projects 12-1/4" from the wall and is only 6-1/8" high. All-alumunim construction, unassembled.



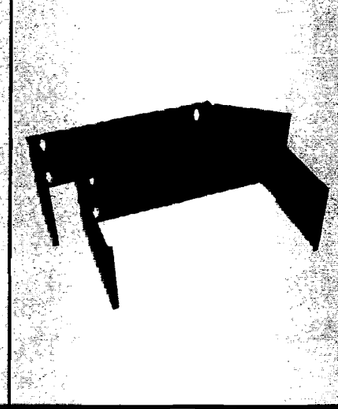
Fixed Wall-Mount Rack

Use Fixed Wall-Mount Rack when equipment weight exceeds the load bearing capacity of a CPI Swing Gate Rack. Fixed Wall-Mount Rack is available in three heights and three depths. Support up to 200 lb. Heavy-duty model supports up to 350 lb. Most rack shelves can be used with the Fixed Wall-Mount Rack.



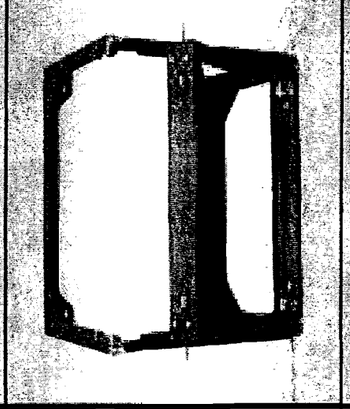
Wall-Mount Rack Enclosure

Select sizes of the Fixed Wall-Mount Rack are available with an enclosure to provide added physical security for equipment. Enclosures feature a locking door and vented top and bottom panels. A fan kit can be added to increase air changes. The enclosure can be removed when servicing equipment.



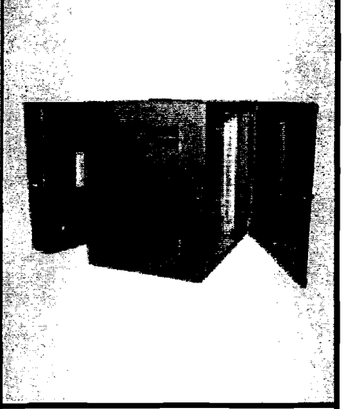
Hinged Wall-Mount Bracket

Ideal for supporting a few patch panels in a small office. Hinged Wall-Mount Bracket provides easy access to the rear of equipment (as with Swing Gate Rack). The bracket can be set between 9" and 13" in stand off from the wall. Two sizes are available: 4 rack spaces or 8 rack spaces. The 4 rack space model supports up to 20 lb of equipment. While the 8 rack space model supports loads up to 30 lb. Steel brackets have painted finishes. Order mounting screws separately.



Standard Swing Gate Wall Rack

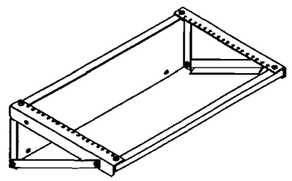
Standard Swing Gate Wall Rack pivots open to the right or left to provide easy access to the rear of equipment and is ideal for storing the mix of patch panels and equipment typical in most small telecommunications rooms. Available in four heights and three depths, including a 25" deep version, Standard Swing Gate Wall Rack will support up to 100 lb of equipment, up to 150 lb with an auxiliary bracing kit.



Cube-iT PLUS Wall Cabinet

If you need strength, physical security and utility, Cube-iT Plus Wall Cabinet is the answer. Cube-iT will support up to 200 lb of equipment and is available in three heights and three depths, including a 30" deep version to accomodiate larger equipment. The hinged sub-panel provides easy access to the rear of equipment and features knock-outs for standard sized conduit and an auxiliary bracket that supports patch panels (freeing rack space for active equipment). Unique design allows one-person installation.

Call 800-834-4969 for more information



Extra Capacity Wall Bracket

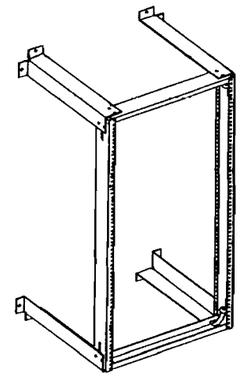
Extra-Capacity Wall Bracket

Part No.	Description	Wt.
11754-X19	19"W x 6U, 12.25"D	5 lb

**Note: Designate finish color: (-1) for Gray, (-2) for White, (-5) for Grained Aluminum and (-7) for Black. Other styles available. Contact Tech Support at 800-834-4969 for additional options.*

Key Accessories

Part No.	Description	Wt.
40605-001	#12-24 Screws, Bag of 50	1 lb



Fixed Wall-Mount Rack

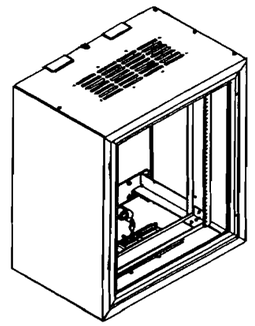
Fixed Wall-Mount Rack

Part No.	Description	Wt.
11960-X06	19"W x 24.5"H x 6"D, 13U	lb
11961-X06	19"W x 38.5"H x 6"D, 21U	lb
11962-X06	19"W x 73.5"H x 6"D, 41U	lb
11960-X12	19"W x 24.5"H x 12"D, 13U	lb
11961-X12	19"W x 38.5"H x 12"D, 21U	lb
11962-X12	19"W x 73.5"H x 12"D, 41U	lb
11960-X18	19"W x 24.5"H x 18"D, 13U	13 lb
11961-X18	19"W x 38.5"H x 18"D, 21U	15 lb
11962-X18	19"W x 73.5"H x 18"D, 41U	19 lb

**Note: Designate finish color: (-1) for Gray, (-2) for White, (-5) for Grained Aluminum and (-7) for Black. Other sizes and styles available. Contact Tech Support at 800-834-4969 for additional options.*

Key Accessories

Part No.	Description	Wt.
11799-001	Cable Rings, Set of 6	2 lb
40605-001	#12-24 Screws, Bag of 50	1 lb
12858-001	Corner Cushions, Set of 4	1 lb



Fixed Wall Rack with Enclosure

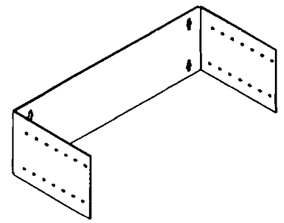
Wall Rack Enclosure

Part No.	Description	Wt.
12264-X16	19"W x 24.5"H x 12"D, 13U Solid Metal Door	44 lb
12265-X16	19"W x 24.5"H x 12"D, 13 U Solid Plexiglass Door	44 lb
12324-X22	19"W x 38.5"H x 18"D, 21U Solid Metal Door	60 lb
12325-X22	19"W x 38.5"H x 18"D, 21U Solid Plexiglass Door	60 lb

**Note: Designate finish color: (-1) for Gray, (-2) for White, (-5) for Grained Aluminum and (-7) for Black.*

Key Accessories

Part No.	Description	Wt.
11755-003	100 CFM Fan/Filter Kit	3 lb
40605-001	#12-24 Screws, Bag of 50	1 lb



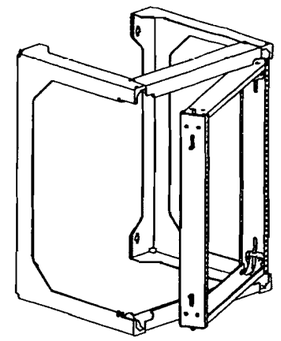
Hinged Wall-Mount Bracket

Hinged Wall-Mount Bracket

Part No.	Description	Wt.
12735-701	19"W x 7"H x 9"-13"D, 4U Black Finish Only	15 lb
12735-702	19"W x 14"H x 9"-13"D, 8U Black Finish Only	25 lb

Key Accessories

Part No.	Description	Wt.
40609-001	#10-32 Screws, Bag of 50	1 lb



Standard Swing Gate Wall Rack

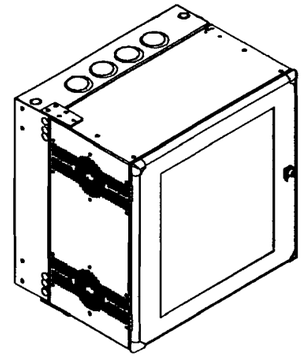
Standard Swing Gate Wall Rack

Part No.	Description	Wt.
11790-X18	19"W x 24.5"H x 18"D, 13U	23 lb
11791-X18	19"W x 38.5"H x 18"D, 21U	27 lb
11807-X18	19"W x 49.0"H x 18"D, 47U	30 lb
11792-X18	19"W x 73.5"H x 18"D, 41U	30 lb
11790-X25	19"W x 24.5"H x 25"D, 13U	42 lb
11791-X25	19"W x 38.5"H x 25"D, 21U	46 lb
11807-X25	19"W x 49.0"H x 25"D, 27U	50 lb
11792-X25	19"W x 73.5"H x 25"D, 41U	50 lb

**Note: Designate finish color: (-1) for Gray, (-2) for White, (-5) for Grained Aluminum and (-7) for Black. Other sizes and styles available. Contact Tech Support at 800-834-4969 for additional options.*

Key Accessories

Part No.	Description	Wt.
11799-001	Cable Rings, Set of 6	2 lb
40605-001	#12-24 Screws, Bag of 50	1 lb
12795-X01	Heavy-Duty Bracket	4 lb
12858-001	Corner Cushions, Set of 4	1 lb



Cube-iT PLUS Wall Cabinet

Cube-iT PLUS Wall Cabinet

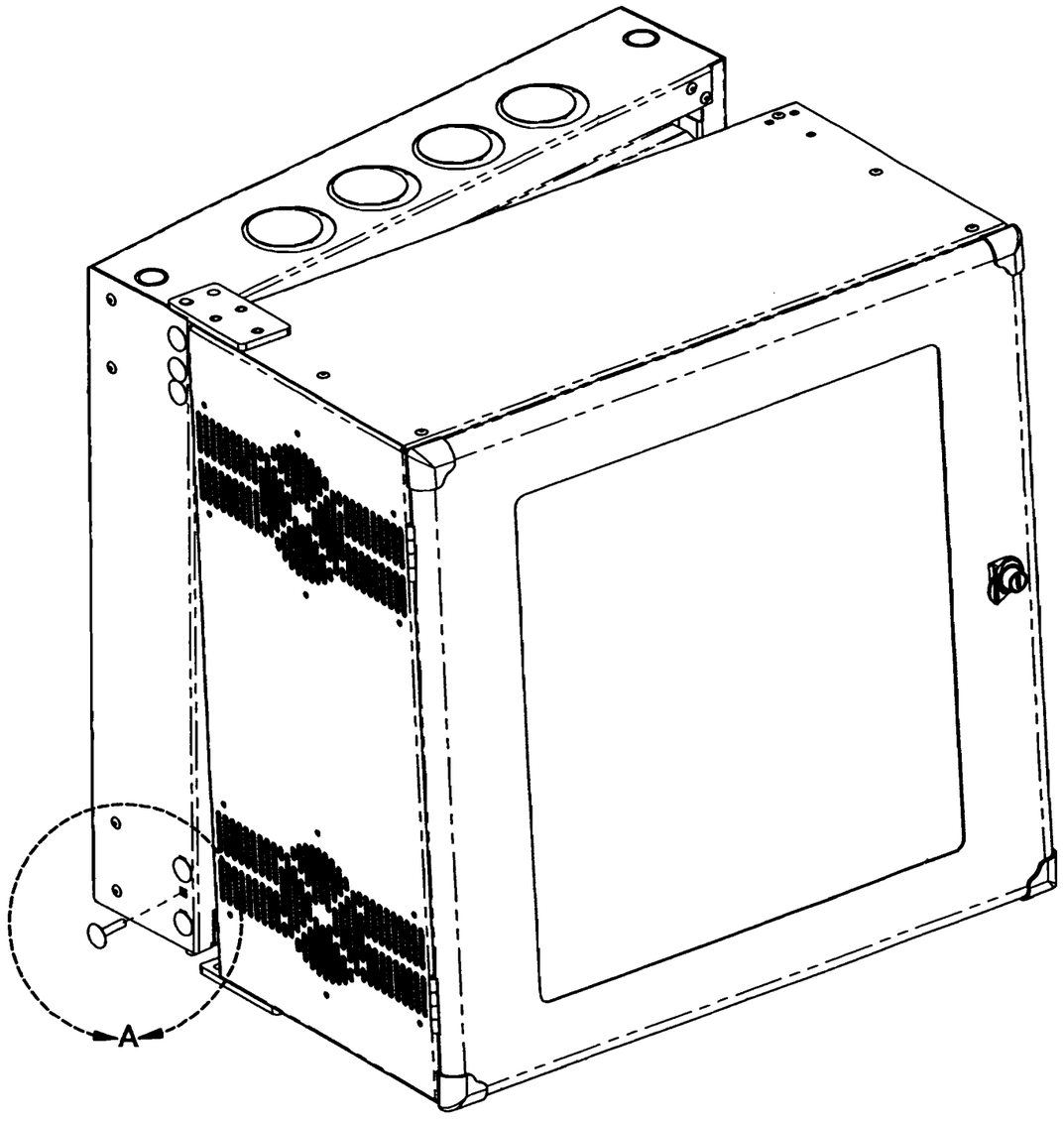
Part No.	Description	Wt.
11890-X24	19"W x 24"H x 18"D, 12U Tapped #12-24 Rails Solid Metal Door	70 lb
11840-X24	19"W x 24"H x 24"D, 12U Tapped #12-24 Rails Solid Metal Door	79 lb
11890-X36	19"W x 36"H x 18"D, 18U Tapped #12-24 Rails Solid Metal Door	99 lb
11840-X36	19"W x 36"H x 24"D, 18U Tapped #12-24 Rails Solid Metal Door	111 lb
11996-X48	19"W x 48"H x 30"D, 26U Tapped #12-24 Rails Solid Metal Door	151 lb

**Note: Designate finish color: (-2) for White, and (-7) for Black. Other sizes and styles available. Contact Tech Support at 800-834-4969 for additional options.*

Key Accessories

Part No.	Description	Wt.
12804-701	100 CFM Fan Kit	lb
12805-701	Filter Kit for Fan	lb
12806-001	Replacement Filters, Box of 6	lb
12796-501	45° Mounting Bracket	lb
12803-701	Light	lb
40605-001	#12-24 Screws, Bag of 50	1 lb

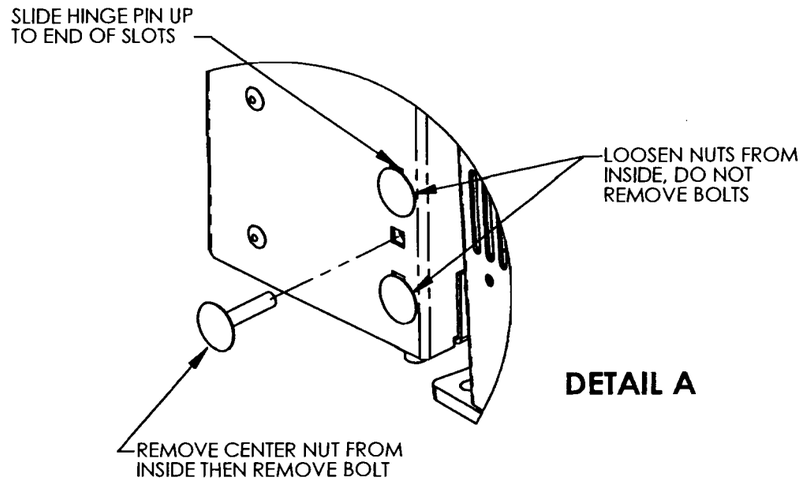
CHATSWORTH PRODUCTS, INC.



REMOVING REAR PANEL FROM CABINET

THIS STEP IS OPTIONAL, THE CABINET CAN BE MOUNTED WITH THE REAR PANEL ATTACHED

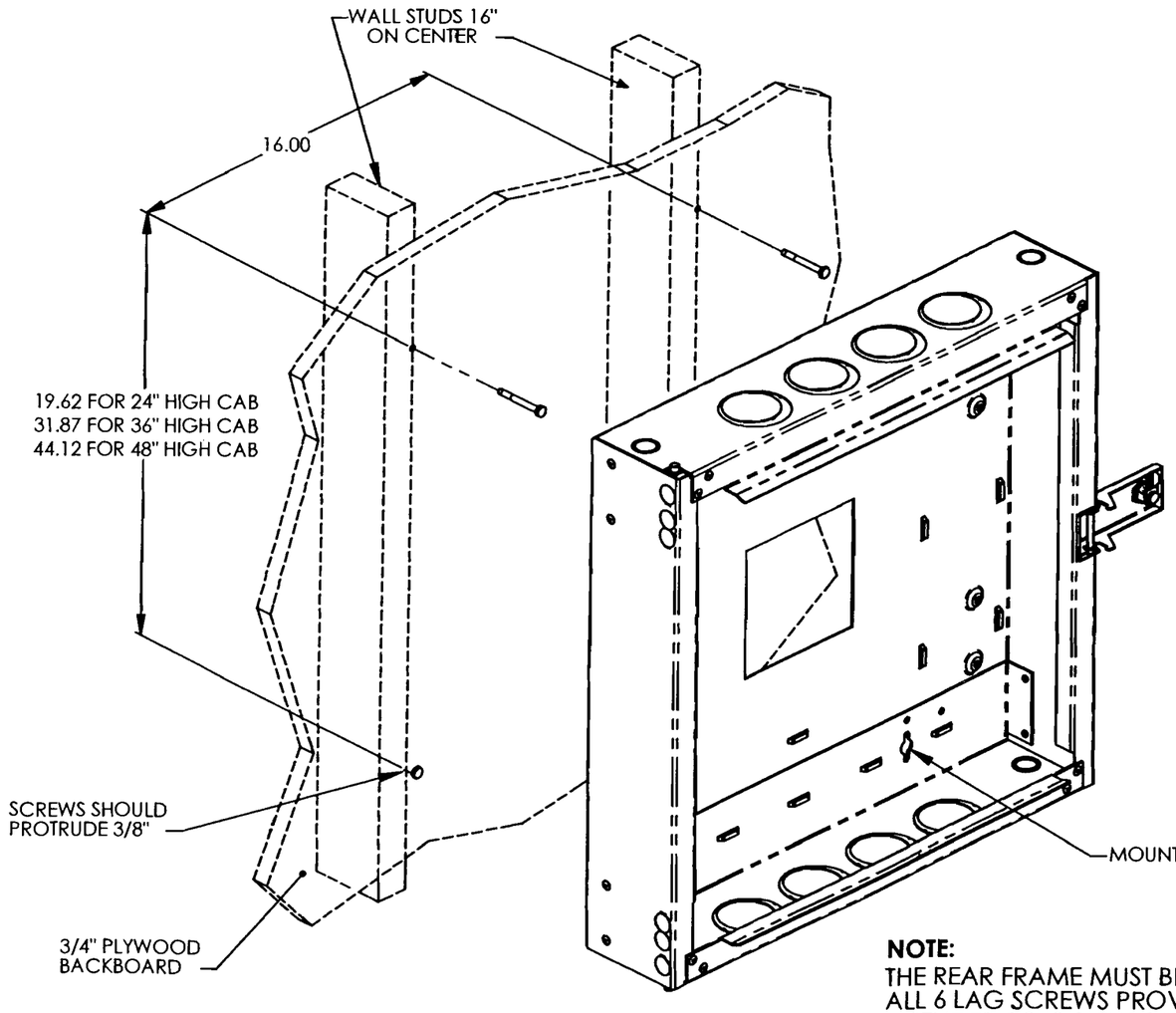
STEP 1. DETERMINE WHICH SIDE THE CABINET WILL HINGE FROM. THE CABINET IS SHOWN WITH THE HINGE ON THE LEFT SIDE, INVERT THE CABINET IF YOU WANT THE HINGE ON THE RIGHT SIDE.
STEP 2. UNLOCK THE REAR FRAME AND OPEN IT TO GET ACCESS TO THE HINGE BOLT NUTS.
STEP 3. REMOVE THE CENTER BOLT FROM THE BOTTOM HINGE ONLY. LOOSEN THE OTHER TWO BOLT NUTS ON THE BOTTOM HINGE. DO NOT REMOVE OR LOOSEN THE BOLTS ON THE TOP HINGE.
STEP 4. SLIDE THE BOTTOM HINGE PIN UP UNTIL THE LOOSENED BOLTS REACH THE END OF THE SLOT. REMOVE THE REAR FRAME BY MOVING THE BOTTOM OF THE FRAME TO THE REAR AND THEN DOWNWARD TO DISENGAGE IT FROM THE TOP HINGE PLATE.



DETAIL A

CHATSWORTH PRODUCTS, INC.

INSTALLATION INSTRUCTIONS, CUBE-IT+ CABINET



MOUNTING REAR PANEL TO WALL

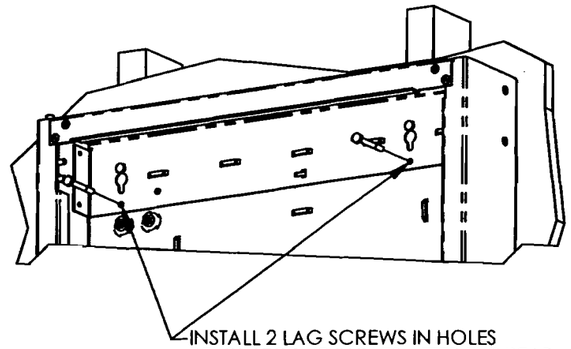
STEP 1. INSURE THAT THE WALL OR MOUNTING SURFACE HAS SUFFICIENT STRENGTH TO SUPPORT THE CABINET AND THE EXPECTED CABINET PAYLOAD. THE MOUNTING SURFACE MUST ALSO BE FLAT AND EXTEND BEYOND THE TOP, BOTTOM, LEFT, AND RIGHT EDGES OF THE REAR PANEL.

STEP 2. DRILL 11/64" PILOT HOLES FOR THE FOUR 1/4-10 X 2" LAG SCREWS TO THE DIMENSIONS SHOWN ON THE DRAWING OR USE THE MOUNTING TEMPLATE PROVIDED. THE SCREWS SHOULD GO DIRECTLY INTO THE WALL STUDS.

STEP 3. INSTALL THE LAG SCREWS INTO THE HOLES. THE SCREW HEAD SHOULD PROTRUDE ABOUT 3/8" FROM THE WALL.

STEP 4. MOUNT THE REAR FRAME TO THE WALL BY HOOKING THE KEYHOLES OVER THE SCREWS. TIGHTEN THE SCREWS SECURELY.

STEP 5. INSTALL THE REMAINING 2 LAG SCREWS IN THE HOLES BELOW THE TOP TWO KEYHOLES.



NOTE:
THE REAR FRAME MUST BE SECURED TO WALL USING ALL 6 LAG SCREWS PROVIDED. THE SCREWS ARE INTENDED TO GO THROUGH 3/4" PLYWOOD BACK-BOARD AND THEN INTO WOOD WALL STUDS. FOR MASONRY SURFACE, THE INSTALLER MUST PROVIDE APPROPRIATE HARDWARE.

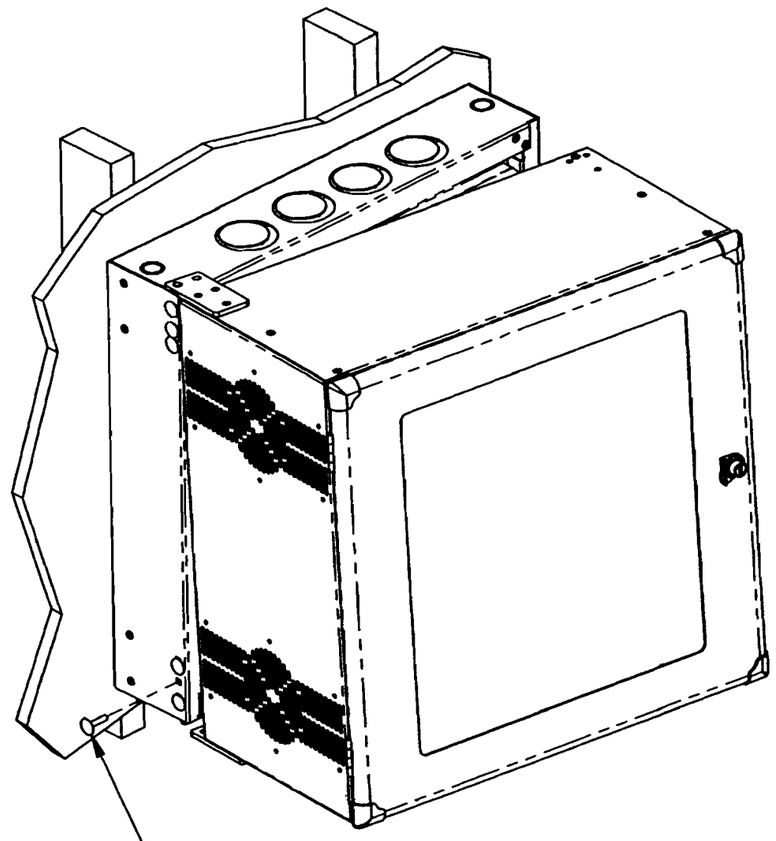
CHATSWORTH PRODUCTS, INC.

INSTALLATION INSTRUCTIONS, CUBE-IT+ CABINET

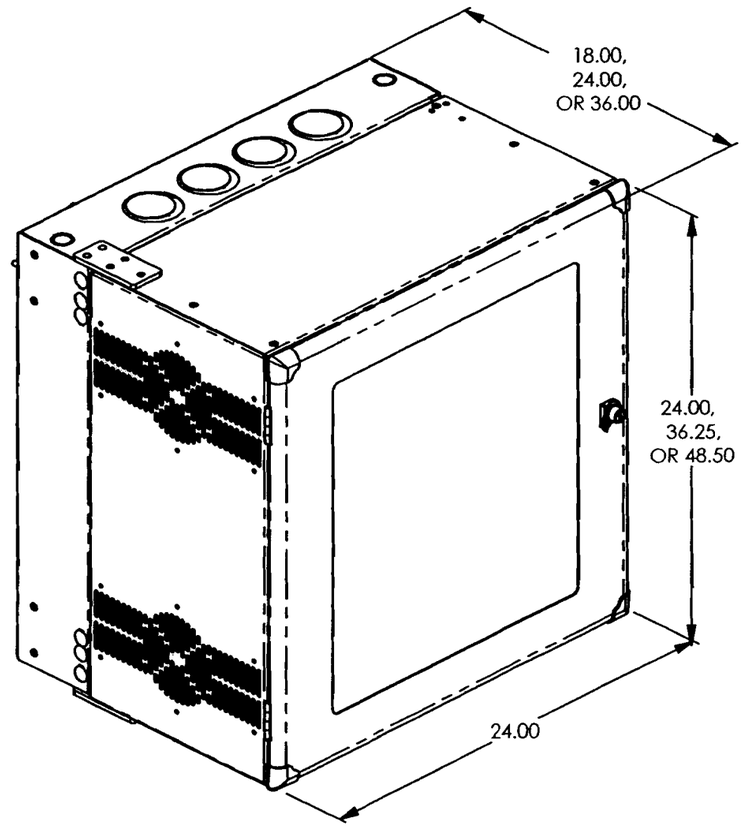
3

MOUNTING CABINET TO REAR PANEL

STEP 1. HOOK THE TOP HINGE PLATE ONTO THE TOP HINGE PIN.
STEP 2. ALIGN THE BOTTOM HINGE PLATE HOLE WITH THE BOTTOM HINGE PIN. SLIDE THE HINGE PIN DOWN INTO THE HINGE HOLE AS FAR AS POSSIBLE.
STEP 3. REINSTALL THE CENTER BOLT AND NUT. TIGHTEN ALL THREE BOTTOM NUTS SECURELY.

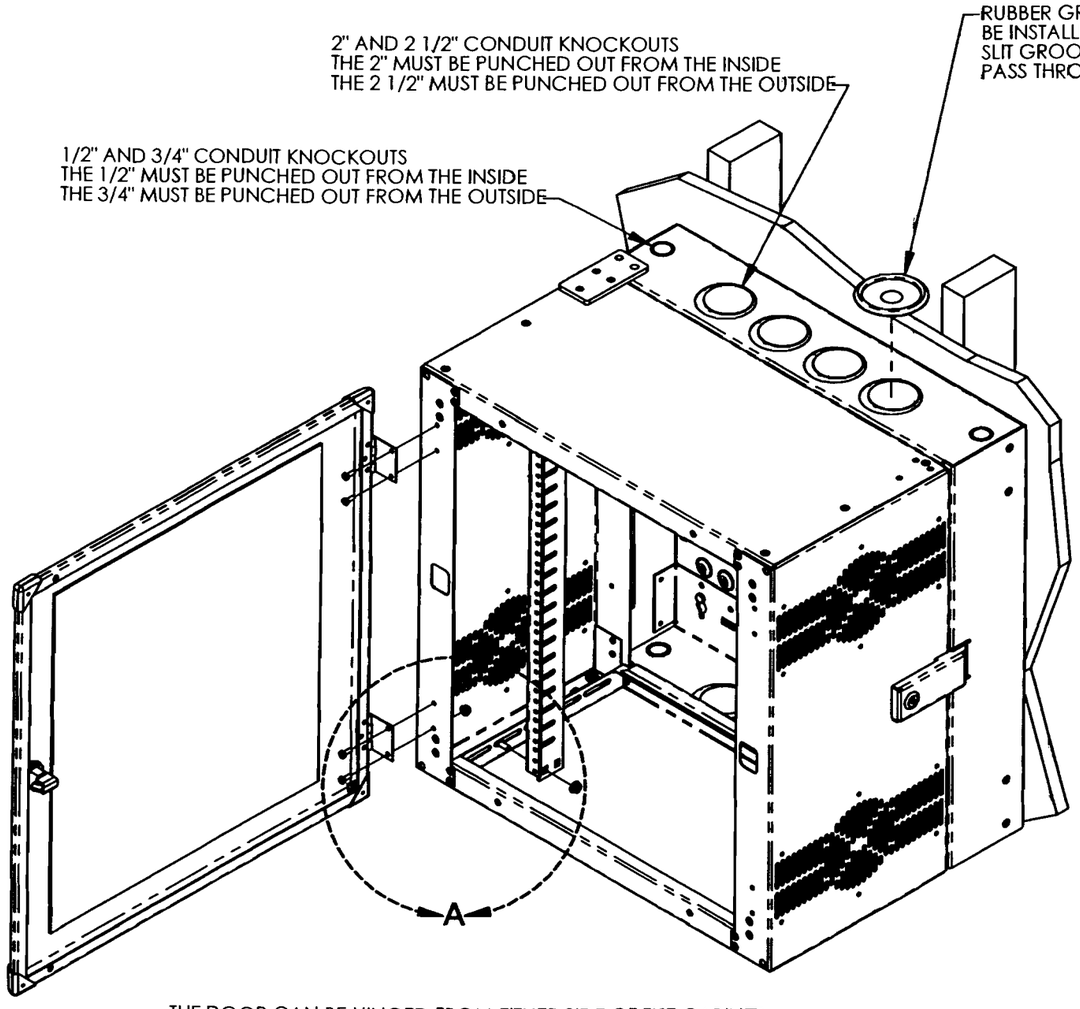


THE CENTER BOLT MUST BE REPLACED TO INSURE THAT THE HINGE PIN DOES NOT SLIP DURING OPERATION



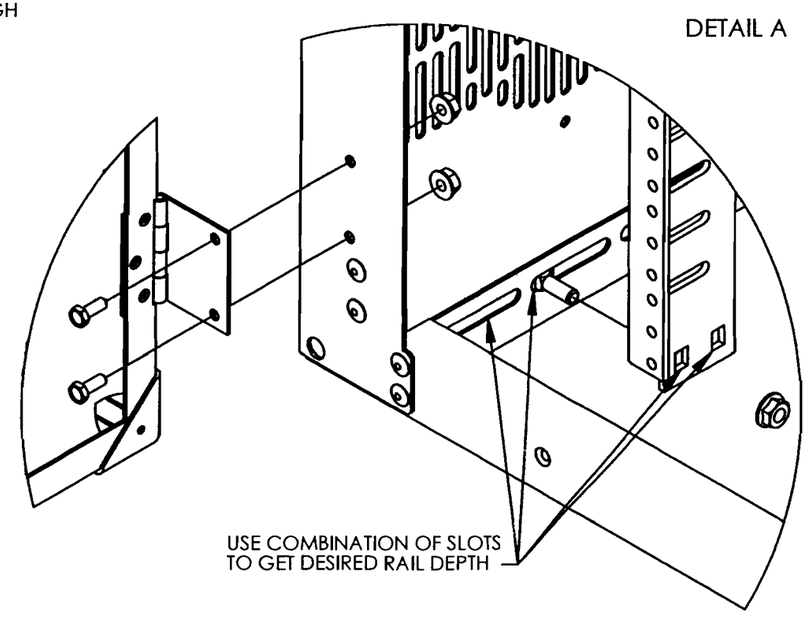
CHATSWORTH PRODUCTS, INC.

INSTALLATION INSTRUCTIONS, CUBE-IT+ CABINET



RUBBER GROMMETS (FOUR PROVIDED) CAN BE INSTALLED IN LARGEST KNOCKOUT HOLE. SLIT GROOVES WITH KNIFE TO ALLOW CABLE PASS THROUGH

DETAIL A



MOUNTING EQUIPMENT RAIL

MOUNTING RAIL DEPTH CAN BE ADJUSTED BY REMOVING NUTS AND MOVING THE RAIL TO THE DESIRED POSITION. USE A COMBINATION OF ONE OF THE TWO SLOTS ON THE RAIL AND ONE OF THE SLOTS ON THE SIDE PANELS.

THE DOOR CAN BE HINGED FROM EITHER SIDE OF THE CABINET.
1. REMOVE THE FOUR SCREWS AND NUTS FROM THE HINGES.
2. TURN THE DOOR OVER.
3. REINSTALL THE SCREWS AND NUTS ON THE OPPOSITE SIDE.

CHATSWORTH PRODUCTS, INC.

INSTALLATION INSTRUCTIONS, CUBE-IT+ CABINET

Section 7-DD

12 Fiber Optical Cable

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

ALTOS® All-Dielectric Gel-Free Cables

A LANscape® Pretium™ Solutions Product

Corning
Cable Systems

Mod# 012CWF-T4131D2

Applications

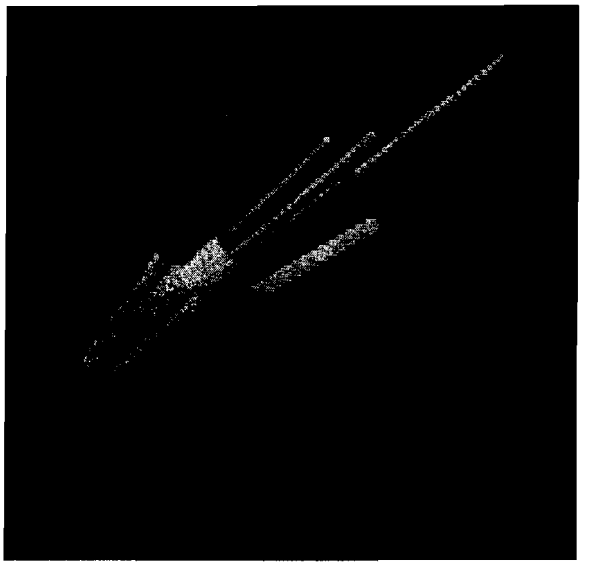
- Campus backbones in lashed aerial and duct installations

Description

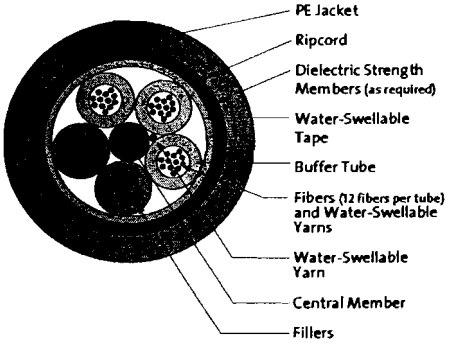
Corning Cable Systems ALTOS® Cables are designed for outdoor and limited indoor use. The loose tube cable is waterblocked to prevent water penetration that could lead to fiber damage.

Features / Benefits

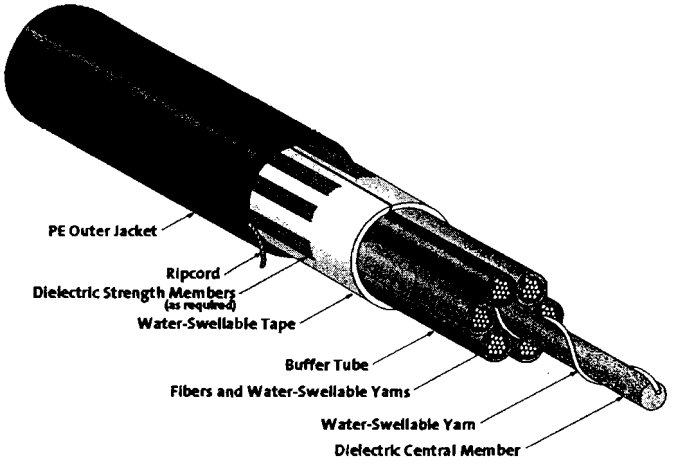
- Gel-free design is fully waterblocked using craft-friendly water-swellable yarns and tapes, making cable access simple and requiring no clean up
- Available in 62.5 µm, 50 µm, single-mode and hybrid versions
- Standard 3.0 mm buffer tube size reduces the number of access tools required by craftspersons
- SZ-stranded, loose tube design isolates fibers from installation, environmental rigors, and allows for easy mid-span access
- Medium Density Polyethylene jacket is rugged, durable and easy to strip
- Available with extended operating temperature to -60°C (-76°F)
- All-dielectric cable construction requires no bonding or grounding
- Available with Gigabit Ethernet and 10 Gigabit Ethernet performance



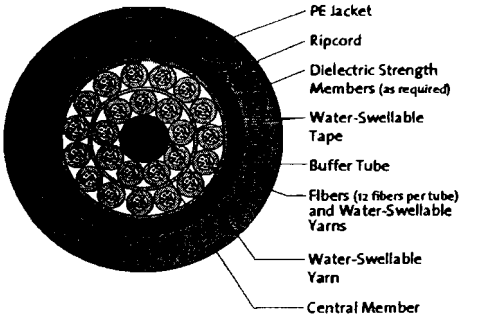
ALTOS All-Dielectric Gel-Free Cable | Photo LAN101



36-Fiber ALTOS Single-Jacket/No-Armor Cable | Drawing CPC-220/1/1



ALTOS All-Dielectric Gel-Free Cable | Drawing CPC-220/1/3



288-Fiber ALTOS Single-Jacket/No-Armor High-Density Cable | Drawing CPC-220/1/2

CORNING
Discovering Beyond Imagination

Product Specifications

ALTOS® All-Dielectric Gel-Free Cables

A LANscape® Pretium™ Solutions Product

Corning Cable Systems

Specifications

Temperatures	Storage: -40° to +70°C (-40° to +158°F) Installation: -30° to +70°C (-22° to +158°F) Operation: -40° to +70°C (-40° to +158°F)
Maximum Tensile Loads	Short-Term: 2700 N (600 lbf) Long-Term: 890 N (200 lbf)
Common Installations	Outdoor lashed aerial and duct; indoor when installed according to NEC® Article 770
Design and Test Criteria	ANSI/ICEA S-87-640

Fiber Count	Maximum Fibers per Tube	Number of Tube Positions	Nominal Cable Weight kg/km (lb/1000 ft)	Nominal Outer Diameter mm (in)	Minimum Bend Radius Loaded cm (in)	Minimum Bend Radius Installed cm (in)
≤ 60	12	5	91 (61)	12.1 (0.48)	18.2 (7.1)	12.1 (4.8)
≤ 72	12	6	94 (63)	12.2 (0.48)	18.8 (7.4)	12.2 (4.8)
≤ 96	12	8	124 (83)	14.1 (0.56)	21.4 (8.4)	14.1 (5.6)
≤ 120	12	10	161 (108)	16.1 (0.63)	24.3 (9.6)	16.1 (6.3)
≤ 192	12	16	164 (110)	17.6 (0.69)	26.7 (10.5)	17.6 (6.9)
≤ 216	12	18	183 (123)	18.4 (0.72)	27.8 (10.9)	18.4 (7.2)
≤ 240	12	20	202 (135)	19.3 (0.76)	29.1 (11.5)	19.3 (7.6)
≤ 288	12	24	252 (169)	21.5 (0.85)	32.3 (12.7)	21.5 (8.5)

Transmission Performance

Fiber Code	K	C	S	S	E
Performance Option Code	**30**	**31**	80	90	**01**
Fiber Type	62.5/125 µm (850/1300 nm)	50/125 µm (850/1300 nm)	50/125 µm (850/1300 nm)	50/125 µm (850/1300 nm)	Single-mode (1310/1383/1550 nm)
Maximum Attenuation (dB/km)	3.5/1.0	3.5/1.5	3.0/1.5	3.0/1.5	0.4/0.4/0.3
Minimum LED Bandwidth (MHz•km)	200/500	500/500	1500/500	1500/500	– / – / –
Minimum Effective Modal Bandwidth (MHz•km)	*220/ –	*510/ –	**2000/ –	***4700/ –	– / – / –
Serial Gigabit Ethernet Distance (m)	300/550	600/600	1000/600	1000/600	5000/ – / –
Serial 10 Gigabit Ethernet Distance (m)	33/ –	82/ –	300/ –	****550/ –	10000/40000

** As predicted by RML BW, per TIA/EIA 455-204 and IEC 60793-1-41, for intermediate performance laser-based systems (up to 1 Gb/s).*

*** As predicted by minEMBc, per TIA/EIA 455-220 and IEC 60793-1-49, for high performance laser-based systems (up to 10 Gb/s).*

**** As predicted by minEMBc, per TIA/EIA 455-220 and IEC 60793-1-49, for high performance laser-based systems (up to 10 Gb/s).*

***** The 550 m distance is equivalent to a 4700 EMB system with standards-compliant transceiver and fiber characteristics, 3.0 dB/km cable attenuation and 1.0 dB total connector loss.*

CORNING
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LANscape® PRETIUM
THE PREMIER SOLUTION

ALTOS® All-Dielectric Gel-Free Cables

A LANscape® Pretium™ Solutions Product

Corning
Cable Systems

Ordering Information

Contact Customer Service for other options.

□ □ □ □ W 4 - T 4 1 □ □ D 2 0

1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 - 3 Select fiber count.

Standard Offerings:

004	012	024	072	144	216
006	018	036	096	192	288

4 Select fiber type (see Transmission Performance Table).

5 / 12 Defines cable type.

W/D = ALTOS® Gel-Free Cable

6 Defines outer jacket.

4 = All-dielectric

7 Defines fiber placement.

T = 12 fibers/buffer tube (standard)

8 Defines length markings.

4 = Markings in feet (standard)

9 Defines tensile strength (see Specifications).

10 - 11 Select performance option code. (see Transmission Performance Table).

13 - 14 Defines special requirements.

20 = No special requirements

CORNING
Discovering Beyond Imagination

LANscape PRETIUM
THE PREMIER SOLUTION

ALTOS® All-Dielectric Gel-Free Cables

A LANscape® Pretium™ Solutions Product

Corning
Cable Systems

Corning Cable Systems LLC • PO Box 489 • Hickory, NC 28603-0489 USA
1-800-743-2675 • FAX: +1-828-901-5973 • International: +1-828-901-5000 • http://www.corning.com/cablesystems

Published in the USA. LAN-78-EN / December 2004 / 4M

CORNING
Discovering Beyond Imagination

LANscape® PRETIUM
THE PREMIER SOLUTION

Section 7-EE

Fiber Optic Fan Out Kit

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Buffer Tube Fan-Out Kits

An Evolant™ Solutions Product

Corning
Cable Systems

MODH FAN-BT25-12

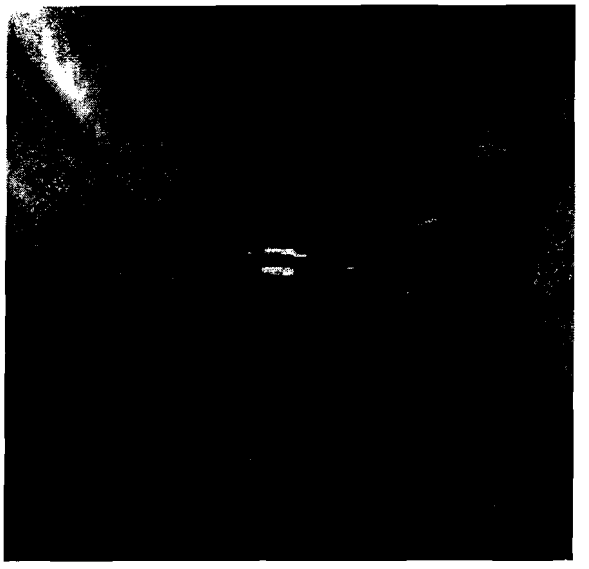
Applications

- Field termination of loose tube cables at indoor or outdoor cross-connects

Description

Corning Cable Systems' Indoor and Outdoor Buffer Tube Fan-Out Kits are specifically designed for the termination of 6- and 12-fiber buffer tubes. These buffer tube fan-out kits provide the ultimate solution for those users who want to field-install connectors. The kits provide the most compact, easy-to-install fan-out solution requiring no additional hardware or space than that for terminating tight-buffered cables.

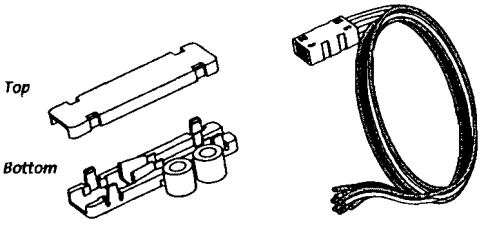
Indoor and Outdoor Kits feature a 900 µm Fan-Out Assembly that is color-coded to match the fiber color scheme. The Fan-Out Assembly is available with 6- or 12-fiber units in lengths of 25 inches. These different lengths provide the installer the flexibility needed for a variety of hardware options.



Buffer Tube Fan-Out Kit | Photo LAN49

Features / Benefits

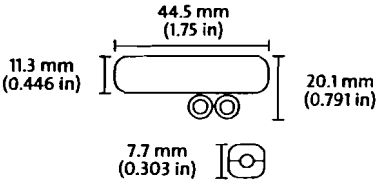
- Colored fan-out tubing
- New snap-together furcation unit eliminates epoxy for indoor kits
- Compact design
- Quick and easy to install
- Optimized for field termination of cables
- Excellent fiber routing capabilities
- Bend radius protection designed into each unit



Furcation Unit

Fan-Out Assembly

Kit Components | Drawing CPC-220/2/1



Completed Kit Dimensions | Drawing CPC-220/2/2

CORNING
Discovering Beyond Imagination

Product Specifications

Buffer Tube Fan-Out Kits

An Evolant™ Solutions Product

Corning
Cable Systems

Ordering Information

To order a Buffer Tube Fan-Out Kit, first determine the application – indoor or outdoor. Next, determine the number of fibers to furcate.

Indoor Buffer Tube Fan-Out Kits

Part Number	Length of Tubing	Number of Fibers per Buffer Tube*
FAN-BT25-06	25 inches	6
FAN-BT25-12	25 inches	12

Outdoor Buffer Tube Fan-Out Kits

FAN-OD25-06	25 inches	6
FAN-OD25-12	25 inches	12

**Refer to cable specifications.*

Tool Kit and Tool Kit Consumables

Part Number	Description
TKT-FANBT-A	Buffer Tube Fan-Out Assembly Tool Kit
TKT-FANBT-C	Buffer Tube Fan-Out Assembly Consumables Kit

CORNING
Discovering Beyond Imagination

Corning Cable Systems LLC • PO Box 489 • Hickory, NC 28603-0489 USA
1-800-743-2675 • FAX: +1-828-901-5973 • International: +1-828-901-5000 • http://www.corning.com/cablesystems

Section 7-FF

Fiber Optic Distribution Patch Panel

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Distribution Patch Panel Enclosure 559542-[ ] (24-Port), 559614-[ ] (48-Port), and 559552-[ ] (72-Port)

MOD # 559542-2

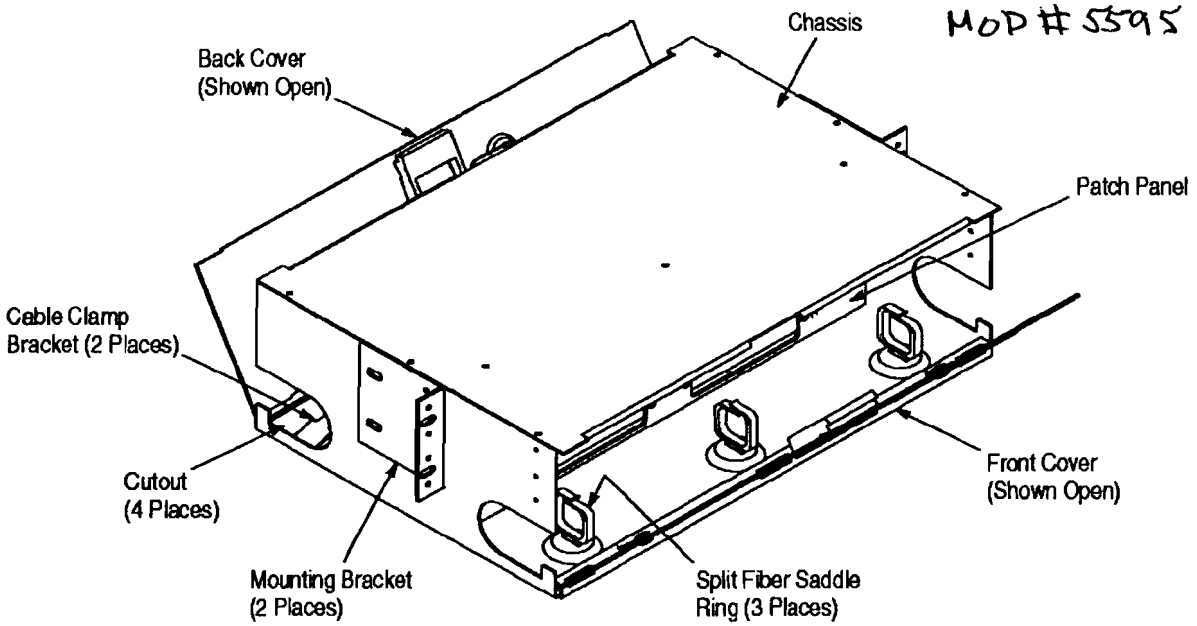


Figure 1

1. INTRODUCTION

AMP Distribution Patch Panel Enclosure 559542-[ ] (24-port), 559614-[ ] (48-port), shown in Figure 1, and 559552-[ ] (72-port) are used for housing singlemode and multimode fiber optic connections. The enclosure fits into standard 483 mm [19.0 in.] or 584 mm [23.0 in.] Electronic Industries Alliance (EIA) racks only.

NOTE *Dimensions in this instruction sheet are in millimeters [with inches in brackets]. Figures are not drawn to scale.*

Read these instructions thoroughly before starting installation.

2. DESCRIPTION (Figure 1)

The enclosure consists of a chassis and interchangeable front cover and back cover. The enclosure features a fixed patch panel, and two cutouts on each side for cable entrance and exit. The patch panel holds "snap-in" adapter plates and is marked by alphabet for connector identification.

Inside the front of the enclosure are three split fiber saddle rings; inside the back of the enclosure are two cable clamp brackets, two split fiber saddle rings, and a lug (mounted onto the floor of the chassis). The cable clamp brackets are used for securing the breakout cable to the enclosure, and the lug is used for securing the central strength member (if present) to the enclosure. Cable routing within the enclosure is facilitated by the fiber saddles.

Two universal mounting brackets and four 12-24 UNF-2A pan head screws are included for mounting in the rack. Also included are two label cards and a danger label.

3. INSTALLATION

3.1. Mounting the Enclosure

CAUTION *ALWAYS use safe lifting techniques. NEVER lift more than you can manage comfortably. Lifting guidelines are available from the Occupational Safety and Health Administration (OSHA).*

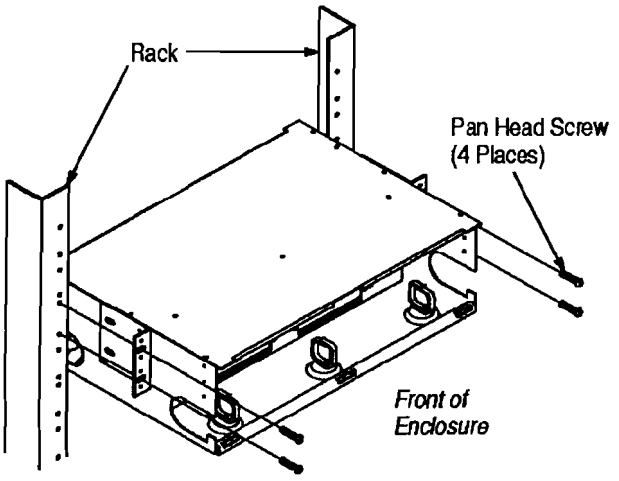
1. Unlatch and open the front cover, and set aside. Unlatch and open the back cover, and set aside.

NOTE *The covers are not attached to the enclosure.*

2. The enclosure is assembled for mounting in a 483 [19.0] rack; mount the enclosure in the rack. See Figure 2.

For a 584 [23.0] rack, remove the screws securing the brackets to the enclosure. Turn the brackets so that the long leg of the "L" is protruding, and secure the brackets to the enclosure using the screws. Mount the enclosure in the rack. See Figure 2.

Mounting Enclosure



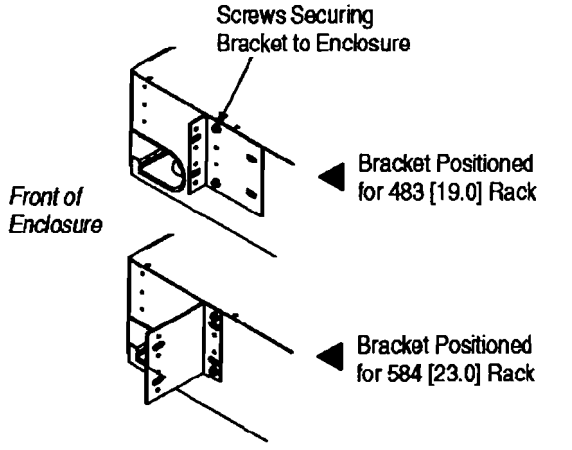
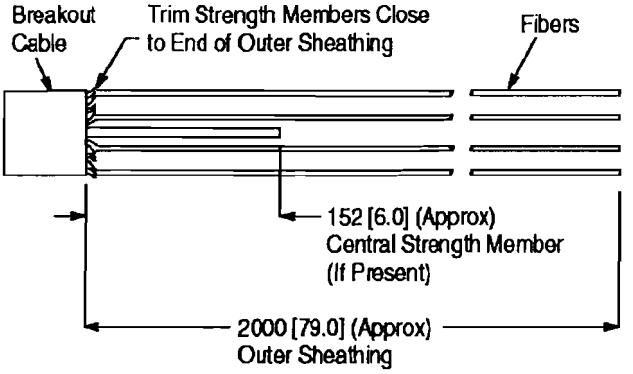


Figure 2

Cable Stripping and Cutting Dimensions



Note: Not to Scale

Figure 3

3.2. Preparing the Cable

DANGER *ALWAYS wear eye protection when working with optical fibers. NEVER look into the end of a terminated or unterminated fiber. Laser radiation is invisible but can damage eye tissue. NEVER eat, drink, or smoke when working with fibers. This could lead to ingestion of fiber particles.*

DANGER *BE VERY CAREFUL to dispose of fiber ends properly. The fibers create slivers that can easily puncture the skin and cause irritation.*

1. Strip the outer sheathing of the breakout cable, and if present, cut the central strength member to the dimensions shown in Figure 3.

2. Trim the strength members close to the end of the outer sheathing. Wipe the fibers with a clean, dry cloth. If necessary, use an alcohol pad to remove any oily residue from the fibers.

3.3. Installing the Adapter Plate onto the Patch Panel

1. Position the adapter plate over the front of the patch panel so that the split end of the lock pins align with the holes in the patch panel. Push the lock pins into the holes until the adapter plate is secure. See Figure 4.

2. Follow same procedure for remaining adapter plates.

3.4. Routing the Cable

Use the following guidelines when installing cable and routing the fiber in the enclosure. Whatever method is used, make sure that it not only meets the application needs, but also conforms to local codes and standards:

- Allow enough fiber in the enclosure for routing
- Coil excess fiber around split fiber saddle rings

Installing Adapter Plate

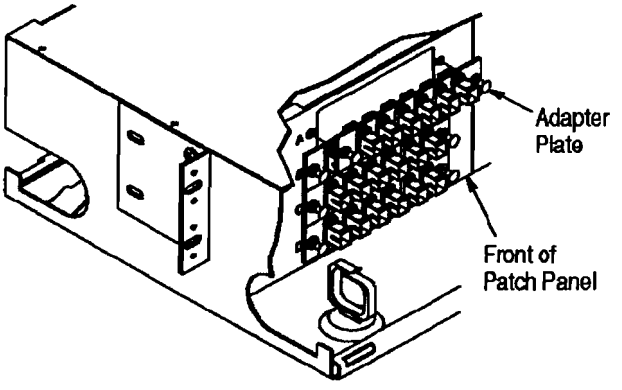


Figure 4

- Keep bend radii of cable and fiber as large as possible (always follow manufacturer's minimum bend radius)

CAUTION *Do NOT exceed minimum bend radii for the cable or fiber. ALWAYS avoid placing fiber under tension or torsion.*

These instructions reflect a typical installation where cable or fiber is routed through only one side of the enclosure, however cable or fiber can be routed through both sides of the enclosure. Follow the same procedure for both.

A. Securing the Breakout Cable

1. Route the cable through the cutout in the back of the enclosure and closest to the adapter plate to be used. Make sure that at least 2000 [79.0] of fiber is inside the enclosure. Lay the cable over the cable clamp bracket, and secure the cable to the bracket using cable ties. See Figure 5.

2. If a central strength member is present, loosen the mounting screw in the lug, and pivot the lug so that the opening faces the cable. Tighten the mounting screw. Loosen the setscrew, and insert the central strength member into the lug so that the central strength member butts against the terminal. Tighten the setscrew firmly. See Figure 5.

B. Routing Fiber

1. Separate the first group of 12 fibers to be located on the first two adapter plates. Terminate these fibers onto connectors according to the instructions provided with the connectors.

2. Dress the fiber around the split fiber saddle ring at the opposite side of the enclosure. Join the connectors to the coupling bushings at the back of the adapter plate. See Figure 6, Detail A.

3. Separate the next group of 12 fibers to be located on the next two adapter plates. Terminate these fibers onto connectors according to the instructions provided with the connectors.

Securing the Breakout Cable

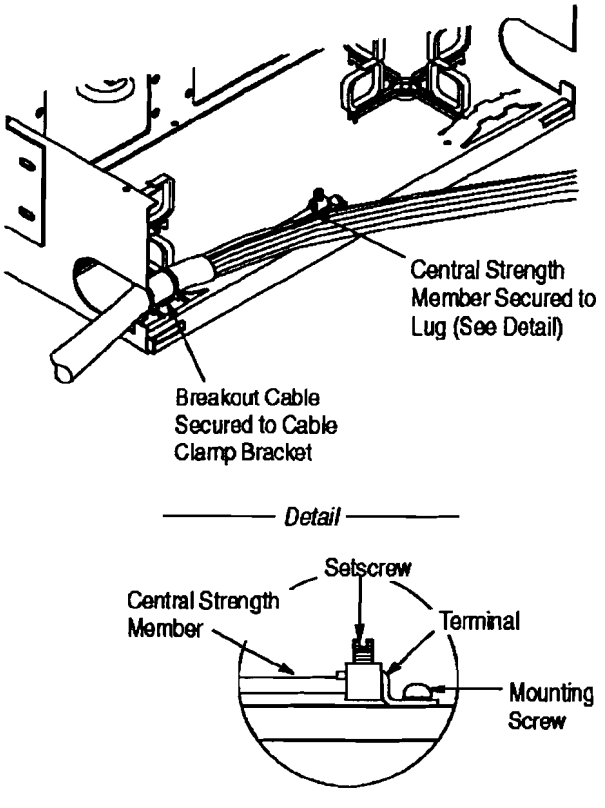
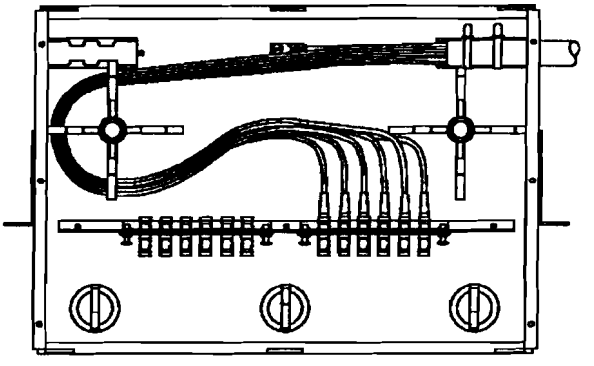


Figure 5

Routing Fiber

Detail A

Back of Enclosure



Detail B

Back of Enclosure

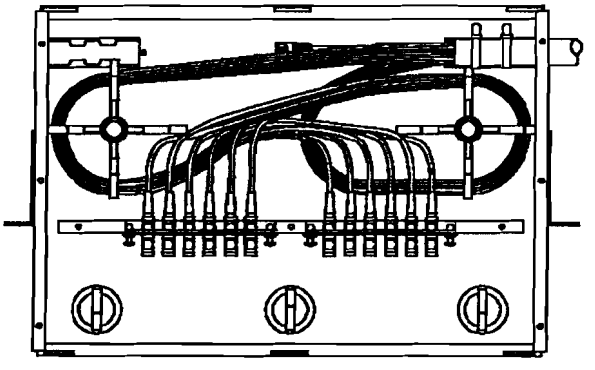


Figure 6

4. Dress the fiber around the other split fiber saddle ring. Join the connectors to the coupling bushings at the back of the adapter plate. See Figure 6, Detail B.

5. If applicable, continue separating groups of 12 fibers and terminating the fibers until the adapter plates are completely loaded.

6. If necessary, fiber can be routed through the back of the enclosure and joined to the front the adapter plate, or routed through the front of the enclosure and joined to the back of the adapter plate. In this case, route the fiber through either opening between the side of the enclosure and the patch panel. Refer to Figure 7.

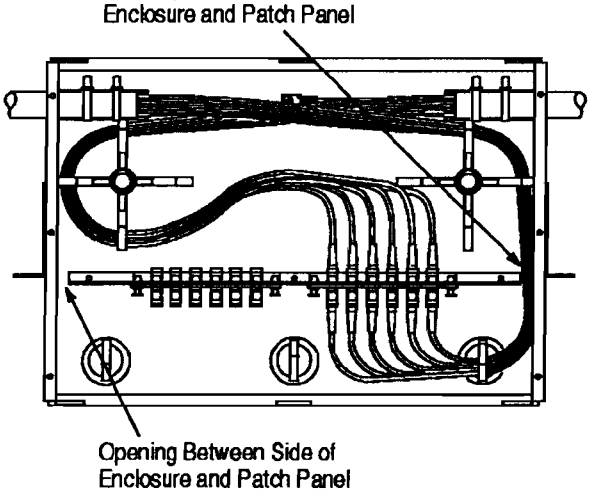


Figure 7

C. Routing Jumper Cable

1. Route the jumper cable through the cutout (either or both sides) in the front of the enclosure.

2. Dress the cable through the split fiber saddle rings, and join the connectors to the coupling bushings at the front of the adapter plate. See Figure 8.

3.5. Inspecting and Closing the Enclosure

1. Record connector positions using the label cards, then install one label card onto the front cover and one label onto the back cover.

NOTE *Some enclosures contain a label holder installed onto the front of the enclosure.*

Routing Jumper Cable

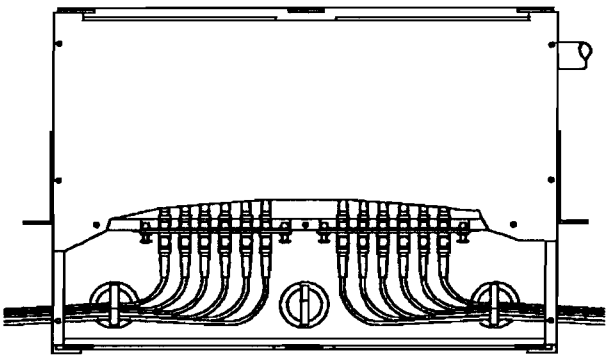


Figure 8

2. Install the danger label onto the front cover.

3. Inspect installation according to the following:
   — enclosure is secure to rack (pan head screws are tight)
   — cable is not nicked or broken
   — cable is secured to cable clamp bracket
   — center strength member (if present) is fully inserted into lug and setscrew is tight
   — there are no sharp bends or kinks in the fibers
   — there are no fibers under tension
   — connectors are undamaged
   — all connectors are fully joined to coupling bushings

4. Install the front and back covers onto the enclosure, close the covers, and inspect closing according to the following:
   — covers are fully latched
   — no cable or fibers are pinched in covers

4. REPLACEMENT AND REPAIR

The enclosure is not repairable if damaged. Order additional enclosures through your representative, or call 1–800–526–5142, or send a facsimile of your purchase order to 1–717–986–7605, or write to:

CUSTOMER SERVICE (038–035)
TYCO ELECTRONICS CORPORATION
PO BOX 3608
HARRISBURG PA 17105–3608

5. REVISION SUMMARY

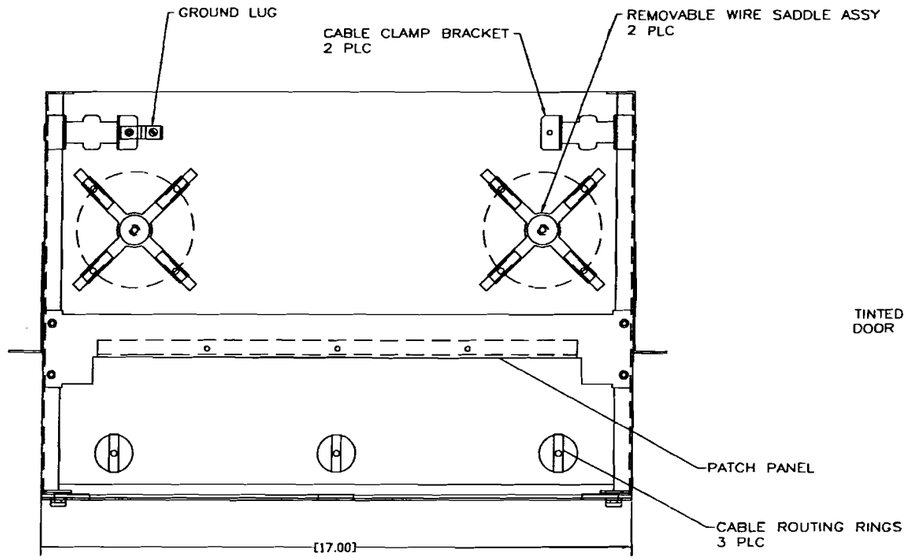
Per EC 0990–1508–00:

- Initial release of instruction sheet

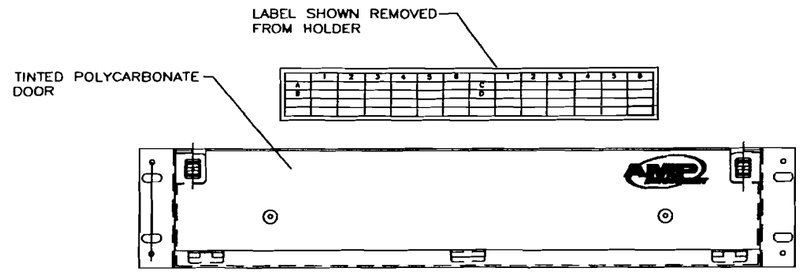
LOC	DIST
CE	16

REVISIONS

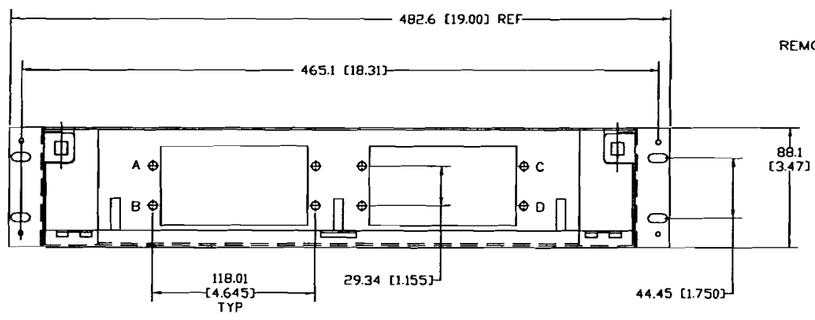
P	LTR	DESCRIPTION	DATE	BY	APVD
	G	REV PER EC 0A00-0986-00	10NOV00	WS	JH



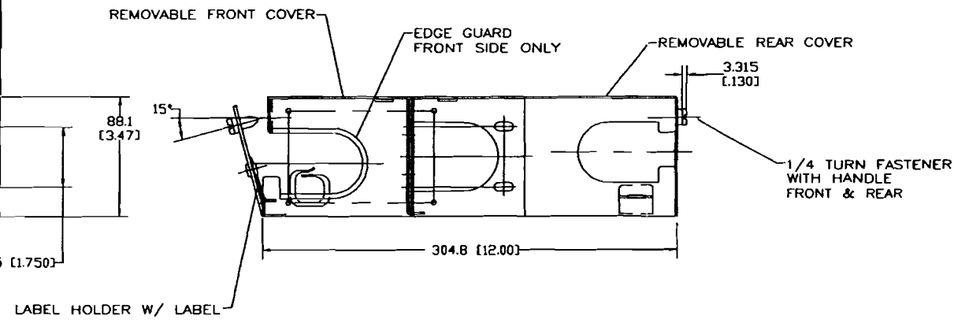
FRONT & REAR COVERS NOT SHOWN IN THIS VIEW



FRONT VIEW WITH DOOR



FRONT DOOR NOT SHOWN IN THIS VIEW



1. FOUR (4) #12-24UNC-2A SCREWS ARE PROVIDED IN BAG INSIDE THE ENCLOSURE
2. THE FOLLOWING ITEMS ARE BAGGED AND PLACED IN THE ENCLOSURE:
   - 24-LINE LABEL, QTY. 1
   - WARNING LABEL, QTY. 2
   - QUARTER-TURN FASTENER HANDLE, QTY. 4
   - QUARTER-TURN FASTENER HANDLE INSTALLATION INSTRUCTION SHEET, QTY. 1

FINISH COLOR	PART NO
BLACK	559542-2
LT ALMOND	559542-1

THIS DRAWING IS A CONTROLLED DOCUMENT.

DIMENSIONS: MM

TOLERANCES UNLESS OTHERWISE SPECIFIED:
0 PLC ± –
1 PLC ± –
2 PLC ± 0.25[.010]
3 PLC ± 0.25[.010]
4 PLC ± –
ANGLES ± –

MATERIAL: 18GAUGE STEEL
FINISH: –

DRN	W.J SOURBEER	10NOV00
CHK	J. HOFFER	10NOV00
APVD	J. HOFFER	10NOV00
PRODUCT SPEC	–	
APPLICATION SPEC	–	
WEIGHT	–	

CUSTOMER DRAWING

AMP — Tyco Electronics Corporation, Harrisburg, PA 17105

RACK MOUNTED, NEMC 24/PORT w/ CABLE BRACKET

SIZE	CAGE CODE	DRAWING NO	RESTRICTED TO
A1	00779	C-559542	–

SCALE 1:2 SHEET 1 OF 1 REV G

AMP 4803 REV 31MAY2000

10NOV00 3:48pm AMP39717

LOC	DIST
CE	16

REVISIONS

P	LTR	DESCRIPTION	DATE	DWN	APVD
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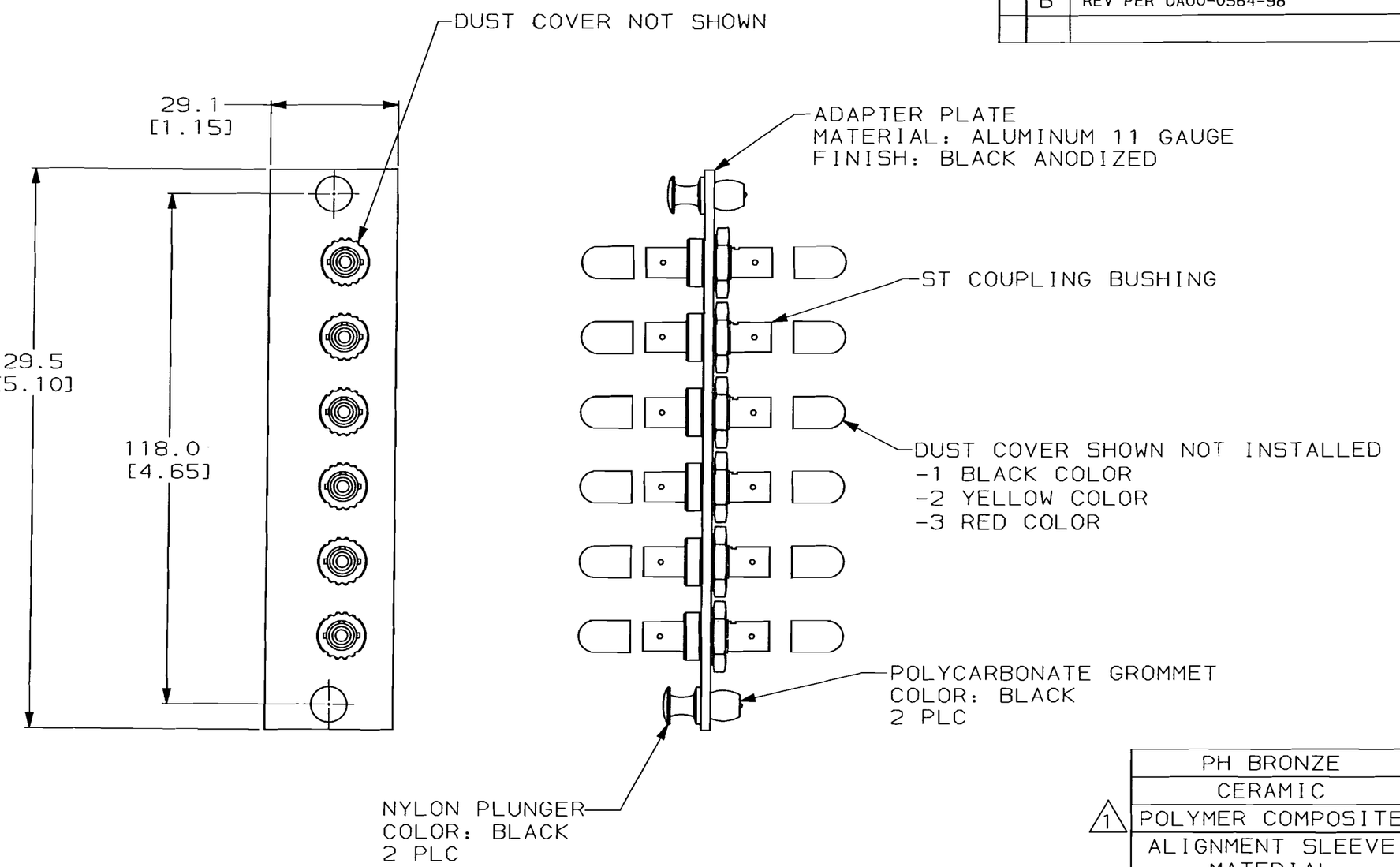


	PH BRONZE	559515-3
	CERAMIC	559515-2
1	POLYMER COMPOSITE	559515-1
	ALIGNMENT SLEEVE MATERIAL	PART NO.

1 BULK PACKAGED 100 PIECES PER PACK

THIS DRAWING IS A CONTROLLED DOCUMENT.

DIMENSIONS: mm [in]

TOLERANCES UNLESS OTHERWISE SPECIFIED:
0 PLC ±-
1 PLC ±-
2 PLC ±0.5 [.02]
3 PLC ±-
4 PLC ±-
ANGLES ±-

MATERIAL -
FINISH -

DWN R R SCHAFFER 11-8-96
CHK J C HOFFER 11-8-96
APVD M FASNACHT 11-8-96
PRODUCT SPEC -
APPLICATION SPEC -
WEIGHT -

AMP Incorporated
Harrisburg, PA 17105-3608

NAME ADAPTER PLATE ASSEMBLY, SNAP-IN, ST 6-PACK

SIZE	CAGE CODE	DRAWING NO
A3	00779	C-559515

CUSTOMER DRAWING | SCALE 1:1 | SHEET 1 OF 1 | REV B

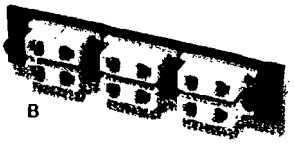
Section 7-GG

Optical Fiber Patch Panel Adapter Kit

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Snap-In Adapter Plates


A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Product Facts

- All Snap-in Adapter Plates fit AMP NETCONNECT unloaded Optical Fiber Enclosures included in this catalog (see pages 238-241)
- MT-RJ Jack Adapter Plates:
  - Hold up to six MT-RJ (standard or secure) Jacks or Pigtail Jack Cable Assemblies
  - Icons on page 283
- MT-RJ Plug Adapter Plates hold up to twelve MT-RJ Plugs (standard only)
- SL Series Discreet Adapter Plates accept SL Series Jacks and Multimedia Inserts

MOD # 559515-1

Description			Coupler Color	Package Qty	Figure	Part Number
MT-RJ (Single Jacks)	12-Fiber (6 MT-RJ Jacks)	Single-mode and Multimode	–	1	A	1278328-3
MT-RJ (Duplex Couplers)	24-Fiber (12-MT-RJ Plugs)	Single-mode and Multimode	Beige	1	B	1435440-1
Duplex LC	12-Fiber	Single-mode	–	1	I	1374463-1
		Multimode	–	1	I	1374463-3
	24-Fiber	Single-mode	–	1	J	1435516-1
		Multimode	–	1	J	1435516-2
Simplex SC	6-Fiber	Single-mode	Blue	1	C	559517-1
		Multimode	Beige	1	C	559517-3
Duplex SC	6-Fiber	Single-mode	Blue	1	C	559558-2
				100	C	559516-2
		Multimode	Beige	1	C	559558-1
				100	C	559516-1
	12-Fiber	Single-mode	Blue	1	D	559596-2
		Multimode	Beige	1	D	559596-1
Duplex SC to ST	6-Fiber	Multimode	Beige	1	E	559601-1
				100	E	559601-2
	12-Fiber	Multimode	Beige	1	F	1278368-1
Simplex ST	6-Fiber	Single-mode	Metallic	1	G	559515-2
		Multimode	Metallic	1	G	559557-1
				100	G	559515-1
Duplex ST	12-Fiber	Single-mode	Blue	1	H	1278567-2
		Multimode	Beige	1	H	1278567-1
Blank				1	K	559523-1
				100	K	559575-1
SL Series Discrete Adapter Plate	6-Port			1	L	1479506-1

NOTE: Highlighted part numbers are routinely stocked for shortest lead times.