OPERATION AND MAINTENANCE MANUAL

VOLUME III OF III
MANUFACTURER OPERATION AND MAINTENANCE MANUALS
- TRANSFORMER SWITCHES
- INSTRUSION DETECTION SYSTEM
- ALARM DIALER AND DATA LOGGER
- LIGHT FIXTURES AND POLES

GRATWICK-RIVERSIDE PARK SITE
NORTH TONAWANDA, NEW YORK

Prepared by:
Conestoga-Rovers & Associates

651 Colby Drive
Waterloo, Ontario
Canada N2V 1C2

Office: (519) 884-0510
Fax: (519) 884-0525

web: http:\\www.CRAworld.com

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Table of Contents

PROJECT GRATWICK PARK
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CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. SAFETY SW'S., XFMRS
SPEC. SECTION 16411
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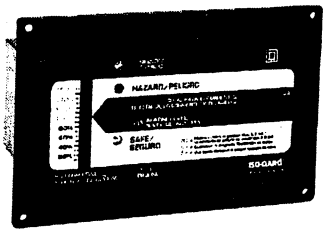
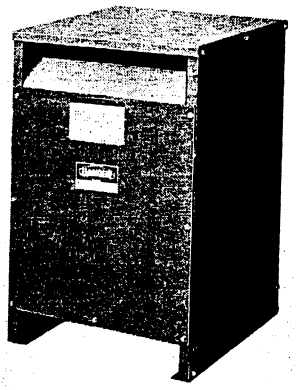
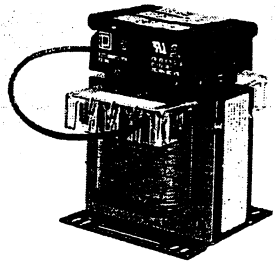
Section 11
Transformers and Hospital Isolated Power Systems



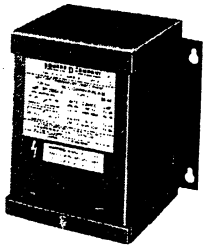
ISOGARD Line Isolation Monitor



General Purpose Transformer



Control Power Transformer



Buck and Boost Transformer

Hospital Isolated Power Systems

✱Transformers

Three Phase – General Purpose Transformers

These general purpose dry type transformers are for use in indoor installations. All ventilated transformers have core and coil assemblies mounted on rubber isolation pads to minimize the sound level. All are manufactured and tested to meet or exceed IEEE, NEMA and ANSI standards. Their compact size permits installations near the load being supplied.

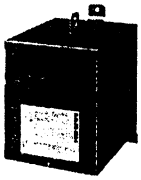
UL Listed through 750 kVA three phase

kVA	Catalog Number▲	Price	Full Capacity Taps	Degree C Temp. Rise	Weight (Pounds)	Enclosure■
Three Phase – 480 Volts DELTA Primary 208Y/120 Volts Secondary 60 Hz						
3	**3T2F**	$ 960.	2–5%FCBN	115	120	12C
6	**6T2F**	1100.	2–5%FCBN	115	145	12C
9	**9T2F**	1470.	2–5%FCBN	115	235	14C
15	**15T2F**	2211.	2–5%FCBN	115	300	14C
15	**15T68F**	2211.	4–2.5%2+2–	115	300	14C
15	**15T3H**	2001.	6–2.5%2+4–	150	200	17D
30	**30T2F**	4065.	2–5%FCBN	115	660	16C
30	**30T3H**	2952.	6–2.5%2+4–	150	250	17D
45	**45T3H**	3553.	6–2.5%2+4–	150	340	18D
75	**75T3H**	5353.	6–2.5%2+4–	150	500	19D
112.5	**112T3H**	7124.	6–2.5%2+4–	150	750	21D
150	**150T3H**	9306.	6–2.5%2+4–	150	800	22D
225	**225T3H**	12406.	6–2.5%2+4–	150	1025	24D
300	**300T3H**	15910.	6–2.5%2+4–	150	1450	25D
500	**500T68H**	25215.	4–2.5%2+2–	150	2100	30D
750	750T90H	40973.	4–3.5%2+2–	150	3950	31D
1000	1000T77H	49428.	2–5%1+1–	150	6300	33F
Three Phase – 208 Volts DELTA Primary 480Y/277 Volts Secondary 60 Hz						
15	**15T64H**	2602.	2–5%FCBN	150	200	17D
30	**30T64H**	3202.	2–5%FCBN	150	250	17D
45	**45T64H**	4002.	2–5%FCBN	150	340	18D
75	**75T64H**	5953.	2–5%FCBN	150	500	19D
112.5	**112T64H**	7953.	2–5%FCBN	150	750	21D
150	**150T64H**	9775.	2–5%FCBN	150	800	22D
225	**225T64H**	13438.	2–5%FCBN	150	1025	24D
300	**300T64H**	17961.	2–5%FCBN	150	1450	25D
500	500T64H	27316.	2–5%FCBN	150	2100	30D
Three Phase – 480 Volts DELTA Primary 240 Volts DELTA Secondary 60 Hz						
6	**6T5F**	$ 1100.	2–5%FCBN	115	145	12C
9	**9T75F**	1470.	4–2.5%FCBN	115	235	14C
15	**15T75F**	2211.	4–2.5%FCBN	115	300	14C
15	**15T6H**	2001.	6–2.5%2+4–	150	200	17D
30	**30T6H**	2952.	6–2.5%2+4–	150	250	17D
45	**45T6H**	3553.	6–2.5%2+4–	150	340	18D
75	**75T6H**	5353.	6–2.5%2+4–	150	500	19D
112.5	**112T6H**	7124.	6–2.5%2+4–	150	750	21D
150	**150T6H**	9306.	6–2.5%2+4–	150	800	22D
225	**225T6H**	12406.	6–2.5%2+4–	150	1025	24D
300	**300T6H**	15910.	6–2.5%2+4–	150	1450	25D
500	**500T63H**	25014.	4–2.5%2+2–	150	2100	30D
750	750T91H	40774.	4–3.5%2+2–	150	3950	31D
1000	1000T78H	49027.	2–5%1+1–	150	6000	33F
Three Phase – 480 Volts DELTA Primary 240 Volts DELTA Secondary with 120 Volts Center Tap★ – See Note #1						
30	**30T6HCT**	$ 3103.	6–2.5%2+4–	150	250	17D
45	**45T6HCT**	3703.	6–2.5%2+4–	150	340	18D
75	**75T6HCT**	5504.	6–2.5%2+4–	150	500	19D
112.5	**112T6HCT**	7754.	6–2.5%2+4–	150	750	21D
150	**150T6HCT**	9727.	6–2.5%2+4–	150	800	22D
225	**225T6HCT**	12868.	6–2.5%2+4–	150	1025	24D
300	**300T6HCT**	17909.	6–2.5%2+4–	150	1450	25D
500	500T63HCT	25582.	4–2.5%2+2–	150	2100	30D
750	750T91HCT	40733.	4–3.5%2+2–	150	3950	31D
1000	1000T78HCT	49527.	2–3.5%1+1–	150	6300	33F
Three Phase – 480 Volts DELTA Primary 480Y/277 Volts Secondary 60 Hz						
15	**15T76H**	$ 2602.	4–2.5%2+2–	150	200	17D
30	**30T76H**	3103.	4–2.5%2+2–	150	250	17D
45	**45T76H**	3721.	4–2.5%2+2–	150	340	18D
75	**75T76H**	5603.	4–2.5%2+2–	150	500	19D
112.5	**112T76H**	7504.	4–2.5%2+2–	150	750	21D
150	**150T76H**	9705.	4–2.5%2+2–	150	800	22D
225	**225T76H**	13107.	4–2.5%2+2–	150	1025	24D
300	**300T76H**	15972.	4–2.5%2+2–	150	1450	25D
500	500T76H	27014.	4–2.5%2+2–	150	2100	30D
Three Phase – 480 Volts DELTA Primary 380Y/220 Volts Secondary 60 Hz						
15	**15T96H**	2602.	4–2.5%2+2–	150	200	17D
30	**30T96H**	3202.	4–2.5%2+2–	150	250	17D
45	**45T96H**	4002.	4–2.5%2+2–	150	340	18D
75	**75T96H**	5953.	4–2.5%2+2–	150	500	19D
112.5	112T96H	7953.	4–2.5%2+2–	150	750	21D
150	150T96H	9775.	4–2.5%2+2–	150	800	22D
225	225T96H	13438.	4–2.5%2+2–	150	1025	24D
300	300T96H	17961.	4–2.5%2+2–	150	1450	25D
500	500T96H	27316.	4–2.5%2+2–	150	2100	30D
Three Phase – 600 Volts DELTA Primary 208Y/120 Volts Secondary 60 Hz						
6	**6T7F**	$ 1169.	2–5%FCBN	115	145	12C
9	**9T7F**	1551.	2–5%FCBN	115	235	14C
15	**15T7F**	2321.	2–5%FCBN	115	300	14C
15	15T8H	2602.	4–2.5%FCBN	150	200	17D
30	**30T8H**	3103.	4–2.5%FCBN	150	250	17D
45	**45T8H**	3703.	4–2.5%FCBN	150	340	18D
75	**75T8H**	5504.	4–2.5%FCBN	150	500	19D
112.5	112T8H	7953.	4–2.5%FCBN	150	750	21D
150	150T8H	9775.	4–2.5%FCBN	150	800	22D
225	225T8H	13438.	4–2.5%FCBN	150	1025	24D
300	300T8H	17961.	4–2.5%FCBN	150	1450	25D
500	500T8H	27316.	4–2.5%FCBN	150	2100	30D
750	750T8H	41584.	4–2.5%FCBN	150	3950	31D
1000	1000T88H	50030.	4–3.5%FCBN	150	6600	33F
Three Phase – 600 Volts DELTA Primary 480Y/277 Volts Secondary 60 Hz						
15	15T74H	2602.	4–2.5%FCBN	150	200	17D
30	30T74H	3202.	4–2.5%FCBN	150	250	17D
45	45T74H	4002.	4–2.5%FCBN	150	340	18D
75	75T74H	5953.	4–2.5%FCBN	150	500	19D
112.5	112T74H	7953.	4–2.5%FCBN	150	750	21D
150	150T74H	9775.	4–2.5%FCBN	150	800	22D
225	225T74H	13438.	4–2.5%FCBN	150	1025	24D
300	300T74H	17961.	4–2.5%FCBN	150	1450	25D
500	500T74H	27316.	4–2.5%FCBN	150	2100	30D
Three Phase – 600 Volts DELTA Primary 240 Volts DELTA Secondary 60 Hz						
15	15T10H	2602.	4–2.5%FCBN	150	200	17D
30	30T10H	3202.	4–2.5%FCBN	150	250	17D
45	45T10H	4002.	4–2.5%FCBN	150	340	18D
75	75T10H	5953.	4–2.5%FCBN	150	500	19D
112.5	112T10H	7953.	4–2.5%FCBN	150	750	21D
150	150T10H	9775.	4–2.5%FCBN	150	800	22D
225	225T10H	13438.	4–2.5%FCBN	150	1025	24D
300	300T10H	17961.	4–2.5%FCBN	150	1450	25D
500	500T10H	27316.	4–2.5%FCBN	150	2100	30D
Three Phase – 240 Volts DELTA Primary 208Y/120 Volts Secondary 60 Hz						
15	**15T12H**	2602.	4–2.5%2+2–	150	200	17D
30	**30T12H**	3202.	4–2.5%2+2–	150	250	17D
45	**45T12H**	4002.	4–2.5%2+2–	150	340	18D
75	**75T12H**	5953.	4–2.5%2+2–	150	500	19D
112.5	**112T12H**	7953.	4–2.5%2+2–	150	750	21D
150	**150T12H**	9775.	4–2.5%2+2–	150	800	22D
225	225T11H	13438.	2–5%FCBN	150	1025	24D
300	300T11H	17961.	2–5%FCBN	150	1450	25D
500	500T11H	27316.	2–5%FCBN	150	2100	30D

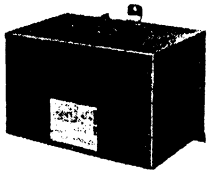
★ **CAUTION: Single Phase load limited to maximum 5% of rated kVA. Contact local Square D Sales Office for other loading.**
Note #1: Connect "B" PH to X3 to meet NEC 384-3.
■ For enclosure styles, see Dimensions Table, Page 11-8
FCBN = Full Capacity Below Normal
Lugs: Furnished by customer.
Taps on transformers 225 kVA and larger may vary in 3% to 5% steps to obtain best design.

Enclosure Styles

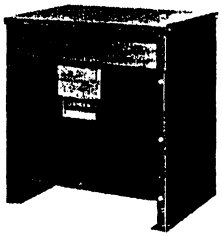
Style A



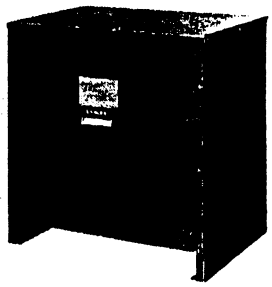
Style B



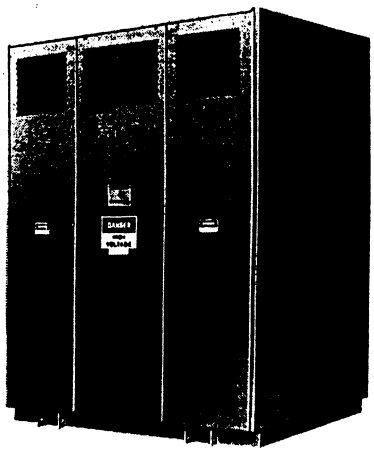
Style C



Style D



Style E



Style F

Table 1: Enclosure Dimensions and Accessories

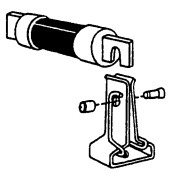
Enclosure Number/Style		Height		Width		Depth		Mounting	Weathershield	Wall Mounting Bracket	Ceiling Mounting Bracket
		IN	mm	IN	mm	IN	mm				
1	A	5	127	4.47	114	3.44	87	Wall	—	—	
2	A	5.5	140	4.47	114	3.44	87	Wall	—	—	—
3	A	5	127	4.85	123	3.75	95	Wall	—	—	—
4	A	5.5	140	5.23	133	4.06	103	Wall	—	—	—
5	A	6.19	157	6.19	157	4.69	119	Wall	—	—	—
6	A	6.69	170	6.19	157	4.69	119	Wall	—	—	—
7	A	8.13	270	6.94	176	5.31	135	Wall	—	—	—
8	A	8.25	210	8.68	220	6.56	167	Wall	—	—	—
9	A	9.56	243	8.68	220	6.56	167	Wall	—	—	—
10	A	10.5	267	8.62	219	6.5	165	Wall	—	—	—
11	A	12.56	319	8.62	219	6.5	165	Wall	—	—	—
12	C	13.5	343	14.75	375	9	229	Wall	—	—	—
13	B	14.75	375	9.75	248	11.75	298	Wall	—	—	—
14	C	14.75	375	19.1	485	12.25	311	Wall	—	—	—
15	B	20	508	15	381	13.5	343	Wall	—	—	—
16	C	22	559	25	635	13.5	343	Wall	—	—	—
17	D	27	686	20	508	16	406	Floor	WS363	WMB361–362	CMB363
	E	27	686	20	508	16	406	Floor	N/A	WMB361–362	CMB363
18	D	30	762	20	508	20	508	Floor	WS363	WMB363–364	CMB363
	E	30	762	20	508	20	508	Floor	N/A	WMB363–364	CMB363
19	D	30	762	30	762	20	508	Floor	WS364	WMB363–364	CMB364
	E	30	762	30	762	20	508	Floor	N/A	WMB363–364	CMB364
20	D	37	940	30	762	20	508	Floor	WS364	WMB363–364	CMB364
	E	37	940	30	762	20	508	Floor	N/A	WMB363–364	CMB364
21	D	37	940	30	762	24	610	Floor	WS364	N/A	CMB364
	E	37	940	30	762	24	610	Floor	N/A	N/A	CMB364
22	D	43.75	1111	32	813	27	686	Floor	WS380	N/A	CMB380
	E	43.75	1111	32	813	27	686	Floor	N/A	N/A	CMB380
23	D	48	1219	48	1219	29.5	749	Floor	WS368	N/A	N/A
	E	48	1219	48	1219	29.5	749	Floor	N/A	N/A	N/A
24	D	49.5	1257	35	889	28.5	724	Floor	WS381	N/A	CMB381
	E	49.5	1257	35	889	28.5	724	Floor	N/A	N/A	CMB381
25	D	49.5	1257	41	1041	32	813	Floor	WS382	N/A	N/A
	E	49.5	1257	41	1041	32	813	Floor	N/A	N/A	N/A
26	D	57.5	1461	41	1041	32	813	Floor	WS382	N/A	N/A
	E	57.5	1461	41	1041	32	813	Floor	N/A	N/A	N/A
27	D	58	1473	48	1219	29.5	749	Floor	WS368	N/A	N/A
	E	58	1473	48	1219	29.5	749	Floor	N/A	N/A	N/A
28	D	60	1524	56	1422	36	914	Floor	WS370A	N/A	N/A
	E	60	1524	56	1422	36	914	Floor	N/A	N/A	N/A
29	D	68	1727	56	1422	36	914	Floor	WS370A	N/A	N/A
	E	68	1727	56	1422	36	914	Floor	N/A	N/A	N/A
30	D	71	1803	48	1219	36	914	Floor	WS383	N/A	N/A
	E	71	1803	48	1219	36	914	Floor	N/A	N/A	N/A
31	D	74	1880	56	1422	40.5	1029	Floor	WS384	N/A	N/A
	E	74	1880	56	1422	40.5	1029	Floor	N/A	N/A	N/A
32	F	94	2388	56	1422	54	1372	Floor	N/A	N/A	N/A
33	F	94	2388	72	1829	54	1372	Floor	N/A	N/A	N/A
34	F	94	2388	84	2134	54	1372	Floor	N/A	N/A	N/A
35	F	94	2388	96	2438	54	1372	Floor	N/A	N/A	N/A

Note: These dimensions are not for construction. Contact Square D for certified points.

Class H Fuse Provisions:

Fusible Square D 30 through 600 Ampere Heavy Duty Safety Switches accept Class H fuses as standard. With Class H fuses installed the switch is UL Listed for use on systems with up to 10,000 RMS Symmetrical Amperes available fault current.

Class R Fuse Provisions:



Fusible Square D 30 through 600 Ampere Heavy Duty Safety Switches will accept Class R fuses as standard. A field installable rejection kit is available which, when installed, rejects all but Class R fuses. With the installation of the rejection kit and Class R fuses, the switch is UL Listed for use on systems with up to 200,000 RMS Symmetrical Amperes available fault current. See Class R Fuse Kits on Page 3-9.

Class J Fuse Provisions:

Provisions for installing Class J fuses are included in 30 through 400 Ampere 600 Volt, and 100 through 400 Ampere 240 Volt, fusible Heavy Duty Safety Switches. Conversion to Class J fuse spacing requires relocating the load side fuse base assembly from the standard Class H fuse location to an alternate position as marked in the enclosure. With Class J fuses installed, the switch is UL Listed for use on systems with up to 200,000 RMS Symmetrical Amperes available fault current. Switches rated 600 Amperes, 240 or 600 Volt, require the addition of an adapter kit, H600J at **$304**. One kit per 3-pole switch.

Class L Fuse Provisions:

Fusible 800A and 1200A Safety Switches use Class L bolt-in fuses and are rated for use on systems with up to 200,000 RMS Symmetrical Amperes at 600Vac maximum.

600 Volts – Single Throw Fusible

System	Amps	NEMA Type 1 Indoor		NEMA Type 3R Raintight (Bolt-on Hubs Page 3-9)		NEMA Type 4, 4X, 5 (304 Stainless Steel) Dusttight, Watertight, Corrosion Resistant **All Cu Current Carrying Parts** (Watertight Hubs Page 3-9)		JIC-Mill & Foundry Type **All Cu Current Carrying Parts** (Watertight Hubs-Page 3-9) NEMA Type 12K With Knockouts		✱NEMA Type 12, 3R† Without Knockouts		Horsepower Ratings▼ 480Vac Std. 3Ø	480Vac Max. 3Ø	600Vac Std. 3Ø	600Vac Max. 3Ø	dc 250	dc 600
		Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price						
2 Wire (2 Blades and Fuseholders) – 600Vac, 600Vdc																	
	30	Use 3 Wire Devices For 2 Wire Applications										–	–	–	–	–	–
	60											–	–	–	–	–	–
	100											–	–	–	–	–	–
	200											–	–	–	–	–	–
	400	H265	$ 2804.	H265R	$ 3616.	H265DS	$ 9499.	–	–	H265AWK	$ 3190.	100♦	250♦	–	–	50	–
	600	H266	4435.	H266R	7124.	H266DS	13587.	–	–	H266AWK	4747.	150♦	400♦	–	–	–	–
	800	H267	6910.	H267R☆	10923.	–	–	–	–	H267AWK	9699.	–	–	–	–	50	50
	1200	H268	9713.	H268R☆	11994.	–	–	–	–	H268AWK	11456.	–	–	–	–	50	50
3 Wire (3 Blades and Fuseholders) – 600Vac, 600Vdc●□																	
	30	H361	$ 352.	H361RB	$ 599.	H361DS	$ 1600.	H361A	$ 644.	H361AWK ✱	$ 607.	5	15	7½	20	–	15
	30	H361-2▲	411.	–	–	–	–	H361-2A▲	657.	H361-2AWK▲	620.	5	15	7½	20	–	15
	60	H362	425.	H362RB	703.	H362DS	1759.	H362A	665.	H362AWK ✱	625.	15	30	15	50	–	30
	100	H363	792.	H363RB	1096.	H363DS■	3488.	H363A	1032.	H363AWK	977.	25	60	30	75	–	40
	200	H364	1138.	H364RB	1506.	H364DS	4879.	H364A	1615.	H364AWK ✱	1524.	50	125	60	150	–	50
	400	H365	3034.	H365R	3688.	H365DS	9728.	–	–	H365AWK	3468.	100	250	125	350	50	–
	600	H366	5099.	H366R	7266.	H366DS	13815.	–	–	H366AWK	5843.	150	400	200	500	–	–
	800	H367	8879.	H367R★	11000.	–	–	–	–	H367AWK	10382.	200	500	250	500	50	50
	1200	H368	11671.	H368R★	13339.	–	–	–	–	H368AWK	12511.	200	500	250	500	50	50
4 Wire (3 Blades and Fuseholders, 1 S/N) – 600Vac																	
	30	H361N	$ 411.	H361NRB	$ 657.	Use 3 Wire Devices Field Installable Solid Neutral Assemblies. Order Separately-See Page 3-10						5	15	7½	20	–	–
	60	H362N	473.	H362NRB	756.							15	30	15	50	–	–
	100	H363N	852.	H363NRB	1158.							25	60	30	75	–	–
	200	H364N	1246.	H364NRB	1605.	H364NDS	$ 4997.	H364NA	$ 1724.	H364NAWK	$ 1624.	50	125	60	150	–	50
	400	H365N	3265.	H365NR	3843.	H365NDS	9948.	–	–	H365NAWK	3697.	100	250	125	350	–	–
	600	H366N	5346.	H366NR	7369.	H366NDS	14046.	–	–	H366NAWK	6095.	150	400	200	500	–	–
	800	H367N	9362.	H367NR★	11470.	–	–	–	–	H367NAWK	10954.	200	500	250	500	50	50
	1200	H368N	12076.	H368NR★	13995.	–	–	–	–	H368NAWK	13219.	200	500	250	500	50	50
4 Wire (4 Blades and Fuseholders) – 600Vac◊												2Ø	2Ø	2Ø	2Ø		
	30	H461	$ 580.	–	–	H461-2DS▲△	$ 1865.	–	–	H461-AWK	$ 708.	7½	20	10	25	–	–
	60	H462	676.	–	–	H462DS△	1949.	–	–	H462AWK	798.	15	40	20	50	–	–
	100	H463	1129.	–	–	H463DS△	5298.	–	–	H463AWK	1227.	25	50	30	75	–	–
	200	H464	1877.	–	–	H464DS△	7997.	–	–	H464AWK	2046.	50	50	50	50	–	–
	400	H465	3943.	–	–	–	–	–	–	H465AWK	4322.	–	–	–	–	–	–
	600	H466	6415.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6 Wire (6 Blades and Fuseholders) – 600Vac◊																	
	100	–	–	–	–	H663DS△	$16485.	–	–	H663AWK	$ 3246.	For applications requiring motor disconnect capability, use electrical interlock. Refer to Page 3-9.					
	200	–	–	–	–	H664DS△	22471.	–	–	H664RWK△	7760.						

▼ Refer to Page 5-13 for additional motor application data. The starting current of motors of more than standard horsepower may require the use of fuses with appropriate time delay characteristics.
† Also suitable for NEMA Type 3R application by removing drain screw from bottom endwall.
■ 250Vdc maximum. Use two outside poles for switching DC.
♦ For grounded "B" phase systems only and with solid neutral assembly installed.
★ Suitable for NEMA Type 5 applications with drain screw installed.
● On 3-pole devices, use two outside poles for switching DC.
▲ 60 Ampere switch with 30 Ampere fuse spacing and clips. Must use 60A enclosure accessories including electrical interlocks.
◊ Not suitable for use as service equipment.
△ Not UL Listed – 6 week shipment.
□ 400 and 600 Amp – 600Vac only.

NOTE: One day shipment is available on DASH Program for non-stock 400 through 1200 Ampere heavy duty switches.

Dimensions NEMA Type 1 and 3R .....Page 3-12
NEMA Type 4, 4X and 5 Stainless and NEMA Type 12 .....Page 3-13
Accessories .....Pages 3-9 and 3-11

For additional information, reference the Heavy Duty Safety Switch Catalog 3110CT9601.

PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. U/G PWR & CONTROL CABLE
SPEC. SECTION 16123
REVIEWED BY AJC
DATE 7/28/99

DOCUMENT APPROVAL / REVIEW

- [x] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY RJ
DATE 8-26-99

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

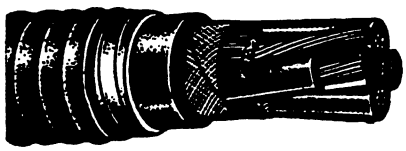
P.O. No. NF 19505

Anixter Part No. 7TD-1420AJ

Description: 14-20/c Teck 90 600v XLP Alum Armor Jacketed

600V — 14 AWG MULTI CONDUCTOR

Galv. Steel or Aluminum Armor
EP or XLP Insulation
Inner PVC Jacket, Interlock Armor



APPLICATIONS:
For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial.

Typical applications are for power, lighting and control circuits in: Pulp and Paper Mills, Steel Mills, Food Processing Plants, Commercial Centers, Mines, Generating Stations, Refineries, Industrial Plants and Chemical Plants.

SPECIFICATIONS:

1. CONDUCTOR: Class B stranded soft copper.
2. INSULATION: Insulations used are cross-linked polyethylene (XLP) or ethylene propylene rubber (EPR) as approved by CSA on Types RW90 XLP or EP Minus 40°C per CSA C22.2, No. 131.
3. GROUNDING CONDUCTOR: 14 AWG uninsulated Class B stranded grounding conductor is included in the cable assembly.
4. ASSEMBLY: Multiple conductor cables are assembled with suitable fillers and binder tape.
5. INNER JACKET: Polyvinyl chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to −40°C.
6. ARMOR: Aluminum or galvanized steel interlocking armor.
7. OVERALL JACKET: Polyvinyl chloride (PVC) heat, flame and moisture resistant jacket suitable for installation in temperatures down to −40°C. The standard color is black but colored jackets will be provided on request. Meets Flame test in accordance with Ontario Hydro Spec. L-891 SM-77. Meets Flame Test in IEEE 383 or better.
8. AMPACITY: Based on not more than three conductors in raceway or cable at an ambient temperature of 30°C per Table 2, Column 4 of the Canadian Electrical Code. These ampacities are also based on a minimum one cable O.D. spacing between adjacent cables. (For a four conductor cable the fourth conductor is considered to be the neutral of a three phase, 4 wire system.)
9. TEMPERATURE: −40°C to 90°C
10. VOLTAGE: 600 Volts

Anixter Number*	No. of Cond.	Approx. Diameters			Approximate Weight Lbs./1000 Ft.				Amps Per Cond.	Connectors	
		Inner Jacket	Armor	Outer Jacket	Aluminum Armor		Steel Armor				
		IN	IN	IN	Unjacketed	Jacketed	Unjacketed	Jacketed		T&B	PLM JAG
7TD-1402	2	.372	.575	0.680	140	205	255	320	15	10464	65-05
7TD-1403	3	.394	.595	0.700	160	225	280	345	15	10464	75-05
7TD-1404	4	.442	.645	0.750	188	260	320	390	15	10464	75-05
7TD-1405	5	.480	.680	0.790	215	290	355	430	12	10465	75-05
7TD-1406	6	.520	.720	0.830	240	320	390	470	12	10465	85-05
7TD-1407	7	.535	.735	0.840	260	340	410	490	10	10465	85-05
7TD-1408	8	.605	.805	0.915	310	395	480	570	10	10465	85-05
7TD-1409	9	.640	.840	0.945	335	425	520	610	10	10467	99-07
7TD-1410	10	.680	.880	0.985	365	460	560	650	10	10467	107-07

* NOTE: After Catalog number use; "SJ" for steel, "AJ" for aluminum, (e.g. 7TD-1407AJ).

600V — 14 AWG MULTI CONDUCTOR

Continued

Galv. Steel or Aluminum Armor
EP or XLP Insulation
Inner PVC Jacket, Interlock Armor

Anixter Number*	No. of Cond.	Approx.Diameters			Approximate Weight Lbs./1000 Ft.				Amps Per Cond.	Connectors	
		Inner Jacket	Armor	Outer Jacket	Aluminum Armor		Steel Armor				
		IN	IN	IN	Unjacketed	Jacketed	Unjacketed	Jacketed		T&B	PLM JAG
7TD-1411	11	0.690	0.890	0.995	380	475	570	670	10	10467	107-07
7TD-1412	12	0.715	0.915	1.02	400	495	590	690	10	10467	107-07
7TD-1413	13	0.725	0.925	1.03	420	520	620	710	10	10467	107-07
7TD-1414	14	0.760	0.960	1.07	485	590	760	860	10	10468	113-07
7TD-1415	15	0.765	0.965	1.08	510	610	780	890	10	10468	113-07
7TD-1416	16	0.790	0.990	1.10	530	630	810	920	10	10468	113-07
7TD-1417	17	0.810	1.010	1.12	550	660	840	950	10	10468	121-07
7TD-1418	18	0.830	1.030	1.14	580	690	870	980	10	10468	125-10
7TD-1419	19	0.840	1.040	1.15	600	710	900	1020	10	10468	125-10
7TD-1420	20	0.855	1.060	1.16	620	730	920	1040	10	10469	125-10
7TD-1425	25	1.000	1.200	1.31	780	900	1140	1260	9	10469	138-10
7TD-1430	30	1.080	1.280	1.39	890	1040	1280	1400	9	10469	138-12
7TD-1440	40	1.200	1.400	1.51	1100	1260	1520	1660	9	10550	156-12
7TD-1450	50	1.310	1.510	1.62	1300	1460	1760	1920	7	10550	174-15
7TD-1460	60	1.430	1.630	1.76	1520	1720	2000	2200	7	10471	195-15
7TD-1470	70	1.510	1.760	1.89	1760	1980	2400	2600	7	10472	195-15
7TD-1480	80	1.600	1.850	1.98	1980	2200	2650	2850	7	10473	218-15
7TD-1490	90	1.690	1.910	2.04	2200	2450	2850	3100	7	10551	218-15
7TD-14100	100	1.830	2.080	2.22	2800	3550	3350	3650	7	10474	236-20

* NOTE: After Catalog number use; "SJ" for steel, "AJ" for aluminum, (e.g. 7TD-1419AJ).

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

P.O. No. NF 19505

Anixter Part No. 7XE-1203AJ

Description: 12-3/c Teck 90 600v XLP Alum Armor Jacketed

600V MULTI CONDUCTOR

Aluminum Armor
XLP Insulation
Inner PVC Jacket
90°C, UL & CSA 600V

APPLICATIONS:
For use in control circuits in industrial plants, commercial buildings, and central and sub-station utility applications. May be installed in trays, racks, hangers, etc., eliminating the need for conduit. Suitable for indoor and outdoor installation.

SPECIFICATIONS:
1. CONDUCTOR: Class B stranded, bare, annealed copper per ASTM B-3, B-8.
2. INSULATION: Crosslinked polyethylene (XLP) per ICEA S-66-524, Type XHHW-2 requirements of UL and RW90 requirements of CSA. Color coding is Method 1, Table K-2 (2 & 3 conductors) or Method 4 (4 or more conductors).
3. ASSEMBLY: The insulated conductors are cabled with a single UL ground wire and fillers to make round.
4. INNER JACKET: Black, sunlight resistant polyvinyl chloride (PVC) applied per ICEA. Jacket is low acid gas per CSA C22.2 No. 0.3.
5. ARMOR: An aluminum interlocked armor is applied overall in accordance with UL 1569, ICEA and CSA.
6. OVERALL JACKET: Black, sunlight resistant polyvinyl chloride (PVC) applied overall per ICEA. Jacket is low acid gas per CSA C22.2 No. 0.3.
7. STANDARDS: Cables meet UL, IEEE 383 and FT-4 70,000 BTU Flame Tests, and are marked "FOR CT USE." Also meets ICEA T-29-520 210,000 BTU Flame Test. Meets CSA −40°C cold impact and bend. Individual conductors and completed cables are tested in accordance with UL requirements for Type MC cables and CSA requirements for Type TECK cables.
8. AMPACITY: Based on not more than three conductors in raceway or cable or earth based on an ambient temperature of 30°C per NEC 310-16. Values have been derated for more than three conductors in accordance with Note 8 to Table 310-16.
9. TEMPERATURE: 90°C
10. VOLTAGE: UL & CSA 600 Volts

Anixter Number	Cond. Size AWG	No. of Strands	No. of Cond.	Insulation Thickness IN	Ground Wire Size AWG	Overall Jacket Thickness IN	Nominal O.D. IN	Approx. Wt. Lbs. 1000 Ft.	Amps Per Cond.	JAG Connector
7XD-1402AJ	14	7	2	.030	14	.050	.672	188	25.0	JAG75-05
7XD-1403AJ	14	7	3	.030	14	.050	.699	212	25.0	JAG75-05
7XD-1404AJ	14	7	4	.030	14	.050	.742	242	20.0	JAG85-05
7XD-1405AJ	14	7	5	.030	14	.050	.765	268	20.0	JAG85-05
7XD-1407AJ	14	7	7	.030	14	.050	.880	335	17.5	JAG95-05
7XD-1409AJ	14	7	9	.030	14	.050	.922	395	17.5	JAG107-07
7XD-1412AJ	14	7	12	.030	14	.050	1.065	492	12.5	JAG113-07
7XD-1415AJ	14	7	15	.030	14	.050	1.047	535	12.5	JAG113-07
7XD-1419AJ	14	7	19	.030	14	.050	1.200	689	12.5	JAG125-10
7XD-1425AJ	14	7	25	.030	14	.050	1.365	882	11.3	JAG138-12
7XD-1430AJ	14	7	30	.030	14	.050	1.429	992	11.3	JAG156-12
7XD-1437AJ	14	7	37	.030	14	.050	1.507	1140	10.0	JAG156-12

600V MULTI CONDUCTOR

Continued

Aluminum Armor
XLP Insulation
Inner PVC Jacket
90°C, UL & CSA 600V

Anixter Number	Cond. Size AWG	No. of Strands	No. of Cond.	Insulation Thickness IN	Ground Wire Size AWG	Overall Jacket Thickness IN	Nominal O.D. IN	Approx. Wt. Lbs. 1000 Ft.	Amps Per Cond.	JAG Connector
7XE-1202AJ	12	7	2	.030	12	.050	.711	223	30.0	JAG75-05
* 7XE-1203AJ	12	7	3	.030	12	.050	.751	260	30.0	JAG85-05
7XE-1204AJ	12	7	4	.030	12	.050	.805	300	24.0	JAG85-05
7XE-1205AJ	12	7	5	.030	12	.822	.822	333	24.0	JAG95-05
7XE-1207AJ	12	7	7	.030	12	.050	.988	449	21.0	JAG107-07
7XE-1209AJ	12	7	9	.030	12	.050	.993	501	21.0	JAG113-07
7XE-1212AJ	12	7	12	.030	12	.050	1.189	676	15.0	JAG125-10
7XE-1215AJ	12	7	15	.030	12	.050	1.160	739	15.0	JAG125-10
7XE-1219AJ	12	7	19	.030	12	.050	1.350	945	15.0	JAG138-12
7XE-1225AJ	12	7	25	.030	12	.050	1.501	1152	13.5	JAG156-12
7XE-1230AJ	12	7	30	.030	12	.050	1.578	1307	13.5	JAG174-12
7XE-1237AJ	12	7	37	.030	12	.050	1.602	1522	12.0	JAG174-15
7XF-1002AJ	10	7	2	.030	10	.050	.759	275	40.0	JAG85-05
7XF-1003AJ	10	7	3	.030	10	.050	.818	330	40.0	JAG85-05
7XF-1004AJ	10	7	4	.030	10	.050	.878	385	32.0	JAG99-07
7XF-1005AJ	10	7	5	.030	10	.050	.918	452	32.0	JAG99-07
7XF-1007AJ	10	7	7	.030	10	.050	1.082	623	28.0	JAG113-07
7XF-1009AJ	10	7	9	.030	10	.050	1.109	657	28.0	JAG121-07
7XF-1012AJ	10	7	12	.030	10	.050	1.352	935	20.0	JAG138-12

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

P.O. No. NF 19505

Anixter Part No. 7XE-1212AJ

Description: 12-12/c Teck 90 600v XLP Alum Armor Jacketed

600V MULTI CONDUCTOR

Aluminum Armor
XLP Insulation
Inner PVC Jacket
90°C, UL & CSA 600V

APPLICATIONS:
For use in control circuits in industrial plants, commercial buildings, and central and sub-station utility applications. May be installed in trays, racks, hangers, etc., eliminating the need for conduit. Suitable for indoor and outdoor installation.

SPECIFICATIONS:
1. CONDUCTOR: Class B stranded, bare, annealed copper per ASTM B-3, B-8.
2. INSULATION: Crosslinked polyethylene (XLP) per ICEA S-66-524, Type XHHW-2 requirements of UL and RW90 requirements of CSA. Color coding is Method 1, Table K-2 (2 & 3 conductors) or Method 4 (4 or more conductors).
3. ASSEMBLY: The insulated conductors are cabled with a single UL ground wire and fillers to make round.
4. INNER JACKET: Black, sunlight resistant polyvinyl chloride (PVC) applied per ICEA. Jacket is low acid gas per CSA C22.2 No. 0.3.
5. ARMOR: An aluminum interlocked armor is applied overall in accordance with UL 1569, ICEA and CSA.
6. OVERALL JACKET: Black, sunlight resistant polyvinyl chloride (PVC) applied overall per ICEA. Jacket is low acid gas per CSA C22.2 No. 0.3.
7. STANDARDS: Cables meet UL, IEEE 383 and FT-4 70,000 BTU Flame Tests, and are marked "FOR CT USE." Also meets ICEA T-29-520 210,000 BTU Flame Test. Meets CSA −40°C cold impact and bend. Individual conductors and completed cables are tested in accordance with UL requirements for Type MC cables and CSA requirements for Type TECK cables.
8. AMPACITY: Based on not more than three conductors in raceway or cable or earth based on an ambient temperature of 30°C per NEC 310-16. Values have been derated for more than three conductors in accordance with Note 8 to Table 310-16.
9. TEMPERATURE: 90°C
10. VOLTAGE: UL & CSA 600 Volts

Anixter Number	Cond. Size AWG	No. of Strands	No. of Cond.	Insulation Thickness IN	Ground Wire Size AWG	Overall Jacket Thickness IN	Nominal O.D. IN	Approx. Wt. Lbs. 1000 Ft.	Amps Per Cond.	JAG Connector
7XD-1402AJ	14	7	2	.030	14	.050	.672	188	25.0	JAG75-05
7XD-1403AJ	14	7	3	.030	14	.050	.699	212	25.0	JAG75-05
7XD-1404AJ	14	7	4	.030	14	.050	.742	242	20.0	JAG85-05
7XD-1405AJ	14	7	5	.030	14	.050	.765	268	20.0	JAG85-05
7XD-1407AJ	14	7	7	.030	14	.050	.880	335	17.5	JAG95-05
7XD-1409AJ	14	7	9	.030	14	.050	.922	395	17.5	JAG107-07
7XD-1412AJ	14	7	12	.030	14	.050	1.065	492	12.5	JAG113-07
7XD-1415AJ	14	7	15	.030	14	.050	1.047	535	12.5	JAG113-07
7XD-1419AJ	14	7	19	.030	14	.050	1.200	689	12.5	JAG125-10
7XD-1425AJ	14	7	25	.030	14	.050	1.365	882	11.3	JAG138-12
7XD-1430AJ	14	7	30	.030	14	.050	1.429	992	11.3	JAG156-12
7XD-1437AJ	14	7	37	.030	14	.050	1.507	1140	10.0	JAG156-12

600V MULTI CONDUCTOR

Continued

Aluminum Armor
XLP Insulation
Inner PVC Jacket
90°C, UL & CSA 600V

Anixter Number	Cond. Size AWG	No. of Strands	No. of Cond.	Insulation Thickness IN	Ground Wire Size AWG	Overall Jacket Thickness IN	Nominal O.D. IN	Approx. Wt. Lbs. 1000 Ft.	Amps Per Cond.	JAG Connector
7XE-1202AJ	12	7	2	.030	12	.050	.711	223	30.0	JAG75-05
7XE-1203AJ	12	7	3	.030	12	.050	.751	260	30.0	JAG85-05
7XE-1204AJ	12	7	4	.030	12	.050	.805	300	24.0	JAG85-05
7XE-1205AJ	12	7	5	.030	12	.822	.822	333	24.0	JAG95-05
7XE-1207AJ	12	7	7	.030	12	.050	.988	449	21.0	JAG107-07
7XE-1209AJ	12	7	9	.030	12	.050	.993	501	21.0	JAG113-07
7XE-1212AJ	12	7	12	.030	12	.050	1.189	676	15.0	JAG125-10
7XE-1215AJ	12	7	15	.030	12	.050	1.160	739	15.0	JAG125-10
7XE-1219AJ	12	7	19	.030	12	.050	1.350	945	15.0	JAG138-12
7XE-1225AJ	12	7	25	.030	12	.050	1.501	1152	13.5	JAG156-12
7XE-1230AJ	12	7	30	.030	12	.050	1.578	1307	13.5	JAG174-12
7XE-1237AJ	12	7	37	.030	12	.050	1.602	1522	12.0	JAG174-15
7XF-1002AJ	10	7	2	.030	10	.050	.759	275	40.0	JAG85-05
7XF-1003AJ	10	7	3	.030	10	.050	.818	330	40.0	JAG85-05
7XF-1004AJ	10	7	4	.030	10	.050	.878	385	32.0	JAG99-07
7XF-1005AJ	10	7	5	.030	10	.050	.918	452	32.0	JAG99-07
7XF-1007AJ	10	7	7	.030	10	.050	1.082	623	28.0	JAG113-07
7XF-1009AJ	10	7	9	.030	10	.050	1.109	657	28.0	JAG121-07
7XF-1012AJ	10	7	12	.030	10	.050	1.352	935	20.0	JAG138-12

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

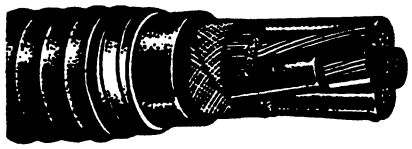
P.O. No. NF 19505

Anixter Part No. 7TE-1225AJ

Description: 12-25/c Teck 90 600v XLP Alum Armor Jacketed

600V — 12 AWG MULTI CONDUCTOR

Galv. Steel or Aluminum Armor
EP or XLP Insulation
Inner PVC Jacket, Interlock Armor



APPLICATIONS:
For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial.

Typical applications are for power, lighting and control circuits in: Pulp and Paper Mills, Steel Mills, Food Processing Plants, Commercial Centers, Mines, Generating Stations, Refineries, Industrial Plants and Chemical Plants.

SPECIFICATIONS:

1. CONDUCTOR: Class B stranded soft copper.
2. INSULATION: Insulations used are cross-linked polyethylene (XLP) or ethylene propylene rubber (EPR) as approved by CSA on Types RW90 XLP or EP Minus 40°C per CSA C22.2, No. 131.
3. GROUNDING CONDUCTOR: 14 AWG uninsulated Class B stranded grounding conductor is included in the cable assembly.
4. ASSEMBLY: Multiple conductor cables are assembled with suitable fillers and binder tape.
5. INNER JACKET: Polyvinyl chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to −40°C.
6. ARMOR: Aluminum or galvanized steel interlocking armor.
7. OVERALL JACKET: Polyvinyl chloride (PVC) heat, flame and moisture resistant jacket suitable for installation in temperatures down to −40°C. The standard color is black but colored jackets will be provided on request. Meets Flame test in accordance with Ontario Hydro Spec. L-891 SM-77. Meets Flame Test in IEEE 383 or better.
8. AMPACITY: Based on not more than three conductors in raceway or cable at an ambient temperature of 30°C per Table 2, Column 4 of the Canadian Electrical Code. These ampacities are also based on a minimum one cable O.D. spacing between adjacent cables. (For a four conductor cable the fourth conductor is considered to be the neutral of a three phase, 4 wire system.)
9. TEMPERATURE: −40°C to 90°C
10. VOLTAGE: 600 Volts

Anixter Number*	No. of Cond.	Approx. Diameters			Approximate Weight Lbs./1000 Ft.				Amps Per Cond.	Connectors	
		Inner Jacket	Armor	Outer Jacket	Aluminum Armor		Steel Armor				
		IN	IN	IN	Unjacketed	Jacketed	Unjacketed	Jacketed		T&B	PLM JAG
7TE-1202	2	.410	.610	.710	165	230	290	355	20	10464	75-05
7TE-1203	3	.434	.635	.740	194	265	325	395	20	10464	75-05
7TE-1204	4	.480	.680	.790	230	305	370	445	20	10464	75-05
7TE-1205	5	.535	.735	.840	265	350	420	500	16	10465	85-05
7TE-1206	6	.610	.810	.915	325	415	495	590	16	10466	95-05
7TE-1207	7	.620	.820	.925	350	440	530	620	14	10466	95-05
7TE-1208	8	.670	.870	.975	390	485	580	670	14	10467	99-07
7TE-1209	9	.705	.905	1.02	420	520	610	710	14	10467	107-07
7TE-1210	10	.755	.955	1.06	495	600	770	870	14	10468	113-07

* NOTE: After Catalog number use; "SJ" for steel, "AJ" for aluminum, (e.g. 7TE-1203AJ).

600V — 12 AWG MULTI CONDUCTOR

Continued

Galv. Steel or Aluminum Armor
EP or XLP Insulation
Inner PVC Jacket, Interlock Armor

Anixter Number*	No. of Cond.	Approx. Diameters			Approximate Weight Lbs./1000 Ft.				Amps Per Cond.	Connectors	
		Inner Jacket	Armor	Outer Jacket	Aluminum Armor		Steel Armor				
		IN	IN	IN	Unjacketed	Jacketed	Unjacketed	Jacketed		T&B	PLM JAG
7TE-1211	11	0.765	0.965	1.08	530	630	810	910	14	10468	113-07
7TE-1212	12	0.890	0.990	1.10	560	670	850	950	14	10468	113-07
7TE-1214	13	0.805	1.01	1.12	590	700	880	990	14	10468	121-07
7TE-1214	14	0.840	1.04	1.15	630	740	930	1040	14	10468	125-10
7TE-1215	15	0.855	1.06	1.17	660	770	960	1080	14	10468	138-10
7TE-1216	16	0.880	1.08	1.19	690	800	1000	1120	14	10468	138-10
7TE-1217	17	0.945	1.15	1.25	760	890	1100	1220	14	10469	138-10
7TE-1218	18	0.965	1.17	1.28	800	920	1140	1260	14	10469	138-10
7TE-1219	19	0.975	1.18	1.29	830	950	1180	1300	14	10469	138-10
7TE-1220	20	0.995	1.20	1.30	860	980	1220	1340	14	10469	138-10
7TE-1225	25	1.130	1.31	1.42	1020	1160	1420	1560	12	10470	138-12
7TE-1230	30	1.200	1.40	1.50	1180	1340	1600	1740	12	10550	156-12
7TE-1240	40	1.340	1.54	1.65	1480	1660	1940	2100	12	10471	174-15
7TE-1250	50	1.470	1.67	1.80	1800	2000	2300	2500	10	10472	100-15
7TE-1260	60	1.690	1.85	1.98	2150	2400	2800	3000	10	10473	218-15
7TE-1270	70	1.690	1.94	2.08	2450	2700	3100	3350	10	10551	219-20
7TE-1280	80	1.850	2.10	2.24	2900	3150	3750	4000	10	10474	236-20
7TE-1290	90	1.960	2.22	2.34	3200	3500	4100	4350	10	10474	236-20
7TE-12100	100	2.060	2.30	2.46	3500	3850	4400	4750	10	10552	261-20

* NOTE: After Catalog number use; "SJ" for steel, "AJ" for aluminum, (e.g. 7TE-1219AJ).

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

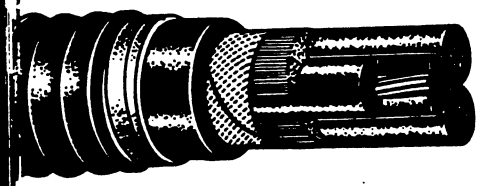
P.O. No. NF 19505

Anixter Part No. 7TK-0603AJ

Description: 6-3/c Teck 90 1KV XLP Alum Armor Jacketed

Teck 90 1 Kv Three Conductors

Aluminum Armor or Galv. Steel, 90°C, 1000 Volt, XLPE Insulation, Inner PVC Jacket, Interlock Armor, Outer PVC Jacket.



APPLICATIONS:

For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial. Approved for use in Class 1, Division 1, hazardous locations. Typical applications are for power, lighting and control circuits in:

Pulp and Paper Mills
Refineries
Steel Mills
Commercial Centers
Mines
Generating Stations
Industrial Plants
Chemical Plants
Food Processing Plants

SPECIFICATIONS:

1. Conductor: Class B stranded soft copper size No 14 AWG-1000MCM.
2. Insulation: Cross-linked polyethylene (XLPE), type RW-90, per CSA Standard C22.2 No 131.
3. Identification: Surface color coding is standard for sizes up to and including No 2 AWG. For larger than No 2 AWG number coding is standard.
4. Grounding Conductor: In multiple conductor cables the uninsulated Class B stranded grounding conductor is included in the cable assembly.
5. Multiple conductor cables are assembled with suitable fillers and binder tape.
6 Inner Jacket: Polyvinyl Chloride (PVC).
7. Armor: Aluminum or galvanized steel interlocking armor.
8. Outer Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to minus 40°C. The standard color is black but colored jackets are available.
9. The Cable is Certified to CSA C22.2 No.131 and No.174 for use in Class 1, Division 1, hazardous locations, (HL Rated), and is flame test rated FT-4.
10. Ampacities (Amps Per Cond.) are based on a 30°C ambient temperature according to the Canadian Electrical Code (Part 1).

ANIXTER CATALOG NUMBER	SIZE AWG/MCM	GROUND COND. SIZE AWG	AMPACITY IN 30°C AMBIENT AIR	APPROXIMATE DIAMETERS						NOMINAL WEIGHT			
				INNER JACKET		ARMOR		OUTER JACKET		ALUMINUM ARMOR		STEEL ARMOR	
				IN	MM	IN	MM	IN	MM	LBS/M FT	KG/KM	LBS/M FT	KG/KM
7TK-1403	14	14	15	0.46	11.68	0.66	16.76	0.76	19.30	260	386	400	595
7TK-1203	12	14	20	0.50	12.70	0.70	17.78	0.81	20.57	300	446	450	669
7TK-1003	10	12	30	0.59	14.99	0.79	19.81	0.89	22.61	380	580	560	833
7TK-0803	8	10	45	0.66	16.76	0.86	21.84	0.96	24.38	490	729	670	996
➔*7TK-0603	6	8	65	0.81	20.57	1.01	25.65	1.12	28.45	720	1071	1000	1488
7TK-0403	4	8	85	0.95	24.13	1.15	29.21	1.26	32.00	960	1428	1300	1934
7TK-0303	3	6	105	1.01	25.65	1.21	30.73	1.32	33.53	1100	1636	1500	2232
7TK-0203	2	6	20	1.08	27.43	1.28	32.51	1.39	35.31	1300	1934	1700	2629
7TK-0103	1	6	140	1.27	32.26	1.47	37.34	1.59	40.39	1700	2529	2100	3124
7TK-1013	1/0	6	155	1.35	34.29	1.55	39.37	1.67	42.42	1900	2827	2400	3571
7TK-2023	2/0	6	185	1.45	36.83	1.65	41.91	1.78	45.21	2300	3422	2800	4165
7TK-3033	3/0	4	210	1.56	39.62	1.81	45.97	1.93	49.02	2800	4166	3500	5208
7TK-4043	4/0	4	235	1.68	42.67	1.93	49.02	2.06	52.32	3300	4910	4000	5952
7TK-2503	250	4	265	1.86	47.24	2.11	53.59	2.25	57.15	3900	5803	4700	6993
7TK-3003	300	4	295	1.97	50.54	2.22	56.39	2.36	59.94	4500	6696	5300	7886
7TK-3503	350	3	325	2.08	52.83	2.32	58.93	2.48	62.99	5000	7440	5900	8779
7TK-4003	400	3	345	2.17	55.12	2.42	61.49	2.57	65.28	5600	8332	6600	3820
7TK-5003	500	3	395	2.39	60.71	2.64	67.06	2.80	71.12	6800	10118	7800	11606
7TK-6003	600	2	455	2.56	65.00	2.81	71.37	2.95	74.93	8100	12052	9200	13689
7TK-7503	750	2	500	2.78	70.61	3.03	76.96	3.17	80.52	9700	14433	11000	16368
7TK-10003	1000	1	585	3.10	78.74	3.35	85.09	3.53	89.66	13000	19344	15000	33430

NOTE: After Anixter number use "SJ" for steel, "AJ" for aluminum.

ANIXTER.

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

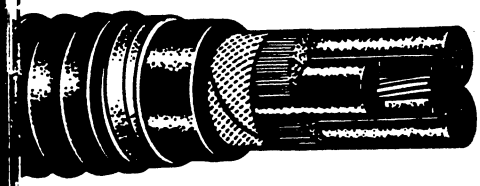
P.O. No. NF 19505

Anixter Part No. 7TK-0403AJ

Description: 4-3/c Teck 90 1KV XLP Alum Armor Jacketed

Teck 90 1 Kv Three Conductors

Aluminum Armor or Galv. Steel, 90°C, 1000 Volt, XLPE Insulation, Inner PVC Jacket, Interlock Armor, Outer PVC Jacket.



APPLICATIONS:

For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial. Approved for use in Class 1, Division 1, hazardous locations. Typical applications are for power, lighting and control circuits in:

Pulp and Paper Mills
Refineries
Steel Mills
Commercial Centers
Mines
Generating Stations
Industrial Plants
Chemical Plants
Food Processing Plants

SPECIFICATIONS:

1. Conductor: Class B stranded soft copper size No 14 AWG-1000MCM.
2. Insulation: Cross-linked polyethylene (XLPE), type RW-90, per CSA Standard C22.2 No 131.
3. Identification: Surface color coding is standard for sizes up to and including No 2 AWG. For larger than No 2 AWG number coding is standard.
4. Grounding Conductor: In multiple conductor cables the uninsulated Class B stranded grounding conductor is included in the cable assembly.
5. Multiple conductor cables are assembled with suitable fillers and binder tape.
6 Inner Jacket: Polyvinyl Chloride (PVC).
7. Armor: Aluminum or galvanized steel interlocking armor.
8. Outer Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to minus 40°C. The standard color is black but colored jackets are available.
9. The Cable is Certified to CSA C22.2 No.131 and No.174 for use in Class 1, Division 1, hazardous locations, (HL Rated), and is flame test rated FT-4.
10. Ampacities (Amps Per Cond.) are based on a 30°C ambient temperature according to the Canadian Electrical Code (Part 1).

ANIXTER CATALOG NUMBER	SIZE AWG/MCM	GROUND COND. SIZE AWG	AMPACITY IN 30°C AMBIENT AIR	APPROXIMATE DIAMETERS						NOMINAL WEIGHT			
				INNER JACKET		ARMOR		OUTER JACKET		ALUMINUM ARMOR		STEEL ARMOR	
				IN	MM	IN	MM	IN	MM	LBS/M FT	KG/KM	LBS/M FT	KG/KM
7TK-1403	14	14	15	0.46	11.68	0.66	16.76	0.76	19.30	260	386	400	595
7TK-1203	12	14	20	0.50	12.70	0.70	17.78	0.81	20.57	300	446	450	669
7TK-1003	10	12	30	0.59	14.99	0.79	19.81	0.89	22.61	380	580	560	833
7TK-0803	8	10	45	0.66	16.76	0.86	21.84	0.96	24.38	490	729	670	996
7TK-0603	6	8	65	0.81	20.57	1.01	25.65	1.12	28.45	720	1071	1000	1488
7TK-0403	4	8	85	0.95	24.13	1.15	29.21	1.26	32.00	960	1428	1300	1934
7TK-0303	3	6	105	1.01	25.65	1.21	30.73	1.32	33.53	1100	1636	1500	2232
7TK-0203	2	6	20	1.08	27.43	1.28	32.51	1.39	35.31	1300	1934	1700	2629
7TK-0103	1	6	140	1.27	32.26	1.47	37.34	1.59	40.39	1700	2529	2100	3124
7TK-1013	1/0	6	155	1.35	34.29	1.55	39.37	1.67	42.42	1900	2827	2400	3571
7TK-2023	2/0	6	185	1.45	36.83	1.65	41.91	1.78	45.21	2300	3422	2800	4165
7TK-3033	3/0	4	210	1.56	39.62	1.81	45.97	1.93	49.02	2800	4166	3500	5208
7TK-4043	4/0	4	235	1.68	42.67	1.93	49.02	2.06	52.32	3300	4910	4000	5952
7TK-2503	250	4	265	1.86	47.24	2.11	53.59	2.25	57.15	3900	5803	4700	6993
7TK-3003	300	4	295	1.97	50.54	2.22	56.39	2.36	59.94	4500	6696	5300	7886
7TK-3503	350	3	325	2.08	52.83	2.32	58.93	2.48	62.99	5000	7440	5900	8779
7TK-4003	400	3	345	2.17	55.12	2.42	61.49	2.57	65.28	5600	8332	6600	3820
7TK-5003	500	3	395	2.39	60.71	2.64	67.06	2.80	71.12	6800	10118	7800	11606
7TK-6003	600	2	455	2.56	65.00	2.81	71.37	2.95	74.93	8100	12052	9200	13689
TK-7503	750	2	500	2.78	70.61	3.03	76.96	3.17	80.52	9700	14433	11000	16368
K-10003	1000	1	585	3.10	78.74	3.35	85.09	3.53	89.66	13000	19344	15000	33430

NOTE: After Anixter number use "SJ" for steel, "AJ" for aluminum.

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

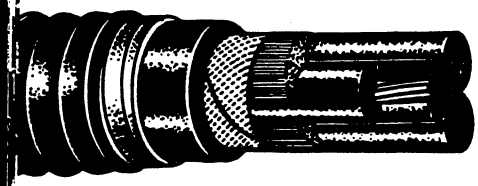
P.O. No. NF 19505

Anixter Part No. 7TK-2023AJ

Description: 2/0-3/c Teck 90 1KV XLP Alum Armor Jacketed

Teck 90 1 Kv Three Conductors

Aluminum Armor or Galv. Steel, 90°C, 1000 Volt, XLPE Insulation, Inner PVC Jacket, Interlock Armor, Outer PVC Jacket.



APPLICATIONS:

For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial. Approved for use in Class 1, Division 1, hazardous locations. Typical applications are for power, lighting and control circuits in:

- Pulp and Paper Mills
- Refineries
- Steel Mills
- Commercial Centers
- Mines
- Generating Stations
- Industrial Plants
- Chemical Plants
- Food Processing Plants

SPECIFICATIONS:

1. Conductor: Class B stranded soft copper size No 14 AWG-1000MCM.
2. Insulation: Cross-linked polyethylene (XLPE), type RW-90, per CSA Standard C22.2 No 131.
3. Identification: Surface color coding is standard for sizes up to and including No 2 AWG. For larger than No 2 AWG number coding is standard.
4. Grounding Conductor: In multiple conductor cables the uninsulated Class B stranded grounding conductor is included in the cable assembly.
5. Multiple conductor cables are assembled with suitable fillers and binder tape.
6 Inner Jacket: Polyvinyl Chloride (PVC).
7. Armor: Aluminum or galvanized steel interlocking armor.
8. Outer Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to minus 40°C. The standard color is black but colored jackets are available.
9. The Cable is Certified to CSA C22.2 No.131 and No.174 for use in Class 1, Division 1, hazardous locations, (HL Rated), and is flame test rated FT-4.
10. Ampacities (Amps Per Cond.) are based on a 30°C ambient temperature according to the Canadian Electrical Code (Part 1).

ANIXTER CATALOG NUMBER	SIZE AWG/MCM	GROUND COND. SIZE AWG	AMPACITY IN 30°C AMBIENT AIR	APPROXIMATE DIAMETERS						NOMINAL WEIGHT			
				INNER JACKET		ARMOR		OUTER JACKET		ALUMINUM ARMOR		STEEL ARMOR	
				IN	MM	IN	MM	IN	MM	LBS/M FT	KG/KM	LBS/M FT	KG/KM
7TK-1403	14	14	15	0.46	11.68	0.66	16.76	0.76	19.30	260	386	400	595
7TK-1203	12	14	20	0.50	12.70	0.70	17.78	0.81	20.57	300	446	450	669
7TK-1003	10	12	30	0.59	14.99	0.79	19.81	0.89	22.61	380	580	560	833
7TK-0803	8	10	45	0.66	16.76	0.86	21.84	0.96	24.38	490	729	670	996
7TK-0603	6	8	65	0.81	20.57	1.01	25.65	1.12	28.45	720	1071	1000	1488
7TK-0403	4	8	85	0.95	24.13	1.15	29.21	1.26	32.00	960	1428	1300	1934
7TK-0303	3	6	105	1.01	25.65	1.21	30.73	1.32	33.53	1100	1636	1500	2232
7TK-0203	2	6	20	1.08	27.43	1.28	32.51	1.39	35.31	1300	1934	1700	2629
7TK-0103	1	6	140	1.27	32.26	1.47	37.34	1.59	40.39	1700	2529	2100	3124
7TK-1013	1/0	6	155	1.35	34.29	1.55	39.37	1.67	42.42	1900	2827	2400	3571
7TK-2023	2/0	6	185	1.45	36.83	1.65	41.91	1.78	45.21	2300	3422	2800	4165
7TK-3033	3/0	4	210	1.56	39.62	1.81	45.97	1.93	49.02	2800	4166	3500	5208
7TK-4043	4/0	4	235	1.68	42.67	1.93	49.02	2.06	52.32	3300	4910	4000	5952
7TK-2503	250	4	265	1.86	47.24	2.11	53.59	2.25	57.15	3900	5803	4700	6993
7TK-3003	300	4	295	1.97	50.54	2.22	56.39	2.36	59.94	4500	6696	5300	7886
7TK-3503	350	3	325	2.08	52.83	2.32	58.93	2.48	62.99	5000	7440	5900	8779
7TK-4003	400	3	345	2.17	55.12	2.42	61.49	2.57	65.28	5600	8332	6600	3820
7TK-5003	500	3	395	2.39	60.71	2.64	67.06	2.80	71.12	6800	10118	7800	11606
7TK-6003	600	2	455	2.56	65.00	2.81	71.37	2.95	74.93	8100	12052	9200	13689
[illegible]-7503	750	2	500	2.78	70.61	3.03	76.96	3.17	80.52	9700	14433	11000	16368
[illegible]-10003	1000	1	585	3.10	78.74	3.35	85.09	3.53	89.66	13000	19344	15000	33430

NOTE: After Anixter number use "SJ" for steel, "AJ" for aluminum.

ANIXTER

Wire & Cable Group
4 Marway Circle
Rochester, New York 14624

716/247-0500
716/429-2423 Fax

07/26/99

Customer: Ferguson Electric

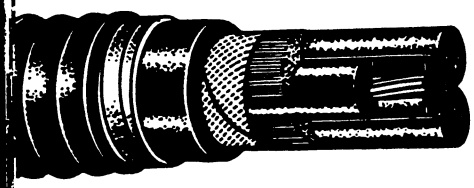
P.O. No. NF 19505

Anixter Part No. 7TK-3503AJ

Description: 350MCM-3/c Teck 90 1KV XLP Alum Armor Jacketed

Teck 90 1 Kv Three Conductors

Aluminum Armor or Galv. Steel, 90°C, 1000 Volt, XLPE Insulation, Inner PVC Jacket, Interlock Armor, Outer PVC Jacket.



APPLICATIONS:

For exposed or concealed wiring in wet or dry locations. For use in ventilated, non-ventilated and ladder type cable troughs and ventilated flexible cableway in wet or dry locations. For direct earth burial. Approved for use in Class 1, Division 1, hazardous locations. Typical applications are for power, lighting and control circuits in:

Pulp and Paper Mills
Refineries
Steel Mills
Commercial Centers
Mines
Generating Stations
Industrial Plants
Chemical Plants
Food Processing Plants

SPECIFICATIONS:

1. Conductor: Class B stranded soft copper size No 14 AWG-1000MCM.
2. Insulation: Cross-linked polyethylene (XLPE), type RW-90, per CSA Standard C22.2 No 131.
3. Identification: Surface color coding is standard for sizes up to and including No 2 AWG. For larger than No 2 AWG number coding is standard.
4. Grounding Conductor: In multiple conductor cables the uninsulated Class B stranded grounding conductor is included in the cable assembly.
5. Multiple conductor cables are assembled with suitable fillers and binder tape.
6 Inner Jacket: Polyvinyl Chloride (PVC).
7. Armor: Aluminum or galvanized steel interlocking armor.
8. Outer Jacket: Polyvinyl Chloride (PVC) heat, flame and moisture resistant jacket, suitable for installation in temperatures down to minus 40°C. The standard color is black but colored jackets are available.
9. The Cable is Certified to CSA C22.2 No.131 and No.174 for use in Class 1, Division 1, hazardous locations, (HL Rated), and is flame test rated FT-4.
10. Ampacities (Amps Per Cond.) are based on a 30°C ambient temperature according to the Canadian Electrical Code (Part 1).

ANIXTER CATALOG NUMBER	SIZE AWG/MCM	GROUND COND. SIZE AWG	AMPACITY IN 30°C AMBIENT AIR	APPROXIMATE DIAMETERS						NOMINAL WEIGHT			
				INNER JACKET		ARMOR		OUTER JACKET		ALUMINUM ARMOR		STEEL ARMOR	
				IN	MM	IN	MM	IN	MM	LBS/M FT	KG/KM	LBS/M FT	KG/KM
7TK-1403	14	14	15	0.46	11.68	0.66	16.76	0.76	19.30	260	386	400	595
7TK-1203	12	14	20	0.50	12.70	0.70	17.78	0.81	20.57	300	446	450	669
7TK-1003	10	12	30	0.59	14.99	0.79	19.81	0.89	22.61	380	580	560	833
7TK-0803	8	10	45	0.66	16.76	0.86	21.84	0.96	24.38	490	729	670	996
7TK-0603	6	8	65	0.81	20.57	1.01	25.65	1.12	28.45	720	1071	1000	1488
7TK-0403	4	8	85	0.95	24.13	1.15	29.21	1.26	32.00	960	1428	1300	1934
7TK-0303	3	6	105	1.01	25.65	1.21	30.73	1.32	33.53	1100	1636	1500	2232
7TK-0203	2	6	20	1.08	27.43	1.28	32.51	1.39	35.31	1300	1934	1700	2629
7TK-0103	1	6	140	1.27	32.26	1.47	37.34	1.59	40.39	1700	2529	2100	3124
7TK-1013	1/0	6	155	1.35	34.29	1.55	39.37	1.67	42.42	1900	2827	2400	3571
7TK-2023	2/0	6	185	1.45	36.83	1.65	41.91	1.78	45.21	2300	3422	2800	4165
7TK-3033	3/0	4	210	1.56	39.62	1.81	45.97	1.93	49.02	2800	4166	3500	5208
7TK-4043	4/0	4	235	1.68	42.67	1.93	49.02	2.06	52.32	3300	4910	4000	5952
7TK-2503	250	4	265	1.86	47.24	2.11	53.59	2.25	57.15	3900	5803	4700	6993
7TK-3003	300	4	295	1.97	50.54	2.22	56.39	2.36	59.94	4500	6696	5300	7886
✱ 7TK-3503	350	3	325	2.08	52.83	2.32	58.93	2.48	62.99	5000	7440	5900	8779
7TK-4003	400	3	345	2.17	55.12	2.42	61.49	2.57	65.28	5600	8332	6600	3820
7TK-5003	500	3	395	2.39	60.71	2.64	67.06	2.80	71.12	6800	10118	7800	11606
7TK-6003	600	2	455	2.56	65.00	2.81	71.37	2.95	74.93	8100	12052	9200	13689
7TK-7503	750	2	500	2.78	70.61	3.03	76.96	3.17	80.52	9700	14433	11000	16368
K-10003	1000	1	585	3.10	78.74	3.35	85.09	3.53	89.66	13000	19344	15000	33430

NOTE: After Anixter number use "SJ" for steel, "AJ" for aluminum.

PROJECT GRATWICK PARK

CONTRACT NO. 9901-07

CONTRACTOR HASELEY CONST. CO.

SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.

ITEM NO. POLES & LUMINAIRES

SPEC. SECTION 16521

REVIEWED BY AJC

DATE 10/21/99

(2ND SUBMITTAL)

DOCUMENT APPROVAL / REVIEW

- [X] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY

DATE 10/28/99

Catalog Number	Type
KAC 400M FP 480 SPD04 DF KACVG	

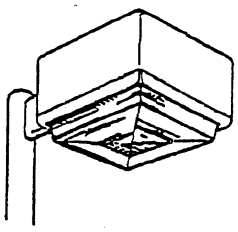
Arm-Mounted Soft Square HID Lighting

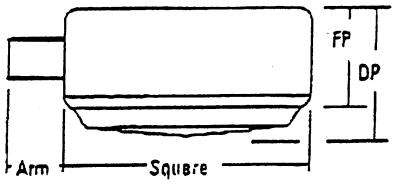
KAC

Metal Halide

400W
30' to 35' Mounting

CONTOUR® SERIES





FEATURES

HOUSING — Rugged, die-cast, soft corner aluminum housing with 0.12" nominal wall thickness. Standard finish is dark bronze polyester powder (DDB), with optional architectural colors available.

DOOR FRAME — Die-cast hinged door frame is fully gasketed with one-piece tubular silicone.

LENS — Prismatic, impact-resistant, tempered glass, drop-dish acrylic lens or drop-dish polycarbonate lens.

MOUNTING — Contoured, extruded 4" soft corner arm for pole or wall mounting is standard, with 9" arm optional. Arm is shipped in fixture carton.

OPTICS — Reflector is optical quality aluminum that works in tandem with a light-diffusing prismatic lens.

ELECTRICAL SYSTEM — Constant-wattage autotransformer ballast, copper wound and 100% factory tested.

SOCKET — Horizontally-oriented, mogul-base, porcelain socket with copper alloy, nickel-plated screw shell and center contact. UL listed 1500W-600V, 4KV pulse rated.

LISTING — UL 1572 listed for wet locations. Listed and labeled to comply with Canadian standards (see options).

Standard dimensions

EPA:	FP Option 1.2 ft² (.11m²)
	DP Option 1.4 ft² (.13m²)
	(both include arm)
Square:	17-1/2 (44.5)
Depth:	FP Option 7-1/8 (18.1)
	DP Option 11-1/8 (28.3)
Weight:	40 lbs. (18.1 kg)

All dimensions are inches (centimeters) unless otherwise specified.

ORDERING INFORMATION

Example: KAC 400M FP 120 SPD04

Choose the boldface catalog nomenclature that best suits your needs and write it on the appropriate line. Order accessories as separate catalog numbers (shipped separately).

KAC400M	FP	480	SPD04	DF KACVG
Series	**Lens**	**Voltage**	**Mounting[2]**	**Options**
KAC400M	FP Flat prismatic C73T lens	120	SPD04[3] Square pole (4" arm)	Shipped Installed
	DPA Drop prismatic acrylic lens	208	SPD09 Square pole (9" arm)	SF Single fuse (120, 277, 347V, n/a TB)
	DPP Drop prismatic polycarbonate lens	240	RPD04[3] Round pole (4" arm)	DF Double fuse (208, 240, 480V, n/a TB)
		277	RPD09 Round pole (9" arm)	PER NEMA twist-lock receptacle only (no photocell)
		347	WWD04[3] Wood pole or wall (4" arm)	QRS Quartz restrike system (250W max, 120V lamp not included)
		480	WWD09 Wood pole or wall (9" arm)	EC Emergency circuit
		TB[1]	WBD04 Wall bracket (4" arm)	CSA Listed and labeled to comply with Canadian standards (120, 277, 347V only)
			Optional Mounting (shipped seperately)	Shipped Separately[4]
			KMA Mast arm adapter	PE1 NEMA twist-lock PE (120, 208, 240V)
			KTMB Twin mounting bar	PE3 NEMA twist-lock PE (347V)
			DAD12P Degree arm (pole)	PE4 NEMA twist-lock PE (480V)
			DAD12WB Degree arm (wall)	PE7 NEMA twist-lock PE (277V)
				KACVG[5] Vandal guard
				KACWG Wire guard
				SC Shorting cap for PER option

Architectural Colors[6]	
Standard Colors	
DDB	Dark bronze (standard)
DWH	White
DBL	Black
Classic Colors	
DMB	Medium bronze
DNA	Natural aluminum
DSS	Sandstone
DGC	Charcoal gray
DTG	Tennis green
DBR	Bright red
DSB	Steel blue

NOTES:
1. Multi-tap ballast (120, 208, 240, 277V). For Canada, consult factory.
2. Arm shipped in fixture carton.
3. The SPD09, RPD09 or WWD09 must be used when two or more luminaires are oriented on a 90° drilling pattern.
4. May be ordered as an accessory.
5. FP lens only.
6. Other architectural colors available; please see paint brochure.
7. Must use RPD09.

Accessories: Tenon Mounting Slipfitter[2]

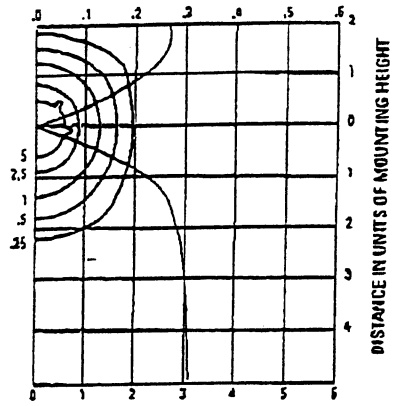
	Number of fixtures					
Tenon O.D.	One	Two@180°	Two@90°	Three@120°	Three@90°	Four@90°
2-3/8" (6)	T20-190	T20-280	T20-290[7]	T20-320[7]	T20-390[7]	T20-490[7]
2-7/8" (7.3)	T25-190	T25-280	T25-290[7]	T25-320[7]	T25-390[7]	T25-490[7]
4" (10.2)	T35-190	T35-280	T35-290[7]	T35-320[7]	T35-390[7]	T35-490[7]

KAC 400M Arm-Mounted Soft Square HID Lighting

Coefficient of Utilization ———
Initial Footcandles ———

KAC 400M DP Test No. 1192121701

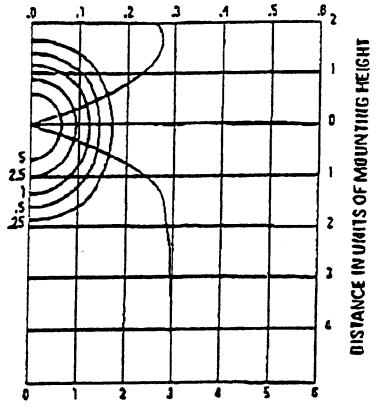
COEFFICIENT OF UTILIZATION



400W Metal Halide lamp, 36000 rated lumens. Footcandle values based on 30' mounting height. Distribution DP, cutoff.

KAC 400M FP Test No. 1192121702

COEFFICIENT OF UTILIZATION



400W Metal Halide lamp, 36000 rated lumens. Footcandle values based on 30' mounting height. Distribution FP, cutoff.

Mounting Height Correction Factor

(Multiply the fc level by the correction factor)

25 ft. = 1.44
32 ft. = 0.88
35 ft. = 0.74

$$\frac{\text{Existing Mounting Height}^2}{\text{New Mounting Height}^2} = \text{Correction Factor}$$

Electrical Characteristics

Wattage/ballast	Primary voltage	Line current (Amps) Start/Operating	Primary dropout voltage	Input watts	Power factor (%)	Regulation Line V = Lamp lumens
	120	2.50/4.00	55			
400 CWA	208	1.45/2.30	95			
Peak-lead	240	1.25/2.00	110	455	90+	±10% = ±10%
Autotransformer	277	1.10/1.75	125			
	480	.73/1.00	225			

Tested to current IES and NEMA standards under stabilized laboratory conditions. Various operating factors cause differences between laboratory data and actual field measurements. Dimensions and specifications on this sheet are based on the most current available data and are subject to change without notice.

KAC M3

KAC-M3.PM6

LITHONIA LIGHTING
HI-TEK INDOOR & OUTDOOR H.I.D. LIGHTING
1815 EAST ELMORE ST., CRAWFORDSVILLE, INDIANA 47933. TELEPHONE 765-362-1827, FAX 765-361-9558
IN CANADA: 1100 50TH AVE., LACHINE, QUEBEC H8T 2V3, A UNIT OF N.S.I. HOLDINGS, INC.

Catalog Number	Type
SSA 30 6J DM19 DDB	
GRATWICK	

Anchor Base Poles

SSA

SQUARE STRAIGHT ALUMINUM
8' to 35' Mounting

FEATURES

SHAFT — Square non-tapered shaft made from extruded 6063-T6 or 6061T6 aluminum alloy. Shaft width is 4", 5" or 6". Wall thickness is .125", .188" or .250" depending on mounting height and loading requirements.

ANCHOR BASE — Cast from 356-T6 aluminum alloy. Anchor bolt holes are recessed and covered by aluminum caps.

HANDHOLE — A rectangular reinforced handhole having nominal dimensions of 2" x 4" for a 4" square and 2-1/2" x 4" for a 5" or 6" square shaft. Handhole cover plate made from aluminum alloy with attachment hardware provided.

GROUNDING — A ground lug located immediately inside the handhole is tapped for 3/8" – 16 UNC ground bolt (by others).

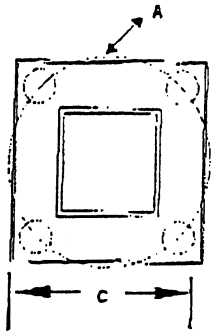
ANCHOR BOLTS — Top 12" galvanized per ASTM A-153. Made of 3/4" or 1" diameter steel rod having a minimum yield strength of 55,000 psi.

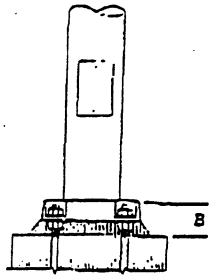
HARDWARE — All screws, nuts and bolts are made of stainless steel.

TOP CAP — Weatherproof, cast aluminum cap provided with all drill-mount poles.

FINISHES — Brushed aluminum is standard. Optional polyester powder paint and anodized finishes available.

BOLT COVERS — Nut covers are included with each anchor base.





ORDERING INFORMATION

Example: SSA 20 4C DM19 BA

Choose the boldface catalog nomenclature that best suits your needs and write it in the appropriate blank.

SSA	30	6J	DM19	DDB Must specify finish
Shaft type	Nominal mounting height	Nominal shaft base size/ wall thickness	Mounting[1]	Options
SSA	8 – 35 feet (See back page.)	(See back page.)		

Mounting[1]

Tenon Mounting
- PT Open top
- T20 2-3/8" O.D. (2" NPS)
- T25 2-7/8" O.D. (2-1/2" NPS)
- T30[2] 3-1/2" O.D. (3" NPS)
- T35[2] 4" O.D. (3-1/2" NPS)

Drill Mounting
- DM19x[3] 1 at 90°
- DM28x[3] 2 at 180°
- DM28 PL[3] 2 at 180° with one side plugged
- DM29x[3] 2 at 90°
- DM39x[3] 3 at 90°
- DM49x[3] 4 at 90°

Options

Standard Finish
- BA Brushed aluminum

Architectural Colors (powder finish)[4]

Standard Colors
- DDB Dark bronze
- DWH White
- DBL Black

Classic Colors
- DMB Medium bronze
- DNA Natural aluminum
- DSS Sandstone
- DGC Charcoal gray
- DTG Tennis green
- DBR Bright red
- DSB Steel blue

Class 1 Architectural Anodize
- ABL Black
- ADB Dark bronze
- ANA Natural

Shaft Base Size	Bolt Circle A	Bolt Projection B	Base Square C	Anchor Bolt Description	Warehouse Template Anchor Bolt Number
4"C	8-1/2"–9-5/8"	3-1/8"	9-15/16"	ABSSA-4C	AB18-0 PJ50045
4"G	8-1/2"–9-5/8"	3-1/8"	9-15/16"	ABSSA-4G	AB30-0 PJ50045
5"	10-1/2"–11-1/2"	3-1/4"	11-9/16"	ABSSA-5	AB30-0 PJ50046
6"	12"–13"	4"	12-1/4"	ABSSA-6	AB36-0 PJ50044

NOTES:

1 When ordering tenon mounting and drill mounting for the same pole, follow this example: DM28/T20.

2 3-1/2" and 4" tenons available on 5" and 6" shafts only.

3 The drilling template to be used for a particular luminaire depends on the luminaire that is used.

Replace "x" with	Drilling Template Reference Number	Drilling for Luminaire Series
1	1	ORCG1, ORDG1
2	2	KRES1
3	3	KRE1, KRES2, KSES1, ORCG2, ORDG2
4	4	KRE2, KSES2, ORC1, ORC2, ORD1, ORD2
Blank	5	All other Lithonia Area Luminaires

Refer to the Technical Data Section of the Outdoor Binder for Drilling Templates.

4 Additional colors available; see Architectural Colors brochure.

IMPORTANT:

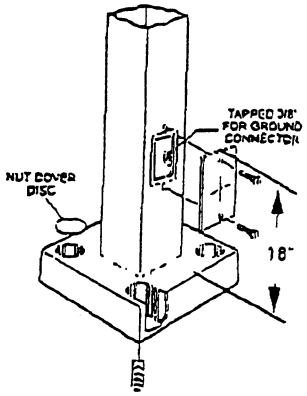
- Do not erect poles without having fixtures installed.
- Factory-supplied templates must be used when setting anchor bolts. Lithonia will not accept claim for incorrect anchorage placement due to failure to use factory template.
- If poles are stored outside, all protective wrapping must be removed immediately to prevent finish damage.
- Lithonia is not responsible for the foundation design.

SSA Square Straight Aluminum Poles

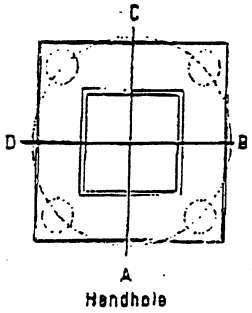
TECHNICAL INFORMATION

				EPA (ft²) with 1.3 gust						
Catalog Number	Nominal mounting height (feet)	Pole Shaft Size(in x in x ft)	Wall Thickness (inches)	80 mph	90 mph	100 mph	Max. weight	Bolt Circle (inches)	Bolt Size (in. x in. x in.)	Approximate ship weight (pounds)
SSA 8 4C	8	4.0 x 8.0	0.125	16.5	12.6	9.9	300	8-1/2-9-5/8	3/4 x 18 x 3	32
SSA 10 4C	10	4.0 x 10.0	0.125	11.5	8.6	6.5	230	8-1/2-9-5/8	3/4 x 18 x 3	37
SSA 12 4C	12	4.0 x 12.0	0.125	12.4	9.2	6.9	160	8-1/2-9-5/8	3/4 x 18 x 3	40
SSA 14 4C	14	4.0 x 14.0	0.125	9.3	6.7	4.8	120	8-1/2-9-5/8	3/4 x 18 x 3	50
SSA 15 4C	15	4.0 x 15.0	0.125	8.0	5.6	3.9	100	8-1/2-9-5/8	3/4 x 18 x 3	52
SSA 16 4C	16	4.0 x 16.0	0.125	6.9	4.7	3.1	90	8-1/2-9-5/8	3/4 x 18 x 3	54
SSA 16 4G	16	4.0 x 16.0	0.188	11.8	8.5	6.2	130	8-1/2-9-5/8	3/4 x 30 x 3	74
SSA 16 5G	16	5.0 x 16.0	0.188	15.0	11.1	7.5	280	10-1/2-11-1/2	3/4 x 30 x 3	83
SSA 18 4C	18	4.0 x 18.0	0.125	4.9	3.0	1.7	70	8-1/2-9-5/8	3/4 x 18 x 3	57
SSA 18 4G	18	4.0 x 18.0	0.188	9.2	6.4	4.4	100	8-1/2-9-5/8	3/4 x 30 x 3	80
SSA 18 5G	18	5.0 x 18.0	0.188	16.8	12.2	8.9	230	10-1/2-11-1/2	3/4 x 30 x 3	91
SSA 20 4C	20	4.0 x 20.0	0.125	3.3	1.7	0.5	40	8-1/2-9-5/8	3/4 x 18 x 3	62
SSA 20 4G	20	4.0 x 20.0	0.188	7.0	4.6	2.9	80	8-1/2-9-5/8	3/4 x 30 x 3	85
SSA 20 5G	20	5.0 x 20.0	0.188	13.6	9.5	6.6	180	10-1/2-11-1/2	3/4 x 30 x 3	107
SSA 20 6G	20	6.0 x 20.0	0.188	22.0	15.9	11.6	230	12-13	1 x 36 x 4	155
SSA 20 6J	20	6.0 x 20.0	0.250	30.4	22.6	17.0	300	12-13	1 x 36 x 4	202
SSA 25 5G	25	5.0 x 25.0	0.188	7.2	4.2	2.0	110	10-1/2-11-1/2	3/4 x 30 x 3	130
SSA 25 6G	25	6.0 x 25.0	0.188	13.2	8.6	5.4	180	12-13	1 x 36 x 4	180
SSA 25 6J	25	6.0 x 25.0	0.250	19.7	13.8	9.5	250	12-13	1 x 36 x 4	224
SSA 30 6G	30	6.0 x 30.0	0.188	7.0	3.4	0.8	130	12-13	1 x 36 x 4	210
SSA 30 6J	30	6.0 x 30.0	0.250	12.2	7.5	4.1	170	12-13	1 x 36 x 4	258
SSA 32 6J	32	6.0 x 32.0	0.250	9.7	5.4	2.3	150	12-13	1 x 36 x 4	272
SSA 35 6J	35	6.0 x 35.0	0.250	6.4	2.6	--	200	12-13	1 x 36 x 4	294

BASE DETAIL



HANDHOLE ORIENTATION[1]



POLE OPTIONS

SUFFIX	DESCRIPTION
FDL [1]	Festoon Outlet – less electrical
FGL [1]	Festoon GFI Outlet – less electrical
H1-18A [1]	Horizontal Arm Bracket – 1 fixture
VD	Vibration Damper (5" and 8" poles only)
L/AB	Less Anchor Bolts
HH [1,2]	Extra Handhole
HHC	Handhole Cover

IMPORTANT:

- These specifications are intended for general purposes only. Lithonia reserves the right to change material or design without prior notice. In a continuing effort to upgrade its products.
- Installation requires grout to be packed under base to ensure full contact with foundation.

NOTES:

1 Specify location and orientation when ordering (specify orientation from handhole and height in feet above base).

2 Combination of tenon-top and drill mount requires extra handhole.

LITHONIA LIGHTING
ARCHITECTURAL OUTDOOR LIGHTING
P.O. BOX A, CONYERS, GEORGIA 30012, TELEPHONE 770 922-9000, FAX 770 483-2825

EZ CONTROLS

General Purpose Electronic Time Switches

- 7 Day, Single Channel
- Single Pole Single Throw (EZ-701-1)
- Double Pole Single Throw (EZ-701-2)
- High Voltage, DPST (EZ-701-72)
- Carry-Over System
- Indoor / Outdoor Case
- 10 Year Memory
- Extremely Versatile

Models

EZ-701-1 (120V)
EZ-701-2 (120V)
EZ-701-72 (208-277V)

Clock Power:
120/208-240/277VAC,
10VA. Maximum, 60HZ.

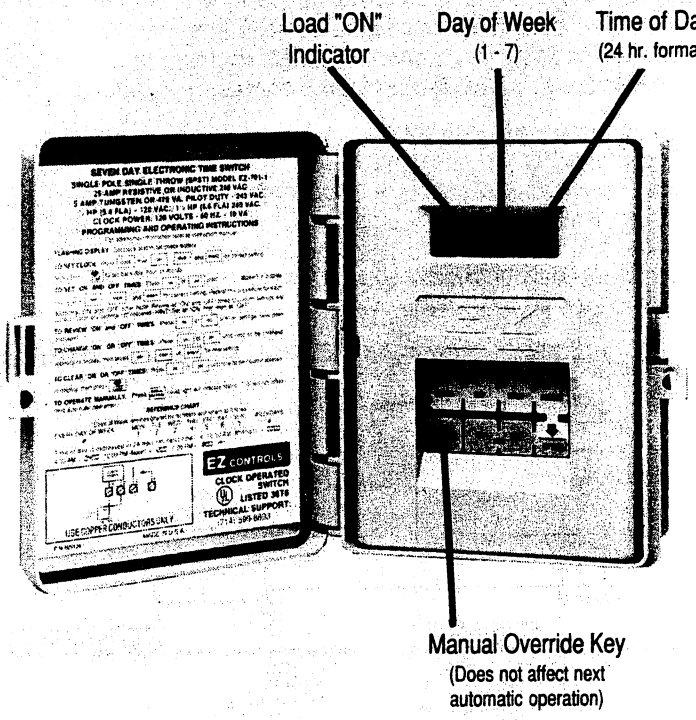
Switch Ratings:
30AMP, Resistive, 120/240VAC
20AMP, Resistive, 277VAC
6AMP, Ballast, 277VAC
5AMP, Tungsten, 120/240VAC
470VA, Pilot Duty, 120/240VAC
1 HP, 120VAC, 2HP, 240VAC

INSTRUCTION MANUAL

These general purpose digital time switches are the ideal alternative to conventional, mechanical time clocks.

With extremely versatile, true seven day scheduling, they can be set to stop and start any load at different times each day with faultless minute accuracy.

The switches are easy to install, program and operate. They feature timing accuracy to the minute, seven day programming, automatic or manual operation, a built-in power carry-over system, and an EZ Controls exclusive 10-year memory, which assures the users programmed settings will be unaffected by power outages, no matter the duration, **no reprogramming is ever required.**



USES AND APPLICATIONS:

- Interior and exterior lighting
- HVAC
- Machinery
- Compressors
- Blowers
- Motors
- Pumps
- Demand control
- Energy management
- Security systems
- Music systems
- Water heaters
- Billboards and signs
- Oil well pumping
- Animal feeders
- Pools and spas

FEATURES AND BENEFITS:

- Modular solid state electronics; silent, reliable and easy to install and service.
- Rechargeable carry-over system, eliminates resetting after power interruptions.
- 10 year memory retention, no reprogramming ever required.
- 24 hour, skip-a-day and fully independent 7 day scheduling, versatility in one model.
- Up to 15 ON or OFF operations per day, 105 per week.
- Lockable indoor-outdoor case, NEMA type 3R.

INSTALLATION AND START-UP

1. Turn power off at the circuit breaker or fuse box.
2. **The time switch control panel may be removed from case for ease of wiring.** Open door, unplug wire harness connector and snap out control panel. (See Fig. 1)
3. **Mount time switch.** Properly locate and position case. Insert screws through holes in case and tighten to secure.
4. **Connect electrical power & load to switch through knockouts.** The time switch provides isolated dry contacts. It is the installer 's responsibility to properly wire power to these contacts. (Use the wiring diagrams below as guide.) Loosen terminal screws and insert power wires under pressure plate as far as possible. Then, tighten terminal screws.
   Be sure to comply with local & national wiring codes.

WARNING: Do not exceed the rated capacity of the time switch. Check load & switch ratings. If tungsten or ballast loads are to be controlled (lighting loads), check ratings carefully and install contactor if needed.

6. **Install rechargeable battery.**
   The time switch has "dual" backup:
   a.) The program settings in memory are retained for up to 10 years, without power or a battery installed. Cutting power to the time switch will not erase the program.
   b.) The battery back-up keeps the time of day during power failure for up to 10 hours. It is recommended that a 9 volt NiCad, rechargeable battery be installed. The battery will automatically be trickle charged by the time switch. (NiCad batteries are readily available at electrical distributors.)

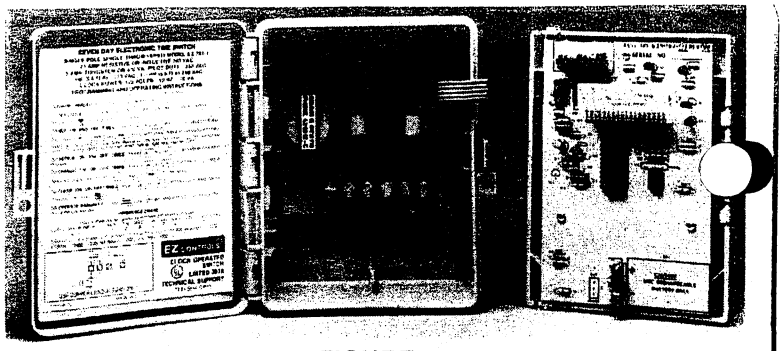
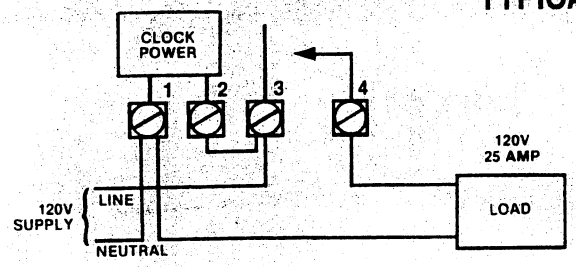


FIGURE 1

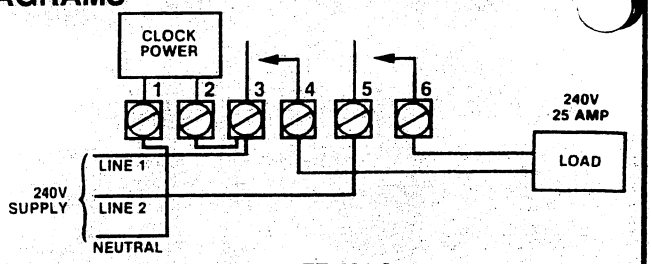
7. **Re-install switch control panel.** Snap in control panel, plug wire harness into pin connector on backside of control panel. Close door.
8. **Turn on power to switch.** CAUTION: Due to the non-volatile memory in this time switch, there may be a previous program stored in its memory, which could cause the equipment being controlled to receive power immediately; therefore, personnel should be kept clear of this equipment until clock and correct "ON/OFF" settings are programmed

   Switch display will begin flashing when power is turned on. This indicates it is now ready for programming.

TYPICAL WIRING DIAGRAMS

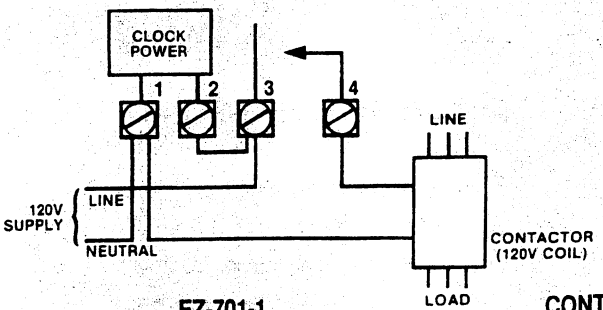


EZ-701-1

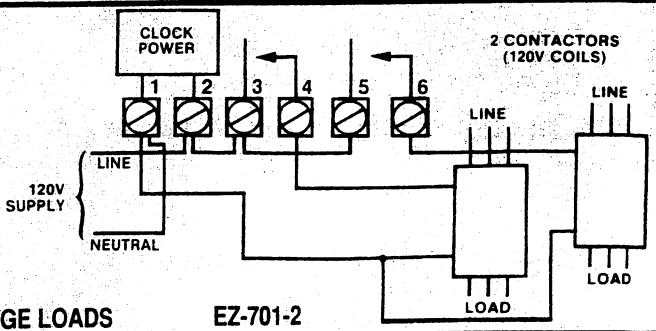


EZ-701-2

CONTROLLING SMALL LOADS

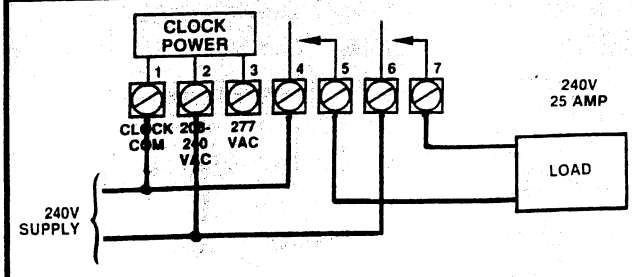


EZ-701-1

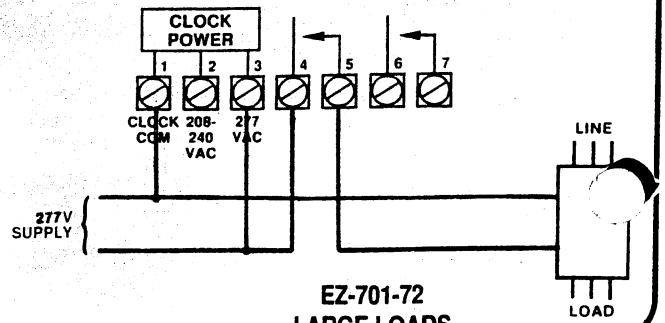


EZ-701-2

CONTROLLING LARGE LOADS



EZ-701-72
SMALL LOADS



EZ-701-72
LARGE LOADS

PROGRAMMING AND OPERATING INSTRUCTIONS

ABOUT THE DISPLAY — The display will show each entry as it is made. When the desired setting appears in the display, programming of that setting is completed, there is no need to press any other keys (such as an "enter" key in some competitors' models). When programming is finished, the display will return to the clock mode (setting day, hour and minute) within two minutes of pressing the last key, or you can return the display to the clock mode by pressing the [CLOCK] key. When the load is turned on (either automatically or by pressing the [MANUAL] key), a light will appear in the left side of the display to indicate the equipment is in operation. If the time switch has a flashing display, it indicates a power outage has occurred. To restore display, press clock key and check time of day. Battery should be checked and, if necessary, replaced.

ABOUT THE PROGRAM MEMORY -- Due to the 10 year memory retention feature, cutting power to the time switch will not erase the user's program. (No battery or power is required to retain the memory.) The user's settings can be changed or cleared at any time. This feature eliminates the need for having to reprogram the time switch after long periods of power outages (such as facility shutdowns for repairs, etc.).

1. **SET THE CLOCK.** Press [CLOCK] then [DAY], [HOUR], and [MINUTE] for today's day (1-7) and today's time. If display skips by setting, press [CLEAR] to back up display to correct setting.

(Mon)	(Tue)	(Wed)	(Thu)	(Fri)	(Sat)	(Sun)	(Week-days)	(Every Day-of Week)
1	2	3	4	5	6	7	d	E

Time of day is expressed in 24 hour military time (12:00AM(midnight) = 0000, 4:00AM = 0400, 12:00PM(noon) = 1200, 6:00PM = 1800)
EXAMPLE: When the clock is set for Thursday at 2:05PM, the display will show [4 1405]

2. **SET "ON" AND "OFF" TIMES .** For the sake of simplicity, it is recommended that all ON times are entered first, then all OFF times. Press [ON] until the display shows five small dashes [- ----], then press [DAY], [HOUR], and [MINUTE] for the correct setting. Continue pressing the [ON] key to enter more ON settings. Every time the [ON] key is pressed, the five dashes will be displayed and you can then enter a new ON setting. Once all ON settings have been entered, enter the OFF settings by pressing the [OFF] key and repeat procedure above. Review all ON and OFF times to confirm the settings are correct. Clear any settings that are not required.

3. **REVIEWING "ON" AND "OFF" TIMES:** Review all ON settings first. Press [ON], the display will show the first ON setting. Continue pressing the [ON] key to review more settings, if any. Every time the [ON] key is pressed, a new setting will be displayed. Once all ON settings are displayed, the time switch will show the five dashes.
NOTE: [1 0000] is a valid setting (Monday, at midnight).
Repeat same procedure for OFF settings by pressing the [OFF] key. Clear or change any unwanted settings.

4. **CHANGING "ON" OR "OFF" TIMES:** Press [ON] or [OFF] to find the setting to be changed, then press [DAY], [HOUR] or [MINUTE] for new setting.

5. **CLEARING "ON" OR "OFF" TIMES:** Press [ON] or [OFF] to find the setting to be cleared, then press [CLEAR]. Stay with all ONs and all OFFs

6. **MANUAL OPERATION:** Press [MANUAL OVERRIDE]. Load status light will indicate when the equipment is in operation. Manual operation will not affect next scheduled setting. However, the time switch will remain in the manual status if there is no automatic program.

7. **TO CLEAR ALL "ON" AND 'OFF" SETTINGS:** If it becomes necessary to change all settings press the [ON] key, then [CLEAR]. Continue pressing the [ON] key and the [CLEAR] key to clear more ON settings. Every time the [ON] key is pressed, a new setting will be displayed and you can then press [CLEAR] to erase that setting. Once all ON settings have been cleared, the display will show the five dashes after pressing the ON key (instead of a setting). Repeat procedure for OFF settings.

COUNTING "ON" AND "OFF" TIME SETTINGS: The time switch has a maximum of 15 set points per day. With the multiple day scheduling on this clock, the set points can be expanded to 105 per week.

POWER CARRY-OVER: The time switch will keep the clock running if power is lost with the installation of a 9 Volt NiCad rechargeable battery. It will not perform any of the programmed operations during a power outage.

NOTE: THE CLOCK WILL NOT AUTOMATICALLY "KICK IN" WHEN IT IS PROGRAMMED UNTIL IT ENCOUNTERS A PROGRAMMED TIME. UPON THE COMPLETION OF THE PROGRAMMING, YOU WILL NEED TO PRESS [MANUAL] TO TURN ON THE LOAD IF IT IS NEEDED ON AT THAT TIME. FOR EXAMPLE, IF YOUR SCHEDULE IS ON AT 0800 AND OFF AT 1700, AND YOU INSTALL AND PROGRAM THE CLOCK AT 1300, THE CLOCK WILL NOT START IMMEDIATELY. YOU MUST PRESS [MANUAL] TO TURN ON THE LOAD; THE LOAD WILL REMAIN ON UNTIL THE 1700 OFF SET POINT IS REACHED.

Programming Examples

24 HOUR PROGRAM

EXAMPLE: Load switches ON at 7:15AM and OFF at 6:45PM every day of the week.
1.) Press [ON] and enter the correct setting. Display shows 2 0715
2.) Press [OFF] and enter the correct setting. Display shows 2 1845
NOTE: Only two set points are used. More ON and OFF settings can be entered, if desired.

24 HOUR WITH SKIP DAYS PROGRAM

EXAMPLE: Load switches ON at 8:10AM and OFF at 5:30PM, Monday through Friday. Load remains OFF Saturday and Sunday.
1.) Press [ON] and enter the correct setting. Display shows d 0810
2.) Press [OFF] and enter the correct setting. Display shows d 1730

7 DAY PROGRAM

EXAMPLE: Load switches ON at 7:30AM, Monday thru Friday. It switches OFF at 5:40PM, Monday thru Friday, except Wednesday when load remains ON until 9:00PM. Load switches ON at 9:45AM on Saturday and switches OFF at 3:00PM on Saturday. Load remains OFF on Sunday.
1.) Press [ON] and enter the correct setting. Display shows d 0730
2.) Press [ON] and enter the correct setting. Display shows 3 1740 → This ON setting cancels out the
3.) Press [ON] and enter the correct setting. Display shows 6 0945 everyday OFF setting on Wednesday
4.) Press [OFF] and enter the correct setting. Display shows d 1740
5.) Press [OFF] and enter the correct setting. Display shows 3 2100
6.) Press [OFF] and enter the correct setting. Display shows 6 1500
NOTE: This program uses 6 set points. There are 9 set points left over for more ON and OFF settings, if desired.

TROUBLESHOOTING HINTS

SYMPTOM / PROBLEM	CHECKS / SOLUTION
Clock is "dead". No display. Nothing works.	• Check wiring to clock terminals 1 & 2. • Check voltage to clock terminals 1 & 2 (120V or 208-277v). • Make sure the wire harness connector is plugged into the control panel.
Clock works (display works) but the load does not turn on.	• Make sure the load light and contacts operate by pressing the manual override key (you can possibly hear a"click"). • Check power wiring to contact terminals. (See diagrams.) • Check load wiring to contact terminals. (See diagrams.) • Check load. (Does it operate when by passing the time switch?) • Visually check the condition of clock contacts. (Check load ratings for possible overload.)
Clock works and you are able to set clock correctly, but the load does not turn ON automatically.	• The clock does not "kick in" right away until it passes through a pro - grammed ON time automatically. "Fake" the time of day by setting the clock one minute before the programmed ON time and wait one minute for the clock to pass through the ON time. The load and light should operate now. Reset the clock to the correct time. If the load is needed to be ON at that time, simply turn the load ON with the manual override key. The clock will automatically turn it off at the next OFF setting. • Review all proper settings. (Follow step 3 in programming instructions.)
Can't get enough settings. Memory seems to "lose" some settings. Unable to set and review all settings.	• You may be "writing over" existing settings, changing prior settings rather than entering new ones. This happens it you alternate between ON and OFF k Stick to setting all ON's first, then all OFF's.
Clock turns load ON (or OFF) when it is not supposed to. Erratic automatic operation.	• This could happen due to mis-programming. We suggest you review all settings, clearing any unwanted ones. Note: if the display shows 1 0000 that is a valid setting, Monday at midnight. (Follow step 3 in programming instructions.) If this review process does not seem to solve the problem, CLEAR ALL settings, then reprogram the time switch. (See step 2.)
Clock "lost" time after power failure.	• Check battery condition. Battery must be a 9 volt rechargeable type, Nickel Cadium (NiCad).

IF AFTER CHECKING ABOVE, YOU STILL HAVE A PROBLEM, PLEASE CALL US FOR TECHNICAL ASSISTANCE AT (800) 445-7623

This controller generates radio frequency energy and may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— re-orient the receiving antenna
— move the controller away from the receiver
— plug the controller into a different outlet so that controller and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4. (Price — $2.00 postpaid)

If you have any questions, need additional information or would like to comment on this product, feel free to write or phone:

EZ CONTROLS, INC., 9330 JERSEY BLVD., RANCHO CUCAMONGA, CA 91730
(909) 466-1707 (800) 445-7623 FAX (909) 466-1283

PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. PRECAST LIGHT POLE BASES
SPEC. SECTION 16521
REVIEWED BY AJC
DATE 9/8/99

(2ND SUBMITTAL)

DOCUMENT APPROVAL / REVIEW

- [ ] APPROVED
- [x] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY QB
DATE 1-28-00

RECEIVED
FEB 15 2000
FERGUSON ELECTRIC CONSTRUCTION CO., INC.

use 6' un. base

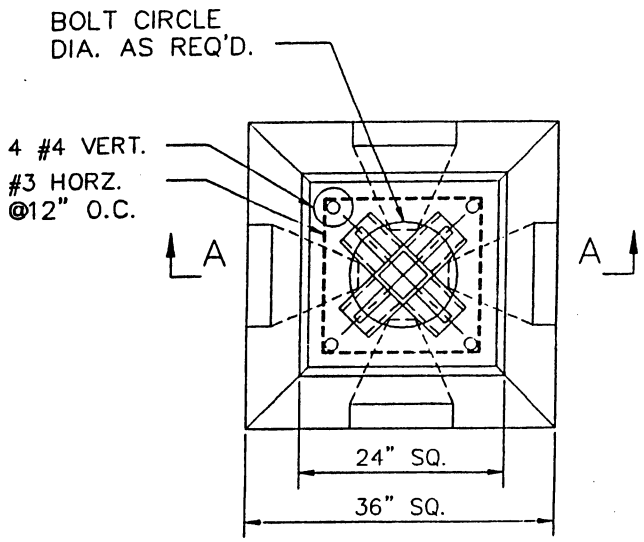
KISTNER CONCRETE PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION	DWG. NO.
UNI-BASE™	LB-UB2436-\

SPECIFICATIONS:

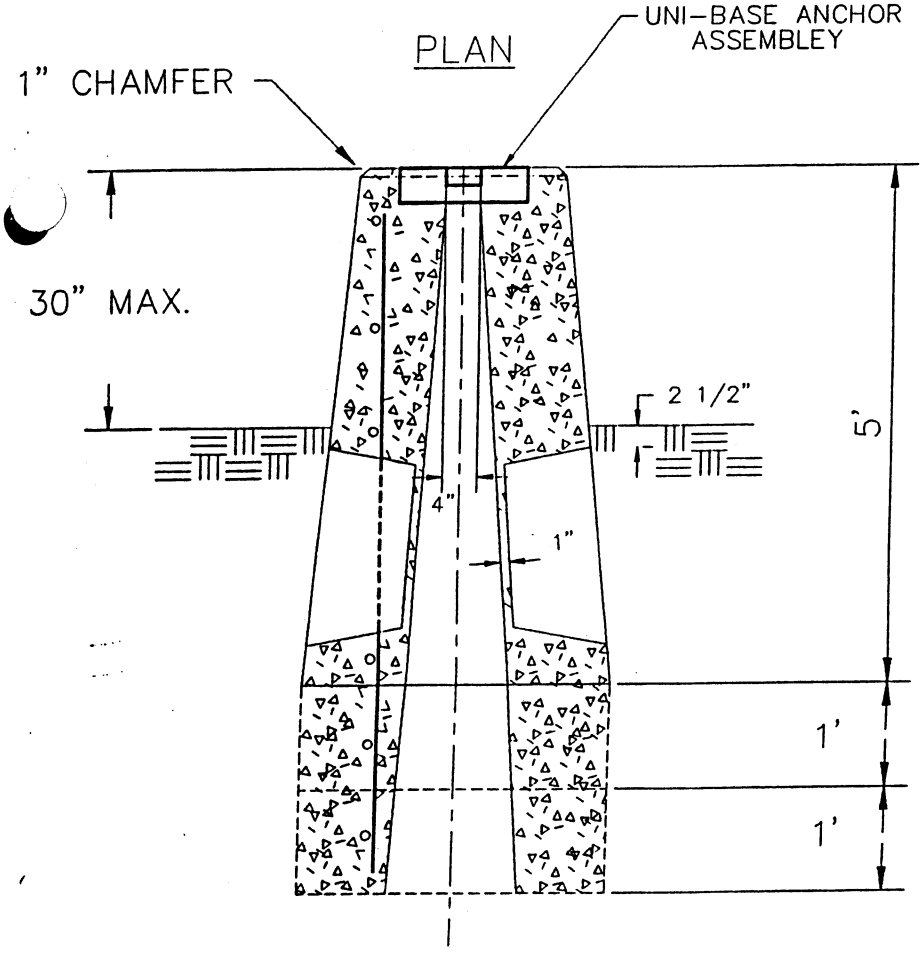
CONCRETE:	4000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%.
STEEL:	A.S.T.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	EPA (SQ. FT.) = 80+1.3.

NOTE: INFORMATION REFLECTS UNI-BASE & ANCHOR ASSEMBLY RATING ONLY. CIVIL-ENGINEER SHOULD BE CONSULTED REGUARDING SOIL & FROST CONDITIONS, POLE & LAMP SIZES.



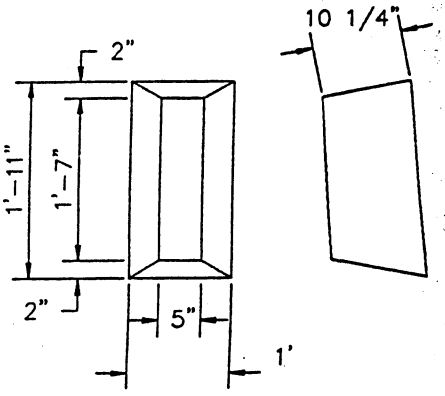
PRODUCT DES.	DEPTH	WEIGHT
UB-2436-5	5 FT.	3543#
UB-2436-6	6 FT.	4727#
UB-2436-7	7 FT.	5911#

PLAN



MIN. BOLT DIA. - 7"
MAX. BOLT DIA. - 14.5"

ANCHORS AVAILABLE FOR:
3/4", 1", 1 1/4", 1 1/2".



BLOCK-OUT DETAIL

SECTION A-A

NOTE: UNITS IN STOCK

PATENT PENDING

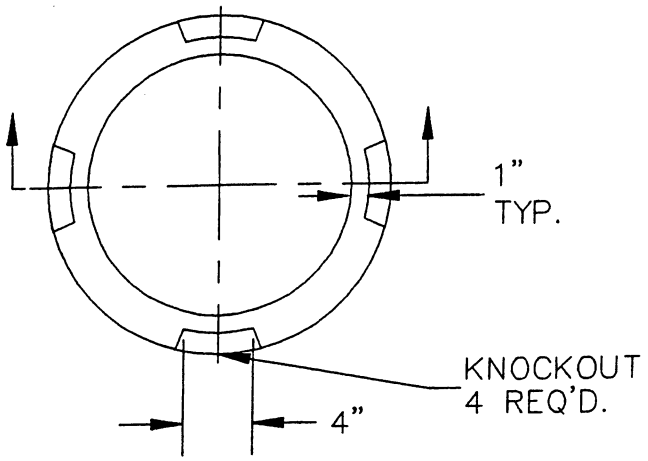
PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. GROUNDING INSPECTION STATION
SPEC. SECTION 16050
REVIEWED BY AJC
DATE 7/28/99

DOCUMENT APPROVAL / REVIEW

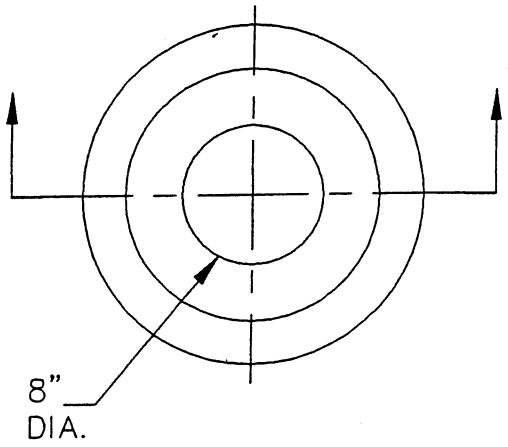
- [x] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY _____
DATE 8-2-99

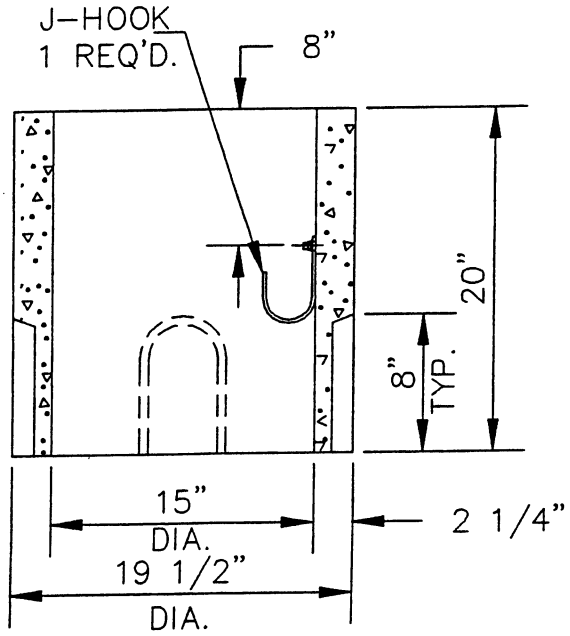
KISTNER CONCRETE PRODUCTS INC. 8713 READ ROAD E. PEMBROKE, N.Y. 14056 (716) 894-2267	PRODUCT DESIGNATION	DWG. NO.
	15" DIA. X 20" PULL BOX	PB-15-S ©



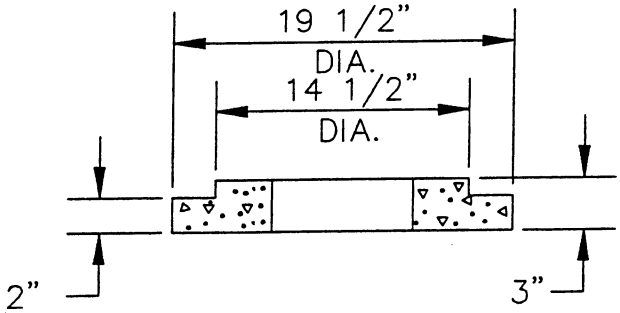
TOP VIEW



TOP VIEW



SECTION



SECTION
CIRCULAR PULL BOX BASE

SPECIFICATIONS:

CONCRETE:	4000 P.S.I. @ 28 DAYS.
ENTRAINED AIR:	5% - 9%.
STEEL:	A.S.T.M. A496-A615 GRADE 60-60 KSI.
DESIGN LOADING:	A.A.S.H.T.O. HS-20-44 WITH 30% IMPACT AND EQUIVALENT SOIL PRESSURE OF 130 (PSF). FLOATATION FORCES NOT ACCOUNTED FOR.

CIRCULAR REINFORCING 0.12 IN. 2/FT.
VERTICAL REINFORCING 0.058 IN. 2/FT.
ONE WIRE HANGER REQ'D.
FOUR KNOCKOUTS
INTERNAL VOLUME: 2.05 CU. FT.

WEIGHT:	
PULL BOX:	209 LBS.
PULL BOX BASE:	57 LBS.
TOTAL:	266 LBS.

N.Y.S.D.O.T. ITEM NO.
680.510101

PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. MANHOLE JUNCTION BOXES
SPEC. SECTION 16050
REVIEWED BY AJC
DATE 7/28/99

DOCUMENT APPROVAL / REVIEW

- [X] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY RJ Lyn
DATE 8-30-99

RECEIVED
SEP 7 1999
FERGUSON ELECTRIC CONSTRUCTION CO., INC.

Crouse-Hinds®

GU, GUE, GUB Junction Boxes

Class I, Groups B,C,D Class II, Groups E,F,G Class III

Application:

GU, GUE, GUB series junction boxes are used in threaded rigid conduit systems in hazardous areas:
- to function as a splice box, pull box or equipment and device enclosure
- indoors and outdoors

Features:▲

- Threaded construction throughout permits use in hazardous areas.
- Bodies have thick walls so they can be factory or field drilled and tapped to meet NEC requirements for Class I hazardous areas.
- Covers are provided with a neoprene "O" ring gasket to meet NEMA 4 requirements for a watertight seal*
- Internal grounding lug provides a means to ground enclosed equipment.
- Boxes are machined for field installed mounting plates.

Standard Materials:

- Bodies – *Feraloy*® iron alloy
- Covers – copper-free aluminum

Standard Finishes:

- *Feraloy* iron alloy –
  GUB01, GUB02 – zinc electroplate and aluminum acrylic paint▲
  All other boxes – zinc chromate primer and aluminum acrylic paint▲
- Copper-free aluminum – natural

Options:▲

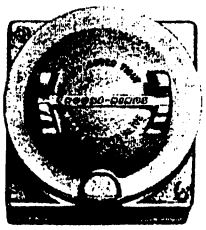
Description	Suffix to be Added to Cat. #
Material –	
Feraloy iron alloy covers	WOD
For GUB01, GUB02, GUB03 and GUB06 to be furnished in copper-free aluminum	SA
Mounting plate for relays, terminal blocks, electrical devices, etc	MP
Factory installed terminal blocks	Information on request

Compliances:▲

- NEC: Class I, Group B,C,D
  Class II, Groups E,F,G
  Class III
- UL Standard: 886
- CSA Standard: C22.2 No. 30

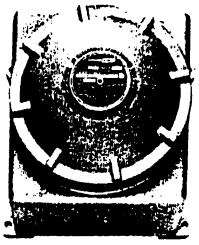
Junction Boxes Without Hubs

(use as first segment of Cat. No. for ordering)



GU:
4 15/16" x 4 15/16" x 4 1/8
3 5/8" cover opening

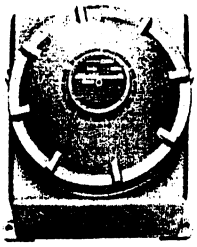
✱ **GUE:**
5 5/16" x 5 5/16" x 5 3/8
3 5/8" cover opening



GUB01:
6 1/2" x 7" x 5 3/4
5 1/2" cover opening

GUB02:
8" x 10" x 5 7/8
7" cover opening

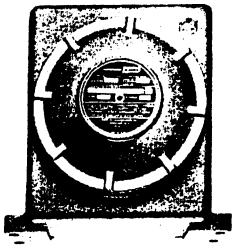
GUB06: 8 1/2" x 10" x 6 7/8"
7" cover opening



GUB03:
11" x 12" x 13/16
9 5/8" cover opening

GUB01110:
14" x 18" x 13 1/2
12 1/4" cover opening

GUB15151: 19" x 21" x 16 5/8"
16 3/4" cover opening



GUB04:
11" x 12" x 8 11/16
9 5/8" cover opening

GUB08:
8 1/2" x 10" x 6 13/16
7" cover opening

Ordering Information:

Junction boxes listed can be furnished with drilled and tapped conduit openings, subject to the limitations of maximum opening, number and spacing shown in Tables 1, 2 and 4.

To Order:

Step 1
Select the box required from photos at left and dimensional drawings on page 6F-12▲

Step 2
Select standard conduit arrangement from Table 1.

Step 3
Determine maximum size conduit opening required from Table 2 (consider conduit opening spacing from Table 4).

Step 4
Select appropriate symbol for required drilled and tapped holes from Table 3.

Example:
Step 1 – box required GUB06
Step 2 – arrangement 108
Step 3 – openings – 1 1/2" at "a" and "c"; 1" at "b" and "d".
Step 4 – symbols are substituted and written in **clockwise order starting with location "a".** For this example: FCFC Complete Cat. No. is made up of three parts: Part 1 – box number; Part 2 – arrangement number; Part 3 – symbols for conduit openings. For this example: GUB06-108-FCFC. When no opening is required at a particular location, use symbol "0" (zero).

If none of the standard arrangements meet requirements, send a sketch showing junction box number with size and location of each opening desired.

▲ Denotes revision.

† Tables 1, 2, 3, 4 and 5 appear on pages 6F-11, 12 and 13.

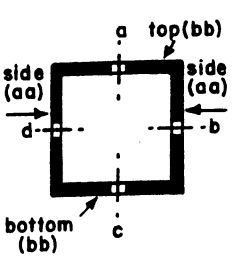
* Not available on GUB01110 and GUB15151.

GU, GUE, GUB Junction Boxes

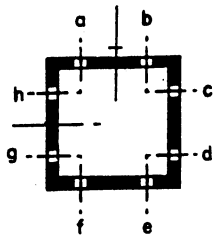
Class I, Groups B,C,D
Class II, Groups E,F,G
Class III

Crouse-Hinds®

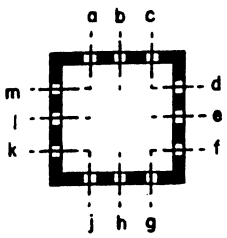
Table 1/Arrangements of Drilled and Tapped Conduit Openings – For other arrangements, send sketch and complete description



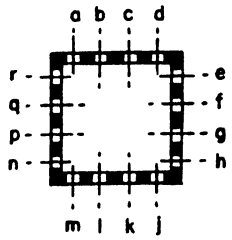
108



109



110



111

Conduit opening arrangements shown in the illustration should meet the majority of requirements.

These GUB junction boxes will be supplied with drilled and tapped openings up to the maximum size and number shown in Table 2.

Table 2/Maximum Size & No. of Drilled & Tapped Holes▲

First Division of Cat. #	Top & Bottom (bb)†				Each Side (aa)†				Back‡			
	1	2	3	4	1	2	3	4	1	2	3	4
Group D*												
GU	1	1			1	1			3	1	¾	¾
GUE	2	1			2	1			3	1	¾	¾
GUB01	2	1½	¾		2	1½	1	½	¾	¾	¾	¾
GUB02	2	2	1	¾	2	2	1½	1	¾	¾	¾	¾
GUB06	2	2	1	¾	2	2	1½	1	2	2	2	2
GUB08	2	2	1	¾	2	2	1½	1	2	2	2	2
GUB03	2	2	1½	1	2	2	2	1¼	4	4	3½	3
GUB04	2	2	1½	1	2	2	2	1¼	4	4	3½	3
GUB01110	2	2	2	1½	2	2	2	2	6	6	4	3½
GUB15151	5	4	3½	2½	5	4	4	3	6	6	6	6
GROUP C◆												
GU	1	1			1	1			3	1	¾	¾
GUE	2	1			2	1			3	1	¾	¾
GUB01	2	1¼	½		2	1¼	½		¾	¾	¾	¾
GUB02	2	1½	¾		2	2	1¼	½	¾	¾	¾	¾
GUB06	2	1½	¾		2	2	1¼	½	2	2	2	1½
GUB08	2	1½	¾		2	2	1¼	½	2	2	2	1½
GUB03	2	2	1¼	¾	2	2	1½	1	4	3½	2½	2½
GUB04	2	2	1¼	¾	2	2	1½	1	4	3½	2½	2½
GUB01110	2	2	2	1¼	2	2	2	2	6	6	4	3½
GUB15151	5	4	3	2	5	4	3½	2½	6	6	6	5
GROUP B◆◆												
GU	1	1			1	1			3	1	¾	¾
GUE	2	1			2	1			3	1	¾	¾
GUB01	2	1¼	½		2	1¼	½		¾	¾	¾¾	
GUB02	2	1½	¾		2	2	1¼	½	¾	¾	¾	¾
GUB06	2	1½	¾		2	2	1¼	½	2	2	2	1½
GUB08	2	1½	¾		2	2	1¼	½	2	2	2	1½
GUB03	2	2	1¼	¾	2	2	1½	1	4	3½	2½	2½
GUB04	2	2	1¼	¾	2	2	1½	1	4	3½	2½	2½
GUB01110	2	2	2	1¼	2	2	2	2	4	4	4	4
GUB15151	4	4	3½	2½	4	4	3½	2½	4	4	4	4

Table 3/Drilled & Tapped Holes

Size	Symbol
½	A
¾	B
1	C
1¼	E
1½	F
2	G
2½	H
3	J
3½	K
4	L
none	0

OF OPENINGS

1
2

1

▲ Denotes revision.

* Group D chart is based on use of staggered unions. If adjacent unions are desired, additional spacing may be necessary.

† Sidewall and top and bottom sizes are based on all openings being in line.

‡ Backwall sizes are based on: two per side – diagonal corners; four per side – one in each corner; three per side – triangular pattern with two on adjacent corners on long wall and third in center of opposite long wall.

◆ Conduit seals are required within 1½" of all conduit entrances for Class I, Group C hazardous locations.

◆◆ Conduit seals are required within 1½" of all conduit entrances for Class I, Group B hazardous locations.

FIRE SAFETY SYSTEMS

FIRE ALARM SYSTEMS
SECURITY SYSTEMS
SCHOOL SOUND SYSTEMS
CLOSED CIRCUIT TELEVISION SYSTEMS
TELEPHONE SYSTEMS
CLOCK SYSTEMS
COMMUNICATION SYSTEMS

SUBMITTAL

SECURITY SYSTEM

2 Buildings

ELECTRICAL CONTRACTOR:
Ferguson Electric

PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. INTRUSION DETECTION SYSTEM
SPEC. SECTION 13420
REVIEWED BY AJC
DATE 11/8/99

2ND SUBMITTAL

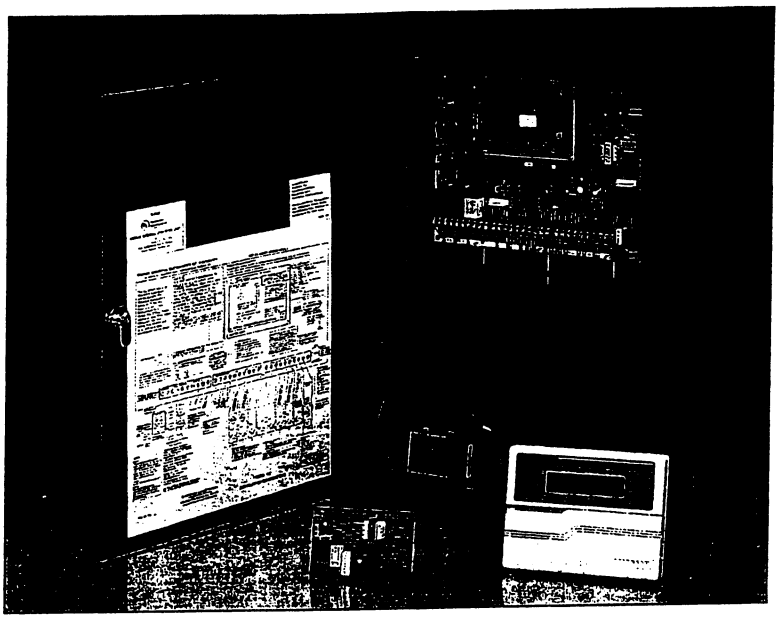
3030 GENESEE STREET BUFFALO, NY 14225 (716) 894-9700
NEW YORK STATE JOURNEYMAN FIRE ALARM MECHANIC

SECURITY SYSTEM

QTY	ITEM	PAGE	DESCRIPTION
	CONTROL PANEL Vista-10	1-3	U.L. Listed 6 zone security control panel with built in siren driver, digital communicator with line seizure, 6 user codes, fully central station reportable and battery backup.
1	Per Building		
	KEYPAD 6137	4	U.L. Listed commercial LCD English display keypad for arming and disarming of the system and system status display.
1	Per Building		
	DOOR CONTACT 900 Series	5	U.L. Listed flush door contact to monitor door entry.
1	Per Building		
	MOTION DETECTOR 990 Series	6	U.L. Listed motion detector with 9 P.I.R. motion beams, look down zone and RFI immunity.
1	Per Building		
	SIREN 700 Series	7	U.L. Listed interior or exterior siren. Weatherproof as required.
1	Per Building		
-	Custom Programming		
-	N.Y.S.L.S.F.A.C.	8	New York State Licensed Security and Fire Alarm System Certificate.
-	Supervision of Installation		Fire Safety System technicians will provide on the job assistance to the electrical contractor including testing and inspecting all equipment and wiring prior to the equipment being installed on the main control. Any and all deficiencies will be corrected prior to the final installation and system balancing. All system components will be tested and demonstrated to the owners representative for acceptance.
-	Owner Training		Fire Safety Systems will provide system operation training to the facility personnel and maintenance personnel on the operation and maintenance of the system. Minimum 8 hours of training, proper operation of the system.

Warranty

Fire Safety Systems will provide a one year warranty from the date of acceptance on all equipment supplied under this contract as long as the equipment failure is from normal and designed usage. Vandalism and acts of god are not considered usage failure.



VISTA-100 INTEGRATED FIRE AND PARTITIONED BURGLARY ALARM CONTROL PANEL

Protection of life and property in commercial applications has reached the next horizon with the VISTA-100.

- Supports eight hardwired zones, 79 V-Plex zones/points or 87 compatible wireless zone/points and eight partitions
- System can be installed on existing wire
- Commercial wireless, hardwired and V-Plex technology
- UL commercial fire and burglary listed, NFPA 72 compliant
- Functional smoke detector walk test mode
- Temporal code 3 programmable notification circuits
- SIA false alarm prevention features
- 12V or 24V versions

*Pending

How To Order:
VISTA-100
VISTA-100-24 for 24V applications

VISTA-100-PAK1

PowerPak Includes:
Vista-100 Control,
6139R Keypad &
5140DLM Dialer Module

Section 1. GENERAL DESCRIPTION

The VISTA–10SE is a control that supports up to 22 zones, using basic hard-wired, and/or wireless, plus remote keypads.

Basic Hardwired Zones (1–6)

Provides 6 basic hardwired zones having the following characteristics:

- Zones 1-6 response time is 300–500 milliseconds.
- Zone 3 programmable High Speed response time (10–15 milliseconds).
- EOLR supervision supporting N.O. or N.C. sensors
- Zone 5 supports as many 4-wire smoke or heat detectors as can be powered from the control).
- Zone 7, 95 and 96 are keypad Panics.
- Zone 8 Duress.
- Zone 9 Tamper.

Optional Expansion Zones (up to 16 total wireless zones)

Wireless Expansion:

- Supports up to 16 wireless zones.
- Requires the use of a 4281 type RF receiver (with 5700 series wireless transmitters) or 5881 (5882 in Canada) type RF Receiver (with 5800 series wireless transmitters), as shown below.

Receiver Model	No. of Zones	Transmitter Type
4281L (4281CN-L*)	Up to 4	5700
4281M (4281CN-M*)	Up to 8	5700
4281H (4281CN-H*)	Up to 8	5700
5881L (5882L*)	Up to 8	5800
5881M	Up to 16	5800
5881H (5882H*)	Up to 16	5800

* Used in Canada.

Remote Keypads

Up to 4 of any of the following keypads may be used:

Fixed-Word Keypads: **4127***, **4137AD**, **6127***, **6128**, and **6137**.

* These keypads cannot be used if the 4285 Phone module is being used.

Alpha Keypads: **5137AD**, **6139** (2-line alphanumeric displays).
6138 (1-line alphanumeric display).

For programming from [illegible] must be connected to the [illegible]

Security Codes

- One Master code for entire system (user 2). Installer code is user 1.
- 4 secondary user codes (users 3–6).
- One duress code (User 8).

system will send a signal [illegible]

Keypad Panic Keys

- Up to 3 programmable panic key functions are provided.
- Designated as Zones 95, 96, 7.
- Activated by wired & wireless keypads.
- Reported separately, distinguished by subscriber ID number.

Paging Feature

If the paging feature has been programmed for your system, your pager will respond to certain conditions as they occur in your system, and display code numbers indicating the type of condition that has occurred.

Quick Arm Feature

"Quick Arm" may be programmed , allowing use of the [#] key in place of the security code for arming (Quick Arm will not work unless the Master code has been programmed into the system).

Optional Output Relays

- Up to 4 relays using one **4204 Relay Module**.
- Actions programmable to respond to zone activity or manual keypad entries.

Optional Phone module

- Supports the Ademco **4285 Phone module**.
- Provides access to the system via on premises or off-premises phones for arming, disarming, etc., plus control of relay outputs.

Optional Long Range Radio

- Allows all messages that have been programmed to go to the primary telephone number to be reported additionally to a 7720 PLUS or 7820 radio.

Alarm Output

- Provides a 12VDC, 2 AMP output that can drive the compatible sounders listed in the EXTERNAL SOUNDERS section (assumes a fully charged battery is connected).
- Steady output for Burglary/Panic, or temporal pulse sounding output for Fire notification, as required by UL.
- Uses current limiting circuitry for protection.

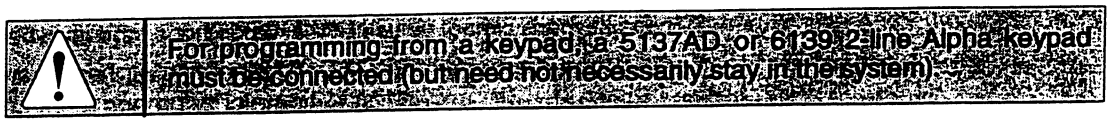
Auxiliary Power Output

- Provides 12VDC, 500mA maximum. Uses current limiting circuitry for protection.
- This output interrupts for smoke detector reset if 4-wire smoke detectors are used.

Programming

- Programmed options are stored in electrically erasable, non-volatile EEROM memory (information can be reprogrammed at any time and will not be lost in the event of a power loss).
- The system can be uploaded, downloaded, or controlled via an IBM compatible computer, using either Ademco's V-Link® downloading software (Rev. 4 or higher) or Ademco's *Compass* Windows downloading software, and a HAYES modem specified by Ademco.

  Keypad programming consists of:
  - Data field programming.
  - Interactive (menu) mode programming.



Communication Formats Supported

- Ademco Low Speed (Standard or Expanded).
- Sescoa/Radionics (Standard or Expanded).
- Ademco Express.
- Ademco Contact ID.

Zone Descriptors

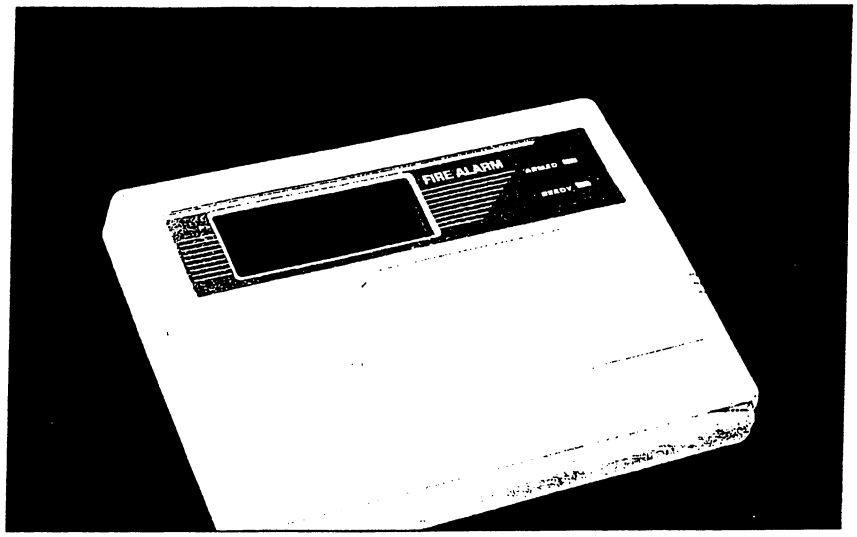
You can assign Alpha descriptors to all zones (useful only when using Alpha keypads and/or the 4285 Phone module).

AC Power Supply

Uses **No. 1321**, 120VAC plug-in transformer with 16.5VAC 25VA output. (1321CN in Canada)

Back-Up Battery

- Rechargeable (Gel type) 12VDC, 4AH minimum.



6137R Deluxe Fixed English Keypad

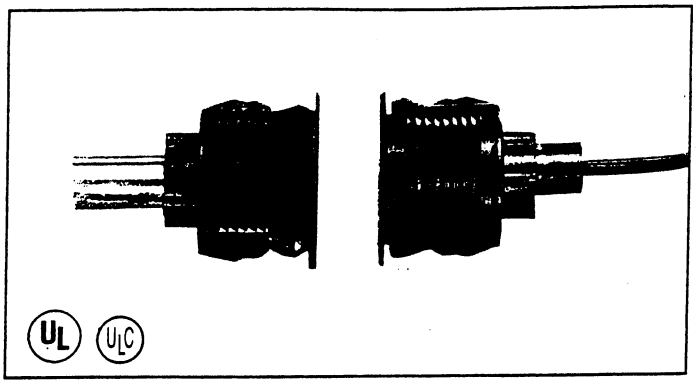
With its extra large, fixed English display and easy-touch, rubber keys, the 6137R commercial fire keypad is as easy to read as it is to operate. The backlit design of the keypad display and keys enhances visibility and recognition.

- Attractively designed red keypad with removable door
- Easy-touch "white" rubber keys
- Extra large fixed English words - backlit and easier to read - 2x16 display
- Three auxiliary keys
- Backlit keys
- Built-in Piezo sounder — makes audible "beeps" for entry/exit delays, system status and other alarm conditions
- Addressable, programmable and supervised
- 6137R keypad for fire applications
- Cost effective
- Available in beige as 6137

How To Order:
6137R - Red for fire applications
6137 Beige

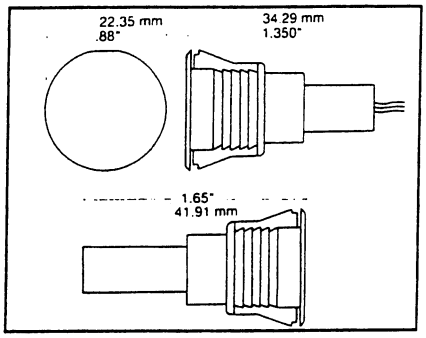
Concealed Contacts

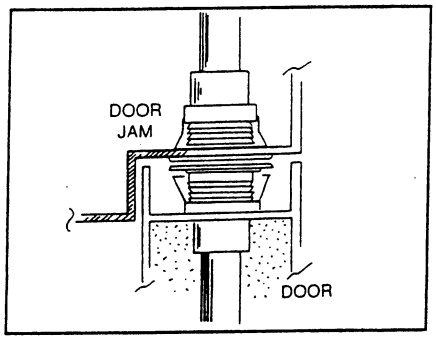
947 Series - Steel Door Contacts



- The clean look of recessed contacts that meets the requirements of steel doors
- 5 foot zip cord leads are standard
- Standard gap: 3/4" in steel
- Both 1" diameter or 3/4" diameter with "lock-in" mounting caps
- Order white or brown

Qty: 5/pkg.



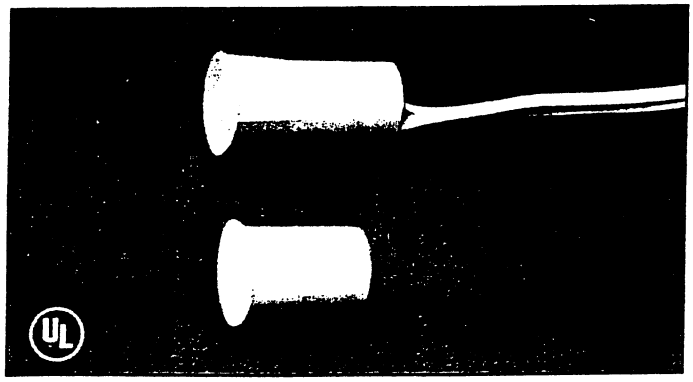


How to Order:

Closed Circuit – **947WH, 947BR**
SPST contacts. Circuit is closed with magnet engaged.

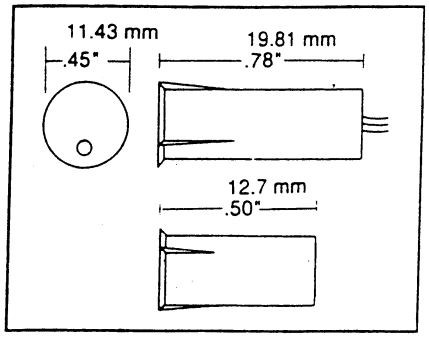
Closed Circuit 3/4" Dia. – **947-75WH, 947-75BR**
When less drilling in steel door is desirable

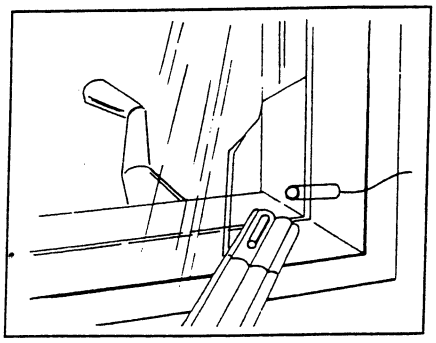
951 Series - 3/8" diameter Miniature Press Fit Contacts



- With magnet only 1/2" long...the 951 is ideal for casement windows, sliding windows and other thin frame applications
- Standard gap: 3/8" min.
- 5 foot zip cord leads standard
- Available in white or brown
- Handy recloseable clear plastic box complete with wire crimps

Qty: 5/pkg.





How to Order:

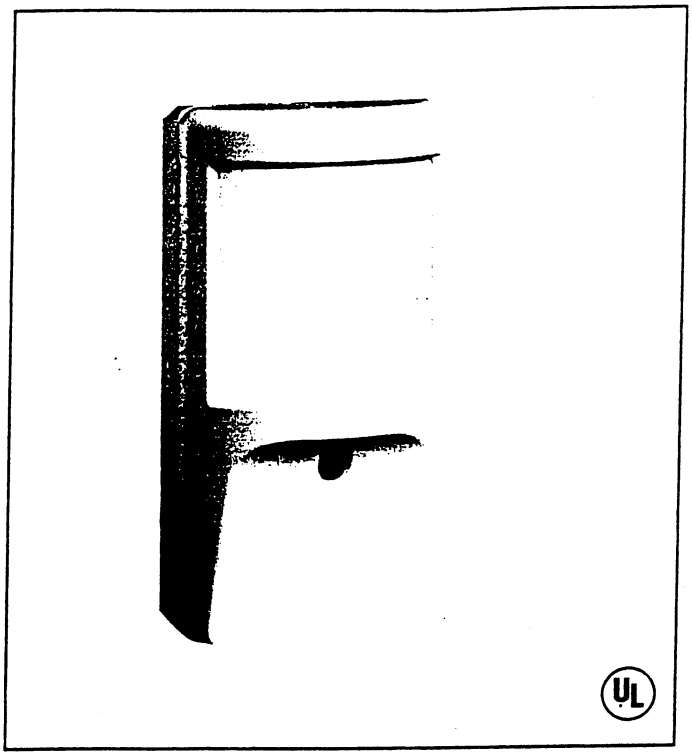
Closed Circuit – **951WH, 951BR**
SPST contacts. Circuit is closed with magnet engaged.

White – **951WH**

Brown – **951BR**

990 Series Twin-Element Fresnel Lens PIRs

The economy PIR for custom installations

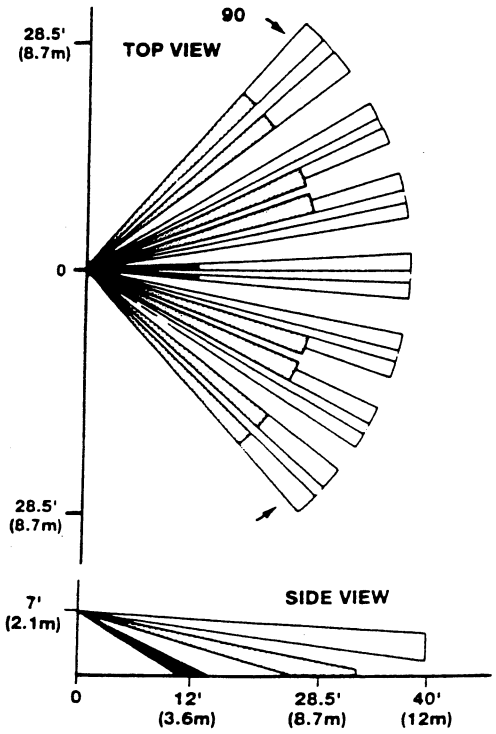


990 *- Wide Angle (40' x 50')*
990LR *- Long Range (70' x 8')*
990PA *- Pet Alley (40' x 50')*

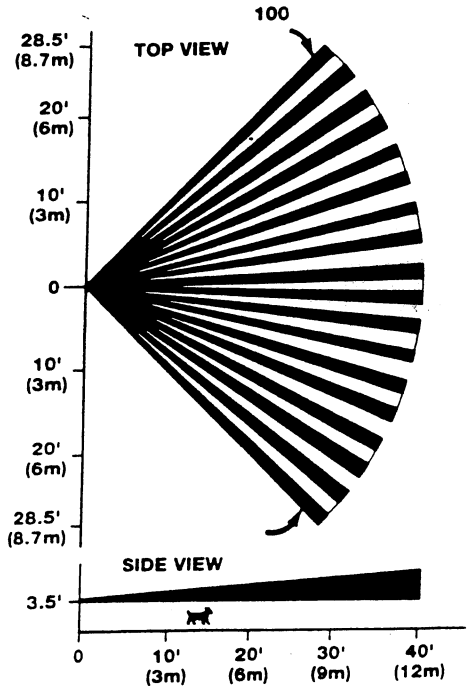
- White lens and white case blend in great on most walls
- Vertical adjustment
- 12 volt operation
- Form A relay
- 15 mA current draw
- Built-in signature analysis pulse count (except 990LR)
- SMD construction for excellent RFI immunity

Dimensions: 2"(W) x $3^{13}/_{16}$"(H) x $1^{5}/_{8}$"(D)

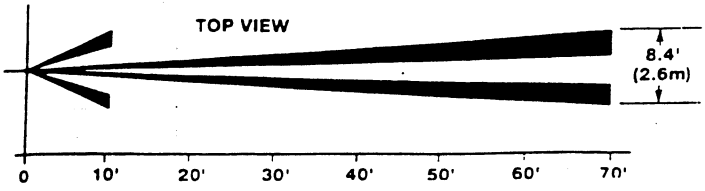
DETECTION AREA – No. 990

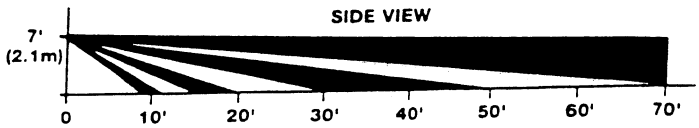


DETECTION AREA – No. 990PA



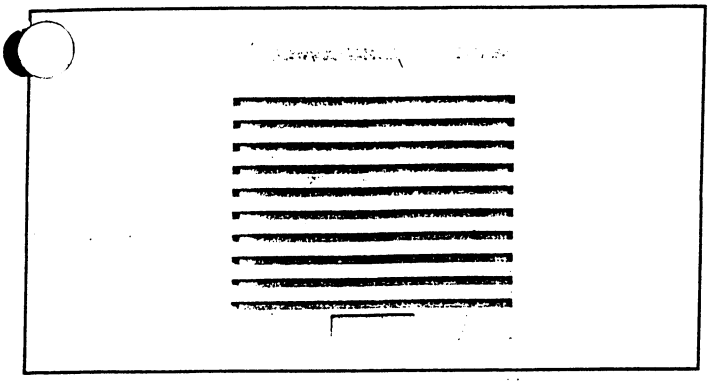
DETECTION AREA – No. 990LR





747 Self Contained Siren

Steve Rapoport, Ademco's Product Manager for Sounding Devices



- 95dB output at 12VDC
- 2 tones - steady and warble
- Durable ABS plastic
- Attractive designer case
- Easy mounting
- Hardware included
- High quality mylar cone
- Private labeling available
- Heavy duty magnet

Specifications:
Voice coil impedance - 8 ohm
Voice coil diameter - .79" (20mm)
Cone diameter - 3.43" (87mm)

Speaker Type:
Mylar cone

Input Voltage:
6-15VDC

dB Output:
95dB @ 12VDC @ 10'

Current Draw:
400mA @ 12VDC 8 ohm load

Operating Temp:
C to 50°C

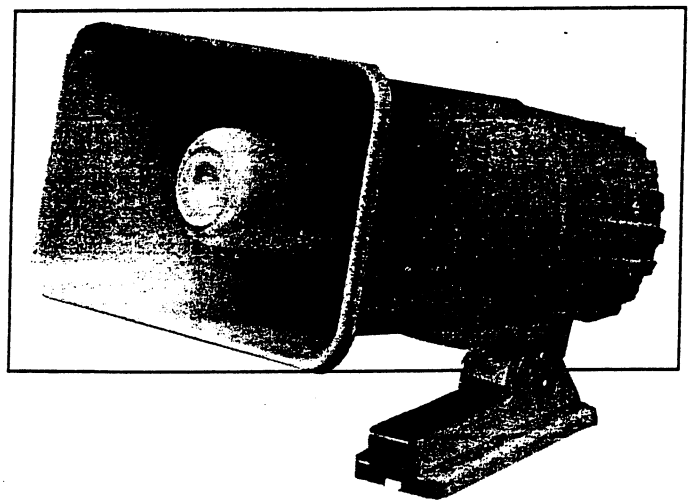
Tone Frequency:
Steady - 1200HZ
Warble - 800HZ to 1200 HZ
1 Second ramp cycle

Magnet Weight:
2.8 oz (71g)

Dimensions:
4" x 4" x 2"
(102mm x 102mm x 51mm)

For private labeling for the 747,
call Ademco Product Management:
516-921-6704 Ext. 1147

702 Electronic Siren (Self Contained)



- 6 to 12 volt DC combination speaker and siren driver
- Extremely loud siren
- Dual channel (yelp or steady)
- Weather resistant
- Enclosed wires, easily tampered
- 30 Watt rating
- 117 db @ 10' (12 volts)
- Protective cabinet available
- Built-in Tamper Plate protects wires from attack

How to Order:
Electronic siren. 6 to 12 volts DC.
702 - 2 sounds
743BE- Cabinet only
955WH- Tamper switch
28-2- Bracket for tamper

UNIQUE ID NUMBER
1200001 66 78

State of New York
Department of State

44846

DIVISION OF LICENSING SERVICES

EFFECTIVE DATE

MO.	DAY	YR.
11	24	98

PURSUANT TO THE PROVISIONS OF ARTICLE 6D OF THE GENERAL BUSINESS LAW AS IT RELATES TO THE BUSINESS OF INSTALLING, SERVICING, OR MAINTAINING SECURITY OR FIRE ALARM SYSTEMS.

EXPIRATION DATE

MO.	DAY	YR.
11	23	00

C/O FIRE SAFETY SYSTEMS
3030 GENESEE ST
BUFFALO, NY 14225

HAS BEEN DULY LICENSED TO ENGAGE IN THE BUSINESS OF INSTALLING, SERVICING, OR MAINTAINING SECURITY OR FIRE ALARM SYSTEMS

In Witness Whereof, The Department of State has caused these presents to be signed and its official seal to be hereunto affixed.

DEPARTMENT OF STATE

Alexander F. Treadwell

SECRETARY OF STATE

QUALIFIER: CONNELLY TERRANCE M

)OS-1098 (REV. 9/97)

®ADEMCO

Security System

ACCESS CODE: 2740

VISTA-10SE

THIS ISSUE INCLUDES THE NEW "QED" (QUICK ENROLLMENT OF DEVICES) PROCEDURE FOR 5800 SERIES TRANSMITTERS

Installation Instructions • Installation Instructions • Installation Instructions

N722-V4 4/97

Section 16. SYSTEM OPERATION

Security Codes

Installer Code

The installer programs the 4-digit Installer Code initially as part of the programming procedure. The factory default Installer code is "**4-1-1-1**", but may be changed in field *20. **Note:** The Installer Code is defined as User #1.

The Installer code is the only code that can allow re-entry into programming mode. In normal operation mode, only the Master code can be used to enter the User codes (refer to *Assigning the Master Code*).

See *MECHANICS OF PROGRAMMING* section in the **PROGRAMMING GUIDE** manual for details on exiting the programming mode via *98 or *99.

Assigning the Master Code

In normal operation mode, assign the 4-digit Master Code as follows:

Installer Code + 8 + 2 + 4-digit Master Code

Note: The Master Code is defined as User #2.

Changing the Master Code

In normal operation mode, the Master code can be changed by entering:

Master Code + 8 + 2 + New Master Code + New Master Code again

User Codes

In normal operation mode, the Master security code can be used to assign up to 4 secondary 4-digit security codes. It can also be used to remove secondary codes from the system (individually).

To assign (or change) a Secondary security code, enter *(via keypad)*:

Master Code + [CODE key] + User # (3–6) + desired 4-digit Secondary Code

The system will emit a single beep when each secondary code has been successfully entered.

To delete a Secondary security code, enter *(via keypad)*:

Master Code + [CODE key] + User # (3–6)

Notes:

- All Master and Secondary security codes permit access to the system for arming, disarming, etc.
- If a secondary code is inadvertently repeated for different users, the lower user number will take priority.
- Opening and closing reports are sent for the Master code as No. 02, with the appropriate subscriber number. Secondary user codes are sent as Nos. 3 through 6 respectively, with the appropriate subscriber number.

Duress Code

Important: This code is useful only when the system is connected to a central station.

This feature is intended for use when you are forced to disarm or arm the system under threat. When used, the system will act normally, but can silently notify the central station of your situation, if that service has been provided. The Duress code may be any 4-digit code assigned to User Number 8.

To program a Duress code:

1. Enter Master Code.
2. Press the CODE [8] key.
3. Press the [8] key again (8 = Duress code User No.).
4. Enter the desired 4-digit Duress Code. The keypad will beep once.
   Note: The Duress code must differ from the Master Code or any other User's Code.

To change the Duress code:

Repeat steps 1, 2, and 3, and then step 4 with the new Duress Code.

To delete the Duress code:

Perform steps 1, 2, and 3, and then stop. When the keypad beeps once it signifies that the code has been deleted.

Keypad Functions

General Information

Note that if you enabled QUICK ARM (field *21), the [#] key can be pressed instead of entering the security code, for any of the arming procedures (Away, Stay, Instant, Maximum, etc.). The security code is *always* required, however, when disarming the system.

NOTE: The "Quick Arm" feature will function only if the Master Code has been programmed (see *Assigning the Master Code* on the previous page).

The keypad allows the user to arm and disarm the system, and perform other system functions, such as bypassing zones, and display zone descriptors. Zone and system conditions (alarm, trouble, bypass) are displayed in the Display Window.

When an alarm occurs, keypad sounding and external sounding will occur, and the zone(s) in alarm will be displayed on the keypad. Pressing any key will silence the keypad sounder for 10 seconds. Disarming the system will silence both keypad and external sounders. When the system is disarmed, any zones that were in an alarm condition during the armed period will be displayed (memory of alarm). To clear this display, simply repeat the disarm sequence (enter the security code and press the OFF key) *again.*

The keypads also feature chime annunciation, and 3 panic key pairs, or individual panic keys (depending on keypad type – see *Panic Keys* on next page), for silent, audible, fire or personal emergency alarms. These keys can notify the central station of an alarm condition, if that service is connected.

Arming Functions

The following is a brief list of system commands. For detailed information concerning system functions, refer to the User's Manual.

Disarmed, Not Ready ..... Before arming, the system must be in the READY condition (all zones must be intact). If the "NOT READY" message appears, press the READY [*] key to display faulted zones.

Arming Away ..... Enter code + AWAY [2].

Arming Stay ..... Enter code + STAY [3].

Arming Instant ..... Enter code + INSTANT [7].

Arming Maximum ..... Enter code + MAXIMUM [4].

Quick Arming ..... Simply press [#] key in place of code, then press
(if enabled) ..... AWAY, STAY, INSTANT, or MAXIMUM to arm system as desired. Note that the [#] key cannot be used in place of code when disarming the system.

Disarming ..... Enter code + OFF [1].

Bypassing Zones ..... Enter code + BYPASS [6] + zone number(s).

Forced (Quick) Bypass ..... To automatically bypass all faulted zones, use
(if enabled) ..... the "Quick Bypass" method:
Enter code + BYPASS, then wait for all open zones to be displayed. Arm when display indicates "Bypass" and "Ready to Arm".

Chime Mode ..... Enter code + CHIME [9].
To turn chime off, enter code + CHIME again.

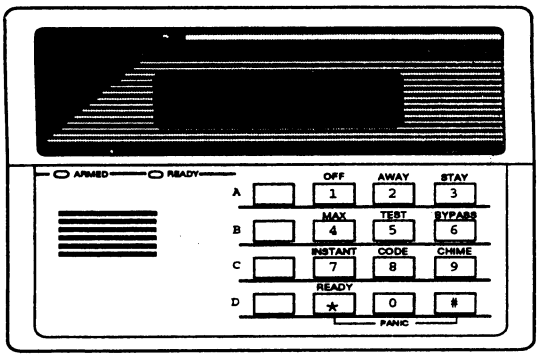
SUMMARY OF ARMING MODES

Arming Mode	Features for Each Arming Mode			
	Exit Delay	Entry Delay	Perimeter Armed	Interior Armed
AWAY	Yes	Yes	Yes	Yes
STAY	Yes	Yes	Yes	No
INSTANT	Yes	No	Yes	No
MAXIMUM	Yes	No	Yes	Yes

Panic Keys

There are three individual panic keys or, on some keypads, panic key pairs. If programmed, they can be used to manually initiate alarms and send a report to the central station.

Each key (or key pair) can be individually programmed for 24-hour Silent, Audible, Personal or Fire Emergency responses. The panic function is activated when both keys of the appropriate key pair are pressed at the same time, or the appropriate lettered key is pressed for at least 2 seconds.



Shown on the left is a typical keypad with individual Panic keys (shown lettered).

The panic functions are identified by the system as follows:

Keys	Displayed as Zone
[A], or [1] & [*]	95
[B], or [*] & [#]	7
[C], or [3] & [#]	96

Notes:

- Keys [A], [B], [C] are not on all keypads.
- Key [D], if present, is not active here.

Important: For the Silent Panic functions to be of practical value, the system must be connected to a central station.

4285 Phone module (if used)

Refer to the separate instructions supplied with the Phone module for information concerning its operating procedures.

Note: The Phone module **cannot** be used to add user codes in this system. User codes must be added by using a wired keypad.

Relay Outputs (if used)

If relay outputs are used, two keypad entries available to the user are included among the system operation choices (34 and 35) that may be programmed (see the *RELAY OUTPUTS* section). They can manually activate or de-activate the relay(s) for starting or stopping some action, such as turning lights on or off, etc.

These keypad entries are: **Security Code + [#] + [7]**

and **Security Code + [#] + [8]**

Note: Whichever entry is used to start/stop the action cannot also be used to stop/start it. The opposite action must either be performed by the other keypad entry or by some other event or operation offered in the programming section.

Exit Alarm Displays (if programmed)

- **A display of "CANCELED ALARM" or "CA" and a zone indication** will appear if an exit or interior zone contained a fault during closing at the time the exit delay ended (e.g., exit door left open), *but the system was disarmed during the entry delay time.* The alarm sounder and keypad sound continuously, but stop when the system is disarmed. No message will be transmitted to the central station.
- **A display of "EXIT ALARM" or "EA" and a zone indication** will appear if an exit or interior zone contained a fault during closing at the time the exit delay ended, *but the system was NOT disarmed during the entry delay time.* The alarm sounder and keypad sound continuously until the system is disarmed (or timeout occurs). An "exit alarm" message is sent to the central station.

(Continued)

- **The "EXIT ALARM" display, etc.** will also result if an alarm from an exit or interior zone occurs within two minutes after the end of an exit delay.

In any of the previous cases, use a second OFF sequence (code plus OFF key) to clear the display.

Trouble Conditions (See Troubleshooting Guide also)

General Information

The word "CHECK" on the keypad's display, accompanied by a rapid "beeping" at the keypad, indicates that there is a trouble condition in the system. The audible warning sound can be silenced by pressing any key. Instruct users to call for service immediately upon seeing any of the following messages.

"Check" and "Battery" Displays

- **A display of "CHECK" and one or more zone numbers** indicates that a problem exists with the displayed zone(s) and requires attention.
- A display of **"CHECK"** and **09** indicates that communication between control and a zone expander or wireless receiver is interrupted. Check the wiring and DIP switch settings on the units.
- **If there are wireless sensors in the system,** the CHECK condition may also be caused by some change in the environment that prevents the receiver from receiving signals from a particular sensor.
- **A display of "BAT"** (Fixed-word keypads) **or "SYSTEM LO BAT"** (Alpha keypads) **with no zone number** indicates that the system's main standby battery is weak.
- **A display of "BAT"** (Fixed-word keypads) **or "LO BAT"** (Alpha keypads) **with a zone number and a once per minute "beeping" at the keypad** indicates that a low battery condition exists in the wireless sensor displayed (zone "00" indicates a wireless keypad). If the battery is not replaced within 30 days, a CHECK display may occur.

  Note: Some wireless sensors contain a non-replaceable long-life battery which requires replacement of the entire unit at the end of battery life (e.g., Nos. 5802, 5802CP).

Power Failure

- **If there is no keypad display at all, and the POWER indicator (if present) is not lit,** operating power for the system has stopped and the system is inoperative.

  Note: The control panel will power up in its previous state (armed or disarmed) after a complete power failure, but will not retain any memory of bypasses.
- **If the message "AC LOSS"** (Alpha keypads) **or "NO AC"** (Fixed-word keypads) **is displayed, and the POWER indicator (if present) is off,** the keypad is operating on battery power only.

  Note: There is a random delay up to 48 minutes before the system will report an AC failure to the central station. The keypad response is about 6 seconds. The restore report has a random delay of up to 12 minutes (if the AC failure report was sent).
- **If the battery standby capacity is used up during a prolonged AC power outage,** the control's auxiliary power will shut down to minimize deep discharge of the battery.

Other Displays (Fixed Word displays are in parentheses)

Busy-Standby (dl). If this remains displayed for more than 1 minute, the system is disabled.

Modem Comm (CC) The system is in communication with the central station for change of function or status verification.

Comm. Failure (FC) A communication failure has occurred.

Open Circuit (OC) The keypad is not receiving signals from the control and sees an open circuit.

Long Rng Trbl (bF) Back-up LRR communication failure.

Section 17. TROUBLESHOOTING GUIDE

SYSTEM (Including Wireless)

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. Transmitter signal not received at 4281/5881.	1a. Transmitter or 4281/5881 not properly powered.	1a Check or change transmitter's battery. Check the control's AC power.
	1b. If Transmitter is 5827/5827BD, house ID code not set in field *24, or transmitter not set to same house code set in that field.	1b. Check code switches inside transmitter. Must match with RF House Code programmed in control.
	1c. Transmitter located too for from 4281/5881.	1c. Move transmitter or 4281/5881.
	1d. Metal shielding between transmitter and 4281/5881.	1d. Check for large metal obstructions, then relocate transmitter if necessary.
	1e. Transmitter malfunctioning.	1e. Verify by activating 4281/5881 with another, similar transmitter. If O.K. now, return defective transmitter.
	1f. 4281/5881 malfunctioning.	1f. Verify by making sure other transmitters cannot activate 4281/5881. If defective, replace and return original 4281/5881.
	1g. Transmitter No. (zone) not programmed.	1g. Verify programming.
	1h. 4281/5881 address incorrect.	1h. Set DIP switch for address "0".
	1i. Field *22 not set properly.	1i. Set field *22 to "1" for 4281 RF receiver, or "2" for 5881 RF receiver
2. Transmitter zone number appears during Go/NoGo test mode, but does not clear.	2a. Transmitter zone type (ZT) is set to 00 (Not Used).	2a. Set ZT to a valid active zone type in field *56.
	2b. Transmitter battery not installed.	2b. Install proper battery.
	2c. 5700 System transmitter's DIP switch not set properly (house ID and transmitter ID).	2c. Check and set the DIP switch.
	2d. 5800 System transmitter serial No. not entered in system.	2d. Enter unit's serial No. in field *56.
	2e. With 5700 System, no response at all to *any* transmitter.	2e. Check 4281 receiver.
3. Low Battery message on keypad.	3a. "Bat" or "System Lo Bat" (no zone Nos.)	3a. System battery is low or missing.
	3b. "Bat" or "Lo Bat" + "00".	3b. Remote RF keypad battery is low.
	3c. "Bat" or "Lo Bat" + "nn".	3c. Transmitter for zone "nn" has a low battery.
4. Periodic beep(s) from keypad.	4a. System is in TEST mode.	4a. Enter "Code" + OFF to exit TEST mode.
	4b. A wireless transmitter low battery has occurred and is displayed.	4b. Enter "Code" + OFF and replace the battery.
	4c. A supervision CHECK has occurred.	4c. Check the wireless transmitter indicated. Restore communication to the RF receiver to cancel the condition.
5. With 5800 RF System, no response to a transmitter in normal operation, although zone number clears during Go/NoGo mode.	Put control in TEST mode. If zone does not respond, try operating the tamper switch or another input to the transmitter.	
	5a. If another input causes the zone to be displayed, the wrong loop input was entered when programming.	5a. Delete input's serial number (not the zone), and enter the proper loop input (see field *56).
	5b. If no response at all from this transmitter, this physical transmitter has not been entered into the system. Go/NoGo display is being cleared by another unit programmed for this zone.	5b. Determine which transmitter is programmed for this zone and reprogram as necessary.
6. Nuisance or phantom alarm.	6a. Sensors not properly installed, wired, or monitored.	6a. Check installation to see if in accordance with established procedure.
	6b. Universal transmitter (5715/5817) programmed wrong.	6b. Check programming switches on transmitter.
7. Intrusion alarm for no apparent reason.	7a. Protected door or window opened while system armed.	7a. Check with all occupants of protected premises.
	7b. Improper user operation of exit/entry delays.	7b. Check setting of entry delay . Exit delay is 15 seconds longer than the entry delay time. Remind user of same.
	7c. Magnets located too far from switches, and/or doors and windows not properly aligned.	7c. Check all openings for proper switch and magnet orientation.

(Continued)

TROUBLESHOOTING GUIDE (continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
7. Intrusion alarm for no apparent reason. (continued)	7d. Magnetic contacts improperly connected or wire broken.	7d. Check wiring connections. Be sure wires are properly stripped and are tightly fastened to screw terminals.
	7e. Entry door programmed as "Instant"	7e. Check and revise programming. Reprogram transmitter number.
	7f. Loose fitting door or window being rattled by wind or vibrations.	7f Mount magnet closer to magnet.
8. Repeated low battery signal.	8a. Transmitter located where temperature drops below 32°F.	8a. Change location. Use magnetic contacts to protect opening.
	8b. Poor quality or unspecified battery in transmitter.	8b. Check battery. Use only batteries specified in the instructions (does not apply to transmitters with non-replaceable batteries).
	8c. Transmitter malfunctioning.	8c. Replace faulty transmitter.
9. Local bell and keypad sound continuously after arming.	9. Exit or interior zone contained a fault at end of Exit Delay (e.g., Exit door left open).	9a. If system disarmed *before* ensuing entry time runs out, "CA" or "Canceled Alarm" will be displayed. Sounding will stop.
	The "Exit Alarm" display, etc. will also result if an alarm from an exit or interior zone occurs within two minutes after the end of an exit delay. ⟶	9b. If system *not* disarmed before entry time ends, "EA" or "Exit Alarm" will be displayed and Exit Alarm message will be sent to central station. Sounding will continue until system is disarmed or timeout occurs.
		Clear display by entering code + OFF a second time. Avoid fault when re-arming.

CONTROL

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. "POWER" light off or "NO AC" displayed	1a. Interrupted AC power supply.	1a. Check transformer connection and power line circuit breaker.
2. Digital communicator message not being received.	2a. Control in TEST mode.	2a. Remove from TEST mode.
	2b. Telephone connection not secure.	2b. Check all connections.
	2c. Digital communicator malfunctioning	2c. Check with a different VISTA–10SE.
	2d. Telephone number in program needs prefix or access code.	2d. Program prefix or access code into the control
	2e. Telephone call to central monitoring station requires operator assistance.	2e. System cannot work in this situation.
3. Does not arm properly.	3a. READY light not on.	3a. Check for faulted zone(s) by pressing [*]; make faulted zone(s) intact, or use Bypass arming, if desired.
4. VISTA–10SE doesn't respond to keystrokes on keypad.	4a. "CC" or "MODEM COMM" displayed.	4a. System is in communication with downloader at central station. Wait until download session is finished.
	4b. "d1" or "System Busy" displayed.	4b. System has just been powered and is in its one minute initialization. To bypass this time, press '#' + '0'.
	4c. "E4" or "E8" displayed.	4c. More zones have been programmed than the zone expansion modules can handle. Delete some zones or use a higher capability RF receiver.
	4d. Keypad address setting incorrect.	4d. Keypads must be set for address 31 (non-addressable mode).

SMOKE DETECTOR

SYMPTOM	POSSIBLE CAUSE	REMEDY
1. Detector alarms, no apparent reason.	1a. Dust, dirt in sensing chamber.	1a. Clean unit's sensing chamber with vacuum cleaner per unit's instructions.
	1b. Improper location.	1b. See unit's instructions for locations to avoid. Relocate as necessary.
	1c. Unit malfunctioning.	1c. Replace detector.
2. Detector's siren sounds.	2a. Unit not receiving required power.	2a. Check for proper installation of battery. Try new battery.
	2b. Unit malfunctioning.	2b. Replace detector.

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Tony Coppola

JOB: Gratwick Park Project

ENGINEER: Murdoch Engineering – Cambridge, On.

P.O. #'s: NF19509, NF19510

Six Sets Submitted

BILL OF MATERIAL

Section 13240-2

- Paragraph 2.1: Qty. 1) Microtel S1000
  Dialer; NEMA 12 enclosure; Four dry contact input modules; 24 hour, 12 volt battery back-up; Two 120 VAC digital output modules (can be programmed to be N.O. or N.C.)

- Paragraph 2.2: Qty. 1) Eurotherm Chessel 4100G Graphic Recorder
  Three channel graphic recorder with P.C. memory card drive and RS232 serial port; Review software is included with recorder
  PLEASE NOTE: new part number and petitioned price revision for graphic unit: 4100G/03210/20032/00000/EE00/0000/00000X/0000/0P03/010M/1000 @ **$2,910.00** – an increase from $2,856.25
  PLEASE NOTE: the customer will have to use a flash memory P.C. card for data storage versus a floppy disk – we can supply the card at a cost of $80.00 ea. (4 MEG) or your customer can purchase them on their own.

Please return one set marked approved.

Sincerely,

Chuck DiLullo
Systems Sales Engineer

1215 Mt. Read Blvd., Rochester, NY 14606-2817 ▪ Tel: 716-254-2100 ▪ Fax: 716-254-0889
115 Ainsley Dr., Syracuse, NY 13210-4284 ▪ Tel: 315-479-7979 ▪ Fax: 315-479-5402
257 Osborne Rd., Albany, NY 12211-1894 ▪ Tel: 518-459-7900 ▪ Fax: 518-459-0001

EUROTHERM CHESSELL

Model 4100(

Channels / Video Memory / Line Power — Slot Type / Door Lock & Seal / No. of Shunts / Shunt Value — No. of Attenuators / Approvals — Language / Manual — Factory Configuration / Transmitter Pwr Su / Logo / Color

Model: **4100G / 03 2 3 0 / 2 0032 / 0000 0 0 / EE 00 / 0 0000**

/cont. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

digit — Check Box

1 Channels (see Note 1)
- No Channels (specify comms option) .. 00
- Two Channels 02
- → Three Channels 03
- Four Channels 04
- Six Channels 06
- Eight Channels (see Note 3) 08
- Ten Channels (see Note 3) 10
- Twelve Channels (see Note 3) 12

2 *Video Memory*
- ***3 MEG*** ..... 2 [X] ***std***

3 Power
- → 90-264 Vac ..... 1 — std
- 24/48 Vdc ***CSA NOT AVAILABLE*** 2

4 Fixed Digit ..... 0 [X]

5 Card Type - choose one (see Note 3)
- 1.44Meg Floppy Disk (w/Packed Data) .. 1
- → PC Slot (Packed Data Incl.) ..... 2 — std

6 Door Seal & Lock (No portable option with IP65)
- → No Lock (IP54 sealing) ..... 0 — std
- Lock with IP54 sealing 1
- Lock with IP65 sealing (can not retrofit) 3

7 Quantity of Shunts (0 to 12)
- None ..... 00 — std
- To specify the number f input shunts, enter a two-digit number from "01 thru "12" ..... __
- → Pricing is per shunt

8 Shunt Value
- None 0
- 100 Ohm 1
- → 250 Ohm 2

9 Qty of 100:1, 1Meg Attenuators (0 to 12)
- None ..... 00 — std
- To specify the number of attenuators, enter a two-digit number from "01 thru "12" ..... __
- Pricing is per attenuator

10 Additional Approvals
- None 0
- Seismic Test - Tested & Approved ..... 1 — Available Contact Factory

11 Fixed Digit ..... 0 [X]

12 Fixed Digit ..... 0 [X]

digit — Check Box

13 Operating Language
- → English ..... E — std
- French ..... F
- German ..... G

14 Manual Language
- No Manual 0
- → English ..... E — std
- French ..... F
- German ..... G

15 Fixed Digit ..... 0 [X]

16 Fixed Digit ..... 0 [X]

17 Factory Configuration (see Note 4)
- → None ..... 0 — std
- Basic - channels, alarms, relays 1
- Options - tot, time, cntr, cust msg 2
- Calculations - derived channels (DV's) ... 3

18 Transmitter Power Supply (see Note 7)
- None 0
- Three Channels, 120 Vac 1
- Three Channels, 240 Vac 2
- Six Channels, 120 Vac 6
- Six Channels, 240 Vac 7

19 Door Logo
- Eurotherm Recorders Inc ..... CO — std
- No Logo ..... NL
- Other 99

20 Door/Case Color
- Green ..... 0 — std
- Gray 1
- Black 2

ACCESSORIES

LA246843X100	Universal Configuration Software 3½" disk (includes configuration cable, below)
DN203969	Cable, configuration, PC to instrument
LA203956U100	Padded Canvas Carrying Case
HA250209X100	Installation and Operation Manual
HA249874X100	Options Manual (DV, Relays, Retrans, Contact Inputs, Comms)
IF250936U04M	4 Meg ATA FLASH slot
IF250936U08M	8 Meg ATA FLASH slot
IF250936U10M	10 Meg ATA FLASH slot
IF250936U20M	20 Meg ATA FLASH slot
IF250426U520	520 Meg PCMCIA hard disk slot
LA250993X100	Eurotherm Review PC Software
HA250993X100	Eurotherm Review I & O Manual

Eurotherm Recorders Inc, One Pheasant Run, Newtown, PA 18940
Phone (215) 968-0660, FAX (215) 968-0662, Email - Sales@recorders.eurotherm.com

4100G

N C Relays / Certifications / Options / Fixed Letter — N O Relays / Form C Relays / N C Relays / Retransmission — Contact Inputs / Packed Data Slot Size / Comms — Software Opts — Math Calculations / Total, Time, Count / Custom Curve / Custom Msg.

cont. / 0 _ _ _ _ X / _ _ _ _ / _ P _ _ / 0 1 0 M / _ _ _ 0

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

digit		Check Box	
21	Fixed Digit	0 X	
22	**Certifications (SEE DIGIT 3)**		
	→ CE (European Certification)	0	std
	CSA (Canadian Std.) ***NOT ON 24/48Vdc***	5	
23	**Options (see Note 7)**		
	→ None	000	std
	Case w/ handle & cord	001	
24	**Hardware Options**		
	Fixed Letter	X X	
25	**Normally Closed Relays (see Note 5)**		
	None	0	std
	Four (one slot)	1	
	Eight (two slots)	2	
	Twelve (three slots)	3	
	Sixteen (four slots)	4	
26	**Normally Open Relays (see Note 5)**		
	None	0	std
	Four (one slot)	1	
	Eight (two slots)	2	
	Twelve (three slots)	3	
	Sixteen (four slots)	4	
	Single Pole Double Throw Relays (see Note 5)		
	None	0	std
	Three (one slot)	1	
	Six (two slots)	2	
	Nine (three slots)	3	
	Twelve (four slots)	4	
28	Analog Retransmission (see Note 2)		
	None	0	std
	Two Outputs (one slot)	2	
	Four Outputs (two slots)	4	
29	**Contact (Event) Inputs (see Note 2)**		
	None	0	std
	Six contact Inputs (one slot)	E	
30	**Data Storage (see Note 3)**		
	With ASCII & Packed Data	P X	
31	***Memory Card Size*** **(see Note 3)**		
	None	0	std
	4 Meg	B	
	8 Meg — ATA "FLASH" MEMORY CARDS	D	
	10 Meg	E	
	20 Meg	F	
	520 Meg — PCMCIA TYPE III HARD DISK CARD	8	
32	***Serial Communications*** **(see Notes 1 & 2)**		
	None	0	std
	RS485 Modbus (one slot)	1	
	RS232 Modbus (one slot)	2	
	→ RS232 File Transfer (one slot)	3	
33	Fixed Digit	0 X	
34	**Software Options**		
	Yes - Packed Logging always included	1 X	
35	Fixed Digit	0 X	
36	***Custom Messages***		
	Twenty Custom Messages	M X	***std***
37	**Math Calculations (see Note 6)**		
	→ Level I (24 DV's, basic, + - x ÷, const)	1	std
	Level II (Level I plus advanced math)	2	
	Level III (Level II plus scientific notation)	3	
38	**Totalizers, Timers & Counters**		
	None	0	std
	2 Totalizers	2	
	4 Totalizers	4	
	6 Totalizers	6	
	6 each Timers and Counters	C	
	6 each Totalizers, Timers & Counters	T	
39	**Custom Linearization Table**		
	None	0	std
	32 point curve	1	
40	Fixed Digit)	0 X	

Notes

CF = Consult Factory before specifying.

Note 1 If "00" input channels are chosen in Field 1, Serial Communications (Digit 32, choices 1 or 2) **must** be specified

Note 2 With up to 6 Inputs, there are **four** option slot positions. With 8 to 12 Inputs, there are **two** option slot positions.

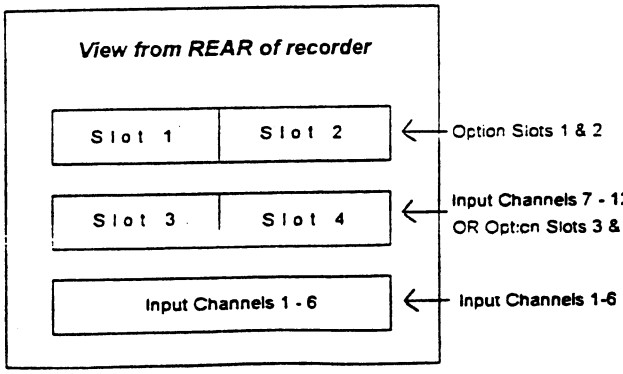
Note 3 With the Floppy Disk or ATA Flash/ PCMCIA hard disk slot drive (digit 5), Packed Data Logging (fixed # in digit 30) is standard. Packed Data logging includes configuration save/restore, and ASCII logging.

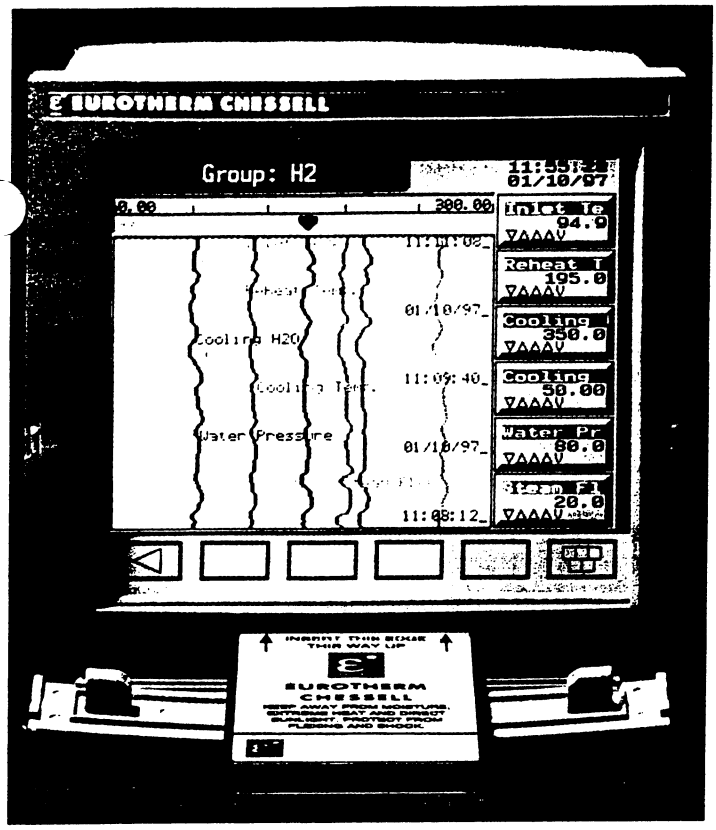
Note 4 Configuration schemes requiring significant development time will be priced individually.

Note 5 Normally Open relays are **OPEN** in alarm.
Normally Closed relays are **CLOSED** in alarm.
SPDT relays - Normally Closed contacts **CLOSED** in alarm

Note 6 Math Level III includes Level II and also permits display of values in scientific (power of 10) notation e.g. 1,000,000 can now be displayed in the form: 1.000 X 10^6 and 0.00001 is: 1.000 X 10^{-5}

Note 7 With Portable Case & TWS Options UPTO ^ ch. ONLY.





- **Full-color VGA display**
- **Touch screen convenience**
- **Up to 12 Universal input channels**
- **Vertical or horizontal trend displays**
- **Vertical or horizontal bargraph displays**
- **Versatile Alarm Summary Display**
- **3.5" Floppy disk or Type II FLASH card**
- **RS-485, MODBUS® RTU Communications**
- **Up to 24 calculated channels**
- **Built in math functions & data archiving software**

Eurotherm Chessell, the world's leading manufacturer of graphic recorders, complements its product family with the all new 100mm "paperless" recorder. The 4100G offers choice, not complexity! Choose from a range of 8 pre-configured color displays that provide the exact process information you want, presented in the way you want it. Touch screen technology makes movement from display to display quick, easy and intuitive; minimizing training. Operating and maintenance costs are reduced by eliminating pens and charts; reliability is exceptionally high due to no moving parts. Long term data storage is available through either a 3.5" floppy disk or a PC card drive that will accept Type II FLASH cards. Archived data can be downloaded to a PC spreadsheet for historical analysis. Using E-Review software, archived data can be reformatted and displayed as trends or easily down-loaded to any standard PC spreadsheet for analysis or report preparation.

Description

The 4100G Video Graphic Recorder has been designed to minimize the number of key strokes necessary to move between displays. The use of simple and straightforward hierarchical displays keeps the operator fully informed about plant operations at all times. Process information is presented in ways familiar to the operator, such as indicator face plates, contact status graphics, bar graphs, and simulated recorder charts.

Display Selection

The ease and rapidity with which the data displays can be operated using the innovative "touch screen" help to keep training requirements to a minimum. Any Group or Point on the display can be selected by simply touching that part of the screen.

Alarm Strategy

A sophisticated alarm package offers four fully configurable alarms per channel. The Alarm Summary page shows the latest 16 alarms from a history of 256 events and shows: Group and tag name, alarm type, time it became active, and the time it cleared. For ease of review, alarms can be sorted by group or point. An Alarm "go to" key quickly searches the trace history for the point selected and automatically shows the trend of the selected point at the time of alarm.

Configuration

Configuration is password-protected and accessed through the operator soft keys. This provides a simple, user friendly method of setting up the instrument with the display and touch screen. A built-in configuration port, used with PC-based configuration software, provides the advantages of off-line configuration.

Features continue on next side ...

EUROTHERM CHESSELL

4100G Video Graphic Recorder

Configuration

continued from previous side ...

Configuration can also be down loaded from the floppy disk or)ICIA card.

LCD Display

A back-lit, quarter VGA liquid crystal display using TFT (thin film transistor) technology provides exceptionally vivid color and clarity. A configurable screen saver feature reduces screen brightness between key strokes and can more than double the half-life of the screen.

Touch Screen

Resistive Touch Screen technology, combining fixed and soft keys, permits quick, easy and positive selection and movement between displays.

Historical Data Storage

The 4100G offers a choice of 3.5", 1.4M floppy disk or PCMCIA card drives as standard. Card drive is for use with a e II FLASH card. Stored includes: input and calculated channels, alarms, events, totalizer and counter values and instrument configuration. Two LOG Groups are available and can be configured to log to the Card or Disk at two independent rates. Logging can be configured to occur periodically or on alarm and/or event. All data are stored in either ASCII or a Packed Binary format depending on the user's application.

Trend Data

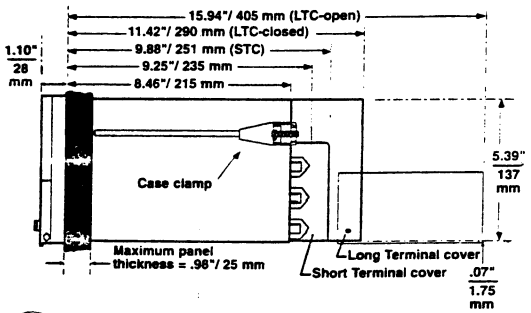
Trend data for display are stored in 1 Mb of nonvolatile FLASH memory so no data are lost on power failure. The optional 3 Mb of FLASH can expand the Trend Memory to store, for example, one month of trend history for 6 points at a 30 second update rate. A snapshot of data stored in the Trend Memory can be written to the floppy or card by recalling the desired data to the screen and using the "screen dump" feature. This feature creates a separate file of the data displayed on the screen that can be used with E-Review software.

Fast Update

Using the latest technology and individual A/D converters, the 4100G offers high speed and high accuracy data measurement and 500ms update. Stored and viewed date are current. All inputs, alarms, calculations, totalizers, etc. are completely updated twice each second.

Options

A wide range of available options permits the 4100G to be used in a variety of applications such as: Continuous Emissions Monitoring, Multistream Analysis, Humidity Calculation, Compensated Steam Flow, Sterilizers and many more. Features such as Custom Messages are ideal for batch processes permitting annotation of records based on event inputs.



CE

The 4100G conforms with the 1995 CE "Low voltage" & "EMC" directive.

®MODBUS is a registered trademark of Gould Inc.

TECHNICAL SPECIFICATIONS For the 4100G

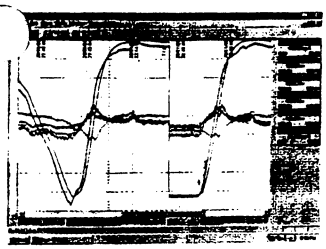
Environmental Performance	
Operating Temperature:	0–50°C
Humidity:	5% to 80% non-condensing
Protection:	IP54 Standard, IP65 (NEMA 4) optional
MTBF:	20 years
Physical	
Panel Size:	144mm x 144mm
Panel Cutout:	138mm x 138mm, +1, -0
Depth behind panel:	251mm with short terminal cover
EMC and Safety	
Electromagnetic emissions:	BS EN 50081-2
Electromagnetic susceptibility:	BS EN 50082-2
Safety:	BS EN 61010
Shock and Vibration:	BS EN 61010, 10 to 150 Hz @ 2g peak
Power Requirements	
Line Power:	90 to 264V, 45 to 65 Hz
DC Power	24–28 Vdc
Consumption:	100VA max., 20VA typical
Preservation of realtime clock is assured with a NiCad battery.	
LCD Display	
Type:	Color TFT, quarter VGA with cold cathode backlighting
Size:	111mm x 84mm
Resolution:	320 x 240 pixels
Screen Brightness:	Configurable from 20% to 100%
Touch Screen	
Type:	Transparent analog format
MTBF:	> 1 million operations
Update Rate	
Inputs update each 500ms. Complete system update each second.	
Alarms	
Number:	4 alarms per channel
Type:	High, Low, Deviation, Rate of Change
Communications	
Wiring:	RS485–wire
Protocol:	MODBUS RTU
Data Storage	
Standard:	Choice of 3.5" 1.4M floppy disk or PC card drive for use with Type II FLASH card
Universal Inputs	
Types of inputs:	Thermocouple, RTD, dc Volts, dc mAmps, ohms, dry contact inputs.
Thermocouple types :	B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel
RTD types:	2 or 3 wire, Pt100, Pt100A, Pt1000, Ni100, Ni1000, JPT100, Cu10
Contact Inputs Isolation:	>10Mohm up to 1 V; 245k ohm 1 to 10V (dc to 65Hz; EN61010)
Options:	
Totalizers:	six, 8 digit totalizers
Timers:	six configurable timers
Counters:	six, 8 digit counters
Derived Channels:	24 configurable
Custom Messages:	20 with embedded sequences
Output Relays:	up to 16 500VA/60W, 250V resist.
Math Level II:	Basic plus 24 advanced calculations
Analog Retransmission	4 configurable outputs
Transmitter Power Supply	Up to six channels

EUROTHERM RECORDERS, INC.
One Pheasant Run • Newtown, PA 18940 • U.S.A.
(215) 968-0660 • FAX: (215) 968-0662
www.eurotherm.com/chessell • e-mail: sales@recorders.eurotherm.com

EUROTHERM CHESSELL

 Printed in U.S.A. CHS-973/598CH10M IA205919/4

A powerful tool for reviewing, analyzing, and printing data obtained from paper and paperless recorders.

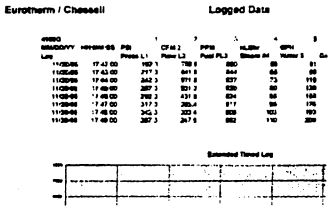


- **View historical data on screen**
- **Modify and compress displayed data**
- **Display trend data in color**
- **Combine data from different recorders**
- **Source data remains secure**
- **Output data to any printer**
- **Windows 95, NT and 3.1 compatible**

Eurotherm Chessell, the world's leading manufacturer of high quality, reliable recorders, offers E-Review, a powerful tool for the analysis and utilization of stored data.

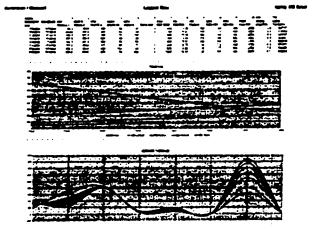
Running under all current Windows packages, E-Review provides an easy way to review your stored data by points, time, and sources. For example, using E-Review's flexibility, you can view and print yesterday's process or batch with today's or one from a week ago by calling up two or more chart windows on screen.

The E-Review Software is a powerful package designed to view and print historical data produced from a range of Chessell recorders and data acquisition instruments. Designed to run on Windows 95, Windows NT 4.0 or Windows 3.1X platforms, analysis of data could not be simpler. All channels retain their original color traces, identifiers, and scales ensuring ease of comparison.



SOURCE DATA REMAINS SECURE

Source Data is retained in an encrypted database produced by Eurotherm Chessell recorders and data acquisition equipment that logs data to floppy disks or PC cards. This encrypted format provides data security -- once written the stored data cannot be changed.

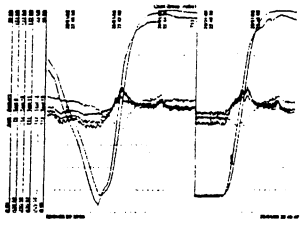


SIMPLE DATA MANAGEMENT

Once within the PC environment, recorder data is stored on hard disk for easy instant access. It can be viewed, analyzed, exported, and manipulated, using any software package in the same way as any other PC data.

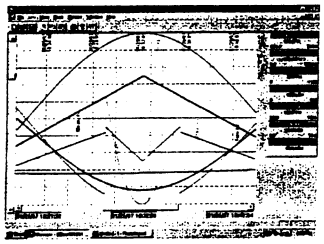
DATA EXPORT

Data is easily copied to the Windows clipboard for integration into other reporting packages such as spreadsheets or word processors. This facilitates the production of professional-looking documents and reports. Displayed data can also be exported as ASCII comma delimited files, from the raw data, for transfer to other software packages.



PRINTER OUTPUT

Any Windows supported printer will produce attractive hard copy outputs in black and white or color. Process data displayed can be printed with scales, time markers, and channel identifiers.



SYSTEM REQUIREMENTS

Minimum PC platform:
386DX PC running DOS 6.0 and Windows 3.1X with 8 Mbytes RAM.
Recommended systems:
Pentium PC running Windows 95 with 8 Mbytes RAM or Windows NT with 16 Mbytes RAM.

In all cases, 5 Mbytes of free disk space is required for installation, plus additional free space for data storage.

EUROTHERM CHESSELL

E-Review Software

4100G

EUROTHERM
CHESSELL

Model 4100G
Video recorder

Installation and
operation manual

EUROTHERM CHESSELL

Declaration of Conformity

Manufacturer's name:	**Eurotherm Recorders Limited**
Manufacturer's address	**Dominion Way, Worthing, West Sussex, BN14 8QL, United Kingdom.**
Product type:	**Industrial video recorder**
Models:	**4100G (Status level E6 or higher)**
Safety specification:	**EN61010-1: 1993 / A2:1995**
EMC emissions specification:	**EN50081-2 (Group1; Class A)**
EMC immunity specification:	**EN50082-2**

Eurotherm Recorders Limited hereby declares that the above products conform to the safety and EMC specifications listed. Eurotherm Recorders Limited further declares that the above products comply with the EMC Directive 89 / 336 / EEC amended by 93 / 68 / EEC, and also with the Low Voltage Directive 73 /23 / EEC

Signed: PRJ de la Nougerède Dated: 18-12-96

Signed for and on behalf of Eurotherm Recorders Limited
Peter De La Nouger de
(Technical Director)

CE

IA249986U500 Issue 2 Dec 96

YEAR 2000 COMPLIANCE

YEAR 2000 COMPLIANT

All software versions of the above listed product comply with the requirements of the British Standards Institute document 'Disc PD2000-1. A Definition of Year 2000 Conformity Reqirements', when the product is used as specified in this manual.

100 mm Graphics Unit

Installation and Operation Manual

Overall contents list

(Continued)

CONTENTS LIST (CONT.)

Safety Notes

1. Before any other connection is made, the protective earth terminal  shall be connected to a protective conductor. The Mains (supply voltage) wiring must be terminated in such a way that, should it slip in the cable clamp, the Earth wire would be the last wire to become disconnected.

WARNING!

Any interruption of the protective conductor inside or outside the apparatus, or disconnection of the protective earth terminal is likely to make the apparatus dangerous under some fault conditions. Intentional interruption is prohibited.

Note: In order to comply with the requirements of safety standard EN61010, the recorder shall have one of the following as a disconnecting device, fitted within easy reach of the operator, and labelled as the disconnecting device.

a. A switch or circuit breaker which complies with the requirements of IEC947-1 and IEC947-3
b. A separable coupler which can be disconnected without the use of a tool
c. A separable plug, without a locking device, to mate with a socket outlet in the building

---

2. Whenever it is likely that protection has been impaired, the unit shall be made inoperative and secured against unintended operation. The nearest manufacturer's service centre should be consulted for advice.
3. Any adjustment, maintenance and repair of the opened apparatus under voltage, should be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.
4. Where conductive polution (e.g. condensation, carbon dust) is likely, adequate air conditioning/filtering/sealing etc. must be installed in the recorder enclosure.
5. Signal and supply voltage wiring should be kept separate from one another. Where this is impractical, shielded cables should be used for the signal wiring. Where signal wiring is carrying (or could carry, under fault conditions) hazardous voltages *, double insulation should be used.
6. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment might be impaired.
7. In the case of portable equipment, the protective earth terminal must remain connected (even if the recorder is isolated from the mains supply) if any of the I/O circuits are connected to hazardous voltages*.
8. In the case of portable equipment, output relays should not be used to switch voltages greater than 30V RMS (42.4V peak) or 60V dc.

* A full definition of 'Hazardous Voltages' appears in BS EN61010. Briefly, under normal operating conditions Hazardous voltage levels are defined as >30V RMS (42.4V peak) or >60V dc.

Symbols used on the recorder labelling

One or more of the symbols below may appear on the recorder labelling.

	Refer to the Manual for instructions
	Protective Earth
	This recorder for ac supply only
	This recorder for dc supply only.
	Risk of electric shock

Static electricity

All circuit boards associated with the recorder contain components which are susceptible to damage caused by static electrical discharge of voltages as low as 60 Volts.

Should it be necessary to handle such circuit boards, appropriate precautions must first be taken to ensure that the recorder, the circuit board, the operator and the work area are all at the same electrical potential.

Touch screens

CAUTION

The touch-sensitive screen used in this product is designed for use by hand only. The use of sharp or pointed implements such as pens, keys and fingernails to operate the instrument must be avoided, or irreperable damage will be done to the surface material. When cleaning the touch-screen, a moist cloth should be used, if necessary with a minimal amount of mild soap solution.

ALCOHOLS SUCH AS ISO-PROPYL ALCOHOL MUST NEVER BE USED ON THE SCREEN.

SCREEN DIMMING

In order to maximise screen life, the brightness of the display is reduced, from its normal 60% of full brightness to 20% of full brightness five minutes after the last operation of the touch screen. The display returns to normal (60%) brightness as soon as the screen is touched again. The 'normal' and dim brightnesses and the 'time-to-dim' can all be edited in 'Instrument configuration' described in section 5.2.

Section 1

INSTALLATION

Contents **Page**

Section 1 Installation

1.1 UNPACKING THE RECORDER

The recorder is despatched in a special pack designed to give adequate protection during transit. Should the outer box show signs of damage, it should be opened immediately and the recorder examined. If there is evidence of damage, the instrument should not be operated and the local representative contacted for instructions. After the recorder has been removed from its packing, the packing should be examined to ensure that all accessories and documentation have been removed. Once the recorder has been installed, any internal packing should be removed, and stored, with the external packing against future transport requirements.

1.2 INSTALLATION

1.2.1 Mechanical installation

Mechanical installation details are shown in figure 1.2.1

The recorder is inserted through the panel aperture from the front of the panel. With the weight of the recorder supported, the panel clamps should be inserted into one opposite pair of the rectangular apertures (either at the top and bottom or at the right and left sides) of the recorder. The jacking screws should then be tightened sufficiently to clamp the recorder into position.

EXCESS FORCE SHOULD NOT BE USED IN TIGHTENING THESE SCREWS, since any resulting distortion of the recorder case may render the recorder inoperative.

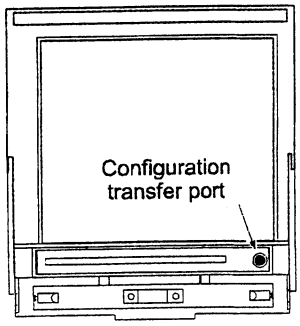
1.2.2 Electrical installation

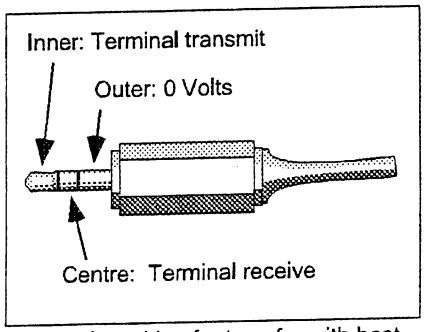
Details for connecting the line supply and for signal wiring are shown in figure 1.2.2. Before carrying out wiring, read the safety notes in Section i above.

Configuration transfer wiring

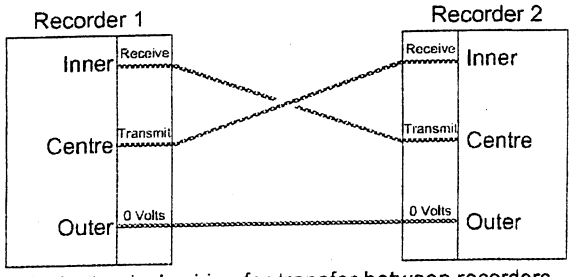
The configuration port is located behind the lower cover flap as shown.

See section 4.12 for details of the configuration transfer facility.

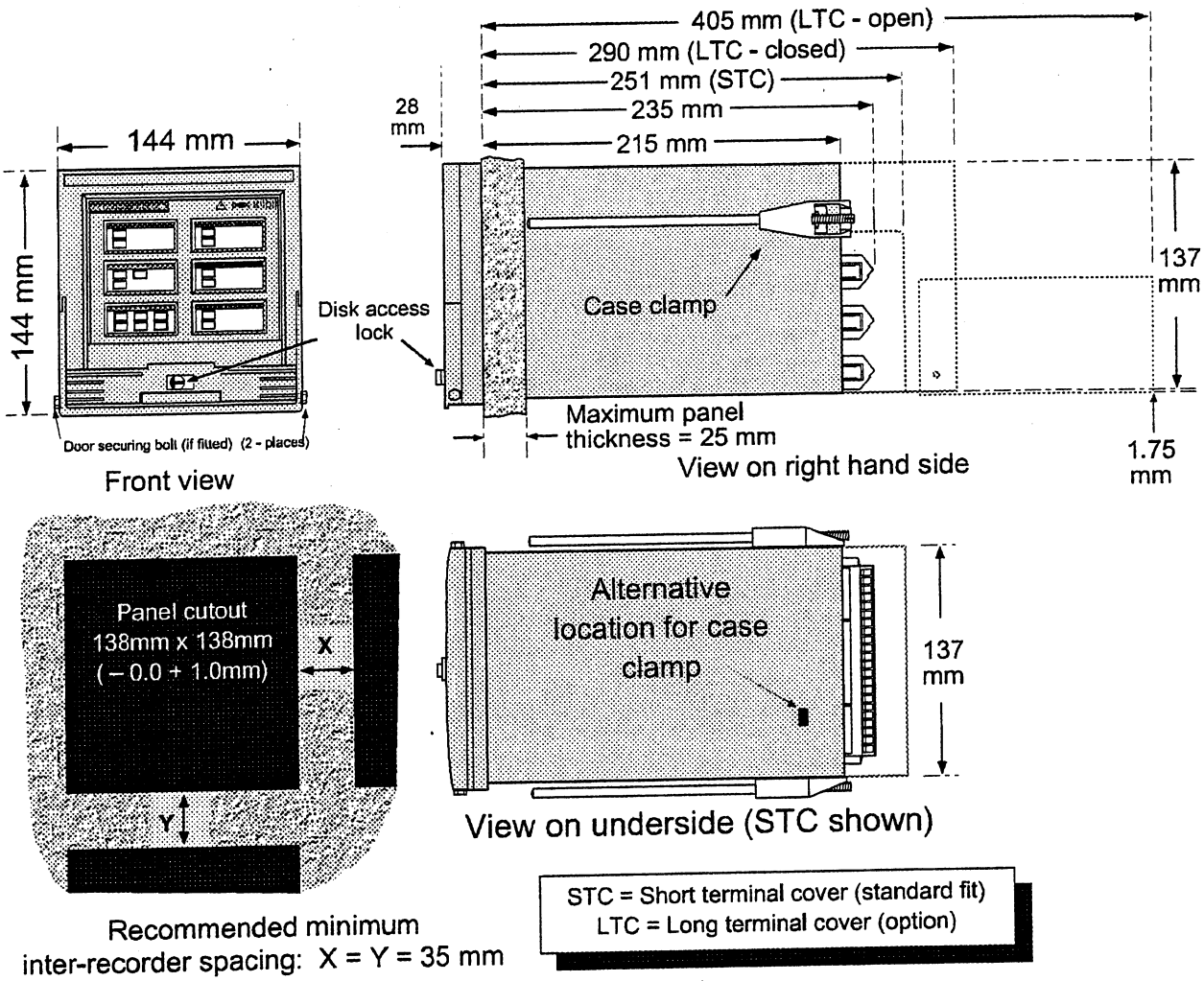




Jack plug wiring for transfer with host computer/dumb terminal



Jack - to - jack wiring for transfer between recorders



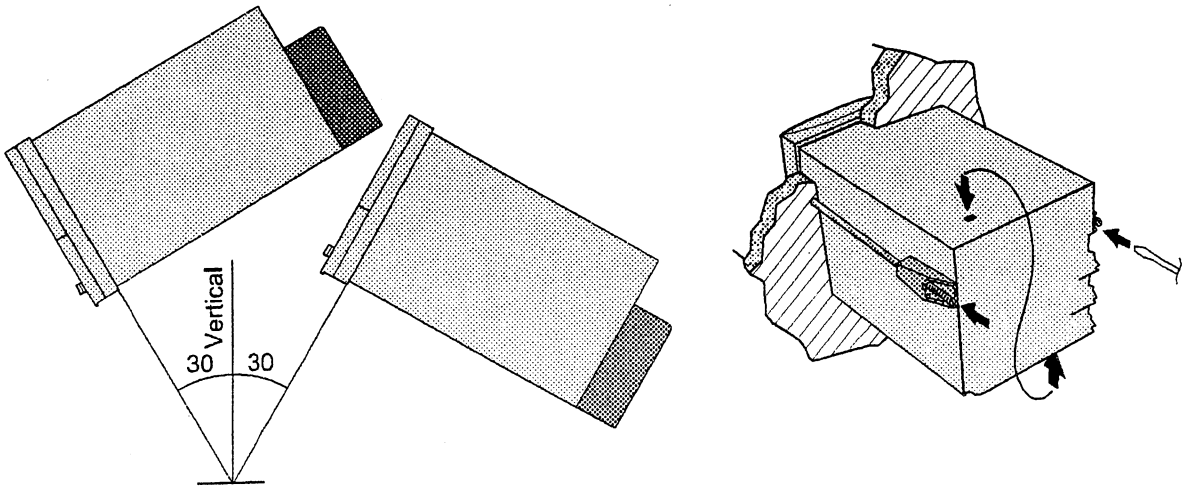
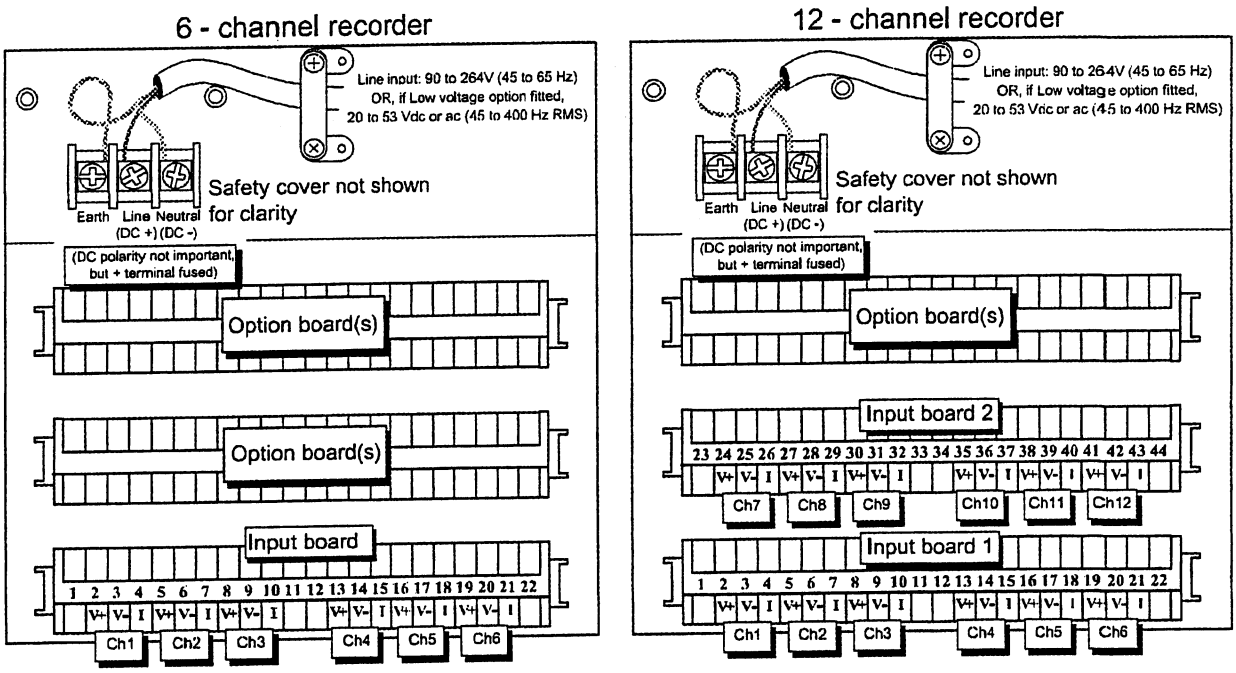


Figure 1.2.1 Mechanical installation



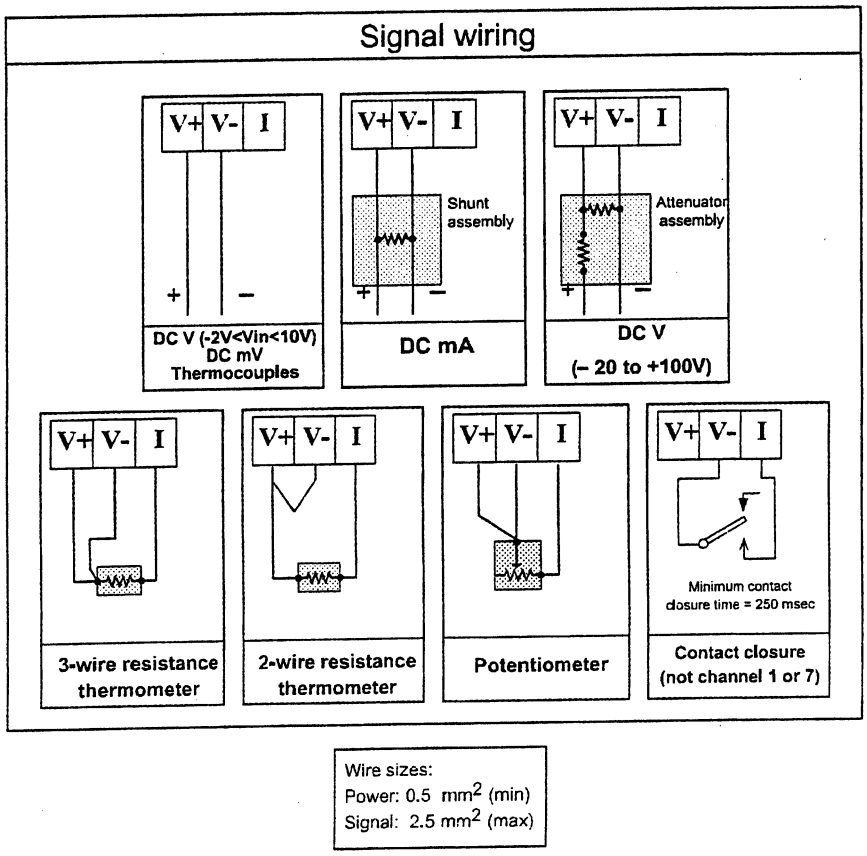


Figure 1.2.2 Electrical Installation

1.3 PREVENTIVE MAINTENANCE

1.3.1 MAINTENANCE SCHEDULE

3-yearly Change battery

1.3.2 Changing the battery

The following procedure applies to recorders fitted with the replaceable coin-cell lithium battery (BR2330 or similar) available from the recorder manufacturer under part number PA261095. Such batteries have been fitted as standard since Status level T35 (November 1999). Recorders manufactured prior to this were fitted with a Nickel-Cadmium battery permanently mounted on a replaceable circuit board (Part No AH249860). If your recorder is fitted with such a board, it should be replaced with the new coin-cell board (AH261096), using kit LA261398. This kit contains full instructions for the replacement.

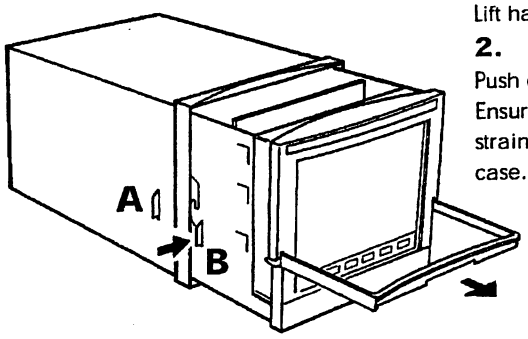
Configuration is retained during battery replacement. volatile values (e.g. time, date, totaliser and maths values) are also retained providing that the recorder has been powered for at least 1 hour prior to the start of the battery replacement procedure.

EQUIPMENT REQUIRED

In addition to normal Pozidriv and slotted-head screwdrivers, the following tools are required.

1. Plastic tweezers
2. 'Stubby' or 'offset' Pozidriv screwdriver (optional)

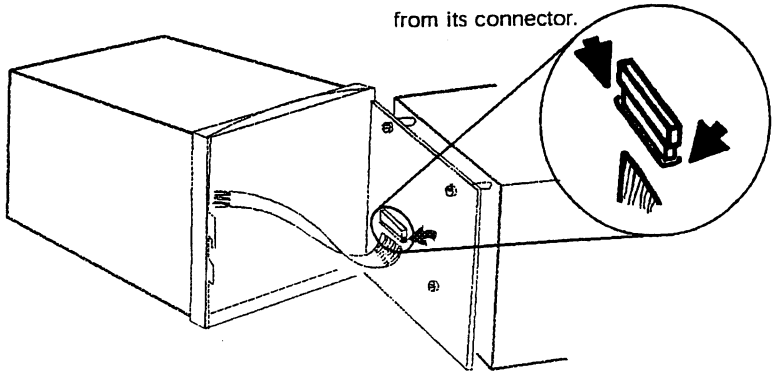
ACCESS TO THE BATTERY BOARD

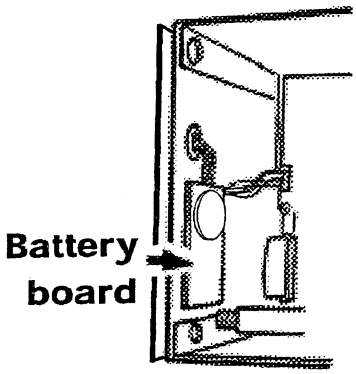


1.
Lift handle and pull until catch A engages

2.
Push catch 'B' in, to unlatch the chassis. Ensuring that the internal flexi-cable is not strained, pull the chassis gently out of the case.

3.
Gently push connector 'ears down to release the flexi-cable from its connector.





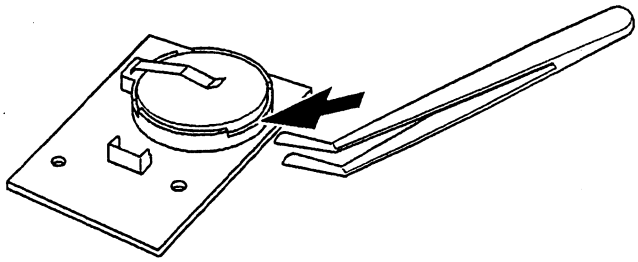
4.
Remove the chassis from the case, and remove the battery board by disconnecting the on-board connector and undoing the two screws.
(See the additional instructions below, if these screws cannot be accessed.)

Place the board on a non-conductive surface (there are no static-sensitive components on this board) and replace the battery as shown below.

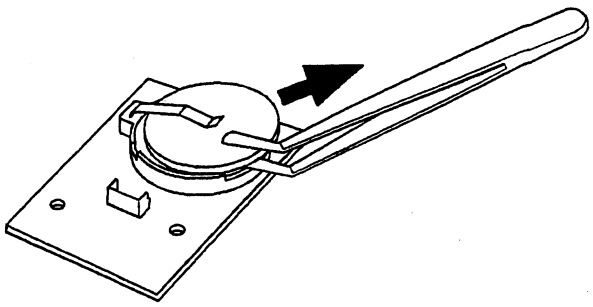
BATTERY REPLACEMENT

Once access to the board has been gained, this procedure is simply a matter of extracting the battery from its holder, as shown below, and pushing the replacement into place, ensuring correct polarity (+ to top),

A PLASTIC or other NON-CONDUCTIVE tool must be used to extract the battery. Use of metal tools will discharge the battery. Plastic tweezers, such as those shown below are available from electronics components distributors..



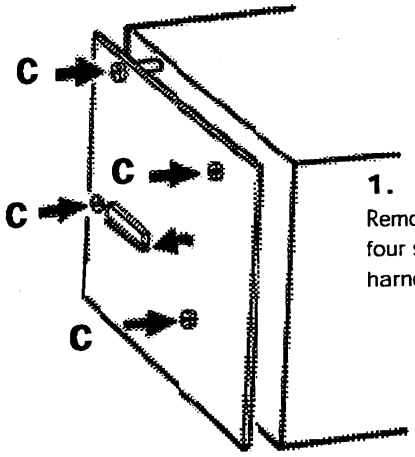
1.
Insert the PLASTIC tweezers (or other non-conductive tool.



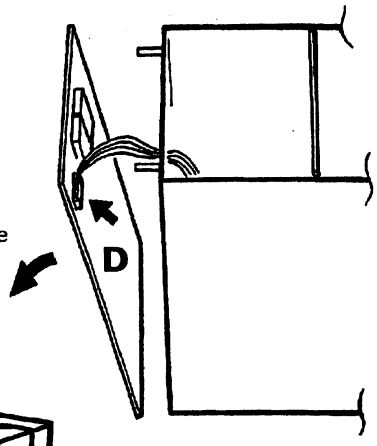
2.
Grasp the battery and pull it out of its holder

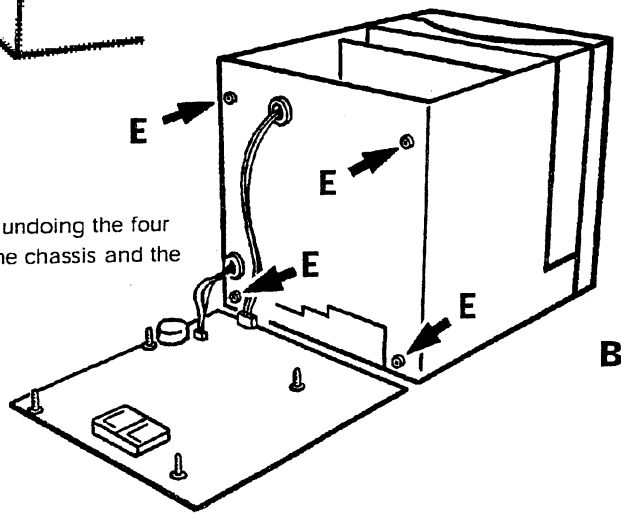
ACCESS TO THE BATTERY BOARD (Cont.)

If the battery board screws cannot be accessed, the back plate of the recorder can be removed as desribed below, and the battery replaced with the board in-situ.

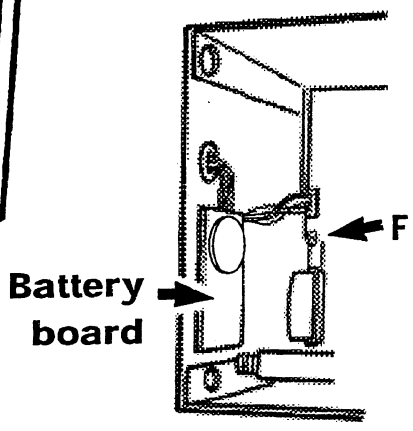


1.
Remove the SBC circuit board by removing its four securing screws (C) and disconnecting the harness connecror (D)





2.
Remove the backplate by undoing the four screws (E) at the rear of the chassis and the single screw (F) 'inside'.



Section 2: Basic Operation

Contents list

Section 2: Basic Operation

2.1 FIRST SWITCH ON

When power is first applied to the recorder, it sets itself up with data which was entered by the manufacturer. In order to make the recorder do what you want it to, this 'Default configuration' has to be modified to suit your particular needs. Figure 2 below shows the various push keys that you will need to do this.

The larger part of section 2 shows you how to set up a channel to an imaginary set of conditions. Once you have done this, setting up the recorder for your own needs should be straight forward. Sections 4 and 5 of the manual are reference guides to the Operator and Configuration display pages respectively so if there is any item which appears in these displays, which you need further information about, these sections should help. Section 3 shows the different ways in which you can display the recorded data.

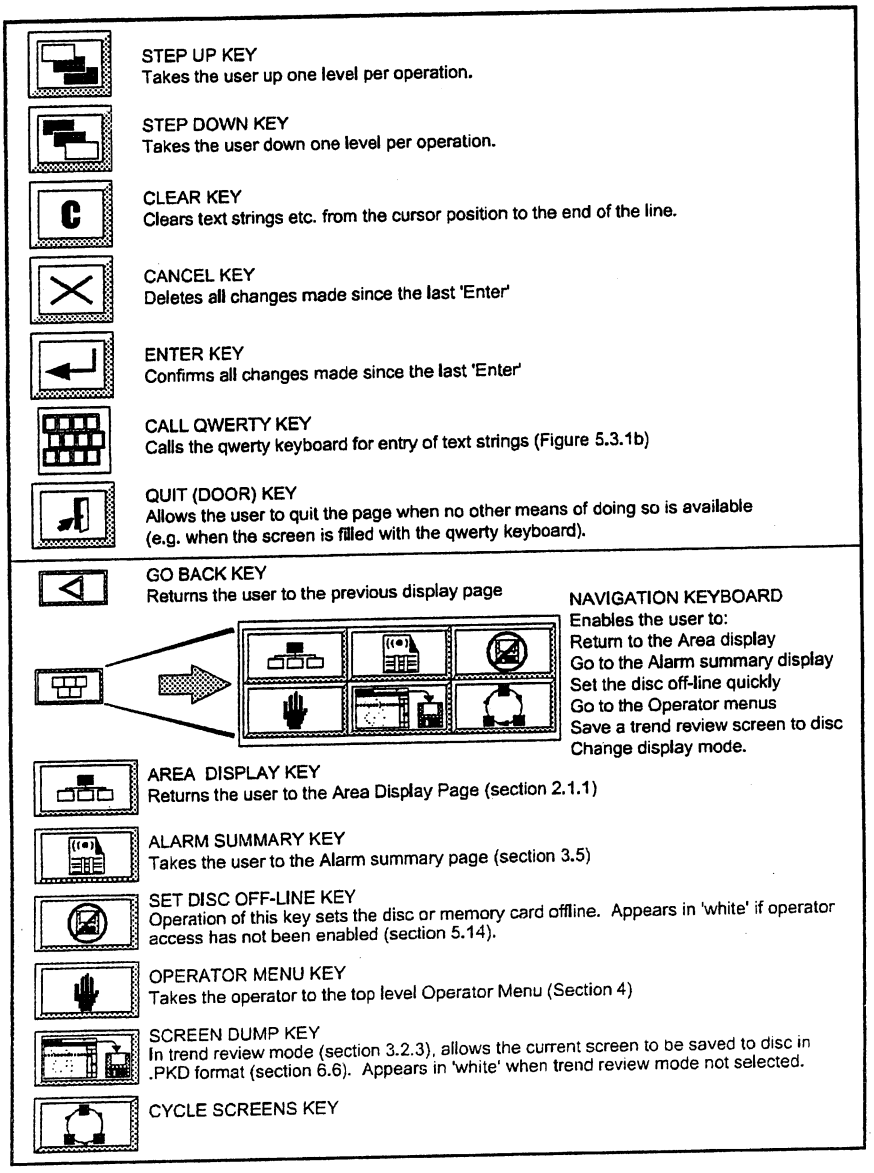


Figure 2 Key Functions

2.1.1 Area Display

This is the name given to the display page which appears when you apply power to the recorder.

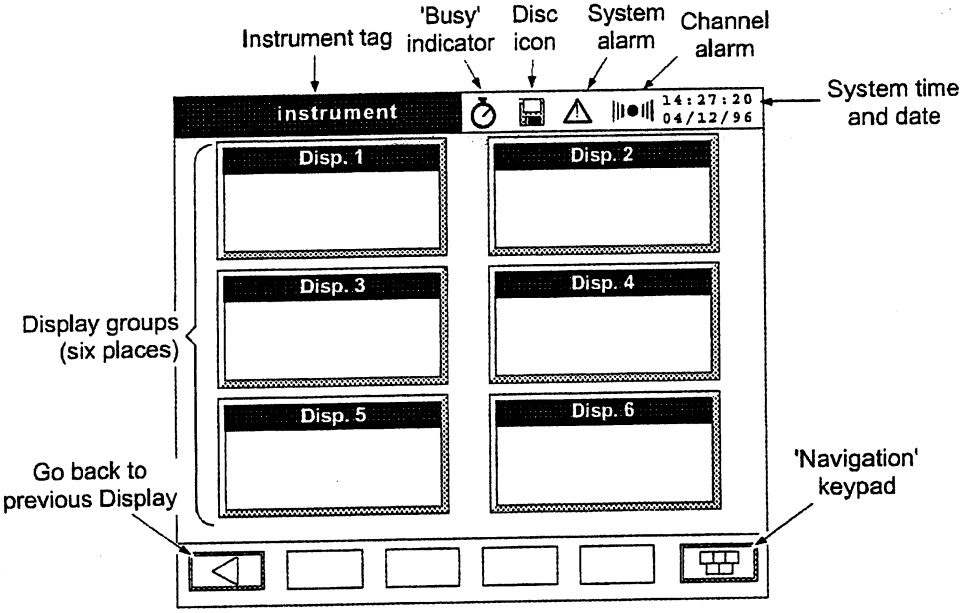
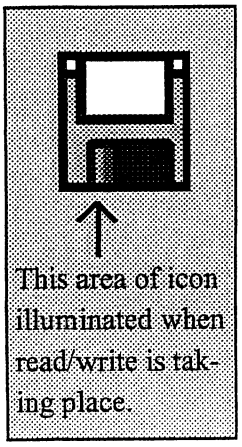


Figure 2.1.1 Area Display Page

As shown in figure 2.1.1 above, the Area display page contains 6 group displays (initially empty) and the following items in a 'Title' bar across the top of the page.

Instrument tag	The title bar initially contains the Instrument tag (up to 16 characters) as set up in 'Instrument' configuration. Other text strings (e.g. Group title) appear depending upon what the recorder is doing.
'Busy' indicator	This 'stopwatch' is used only during trend history, and therefore does not appear on this Area display page - it is included here for completeness. The drawing of history traces is carried out in two stages: a set of initial traces for immediate viewing, replaced by the complete traces after a time period, the length of which depends on the complexity of the history. The stopwatch is displayed, with the hand rotating clockwise, for the duration of this time period.
Disc icon	Appears when a PC card is correctly inserted in the slot*. A small area of the icon illuminates when the card or disc is being read from or written to.
System Alarm	This appears if a System alarm becomes active. See section 4.7 for a list of possible causes.
Channel alarm	This icon appears if any channel alarm becomes active.
Time and date	System time and date appear at the top right of the display.



Two further keys appear at the bottom of the screen:

Go Back	Although not used in this, our first page, pressing this area in any subsequent display causes the previously displayed page to be recalled.
Keypad	Contains a number of keys to help find our way through the displays. Figure 2.1.2 shows what happens if you press this area.

*Note: With floppy discs, the icon does not appear until the disc is first accessed, after which it will remain on display until the disc is ejected.

2.1.2 Keypad

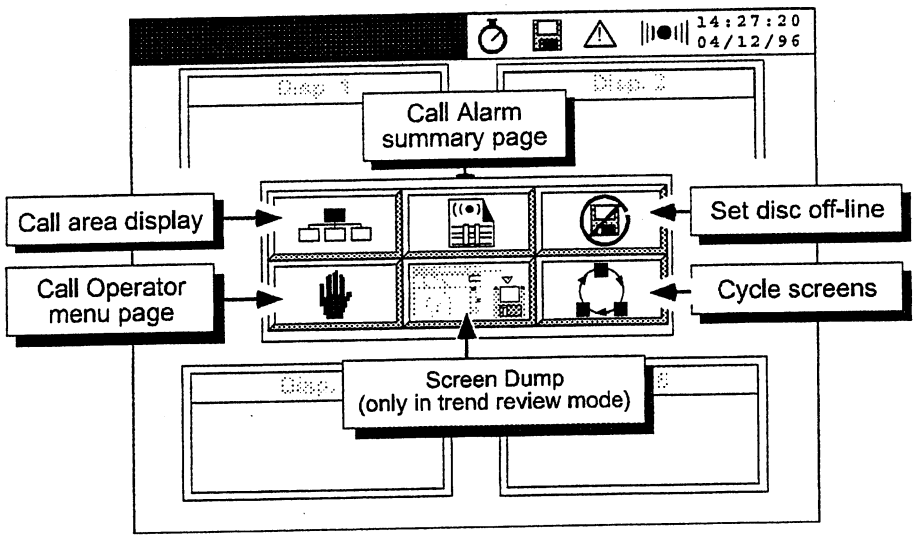


Figure 2.1.2 Keypad functions

The keypad contains the following keys

Call area display	Available from any display other than the Area display itself.
Alarm summary	Takes the user directly to the 'Alarm summary' display which lists up to 256 alarm events in pages of 16. See section 3.5 for a fuller description.
Disc offline	Takes the user straight to the Disc offline display page described in section 6.4.4. If the operator is not permitted to switch the disc on/off, the icon appears in 'white'.
Operator menu	Operation of this key calls the Operator menu page which allows access to all the recorder operation and configuration functions.
Cycle screens	This key allows the user to scroll through the different ways of displaying the recorder process variables (points). Not active from the Area page.
Screen dump	Appears only in Trend Review mode - see section 3.2.3

Process Variable (PV)

The generic name given to any input or derived channel, or totaliser or counter value. Process variables are also referred to as 'Points'

2.1.3 Display Groups

There are 6 display groups available, each of which can have 6 points associated with it. The content of each group is defined by the user in 'Group' Configuration. The points in one of these groups can be 'traced' on the display as though the display is a traditional chart, with a configurable number of divisions. Alternatively, the points can be displayed as bargraphs, or as digital values. See section 3 for further information.

As shown above, each group appears as a rectangle in the area display. When the recorder is delivered, all the groups are empty. Once a group is configured to have one or more points in it, these points are represented by smaller rectangles within the group icon (figure 2.1.3). If any of the points has an active alarm, its 'box' is filled red, either flashing (unacknowledged) or steady (acknowledged).

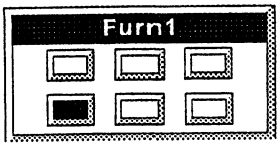


Fig 2.1.3
Group Display (Area Page)

The amount of tracing that the recorder can hold in its memory depends upon (amongst other things) what the total number of points is and what type of points they are (digital inputs take much less memory space than analogue inputs). The examples below show recording periods for some typical configurations, both for the standard recorder memory of 800kB and for the extra memory option (2.8 MB).

TRACE TIME EXAMPLES

Scan Rate (seconds)	1 point	3 points	6 points	12 points
1	1.5 days	16 hrs	9 hrs	4.2 hrs
2	2.9 days	1.3 days	17.25 hrs	8.4 hrs
5	7.3 days	3.3 days	1.8 days	21 hrs
10	14.6 days	6.5 days	3.7 days	1.8 days
30	1.5 months	19.5 days	11 days	5.3 days
60	2.9 months	1.3 months	22 days	10.5 days
120	5.8 months	2.6 months	1.5 months	21.0 days

Table 2.1.3a Approximate total trace times (standard 800 MB memory)

Scan Rate (seconds)	1 point	3 points	6 points	12 points
1	4.4 days	2 days	1.1 days	13 hours
2	8.8 days	3.9 days	2.2 days	1.1 days
5	21.9 days	9,8 days	5.5 days	2.6 days
10	1.5 months	19.5 days	11.0 days	5.3 days
30	4.4 months	2 months	1.1 months	15.8 days
60	8.8 months	3.9 months	2.2 months	1.1 months
120	17.5 months	7.8 months	4.4 months	2.1 months

Table 2.1.3b Approximate total trace times (optional 2.8 MB memory)

ADAPTIVE RECORDING

With slow trace speeds, it is possible for one screen pixel (dot) to cover a number of readings. Under normal trending conditions, the trace shows only the instantaneous value of the signal at the time the dot is placed and it is thus possible that fast transients can be missed. A feature called 'Adaptive Recording' solves this problem by placing extra dots on the screen (without 'chart' movement), effectively plotting the minimum and maximum values reached by the signal during one pixel height. Adaptive recording is enabled in Group configuration, and when enabled, it applies to every point in the group. This should be borne in mind as adaptive recording reduces the total trace time available, each point with adaptive recording being equivalent to two normal points of the same type.

Under normal tracing, the value shown on the faceplate is the instantaneous value of the trace whether adaptive recording is enabled or not. See also trend review - section 3.2.3.

2.1.4 Other groups

LOG GROUPS

If a disk archive option is fitted, two further groups Log 1 and Log 2 appear in the right hand pick list. The contents of these groups are defined in Group Configuration (section 5.4.1).

Two files (Archive 1 and Archive 2) are defined in Archive Configuration (section 6.6). The contents of log 1 are sent to the filename defined in Archive 1, and the contents of log 2 are sent to the filename defined in Archive 2.

Archiving can be initiated in three ways as follows:

OPERATOR INITIATION
As shown in section 4.9, the operator can use the 'Enter' key to log either log 1 or log 2 at any time.

JOB ACTION
Two jobs are available (Log 1 to archive 1 and Log 2 to archive 2) to initiate a log when the job goes active, goes inactive or on alarm acknowledgement.

AUTOMATICALLY (LOG 2 ONLY)
Two archive intervals ('A' and 'B') can be set up in Archive 2 configuration. The contents of log 2 are subsequently saved to the filename defined in Archive 2 at interval A unless archive interval B has been selected by job action. Setting the interval to 00:00:00 stops automatic archiving.

DV GROUP

If the relevant options are fitted, the DV group can be used to assemble derived channels, totalisers etc. to be averaged, group reset/preset etc.

2.2 CONFIGURING A CHANNEL

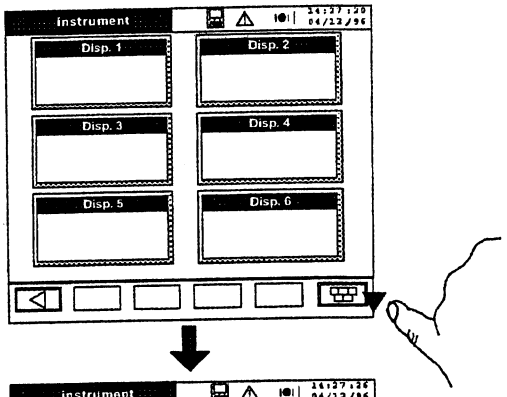
This section describes how to set up a channel to the following set of parameters:

Channel Number ..... 3 (section 2.2.2)
Input range ..... 0 to 900°C (section 2.2.3)
Input type ..... Type K Thermocouple (section 2.2.3)
Chart span ..... 400 to 800°C (section 2.2.3)
Input break response ..... Drive high (section 2.2.3)
Tag ..... Furnace1 TempB (section 2.2.3)
Alarm type ..... Absolute high, Latching (section 2.2.4)
Alarm threshold ..... 780°C (section 2.2.4)
Alarm job ..... Sound Buzzer until acknowledged. (2.2.4)
Trace type ..... Green, 5 division, linear (section 2.2.5)
Group name ..... Furn1 (section 2.2.6)
Chart divisions ..... 5 (section 2.2.6)

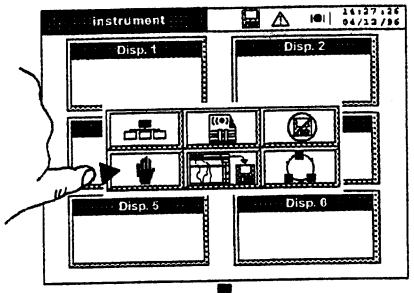
2.2.1 Access to Configuration

Note: The recorder is despatched with the password 00010

From the Area Page, press the keypad icon, then the 'Hand' key.



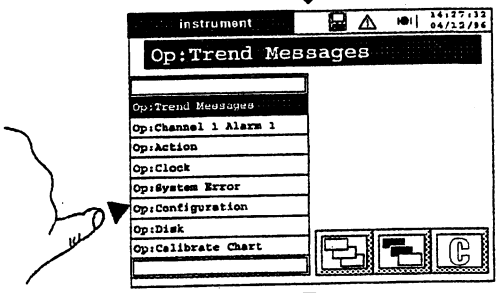
This results in the appearance of the top level operator menu display.



Either press in the 'Op:Configuration' area, or run your finger down the array until 'Op:Configuration' is 'highlighted'

(Highlighted means that the background colour changes to yellow to indicate you have selected the correct area).

Note the appearance of three new keys at the bottom of the screen. Although not all of their icons are visible on this display page,, they are (from left to right) 'Step up', 'Step down' and 'Clear'

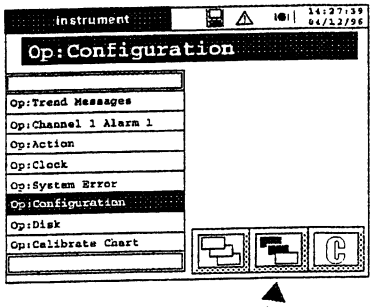


'Step up' takes you to a higher level of the menu structure that you are in.

'Step down' takes you to the next lowest level of menu

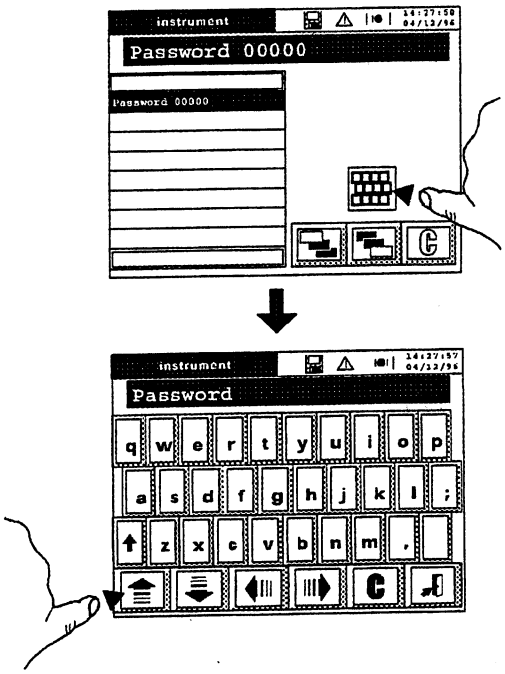
'Clear' is used when entering text or numerical strings.

Press the 'Step down' key.



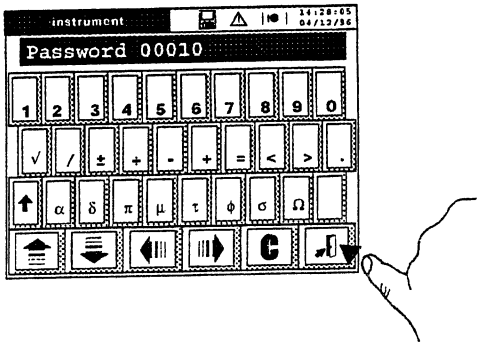
2.2.1 ACCESS TO CONFIGURATION (Cont.)

Press the 'Call Qwerty' icon to call the first of the keyboards to the display.



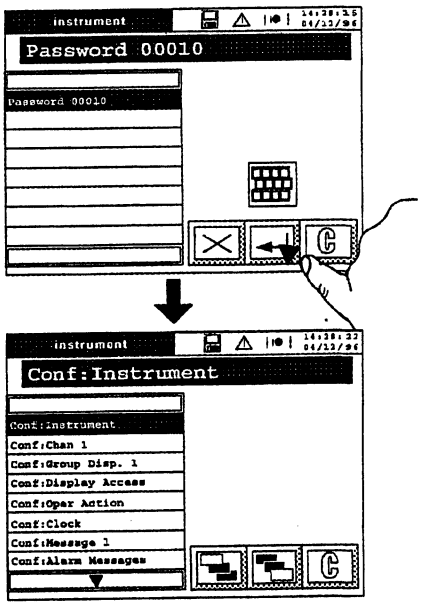
Operate the Up key to access the numeric keyboard.Enter 00010

Note that the configuration item and its current value are shown in the status line near the top of the display. If any change is made to this value, its colour changes from green to red to indicate that a change has taken place.



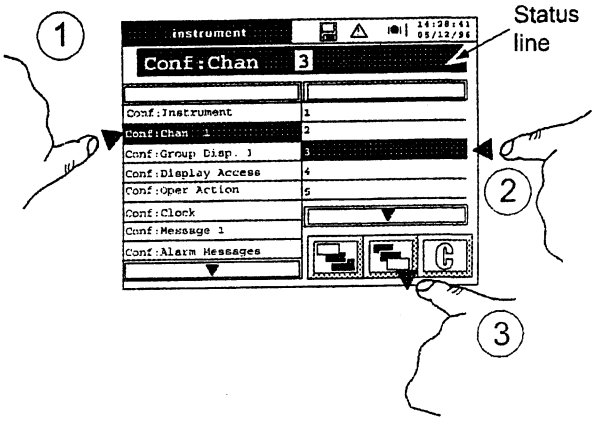
Press the door (quit) icon then the Enter key to call up the complete configuration list.

2.2.2 Channel number selection



Press, or run your finger up the list to highlight the 'Conf:Chan 1' item. When selected, the right-hand side of the display shows a 'pick list' of all the available channel numbers with the current selection in a different colour from the others.

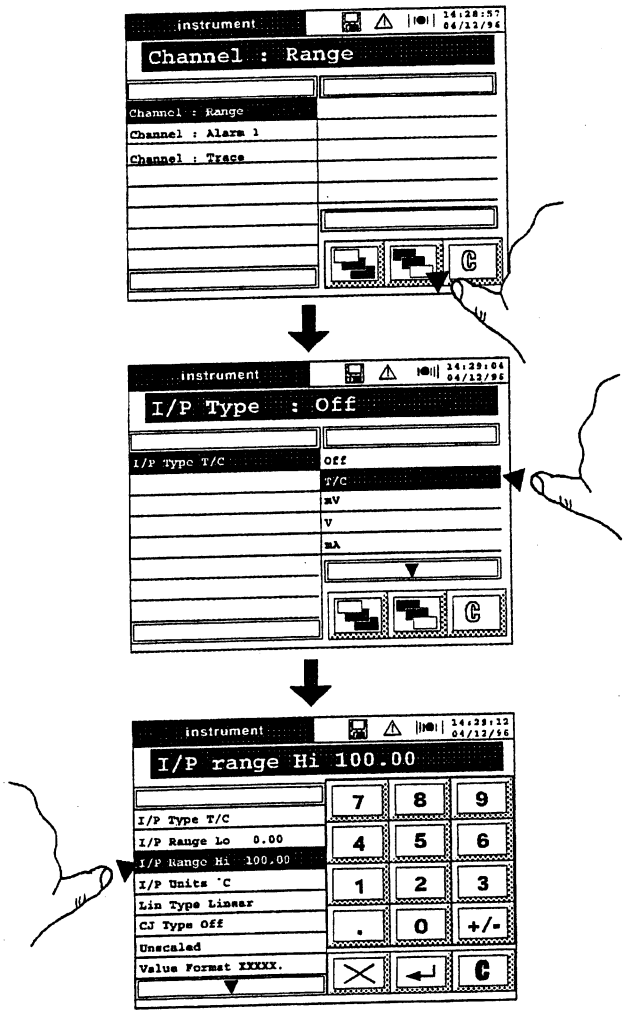
Channel N°3 is selected by pressing area 3 or running the finger up or down the list until '3' is highlighted. The selected channel's configuration is then accessed by pressing the Step down key.



2.2.3 Input range configuration

INPUT RANGE

Enter Range Configuration using the Step down Key.



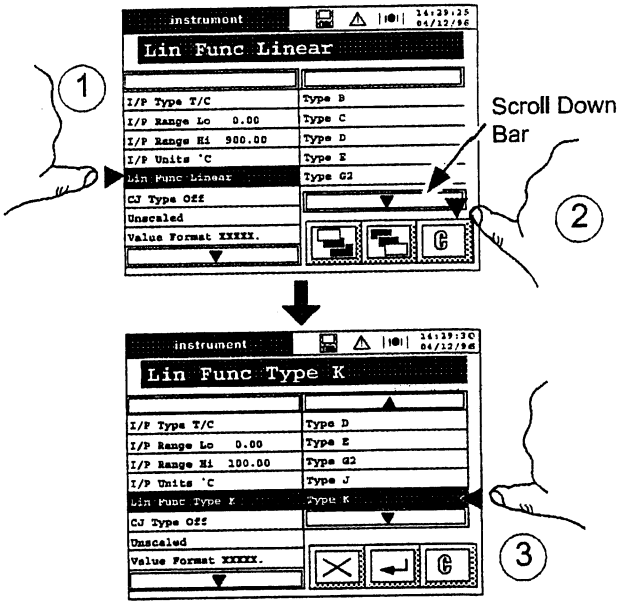
Select T/C (Thermocouple) as input type.

As can be seen, the default 'I/P Range lo' value is 0.00 which is as required, so select 'I/P range Hi'.

As soon as the 'I/P range Hi' area is highlighted, a keyboard appears to allow a value to be entered.

Type '900' using the keyboard, then as the default Inputs units are °C, which is what we want, we can go straight to Linearisation type.

LINEARISATION TYPE



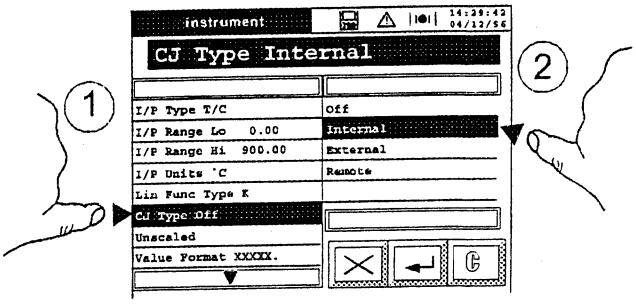
initial list. The down pointing arrow in the scrollbar below the list tells us that there are more items in the scroll list, and if you press the scroll bar a couple of times, 'Type K' will appear.

Select type K as the linearisation function.

CJC TYPE

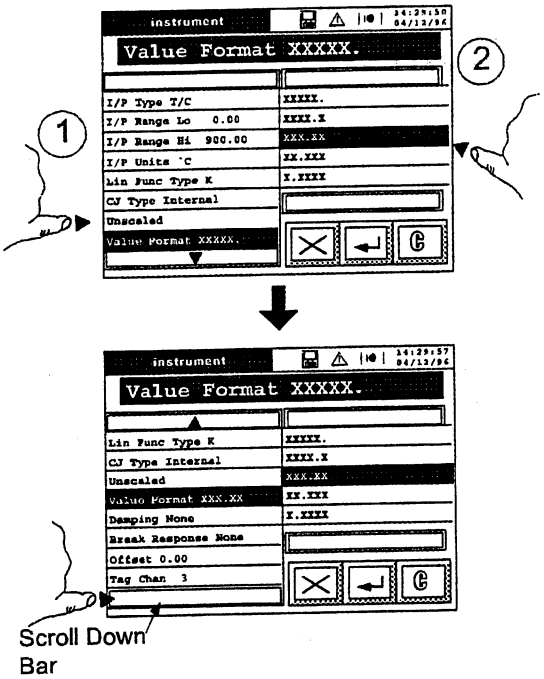
Select CJC from the left side of the screen. The Right hand half of the screen contains the CJC types that are selectable.

Select 'Internal'.



2.2.3 CHANNEL CONFIGURATION (Cont.)

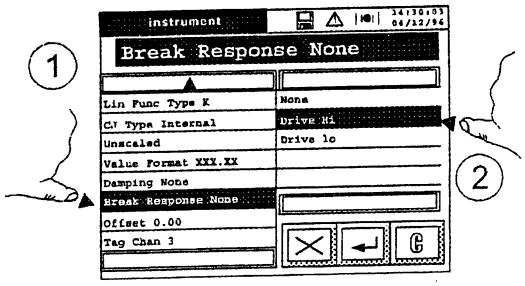
As we don't want to scale the input, we can ignore this item ('Unscaled') and go straight to Value Format. The value format required is XXX.XX, so select this item from the right-hand column once you have selected 'Value Format' from the left-hand column.



Look for any further 'hidden' fields, by pressing the scroll bar under the left column either repeatedly, or continuously.

I/P BREAK RESPONSE

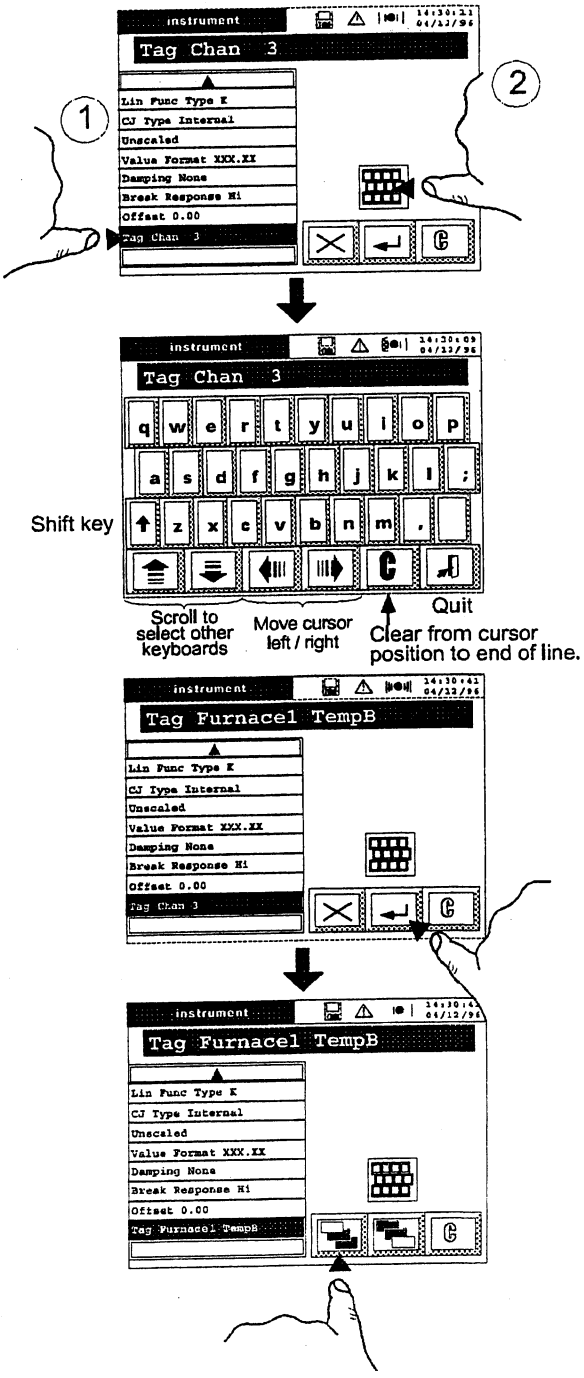
We are not interested in damping the input signal, so select 'Break Response' from the left-hand column, then 'Drive hi' from the right-hand column.



We are not going to enter an offset, so select 'Tag' in the left hand column, then press the 'Call qwerty' keyboard icon.

CHANNEL TAG

The text for the channel 3 tag (Furnace1 TempB) is entered using the qwerty keyboard that appears when you press the 'Call qwerty' key, together with the numeric keyboard which you can access using either the scroll up or the scroll down key. Section 5.3.1 shows you the complete character set available.



Return to the Top Level channel page by pressing the 'Step up' key.

2.2.4 Alarm configuration

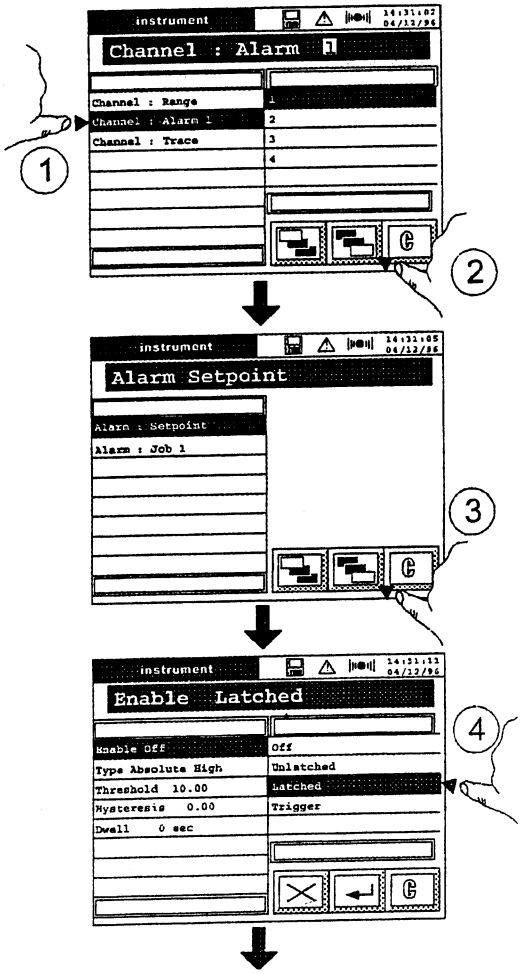
SETPOINT

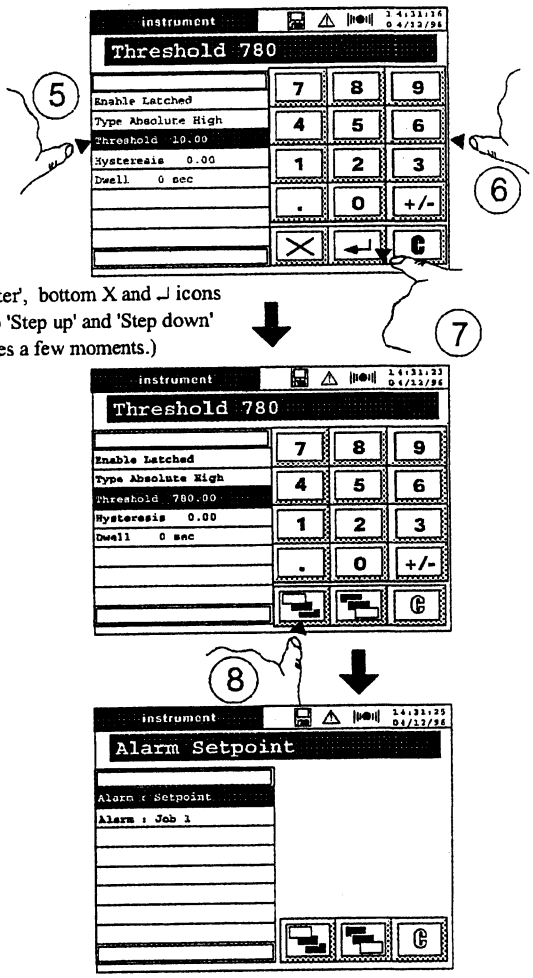
Up to four alarm setpoints can be configured for each channel. Each of these setpoints can cause up to 2 jobs to be executed (see section 5.3.2 for full details).

From the top level channel configuration page, select 'Channel : Alarm 1', then press the Step down key.

The resulting top level alarm page shows 'Alarm : setpoint' highlighted. Press the Step down key.

As shown below, the Absolute high, Hysteresis, and Dwell items are as required, so all we have to do is set the 'Enable' to Latched and the threshold value to 780.

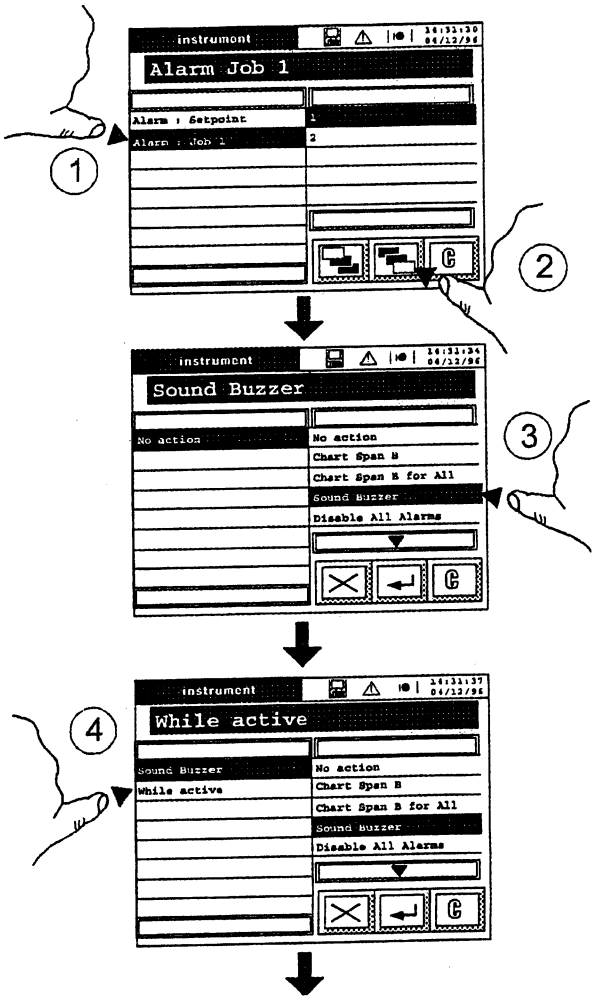


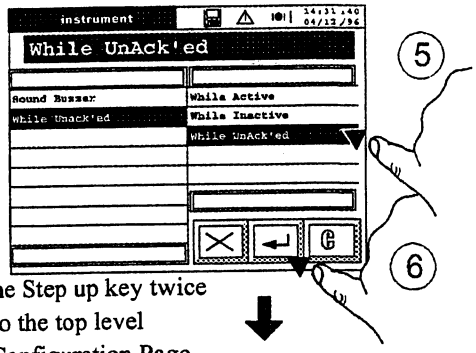


2.2.4 ALARM CONFIGURATION (Cont.)

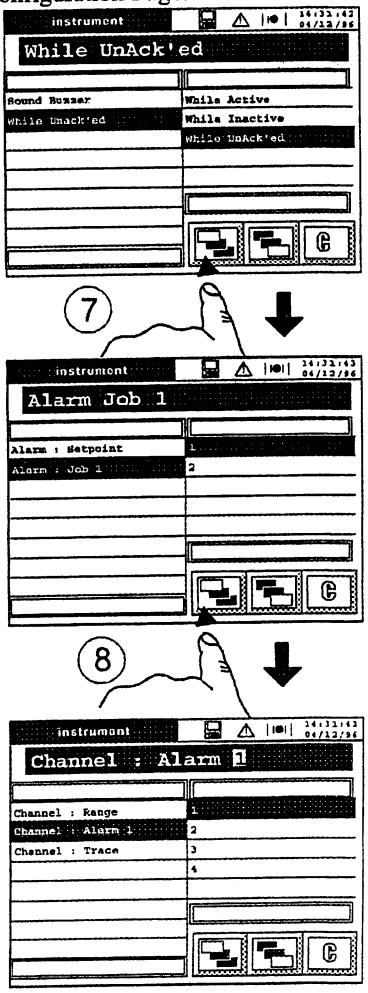
JOBS

Set Job 1 to 'Sound Buzzer' 'While Unacknowledged' as shown below.





Operate the Step up key twice to return to the top level Channel Configuration Page.

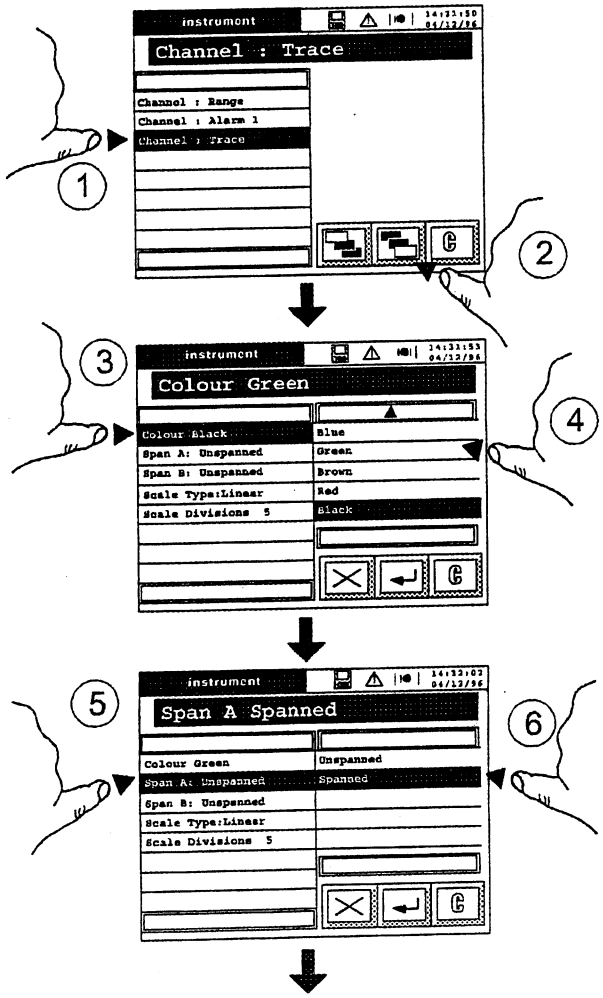


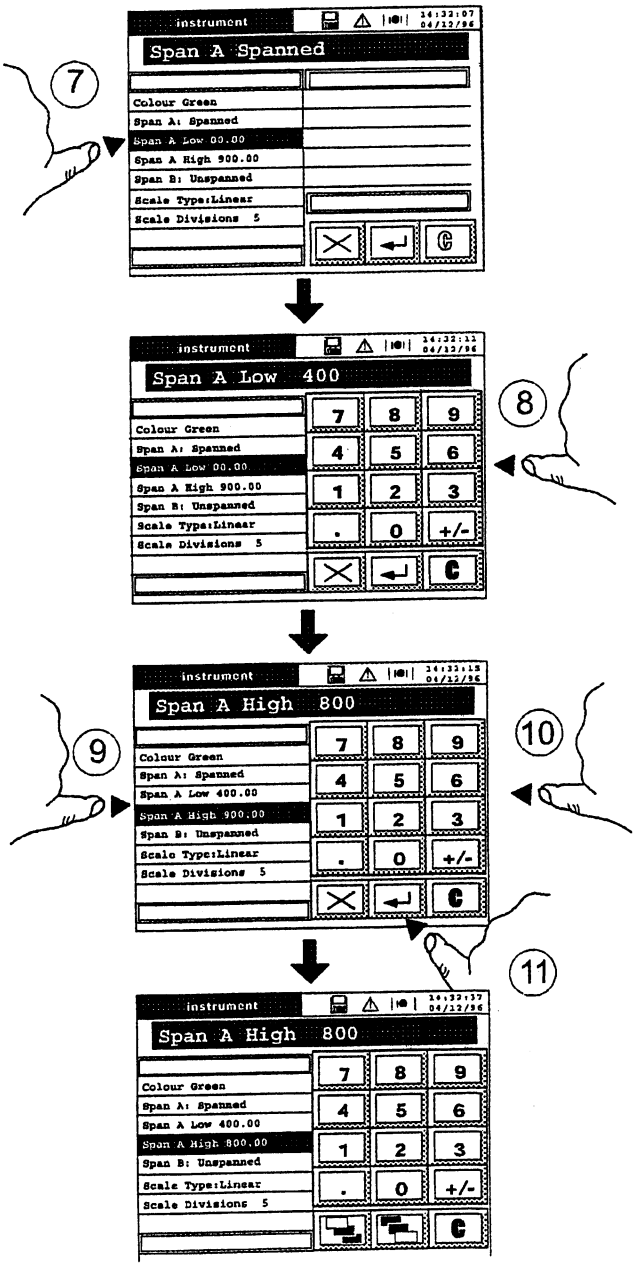
2.2.5 Channel Trace Configuration

From the top level Channel configuration page, select Channel Trace.

We want to select green as the trace colour, and 400 to 800 as span A. (Span A is the normal span used during recording; Span B can be switched to by Job action - for example if an alarm is triggered and you want to enlarge the area round the alarm value.)

The scale type of linear, with 5 divisions is as required, so we don't need to change this.

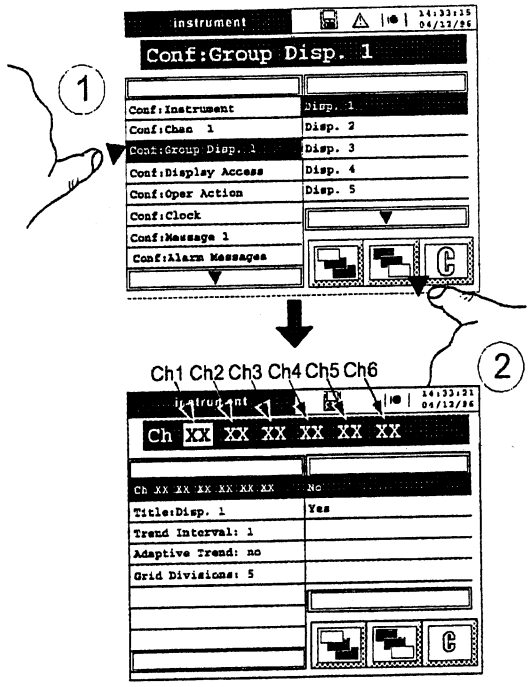




Operate the Step up key twice to return to the top level configuration page (not shown).

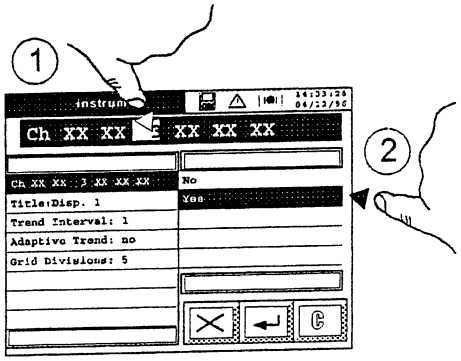
2.3 GROUP CONFIGURATION

We are going to enter channel 3 into the group currently called 'Disp. 1', and then we shall re-name the group 'Furn1'

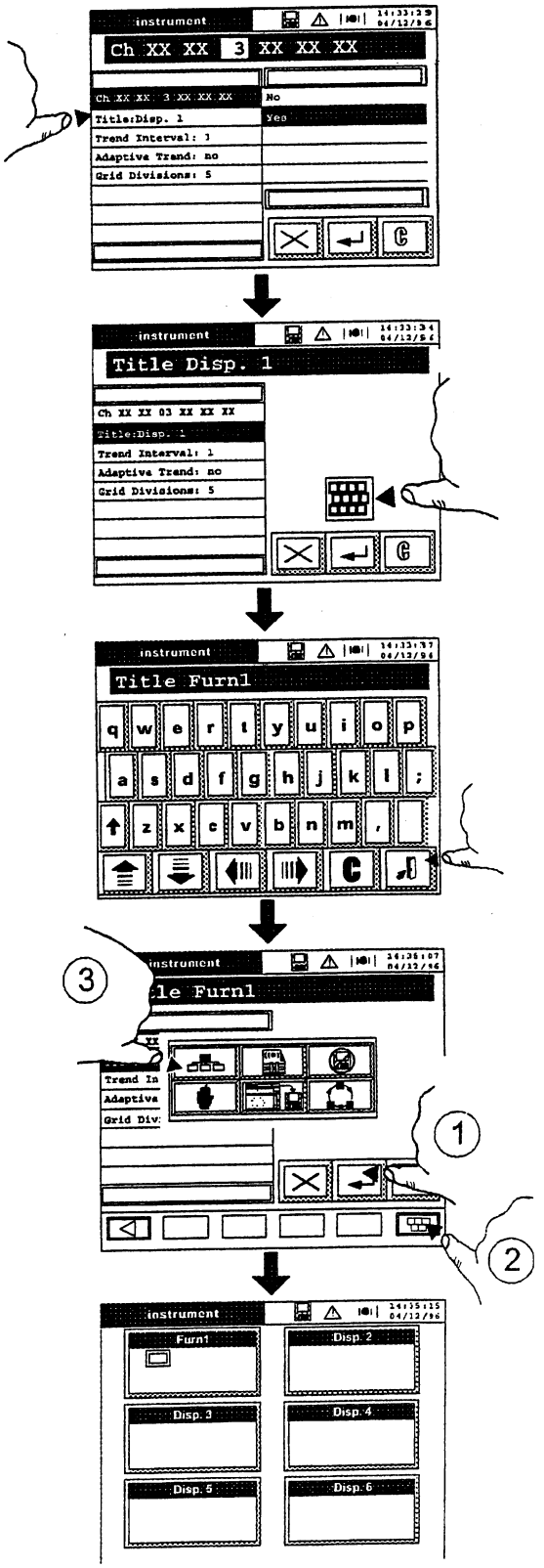


The status line contains the channels 01 to 06 in order from left to right. Because none of them is currently included in the group, each channel number is represented by 'XX'.

To include channel 3, press the third 'XX' in the status line, then select 'Yes' from the 'pick list' on the right hand half of the display.



The title of the group is changed using the text entry techniques already discussed for the channel tag.



'Grid divisions' is already set to 5, as required, so when the group name has been entered, we can return to the area display.

Section 3 Display Modes

List of contents

Section 3 Display Modes

3.1 INTRODUCTION

Once the recorder channels have been configured, they can be displayed in one of a number of formats. At first switch-on, three formats are available:, Vertical trend, Horizontal bargraph and Numeric and these formats can be scrolled-through at will, using the 'Cycle screens' key. (The Cycle screens key is one item of the pop-up keyboard which appears when the keyboard icon (below the bottom right-hand corner of the display) is touched.)

The recorder has other display modes which can be set up to appear as part of the 'cycle screens' list: Full vertical trend, Horizontal trend Vertical bargraph. All six modes can be put into or taken out of the scroll list as a part of Display Access configuration described in Section 5.5.

Figure 3.1a shows how to select the default, vertical trend, mode from the Area page, by touching the required group icon.

Figure 3.1b is an attempt to depict all six alternative display modes.

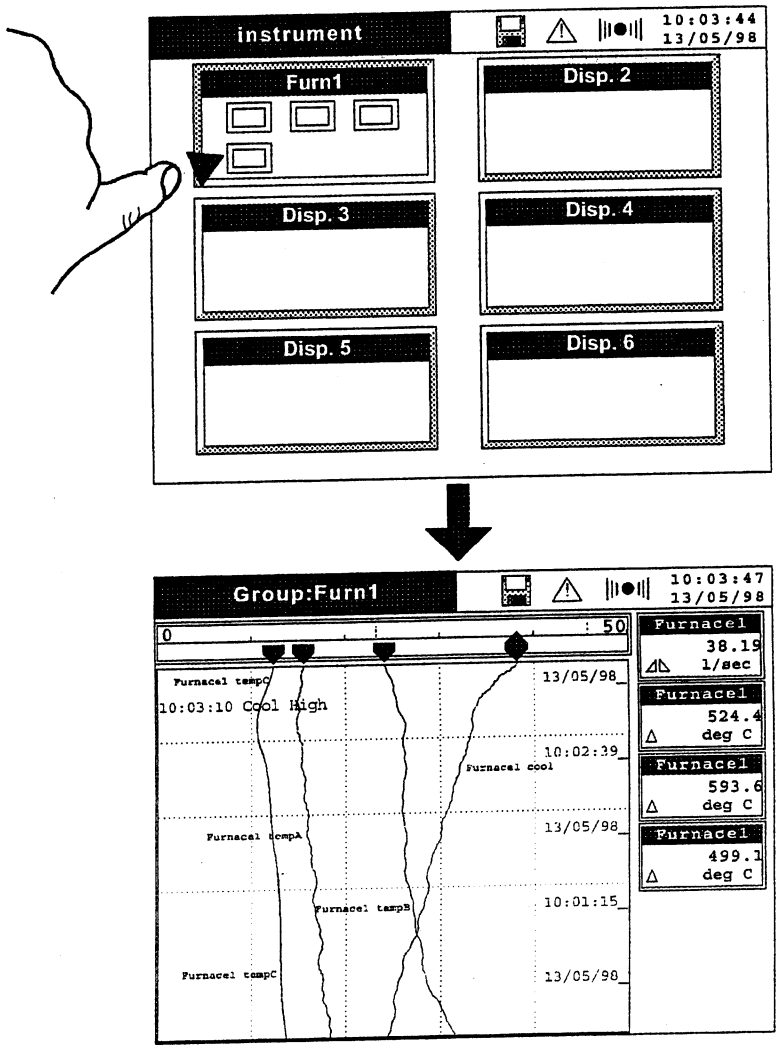


Figure 3.1a Accessing Trend display mode

3.1 INTRODUCTION (Cont.)

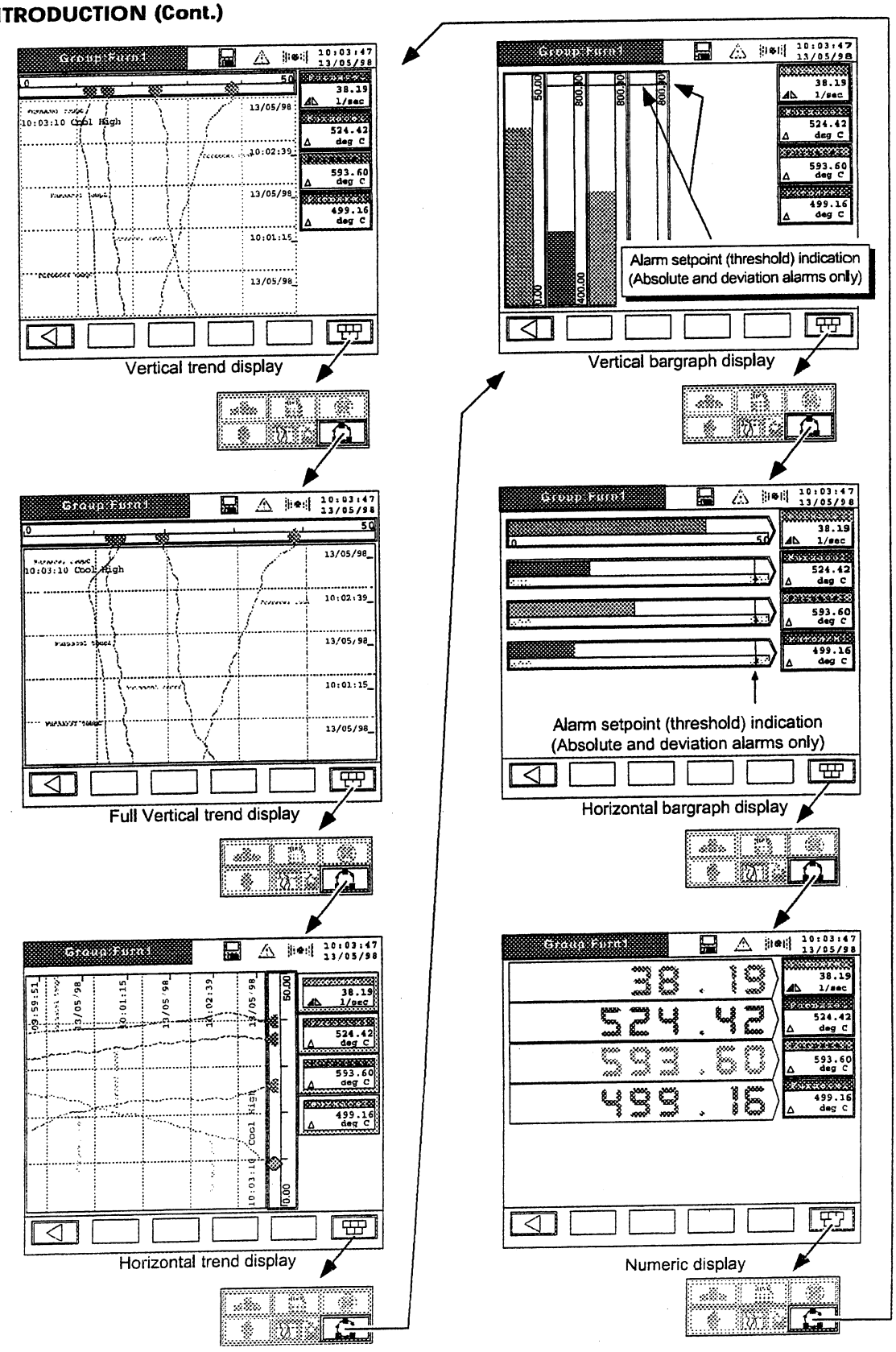


Figure 3.1b Selection of display mode

3.2 TREND DISPLAYS

3.2.1 Vertical trend display

The default type of display is the 'Vertical trend' display, which shows one group-full of points as though they were being traced on a chart. As well as this analogue tracing, the 'Faceplates' show the current measured value of the points in the group digitally, and also contain alarm symbols showing the types of alarm configured for each point.

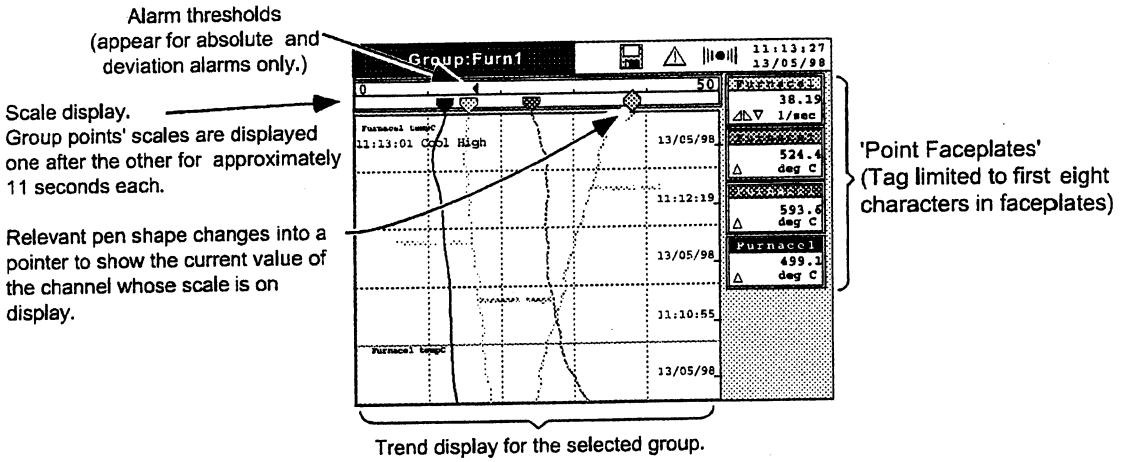


Figure 3.2.1 Trend display

ALARM SYMBOLS

Symbols for non-active alarms are filled with a neutral colour. Symbols for active alarms are filled red, either steady or flashing, according as the alarm is acknowledged or not.

Table 3.2.1 shows the symbols which may appear against the type of alarm they represent. Alarm types and actions are discussed in section 5.3.2

△ Absolute high
▽ Absolute low
◿ Rate-of-change rising
◺ Rate-of-change falling
▷◁ Deviation in
◁▷ Deviation out
□ Digital alarm

Table 3.2.1 Alarm symbols

DISPLAY HEIGHT (IN SECONDS)

As discussed in 'Group configuration (section 5.4) a trend interval can be entered to set the time axis of the display. The display height is equal to 180 trend intervals. Thus, at the default Trend Period of 1 second, the display height represents 3 mins. At the maximum period (1200 sec), the display height is 180 x 1200 = 216,000 seconds or 60 hrs.

3.2.2 Point focus trend display

If a point's faceplate is pressed, the display changes to the 'Point Focus' display. The Point Focus display (figure 3.2.2) is similar to the trend display discussed above, with the following differences:

1. To emphasise the selected trace, all other traces are 'thinned'..
2. The scale/pen display no longer scrolls through all the points, but 'locks' onto the selected trace.
3. Only the selected point's faceplate remains on display.
4. Alarm faceplates appear to the right of the display. If operator permissions (section 5.14) allow, pressing an alarm faceplate calls the relevant operator page, allowing the user to change the thresholds. Entry of the new threshold value returns the user to the Point focus display.

To return to the standard Trend display, press the faceplate.

3.2.2 POINT FOCUS TREND DISPLAY (Cont.)

Operation of the cycle screens key causes a point focus version of whichever type of display is next on the scroll list. This is the only way of getting a full vertical trend point focus display (section 3.2.4)

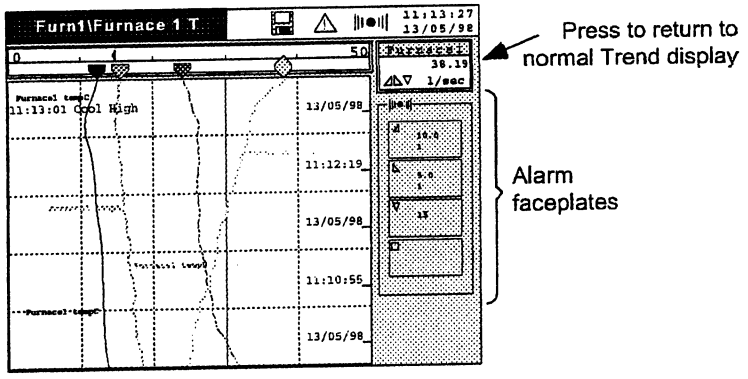


Figure 3.2.2 Point focus trend display

3.2.3 Trend review

This feature allows the entire recorded length of tracing to be scrolled through. Trend review is accessed from horizontal or vertical trend (including point focus) displays, by touching the display screen for 2 seconds. The screen changes as shown in figures 3.2.3a/b and remains static, although recording continues as normal as evidenced by the continuous movement of the History Position slider, as the current page becomes progressively older.

To return to the previous trend display, use the Go Back key below the lower left corner of the screen.

VERTICAL TREND REVIEW

When entered from a normal trend display, the point faceplate above the slider controls, and the scale over the 'chart' scroll through all the group points. When entered from a point focus display, the faceplate and scale show just the selected point (i.e. no scrolling occurs).

A cursor (initially at the very top of the 'chart') can be moved to any position by touching the screen and 'dragging'. The time and date displayed above the point faceplate relate to the cursor position

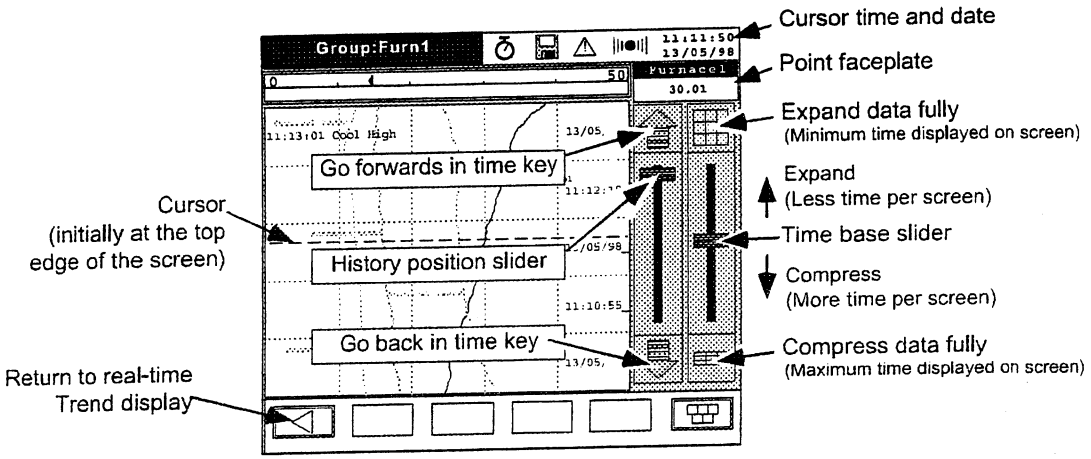


Figure 3.2.3a Trend review display (vertical tracing)

3.2.3 TREND REVIEW (Cont.)

HORIZONTAL TREND REVIEW

When entered from a normal trend display, the point faceplate in the lower right hand corner and the scale to the right of the 'chart' scroll through all the group points. When entered from a point focus display, the faceplate and scale show just the selected point (i.e. no scrolling occurs). When adaptive recording is in operation for the displayed group, the face plate contains two values (minimum and maximum) as described in 'Trend Review Operation' below.

A cursor (initially at the right hand edge of the 'chart') can be moved to any position by touching the screen and 'dragging'. The time and date displayed in the top right hand corner relate to the cursor position.

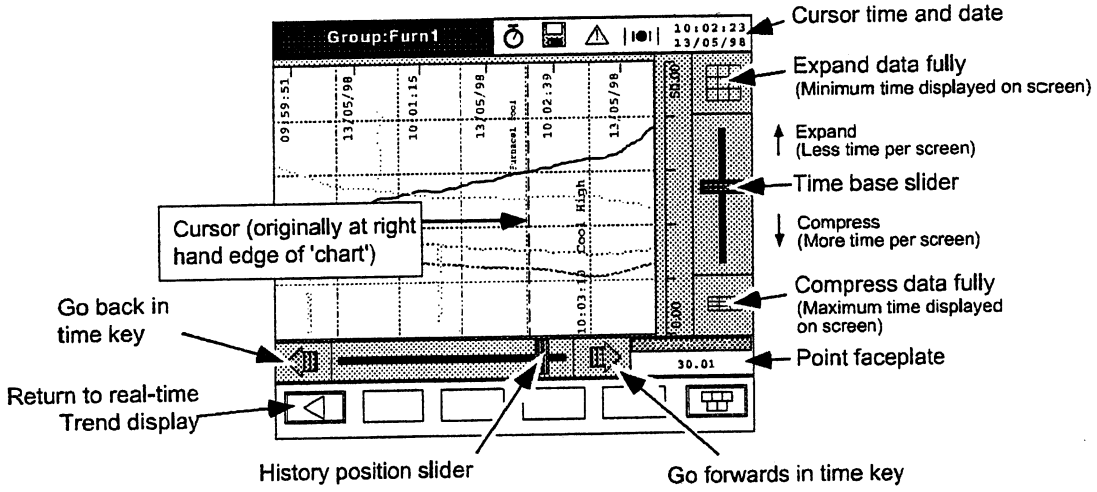


Figure 3.2.3b Trend review display (horizontal tracing)

TREND REVIEW OPERATION

Two sets of controls are provided:

a. Timebase slider. Expands/compresses the amount of data on the screen. When expanding data, the centre of expansion is the cursor. The keys above and below the time base slider allow you to show the screen data at maximum compression (Compress data fully) or minimum compression (Expand data fully) at a touch. A grey line is drawn across the screen at each time-base discontinuity, and at every power cycle.

b. History Position. Allows the user to move backwards and forwards through the recorded history, either in fine steps (keys) or coarse steps (slider). The position of the slider 'knob' is linearly related to where the current screen is in the total history range; the nearer the top (right edge for horizontal trends) - the later the data.

Using these controls it is possible, for example, to use the two sliders to locate a particular item, time stamp etc. The cursor can then be moved to the item (by sliding a finger on the screen), and the area expanded about the cursor using the Timebase slider.

(Continued)

3.2.3 TREND REVIEW (Cont.)

TREND REVIEW OPERATION (Cont.)

Because each dot on the screen (pixel) is a fixed size, the amount of time 'covered' by each pixel varies according to scan rate and screen compression. When using the compression facility, the screen is redrawn immediately, so the trend review facilities can be used, but the recorder then calculates what the maximum and minimum values of the signal were during the time period covered by each pixel. Whilst it is doing this, a clock icon appears at the top of the screen. Once the calculation is complete, the screen is refreshed with each each signal represented by two traces - one showing the minimum and one the maximum value reached. (Frequently, the two traces are so similar that they are indistinguishable.) If adaptive recording is enabled for the displayed group, the point faceplate contains the minimum and maximum values of the trace at the cursor time position as displayed in the top right hand corner of the screen.

SCREEN ARCHIVE

The contents of a trend review screen can be archived in .PKD format to a memory card/PC disc etc. To carry out the save, use the navigation keyboard as shown below in figure 3.2.3c. The data will be saved to a file called *Groupname*.PKD, PK1, PK2... etc. as explained in section 6.7.5. Any characters, other than those in the following list, which are used in the group name are replaced by underscore characters.

A to Z, a to z, 0 to 9 à ê è ô ù # $ % & ( ) - _ ! ^ ‘ { } ~ â ë ï î ì ò û ÿ á í ó ú

With adaptive recording enabled, two items are saved to the archive file for each point, identified by the text 'MAX' or 'MIN' appended to the point's tag.

Where a power-off event, or a change in time base appears on the screen, an archive file is generated for each time segment.

Notes:
1. Screen archive is available only from trend history display.
2. Screen archive to PKD file is avaiable on all recorders, whether the archiving option is fitted or not

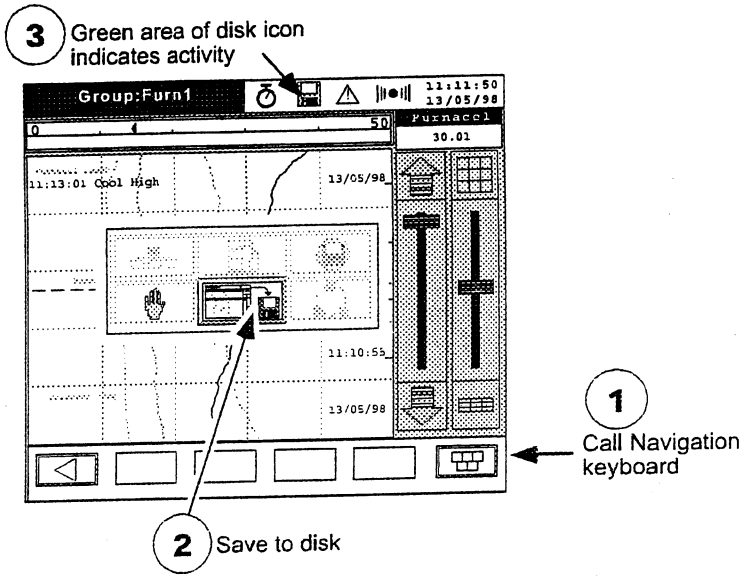


Figure 3.2.3c Saving the screen to disk

3.2.4 Full vertical trend display

Note: To add this display mode to the 'Cycle screens' list the Display Access configuration must be entered, and 'Full Vert' set to 'yes'.

Similar to the normal Vertical trend display, this gives more resolution, by occupying the full width of the screen. The point 'faceplates do not appear, so point focus cannot be entered from this display but can be entered by going into point focus in another display mode, and then using the cycle screens key. Trend review is available as normal by touching the screen for two seconds. Figure 3.2.4 shows a Full Vertical Trend page.

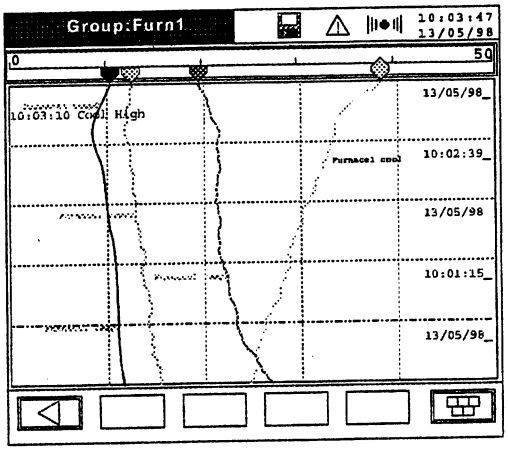


Figure 3.2.4 Full Vertical Trend display

3.2.5 Horizontal trend display

Note: To add this display mode to the 'Cycle screens' list the Display Access configuration must be entered, and 'Horiz' set to 'yes'.

Again this display mode is similar to the Vertical trend mode, but the traces run horizontally instead of vertically. The point face plates operate in the same way as for vertical trending. Trend review is described above in section 3.2.3.

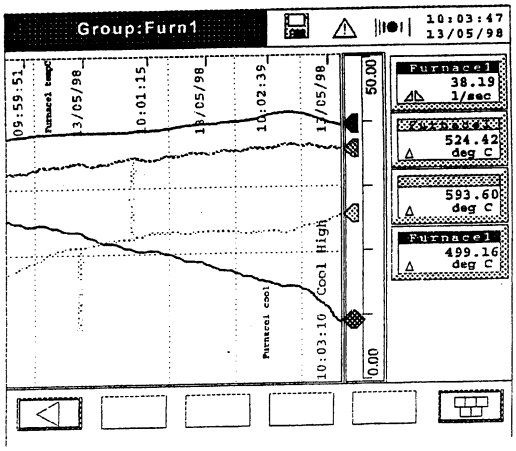


Figure 3.2.5 Horizontal Trend display

3.3 BARGRAPH DISPLAYS

Note: To add Vertical Bargraphs display mode to the 'Cycle screens' list the Display Access configuration must be entered, and 'Vert bars' set to 'yes'.

As described in section 3.1 above, the Cycle Screens key can be used to replace the trend display with a bargraph version of the group, as depicted in figure 3.3. As with the Trend display described above, pressing one of the point faceplates calls a bargraph version of the Point Focus display (figure 3.3b).

To return from point focus to standard bargraph, touch the channel faceplate again.

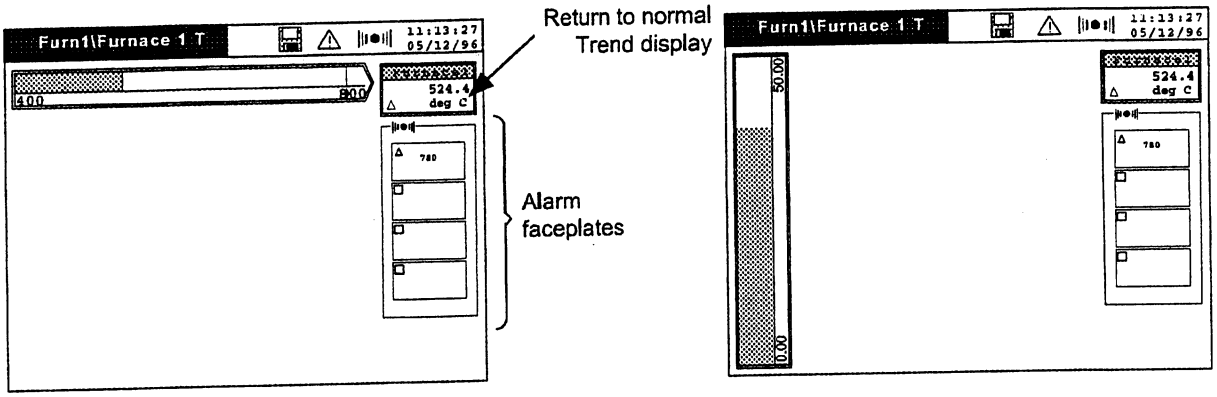


Figure 3.3a Standard horizontal and vertical bargraph displays

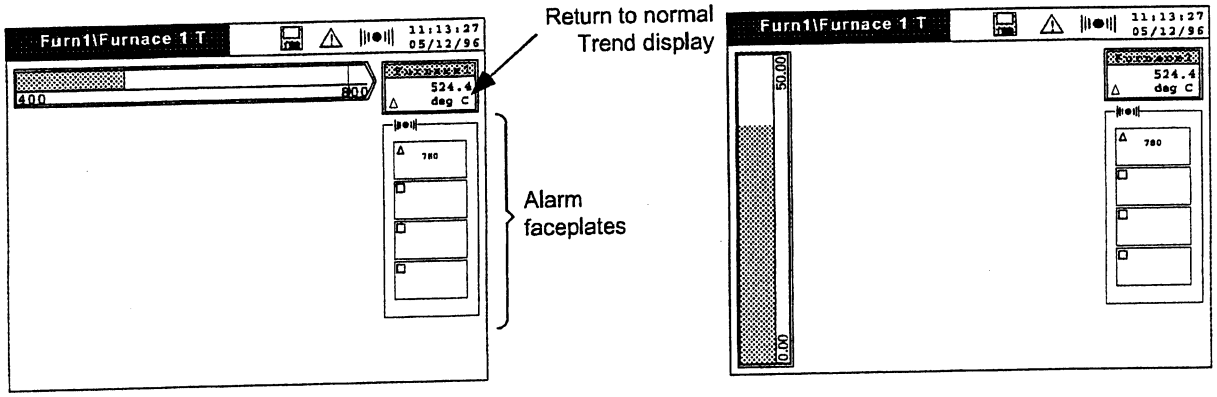


Figure 3.3b Point focus bargraph displays

As with the point focus trend display, the alarm faceplate can be used to change the threshold if the user has permission (section 5.14).

3.4 NUMERIC DISPLAYS

As described in section 3.1 above, the Cycle Screens key can be used to replace the bargraph display with a numeric display of the group points, as depicted in figure 3.4a. As with the Trend/Bargraph displays described above, pressing one of the point faceplates calls a numeric version of the Point Focus display (figure 3.4b).

To return from point focus, touch the channel faceplate again.

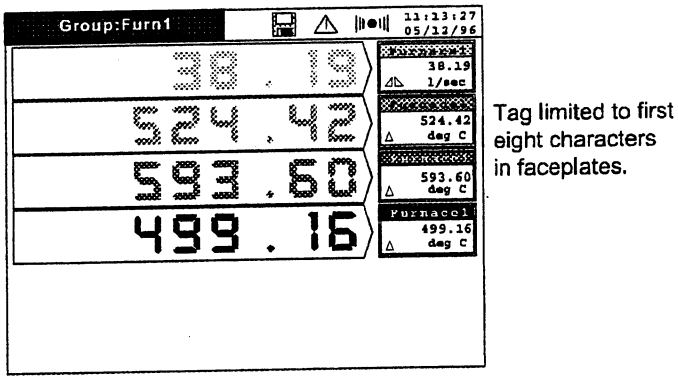


Figure 3.4a Standard numeric display

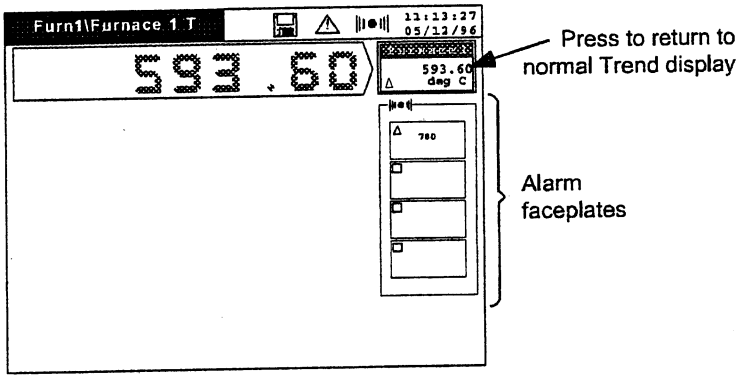


Figure 3.4b Point focus numeric display

Note: In both the above displays, digital inputs would be shown as sets of switch contacts.

As with other point focus displays, the alarm faceplate can be used to change the threshold if the user has permission (section 5.14).

3.5 ALARM SUMMARY DISPLAY

The alarm summary page can be called from any other page, using the 'Page' item in the pop-up 'Navigation' keyboard.

The alarm summary page contains the latest 16 alarm events. 15 further pages can be called, which allows up to 256 alarm events to be viewed. When all the pages are full, further alarms will cause the oldest alarms to be discarded, whether or not they are active/acknowledged etc.

When first called, the page contains alarm events from all sources, showing alarm number and type, the date/time each alarm became active and (if relevant) the date/time it was cleared. Active alarms are highlighted with a red background, flashing if not acknowledged.

By selecting (touching in the Group column) an alarm event and then touching the 'Group' filter key (figure 3.5) then only those alarm events which are associated with the selected point's group will be displayed. In the same way, you can choose to display only those alarm events which are associated with the selected alarm event's point, by using the 'Point' filter key.

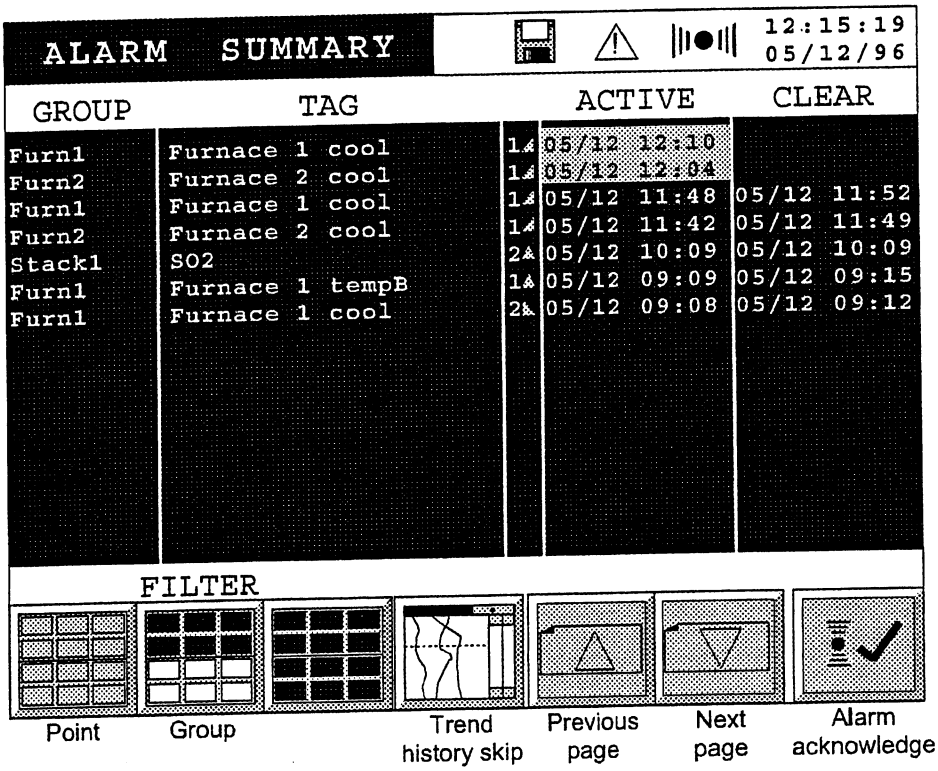


Figure 3.5 Alarm summary page

The alarm acknowledge key acknowledges all active alarms on display (i.e. All, Group, or Point alarms, according to which filter (if any) is in use).

The Next/Previous page icons appear only when appropriate.

Note: Only the first seven characters of the group name appear in the group column. This should be borne in mind when configuring the group title. For example, Group names 'Furnace1' and 'Furnace2' would both appear as 'Furnace'

3.5.1 Trend history skip

After an alarm event has been selected, a touch of the Trend History Skip key calls the trace history page for that group, with the alarm trigger point and cursor at the centre of the display. The message 'Trend Data Expired' appears instead, if the alarm trigger data has lapsed. The amount of trace stored depends on a number of things including the total number of points configured, scan rate, amount of memory etc. as discussed in section 2.1.3 above.

The trend history display will be vertical or horizontal depending on configuration, as detailed in table 3.5.1 below. An 'X' in a column means that it does not matter whether the entry is yes or no (i.e. X = don't care).

Currently selected Group Display mode	Enabled display modes			Resulting trend history mode
	Vertical trend	Horizontal trend	Bars	
Numeric	No	No	X	Vertical
Numeric	No	Yes	X	Horizontal
Numeric	Yes	No	X	Vertical
Numeric	Yes	Yes	X	Vertical
Vertical trend				Vertical
Full vertical trend				Vertical
Horizontal bars				Vertical
Horizontal trend				Horizontal
Vertical bars				Horizontal

Table 3.5.1 Vertical/horozontal trend history mode parameters.

Section 4: Operator pages

Contents list

Section 4: Operator pages

4.1 INTRODUCTION

The display pages are divided into two sets; those which are accessible to any operator (called 'Operator pages' and those for which a password is required (called 'Configuration' pages and described in section 5). It is possible, in the 'Conf:Access' pages to enable or disable some of the items to which the operator has free access through the operator pages (e.g. the ability to change alarm thresholds). These items are listed in section 5.14.

The top level of Operator pages is accessed from the 'navigation keyboard' below the bottom right-hand corner of the display, as shown below in figure 4.2. The actual contents of this page depends on the number of options fitted to the recorder: for the purposes of this manual it will be assumed that the only option fitted is a disc drive. For details of all other options, reference should be made to the options manual.

4.2 TOP LEVEL OPERATOR PAGE

This page appears when the 'Hand' symbol of the pop-up keyboard is pressed, as shown in figure 4.2. The figure shows access from the Area page, but it is equally possible to call it from any other page (except of course, the page itself).

Each of the items which appears in the left hand column is accessed by touching the item, then using the 'Step down' key as described in section 2 above.

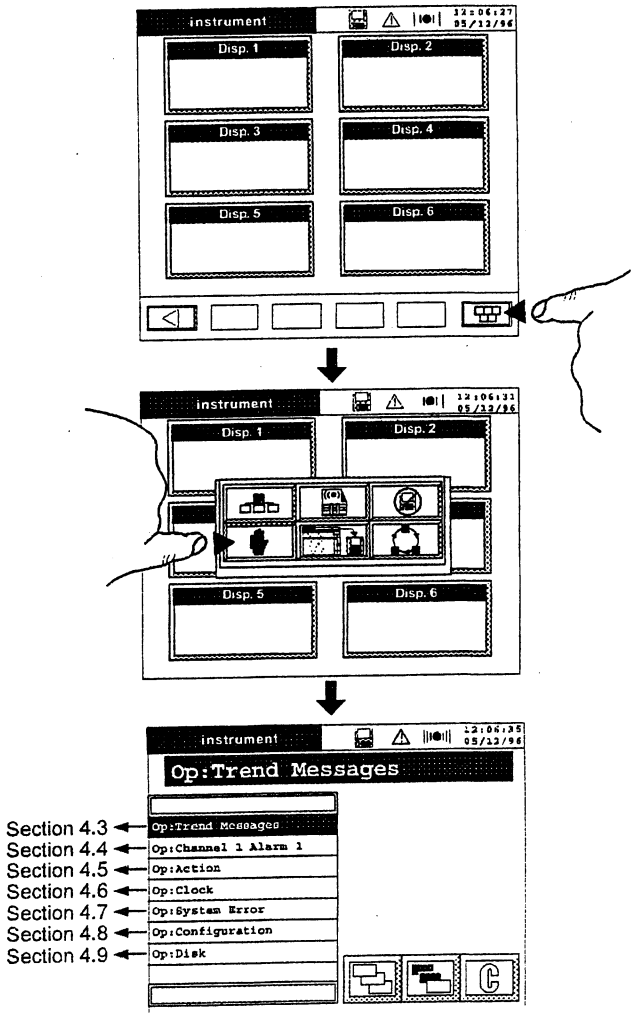
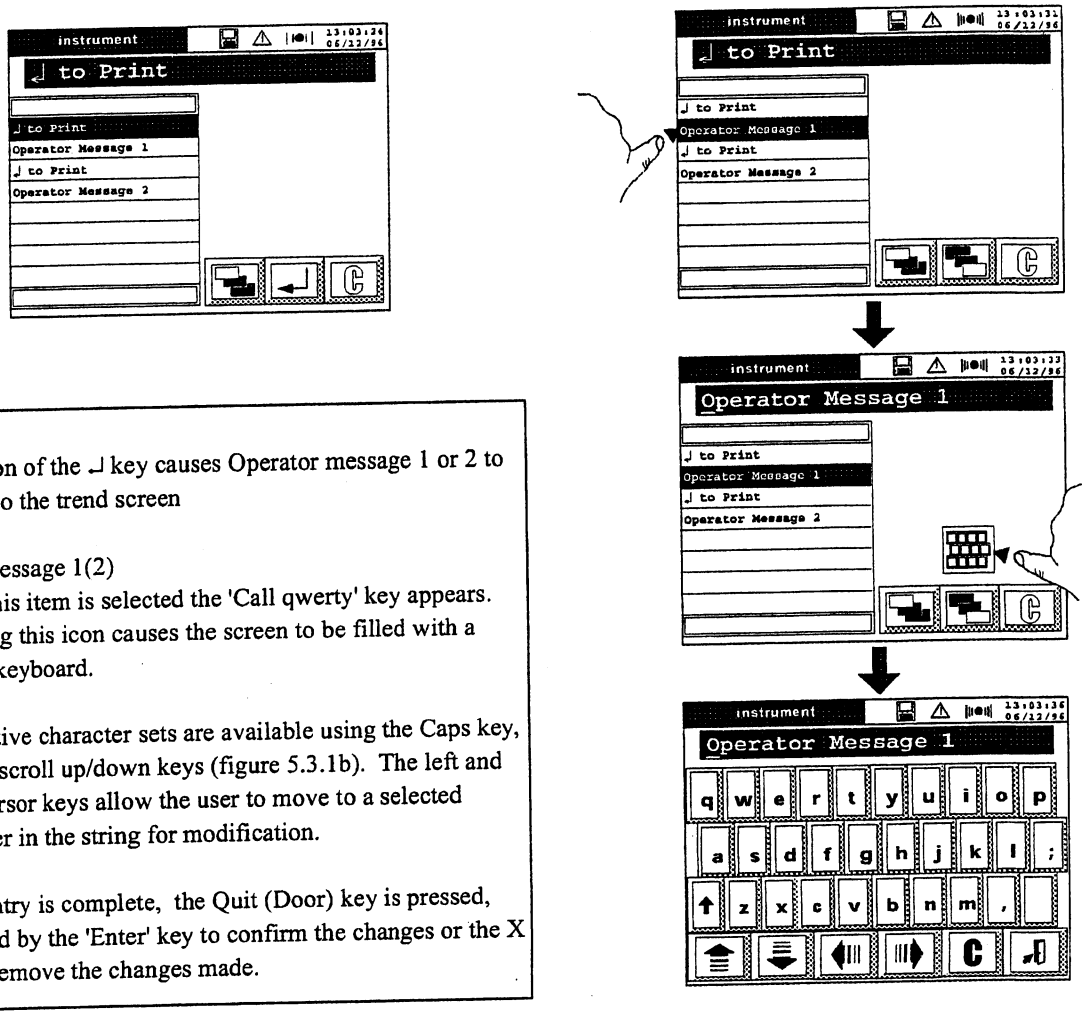


Figure 4.2 Access to top level operator page

Note: In common with the rest of this manual, shading in the figures is used only sparingly in order to optimise the quality of reproduction. As a result of this policy, the illustrations do not always match the actual display pages they are intended to represent.

4.3 TREND MESSAGES

This feature allows one of two 'Operator messages' to be queued for 'printing' on the display. The messages are fully editable by the operator and can include the current date, time, numeric value of a point etc. automatically. See 'Embedded sequences' in section 5.8 for further details.



↵ to Print

Operation of the ↵ key causes Operator message 1 or 2 to be sent to the trend screen

Operator Message 1(2)

When this item is selected the 'Call qwerty' key appears. Touching this icon causes the screen to be filled with a qwerty keyboard.

Alternative character sets are available using the Caps key, and the scroll up/down keys (figure 5.3.1b). The left and right cursor keys allow the user to move to a selected character in the string for modification.

Once entry is complete, the Quit (Door) key is pressed, followed by the 'Enter' key to confirm the changes or the X key to remove the changes made.

Figure 4.3 Trend message pages

4.4 ALARM VIEW

This feature is accessed by selecting the Op:Channel 1 Alarm 1 item in the top level operator page This allows the user to select a channel and one of its associated alarms for viewing, and if the relevant operator permissions allow, to change the threshold value.

If access permission exists, a numeric keyboard fills the right-hand half of the screen to allow the existing value to be edited.

The alarm pick list is called by touching the alarm number character in the status line, once the required channel number has been selected.

Examples of the types of display that can occur are as follows:

Alarm is off
This means that the alarm is disabled

Abs Hi (Lo) Thold 780.00
The alarm is an Absolute High (Low) type with a threshold of 780.00

Dev In (Out) Ref 80.00
Deviation 1.00
This is a deviation in (out) type alarm with a reference value of 80, and a deviation of ± 1.00

Roc Ris (Fall) Chg 1.00
Per second
This means that the alarm is a Rate-of-Change Rising (Falling) type, with a change value of 1.00 and a period (within which the change is acceptable without triggering the alarm) of 1 second.

Full details of alarm types/actions etc. are to be found in section 5.3.2

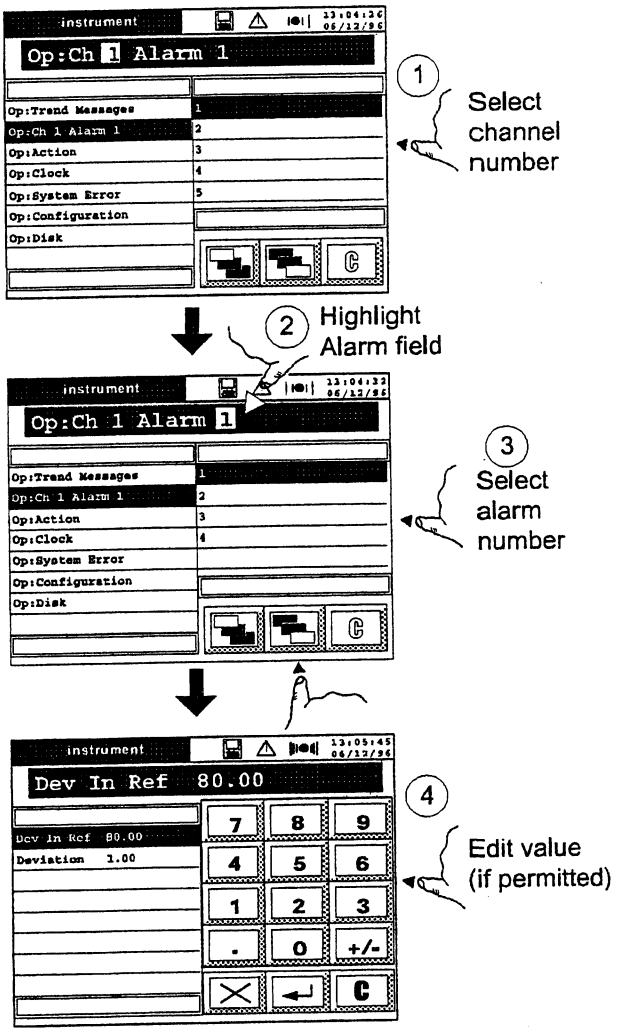


Figure 4.4 Alarm view pages

4.5 OPERATOR ACTION

This display consists of a single statement (default: ↵ to ACK ALL). In the case of this default, operation of the 'Enter' key acknowledges all active alarms.

4.5.1 To change the action

The way this function works is that from this page only, the 'Enter' key acts as a trigger to what is called an 'internal event'. In Event configuration (section 5.10) you will find that event 1 has 'Operator key' as its source, and 'Ack all alarms' as its Job N° 1. By changing Job N°1, or by adding a further action as Job N° 2, you can change what happens when you operate the 'Enter' key on the Operator Action page.

4.5.2 To change the name

The Operator Action Configuration page (Section 5.6) allows you to change the text string from '↵ to ACK ALL' to the text of your choice, and also allows you to define the key's operation as latching or not.

4.6 CLOCK

This page displays the time and date as held in the recorder's real-time clock. To change the time, date, and date format, the Clock configuration page must be accessed (section 5.7).

4.6.1 Back-up battery

The system date and time, and any volatile maths or totaliser values are maintained under power-off conditions, by a replaceable coin-cell battery. For typical recorder usage, such as those described below, this battery will last for over two years. A replacement procedure is given in section 1.3 (Preventive Maintenance) above.

TYPICAL USAGE EXAMPLES

1. Recorder powered continuously, except for an annual period of four weeks during which it is switched off.
2. The recorder is powered up each morning, then off again eight hours later.

4.7 SYSTEM ERROR

This page displays any active system errors a selection of which is shown in figure 4.7.

Bad Remote CJ Temp
This means that the remote CJ facility is enabled, but there is no 'GOOD PV' available as a remote CJ source.

↵ Clr Disk Overdrive
This means that the internal archiving buffer is full. Cleared by touching ↵ key.

Battery Failure.
This tells the user that the RAM support battery is no longer holding its charge and should be changed.

Clock Failure
The internal clock was corrupt at power-up, or the time has never been set. The error is cleared by setting the current time and date. Can be caused by an exhausted battery, which would have a separate error (Battery Failure)

EEPROM DB defaulted
Part of the configuration was found to be corrupt at start-up and the data base has been defaulted

Bat backed RAM cleared
This appears if the back-up battery has failed and the unit has been switched off for more than 48 hours (typ) without the battery being replaced. This RAM maintains the real-time clock, and holds totaliser and counter values if the Totaliser/Counter/Timer option is fitted.

DV Run time error
Occurs if there is a reason why a valid PV cannot be generated from a derived variable channel (e.g. the denominator in a division function passes through zero).

Output ch Failure
Output channel hardware fault

Input Chan Failure
Input channel hardware fault, or if configured to use a remote CJ, the remote CJ is disabled or not supplying a suitable signal.

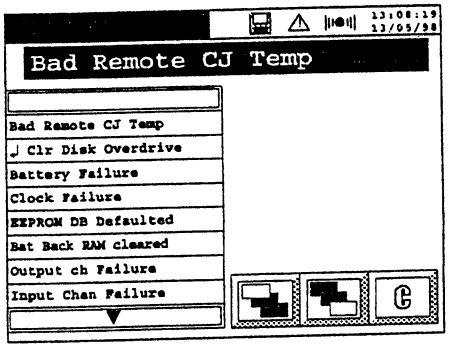


Figure 4.7 System error display page

4.8 CONFIGURATION

This allows the operator to access the configuration pages (section 5) of the instrument upon entry of the correct password. For further information see section 2.2.1 or section 5.2.1.

The factory entered password is 00010, but this can be edited in Instrument Configuration (section 5.2)

4.9 DISK PAGES

Note: Operator access must be enabled (section 5 .14) before disk fields other than 'Directory', Status' or 'Offline' become available to the operator.

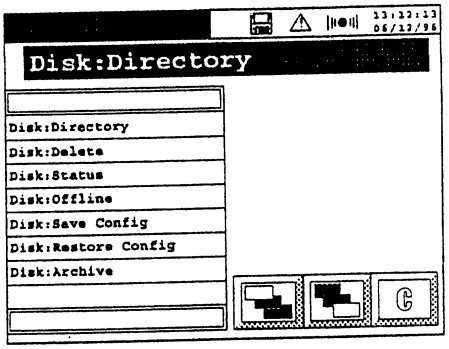


Figure 4.9 Disk pages

All these pages, except 'Disk:Archive' are fully described in Section 6.

4.9.1 Archiving to disk

Selecting 'Disk:Archive', then operating the step down key, calls the 'Enter to send log' page depicted below. Operation of the enter key causes the contents of the selected log to be sent to the relevant file on the disk. Log 1 is always saved to the file defined in the 'Archive 1' configuration page; log 2 is always sent to the file defined in the 'Archive 2' configuration page (see section 6).

The contents of logs 1 and 2 are set in group configuration (section 5.4), where Log 1 and Log 2 appear in the scroll list after display groups 1 to 6. (If the maths pack is fitted, the DV group comes between Log1 and Log 2 in the list.)

Either of the two logs can also be sent to disk by job action (section 5.3.2), and if an archive interval is set in 'Archive 2' configuration, then the contents of log 2 can be sent to disk automatically at that archive interval. Setting the interval to 00:00:00 stops automatic logging.

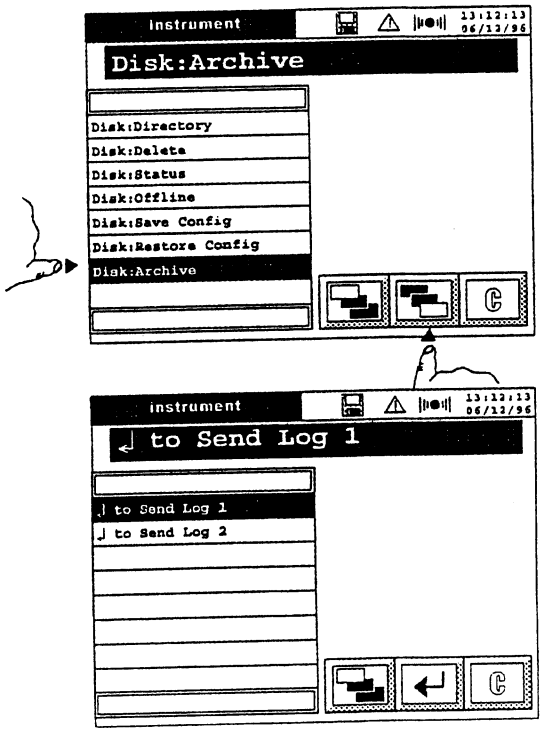


Figure 4.9.1 Enter to archive

Note: Before archiving, always ensure that a memory card or disk is fitted. No warning is given if an attempt is made to archive when no disc is present. The recorder will continue to try to send the data until a disc is fitted.

This page is deliberately left blank

Section 5: Configuration pages

List of Contents

(Continued)

LIST OF CONTENTS (Cont.)

Section 5: Configuration pages

5.1 INTRODUCTION

Section 5 describes the configuration pages associated with the unit. Configuration is entered by means of a password as described in section 2.2.1 above. This results in the appearance of the top level configuration pages as depicted in figure 5.1

Note: The unit is despatched from the factory with a password of 00010.

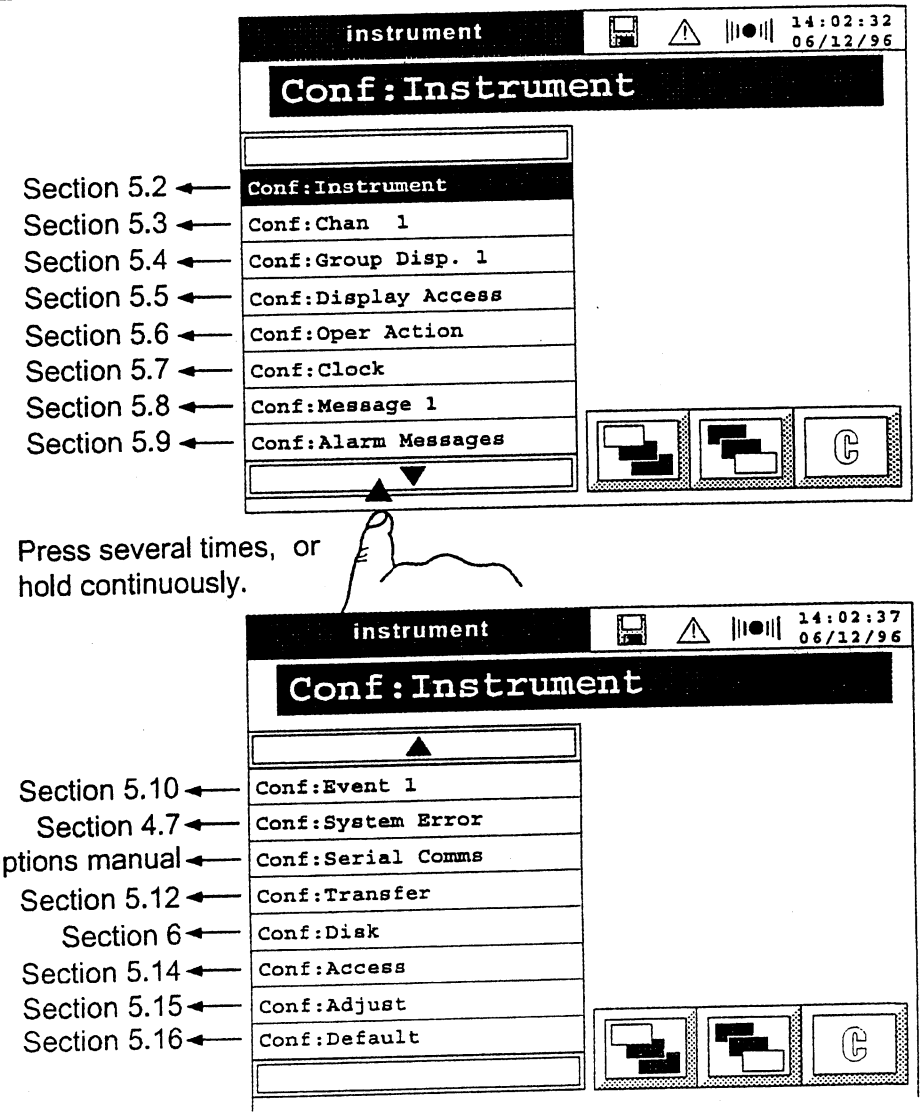


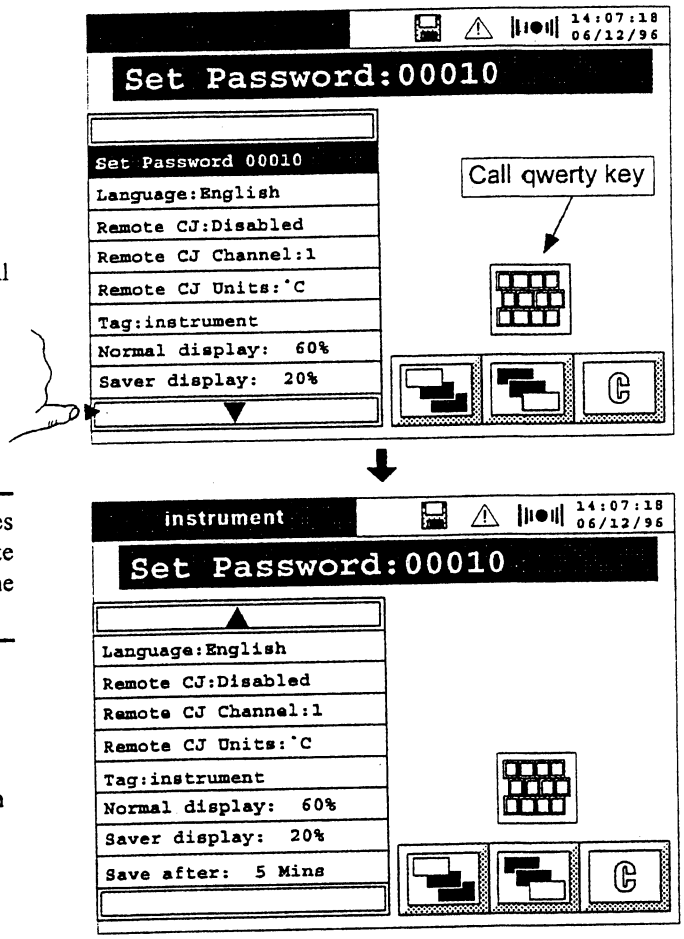
Figure 5.1 Top level Configuration pages

5.2 INSTRUMENT CONFIGURATION

Selection of Conf:Instrument, followed by the 'Step down' key calls the Top Level Instrument Configuration page.

5.2.1 Set Password

To enter a new password, the 'Call qwerty' key is used to call the first of the keyboards to the display. Use of the up and down arrow keys and the 'Caps' key allows the alternative character sets to be displayed. Enter any five-character alpha-numeric string. For full details of the character sets see figure 5.3.1b below.



> Note: Setting the password to 00000 disables the password altogether, allowing immediate access from the 'OP:Configuration' item in the top level Operator page.

5.2.2 Language

Selection of this item shows that English, French or German can be chosen from the right-hand pick list. All further displays are in the selected language

5.2.3 Remote CJ

One of the configuration items for each thermocouple input channel, is 'CJC type' which can be set to Internal, External or Remote. It is here, in Instrument configuration that a separate channel can be defined to measure the remote CJ temperature. Remote CJ can also be enabled and disabled here, and its temperature units defined as Celsius, Fahrenheit, Kelvins or Rankine.

When configuring the channel which is measuring the remote CJ temperature, the temperature units must match the Remote CJunits.

5.2.4 Tag

As with the password, described above, the qwerty keyboards are used to enter an instrument descriptor of up to 20 characters, to appear in the Title Bar of the Area display and the Operator and Configuration display pages.

5.2.5 Normal/Saver display

As despatched from the factory, the normal operating brightness of the display is 60% of maximum. This changes to 20% of maximum after 5 minutes of 'no action'. Both the normal and 'saver' display brightnesses can be set between 20% and 100% in 10% increments, and the time-to-dim (Save after:) can be set in minute increments from 1 to 99 minutes.

5.3 CHANNEL CONFIGURATION

Note: Changing input type to or from 'digital' will cause the history of any group which contains that channel to be lost.

Accessed by Selecting 'Conf:Channel 1' from the top level Configuration page, then choosing the required channel number from the pick list, then operating the Step Down key.

This brings the top level Channel Configuration page to the display. As can be seen from the figure, the channel configuration is split into three sections: Range, Alarms and Trace.

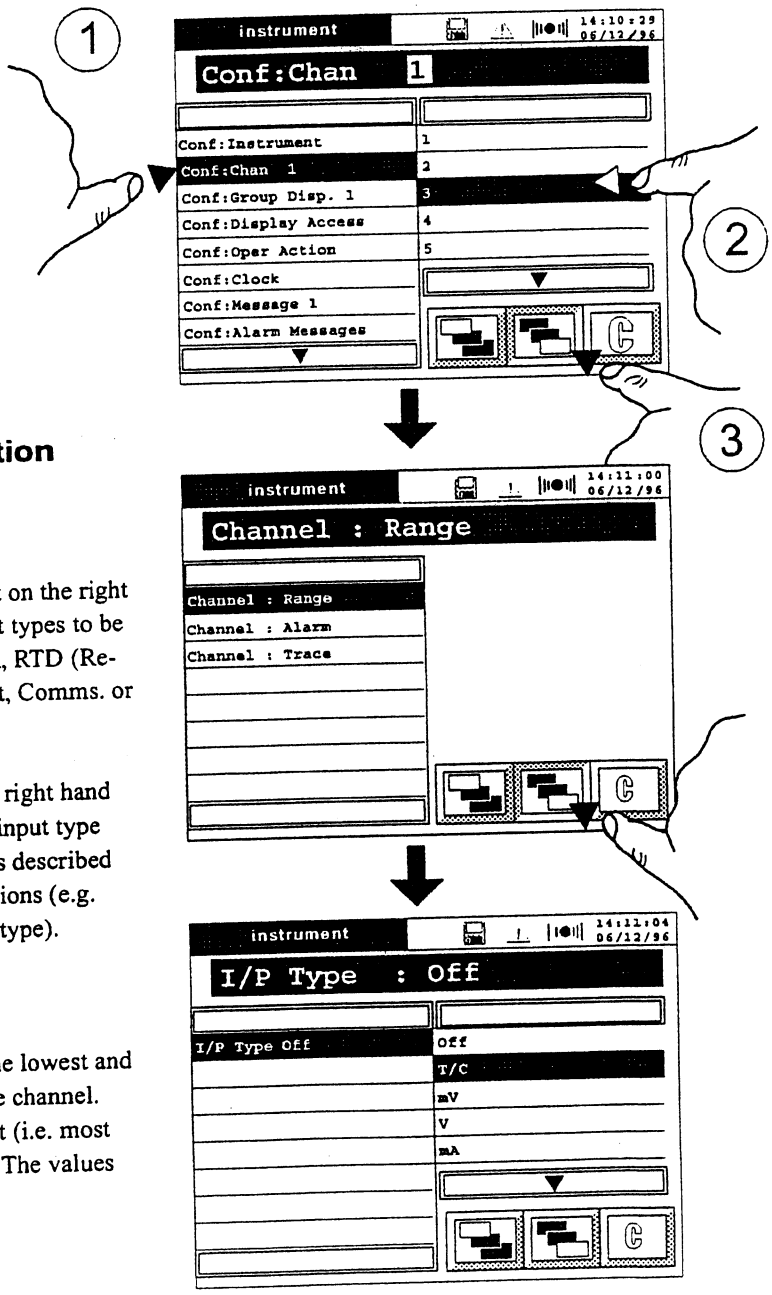


Figure 5.3.1a Entry to Channel range configuration

5.3.1 Channel range configuration

Input type

The default input type is OFF. The picklist on the right hand side allows one of the following input types to be selected: T/C (Thermocouple), mV, V, mA, RTD (Resistance thermometer), Ohms, Digital input, Comms. or Test.

Subsequent items appearing in the left and right hand columns depend to a certain extent on the input type selected. For this reason some of the items described below may not appear for some configurations (e.g. 'CJC Type' does not appear for RTD input type).

Input range

The low and high settings should match the lowest and highest values which will be applied to the channel. This allows the recorder to choose the best (i.e. most accurate) electronic range for your input. The values are entered using the numeric keyboard.

Shunt value

For mA type inputs only, this allows a shunt value to be entered. The entered value must match that of the fitted shunt, or gross errors will occur.

Input units

For T/C and RTD inputs only, allows Celsius, Fahrenheit, Kelvins or Rankine to be selected. For those channels using a Remote CJ, these input units must match the Remote CJ units set up in Instrument configuration (section 5.2.3 above).

5.3.1 CHANNEL RANGE CONFIGURATION (Cont.)

Linearisation type

The linearisation types (if any) which appear on the scroll list depend on the Input Type selected. The complete list is:
Linear, square root, $x^{3/2}$, $x^{5/2}$,
Thermocouple types B, C, D, E, G2, J, K, L, N, R, S, T, U, Ni/NiMo, Platinel,
RTD types PT_{100}, Pt_{1000}, Ni_{100}, Ni_{120}, JPT_{100}, $Pt_{100}A$, Cu_{10}

CJC type

For thermocouple inputs only, allows Off, Internal, External or Remote to be selected as cold junction type.

Internal uses the recorder's internal temperature sensor to apply cold junction compensation.

External is used where the cold junction of one or more thermocouples is maintained at a known temperature. When 'External' is chosen as CJC type, the known temperature is entered using the keyboard.

Remote uses a temperature sensor connected to a separate input channel to measure the cold junction temperature of one or more remote thermocouples. This allows copper cable to be used from the remote location to the recorder, instead of high cost compensation cable. The input channel for the CJ temperature measurement is set up in 'Instrument' configuration (Section 5.2.3).

Unscaled/scaled

This allows the input to be scaled (e.g. 4 to 20 mA input = 0 to 250 RPM). The scaling low (0 for this example) and high (250) values are entered using the keyboard. The Scale units (RPM) are entered using the qwerty keyboard.

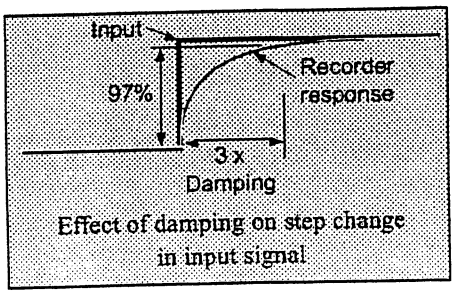
Value Format

Allows the decimal point position to be chosen for the process value from the right-hand pick list.

Damping

For 'noisy' slowly changing signals, damping can be used to filter noise so that the underlying trend can be seen more clearly. 2, 4, 8, 16, 32, 64, 128 or 256 seconds can be chosen from the right hand pick list.

It is not recommended that damping be used on quickly changing signals.



Effect of damping on step change in input signal

Break Response

For lower ranges only (i.e. thermocouples and voltages less than 1V) the recorder can be made to respond in a known way if a break in the input circuit is detected.

Break response can be set to
a. None (trace drifts with input wiring acting as an aerial)
b. Drive hi (trace is placed at the right hand edge of the 'chart')
c. Drive lo (trace is placed at the left hand edge of 'chart')

5.3.1 CHANNEL RANGE CONFIGURATION (Cont.)

Open / Closed

For Input Type digital, the PV display consists of a text string. The strings to appear under open (logic low) and closed (logic high) conditions (Open, Close, Hi, Lo, On, Off) can be chosen from the pick list. If __-__ and _____ are chosen for Open and Closed, then the input will be shown graphically as a common/normally open pair of switch contacts on the point faceplate and in the Numeric diplay mode (see section 3)

Test Waveforms

When Input Type is selected as 'Test', the following test waveforms can be selected:

Triangle 5 hrs, 40 mins; Sine 5 hrs, 40 mins

Tag

This allows a 14-character descriptive name (tag) to be associated with each channel using the qwerty keyboard(s). This tag is used both for display alongside the channel and for logging. It should be noted that on point faceplates (section 3), the tag is truncated to the first eight characters only. Thus 'Furnace1 TempA' and 'Furnace1 Cool' would both appear as just 'Furnace1'.

The figure below shows the character set available to the user. To save space, both the normal and the shift sets are shown in the three diagrams. When the text string has been entered, the Quit key returns you to the page which called the keyboard, where the step up and step down keys are temporarily replaced with Cancel and Enter keys. These two keys allow you to Cancel the changes made, or to Confirm them, respectively.

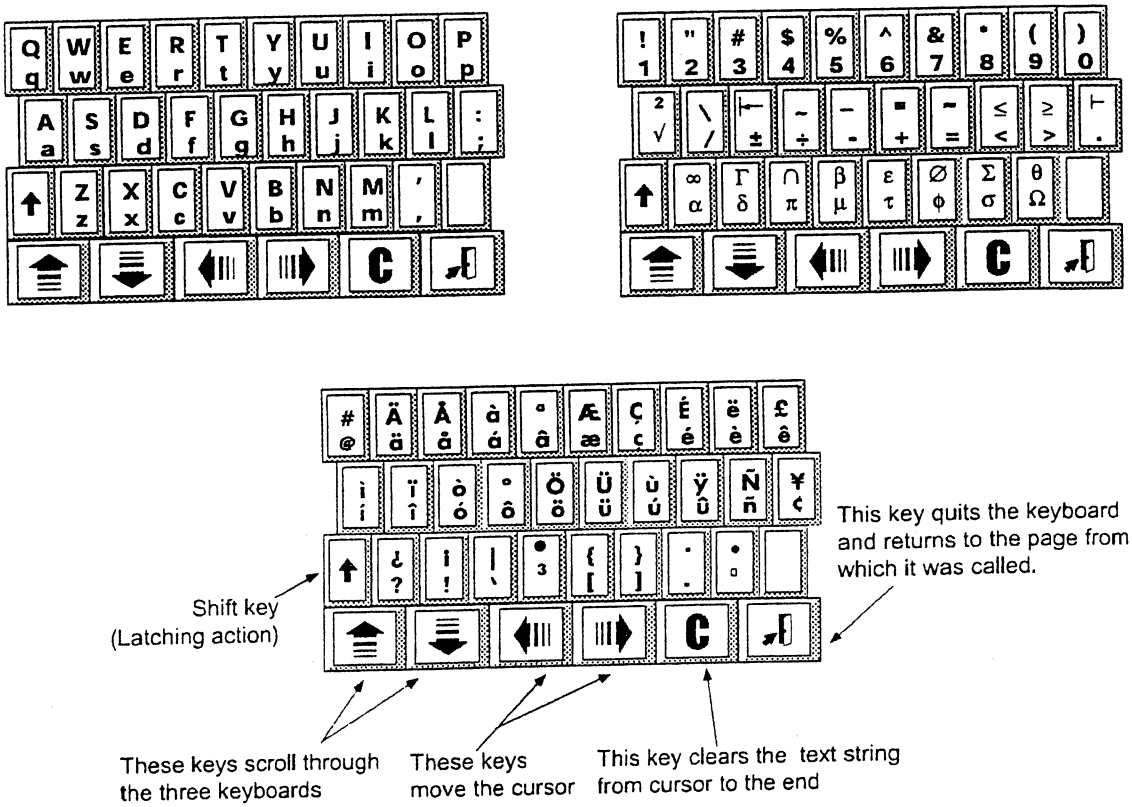


Figure 5.3.1b Character set

5.3.2 Alarm configuration

Up to four alarms can be configured for each channel. For absolute and deviation alarms, a hysteresis value can be entered to prevent spurious triggering should the process value 'hover' around the alarm threshold. For all types of alarm, a Dwell period can be configured, and if the alarm clears within this period, the alarm is ignored.

Each alarm can initiate up to two jobs, as described in this section (Jobs configuration)

Setpoint configuration

Allows you to set up alarm type, threshold value, hysteresis etc. Figure 5.3.2a shows the top level page for absolute alarms. For deviation and rate-of-change alarms, some of the menu items will be different from those shown.

Enable

Off — The alarm is disabled

Unlatched — When triggered, the alarm stays active until the triggering source returns to a non-alarm state. Alarm indicators flash until acknowledged or until the alarm clears. When acknowledged, the indicator stays on permanently until the alarm is no longer active. Alarm messages appear on the trend display.

Latched — When triggered, the alarm stays active until it has been acknowledged and the triggering source returns to a non-alarm state. Alarm indicators flash until acknowledged, then stay permanently on until the alarm is no longer active. Alarm messages appear on the trend display. Continuous jobs (e.g. change chart speed) remain active only until the triggering source returns to a non-alarm state (whether acknowledged or not).

Trigger — When triggered, any jobs associated with the alarm are initiated, and for continuous jobs (e.g. sound buzzer) continue until the triggering source returns to a non-alarm state. Trigger alarms are not annunciated, nor do alarm messages appear on the trend display.

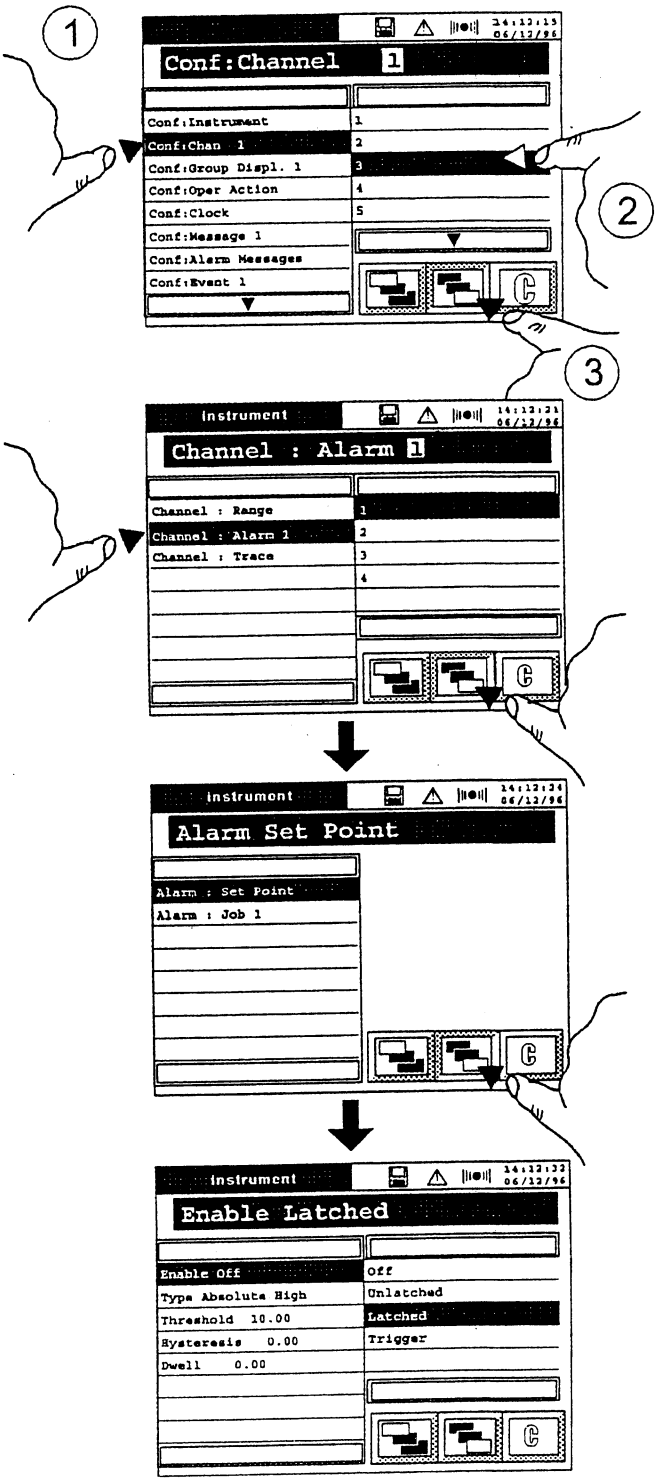


Figure 5.3.2a Entry to channel alarm configuration

5.3.2 ALARM CONFIGURATION (Cont.)

In the following diagrams, PV values increase from left to right

ALARM TYPES

Absolute alarms

An absolute high alarm becomes active when the PV value rises above the alarm threshold value. The alarm remains active until the measured value falls below (*setpoint - hysteresis*).

An absolute low alarm becomes active when the PV value falls below the alarm threshold value. The alarm remains active until the measured value rises above (*setpoint + hysteresis*)

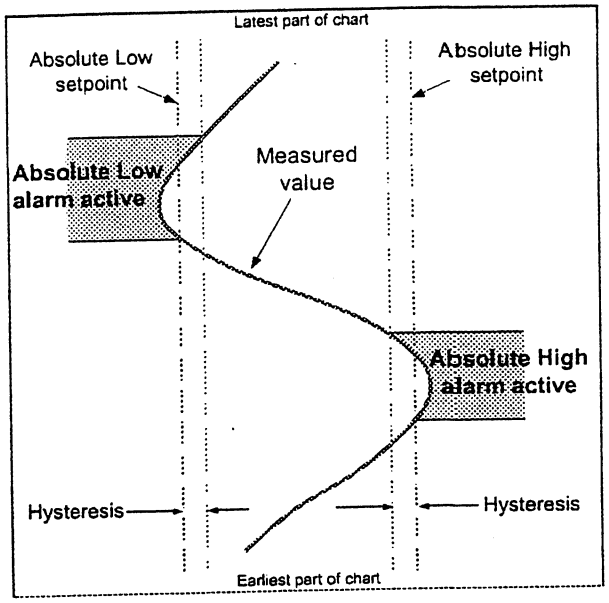


Figure 5.3.2b Absolute alarm definition

Deviation alarms

Deviation alarms require a reference value and deviation value and can have a hysteresis value entered if required.

'Deviation out' alarms are active

a when the PV value rises above (*Reference + Deviation*), and remains above {(*Reference + deviation*) - *hysteresis*},

or

b. when the PV value falls below (*Reference - Deviation*) and remains active until the PV value rises above. (*Reference - Deviation*) + *Hysteresis*.

'Deviation in' alarms are the inverse of the above, as shown in the sketch below.

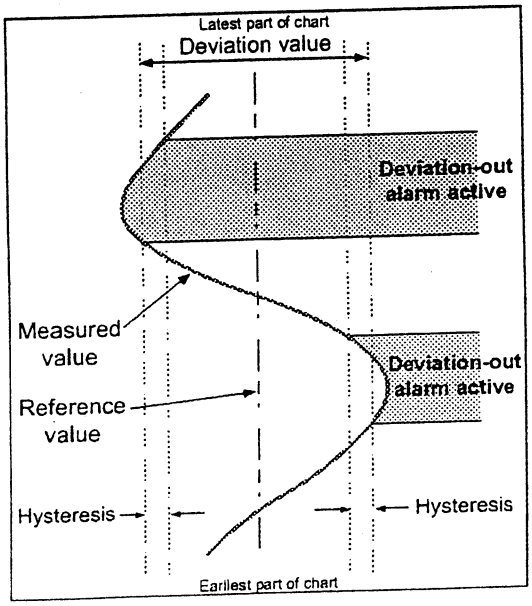


Figure 5.3.2c 'Deviation out' alarm definition

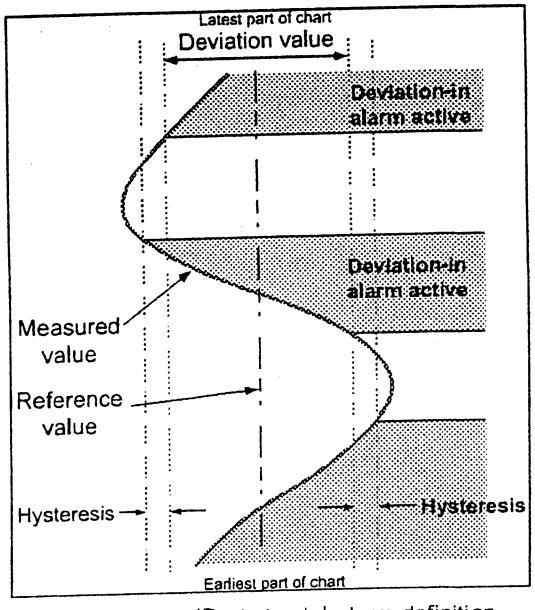


Figure 5.3.2d 'Deviation in' alarm definition

5.3.2 ALARM CONFIGURATION (Cont.)

Rate-of-change alarms

With rate-of-change alarms, a value, a time period and an averaging period have to be configured. In the accompanying sketch, the Value is 200 litres and the Time Period is one minute.

The alarm is triggered if the PV changes by more than the configured Value in less than the configured Time Period (i.e. more than 200 litres/ minute in the sketch)

The averaging period can be used to change the sensitivity of the alarm, such that noise spikes or normal oscillations in the input signal do not trigger false alarms.

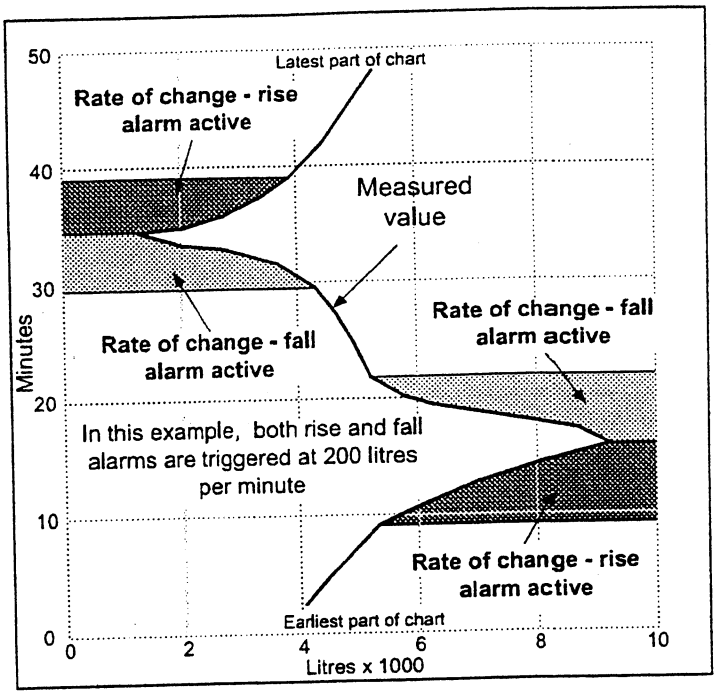


Figure 5.3.2e Rate of change alarm definitions

Alarm parameters

THRESHOLD
Sometimes called 'setpoint', this is the trip point for absolute alarms.

REFERENCE
For Deviation alarms, this sets a 'central' value on each side of which the Deviation Value (see immediately below) is to operate.

DEVIATION
For Deviation alarms only, this is a value each side of the reference value, within which a Deviation IN alarm is active, and outside which a Deviation OUT alarm is active. See figures 5.3.2c and 5.3.2d above.

CHANGE
For Rate-of-Change alarms only, this allows a value (D) to be entered using the keyboard. If the change in the channel value (ΔPV) over the specified time period T (see below) is greater than D ($\Delta PV/T > D$) then the alarm is tripped.

PER
For Rate-of-Change alarms, allows a time period to be selected for the above change value. 1 second, 1 minute or 1 hour can be selected as the period.

AVERAGE
Allows a period of 0 to 9 seconds to be entered for Rate-of-Change alarms. This has the effect of preventing spurious alarms being triggered by transient changes in the PV value.

HYSTERESIS
Allows a 'deadband' to be entered for absolute and deviation alarms, to prevent alarms being continuously triggered if the process variable value hovers around the trip point.

DWELL
This feature allows the triggering of any alarm to be delayed for a period configurable up to 2047 seconds. If the alarm source returns to a non-alarm state during the Dwell period, the alarm is ignored.

5.3.2 ALARM CONFIGURATION (CONT.)

Jobs Configuration

Each alarm can have two jobs associated with it, selected from the list in table 5.3.2 below. An example (to set Channel 3, alarm 2, job 2 to Print message 5 when the alarm is acknowledged) is given in figure 5.3.2f below.

Jobs cause the operation of the recorder to change as the result of an initiating trigger which can be an alarm going active, an event input, a totaliser reaching a previously specified value and so on. For definitions of maths pack, totaliser, counter and timer jobs, please refer to the options manual.

Notes:
1. The table below shows jobs for all options available at time of print. If an option is not fitted, its jobs do not appear in the scroll list.
2. DV = Derived variable (maths pack option); Tot = totaliser

No action	
Chart Span B Ch N	While Active, While Inactive, While UnAck'd
Chart Span B for all	While Active, While Inactive, While UnAck'd
Sound Buzzer	While Active, While Inactive, While UnAck'd
Disable all alarms	While Active, While Inactive, While UnAck'd
Ack All Alarms	On Going Active, On Going Inactive, On Acknowledge
Log 1 to archive 1	On Going Active, On Going Inactive, On Acknowledge
Log 2 to archive 2	On Going Active, On Going Inactive, On Acknowledge
Archive interval B	While Active, While Inactive, While UnAck'd
Print Message N	On Going Active, On Going Inactive, On Acknowledge
Display Message N	On Going Active, On Going Inactive, On Acknowledge
Message N to archive 1	On Going Active, On Going Inactive, On Acknowledge
Message N to archive 2	On Going Active, On Going Inactive, On Acknowledge
Reset DV N	On Going Active, On Going Inactive, On Acknowledge
Reset all DVs	On Going Active, On Going Inactive, On Acknowledge
Switch to B DV N	While Active, While Inactive, While UnAck'd
Disable DV N	While Active, While Inactive, While UnAck'd
Disable all DVs	While Active, While Inactive, While UnAck'd
Trigger DV N	On Going Active, On Going Inactive, On Acknowledge
Start Timer N	On Going Active, On Going Inactive, On Acknowledge
Reset Timer N	On Going Active, On Going Inactive, On Acknowledge
Increment Counter N	On Going Active, On Going Inactive, On Acknowledge
Decrement Counter N	On Going Active, On Going Inactive, On Acknowledge
Preset Counter N	On Going Active, On Going Inactive, On Acknowledge
Preset All Counters	On Going Active, On Going Inactive, On Acknowledge
Disable all Counters	While Active, While Inactive, While UnAck'd
Preset Tot	On Going Active, On Going Inactive, On Acknowledge
Preset All Tots	On Going Active, On Going Inactive, On Acknowledge
Disable All Tots	While Active, While Inactive, While UnAck'd
Add 1 hour	On Going Active, On Going Inactive, On Acknowledge
Subtract 1 hour	On Going Active, On Going Inactive, On Acknowledge

Table 5.3.2 Jobs list

5.3.2 ALARM CONFIGURATION (Cont.)

Job configuration (Cont.)

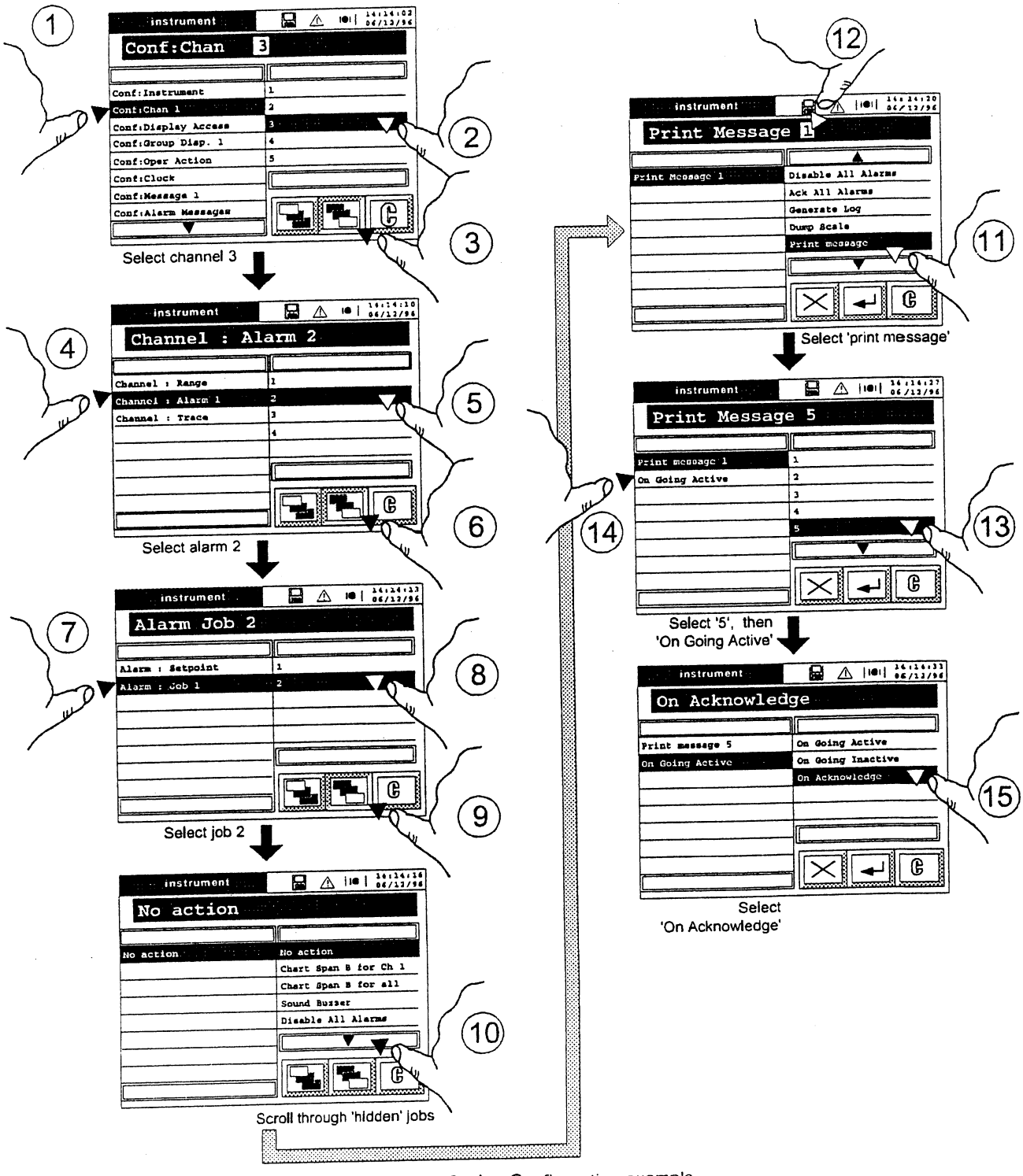


Figure 5.3.2f Job Configuration example

5.3.3 Channel trace configuration

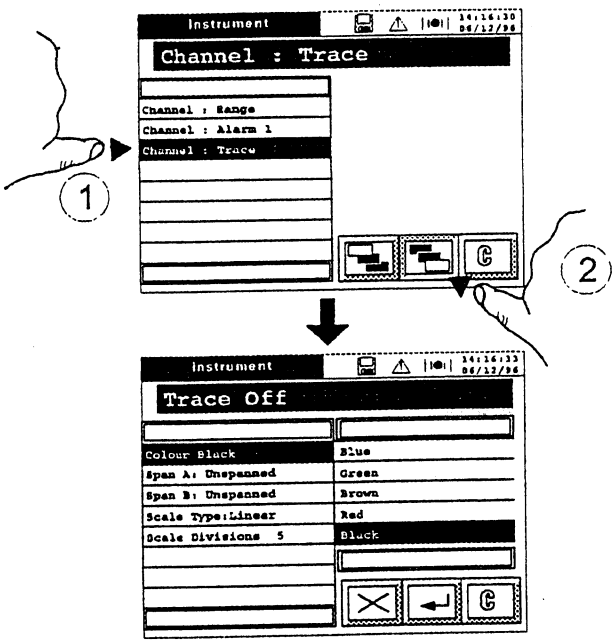


Figure 5.3.3 Channel trace configuration

This section of configuration allows you to:

a. Select trace colour
b. Set spans A and B for the channel
c. Scale type and divisions

COLOUR

The following colours can be selected for each trace: violet, blue, green, brown, red and black. The channels' tags and scales are presented on the 'chart' in the same colour as the trace, allowing ready identification. Where channel traces cross, or where channels have identical traces, the trace associated with the higher channel number will overwrite the other(s). Derived variable traces overwite input chanel traces.

SPAN A/SPAN B

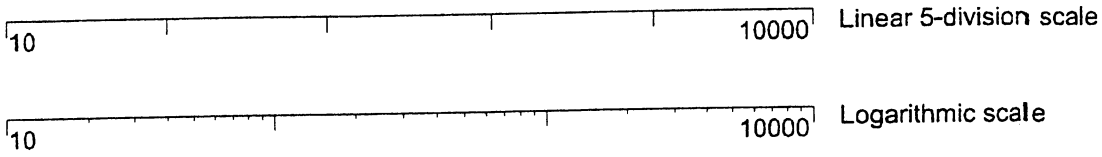
This allows two spans (A and B) to be selected for the trace so that a certain part of the trace can be magnified under certain circumstances (e.g. when the channel goes into alarm).

For example you may wish to record a process warming up from say 20°C to its operating temperature of 700°C, and then to look more carefully at any small variations. In order to do this for channel 1, Span A could be set to 0 to 900°C and span B to 600 to 800°C. An alarm could then be set up to trigger at say, 600°C with an associated job: 'Span B for 1' 'whilst active'. If Span A/Span B are left 'Unspanned', the input range is used.

5.3.3 CHANNEL TRACE CONFIGURATION (Cont.)

Scale type

This allows the selection of linear or logarithmic as the scale type for the channel to appear at the top of the trend display pages. For linear scales, the number of divisions can be defined by accessing the 'Divisions' field below. For logarithmic scales, the divisions are decades. The figure shows linear (5 division) and logarithmic scales for the range 10 to 10000.



Note: Logarthmic scales must be entirely positive and non-zero. If a scale limit or process value is zero or negative, the trace is drawn at scale low.

Scale divisions

Allows any integer between 1 and 10 inclusive to be used for linear scales. This value is independent of the number of 'chart' divisions which appear on the screen and which is set up in Group Configuration (see section 5.4 below). For scales defined as logarithmic, the scale is divided into decades, as indicated above.

Linear scale divisions appear only in trend displays. Logarithmic scales also appear on bargraph displays.

5.4 GROUP CONFIGURATION

The basic recorder contains six display groups (groups 1 to 6) which contain groups of channels for trending on the screen.

If the maths pack option is fitted (options manual) a further DV group is added to allow groups of channels etc. to be averaged, reset etc. This group cannot be displayed.

If an archiving option is fitted (section 6) two log groups are added: Log 1 and Log 2, for sending logs to disc.

Group configuration allows the contents of each group to be defined, and for display groups, allows the 'trend interval' and group title to be set up as described below.

Adaptive recording (section 2.1.3) can be selected 'on' or'off' for any display group, and applies to all points in that group. Grid divisions can be selected between 1 and 10, to vary the number of divisions across the 'chart'.

5.4.1 Group content

Initially, the groups are empty, so all channels and all relevant options (totalisers, counters, maths channels etc.) have to be added by the user, remembering that a maximum of six points can be placed in any one group.

Figure 5.4 shows a basic instrument with six input channels and no options having channel three added to display group 1. As can be seen, the selection of the item to be added is made from the 'status line' and then 'Yes' touched. (No is touched to remove previously entered items).

If options are fitted, they appear as extra lines in the left side of the screen, in the order:

Input channels (Ch) 1 to 6 (standard)
Input channels (Ch) 7 to 12
Derived channels (DV) 1 to 6
Derived channels (DV) 7 to 12
Derived channels (DV) 13 to 18
Derived channels (DV) 19 to 24
Totalisers (To) 1 to 6
Counters (Co) 1 to 6

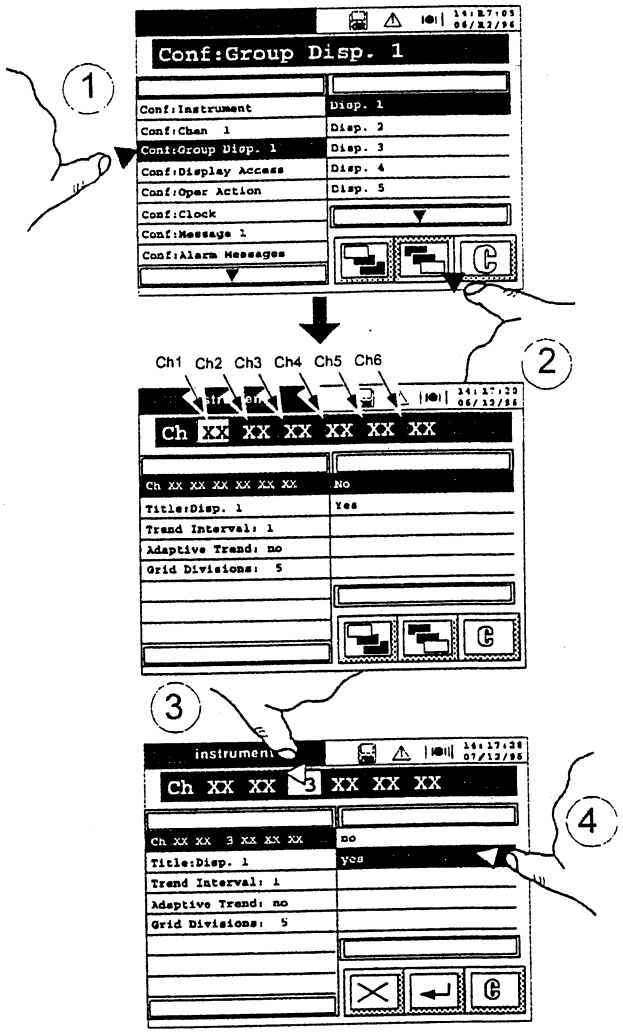


Figure 5.4 Access to group configuration

Note: Group history in trend review is lost if:

a Group content is edited
b The group sample interval is changed
c The input type of any of the group's points is changed to or from 'digital'.

5.4 GROUP CONFIGURATION (Cont.)

5.4.2 Group title

For display groups only, allows a title of up to nine characters to be entered to describe the group. Characters are selected from the qwerty keyboards shown in figure 5.3.1b, above. When entering titles, the following should be borne in mind:

a only the first seven characters of group titles appear in the alarm summary page.

b When performing a screen dump of a trend review screen, non-valid characters are replaced by underline characters (see 'Screen archive' in section 3.2.3 for details).

5.4.3 Trend interval

Trend interval is entered using the numeric keyboard in whole seconds from 1 to 1200. This allows the amount of time per screen height to be set, there being 180 trend intervals per screen, Table 5.4.3 shows (a selection of) the resulting times which can be achieved. (See also section 2.1.3 for total storable trend time.)

As can be seen, the screen height increases by 3 minutes for each extra second of trend interval or by 1 hour for every extra 20 seconds etc.

Although, for reasons of space, the table does not include every possible trend interval, it is possible to work out non-included times/screen by simple arithmetic. For example if you want 24 hrs per screen, you can add the trend intervals for 20 hrs (400 secs) and for 4 hours (80secs) to give a trend interval of 480 seconds, or you can multiply the trend interval for 4 hours (80secs) by six and so on.

Interval (secs)	Time per screen height		
	seconds	minutes	hours
1	180	3	0.05
2	360	6	0.1
3	540	9	0.15
4	720	12	0.2
5	900	15	0.25
6	1080	18	0.3
7	1260	21	0.35
8	1440	24	0.4
9	1620	27	0.45
10	1800	30	0.5
20	3600	60	1
30	5400	90	1.5
40	7200	120	2
50	9000	150	2.5
60	10800	180	3
70	12600	210	3.5
80	14400	240	4
90	16200	270	4.5
100	18000	300	5
200	36000	600	10
300	54000	900	15
400	72000	1200	20
500	90000	1500	25
600	108000	1800	30
700	126000	2100	35
800	144000	2400	40
900	162000	2700	45
1000	180000	3000	50
1100	198000	3300	55
1200	216000	3600	60

Table 5.4 Trend interval *versus* screen height

5.4.4 Adaptive recording

As explained in section 2.1.3, it can sometimes be useful to ensure that short term or 'fast' transients are not missed, particularly at slow trend rates. Setting 'Adaptive Trend' to 'on', will enable adaptive recording for every point in the group.

Notes:
1. adaptive recording applies only to display groups
2. each point with adaptive recording enabled counts as two when calculating the total trend time in memory (table 2.1.3)

5.4.5 Grid divisions

This allows the number of grid divisions which appear on the 'chart' to be entered. Any number between 1 and 10 can be entered. An entry of '1' produces grid lines at 0% and 100% only. Setting the value to '2' divides the chart into halves with a grid line at 50% and so on, up to 10, which produces grid lines every 10% from 0 to 100% inclusive.

5.5 DISPLAY ACCESS CONFIGURATION

This allows the operator to select which of the display modes (section 3) to have in the 'Cycle Screens' scroll list.

All the available trend, bar and numeric modes can be selected to appear (yes) or not (no) as required, with 'Vertical Trend', 'Horizontal Bars' and 'Numeric' set to 'yes' as defaults.

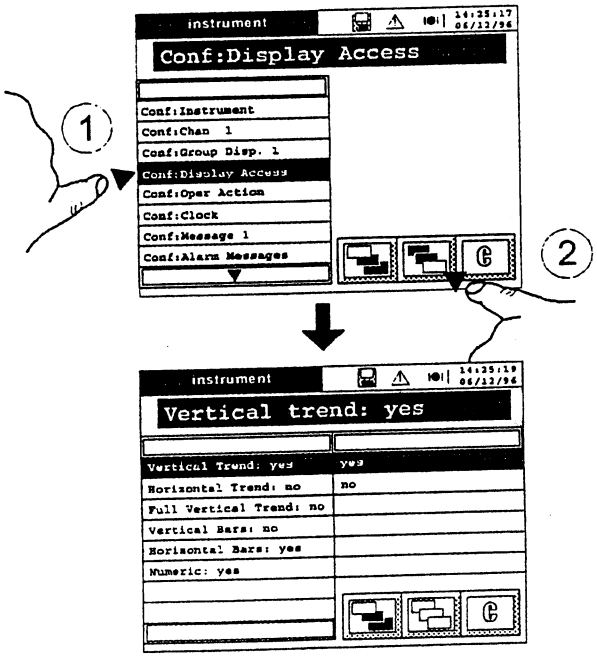


Figure 5.5 Display access pages

5.6 OPERATOR ACTION CONFIGURATION

This defines the text string (↵ to ------) which appears in the Operator Action page (section 4.5), and whether the trigger is to be latching or non-latching. Text entry is carried out using the qwerty keyboards (figure 5.3.1b).

When used from the Operator Action page, the 'Enter' key acts as a trigger to an 'internal event', and can initiate up to two jobs. See section 5.10 (Events) for more details

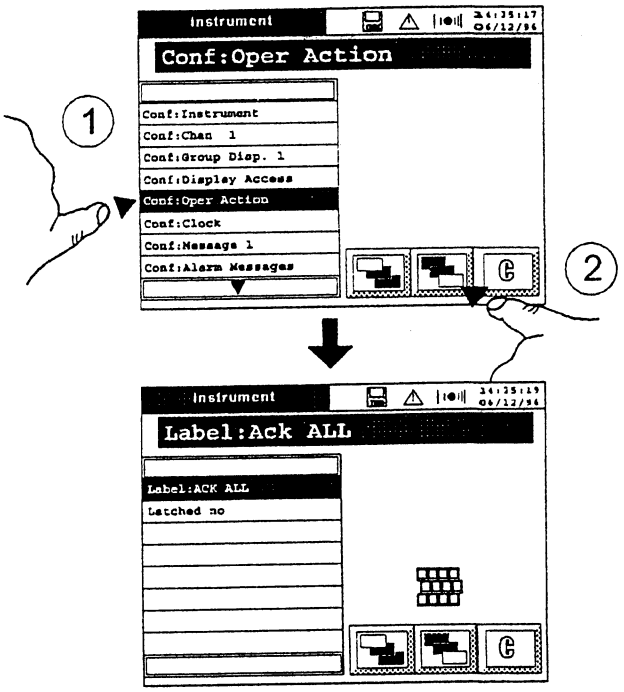


Figure 5.6 Operator action configuration

5.7 CLOCK CONFIGURATION

This part of the recorder's configuration allows you to set the current time and date using the keyboard, and the date format (Day/Month/Year or Month/Day/Year) from a pick list.

A valid date must first be set before the format can be changed.

The time and date are maintained, under power-off conditions, by a battery as described in section 4.6.1

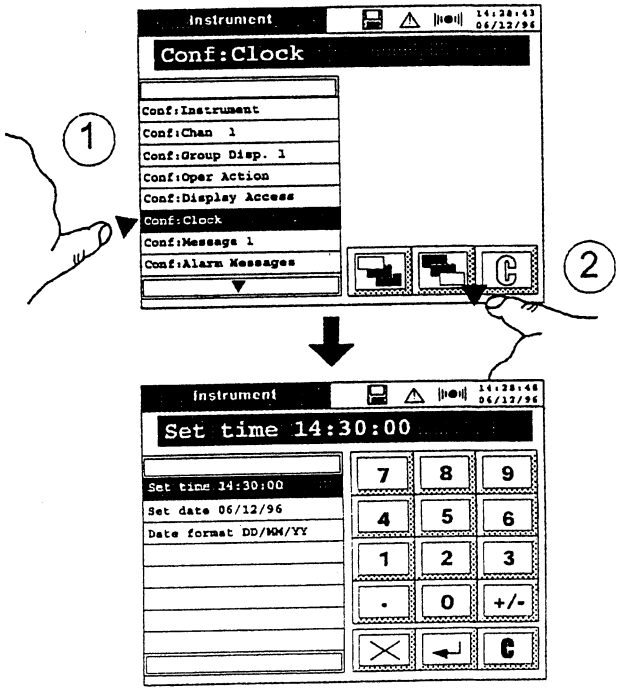


Figure 5.7 Clock configuration

5.8 MESSAGE CONFIGURATION

This part of the configuration allows up to 20 messages to be entered, for display and/or to appear on the 'chart' as the result of operator or Job action. Entered using the qwerty keyboards shown in figure 5.3.1b, these messages can include 'embedded sequences' as described below, including the operator messages described in section 4.3.

5.8.1 Embedded sequences

Message text is freely editable, and may contain one or more 'Embedded sequence' each of which causes the current value of a particular variable (e.g. time, date, value of channel N) to be automatically included in the message. The sequences are embedded using < and > as delimiters to separate them from one another and from normal text.

Although the message is limited to 20 characters at the display, the embedded sequences will expand fully on the 'chart' or at the disc if fitted. The available sequences, which must be entered as shown, are as follows:

ONE PART SEQUENCES

<TIME>	Embeds the current time in hh:mm:ss format
<DATE>	Embeds the current date in the format (DD/MM/YY or MM/DD/YY) defined in clock configuration (section 5.7)
<OP1>	Embeds operator message N°1. If this itself contains embedded sequences, these are not expanded.
<OP2>	As for OP1 above, but for operator message N°2.

TWO PART SEQUENCES

The remaining sequences require an Item and a Type to be entered either as <Item.Type> or as <Item–Type>. If the latter (hyphen) format is used, the 'Type' will be highlighted if in alarm.

ITEMS

Blank	Uses the triggering item (e.g. alarm) itself as the message triggering source
n	Uses measuring channel n as the message triggering source
Dnn	Uses derived channel nn as the triggering source.
Tn	Uses totaliser n as the source if TCT option fitted
Cn	Uses counter n as the source if TCT option fitted
tn	Uses timer n as the source if TCT option fitted
En	Uses event n as the source.

TYPES

PV	Causes the Item's process value to be embedded
TA	Causes the item's tag to be embedded
UN	Causes the Item's units string to be embedded
NO	Causes the Item's ID to be embedded (e.g. t2, 06)

EXAMPLES

An alarm going active on channel 3 has 'Print Message 1 on going active' as one of its jobs.

If Message 1 were set up to be: `<TIME><.TA><-PV>` then the current time and the tag and process value of channel 3 would be printed on the chart.

If, instead, Message 1 were `<TIME><6.TA><6-PV>` then the current time and the tag and process value of channel 6 would be printed on the chart when the channel 3 alarm went active.

5.9 ALARM MESSAGES

On/off messages (HH:MM Alarm on CCn, and HH:MM Alarm off CCn) can be printed on the 'chart' when alarms become active (on), or become non-active (off). HH:MM is the time, CC is the channel number and 'n' is the alarm in question.

Similar messages can also be printed to show when alarms are acknowledged.

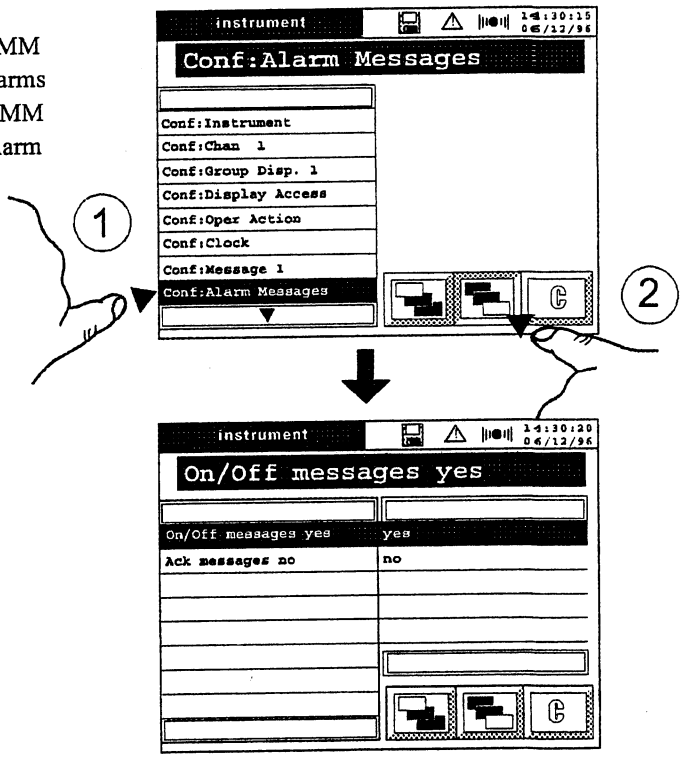


Figure 5.9 Alarm message on/off displays

5.10 INTERNAL EVENTS

There are six internal events, which can be triggered by one or more stimuli, and which can generate up to two jobs each when active. Input sources can be ANDed or ORed, so multiple logical inputs can be used. For example, to sound a buzzer only when channel 1 and channel 2 and channel 4 are all in alarm, we could set up events 1 and 2 as follows:

Event 1:
- Enabled
- Source 1(S1) AND Source 2 (S2)
- S1:Alarm on ch 1.
- S2:Alarm on ch 2.

Event 2:
- Enabled
- S1 AND S2
- S1:Alarm on ch 4
- S2:Event 1

Event 2, Job 1
- Sound Buzzer
- While active.

5.10.1 Event sources

Event sources are:
Operator Key (See sections 4.5 and 5.6 - Operator action)
Alarm on Ch N (Alarm on specified channel)
Glb Channel alarm (Alarm on any channel)
Glb UnAck Ch Alm (Unacknowledged alarm on any channel)
System error (Section 4.7)
Clock failure
Event N (Another specified event)
Power up

5.10 EVENT CONFIGURATION (Cont.)

5.10.2 Event Jobs

Each event can have up to 2 jobs associated with it. These jobs and their configuration are as described in section 5.3.2 above

5.11 SYSTEM ERROR DISPLAY

This is identical with the Operator System Error Display described in section 4.7

5.12 CONFIGURATION TRANSFER

This facility allows the transfer between recorders, or between the recorder and a host computer using a jack socket located to the right of the disc slot (behind the 'flap' below the display). Section 1.2.2 gives wiring details.

Only the Baud rate is configurable at the recorder. If you are transferring to and from a host computer, the other settings needed are: Eight data bits, One stop bit and No parity.

The configuration transfer circuit is designed for use with TTL (0 to +5V) signals. A converter may be required with some host computers to change the signals to 12 Volts.

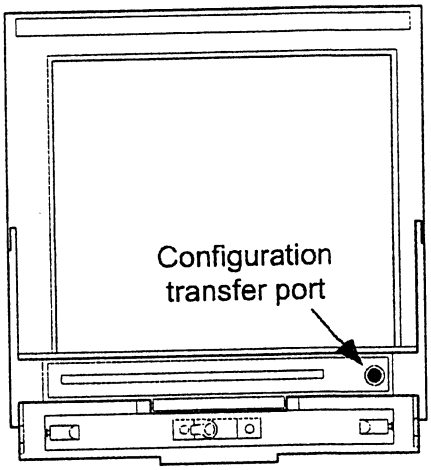


Figure 5.12a transfer port location

The Transfer function will overwrite the destination recorder's configuration, ensure that the transfer is carried out in the correct direction (i.e. from save to restore)

↵ to Save config

Operation of the enter key causes the configuration to be saved to another recorder (set to 'Restore') or to a host computer.

↵ to Restore Config

Operation of the enter key causes a new configuration to be retrieved from another recorder (set to 'Save') or from a host computer.

Baud Rate

Specifies the number of characters per second at which the transfer will take place. The setting (1200, 1800, 2000, 2400, 4800, 9600 or 19200) must be the same for both sending and receiving devices.

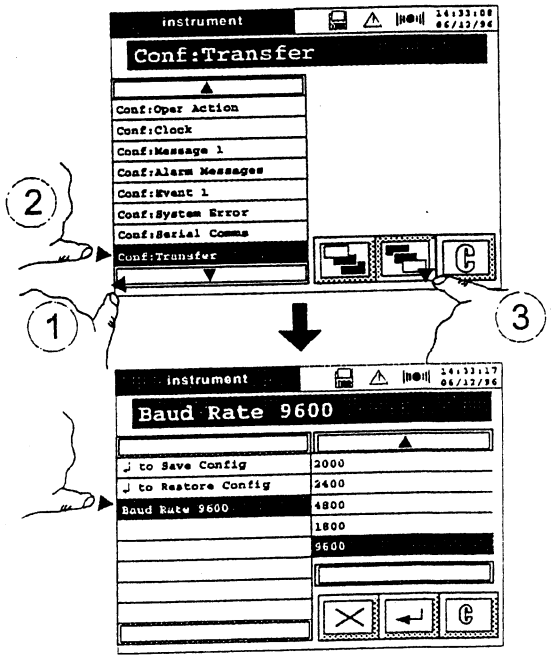


Figure 5.12b Configuration transfer pages

5.13 DISC

See section 6

5.14 OPERATOR ACCESS

For the sake of security, it is possible to enable/disable certain of the operator functions. These functions are listed below, together with their 'default permissions' (i.e. how they are despatched from the factory).

Edit / print messages: default = Yes
Initiate Log: default = Yes
Adjust alarm thresholds: default = No
Disc functions:
- View directory = Yes
- Delete files = No
- View status = Yes
- Set disc offline = Yes
- Save config = No
- Restore config = No
- Archive data = No

5.15 ADJUST

5.15.1 Input adjust

This feature allows input channels to be adjusted to make allowance for non-standard inputs. The technique used is to apply a known input at the low end of the input range for each channel in question. Once the reading displayed by the recorder has stabilised, the 'correct' value is entered. The process is repeated for a value near the high end of the input range.

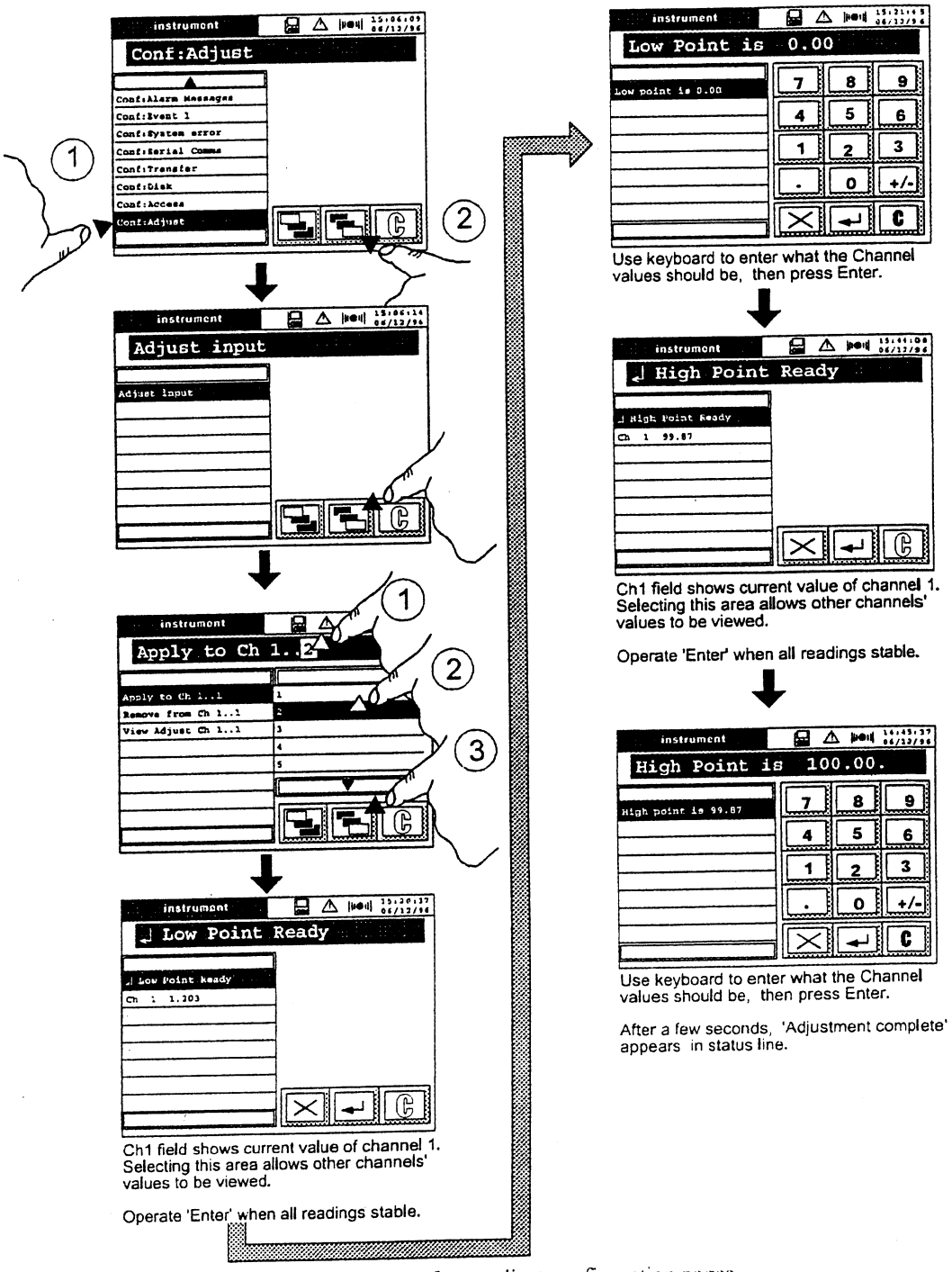


Figure 5.15.1a Input adjust configuration pages

5.15.1 INPUT ADJUST (Cont.)

Adjustments can be removed, and channels can be checked to see if they are 'adjusted' as shown in figures 5.15.1b and 5.15.1c respectively.

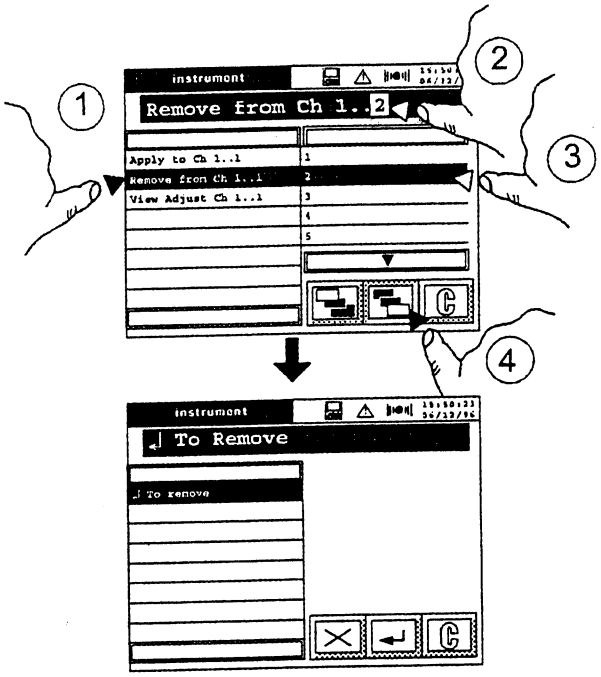


Figure 5.15.1b Adjustment remove

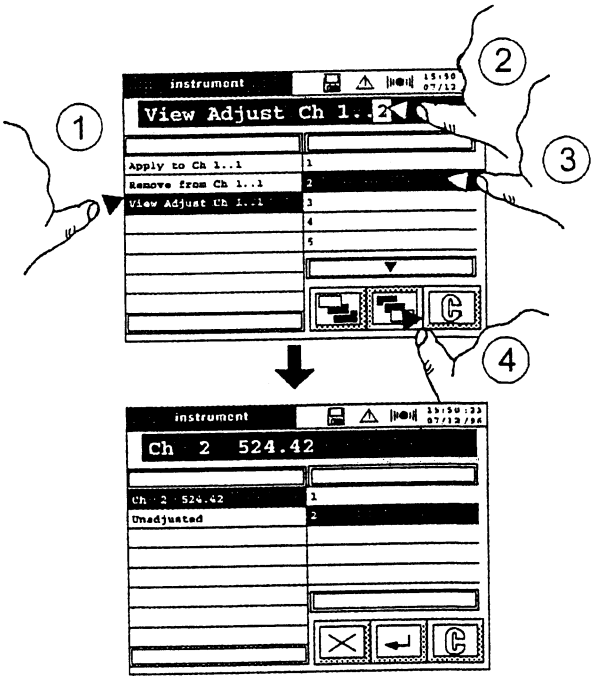


Figure 5.15.1c Adjustment view

5.16 DEFAULT CONFIGURATION

This feature returns the recorder's configuration to its default state. All user-entered adjustments are lost, and if required must be re-entered after the default configuration has been returned to.

Operating the Enter key from the '↵ to default config' page, causes a '↵ sure?' confirmation request to appear.

If you wish to procede with restoring the configuration, operate the Enter key from the confirmation page. If not, use the 'Go back to previous display' key (bottom left below the screen) or the navigation keyboard to quit the page.

If you do go ahead, by operating the Enter key, a 'Please wait' message appears for about 1 minute, after which a display language has to be selected. Once this has been done, the recorder re-initialises itself.

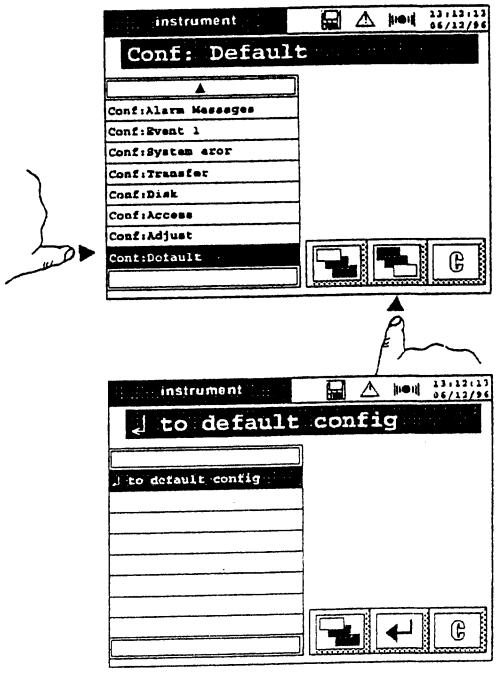


Figure 5.16 default configuration

Section 6 Mass Storage

Contents

HARD DISK OPTION ESSENTIAL INFORMATION

Caution

Although the hard disk is designed for use in an industrial environment, it can be damaged if not handled correctly. Therefore:

1. Please do not drop the hard disk
2. Please do not expose to extremes of heat, humidity or magnetic field strength.
3. Please do not remove the disk whilst data is being read from or written to it. To do so might result in irreparable sector corruption.
4. Because of temperature considerations, ATA Hard disks are not specified for use in instruments fitted with the portability case option.

Notes:

1 When not in use, the disk should be kept in the protective pouch provided.

2 The DOS format used on disks imposes a limitation on the number of files which can be placed in the root directory. This limit depends on where and how the disk is formatted and is outside the control of the recorder manufacturer. If the maximum number of files is reached, the disk behaves as though it is full; Configuration saves will report 'Media full' and, when archiving, the oldest archive file on the disk will be deleted to make room. If your application requires the storing of large numbers of files on one disk, each disk should first be investigated to see how many files can be stored.

Typical maximum numbers of files are as follows:

PC card hard disk = 511
PC card ATA flash = 127
Floppy disk = 223

6 MASS STORAGE

6.1 INTRODUCTION

Notes:

1 Some disk functions are not accessible to the operator until they have been enabled in 'Operator Access' configuration as described in section 5.14

2 When using a floppy disk as the storage medium, any data logged within the 30 seconds prior to a power failure to the recorder, will be lost. Using other media, only data logged within the second before a power failure may be lost.

3. Before changing media, the disk drive MUST be switched Off-line, or data will be corrupted.

Files are stored in DOS format, and configuration software, available from the manufacturer, to run on a PC, can be used in conjunction with the disk (and a suitable reader) to create or modify configurations for subsequent down loading to the recorder.

Most disk functions are available both from the configuration menu and from the operator menu (unless access permission has been denied - see section 5.14). The major functional options are:

Save and restore option:	Configuration save and restore
ASCII log option:	As Save and Restore option but with ASCII Data logging.
Compressed log option:	As ASCII log option but with PACKED data format.

Reformatting software is available to convert PACKED format data logs to ASCII format thus allowing manipulation of the data in PCs.

'Graphical replay' software is also available to run under Windows™, to allow data from one or more graphics units to be stored indefinitely and to be presented graphically using well-known techniques.

6.2 DISK INSERTION

The disk or PC card is inserted into a slot located behind the lower cover flap at the front of the recorder (figure 6.2). When correctly inserted, the disk icon appears at the top of the screen after a few seconds*. Disk orientation is as indicated on the disk label. Only formatted discs may be used: if an unformatted disk is inserted, a 'Disk insert failed - please re-insert' message appears.

If an unrecoverable disk error occurs on insertion, a 'Disk insertion failed' message appears and the recorder restarts.

To remove the disk, operate the push-button disk ejector adjacent the card slot.

* Note: For PC discs only: with floppy discs, the disk icon does not appear until the disk is first accessed, after which the icon remains on display until the disk is ejected.

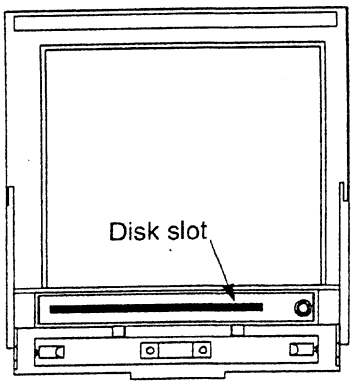


Figure 6.2 Disk slot location

6.3 TOP LEVEL MENU

Operation of either the OP:Disk or the Conf:Disk items results in the top level Disk page being displayed.

Note: Initially, operator access to disk functions other than 'Directory', 'Status' and 'Off-line' is denied, and if this is not changed (section 5.14) other functions do not appear in the operator top level menu.

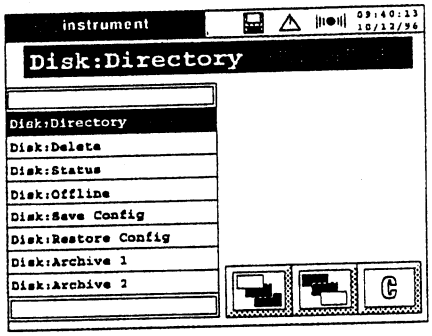


Figure 6.3 Top level disk menu

To enter any part of the menu structure, the relevant item is selected in the left hand column, then the Step down key is operated.

6.4 GENERAL FUNCTIONS

6.4.1 Directory

The display shows the name of the first file on the disk, together with its size in Bytes and the time and date of the file's creation.

The down arrow key allows the user to scroll through other file names held on the disk.

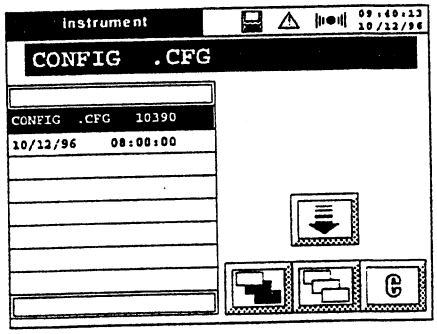


Figure 6.4.1 Directory function display pages

6.4.2 Delete

As shown in figure 6.4.2, the display shows an '↵ erase oldest file' statement.

The down arrow key allows the user to scroll through the file names held on the disk.

For each filename on display, operation of the 'Enter' key generates a request for confirmation of erasure. A further operation of the 'Enter' key removes the file from the directory.

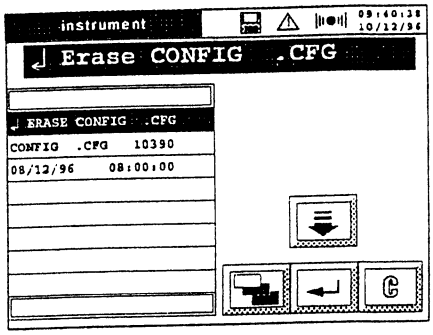


Figure 6.4.2 Delete file display pages

6.4.3 Status

This display tells the user how much of the storage capacity is currently used (11kB in the example) out of the total available (1.4MB in the example).

Note: 'Empty' disks/cards use some space for format data,

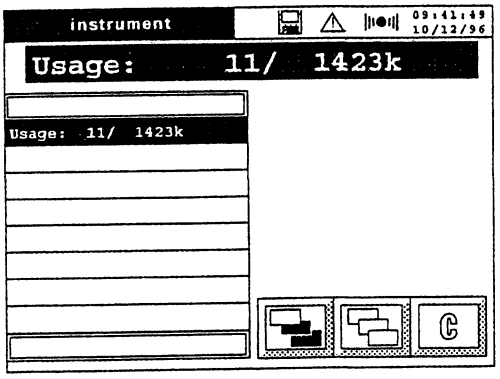


Figure 6.4.3 Status display pages

6.4.4 Off-line

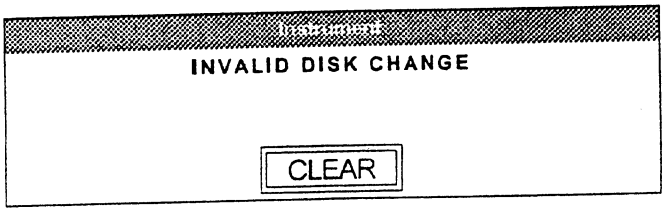
In order to ensure that no corruption of data takes place whilst changing media, access to the disk must be inhibited whilst replacement is carried out.

This is done by setting it off-line either by selecting Disk:Offline from the left hand column, then operating the Step Down key, or by operating the Disk off-line key of the navigation keyboard.

In either case, the message 'Flushing Disk Cache' is displayed for some seconds.

The storage medium remains off line until the Step Up key is operated.

Should an attempt be made to change the disk without first setting the drive off line, a 'dialogue box' might appear as below, and if so, it is possible that some data has been lost. This box remains on display until the CLEAR key is touched.



Note: in order to maximise the transmission rate when using the MODEM (Remote Operation option), the disk might occasionally be placed off line for short periods (under user control). Should this occur and a write to disk is required, a 'disk overdrive' message will appear.

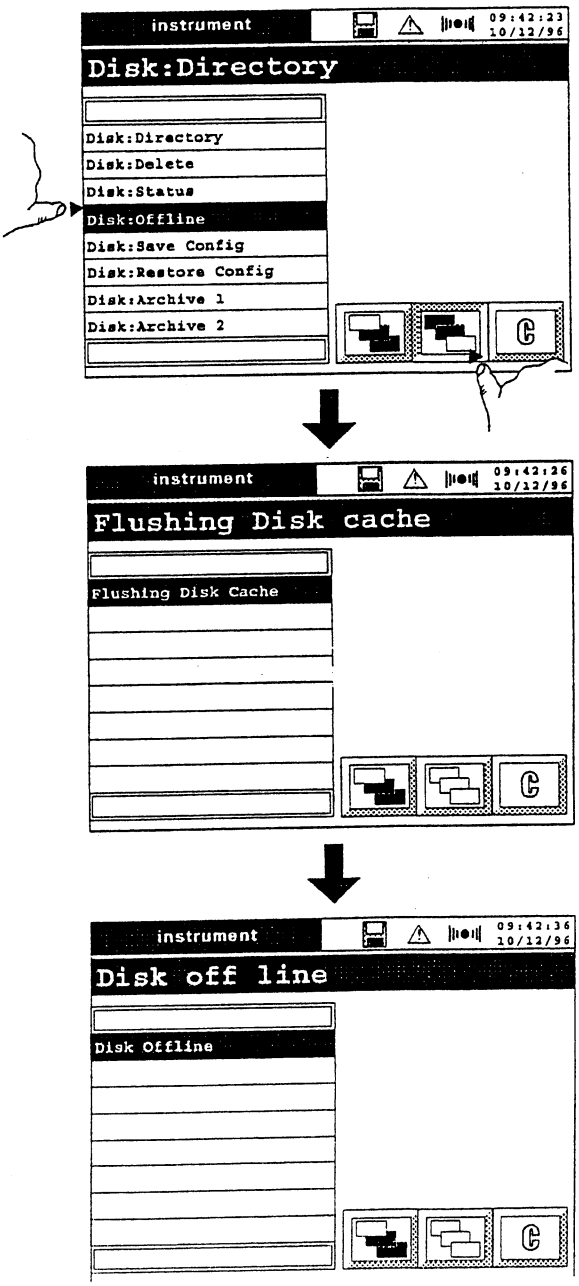


Figure 6.4.4 Setting the disk off line

6.5 CONFIGURATION SAVE AND RESTORE

6.5.1 Save

The 8-character filename can be edited using the qwerty keyboard.

All configuration files have the non-editable extension '.CFG'.

Should the filename already exist, an overwrite confirmation is requested. 'Enter' confirms overwrite, or 'Step up' returns to the original filename.

Note that only DOS format file names are allowed. Section 6.7.1 gives the permitted character set.

When the required filename has been entered, operate the quit (door) key.

The filename is confirmed and the save initiated by pressing the Enter key.

During the save, the text 'Saving Config' appears at the status line (not shown in figure 6.5.1).

When the save is complete, a 'pop-up' box appears with the message 'Config Save Complete'.

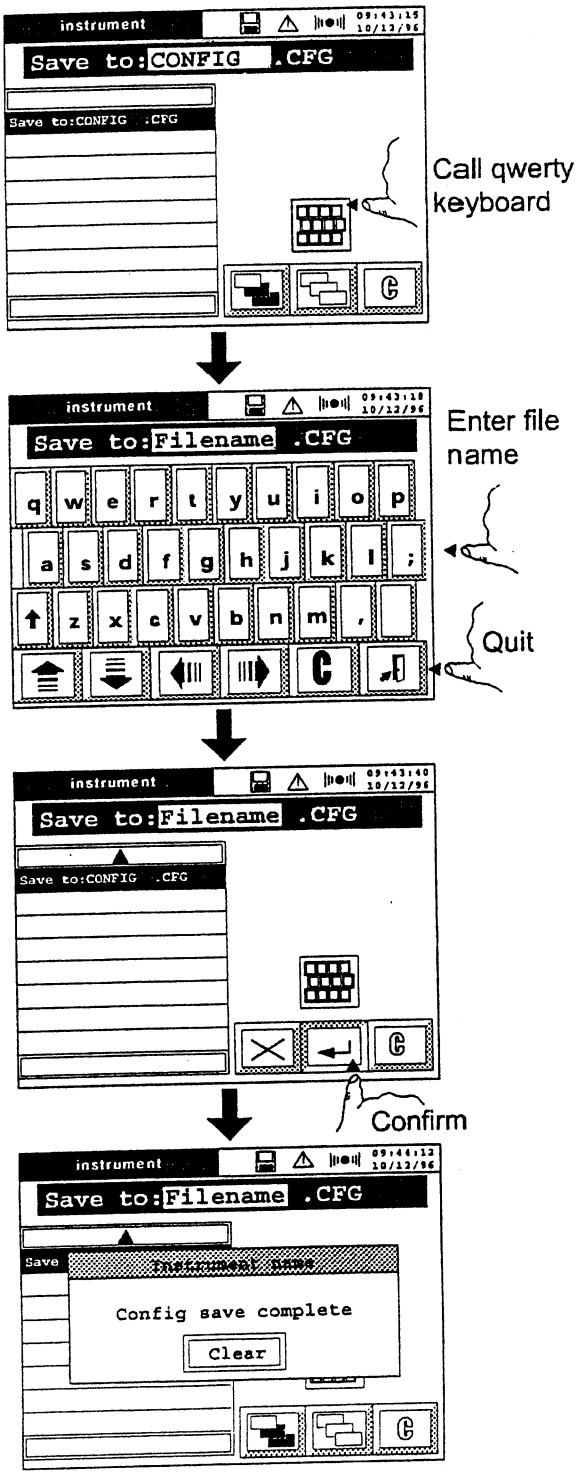


Figure 6.5.1 Save Configuration displays

6.5.2 Restore

This allows the names of all the files held on the card to be scrolled through using the down arrow key. Configuration files can be identified as they have .CFG as their extension

Once the required file name is displayed, operation of the 'Enter' key causes the configuration to be read from the disk.

Whilst the configuration is being read, the message 'Restoring config.' is displayed.

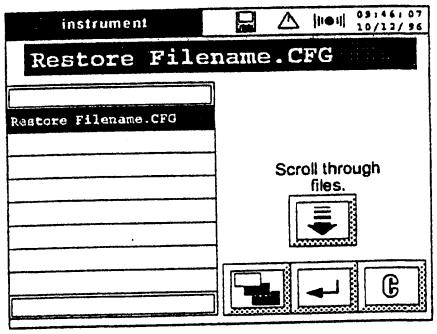


Figure 6.5.2 Restore configuration display

Once the configuration read is complete, the recorder re-initialises itself and returns to the 'Area' display.

6.6 DATA LOGGING (ARCHIVE)

This feature allows archiving of the contents of the Log 1 and Log 2 groups to the disk. Two file configurations are set up, called Archive 1 and Archive 2. The contents of Log 1 group are saved to the filename defined in Archive 1; Log 2 being sent to the filename defined in Archive 2.

As described in section 2.1.4, logging to file can be initiated by job, through operator action, or (for log 2 group only) automatically at configurable period. According to which of the archiving options is fitted, data can be logged in ASCII format (both options) or in PACKED format which is a compressed format for high density data archiving. Reformatting Software for running on a PC, is available from the manufacturer to allow conversion of the compressed data into ASCII comma-delimited format, suitable for direct use with PC spreadsheet or word processing packages.

See section 6.7 for details of permissible file names / types.

6.6.1 Top level menu

Figures 6.6.1a and b show the top level Archive 1 and Archive 2 pages for ASCII (figure 6.6.1a) and PACKED (figure 6.6.1b) formats.

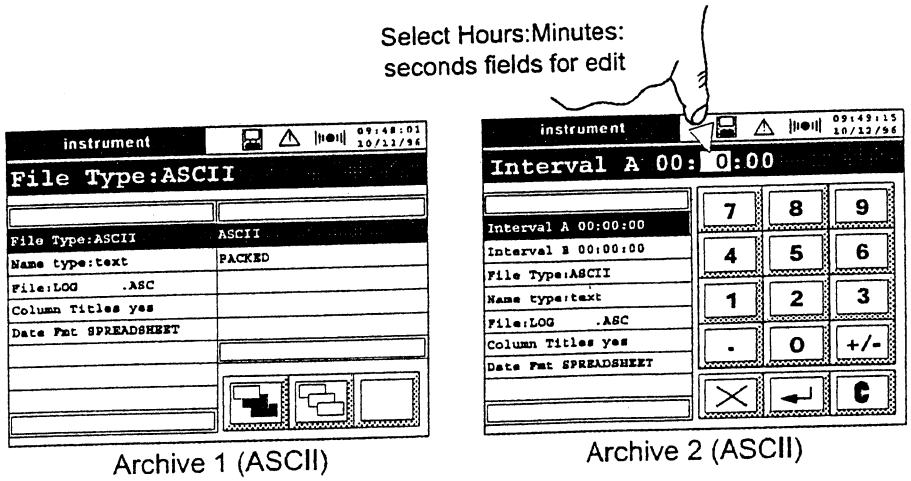


Figure 6.6.1a Top level archive menu (ASCII)

6.6.1 TOP LEVEL ARCHIVE MENU (Cont.)

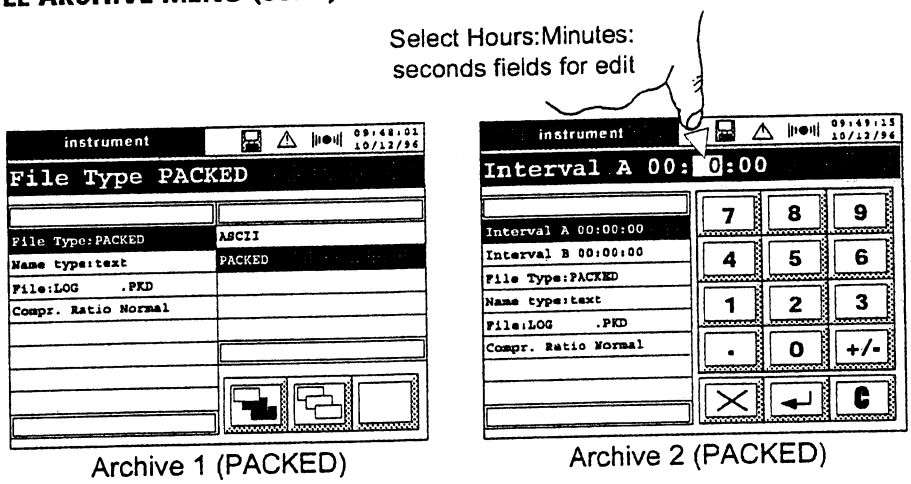


Figure 6.6.1b Top level Archive menu (PACKED)

6.6.2 Archive parameters

Parameter	Choices	Definition
Archive Int.		For Archive 2 only, allows hours, minutes or seconds to be selected for edit from the status line. Value entered using the keyboard. Entry of 00:00:00 inhibits logging.
File type	ASCII	Produces comma delimited columns of data. File name extension is .ASC (See table 6.6.2 below for examples)
	PACKED	Proprietary format. Data is stored in a compressed manner which requires a reformatting tool to extract data from it. File name extension is .PKD
Name type	Text	Fixed file name - see section 6.7.1.
	Hourly	New file opened hourly - see section 6.7.2.
	Daily	New file opened daily - see section 6.7.3.
	Counter	File name takes counter value - see section 6.7.4.
File Column titles (ASCII)	Yes/No	See section 6.7 If YES, comma delimited column titles are sent if 'Item tag' is selected 'yes' in Group Format - Log1 (2).
Date format (ASCII)	DD/MM/YY,HH:MM:SS	First two columns used to specify time and date of archive. (DD/MM/YY might be MM/DD/YY according to the date format selected in Clock configuration
	Spreadsheet	Single, floating-point number. The integer part is the number of days since 0 hrs on the 31st Dec 1899, the decimal part is the proportion of the day since midnight. For example, Noon on the 1st Jan 1900 would be represented by a value of 1.5, whilst a value of 35236.25 would represent 6 am on the 31st July 1996.
	Integer	Compresses time and date as YYMMDDHHMMSS, so that 6 am on the 1st June 1996 would be represented as 960601060000.
Compr. Ratio (Packed)	Normal	Compresses the data, but provides an exact copy.
	High	Compresses the data more than NORMAL. Input channel values are saved to 0.02% accuracy, Totalisers, counters and derived channels are saved to 0.000004% of display accuracy (4 parts in 10^8)

6.6.2 ARCHIVE PARAMETERS (Cont.)

File containing two input channels (2 and 3) including item tag, with DD/MM/YY,HH:MM:SS date format. Column headers (Channel tags) included: "XXXXA", ,"2","3" "DD/MM/YY","HH:MM:SS","°C","Bar" "Log 1",,"TempVes1","PresVes1" 29/02/96,12:15:06,28.93,0.989 29/02/96,12:16:04,28.71,0.963 (Where XXXXA is the recorder model number)	File containing two input channels (1 and 3) NOT including tags or units, with DD/MM/YY,HH:MM:SS date format. "XXXXA", ,"1","3" ,, "Log 1",, 29/02/96,12:15:06,39.94,0.905 29/02/96,12:15:06,28.71,0.963 (Where XXXXA is the recorder model number)

Table 6.6.2 Examples of ASCII format files

6.6.3 Automatic file deletion

Should the disk or card become full whilst chart copy or data logging / archiving activities are being carried out, the oldest data logging / archiving file on the card is deleted. (The oldest file will be deleted whether or not it is of the same type as the one being written.) **Existing configuration files (.CFG) are not deleted.**

Should the disk/card become full whist a Configuration Save is being attempted the Save will be aborted and the message 'Err:Card full' will be displayed until cleared by the 'Clear' key.

6.7 FILE NAMES

As shown in figure 6.7, the following types of file name may be used when archiving data.

1. Text
2. Daily (Uses the recorder's real-time clock)
3. Hourly (Uses the recorder's real-time clock)
4. Counter value.

The file names consist of up to eight characters, followed by a three-character non-editable extension.

6.7.1 Text file names

With 'Name type' selected as 'Text', the NN—NN field can be freely edited with alphanumeric characters as shown below. The use of any other character (including blank spaces) will result in a fleeting 'Invalid config' message.

A to Z, a to z, 0 to 9 à ê è ô ù # $ % & ( ) - _ ! ^ ' { } ~ â ë ï î ì ò û ÿ á í ó ú

6.7.2 Hourly file names

With 'Name Type' set to 'Hourly', only the first two characters (NN) can be edited. The remainder of the file name will be the time and date on which the copy was initiated. Thus if an ASCII log were started some time between nine and ten a.m. on the 3rd of August, then the file name would be NN080309.ASC.

6.7.3 Daily file names

Daily filenames are similar to hourly filenames except that they contain the date rather than the time at which the file is opened Only the first two characters (NN) can be edited; the remainder of the file name will be the date on which the file was initiated. Thus if an ASCII log were initiated some time on the 3rd of August 1996, then the file name would be NN960803.ASC.

6.7.4 Counter file names

Applicable only to recorders with the TCT (Timers/counters/totalisers) option fitted,

With "Counter' filenames, none of the filename characters can be edited; the file name being the value of counter N. This allows, for example, a separate archive to be made for individual batches, if counter N is set up to hold the batch number. Should the counter be incremented during data transfer, the file will be closed at an appropriate point, and a new file opened with the counter's new value for a file name.

6.7.5 File name extensions

All logging file names have extensions ASC or PKD according as they are ASCII or PACKED format (section 6.6).

If an ASCII archive is attempted to a file which already exists, then the extension is 'incremented' from ASC to AS1. If AS1 also exists, the extension will be incremented to AS2, AS3 — A10 — 100, and so on (up to 999), until an unused file name is found. PKD extensions are treated in exactly the same way.

Configuration file names (.CFG extensions) are different in that if an attempt is made to create a configuration file which already exists, a warning message appears asking for overwrite permission, and if this is given, the existing file will be overwritten and lost.

6.8 OTHER INFORMATION

6.8.1 Error messages

In the event of an error occurring during disk use, a message will appear either for a few seconds, or until an associated 'CLEAR' key is operated. The following error messages are possible, if all disk/card options are fitted: Note that the word 'disk' is used for both floppy discs and hard drives ('PC Cards').

Bad filename	Disk reader fault
Directory empty	Disk read failure
Disk overdrive	Disk write failure
Disk changed	Disk data corrupted
Disk not formatted	Disk full
Disk not fitted	Disk worn - please replace
File write protected	Disk corrupt - please replace
Invalid disk change	

Though many of the above are self explanatory, the following information may be useful.

BAD FILENAME

Appears if non-usable characters (e.g. spaces, slash characters) are used when entering file names for configuration files. See section 6.7.1 above for the acceptable character set.

DISK CORRUPT - PLEASE REPLACE

This message appears when the disk is damaged to the extent that a write cannot be performed properly. In such cases, it is possible that some data has been lost. If the damaged area is in the system part of the disk, it might appear to the recorder to be unformatted, and the disk icon will disappear. The disk should be replaced immediately.

DISK OVERDRIVE

Data from the recorder is stored temporarily in an internal (buffer) memory, before being transferred to the disk. (This cuts down on the number of read/write operations performed on the disk, and thus increases its life.) Should the disk be unavailable for this transfer, the buffer memory will become full and 'overflow'. When this happens the Disk Overdrive' message is generated.

The disk might be unavailable because (for example) it is off line, it is damaged or, it is missing. Note that the disk can be switched off line for short periods by the Remote Operation Option (under user control) in order to maximise the MODEM transmission rate.

DISK WORN - PLEASE REPLACE

Appears when a number of attempts had to be made before a write to disk was successful. No data is lost, but it is recommended that the disk be replaced as soon as is practicable.

INVALID DISK CHANGE

This message occurs when the disk is removed without it's having been switched off-line first, and indicates the possibility that data has been lost.

Section 7 Reference

Contents

7.1 ERROR MESSAGES

See section 6.8.1 for Mass Storage Media error messages

BAD REMOTE CJ Temp

This message appears at any time if a channel measuring a remote temperature is OFF or is not generating a valid output. The message remains until cleared by the operator

BAT BACK RAM Cleared

This appears if the back-up battery has failed AND the unit has been switched off for more than 48 hours (typical) without a replacement being fitted. The battery maintains the real-time clock and supports the RAM which holds totaliser and counter values (if the Totaliser/Counter/Timer option is fitted).

BATTERY FAILURE

This message appears when the RAM support battery is no longer holding its charge and should be replaced.

CLOCK FAILURE

This message appears at power-up if

a. the clock has lost date or time (or the clock has never been set), or
b. if the battery is exhausted (see 'Bat Backed RAM Cleared' above) or
c. there is a hardware fault in the clock circuit.

The error is cleared by setting time and date.

DV RUN TIME ERROR

This is printed on the chart when a derived variable cannot calculate a value. Examples are if the divisor in a divide function passes through zero, or if the input value to a square root extraction function goes negative.

EEPROM DB DEFAULTED

This message appears at power up if any part of the database is found to be corrupt at power-up, and the database has been defaulted.

INPUT CHAN FAILURE

Input channel hardware fault, or if configured to use a remote CJ, the remote CJ is disabled or is not providing a suitable signal.

INVALID INDEX

This message appears if a channel / totaliser etc. number is entered which is greater than the maximum number of channels / totalisers etc. fitted.

INVALID CONFIG

This message appears if one part of the configuration conflicts with another e.g. if the linearisation type does not match the input type.

MODEM FAILURE

Occurs if:

a. Modem not fitted/powered-on
b. Wiring to Modem incorrect
c. Incompatible type of Modem in use
d. User-entered initialisation string not recognised.

7.1 ERROR MESSAGES (Cont.)

OUTPUT CH FAILURE

Output channel hardware fault

> RANGE

This appears whenever the value of the I/O signal lies above the currently selected hardware range.

< RANGE

This appears whenever the value of the I/O signal lies below the currently selected hardware range.

7.2 LIST OF EFFECTIVE PAGES

This (issue 10) manual consists of the following pages at their stated revision levels.

Section 1
Page i - 1 ..... Issue 10 Jan 00
Page i - 2 ..... Issue 10 Jan 00
Page i - 3 ..... Issue 10 Jan 00
Page i - 4 ..... Issue 10 Jan 00
Section 1
Page 1 - 1 ..... Issue 9 Oct 99
Page 1 - 2 ..... Issue 9 Oct 99
Page 1 - 3 ..... Issue 9 Oct 99
Page 1 - 4 ..... Issue 9 Oct 99
Page 1 - 5 ..... Issue 9 Oct 99
page 1 - 6 ..... Issue 9 Oct 99
Section 2
Page 2 - 1 ..... Issue 7 Dec 98
Page 2 - 2 ..... Issue 7 Dec 98
Page 2 - 3 ..... Issue 7 Dec 98
Page 2 - 4 ..... Issue 7 Dec 98
Page 2 - 5 ..... Issue 7 Dec 98
Page 2 - 6 ..... Issue 7 Dec 98
Page 2 - 7 ..... Issue 7 Dec 98
Page 2 - 8 ..... Issue 7 Dec 98
Page 2 - 9 ..... Issue 7 Dec 98
Page 2 - 10 ..... Issue 7 Dec 98
Page 2 - 11 ..... Issue 7 Dec 98
Page 2 - 12 ..... Issue 7 Dec 98
Page 2 - 13 ..... Issue 7 Dec 98
Page 2 - 14 ..... Issue 7 Dec 98
Section 3
Page 3 - 1 ..... Issue 8 May 99
Page 3 - 2 ..... Issue 8 May 99
Page 3 - 3 ..... Issue 8 May 99
Page 3 - 4 ..... Issue 8 May 99
Page 3 - 5 ..... Issue 8 May 99
Page 3 - 6 ..... Issue 8 May 99
Page 3 - 7 ..... Issue 8 May 99
Page 3 - 8 ..... Issue 8 May 99
Page 3 - 9 ..... Issue 8 May 99
Page 3 - 10 ..... Issue 8 May 99
Page 3 - 11 ..... Issue 8 May 99
Page 3 - 12 ..... Issue 8 May 99

Section 4
Page 4 - 1 ..... Issue 9 Oct 99
Page 4 - 2 ..... Issue 9 Oct 99
Page 4 - 3 ..... Issue 9 Oct 99
Page 4 - 4 ..... Issue 9 Oct 99
Page 4 - 5 ..... Issue 9 Oct 99
Page 4 - 6 ..... Issue 9 Oct 99
Page 4 - 7 ..... Issue 9 Oct 99
Page 4 - 8 ..... Issue 9 Oct 99
Section 5
Page 5 - 1 ..... Issue 9 Oct 99
Page 5 - 2 ..... Issue 9 Oct 99
Page 5 - 3 ..... Issue 9 Oct 99
Page 5 - 4 ..... Issue 9 Oct 99
Page 5 - 5 ..... Issue9 Oct 99
Page 5 - 6 ..... Issue 9 Oct 99
Page 5 - 7 ..... Issue 9 Oct 99
Page 5 - 8 ..... Issue 9 Oct 99
Page 5 - 9 ..... Issue 9 Oct 99
Page 5 - 10 ..... Issue 9 Oct 99
Page 5 - 11 ..... Issue 9 Oct 99
Page 5 - 12 ..... Issue 9 Oct 99
Page 5 - 13 ..... Issue 9 Oct 99
Page 5 - 14 ..... Issue 9 Oct 99
Page 5 - 15 ..... Issue 9 Oct 99
Page 5 - 16 ..... Issue 9 Oct 99
Page 5 - 17 ..... Issue 9 Oct 99
Page 5 - 18 ..... Issue 9 Oct 99
Page 5 - 19 ..... Issue 9 Oct 99
Page 5 - 20 ..... Issue 9 Oct 99
Page 5 - 21 ..... Issue 9 Oct 99
Page 5 - 22 ..... Issue 9 Oct 99
Page 5 - 23 ..... Issue 9 Oct 99
Page 5 - 24 ..... Issue 9 Oct 99

Section 6
Page 6 - 1 ..... Issue 10 Jan 00
Page 6 - 2 ..... Issue 10 Jan 00
Page 6 - 3 ..... Issue 10 Jan 00
Page 6 - 4 ..... Issue 10 Jan 00
Page 6 - 5 ..... Issue 10 Jan 00
Page 6 - 6 ..... Issue 10 Jan 00
Page 6 - 7 ..... Issue 10 Jan 00
Page 6 - 8 ..... Issue 10 Jan 00
Page 6 - 9 ..... Issue 10 Jan 00
Page 6 - 10 ..... Issue 10 Jan 00
Section 7
Page 7 - 1 ..... Issue 10 Jan 00
Page 7 - 2 ..... Issue 10 Jan 00
Page 7 - 3 ..... Issue 10 Jan 00
Page 7 - 4 ..... Issue 10 Jan 00
Page 7 - 5 ..... Issue 10 Jan 00
Page 7 - 6 ..... Issue 10 Jan 00
Page 7 - 7 ..... Issue 10 Jan 00
Page 7 - 8 ..... Issue 10 Jan 00
Annex A
Page A - 1 ..... Issue 8 May 99
Page A - 2 ..... Issue 8 May 99
Page A - 3 ..... Issue 8 May 99
Page A - 4 ..... Issue 8 May 99
Index
Page 1 ..... Issue 9 Oct 99
Page 2 ..... Issue 9 Oct 99
Page 3 ..... Issue 9 Oct 99
Page 4 ..... Issue 9 Oct 99

7.3 GLOSSARY OF TERMS

The following glossary is general to all the manufacturer's products and may thus contain terms which are not applicable to your particular unit. In particular, many of the terms are relevant only to configurable recorders.

Alarm	A function which is triggered when an *input signal* or a signal derived from it reaches a certain value (absolute or deviation alarms) or changes faster than a specified rate (rate-of-change alarms) or changes state (digital alarms). Once triggered, the alarm can initiate a *job list*, such as causing a *relay output* to change state, sounding a buzzer, changing chart speed etc.
Analogue input	An input which changes in a smooth (non-stepped) way (e.g. thermocouples, resistance thermometers).
Analogue output	An output from the recorder which is a scaled and linearised copy of an *analogue input* or *derived channel*. Also called retransmission output.
Attenuator	A resistive device which reduces the signal voltage by a known ratio (usually 100:1)
Break response	The recorder can detect an open circuit at its input terminals. As a part of the channel configuration, the instrument's response to an open circuit can be defined as 'None', 'Drive high' or 'Drive low'. If 'none' is selected the trace is allowed to drift according to what the input wiring is picking up (acting as an aerial). Drive high (low) causes the trace to be drawn at the extreme right (left) side of the chart.
Chart cassette	A mechanical paper transport system for containing and feeding the chart past the *pens* or *printhead* at a known speed. The cassette includes reservoirs for unused (pay-out tray) and used (take-up tray) sections of chart.
Cold Junction Compensation	Also known by the abbreviation CJC. The voltage generated by a *thermocouple* (TC) junction depends on the temperature difference between the actual bonded junction (the hot junction), and the other (non-bonded) end of the conductors (the cold junction (CJ)). Thus, for any reading from a TC to be accurate, the temperature of the CJ must be taken into account. This can be done in three ways: Internal, External or Remote. Internal. The recorder has integral temperature detectors measuring the temperature near the terminal blocks (the cold junction for directly connected TCs). External. For remote TCs, the cold junction can be held at a known temperature. This temperature is entered (in degrees) as a part of the CJC configuration. Remote. For remote TCs, an auxiliary temperature detector can be used to measure the cold junction temperature. This detector is then connected to a separate input channel. This input channel number is entered as a part of the CJC configuration.
Communications	Most recorders now offer a 'Serial Communications' option to allow a computer (PC) to communicate directly with one or more recorders in order to *configure* them, or to read information from them regarding the *process variables* being measured.
Configuration	This is used as a verb to mean 'the process of telling your recorder what you want it to do', and as a noun to mean 'the way in which the recorder has been set up (or configured)'. Recorders fitted with *memory card* or *communications* options can save their configuration to the memory card or to the host computer. This ensures against loss, and also allows configurations to be copied from one recorder to another.
Continuous trace	This is used to describe recorders which have a single *pen* associated with each *process variable*, and this pen *traces* the value continuously. See also multipoint recorder.
Counters	Counters can be incremented or decremented by digital/discrete inputs or by *job list* action. Counters can be preset. Each counter can have a set point which triggers a *job list* when the counter value passes through the set point either incrementing (High) or decrementing (Low).

Data acquisition
A general term describing the successful reading of an input signal. The term Data Acquisition Unit describes those units which are able to read input signals and act upon them (*alarms retransmission* maths functions etc) without necessarily having the facility of displaying or recording them.

Derived channel
A 'pseudo' channel which contains the results of maths pack operations so they can be traced on the chart, logged etc.

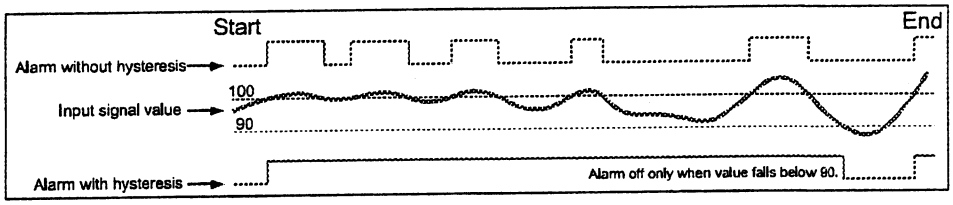
Derived Variable (DV)
The result of one or more *input channel* or *derived channel* being acted upon by a *mathematical function* (e.g. Channel average).

Digital (discrete) input
An input which has only two states (on or off). Examples are switch inputs or voltage pulse inputs.

Event input
A discrete (switch) or digital (voltage level) input. When active, an event input can initiate a *job list.*

Graphics recorder/unit
A recorder or display unit which uses a touch-sensitive liquid crystal display both as its operator interface, and to display traces as though on a chart. Recorders can come with or without charts; chartless recorders using electronic storage rather than paper to save information.

Hysteresis
When an *input signal* is 'hovering' near a *setpoint*, then an annoying and potentially damaging series of *alarms* can be generated, instead of just one alarm which can be acknowledged and the cause dealt with if necessary. To avoid this, a 'hysteresis' value can be entered in the alarm configuration, which effectively puts a dead band round the set point. For example an absolute high alarm with a set point of 100 and a hysteresis value of 10, would be triggered when the input signal value rose above 100, but would not re-trigger again until after the alarm had been 'cleared' by the process value falling below 90. An attempt to depict this example is given in the figure below.



Input channel
An input circuit which accepts voltage, current or digital *input signals* from the user.

Input signal
A voltage, current or digital input applied to the recorder input circuits. See also Analogue input and Digital (discrete) input.

Job list
A set of actions to be carried out by the recorder, when the job list becomes active. Typical 'jobs' are to activate a *relay*, display a message, change chart speed etc.

Linearisation table
Most *transducers* produce an output which is not directly proportional to the input. For example, the voltage output from a *thermocouple* does not vary linearly with the temperature it is exposed to. The recorder uses a 'look-up' table to find a temperature value for any mV input from a specified thermocouple type. Similar tables exist for other transducers such as *resistance thermometers*. In most modern instruments, the user can enter one or more tables of his/her own.

Log
Logging allows *process variable* values to be printed numerically in tabular form on the chart. Alternatively, logs can be sent to the *memory card* (if fitted).

Mathematical function
With the maths pack option(s) fitted, a number of mathematical functions become available to the user. For example, you may want to look at the difference between two *input signals*, in which case a simple Subtract function would be used. The resulting *Derived Variable* can be traced, using a *derived channel*, or could be used to trigger a *job list* if the difference between the two input signal became too great or too small, and so on. A complete list of functions is given below, but not all are available on all instruments.

Maths functions (Cont.)

Constant	Square root	Log base 10	Latching maximum	Switch
Copy	Channel average	Rate of change	Continuous maximum	High select
Add	Group average	Sample and hold	Polynomial	Low select
Subtract	Rolling average	Channel minimum	Relative humidity	Trace generator
Multiply	Exponent	Latching minimum	Linear mass flow	Stopwatch
Divide	Natural log	Continuous minimum	Square root mass flow	Time stamp
Modulus	10^X	Channel maximum	Zirconia probe	F value

Measured value — An umbrella term which means: the value of an *input channel, derived channel, totaliser, counter, timer* etc. measured in mathematical units as a proportion of the *span*. See also Process variable.

Memory card — Used to describe SRAM (Static Random Access Memory) solid state memory cards, or portable hard or floppy disks, used to record *configurations*, data etc. which can then be taken to a remote PC for further analysis, if required.

Multipoint recorder — This is used to describe recorders which have multiple pen *printheads* rather than individual pens to produce the *trace* on the chart. Each trace is made up of dots, produced by the print-head as it traverses across the chart at regular intervals. Advantages are that many more traces can be laid down on the chart, the traces can be annotated for identification and messages can be printed on the chart. Disadvantages are that fast transients may be missed at low chart speeds.

Operator interface — A term used to describe the controls (e.g. pushbuttons, keypads) and visual feedback (display) that are used to operate and configure the unit.

Paper transport system — This includes the *chart cassette* and the mechanical system, motors etc. needed to move the chart through the cassette. The paper transport system is often considered to be an integral part of the *writing system*.

Pen — A fibre-tipped disposable stylus with an integral ink reservoir. Used to draw (trace) the value of a single process variable on the chart in *continuous trace* recorders.

Pen offset compensation — With most *continuous trace* recorders, the mechanical positions of the pen tips are offset, in the time axis, in order that they do not collide with one another as they traverse the chart. A result of this is that simultaneous events in more than one channel can appear to be very far from simultaneous, particularly at slow chart speeds. To overcome this apparent time difference, most recorders now offer pen offset compensation, which delays the signals of all but the final channel. This has the disadvantage that changes may not appear on the chart until a considerable time after they have happened.

Pen tray — With modular recorder designs, each *pen* has its own mechanical system (including motor and feedback device) associated with it to drive it backwards and forwards across the chart. Pen tray is the general term for such mechanical systems. With some recorders, the pen drive electronics are integral with the pen tray.

Printhead — This is a device which, together with a disposable multi-colour cartridge, allows multi-point recorders to mark the chart.

Process variable — An umbrella term which means: the value of an *input channel, derived channel, totaliser, counter, timer* etc. measured in engineering units (e.g. Degrees Celsius). See also Measured value.

Relay output — A set of contacts which changes state as a result of a *job list* being run. Relays are energised continuously except when 'in alarm', so that if power to the recorder fails they go into their 'alarm' state.

Resistance thermometer — Also known as a resistance temperature detector (RTD), a resistance thermometer is constructed of a material whose resistance varies in a known way on the temperature it is exposed to. The resistance variation is non-linear, but for any given type, this non-linearity is well known and invariable and is compensated for by *linearisation tables* in the recorder memory.

Retransmission output — See Analogue output.

Setpoint	Also known as 'threshold', this is the point at which an *alarm* becomes active or inactive. See also *hysteresis*.
Shunt	The input circuit of each recorder channel measures voltage signals. If current signals are connected to the recorder, a low value resistor must be placed across the inputs, to convert the current signal to Volts, according to Ohms law (Volts = Amps x Ohms). Thus, a 0 to 20 mA (0.02 Amps) signal applied across a 250 Ω resistor produces a voltage range of 0 to (0.02 x 250) Volts = 5 Volts. Such resistors are called 'Shunt resistors' or 'Shunts' for short, and are usually of very close tolerance.
Span	Span has two common meanings: the right-most grid of the chart, or the value given by (maximum value - minimum value). The two meanings are identical where the minimum value is zero.
Trace	The line produced on the chart or display screen showing the value of the *process variable* being measured.
Thermocouple	A junction of two dissimilar metals which produces a small voltage, the value of which depends on the temperature of the junction. The voltage varies in a non-linear way with temperature, but for any given type, this non-linearity is well known and invariable and is compensated for by *linearisation tables* in the recorder memory.
Threshold	See setpoint.
Timer	Timers carry out general timing functions, and can initiate *job lists*.
Totaliser	A mathematical function which allows flow rates (e.g. cubic feet per second) to be converted to actual quantities (e.g. cubic feet).
Transducer	A device which produces an electrical output proportional to temperature, flow rate, pressure, speed, position etc. Common transducers are potentiometers, *thermocouples*, *resistance thermometers (RTDs)* and flow meters.
Transmitter	Thermocouple wire (compensation wire) is expensive, and if the thermocouple is a long way from the measuring device, it is often cheaper to instal a 'transmitter' local to the thermocouple. This device converts the mV signal from the thermocouple to a mA signal which can then be wired to the recorder using normal copper wire. Transmitters can be self powered, or they may need power generated for them. Most recorders can be fitted with Transmitter Power Supplies as an option.
Writing system	A general term used to describe the mechanical means of moving *pens/printheads* across the chart width. The term often includes the paper transport system used to drive the chart through the cassette.
Zero	Zero is generally taken to mean the value associated with the left-most grid line on the chart. Its actual value need not be zero, as long as it is less than the Span value.

Annex A

TECHNICAL SPECIFICATION

CONTENTS ..... PAGE

INSTALLATION CATEGORY AND POLLUTION DEGREE

This product has been designed to conform to BS EN61010 installation category II and pollution degree 2. these are defined as follows:

INSTALLATION CATEGORY II
The rated impulse voltage for equipment on nominal 230V ac mains is 2500V.

POLLUTION DEGREE 2
Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

A1 TECHNICAL SPECIFICATION (Recorder)

Board types (I/O)

Universal input board (standard)
3-Changeover relay output board (optional)
4 Normally open relay output board (optional)
4 Normally closed relay output board (optional)
2 channel analogue output (retransmision) board (optional)

Options (See options manual)

Host Communications
Event inputs
Custom Linearisation
Transmitter Power Supply (TRS)
Totalisers/Counters/Timers (TCT)
Maths pack
Additional 'Flash' memory

Environmental Performance

Temperature limits		Operation: 0 to 50°C (0 to 40°C if PC Card hard disc fitted). Storage: -20 to + 70°C
Humidity limits		Operation: 5% to 80% RH (non-condensing). Storage: 5% to 90% RH (non condensing)
Altitude (max.)		<2000 metres
Protection		Door and Bezel: IP54. Sleeve: IP20. Transmitter power supply rear cover: IP10
Shock		BS EN61010
Vibration		10 Hz to 150Hz at 2g peak

Physical

Panel mounting		DIN43700
Bezel size		144 x 144 mm.
Panel cutout dimensions		138 x 138 (both - 0 + 1 mm)
Depth behind bezel rear face		215 mm (No terminal cover); 251 mm (with terminal cover)
Weight		<3.5 kg
Panel mounting	Disc drive installed	Panel must be vertical ± 30°
	No disc drive	Unrestricted

Electromagnetic compatibility (EMC)

	Emissions	BS EN50081-2
	Immunity	BS EN50082-2
Electrical safety		BS EN61010. Installation category II; Pollution degree 2

Power requirements

Line voltage	45 to 65 Hz	90 to 264V (standard)
		90 to 132V (Enhanced interrupt protection variant)
	low voltage option	20 to 53V dc or peak ac, (45 to 400Hz)
Power (Max)		100VA
Fuse type		None
Interrupt protection	standard	40 msec. at 75% max. instrument load
	enhanced	120 msec. at 75% max. instrument load

Operator interface

Display type	5.5 inch Colour TFT LCD with cold cathode backlighting.
Display resolution	320 x 240 pixels
Touch screen	Resistive, analogue, toughened membrane

A2 TECHNICAL SPECIFICATION (Input board)

General

Termination	Edge connector / terminal block
Maximum number of inputs	6 (standard); 12 with second input board (option).
Input ranges	- 8 to + 38 mV, - 30 to + 150 mV; - 0.2 to + 1 Volt, - 2 to + 10 Volts (0 to +10 Volts for channel 1)
Input types	DC Volts, dc millivolts, dc milliamps (with external shunt), thermocouple, 2 / 3-wire resistance temperature detector (RTD), Ohms, Contact closure (not channel 1) (Minimum contact closure = 250msec)
Input type mix	Freely configurable
Noise rejection (48 to 62 Hz)	Common mode: >140dB (channel - channel and channel - to - ground). Series mode: >60dB.
Maximum common mode voltage	250 Volts continuous
Maximum series mode voltage	45 mV at lowest range; 12 Volts peak at highest range.
Isolation (dc to 65 Hz; BS EN61010)	Installation category II; Pollution degree 2 (See page A-1 for definitions)
	300 V RMS or dc Channel - to - channel (double isolation), Channel to common electronics (double isolation) and channel - to - ground (basic isolation)
Dielectric strength	Channel - to ground =1350 Vac for 1 minute; Channel - to - channel = 2300 Vac for 1 minute.
Insulation resistance	>10 MΩ at 500 V dc
Input impedance	38mV, 150 mV and 1 V ranges: >10 MΩ; 10 V range: 68.8 kΩ
Overvoltage protection	50 Volts peak (150V with attenuator).
Open circuit detection	± 57 nA max.
Recognition time	500 msec.
Minimum break resistance	10 MΩ

DC Input ranges

Shunt: Externally mounted resistor modules

Additional error due to shunt: 0.1% of input

Performance

Low Range	High Range	Resolution	Maximum error (Instrument at 20°C)	Worst case temperature performance
-8 mV	38mV	1.4µV	0.085% input + 0.06% range	80ppm of input per deg C
-30 mV	150mV	5.5µV	0.084% input + 0.04% range	80ppm of input per deg C
-0.2 Volt	1 Volt	37µV	0.084% input + 0.05% range	80ppm of input per deg C
-2 Volts	10 Volts	370µV	0.275% input + 0.04% range	272ppm of input per deg C

Resistance inputs

Ranges (including lead resistance): 0 to 150 Ω, 0 to 600 Ω, 0 to 6k Ω

Influence of lead resistance: Error = negligible;

Mismatch = 1 Ω/Ω

Temperature scale: ITS90

Types and ranges

RTD Type	Overall range (°C)	Standard	Max linearisation error
Cu10	-20 to + 400	General Electric Co.	0.02 °C
JPT100	-220 to + 630	JIS C1604:1989	0.01 °C
Ni100	- 60 to + 250	DIN43760:1987	0.01 °C
Ni120	-50 to + 170	DIN43760:1987	0.01 °C
Pt100	-200 to + 850	IEC 751	0.01 °C
Pt100A	-200 to + 600	Eurotherm Recorders SA	0.09 °C
Pt1000	-200 to + 850	IEC 751	0.01 °C

Accuracy and resolution

Low Range	High Range	Resolution	Maximum error (Instrument at 20°C)	Worst case temperature performance
0Ω	150Ω	5mΩ	0.045% input + 0.110% range	35ppm of input per deg C
0Ω	600Ω	22mΩ	0.045% input + 0.065% range	35ppm of input per deg C
0Ω	6kΩ	148mΩ	0.049% input + 0.035% range	35ppm of input per deg C

A2 TECHNICAL SPECIFICATION (Cont.)

Thermocouple data

Temperature scale	ITS90
Bias current	0.05 nA
Cold junction types	Off, internal, external, remote
CJ error	1°C max with instrument at 25°C
CJ rejection ratio	50:1 minimum
Remote CJ	Via any user-defined input channel
Upscale / downscale drive	High, low or none selectable for each thermocouple channel
Types, ranges and accuracy	See table

T/C Type	Overall range (°C)	Standard	Max linearisation error
B	0 to + 1820	IEC 584.1	0 to 400°C: 1.7°C 400 to 1820°C: 0.03°C
C	0 to + 2300	Hoskins	0.12°C
D	0 to + 2495	Hoskins	0.08°C
E	- 270 to + 1000	IEC 584.1	0.03°C
G2	0 to + 2315	Hoskins	0.07°C
J	- 210 to + 1200	IEC 584.1	0.02°C
K	- 270 to + 1372	IEC 584.1	0.04°C
L	- 200 to + 900	DIN43700:1985 (To IPTS68)	0.20°C
N	- 270 to + 1300	IEC 584.1	0.04°C
R	- 50 to + 1768	IEC 584.1	0.04°C
S	- 50 to + 1768	IEC 584.1	0.04°C
T	- 270 to + 400	IEC 584.1	0.02°C
U	- 200 to + 600	DIN 43710:1985	0.08°C
Ni/NiMo	0 to + 1406	Ipsen	0.14°C
Platinel	0 to + 1370	Engelhard	0.02°C

Index

A

B

C

C (Cont.)

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

S (Cont.)

T

V

W

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Inter-Company sales and service locations

Australia
Eurotherm Pty. Limited.
P.O. box 6764 Baulkham Hills BC,
Baulkham Hills,
NSW 2153

Telephone: 61 2 9634 8444
Fax: 61 2 9634 8555
Email: vincelen@eurotherm.com.au
or: vince.lendrum@eurotherm.com.au

Austria
Eurotherm Meß-und Regeltechnik GmbH
Geiereckstraße 18/1,
A1110 Wien,
Telephone: 43 1 798 76 01-04
Fax: 43 1 798 76 05

Belgium
Eurotherm BV,
Herentalsebaan 71-75,
B 2100 Deurne
Antwerpen
Telephone: 32 3 322 3870
Fax: 32 3 321 7363

Denmark
Eurotherm Danmark A/S
Finsensvej 86,
DK 2000 Fredriksberg,
Telephone: 45 38 871622
Fax: 45 38 872124

France
Eurotherm Mesures SA,
15, Avenue de Norvège,
ZA de Courtaboeuf,
BP225
F - 91942 Les Ulis, CEDEX
Telephone: 33 1 69 18 51 00
Fax: 33 1 69 18 51 99

Germany
Eurotherm Meßdatentechnik GmbH
Ottostraße 1,
D-65549 Limburg a.d.Lahn
Tel: 49 64 31 29 80
Fax: 49 64 31 29 81 19

Great Britain
Eurotherm Recorders Limited,
Dominion Way,
Worthing,
West Sussex BN14 8QL
Telephone: 01 903 205222
Telex: 877296 CHESEL G
Fax: 01 903 203767
Email: Sales@recorders.eurotherm.co.uk
or: Support@recorders.eurotherm.co.uk
Web: http://www.eurotherm.co.uk

Hong Kong
Eurotherm Limited,
Unit D, 18/F Gee Chang Hong Centre,
65, Wong Chuk Hang Road,
Aberdeen.
Telephone: 852 2873 3826
Telex: 69257EIFEL HX
Fax: 852 2870 0148

India
Eurotherm India Limited,
152, Developed Plots Estate,
Chennai 600 096,
Telephone: 91 44 4961129
Fax: 91 44 4961831

Ireland
Eurotherm Ireland Limited,
IDA Industrial Estate,
Monread Road,
Naas,
Co. Kildare
Telephone: 353 4587 9937
Fax: 353 4587 5123

Italy
Eurotherm SpA,
Via XXIV Maggio,
I-22070 Guanzate,
Como.
Telephone: 39 31 975111
Telex: 380893
Fax: 39 31 977512

Japan
Eurotherm Business Unit,
Nemic Lambda KK,
Denpa Building,
1-11-15 Higashi Gotanda,
Shinagawa, Tokyo 141-0022
Telephone: 81 3 3447 6441
Fax: 81 3 3447 6442

Korea
Eurotherm Korea Limited,
Suite # 903
Daejoo Building,
132-19, Chungdam-Dong,
Kangnam-Ku,
Seoul, 135-100
Telephone: 82 2543 8507
Telex: EI KOR K23105
Fax: 82 2545 9758

Netherlands
Eurotherm BV,
Genielaan 4,
2404CH Alphen aan den Rijn,
The Netherlands
Telephone: 31 172 411 752
Fax: 31 172 417 260

Norway
Eurotherm A/S,
Post Boks 288,
N - 1411 Kolbotn,
Norway,
Telephone: 47 66 803330
Fax: 47 66 803331

Spain
Eurotherm España SA,
Pol. Ind. De Alcobendas,
Calle de la Granja 74,
28108 Alcobendas,
Madrid.
Telephone: 34 91 661 60 01
Fax: 34 91 661 90 93

Sweden
Eurotherm AB,
Lundavägen 143,
S-21224 Malmö.
Telephone: 46 40 38 45 00
Fax: 46 40 38 45 45

Switzerland
Eurotherm Produkte (Schweiz) AG,
Schwerzistraße, 20,
CH-8807 Freienbach.
Telephone: 41 55 415 44 00
Fax: 41 55 415 44 15

United States of America
Eurotherm Recorders Inc.
One Pheasant Run,
Newtown Industrial Commons,
Newtown PA 18940.
Telephone: 1 215 968 0660
Fax: 1 215 968 0662
Web: http://www.eurotherm.com/chessell
e-mail:sales@recorders.eurotherm.com

EUROTHERM
CHESSELL

EUROTHERM RECORDERS LIMITED
A member of the Eurotherm PLC Group of Companies
Dominion Way, Worthing, West Sussex, BN14 8QL
Telephone: 01 903 205222. Telex: 877296. Facsimile: 01 903 203767
e-mail: Sales@recorders.eurotherm.co.uk
e-mail: Support@recorders.eurotherm.co.uk
Website: http://www.eurotherm.co.uk

PROJECT GRATWICK PARK
CONTRACT NO. 9901-07
CONTRACTOR HASELEY CONST. CO.
SUB-CONTRACTOR FERGUSON ELECT. CONST. CO. INC.
ITEM NO. AUTOMATIC DIALER
SPEC. SECTION 13240
REVIEWED BY AJC
DATE 10/11/99

2ND SUBMITTAL

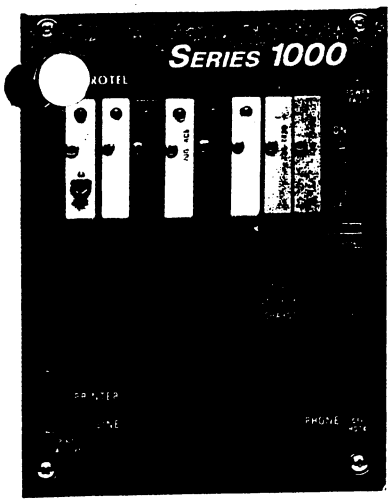
DOCUMENT APPROVAL / REVIEW

- [x] APPROVED
- [x] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] REVISE AND RESUBMIT
- [ ] REVIEWED FOR CONTENT

BY R J Snyder
DATE 10/29/99

must be supplied with 4X(four) digital outputs

..... SERIES 1000 .....



The Microtel Series 1000 remote monitoring solution is the ultimate in dialing notification and alarm systems. Offering the user many features, Microtel's Series 1000 is a versatile, state of the art dialer that can be configured in any number of ways to meet the most simple or highly complex technological needs of the user.

- Voice, Fax, Computer or Pager Notification
- "Real Voice" Digitized Speech
- 100% Modular Digital or Analog Input/Output Configuration
- Standard or Cellular Telephone Connection
- 3 Year Parts & Service Warranty

FEATURES

- **Expandable to 41 Channels w/ User-Selectable Modules for I/O Configuration**
  Users can specify a plug-in module for each individually-monitored channel; digital or analog I/O channels; variable voltage and current options allow for factory-configured dialer that interfaces with most existing field instrumentation and eliminates expensive instrument replacement and calibration

- **Convenient Local/Remote Programmability**
  Programmable locally via touch-tone phone and laptop computer; remotely by touch-tone phone; or configure for use with a cellular phone; local printer port logs all system events

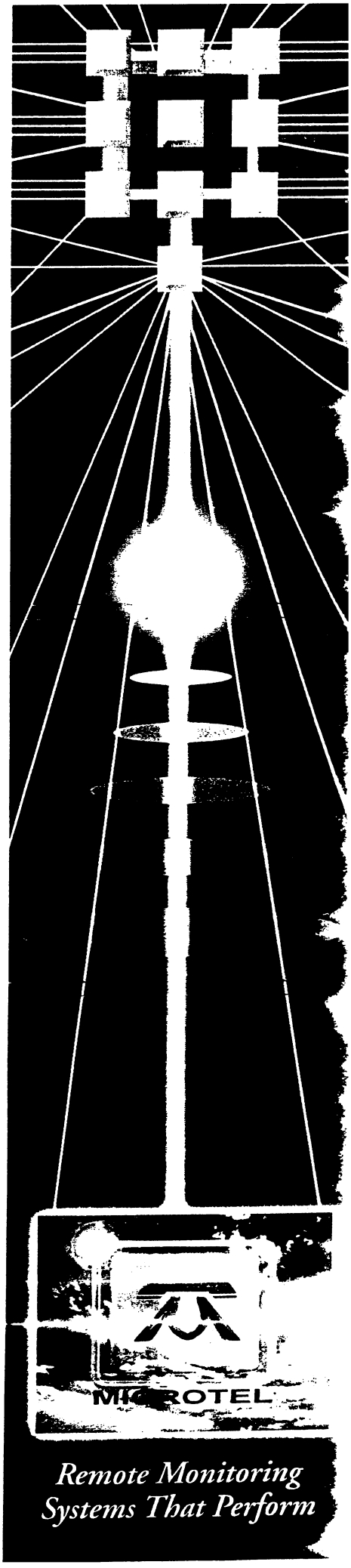
- **Communications Compatibility**
  Each I/O channel has an independent telephone list from a master telephone directory; direct telephone or cellular communications to fax or answering machines, digital or voice radio pagers or to a computer

- **Call Progress Decoding**
  Full-function call progress decoding allows system to detect and react to a dial tone, paging queues, human voice, busy and no answer; invaluable when configuring the system to call pagers, PA systems, answering and fax machines

- **Sturdy Panel Mount or NEMA 12 Enclosure**
  Multiple installation options include non-enclosure panel mounting or housing the Microtel Series 1000 Dialer in a NEMA 12 rated fiberglass enclosure with locking stainless steel hardware and gaskets

- **MicroWIN 2000 Software**
  With Microtel's MicroWIN 2000 software, edit the dialer's configuration and view, store or print status information while on or off-line. It's the newest and easiest way to communicate with a Microtel Series 1000 dialer

MICROTEL
206 West Judge Perez Drive, Chalmette, Louisiana 70043
Telephone 504.276.0571 Fax 504.276.0574
www.microtel-inc.com e-mail: microtel2@aol.com



..... SERIES 1000 .....
TECHNICAL SPECIFICATIONS

Environmental

Temperature	20° to 130° F
Humidity	0 to 95%, non-condensing
Surge	2500V per ANSI C-37-90A-1974, common and differential mode

Electrical

Power Requirements	120VAC/12 VDC, 10 Watts UL & CSA listed power supply
Fault Sensing Current	5mA per channel
Run Time Inputs	00:00:00 (DD:HH:MM)
Totalizer - Counter	000000 Counts, 1 pps. ch. 1-7, 50 pps. ch. 8
Battery Back-up	6 hours typical
Power Outage Detection Time	1-5999 seconds

Physical

Dimensions	10.5" H x 9" W x 6.5" D
Weight	10 lbs.
Mounting Method	Flange mount, 4 points
Enclosure	NEMA 12 standard, others optional

Telephone System

FCC Registered for direct interconnect	FCC Registration Number 1QEUSA-21532-AL-E
Dialing Capacity	9 numbers, 60 digits each
Ringing Format	Pulse or tone
Answer Delay	Programmable, 1 to 99 rings
Acknowledge Intercall Delay	1 minute to 100 days
Call Acknowledgments Method	Tone or callback, auto-acknowledgment
Unacknowledged Intercall Delay	1 to 99 minutes
Call Progress Decoding	Voice, dial tone, busy, ring-back pager, terminal tone, answer back tone

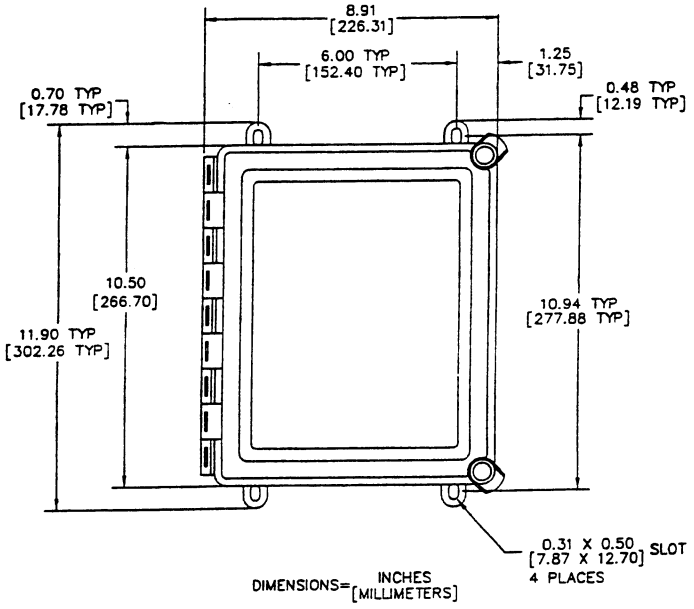
Operational

Fault Detection Method	Normally open or closed, analog setpoint selectable, programmable
Fault Delay Time Constant	1 to 5999 seconds
Station Identification	6 seconds
Message Selection	3 seconds
Data Retention	Non-volatile memory
Programming	Local/remote touch-tone telephone or computer

System Diagnostics

Audible Indicators	Vocal status of all fault conditions, station identification and acknowledge response
Visual Indicators	Power, Fault, Run, Phone off-hook, Line off-hook, Incoming call, Call in progress, FAX in progress
Options	Panel mount systems, assorted NEMA enclosures, additional power/phone line surge protection, MicroWIN 2000 for local configuration
Warranty	3 year Parts & Service
Applications	Remote pump stations, unmanned oil fields, greenhouses, refrigerated storage areas, level control, pressure, temperature, vacuum, leak detection, pH monitoring, fire, equipment malfunction, flow, residual, weight, power unmanned substations, HVAC, computer rooms, fuel storage

Dimensions

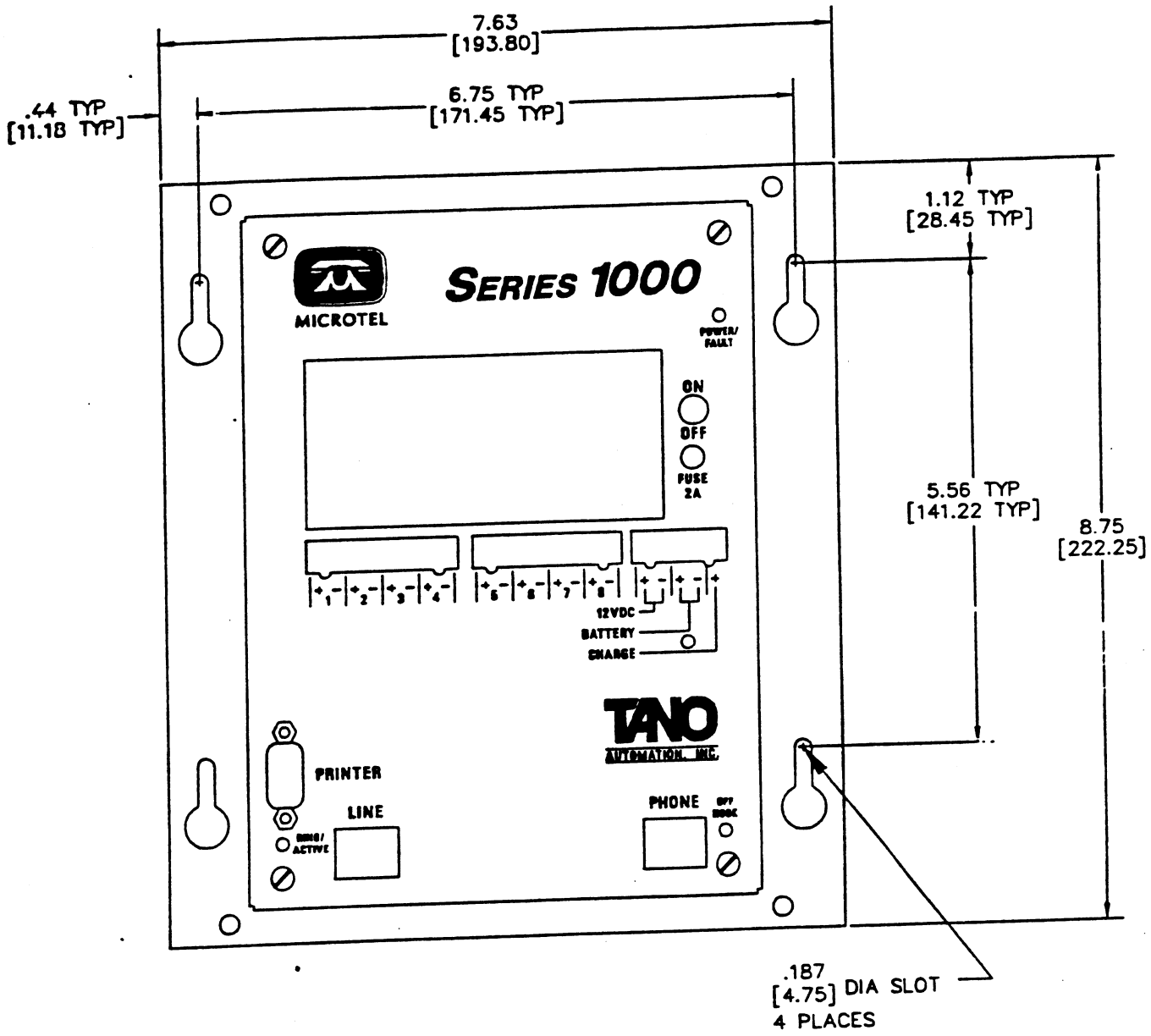


Contact Microtel or your nearest authorized representative for a complete set of engineering specifications or Microtel "Specs on Disk"

Represented by

PRINTED IN USA

2.2 PHYSICAL INSTALLATION - PANEL MOUNT, FIGURE 2



DIMENSIONS= INCHES / [MILLIMETERS]

Battery Operational:	12 Volt 1.9 AH Lead Acid Battery Option (6-12 hours backup time typical)
Battery Internal:	3 Volt Lithium for Speech Storage/Real Time Clock

A.3 PRINT

Interface:	Serial RS-232, 2400 Baud, 8 Data, No Parity, 1 Stop Hardware Handshaking
Printer Modes:	Continuous Event Log with Time and Date Stamp Configuration Report Snapshot Status Report

A.4 ENVIRONMENTAL

Temperature:	32°F to 130°F operating 0°F to 130°F storage
Humidity:	0-95% RH, Noncondensing
Surge:	2500 V Per ANSI
EMI/RFI:	Per FCC Part 15c

A.5 ENCLOSURE

Options:	Panel Mount Chassis (7.7" wide 8.8" high x 4" deep) Suitable for Wall or Panel Mounting Battery Mounted Separately Nema 12 Fiberglass Case with Hard Cover Nema 12 Fiberglass Case with Clear Cover (9" Wide, 10.5"high, 6.5" deep)
Weight:	Panel Mount Unit 4 lbs Nema 12 case: 6 lbs Battery and holder: 3 lbs Full system: 13 lbs

Microtel Series 1000 Dialer

Operating Manual

May 28, 1998

For Firmware Version 3.0

MICROTEL

206 West Judge Perez Drive
Chalmette, Louisiana 70043
504/276-0571
Fax: 504/276-0574
Email: Microtel2@aol.com

Record of Changes

Revision	Changes
15 May 1997	Original Document
1 January 1998	Page 4: Updated **How Does an Alarm Get Ackowledged** Page 7: Added section **Can an S1000 Talk to a Computer?** Page 19: Added **Basic System Information** Command Summary Page 21: Added **Callback Acknowledge** enable/disable command to manual (***008**). Also, Voice Interaction Delay moved here (***006**) Page 23: Put Time and Date on own page Page 26: Added **Point Programming** Command Summary Page 28: Added **Report Status Flag** enable/disable command to manual (***c7**). Also added **Channel Alarm Configuration** option **5**. Tells a channel output to remember the channel state even after power gets cycled. (***c8**) Page 37: Added **System Status** Command Summary Page 41: Moved **Advanced Topics** to before **Maintence** Section Page 42: Added telephone escape codes ***985** and ***986** to list. Page 46: Expounded on a dialer connecting to a computer Page 52: Updated Dialer Specs Page 59-63: Updated Part Numbers Page 69: Updated Command Summary
28 May 1998	Page 27: Added **Follow Types** to the Type descriptions. Page 13: Updated **Quick Start Procedure**.

Page 39

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Page 35 - ALARM ACKN.

INTRODUCTION

Thank you for choosing the Microtel *Series 1000* Dialer to implement your remote alarm monitoring solution. You have chosen a product that is simple to set up and easy to use. The *Series 1000* has been designed and manufactured to operate with minimal operator intervention.

The Microtel *Series 1000* features a single level, interactive command structure--there are no multi-level menu structures to navigate. Commands are sent to the *Series 1000* through your telephone either locally or during a call to or from the dialer, by pressing a sequence of touch-tones on your telephone. Each command entered is acknowledged with a spoken response from the dialer, providing verification that the command was entered correctly and understood by the dialer.

The *Series 1000* features true modularity--I/O channels operate completely independently of each other. Using the commands listed in this manual, each I/O module in your dialer can be configured to operate uniquely to satisfy your application requirements. For each I/O channel, you may record a voice message, choose the format of spoken status reports, program an alarm integration delay, alarm call out operation, and telephone number calling sequence. Analog inputs also have user-selectable low and high alarm setpoints.

About this Manual: This manual is organized with the most crucial information in the front; more advanced topics are saved for last or included in the appendices.

Who Should Read this Manual: Anyone involved with use of the dialer should read the *General Description* and *Operation* chapters of the manual. The *Operation* chapter in particular should be read by any personnel who may be required to respond to alarm calls from the dialer. The additional chapters can be read at a later time, or when necessary by authorized personnel to maintain the dialer or troubleshoot any problems you might encounter. System administrators should read the *Advanced Topics* chapter for information on the use of the dialer's remote software configuration capabilities.

In a Hurry to Setup?: Read the quick start section of the *Installation* chapter.

If you encounter a difficulty that cannot be resolved using the information in the manual, call **MICROTEL** at (504) 276-0571 or, after hours, call the Technical Support Pager at (504) 843-9248.

Again, thank you for choosing **MICROTEL**.

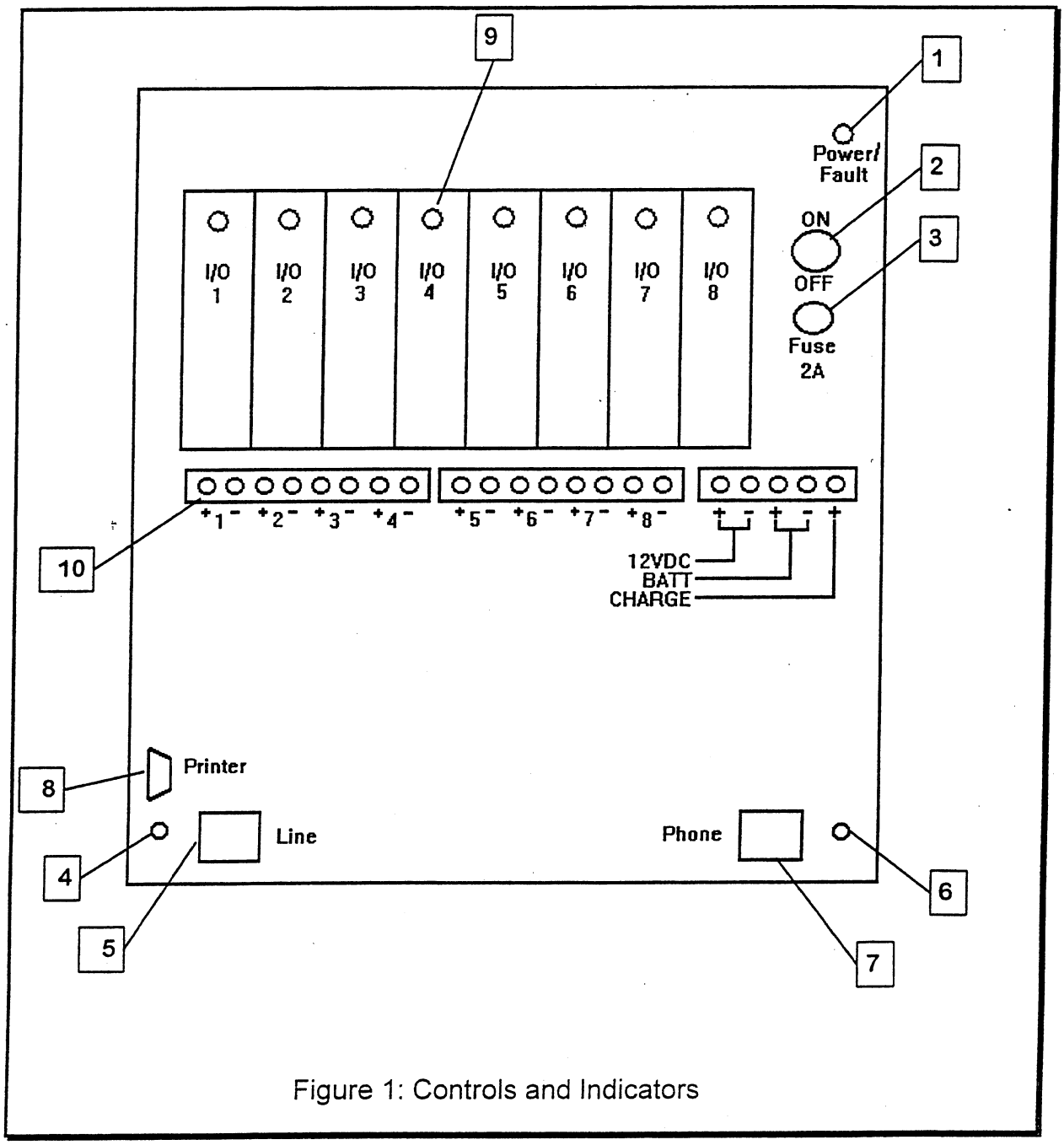


Figure 1: Controls and Indicators

CHAPTER 1 - Description Of The Series 1000 Dialer

The *Series 1000* is a small, rugged, and simple, but powerful, device which easily handles complex dialing notification and alarm monitoring. To accomplish these tasks, the *Series 1000* has an equally simple operator interface. Figure 1 shows the front panel of the dialer and the following paragraphs describe the visible features.

(1) **POWER/FAULT LED** located in the upper right corner, above the power on/off switch indicates normal run status, Input/Output (I/O) faults, power failure, and dialer internal errors. Use the following guidelines when observing this LED:

Normal Operation:	Flicker 95% ON	5% OFF
Power failure:	Blink 10% ON	90% OFF
I/O fault or internal error:	Blink 50% ON	50% OFF

(2) **ON/OFF SWITCH** located in the upper right corner, below the Power/Fault LED, turns the dialer on or off.

(3) **FUSE (2A)** is an easily accessible fuse which protects the dialer's electronics.

(4) **LINE LED** located adjacent to the LINE connector indicates call progress while the dialer is off-hook and ring detection when on-hook.

(5) **LINE JACK** is a standard RJ11 phone jack where an outside line is connected to the dialer. (See next chapter for instructions)

(6) **PHONE LED** located adjacent to the PHONE connector is turned on whenever the dialer senses that a telephone connected to the phone jack is off-hook, or during FAX transmissions.

(7) **PHONE JACK** is a standard RJ11 phone jack used to connect a local phone to the dialer.

(8) **PRINTER JACK** is a standard DB -9 connector used to interface serially with a local printer or computer.

(9) **I/O MODULE LEDs** indicate the status of the individual module. Refer to the appendices for more information on the different I/O modules.

(10) **TERMINAL BLOCKS** are used to connect the external sensors to the I/O modules.

How Does the Dialer Work? This section provides a simple theory of operation by asking a few questions about typical use of the dialer. The following paragraphs assume the dialer is hooked up and running as described in the *Installation* chapter. The *Operation* chapter provides the details that are missing from the discussion below.

What Happens when an Alarm Occurs? Each Input/Output (I/O) channel of the dialer has its own alarm list, a list of up to nine people, fax machines, or pagers to call in the event of an alarm. When an alarm occurs, the dialer begins to place a series of telephone calls in an attempt to have someone acknowledge the alarm.

The dialer reports the current alarm status when an outgoing call is answered. The dialer will report four conditions to whoever answers the phone:

1) Which channels are in alarm.
2) Which channels in alarm have been acknowledged.
3) Which channels are now normal (a channel that has gone into and out of alarm without being acknowledged).
4) The current status of the channels that have their **Report Status Flag** Enabled (***c7**, ****c7n**)

How does an Alarm get Acknowledged? An alarm can be acknowledged in four ways:

1) Entering the '*' key on your touch-tone phone during message playback.
2) Calling back the dialer immediately after it calls you (callback acknowledge). This feature is necessary if the called party does not have a touch-tone phone. When the dialer is called back, it will report which alarms have been callback acknowledged. This feature can be disabled if desired (***008**, ****008n**)
   (See Chapter 3, *Operation*)
3) The dialer will automatically acknowledge a successful call to a pager, answering machine, or P.A. system if the telephone number is embedded with an auto acknowledge code. (See chapter 5, *Advanced Configuration*).
4) Once in the system, a series of touchtone commands can be done that will acknowledge either all current alarms or just specified individual alarms.

For the first three methods, the dialer will acknowledge all alarms in the system that are programmed to call the same telephone number as the one that was called. This feature assures that acknowledgments only apply to alarms associated with each channel's calling list.

What if I'm not Home? The Call Progress Decoding features of the dialer allow it to determine if the called telephone number is busy or did not answer. In either case, the dialer will wait 10 seconds before going off-hook and placing a call to the next number on the calling list.

When the dialer is off-hook, it has the capability to detect dial tone, busy, ringback, modem, and voice signals. This allows it to detect if a called party answered or not, thus reducing the time to alert authorized personnel of existing alarm conditions. If a call is not answered, or the called number is busy, the dialer will abort the call and begin calling the next number for that channel in its alarm's calling list. Call progress decoding is also useful for sensing pager terminal tones, or long distance service access prompts before continuing a dialing sequence. It is even possible for one *Series 1000* dialer to call another dialer, gain access to it, and actuate outputs on that dialer. The call progress features of the *Series 1000,* described in the *Advanced Topics* chapter, is also flexible enough to traverse preset menus via touch-tone commands.

Will the Dialer Call Me Back? Maybe. Each I/O channel has its own independent snooze timer. When an alarm is acknowledged, the snooze timer for that individual channel is started, and alarm calls for that channel are suspended. If a channel is still in alarm after the snooze period ends, then the dialer will begin a new alarm dialing sequence (starting with the first number on the specific channel's calling list).

A channel can also be programmed to make calls when the status returns to normal operation. If a channel's input state returns to normal during a snooze period, then the balance of the snooze delay will be abandoned, and the dialer will begin making call-outs beginning with the first telephone number on the associated call-outs list.

How does the Dialer Know Who to Call? The dialer has a System Telephone Directory composed of up to 9 user-programmed telephone numbers. Each telephone number in the System Telephone Directory can be up to 60 digits long. Special '*' control sequences may be embedded within a user-programmed telephone number. These include tone/pulse selection dialing, pauses, wait for tone, quiet, or voice, auto acknowledgment of an alarm call-out, dial '*' or '#' for interfacing to telephone equipment, turn on or off a dialer output during an alarm call, or specify that the number corresponds to a FAX machine. These special sequences allow a tremendous amount of flexibility on a telephone number by number basis.

How does the Dialer Prioritize its Calls? The dialer maintains an inherent priority of the input modules: the system call-at is highest priority, followed by channel #1, channel #2,...channel #8, and the power fail channel #9. Each telephone number in the System Telephone Directory has its own Disable Timer. If a telephone number's Disable Timer has a non-zero value, then that telephone number will not be called during alarm call out sequences.

When the dialer detects a new alarm condition, it will search the new channel's calling list, beginning with the *first* number on the list, for the first telephone number with a disable timer equal to zero. If the telephone number has the *991 FAX code embedded in it, then the dialer will begin to generate a current alarm status report to FAX. The dialer will then go off-hook and begin to dial the telephone number if the following conditions are true:

A. The System Disable Timer = 0.

B. The Call Spacing Timer = 0, and the dialer has been on-hook for at least the network recovery time (10 seconds). (See Chapter 3, Call Spacing Delay)

C. The local telephone is on-hook (not connected to dialer or outside line).

D. The telephone number's Disable Timer = 0.

E. The telephone line is operational (dial tone is detected).

During the dial out sequence, the dialer will implement all special control sequences and/or call progress features embedded within the current telephone number. If the dialer successfully connects with the called number, then it will either report the verbal alarm message, or transmit the current alarm status FAX report as described later.

If the dialer is reporting a verbal alarm message, it will repeat the message the number of times programmed in the system Message Repeats register, or the number of times programmed in the called telephone number using the '*94n' Alternate Message Repeat count escape sequence. While speaking the alarm message, the dialer simultaneously listens for a touch-tone entered by the user at the remote phone. If it receives a valid tone, it will terminate alarm reporting, and examine the tone received. If the user entered a '*' key, then the dialer will accept it as an acknowledgment of the alarm condition. Any other keys received will *not* acknowledge the alarm condition. The dialer will then indicate the acknowledge status and prompt the user to enter a 4-digit access code.

If the user enters the correct code, access will be granted and the user may review or program the dialer's configuration using the touch-tone commands described in this manual. If at any time during remote menu access the user does not enter a command within 30 seconds, the dialer will speak a disconnect warning and hang up.

If an incorrect or no access code is entered during a timed access code entry time (10 seconds), the dialer will disconnect and initialize the system Call Spacing delay timer. If the alarm condition(s) were acknowledged, then the snooze timer(s) associated with the reported alarm condition(s) will be initialized with a value equal to the programmed system Snooze Delay. If alarm conditions were not acknowledged, calls will continue to be placed to the next telephone numbers on the channel's calling list after the system Call Spacing delay has expired.

Can the Dialer print or send me a Hard Copy Report? Yes, in addition to voice reporting of alarms, the Microtel *Series 1000* is capable of locally printing or transmitting a hard copy alarm status report, or a report of all programmed setup data, to a FAX machine.

The *Series 1000* supports a serial printer interface **only**. Therefore, you must have a serial printer, or install a serial interface card in the printer you have. Serial printer interfaces are inexpensive and readily available at your local computer store. The dialer transmits serial printer data at 2400 baud, 8 data bits, 1 stop bit, and no parity.

In addition, the printer's serial interface must support DTR (Data Terminal Ready) hardware handshaking. With this method, when the printer buffer level surpasses some high water mark, the printer asserts the DTR signal, telling the dialer to halt transmission. After the printer has emptied most of the data out of its buffer, it will re-assert the DTR signal, indicating to the dialer that it may resume data transmission. The DTR hardware handshaking protocol is a common method supported by most serial interfaces.

Refer to Chapter 3 and Chapter 5 for more information on sending a FAX report.

How can I Make an Alarm Sound in the Vicinity of the Dialer? Any digital output channel can be configured as a local alarm type. A local alarm will be turned on whenever a new alarm condition exists within the dialer. This output could be connected to a siren or bell to warn the local area of the alarm condition. Refer to Chapter 3 for more information on local alarms.

Can an S1000 Dialer Talk to a Computer? Yes. Software is available to configure and monitor your dialer's I/O. Please call factory for additional information.

CHAPTER 2 - Installation

Installation of the *Series 1000* involves several, simple steps. This chapter outlines the 5 steps necessary to quickly get the dialer up and running. At the end of the chapter is a Quick Start procedure which configures the dialer for simple call-on-alarm operation. Refer to the appendix for outline and mounting diagrams of the dialer.

Step One - Connect the Power Supply Connect the supplied external Stancor transformer to the 12 VDC terminals as shown in Figure 2 below. Plug the transformer into a MicroMax Surge Suppressor (supplied with the dialer).

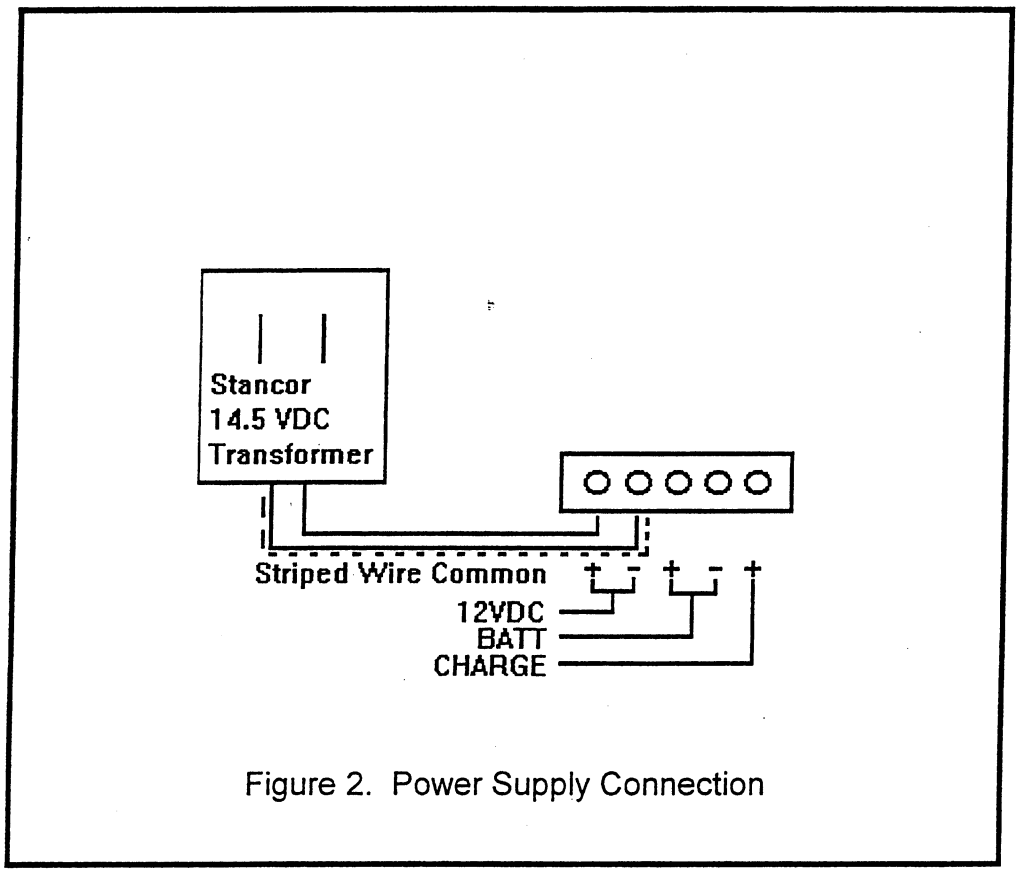


Figure 2. Power Supply Connection

NOTE: Alternatively, you may connect any 12 to 16 Volt DC power (such as a solar panel) to the dialer. Connect the positive side of the voltage source to 12VDC+, and the COMMON lead to 12VDC- of the power supply terminal block of the dialer.

Step Two - Connect a Battery and Enable Charging Circuit of the dialer to insure uninterrupted operation in case of an AC power failure. Refer to Figure 3.

1. Turn power to the dialer OFF.
2. Connect the battery wires to the BATTERY+ and BATTERY- terminals.
3. Turn power to the dialer ON. Test the battery backup circuit by removing the AC power to the dialer (leave POWER switch ON). The dialer should remain ON, and after a few seconds, the POWER/FAULT LED should indicate a power failure (ON 10%, OFF 90% duty cycle). Reapply AC power to prevent a power fault alarm call out at this time.
4. Connect a DC voltmeter across the CHARGE and BATTERY- terminals.
5. Using a small jewelers screwdriver, adjust the potentiometer located beneath the power connector until the voltage is between 13.5 - 13.8 Volts DC.
6. Connect a jumper between BATTERY+ and CHARGE of the power connector. This step enables the charging circuit in the dialer.

NOTE: A power supply voltage greater than **12 VDC** is required to operate the *Series 1000* battery charger.

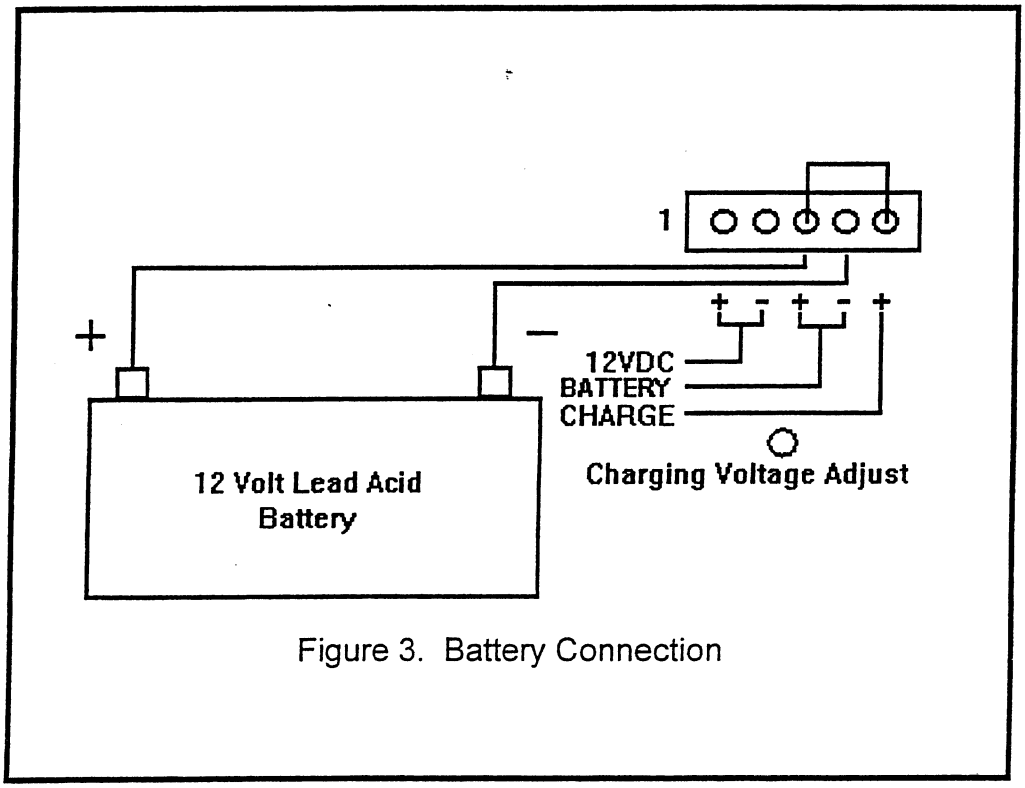


Figure 3. Battery Connection

Step Three - Telephone Connections include the external phone line for call-outs and the optional local telephone connection for local programming and monitoring.

1. Connect the dialer's LINE jack to the EQUIPMENT Phone jack of the MicroMax Surge Suppressor using the cable supplied with your dialer.
2. Connect the Telephone LINE jack on the MicroMax Surge Suppressor to the RJ11 jack of your outside line using the cable supplied with the MicroMax Surge Suppressor.
3. Connect a local telephone (optional) to the dialer's PHONE jack, as shown in Figure 5 below.

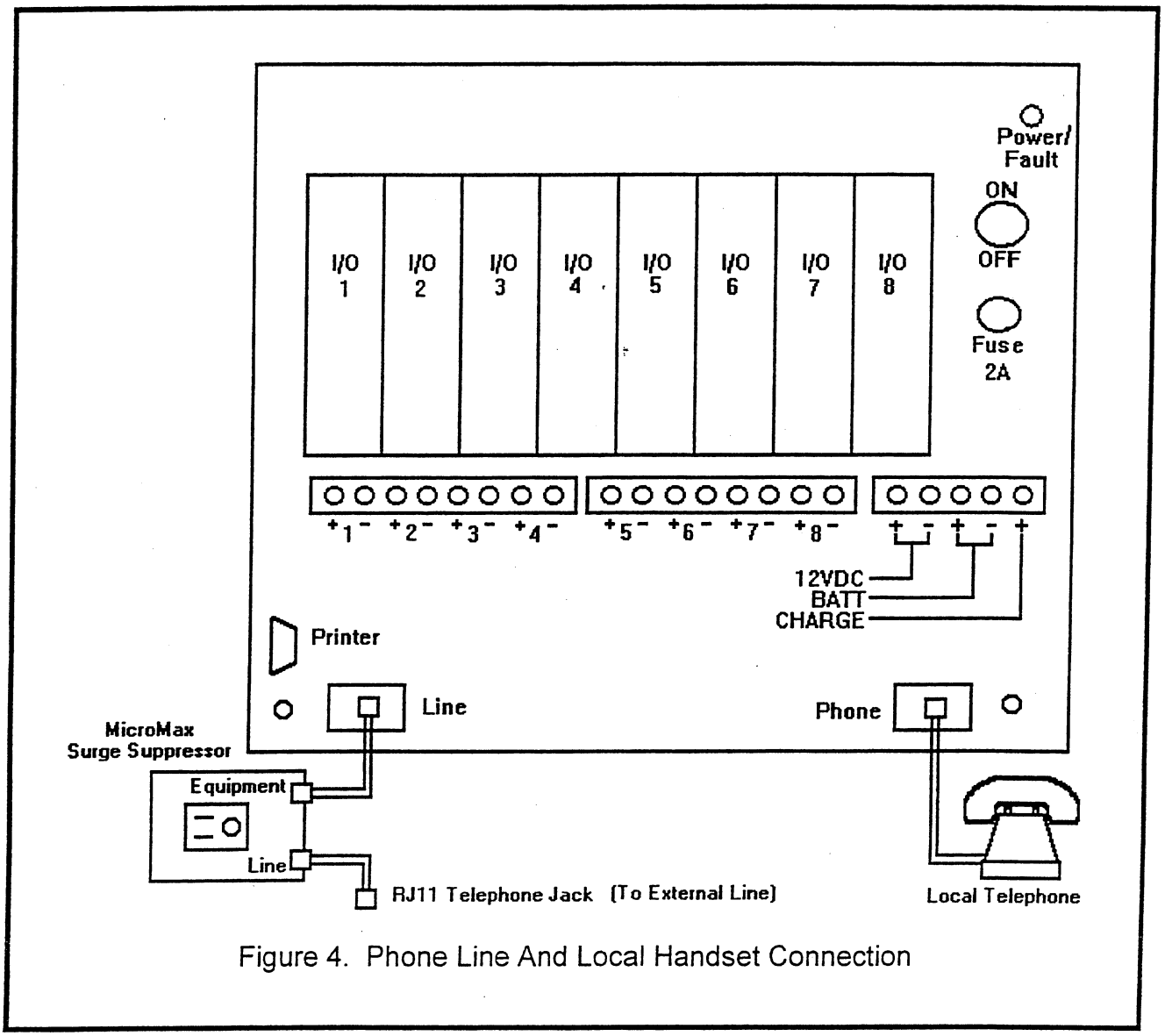


Figure 4. Phone Line And Local Handset Connection

NOTE: Telephone line transients and surges can damage the dialer or disrupt its operation. We recommend use of the MicroMax Surge Suppressor for normal operations.

Step Four - Connect External Input/Output to the Dialer Each I/O module has two (2) corresponding I/O terminals. See Figure 5 below. Use 22 AWG shielded twisted pair wire when wiring external sensors to the I/O terminals. Observe polarity when making connections. Whenever possible, ground the shield at the sensor end only. Sensor control wires should never share conduit with AC power wiring.

NOTE: Keep I/O runs to a maximum length of 150 ft.

Refer to the Appendix for detailed field wiring diagrams, as well as electrical specifications for each type of I/O Module you may install in the *Series 1000*. After physical installation, each I/O module's alarm operation must be configured. This is covered in detail in the next chapter. The Quick Start procedure at the end of this chapter provides info on a simple call-on-alarm configuration.

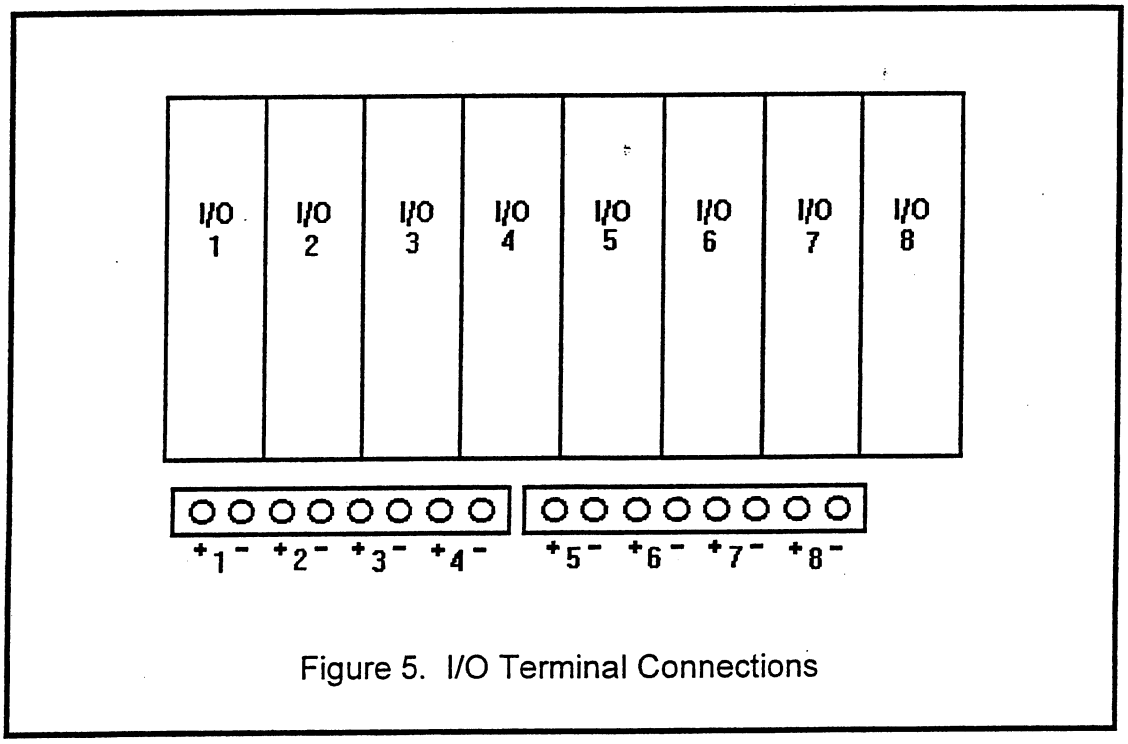


Figure 5. I/O Terminal Connections

Step Five - Installing a Local Printer is a convenient way to print alarm report and enable continuous data logging. Keep in mind, the *Series 1000* supports a serial printer interface as described in Chapter 1, *Description*. Follow the instructions to connect and configure a local printer.

1. Connect a DTE-to-DCE (Straight) RS232C cable with a 9 pin female D-SUB connector on one end to the dialer's PRINTER port.
2. Connect the other end (25 pin female D-SUB) to the serial interface port of your printer.

NOTE: The printer port on the *Series 1000* is used to support advanced features such as a local computer interface (See Chapter 4, *Advanced Topics* for more information). To configure the port for printing only, continue with these instructions.

3. Plug a touch-tone telephone into the dialer's PHONE jack.
4. Pick up the telephone handset and press the '#' key.
5. Listen for the dialer to speak, "System ready".
6. Enter **052 on the telephone's keypad.
7. Listen for dialer's response, "Printing Enabled".
8. Turn the Printer power OFF, then ON again to reset it.

Refer to Chapter 3, *Operations*, for information on how to print reports and enable continuous event logging.

Quick Start Procedure

This procedure is designed to get the *Series 1000* dialer operating in a typical manner with a minimum of programming. All that is needed is a touch-tone phone with a mute button and a Microtel Series 1000.

1. Plug the touch-tone telephone into the Dialer PHONE jack. Take the telephone off-hook.
2. Turn on the Power Switch and verify the Dialer has power. (Power/Fault light will pulse with a 95% duty cycle indicating no errors). The **Off Hook** light will come ON (red) indicating the unit is ready to accept touch-tone commands from the local telephone. At this point, press the Mute button on the telephone. This will clear up all background noise while still allowing touch-tones to be sent.
3. Press the # key on the telephone. The Dialer will respond "System Ready."

NOTE: Any time you wish to start over, press the # key and listen for "System Ready."

4. Set Time and Date

   - Enter the command **060HHMM, where the actual 24-hour time is substituted for HHMM. For example, if the time is 1:00 p.m., enter **0601300.
   - The Dialer will respond, "The time is one three zero zero" for the above example.
   - Enter the command **061MMDDYY where the actual date is substituted for MMDDYY. For example, if the date is January 2, 1997, enter **061010297.

     Note that if the year is 2000 or above, simply put the last 2 digits of the year. For example, the year 2003 would be entered as YY = 03.
   - The Dialer will respond, "The date is zero one zero two nine seven" for the above example.

5. Enter the Telephone Number of the Dialer.

   - Enter the command **010p**, where p is the telephone number (up to 16 digits) of the Dialer's telephone line. For example, if the Dialer is connected to 504-276-0571, Enter **010 5042760571 **.
   - The Dialer will respond, "The system telephone number is 5042760571."

6. Enter Telephone Numbers to Call upon Alarm.

   - Enter **01np**, where n = 1,2,3,...9 is the dialer's directory index of telephone numbers and p is the actual telephone number (including optional escape codes of up to 60 digits). Example: Telephone Number 2 in the directory is 555-1212. The command to enter this number is **012 5551212**.
   - The Dialer will respond, "Telephone number two is 5551212."

7. Configure Channel Type

   - Enter the command **c2nn, where c is the I/O channel (numbered 1 to 8 from left to right) and nn is the I/O type to be programmed. See Configuring Input/Output Modules in Chapter 3 (Page 27) for a list of module types. Repeat for each channel used.

NOTE: This command defaults all the information for a channel. Make sure this is the first command performed on a channel.

8. Review Channel Input/Output Values

   - Once a channel's type has been configured (see 7 above), this channel can now report its current status condition. Enter the command *c0 to review the programmed channels status conditions, where c is the channel number 1 to 9. This is an easy way to tell that the dialer is connected properly to the external devices. Example: Enter *10 to review channel 1's current status condition.

9. Assign Telephone Numbers to Individual Channels.

   - Enter **c41t*, where c is the I/O channel (numbered 1 to 8 from left to right) and t is the index number of the telephone number you wish to dial (t = 1,2,3,...9). Example: If you want an alarm on channel 1 to call the telephone numbers 2 and 4 to report the error, enter the command **14124*. This will set this channel's calling list to be the numbers 2 and 4.

10. Configure the Inputs to Call On Alarm.

NOTE: The pre-configured inputs come from the factory disabled preventing nuisance telephone calls.

   - Enter the command, **c82, where c is the input channel number on the Dialer. Example: Enter **382 to arm input channel number 3 to call on alarm.

   - The Dialer will respond, "Channel three alarm setup is two, call on alarm."

   - Repeat procedure for the next alarm and corresponding I/O channel. Channel 9, the internal power fail alarm, can also be configured to call on alarm.

11. Record System and Alarm Voice Messages (Optional)

System ID Voice Message

   - Press **001 to record up to a six second system voice message. The dialer will respond "Ready".

- Speak your message clearly into the handset. You may trim the message by pressing any touch tone button.
- Verify your message by pressing *001 to listen.

Individual Alarm Messages

- Press **c1 to record an alarm message for a specific I/O channel. (c = 1 to 9 for the I/O channel of interest). The dialer will respond "Ready".
- Speak your message clearly into the handset. You may trim the message by pressing any touch tone button.
- Verify your message by pressing *c1 to listen.
- Repeat procedure for the next I/O channel and message.

NOTE: The Dialer will use its internal, digitized voice and vocabulary for alarm reporting if you do not record these messages.

12. Test Call Out

Force a test call to one of the telephone numbers you entered after configuring your Dialer. Enter **057n, where n = 1-9, is the directory index of the telephone number. After the dialer responds, the dialer will wait for you to hang up the phone before calling the number you specified.

13. Verify Configuration Data is Saved in the Dialer.

Turn OFF the Dialer's power switch, wait a few seconds, then turn it ON again. The red Power/Fault light should pulse with a 95% duty cycle indicating the new configuration data has been saved in memory.

Many more features are available with the *Series 1000* Dialer. Read the *Operations* and *Advanced Topics* chapters for more information on configuring the dialer for your specific application.

Note for MicroWIN Users: If the Series 1000 Dialer is to be called via a **MicroWIN System**, the dialer will need to put into **Data Answer Mode**. Enter the command **0581. To return to **Voice Answer Mode**, enter the command **0580 (See **Connecting to the Dialer via Modem** in the **Advanced Operations** section).

CHAPTER 3 - Operation

This chapter, divided into Configuration and Operation sections, will explain how to configure the *Series 1000* dialer to react to I/O events and how an operator can make the dialer respond to remote commands. The Microtel *Series 1000* features a single level, interactive command structure--there are no multi-level menu structures to navigate. Commands are sent to the *Series 1000* through your telephone either locally or during a call to or from the dialer, by pressing a sequence of touch-tones on your telephone. Each command entered is acknowledged with a spoken response from the dialer, providing verification that the command was entered correctly and understood by the dialer.

All programming commands (commands that modify dialer configuration or cause an action to occur) begin with '**' (two stars). All review (report) commands begin with a '*' (single star). After each command is entered, the dialer will respond with a voice message. Most commands require exactly the same number of keys every time, but some commands have a variable data length. The end of variable length data commands is performed with the '**' (two stars).

NOTE: An unwanted command can be terminated at any time by pressing the '#' key. The dialer will respond, "System ready", indicating it is ready to accept a new command.

Throughout this manual, all commands are highlighted for quick reference as follows:

*nnn	Review item
**nnnddd	Configure item

If your telephone line is not yet installed, you can still configure your dialer:

1. With power to the dialer off, connect the telephone to dialer's PHONE jack.
2. Take the telephone off-hook.
3. Turn ON power to the dialer.
4. The telephone should now be connected to the dialer (indicated by the PHONE LED being ON and the Dialer reporting 'SYSTEM READY').
5. You may now enter any of the touch-tone commands to query/configure the dialer.
6. When you are finished, hang-up. The PHONE LED should turn OFF indicating that you hung-up. To have it pick up again, redo this procedure.

Configuration

The configuration commands described in this section modify basic dialer operation and store information about the dialer's operational behavior in nonvolatile memory. You should only have to configure your dialer once -- all changes are saved permanently, even if AC and battery power are removed from your dialer. This section consists of the following subsections:

- Basic System Information - Set/Query various system values
- Time/Date Setting - Set/Query the Dialer's Time and Date
- Automatic Call-outs - Set/Query the Dialer's independent Call At Times
- Telephone Numbers - Set/Query each of the outgoing phone numbers
- Input/Output Modules - Set/Query the I/O Point configurations

The following abbreviations are used in the manual to represent user-selected inputs in the Dialer configuration commands:

Abbreviation	Meaning
c	I/O Channel Number, 1-8 (9 = power-fail), 1 is leftmost
DDHHMM	Days(00-99), hours(00-23), minutes(00-59) - 000000 is disabled
HHMM	Time in 24 hour format (0000-2359)
MMDDYY	Date in month, day, year format
~	Recorded speech
n	1 digit numeric data
nn	2 digit numeric data
nnn	3 digit numeric data
nnnn	4 digit numeric data
t	Variable length Telephone selections (up to 9 selections)
p	Variable length Telephone number (up to 60 digits) with escape codes
aaa	3 Digits corresponding to an Analog value (00.0 - 99.9%)
w	Day of week (1=Sunday ... 7=Saturday, 9=all days)

Basic System Information Overview

The following commands configure and report the current values for the overall system level operations of the *Series 1000*. These settings include:

Section	Current Setting	Change Setting	Meaning
Voice System Name	***001**	****001~**	User defined Voice System Name for the Dialer
Call Spacing Time	***002**	****002MM**	Time in minutes the dialer waits after making an answered outgoing call before making another one
Ring Count	***003**	****003nn**	Waits **nn** rings before answering an incoming call
Access Code	***004**	****004nnnn**	Code to get access to the Dialer during a callin or callout
Message Repeat Count	***005**	****005nn**	Number of times the Dialer will repeat the alarm messages for a callin or callout
Voice Interaction Delay	***006**	****006n**	Delay time between entering a command and the dialer responding to this command
Callback Acknowledge	***008**	****008n**	Enabling Callback Acknowledge. **n=1** Enables it. **n=0** Disables it
Snooze Delay Time Interval	***074**	****074 DDHHMM**	The delay after which the Dialer will re-arm an acknowledged alarm so that alarm will again generate callouts
System Telephone #	***010**	****010p****	The Dialer's telephone number **(Required for faxes to comply with FCC Regulations)**

A **Glossary of Dialer Terminology** that defines these parameters with respect to the *Series 1000* operation is provided in the Appendix.

Basic System Information

The following commands configure and report the current values for the system level information of the *Series 1000.* A Glossary of Dialer Terminology that defines these parameters with respect to *Series 1000* operation is provided in the Appendix.

- **Voice System Name** The name the dialer will say in introduction before making any report.

*001	Play system name
**001~	Record system name

Once the command to Record the system name has been typed in, the Dialer will respond by saying 'Ready'. When you hear this, speak the message. Once you have finished speaking, you can either wait until it finishes recording or press the '#' key to trim off the end of the message. If the message is trimmed, type '*001' to replay the message.

Example voice responses-

Microtel SERIES 1000 (default in the normal system voice)

-or-

Jonesburg remote site number 6 (recorded)

- **Call Spacing Delay** This is the number of minutes the dialer will wait after an answered Callout before beginning any other Callouts (01-99 minutes).

*002	Review call spacing
**002MM	Program call spacing

Example- Command: **00260
Response: *The call delay period is six zero minutes.*

- **Ring Count** The number of rings the dialer will see before answering an incoming call.

*003	Review ring count
**003nn	Program ring count

Example- Command: **00305
Response: *The ring count is five.*

- **Access Code** This 4 digit access code is required to access configuration commands during a telephone call to and from the dialer.

*004	Gives the status of the access code (Enabled/Disabled)
**004nnnn	Program access code

NOTE: The factory set default code is '1234'. Use a 0000 access code value to disable access code requirement. Access code is not required to configure the dialer through the local PHONE jack.

Example- Command: **0041357
Response: *The access code is enabled.*

- **Message Repeat Count** The number of times the dialer will repeat the initial system status report for a callout or callin. This value can be overridden for an individual phone number by placing an alternate message repeat count command within the telephone number (***94n** escape sequence). The escape code ***940** will cause no status message to be spoken (useful when dialing paging terminals).

*005	Review Message repeat count
**005nn	Program Message repeat count

Example- Command: **00503
Response: *The message repeat count is three.*

- **Voice Interaction Delay** A programmed time delay (in tenths of a second) that sets the time between command entry and the dialer's voice response, and between spoken phrases during status message reports.

*006	Review voice interaction delay
**006n	Program voice interaction delay

Example- Command: **0061
Response: *The voice delay is one.*

- **Callback Acknowledge Enable Switch** This flag tells the dialer whether to or not to acknowledge the current alarms when it receives a callback.

When an alarm occurs, callouts will be made to a specific set of phone numbers to report the active alarms. It will continue calling until all alarms get acknowledged (or these alarms clear). Once finished with a callout, it will wait an intercall delay period before placing the next call. During this time, a user can place a call to the system that would acknowledge all channels that are currently in alarm that are programmed to call the phone number the dialer had just previously called. This switch allows you to **Enable** or **Disable** this type of acknowledgement

*008	Review Callback Acknowledge Setting
**0080	Disable Callback Acknowledge
**0081	Enable Callback Acknowledge

Example- Command: **0081
Response: *Callback Acknowledge is Enabled.*

- **Snooze Delay** This is the amount of time an acknowledgement for a channel's alarm will last. During this time delay, no callouts for this channel's alarm will be made. If the channel's alarm condition persists after this snooze delay expires, callouts will once again be made for this channel's alarm.

*074	Review snooze delay time interval
**074DDHHMM	Program snooze delay time interval

Example- Command: **074001234
Response: *The snooze delay is one two hours three four minutes.*

- **System Telephone Number** A telephone number of up to 16 digits used as identification within a FAX header.

*010	Review System Telephone number
010p	Program System Telephone number

NOTE: FCC Regulations require a phone number be included in the header of any FAX. See Appendix for more on the FCC requirements.

Example- Command: **0105551212**
Response: *The system telephone number is five five five one two one two.*

Time And Date Setting

The *Series 1000* has an onboard real-time clock used to Time/Date stamp dialer events, as well as allow status call-outs to occur at specific times. Time and Date are maintained even if power is lost to the dialer. Use the following two commands to initialize your dialer's local time, or to set it back/ahead in conjunction with Daylight Savings Time.

- **Time** Current dialer time in 24 hour format (military format).

*060	Report Time
**060HHMM	Set Time

Example- Command: **0600327
Response: *The time is zero three two seven.*

- **Date** Current date in MMDDYY format.

*061	Report Date
**061MMDDYY	Set Date

Example- Command: **061061298
Response: *The date is zerō six one two nine eight.*

The following is an example of when the date is May 14th, 2013.

Example- Command: **061051413
Response: *The date is zero five one four one three.*

Automatic Call Outs

Use the following two commands to program your dialer to deliver a spoken or FAX status report of the monitored site at specific times on a weekly or daily basis.

- **Call At Time** When a timer in the HHMM format matches the current time, a status update call will be placed to the system calling list (described below). The time that can be set as either once a week or once a day at a specified time. Once the command is entered, the response will report the next Call At Time.

*062	Report Next Call At time
**062wHHMM	Program Call At time

Use the table below to set the Call at Time dates.

w	0	1	2	3	4	5	6	7	9
Value	None	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Daily

Examples- Command: **06210832
Response: *The Call At time is Sunday zero eight three two.*

If the current time is 11am on Wednesday,

Command: **06291210
Response: *The Call At time is Wednesday one two one zero.*
-or-
Command: **06291010
Response: *The Call At time is Thursday one zero one zero.*

- **Call At List** A list of phone numbers to call when the Call At Time occurs.

*063	Report Call At telephone list
**063t*	Program Call At telephone list

(t is a list of 0 to 9 digits followed by a *).

Example- Command: **06328*
Response: *The system telephone list is two eight.*

When the system Call At Time is reached, phone calls will be placed to phone numbers 2 then 8 repeatedly until the alarm is acknowledged.

NOTE: When calling a fax machine, to prevent multiple faxes, embed the auto acknowledge escape code (***90**) in the last telephone number in the call at list.

Telephone Numbers

) described in the theory of operation in Chapter 1, the dialer can store up to nine (9) phone numbers in the System Telephone Directory. This section explains how to program the dialer's telephone numbers and shows how to customize the numbers for certain call-out situations.

Use the following command to enter each telephone number into the *Series 1000* dialer:

*01n	Review Telephone n (n=1 to 9)
01np	Program Telephone n (n=1 to 9)

p = telephone number of up to 60 digits with escape codes for one of 9 (nine) telephone numbers. The telephone data is terminated with '**' (two asterisks).

Example- Command: **0112760571**
Response: *Telephone number one is two seven six zero five seven one*

Example- Command: **0152432400**
Response: *Telephone number five is two four three two four zero zero*

These phone numbers may be customized to use the Call Progress features of the dialer. Refer to the *Advanced Topics* chapter for a full discussion about using these powerful ltures of the *Series 1000* Dialer.

Configuring Input/Output Modules

The *Series 1000* features true modularity--I/O channels operate completely independently of each other. Using the following commands, each I/O channel in your dialer can be configured to operate uniquely to satisfy your application requirements. For each I/O channel, you may record a voice message, choose the format of spoken status reports, program an alarm integration delay, alarm call out operation, and telephone number calling sequence. Analog inputs also have user-selectable low and high alarm setpoints.

NOTE: Always verify the I/O channel TYPE before proceeding to configure any other values for a channel. The dialer will reset a channel's settings when this channel's TYPE is modified. If you are adding a new I/O channel to your dialer, you must configure this channel's TYPE first. Refer to Advanced Topics for information on adding I/O modules to an existing configuration.

NOTE: Input modules come from the factory configured as STATUS only. At the very least, you must configure your inputs to Call On Alarm (described below).

The following commands configure and report the current values for the channel level operations of the *Series 1000*. They are in the order presented in the text. These settings include:

Section	Current Setting	Change Setting	Meaning
Channel Type	***c2**	****c2nn**	I/O Type of channel **c**
Alarm Configuration	***c8**	****c8n**	Determines how channel **c**'s alarm operation will be handled
Report Status Flag	***c7**	****c7n**	Tells the dialer to report channel **c**'s status as part of its answer message (**n=0:Don't, 1:Do**)
Channel Telephone List	***c41**	****c41t***	List of telephone numbers that will be called to report an alarm condition for channel **c**
Channel Status	***c0**		Reads back the current status for channel **c**
Clear Channel Counters		****c0**	Clears the Counter, Runtime, Time In Alarm values for the channel **c**
Channel Voice Name	***c1**	****c1~**	Spoken name for channel **c**
Channel Report Format	***c3**	****c3nn**	Selection of status information that is spoken for channel **c** (***c0**)
Channel ON/OFF Delay	***c5**	****c5nMMSS**	Time that a physical state change will have to occur for before channel **c**'s alarm state changes
Analog High Setpoint	***c90**	****c90aaa**	High setpoint for an analog input (in percent). Used for analog alarm monitoring
Analog Low Setpoint	***c91**	****c91aaa**	Low setpoint for an analog input (in percent). Used for analog alarm monitoring

- **I/O Channel Type**

*c2	Report I/O channel c TYPE
**c2nn	Program I/O channel c TYPE
**c208Cv	Program I/O channel c to Follow Channel C's Value

Selection of I/O channel type (c = 1 to 8 for I/O channels starting at leftmost slot).

N	Setting	Meaning
00	SPARE	No Type Selected
01	Digital Input Normally Open	Contact closure Normally Open
02	Digital Input Normally Closed	Contact closure Normally Closed
03	Digital Output	Digital Output that is user definable to be Open or Closed
04	Analog Output (00.0 - 99.9%)	Analog Output that is user definable to be at some setting
05	Analog Input (00.0 - 99.9%)	Current Percentage of an input value
06	Local Alarm Output	Digital Output that Closes when there is a local alarm
08	Follow Channel Output	Digital Output that Closes depending on the followed channel's state (see below)

Example- Command: **3201
Response: *Channel three type is one normally open digital input.*

NOTE: When using **Digital** or **Analog Outputs**, see the section labeled **Site Control.**

**c208CV	Program I/O channel c to Follow Channel C's Value

Value	Setting	Meaning
C	Followed Channel (1-9)	The I/O Channel whose channel status is being followed.
V	Type of Follow Channel (1-5) **0**) Digital Output Follow Channel **1**) Dout Follow Channel Status **2**) Dout Follow Channel Alarm **3**) Dout Follow Fill Algorithm **4**) Dout Follow Empty Algorithm	The condition that this Output Channel is following.

Example- Command: **420832
Response: *Channel four type is eight digital output following channel three alarm.*

- **I/O Alarm Configuration** Selection of channel **c**'s alarm operation. For instance, latched, call on alarm, etc.

*c8	Review I/O channel c alarm configuration
**c8n	Program I/O channel c alarm configuration

The following table describes the different types of alarm configurations possible with the *Series 1000* Dialer.

n	Value	Meaning
0	None	no alarms generated
1	LATCHED	no alarms generated
2	COA (call on alarm)	A call is placed when input changes from normal to alarm after the I/O delay time. If the monitored input goes back to a normal condition, no more alarm call-outs will be made for that previous fault.
3	COA LATCHED	A call is placed when input changes from normal to alarm after the I/O delay time. Calls will persist until the alarm is acknowledged.
4	RTN (call on return)	Same as call on alarm, with a second call made when the alarm condition goes away.
5	Remaining in current output state	For Digital and Analog Outputs. **Please use this feature with Caution.** The output state of this channel will remain the same even after the dialer gets turned off and back on. **Make sure that this feature fits with your application.**

When this value is modified, the alarm condition for this point will be reset.

Example- Command: **184
Response: *Channel one alarm setup is four call on alarm and return to normal.*

NOTE: When using **Digital Outputs**, see the section labeled **Site Control**.

- **Report Status Flag** When this is set, the dialer will report this channel's current status values in the opening message for a callout or callin.

*c7	Review Report Status Flag
**c70	Clear Report Status Flag (Default)
**c71	Set Report Status Flag

This is used to automatically relay certain channel status information during callouts and callins without the user having to enter any commands to retrieve it.

- **I/O Channel Telephone List** A list of selected phone numbers an I/O channel will call repeatedly upon alarm until the alarm is acknowledged.

*c41	Review I/O c Telephone selections
**c41t*	Program I/O c Telephone selections

t is a list of 0 to 9 digits.

Examples- Command: **14128*
Response: *Channel one telephone list is two eight.*
-and-
Command: **241*
Response: *Channel two telephone list is none.*

NOTE: When the channel's telephone list is none, it will skip over this channel when looking for the highest priority channel in alarm.

- **I/O Channel Status/Clear Counters** A spoken status message for I/O channel **c** only. The data spoken is dependent upon the user-configured report format for channel **c**. This will also speak the alarm condition for that channel. It will specify if the channel is currently in alarm, has an alarm that has been acknowledged, or is now normal (had an unacknowledged alarm that has since cleared).

*c0	Report I/O channel c status
**c0	Reset and Report I/O channel counter and runtime

Example voice messages-

Digital Input Type	*Channel one normally open digital input is Open.*
Digital Output Type	*Channel two digital output is ON.*
Counter Input	*Channel one normally open digital input zero counts.*
Analog Input	*Channel four analog input is at seven five point zero percent.*
Power Fail	*Channel 9 Power Normal.*

Example- Command: **10
Response: *Channel one normally open digital input zero counts runtime is zero.*

- **I/O Channel Voice Name** An individual I/O channel's spoken voice name.

*c1	Play I/O channel c voice name
**c1~	Record I/O channel c voice name

Sample Message- *Channel one normally open digital input.*

A new channel name can be recorded with the '**c1' command. Once the command is typed and the dialer responds 'Ready', record your voice message. A maximum of 3.25 seconds of recording time is allowed for each I/O module. Pressing any key will trim the recording allowing a variable length message to be saved.

- **I/O Channel Report Format** Selection of spoken status Report Format. This entry selects which data is reported when playing a channel's status message (***c0**). More than one data item can be chosen at a time by entering a value that is the sum of the desired data items, (for example, to report the counter value and run time, use the value of **nn**=06, 2 for counter plus 4 for run time). See table below.

*c3	Review I/O channel c status REPORT format
**c3nn	Program I/O channel c status REPORT format

nn	**Voice Response**	***Spoken Status*/Meaning**
00	None	*Channel c report format is zero none.* Will only report the name and if it's in alarm
01	Report Current Status	*Channel c report format is one status.* The current setting of the I/O Channel
02	Report Counter Value	*Channel c report format is two count.* For Digital, the number of transitions from Open to Closed
04	Report Run Time	*Channel c report format is four run time.* Total length of time this channel has been in a fault condition
08	Report Time In Alarm	*Channel c report format is eight time in alarm.* Length of time this channel is currently in alarm (0 if out of alarm)
15	Report All	*Channel c report format is one five status, count, run time, time in alarm.* Combination of all Report formats

- **I/O Channel ON/OFF Delay**

When channel **c** changes state, this timer delays an alarm until the channel has been in the alarm state for this period. This parameter will filter out noisy, or temporary, state changes from placing undesired nuisance alarm calls.

*c5	Report I/O channel c delay
**c5nMMSS	Program I/O channel c delay

There is a difference between the ON and OFF delay. The ON delay is how long the alarm condition must be present before the dialer alarm takes affect. If the alarm condition clears before the ON delay time expires, the delay counter resets. The OFF delay is how long the alarm condition has to be clear before the dialer alarm clears. If the alarm condition reoccurs before the OFF delay time expires, the delay counter resets.

To program the ON and OFF delays, the command **c51MMSS will be used (n=1). This will set both the ON and OFF delay times to the set time period (MMSS). To program the OFF delay, the command **c52MMSS will be used (n=2). This will set only the OFF delay time.

Example- Command: **1510030
Response: *Channel one alarm on delay is three zero seconds and off delay is three zero seconds.*

(another example for **Channel ON/OFF Delay**)

Example- Command: **1520004
Response: *Channel alarm one on delay is three zero seconds and off delay is four seconds.*

- **I/O Channel Analog Input Setpoints**

High Setpoints This analog setpoint parameter sets a level that if it gets exceeded by the analog input, it will cause an alarm call after the I/O channel delay time is reached (0% disables this channel's high alarm).

*c90	Review I/O channel c analog input high setpoint
**c90aaa	Program I/O channel c analog input high setpoint

Example- Command: **190876
Response: *Channel one analog input high setpoint is eight seven point six percent.*

Low Setpoints The value at which a low alarm occurs for this analog input (0% disables this channel's low alarm).

*c91	Review I/O c analog input low setpoint
**c91aaa	Program I/O c analog input low setpoint

Example- Command: **191123
Response: *Channel one analog input low setpoint is one two point three percent.*

NOTE: All analog inputs or outputs are expressed as a percentage of full scale with a range of 0% (zero) to 99.9%. A simple conversion from percentage to actual engineering values is made with a direct proportion. A conversion chart is provided in the Appendix to convert to and from commonly used engineering values. To use these charts, locate the percentage or engineering unit and read the corresponding conversion.

Operations

This section details the normal operation of a dialer, from both local and remote locations. Sections will detail the following actions:

- Alarm Acknowledgment
- System Status
- Site Control
- Printer Operations

A telephone connected to the *Series 1000* PHONE jack can be used both as a normal telephone by pressing a '9' for a connection to the line, or as the human-to-machine interface to configure and inquire the *Series 1000* dialer.

To use the outside line:

1. Pick up the local telephone connected to the *Series 1000* jack labeled PHONE.
2. Dial '9'.
3. The telephone will now be connected to the outside phone line.
4. Listen for the dial tone.
5. You may now place a telephone call.
6. To get back to the *Series 1000*, hang-up the phone, then pick it up again.

When the local telephone rings, you may receive the call by picking up the handset before the dialer's answer delay (ring count) elapses.

Alarm Acknowledgment

When the *Series 1000* calls you, you may wish to respond to the call differently depending on what type of alarm has occurred, who is on duty, the time of day, severity of the alarm, etc.

When the dialer calls you to report an alarm condition, if you wish the dialer to go to the next phone number on its calling list, simply listen to its message and hang up the phone. The dialer will continue on after the call spacing delay to the next phone number on the list until it receives an acknowledgment or the unlatched alarm goes away by itself.

If you wish to acknowledge the call from your touch-tone phone, press the '*' key on your telephone *while* the alarm message is being spoken. The dialer will respond by reporting that the alarms are acknowledged. If you then need access to the remote programming commands, enter the 4 digit access code. After gaining access to the dialer, you have a different set of choices available to acknowledging the dialer's alarms. The first choice is to acknowledge all alarms (not just ones armed to call your telephone number), including any system errors that were enunciated. Use the following command to acknowledge all alarms:

**071	Acknowledge all alarms present

Example- Command: **071
Response: *Acknowledge alarms accepted.*

A second choice is to only acknowledge an alarm on a specific channel. Use the following command to acknowledge an alarm on a single channel:

**072c	Acknowledge alarms on channel c

Example- Command: **0721
Response: *Channel one alarm acknowledged.*

If no other unacknowledged alarms exist, no additional calls will be made. If any unacknowledged alarm exists, the calls will be made to that alarm's telephone list.

NOTE: An entry of **0720 will acknowledge System only alarms.

NOTE: If you don't have a touch-tone phone, you can acknowledge the alarm call by hanging up the phone and calling the dialer back within the call-spacing period. When the dialer answers the telephone call, all channels armed to call the most recently dialed telephone number will be acknowledged. This feature can be disabled. See Section **Callback Acknowledge Enable Switch** (***008**, ****008n**).

If you wish to find out which channels call your phone number before acknowledging the current alarm conditions, enter the following command:

*03n	Report Alarms armed to call Telephone n

Example- Command: *031
Response: *Alarms enabled for telephone number one are three four five six seven eight nine.*

System Status

The *Series 1000* allows for easy checking of system status and capability. Spoken or faxed status reports of your entire dialer-monitored system can easily be generated. The following paragraphs describe the commands necessary to generate such reports and test the dial-out capabilities of the *Series 1000*.

A spoken system status report can be received from the dialer by entering the following command from a touch-tone telephone either locally, or remotely after answering or calling the dialer: The dialer will speak a voice message of system name, software version, system errors if present, current alarms, counter values and run time accumulators of individual I/O modules. The data spoken for each I/O channel will depend upon the user-configured status report format.

This is an overview of the commands that are shown in this section.

Section	Command	Action
System Status	***000**	Report System Status
Report Channel Status	***c0**	Report status information for channel **c**
Clear Channel's Runtimes	****c0**	Clear Runtime/Time In Alarm/Counter's for channel **c**
Make Callout/Fax Status Report	****056n**	Make call to telephone # **n**. If to a fax (***991**), this will send a status report
Make Callout/Fax Configuration Report	****057n**	Make call to telephone # **n**. If to a fax (***991**), this will send a configuration report

- **System Status** Gives a complete status of all points monitored by the dialer

*000	Report system status

Example- Command: *000
Response: *MICROTEL SERIES ONE THOUSAND two point zero*
Channel one normally closed digital input in alarm
Channel two normally open digital input
Channel three normally open digital input is open
Channel nine power normal

- **Individual I/O Channel Status** A spoken status message for I/O channel c only. The dialer response is dependent upon the configured report format for channel c and the current alarm condition for that channel: currently in alarm, alarm acknowledged, or now normal (an unacknowledged fault condition cleared).

*c0	Report I/O channel **c** status

Example voice messages-

Digital Input Type	*Channel one is Open now Normal.*
Digital Output Type	*Channel two Digital Output is ON.*
Power Fail	*Channel nine Power Normal.*

- **Reset Counters and Runtime Registers** Clears I/O channel counter and runtime registers. Refer to the section on configuration of I/O channels for other types of channel report formats.

**c0	Reset I/O channel's counter and runtime

Example- Command: **10
Response: *Channel one normally closed digital input zero counts runtime is zero.*

Use either of the following commands to force the dialer to call a specific telephone number and give a status report, or to fax a status or configuration report. Before using these commands, telephone number n must have already been entered into the System Telephone Directory. If a telephone number will be used to send a fax report, it needs to contain the ***991** escape sequence (See *Telephone Numbers* in the Configuration section). Example FAXes are included in the appendix.

NOTE: These commands will not be accepted by the dialer if an unacknowledged alarm is present, or if the dialer called you.

- **Fax Status Report** This command will fax a snapshot system status report to telephone number n (n=1-9, telephone directory index). If telephone n does not have the ***991** escape sequence embedded within it, then the dialer will just speak a voice status report.

**056n	Fax Status Report

Example- Command **0561
Response: *Fax status report to telephone number one.*

- **Fax Configuration Report** This command will fax the system configuration data to telephone number n. This report can be kept as a record to verify that the dialer is configured correctly. If telephone n does not have the ***991** escape sequence embedded within it, then the dialer will just speak a status report.

**057n	Fax Configuration Report

Example- Command **0572
Response: *Fax system data to telephone number two.*

Site Control

The *Series 1000* makes it possible to immediately begin equipment maintenance before arriving at a remote site, or teleservice a physical process. Use the following touch-tone commands to actuate digital outputs or control analog outputs over the telephone. An example use would be turning a pump on or off when responding to an alarm call from the dialer, or adjusting a variable-speed output device to control a measured parameter.

- **Controlling Digital Outputs** When a channel's I/O Type is **Digital Output** (***c2**, ****c203**, see Section **Configuring Input/Output Modules** for more details), the user can set the output state by entering the proper touchtone command.

*c6	Report I/O channel c Digital Output status
**c60	Program Digital Output channel c to be **OFF**
**c61	Program Digital Output channel c to be **ON**

There are two types of **Digital Outputs**: **Latched** and **Momentary**. A **Latched** Output will maintain the last state the user commanded. A **Momentary** Output will cause the output to close for this channel's **On Delay Time** (***c5**, ****c51MMSS**, see Section **I/O Channel ON/OFF Delay**), then reopen.

To make a Digital Output **Momentary**, the command is ****c80**. To make this Output **Latched** (Default), the command is ****c81**. To make this Output **Latched** and to remain in this output state even after the dialer's power has cycled, the command is ****c85**.

Before using **c85, make sure that this fits your application. Use this feature with caution since just the action of turning on a dialer can cause a pump to run.

Example- Command: **161
Response: *Channel one output is ON.*
Example- Command: **160
Response: *Channel one output is OFF.*

NOTE: If this command doesn't seem to control the output, make sure that the channel's Type is Digital Output (See ***I/O Channel Type*** (***c2**, ****c203**)).

- **Setting An Analog Output** This setpoint directly controls an analog output value where "aaa" represents the analog value in percent from 0% to 99.9% (aa.a%).

*c92	Report I/O channel c analog output setpoint
**c92aaa	Program I/O channel c analog output setpoint

Example- Command **292250
Response: *Channel two analog output is two five point zero percent.*

Printer Operations

If local printer logging is enabled, all dialer events--alarms, answered and originating telephone calls, diagnostic messages--are time/date stamped and logged to an external printer connected to the dialer's serial printer port. Also, "snapshot" status reports or printouts of all programmed configuration data can be initiated by entering one of the following touch-tone commands from a local or remote telephone. The commands to use the printer are given below.

- **Enable/Disable Printer** The enable command will enable continuous printer logging of all dialer status changes (input and output state changes, call-outs, alarm acknowledgments, power on/off cycles, etc.). The disable command disable continuous printer logging.

**052	Enable printing
**053	Disable printing

Example- Command: **052
Response: *Printing Enabled.*
Example- Command: **053
Response: *Printing disabled.*

NOTE: You must disable printing before you can enable the Testset feature described in the *Advanced Operations* Chapter.

- **Print Status Report** This command will cause a snapshot printed report of current status information.

**050	Print status report

Examples- Command: **050
Response with printer enabled: *Printing status report.*
Response with printer disabled: *Printing disabled.*

- **Print Configuration Report** This command will cause a printed report of all non-voice configuration information. The printer must be enabled to print a report.

**051	Print configuration report

Examples- Command: **051
Response with printer enabled: *Printing system setup report.*
Response with printer disabled:: *Printing disabled.*

CHAPTER 4 - Advanced Topics

This chapter details more advanced topics concerning the setup, configuration, and operation of the *Series 1000* dialer. This chapter also includes information on using a personal computer and the Configurator software to configure the *Series 1000* via a modem connection. The chapter is divided into setup, configuration, and operations sections.

Advanced Setup

Adding and Removing I/O From Your System

- **Adding I/O Modules to Your System** Normally, your *Series 1000* dialer comes from the factory with the exact I/O modules for your application pre-installed. The modular design of the *Series 1000* allows you to easily add I/O capability to your dialer without removing it from its location. The following procedure describes how to add an I/O point to the dialer. A list of the different types of I/O modules available from the factory, as well as field wiring diagrams, is included in the Appendix.

  1. Turn OFF power to dialer.
  2. Insert the new module into an unused I/O slot (numbered 1 to 8 from left to right) of the *Series 1000* Dialer.
  3. Screw in the new module and Turn ON power to Dialer.
  4. Configure the new I/O module's type.
  5. Record a voice message for the new I/O channel.
  6. Configure the spoken status report format for the I/O channel.
  7. Configure the telephone list to call during alarm.
  8. Configure the delay for the I/O channel.
  9. Set up the alarm configuration (i.e., Call-on-Alarm, LATCHED, etc.)
  10. For analog inputs enter low and/or high alarm setpoints.

  After finishing configuration of the new I/O module, turn off power to the dialer, wait a few seconds, then turn on again. The POWER/FAULT LED of the *Series 1000* should be flickering at a 95% duty cycle indicating that the new configuration data has been stored securely in nonvolatile memory. Refer to Chapter 3, *Configuration* section for more information on configuring I/O modules.

- **Removing an Unused I/O Module** If an I/O module is no longer to be used, simply configure its type as SPARE, using the command '**c200', where c = channel index of module to be removed. I/O modules configured as SPARE are ignored by the dialer. Turn power OFF to the dialer before physically removing the module.

Advanced Configuration Options

Advanced Phone Number Features

- **Call Progress Coding Features** The *Series 1000* has very powerful call progress coding features which allow great flexibility in making phone calls to pagers, fax machines, other dialers, or regular telephones. The following table lists the different codes which can be used to customize how the dialer will make a call-out. These codes are used extensively in the following examples.

Telephone Number Escape Codes	
Code	**Command**
*0	Tone Dial (Default)
*1	Pulse Dial
*2	2-Second Pause
*3	Flash Hook (go on hook for 100 milliseconds)
*4	Wait for Voice or Answer
*5n	Wait for Tone (n seconds)
*6n	Wait for Quiet (n seconds)
*7nn	Set Wait Timer to Abort (if condition does not occur in nn seconds)
*8nn	Set Wait Timer to Continue (if condition does not occur in nn seconds)
*90	Auto Acknowledge this Call
*91	Dial '*'
*92	Dial '#'
*93n	Close (Turn ON) Digital Output Channel n
*94n	Set this Call Alternate Message Repeat Count of n
*95n	Set this Call Alternate Voice Interact Delay
*96n	Open (Turn OFF) Digital Output Channel n
*980	Dial 'A'
*981	Dial 'B'
*982	Dial 'C'
*983	Dial 'D'
*984	Dial Channel Number ('0', '1', '2',..., '9') That Caused This Callout
*985	Dial All Current Channel Numbers That Are In Alarm
*986	Dial All Current Channel Numbers That Have Unacknowledged Alarms
*990	Modem Callout
*991	Fax Callout

When entering call progress sequences in telephone numbers, you must *first* set the Wait Timer (*7nn or *8nn), *then* set the specific condition to wait for (*4, *5n, or *6n). Also, the Wait Timer stays in effect until overridden. So, when programming your telephone numbers into the dialer, always explicitly set Wait Time-outs (*7nn or *8nn) before waiting for Tone, Quiet, Voice or Answer detect. The following example should illustrate:

Example 1- Program phone number 3

```
|       Dial a pager system at 5551212
|       |           Wait for up to 30 seconds for answer
|       |           |         Wait 4 Seconds After Answer
|       |           |         |       Wait 15 seconds for 2 seconds of quiet,
|       |           |         |       then speak the message
|       |           |         |       |           Terminate entry
|       |           |         |       |           |
Command **013 5551212 *730*4  *2*2    *815*62     **
```

Response: *Telephone number three is five five five one two one two STAR seven three zero STAR four STAR two STAR two STAR eight one five STAR six two*

It is very important to enter the *730*4 wait-for-answer sequence in this example, because the intent is to wait *until* the pager system answers and finishes speaking its greeting *before* delivering the spoken alarm report. The following illustrates a case where this would not be necessary:

Example 2- Program phone number 1

```
|       Dial 9
|       |       Pause for 2 seconds
|       |       |       Dial 555-1212
|       |       |       |             Terminate telephone entry
|       |       |       |             |
Command: **011  9       *2      5551212     **
```

Response: *Telephone number one is nine STAR two five five five one two one two.*

Here, nothing comes after the actual dialed telephone number, so a default 30 second wait-for-answer will occur. In general, if the dialer must wait for some event to occur before continuing to dial the remaining digits, then you must program the Wait Timer and Wait For condition as shown in Example 1 above.

Example 3- Program phone number 2

```
|       Key a P.A. (public address) with I/O channel 1
|       |       Repeat the status message one time
|       |       |       Auto Acknowledge all alarms with phone number 2.
|       |       |       |       Terminate telephone entry
|       |       |       |       |
Command: **012  *931    *941    *90     **
```

Response: *Telephone number two is STAR nine three one STAR nine four one STAR nine zero.*

Example 4- Program phone number 4

```
                |       To send a Fax report
                |       |       To 555-1212
                |       |       |               Terminate telephone entry
                |       |       |               |
Command:        **014   *991    5551212         **
```

Response: *Telephone number four is STAR nine nine one five five five one two one two.*

The *991 escape sequence shown must be embedded within telephone numbers calling to FAX machines. This tells the dialer to begin to generate a FAX report before it goes off-hook and dials the remote machine. Always put the *991 sequence, as well as any other non-call progress sequences (such as auto acknowledge), at the beginning of the telephone number string before the dialer goes off-hook to dial regular telephone digits.

Example 5-

```
                Program phone number 2
                |       No Voice Message (Pager).
                |       |       Auto acknowledge call
                |       |       |       Dial Pager Terminal (Example Phone #)
                |       |       |       |       Wait 30 seconds for Answer
                |       |       |       |       |       Wait 4 Seconds After Answer
                |       |       |       |       |       |       Dial No. for pager
                |       |       |       |       |       |       |       Dial a '*'
                |       |       |       |       |       |       |       |       Dial Current Alarm
                |       |       |       |       |       |       |       |       |       Dial '*'
                |       |       |       |       |       |       |       |       |       |       Dial All Alarms
                |       |       |       |       |       |       |       |       |       |       |       Termination
                |       |       |       |       |       |       |       |       |       |       |       |
Command:        **012   *940    *90     5551212 *730*4  *2*2    5556565 *91     *984    *91     *985    **
```

This example illustrates using the Automatic Current Alarm Display feature with a pager system. When the escape code *984 is embedded within a telephone number, it causes a single digit ('0'-'9') according to the current alarm to be dialed. Thus, when dialing a numeric pager, the actual alarm index can be included in the page. Insert this code after the telephone number that is sent to the paging terminal. Use a '*' key to indicate that the following digit is the alarm index. The escape code *985 is used to show all current alarms on the system.

If channel 4 was the current channel in alarm and channels 6 and 7 are also in alarm when the page is sent, it will read '5556565*4*467' when you get your message.

NOTE: Some pagers do not accept the '*' (*91) or '#" (*92) dtmf tones as input. Also, some require the '#' (*92) to terminate the input sequence. See pager system documentation for details.

Advanced Operations

- **Configuring the Dialer from a Local Computer** In addition to its interactive touch-tone/voice interface, the *Series 1000* may also be configured from a local computer. In this case, you will need to receive the program **term8** that will be used as a terminal to the dialer. The software can be downloaded off the Microtel web sight (**www.microtel-inc.com**). When this is run and your computer is connected to your dialer, a menu structure is presented on the computer screen. Menu navigation and data entry is accomplished from the computer keyboard. If you wish to create custom text messages to be printed on FAX reports from the dialer, you must use the local computer (or remote **Windows Dialer Configurator**) interface to enter them. The following two (2) commands pertaining to operating the dialer's local testset are listed here for reference:

**054	Enable test set
**055	Disable test set

The enable command will allow for a local computer interface through the printer (RS232) serial port on the dialer to talk to either COM 1 or COM 2 on you computer. The printer must be Disabled for this action to work (See Printer Operations in Chapter 3 for more information).

Example- Command: **054
Response: *Enabled.*
Example- Command: **055
Response: *Disabled.*

- **Connecting to the Dialer via Modem** The *Series 1000* allows the operator to configure the dialer as a modem. By changing the **Answer Mode** with the following command, the dialer will answer an incoming call in either data or voice mode. The normal mode of operation is voice mode. When the answer mode is set to **Voice Mode (n=0 - **0580)**, the dialer will answer a call with voice prompts and operate in the normal manner. When the dialer is configured to **Data Mode (n=1 - **0581)**, the dialer will answer the telephone as a modem by emitting a carrier tone. If the dialer doesn't connect within ~15 seconds, it will switch to voice mode for this call to allow users to still make call-ins while the answer mode is in Data Mode. Once the dialer connects, the dialer will respond to ASCII commands sent to the dialer. Each command should start on a new line and followed by a carriage return. The following is a list of ASCII commands which can be sent to the dialer.

Command	Response
SETUP	Reports the current setup for the Dialer
STATUS	Reports current readings of the I/O Points on the Dialer
ACK	Will acknowledge the current alarms on the Dialer
HANGUP	The Dialer will drop carrier and hangup.

A call should be terminated by the party calling the dialer. Once the dialer loses carrier and is hung-up on, the dialer will continue to answer call-ins and make call-outs as normal.

**058n	Program the dialer's answer mode (n - 1=Data, 0=Voice)

Example- Command: **0581
Response: *Data mode enabled.*

Note: When using a **MicroWIN System** to call the dialer, the dialer will need to be put in **Data Answer Mode** before any call from MicroWIN will be successful.

- **Disable Timers** The disable timers provide a way to temporarily prevent unwanted alarm calls from being placed.

When disable timer zero has been set to any non-zero value, no calls will be placed until either the timer counts down to zero or is programmed back to zero. Typical uses of this function would include disabling false calls during planned maintenance on equipment monitored by the dialer.

When disable timer one through nine is non-zero, then calls to that corresponding phone number alone are disabled. An example use would be disabling phone one for whatever time period required while the person responsible for responding to phone calls is not available.

Use the following command syntax to review/set disable timers:

*02n	Report disable timer current value
**02nDDHHMM	Set disable timer n

DDHHMM (00-99 Days, 00-23 Hours, 00-59 minutes)

n=0 This indicates the System Disable Timer. This setting disables all outgoing calls while this countdown timer is non-zero.

n=1-9 This indicates telephone number n Disable Timer. This disables the dialer from placing calls to phone number n while this countdown timer is non-zero.

Examples- Command: **020000105
Response: *The system disable timer is one hour five minutes.*

Command: **021010105
Response: *Telephone number one disable timer is one day one hour five minutes.*

The Following is an example of use:

The on-call person is going out of town for 3 days. He wishes his family not to be disturbed while he is gone. The dialer is instructed to skip his phone number during an alarm call-out sequence. In this case, the command **021030405 would prohibit alarm calls to be placed to phone 1 for 3 days, 4 hours, and 5 minutes beginning at the time the command is sent.

- **Initializing Configuration Data** These programming commands configure the dialer with default data. Before initializing, print or FAX a copy of your dialer's current configuration as described in Chapter 3, Operations section.

****009001973**	*Initialize System Data*
****009102846**	*Initialize Telephone Data*
****009200534**	*Initialize Channel Data*

CAUTION: Programmed data will be reset to Defaults. These commands should only be used if it is necessary to clear out all configuration data.

CHAPTER 5 - Maintenance/Troubleshooting

The *Series 1000* Dialer is built to require minimal maintenance. Only three items, the system battery, fuse, and internal clock, require your attention from time to time for your dialer to continue performing with no problems.

BATTERY: A battery in typical standby use will last approximately 2 to 4 years. Battery life is mostly dependent upon the number of power outages sustained and the age of the battery. A new battery should take no longer than 24 hours to gain full charge, capable of powering the system through a power outage of typically 6 hours. Battery backup time may vary by a few hours depending on your I/O module configuration; the battery backup time is proportional to the number and types of I/O modules you have installed in your dialer.

Check the System Battery by using a DC voltmeter to measure the open circuit (no-load) terminal voltage of the battery at room temperature (20 degrees Celsius). If the voltage is less than 12.5 volts, the battery has a residual capacity of less than 50%. If the voltage is less than 12.0 volts, the battery is completely worn out.

Refer to Chapter 2, ***Battery Connection***, for instructions on installing a new battery and adjusting the dialer's battery charging circuit.

ONBOARD CLOCK: After initially setting time and date, periodically check the accuracy of your dialer's onboard clock. It may run a couple of minutes fast or slow per month. In addition, you will have to set the time back/forward to correspond with Daylight Savings Time. The time can be conveniently reviewed and adjusted over the telephone by entering the touch tone command with the new time in 24-hour format (**060HHMM). Refer to Chapter 3, *Time and Date*, for additional explanation and examples.

An internal 3 Volt lithium cell maintains time/date when power to the dialer is removed. It has a capacity of approximately a year. If power to your dialer is to be removed for an extended period, consult the factory about removing an internal jumper to preserve battery energy.

FUSES: Consult the following table for fuse replacement. Blown fuses can be indicative of other problems. Verify field wiring and sensor electronics if replaced fuses blow repeatedly.

For:	Use the following:
Series 1000 Dialer	Littelfuse Micro 2A273 -- Microfuse 2A/125V
Grayhill Output Modules	Littelfuse Metric (5 X 20 mm) -- Use Amp/Volt rating of old fuse
Opto 22 Output Modules	Wickmann TR5 Sub-Miniature -- Use Amp/Volt rating of old fuse

TROUBLESHOOTING:

Symptom: **Voice data lost or clock and calendar lost.**
Cause: 3v battery replacement.
Cause: Jumper J14 on processor board not installed.

Symptom: **Unable to place telephone calls (Line LED comes on but no ring at called telephone number).**
Cause: Phone number not entered correctly.
Cause: Call being placed to different number/list than expected.
Cause: Phone line not plugged-in, phone line broken or in use.

Symptom: **Unable to program with local telephone even when Off Hook light is on.**
Cause: Incorrect command format (all commands begin with * or **). To clear out the message buffer at any time, press the '#' key.
Cause: Touch-tone phone must be used (listen for tones when keys are pressed).
Cause: Phone not plugged in correctly (local telephone must be plugged into PHONE jack, and OFF HOOK LED should be on).
Cause: Dialer off-hook placing call (LINE LED is on).
Cause: You hear 'System Ready', but are not able to get a response. Loud or semi-noisy environment: program from a remote phone or use a mute button on the local phone.

Symptom: **Not placing alarm call (Line LED does not come on at all) with Input channel in fault condition even though Power/Fault Indicator is blinking 50 On/50 Off.**
Cause: Local telephone is off-hook.
Cause: System or telephone disable timer set.
Cause: Intercall (Snooze or Call-spacing) delay set.
Cause: No valid telephone numbers to call for channels in alarm.

Symptom: **Not placing alarm call with Input channel in fault condition. Also, Power/Fault Indicator is still at a steady flicker.**
Cause: No faults are currently recognized by the dialer.
Check to see what the dialer thinks it is reading for this channel Type in ***c0** to listen to the channel's current condition.
If it says that the channel is '**Spare**', the channel hasn't been programmed yet. It needs to be programmed (see Section **Configuring Input/Output Modules**).
If it says inproper input condition, need to check external Wiring, I/O Module Type plugged into the dialer channel, and Dialer Channel Type Programming (***c2**).
If it says the proper input condition, make sure the channel is properly set to being **Normally Open** or **Normally Closed** (***c2**, see Section **Configuring Input/Output Modules**)
Then, you need to check the channel's **Alarm Configuration** (***c8**). If set as '**None**', no calls will be made from this channel. Need to set to **Call On Alarm** (****c82**).

Symptom: **Dialer is dead (Power LED is on steady, not flickering).**
Cause: Possible external damage or non-recoverable CPU error (Call Technical Support).

Symptom: **Dialer is dead (Power LED is off).**
Cause: Check power to dialer. Make sure it is wired properly to the dialer.
Cause: Possible external damage or Non-recoverable CPU failure (Call Technical Support).

Symptom: **MicroMax Surge Protector - Dialer is not responding locally and seemingly hangs up the call right after the first ring (Power LED is blinking).**

Cause: If you have a MicroMax surge protector on the line, the surge protector may be interfering with the dialer's operation. Possible Cure: Try unplugging the line connector from the dialer so it isn't connected to any device and then turn on and off the dialer a few times trying to get it to pick up locally (It may take a few times for it to work). If it still doesn't respond, try connecting the wall jack directly to the dialer and try cycling power a few times while trying to again connect locally. If none of this works, Call Technical Support.

APPENDICES

APPENDIX A: Technical Specifications

A.1 Communications

Phone Interface:	FCC 68 Registration Number: **1QEUSA-21532-AL-E** Pass-through Phone Handset Cellular Phone Connection or equivalent.
Ringer Equivalence Number:	1.2B(ac)
LED Indicators:	Dialer Off-hook/Ring Detect/Call Progress Telephone Off-hook/FAX-in-progress System Status/Power-fail
Dialing Capacity:	9 Phone Numbers, 60 Digits Each Tone or Pulse Dial Special Sequences for Selection of Pulse/Tone, Pause, Call Progress Detection, Turning ON/OFF Output Modules, Auto Acknowledging Alarms, Communicating with FAX machines or Computers.
Call Progress Detection	Dial Tone Detect Busy Detect Ring Back Detection Quiet/Voice/Answer/Pager Terminal Tone detect
Answer Delay:	1-99 Rings (Call Back Acknowledge)
Fax:	Group 3 Fax Compatible Single-page Alarm Status or Dialer Configuration Reports

A.2 Electrical

Input Power:	Plug in Wall Power Supply, 120 VAC to 14.5 VDC UL/CSA approved. or 12-16VDC @ 0.5 Amp (Dialer only) or 14.5-16VDC (Dialer with Battery) Solar Power Interface Compatible Power On/Off Switch Power-fail Indicator Externally Accessible Fuse Optional: Micromax Surge Suppresor

Battery Operational:	12 Volt 2.2 AH Lead Acid Battery Option (6 hour backup time typical)
Battery Internal:	3 Volt Lithium for Speech Storage/Real Time Clock

A.3 Printing

Interface:	Serial RS-232, 2400 Baud, 8 Data, No Parity, 1 Stop Hardware Handshaking
Printer Modes:	Continuous Event Log with Time and Date Stamp Configuration Report Snapshot Status Report

A.4 Environmental

Temperature:	20°F to 130°F operating 0°F to 130°F storage
Humidity:	0-95% RH, Noncondensing
Surge:	2500 V Per ANSI
EMI/RFI:	Per FCC Part 15c

A.5 Enclosure

Options:

Panel Mount Chassis
(7.7" wide 8.8" high x 4" deep)
Suitable for Wall or Panel Mounting
Battery Mounted Separately
Nema 4 Fiberglass Case with Hard Cover
(12" Wide, 15.5" High, 6.6" Deep)
Nema 12 Fiberglass Case with Hard Cover
Nema 12 Fiberglass Case with Clear Cover
(9" Wide, 10.5"High, 6.5" Deep)

Weight:

Panel Mount Unit	4 lbs
Nema 12 case:	6 lbs
Battery and holder:	3 lbs
Full system:	13 lbs

A.6 Speech

Type:	Digitized Resident and User-Recorded Messages ADPCM
Recordable Message Lengths:	6 Seconds System Message 3.25 Seconds Each I/O Name

A.7 I/O Modules

Capacity: 8 I/O Socket Locations for Plug-in Modules

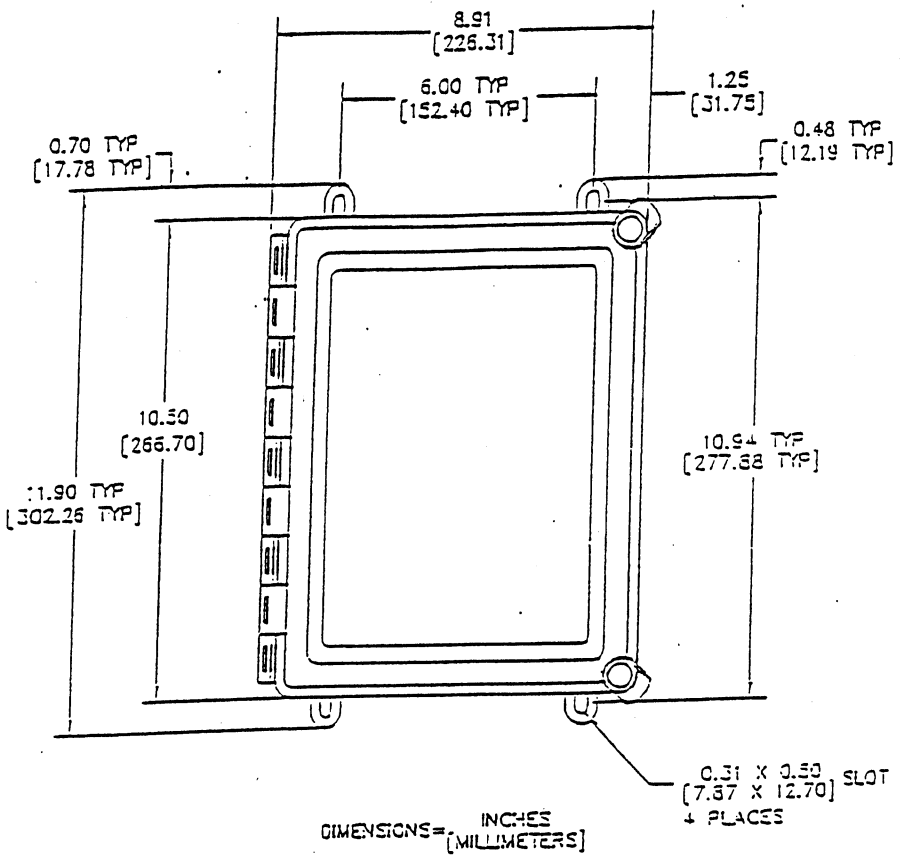
I/O Module Types:

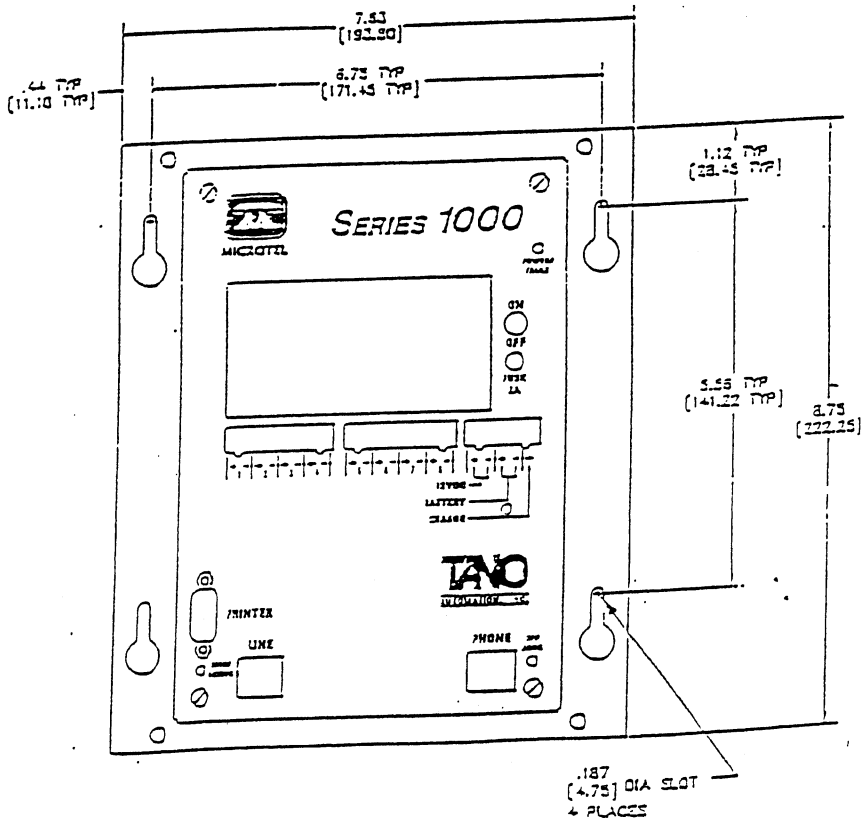
Tin No.	Description
61558	Digital Input, Isolated, Dry Powered
61567	Switch Module
61556	Digital Output Contact, Dry, N.O.
61557	Digital Output Contact, Dry, N.C.
61549	Analog Input, 4-20 mA, Isolated
61550	Analog Output, 4-20 mA, Isolated
61545	Digital Input, 120 VAC
61546	Digital Input, 3 to 32 VDC
61547	Digital Output, 60 VDC
61548	Digital Ouput, 120 VAC Output
61551	Analog Input, 1 to 5 VDC
61552	Analog Output, 1 to 5 VDC
61553	Digital Input, 5 to 60 VDC
61554	Digital Input, 5 to 200 VDC

A.8 I/O Functional Modes

Discrete Status:	ON/OFF or OPEN/CLOSED
Discrete Alarm Inputs:	ALARM/NORMAL/STATUS
Analog Status Inputs:	0.0 to 99.9%
Analog Alarm Inputs:	High and Low Set Points
Analog Outputs:	0.0 to 99.9%
Accumulator:	32-Bit Accumulator, 50 pps. Channel 8
Low Speed Counter Inputs:	0.5 pps. Channels 1-7, (2 sec/pulse)
Run Time Inputs:	00:00:00 (DD:HH:MM)
Local Alarm Output:	Alarm/Normal
Power Fail Detection:	Power Fail/Normal

A.9 Series 1000 Outline and Mounting Diagram





APPENDIX B: Glossary Of Dialer Terminology

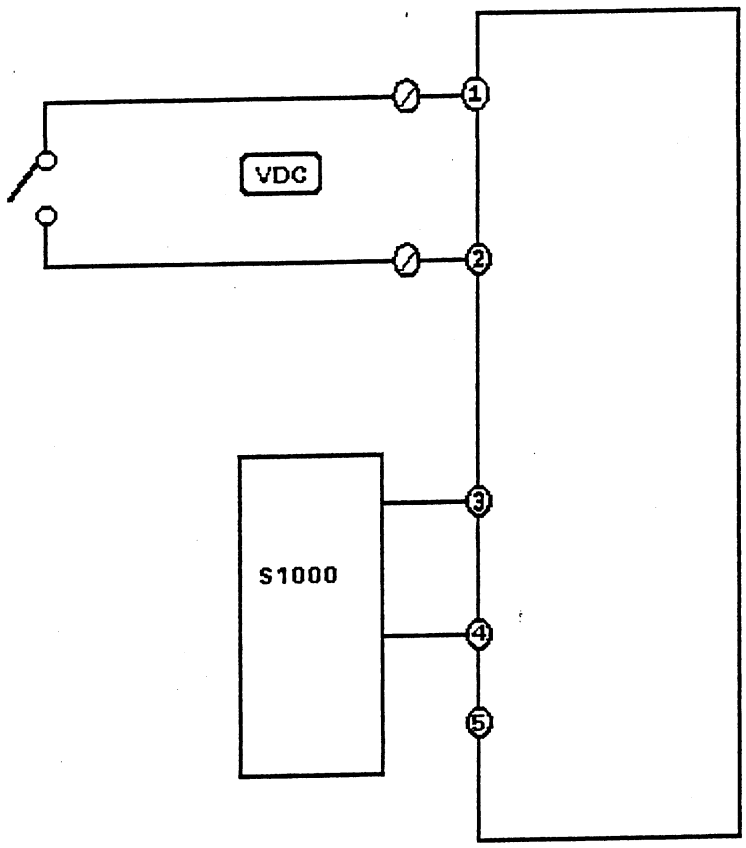
Acknowledge	Stops the dialer from placing additional calls concerning an alarm condition. Acknowledgment can be made by entering the '*' during alarm playback, with the acknowledgment command (**071,**072c), with call-back acknowledge, or by an auto acknowledge phone escape sequence (*90) embedded within the telephone number.
Alarm condition	An event detected by the dialer usually causing a phone call.
Analog	An I/O channel type that uses a numerical value (0.0% to 99.9%).
Call-spacing	The time delay between successive answered unacknowledged telephone calls.
Interaction delay	A programmable time delay between a keyboard command and its voice message response, to allow the user to move the phone handset to the ear. If the keypad is located separately from the ear piece, then a 0 delay will speed Interaction delay.
I/O channel	A dialer to outside world connection.
Latched type	An I/O channel parameter that will store an alarm condition even if the alarm condition goes away. The alarm condition will be held until the alarm is acknowledged.
New alarm	Any alarm that has not yet initiated a call out sequence or an alarm still present after the snooze delay.
Phone list	A sequence up to 9 digits indicating which phone numbers to call from the telephone directory.
Phone number	A sequence of up to 60 digits used to dial a phone number or perform a dial escape sequence function.
Report format	A selection of what data is reported during a call within a status message.
Snooze delay	The time between when an alarm is acknowledged and when it begins to cause calls again.
Unlatched type	An I/O channel parameter that causes an alarm to self-clear if the alarm condition goes away.

APPENDIX C: Percent/Current/Voltage/Temperature Conversions

0%	4.00ma.	1.00volts	-40°F	-40°C	50%	12.00ma.	3.00volts	50°F	10°C
1%	4.16ma.	1.04volts	-38°F	-39°C	51%	12.16ma.	3.04volts	52°F	11°C
2%	4.32ma.	1.08volts	-36°F	-38°C	52%	12.32ma.	3.08volts	54°F	12°C
3%	4.48ma.	1.12volts	-35°F	-37°C	53%	12.48ma.	3.12volts	55°F	13°C
4%	4.64ma.	1.16volts	-33°F	-36°C	54%	12.64ma.	3.16volts	57°F	14°C
5%	4.80ma.	1.20volts	-31°F	-35°C	55%	12.80ma.	3.20volts	59°F	15°C
6%	4.96ma.	1.24volts	-29°F	-34°C	56%	12.96ma.	3.24volts	61°F	16°C
7%	5.12ma.	1.28volts	-27°F	-33°C	57%	13.12ma.	3.28volts	63°F	17°C
8%	5.28ma.	1.32volts	-26°F	-32°C	58%	13.28ma.	3.32volts	64°F	18°C
9%	5.44ma.	1.36volts	-24°F	-31°C	59%	13.44ma.	3.36volts	66°F	19°C
10%	5.60ma.	1.40volts	-22°F	-30°C	60%	13.60ma.	3.40volts	68°F	20°C
11%	5.76ma.	1.44volts	-20°F	-29°C	61%	13.76ma.	3.44volts	70°F	21°C
12%	5.92ma.	1.48volts	-18°F	-28°C	62%	13.92ma.	3.48volts	72°F	22°C
13%	6.08ma.	1.52volts	-17°F	-27°C	63%	14.08ma.	3.52volts	73°F	23°C
14%	6.24ma.	1.56volts	-15°F	-26°C	64%	14.24ma.	3.56volts	75°F	24°C
15%	6.40ma.	1.60volts	-13°F	-25°C	65%	14.40ma.	3.60volts	77°F	25°C
16%	6.56ma.	1.64volts	-11°F	-24°C	66%	14.56ma.	3.64volts	79°F	26°C
17%	6.72ma.	1.68volts	-9°F	-23°C	67%	14.72ma.	3.68volts	81°F	27°C
18%	6.88ma.	1.72volts	-8°F	-22°C	68%	14.88ma.	3.72volts	82°F	28°C
19%	7.04ma.	1.76volts	-6°F	-21°C	69%	15.04ma.	3.76volts	84°F	29°C
20%	7.20ma.	1.80volts	-4°F	-20°C	70%	15.20ma.	3.80volts	86°F	30°C
21%	7.36ma.	1.84volts	-2°F	-19°C	71%	15.36ma.	3.84volts	88°F	31°C
22%	7.52ma.	1.88volts	-0°F	-18°C	72%	15.52ma.	3.88volts	90°F	32°C
23%	7.68ma.	1.92volts	1°F	-17°C	73%	15.68ma.	3.92volts	91°F	33°C
24%	7.84ma.	1.96volts	3°F	-16°C	74%	15.84ma.	3.96volts	93°F	34°C
25%	8.00ma.	2.00volts	5°F	-15°C	75%	16.00ma.	4.00volts	95°F	35°C
26%	8.16ma.	2.04volts	7°F	-14°C	76%	16.16ma.	4.04volts	97°F	36°C
27%	8.32ma.	2.08volts	9°F	-13°C	77%	16.32ma.	4.08volts	99°F	37°C
28%	8.48ma.	2.12volts	10°F	-12°C	78%	16.48ma.	4.12volts	100°F	38°C
29%	8.64ma.	2.16volts	12°F	-11°C	79%	16.64ma.	4.16volts	102°F	39°C
30%	8.80ma.	2.20volts	14°F	-10°C	80%	16.80ma.	4.20volts	104°F	40°C
31%	8.96ma.	2.24volts	16°F	-9°C	81%	16.96ma.	4.24volts	106°F	41°C
32%	9.12ma.	2.28volts	18°F	-8°C	82%	17.12ma.	4.28volts	108°F	42°C
33%	9.28ma.	2.32volts	19°F	-7°C	83%	17.28ma.	4.32volts	109°F	43°C
34%	9.44ma.	2.36volts	21°F	-6°C	84%	17.44ma.	4.36volts	111°F	44°C
35%	9.60ma.	2.40volts	23°F	-5°C	85%	17.60ma.	4.40volts	113°F	45°C
36%	9.76ma.	2.44volts	25°F	-4°C	86%	17.76ma.	4.44volts	115°F	46°C
37%	9.92ma.	2.48volts	27°F	-3°C	87%	17.92ma.	4.48volts	117°F	47°C
38%	10.08ma.	2.52volts	28°F	-2°C	88%	18.08ma.	4.52volts	118°F	48°C
39%	10.24ma.	2.56volts	30°F	-1°C	89%	18.24ma.	4.56volts	120°F	49°C
40%	10.40ma.	2.60volts	32°F	0°C	90%	18.40ma.	4.60volts	122°F	50°C
41%	10.56ma.	2.64volts	34°F	1°C	91%	18.56ma.	4.64volts	124°F	51°C
42%	10.72ma.	2.68volts	36°F	2°C	92%	18.72ma.	4.68volts	126°F	52°C
43%	10.88ma.	2.72volts	37°F	3°C	93%	18.88ma.	4.72volts	127°F	53°C
44%	11.04ma.	2.76volts	39°F	4°C	94%	19.04ma.	4.76volts	129°F	54°C
45%	11.20ma.	2.80volts	41°F	5°C	95%	19.20ma.	4.80volts	131°F	55°C
46%	11.36ma.	2.84volts	43°F	6°C	96%	19.36ma.	4.84volts	133°F	56°C
47%	11.52ma.	2.88volts	45°F	7°C	97%	19.52ma.	4.88volts	135°F	57°C
48%	11.68ma.	2.92volts	46°F	8°C	98%	19.68ma.	4.92volts	136°F	58°C
49%	11.84ma.	2.96volts	48°F	9°C	99%	19.84ma.	4.96volts	138°F	59°C

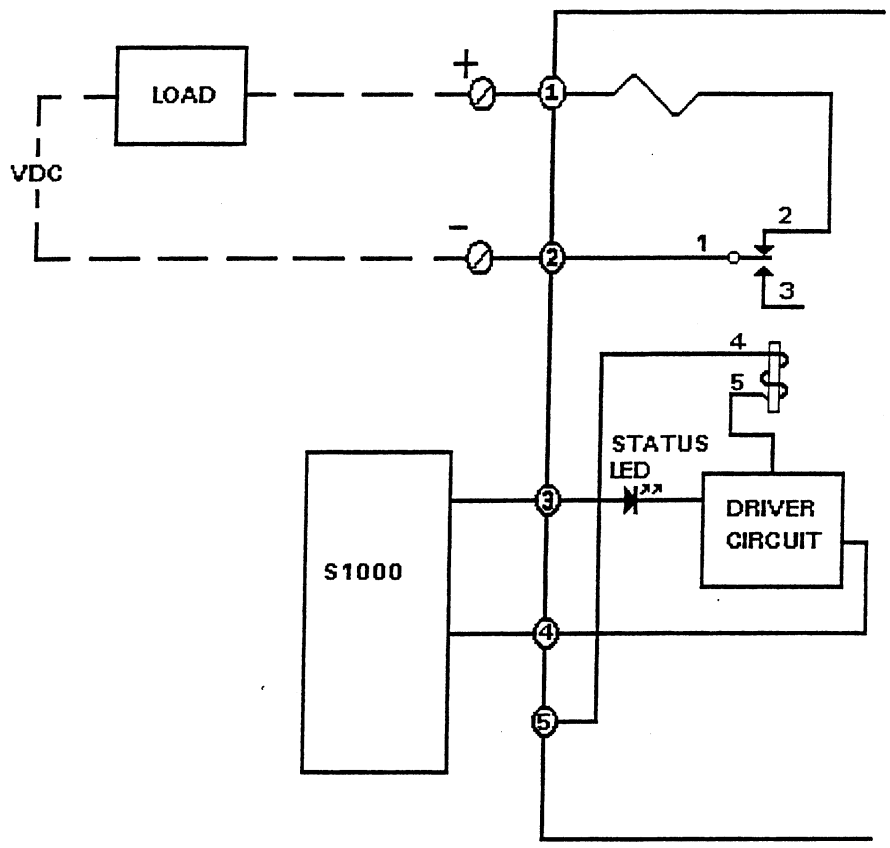
APPENDIX D: I/O Module Wiring Diagrams

1 Isolated Dry Contact Input



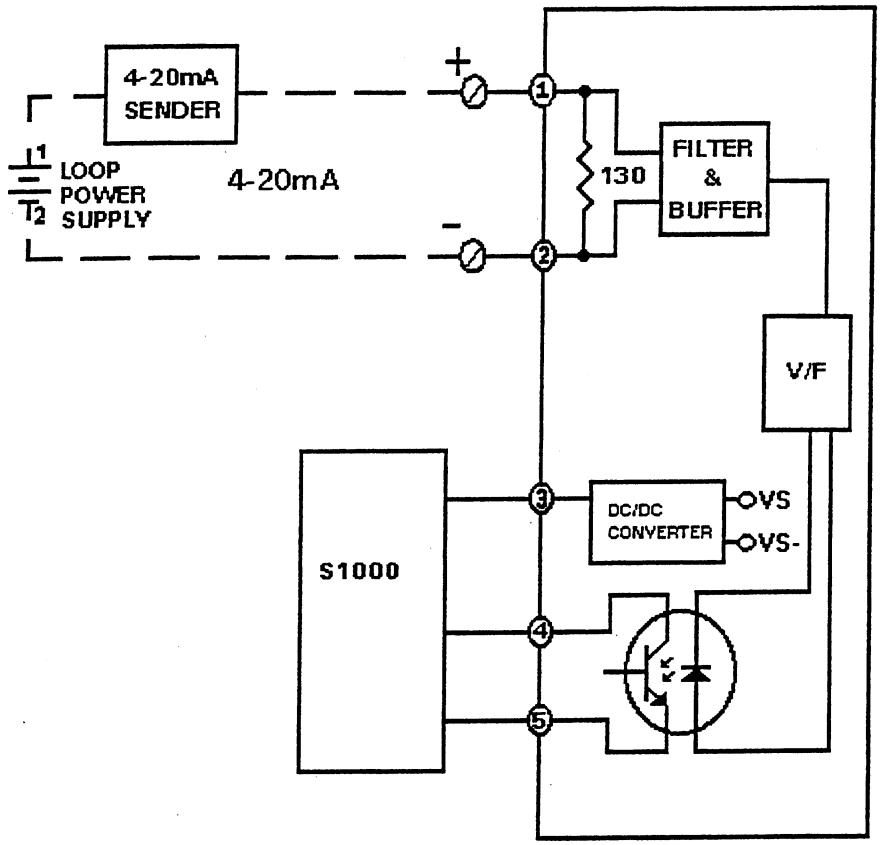
PART NUMBER:	61558
COLOR:	WHITE
MAXIMUM DRY CONTACT VOLTAGE RATING:	25 Vdc
MINIMUM DRY CONTACT CURRENT RATING:	5 mA
CONTACT RESISTANCE (OUTPUT LOW):	≤ 1.25 K Ohm
CONTACT RESISTANCE (OUTPUT HIGH):	> 20 K Ohm
ISOLATION:	2500 Vrms

D.2 N.C. Dry Relay Output



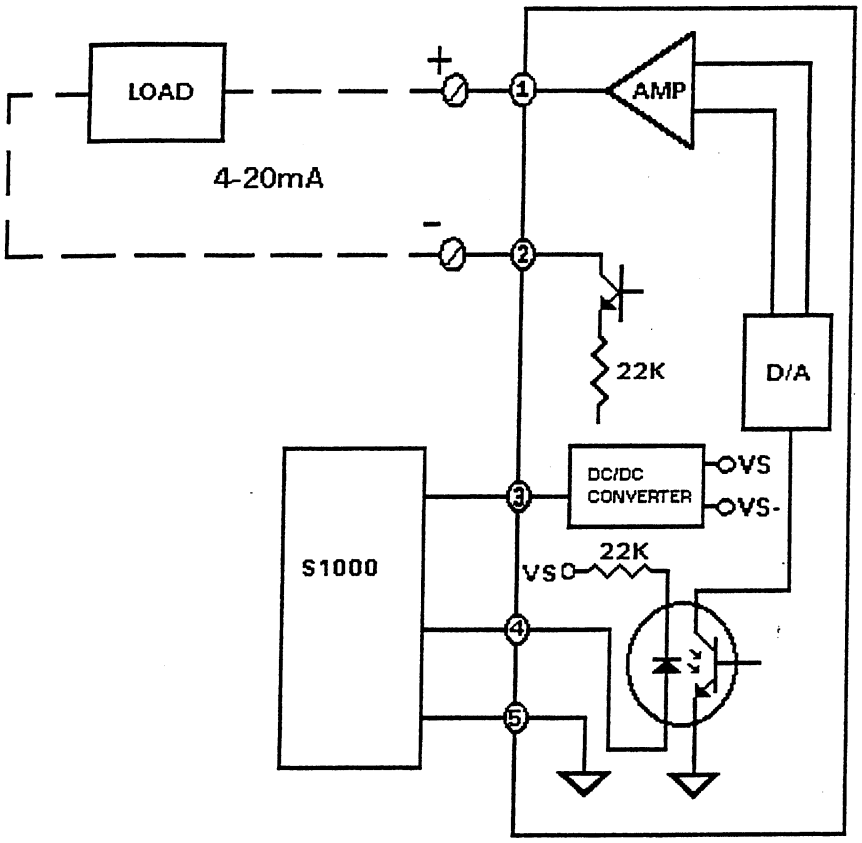
PART NUMBER:	61557
COLOR:	RED
CONTACT RATING:	10 VA
SWITCHING VOLTS:	100 Vdc/130 Vac Max.
SWITCHING CURRENT:	0.5 Amps Max.
CARRY CURRENT:	1.5 Amps Max.
CONTACT ON-RESISTANCE:	200 milliohms
MECHANICAL LIFE:	5 Million cycles
ISOLATION:	1500 VDC

D.3 4-20 mA Analog Input



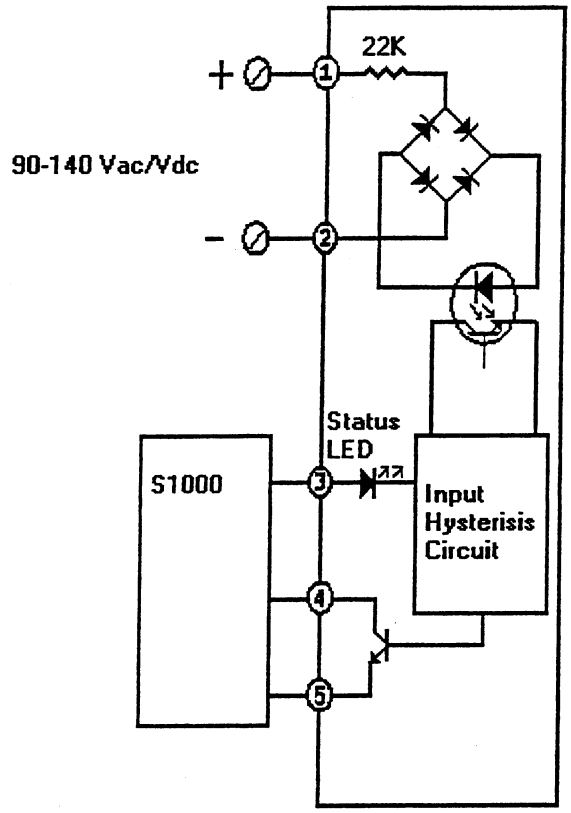
PART NUMBER:	61549
COLOR:	BLUE
INPUT RESISTANCE:	130 OHMS
COMMON MODE REJECT:	>-100 dB
ACCURACY, FULL SCALE AT 25C:	±0.1%
RESOLUTION:	3.9uA (12 BITS)
ISOLATION:	2500 Vrms

D.4 4-20 mA Analog Output



PART NUMBER:	61550
COLOR:	ORANGE
MAXIMUM OUTPUT CURRENT (SOURCE):	20 mA, 450 Ohm max. loop resistance
ACCURACY, FULL SCALE AT 25C:	±0.3%
RESOLUTION:	3.9uA (12 BITS)
ISOLATION:	2500 Vrms

D.5 120 Vac Input



PART NUMBER:	61545
CASE COLOR:	YELLOW
INPUT VOLTAGE RANGE:	90-140 Vac
NOMINAL INPUT RESISTANCE:	22K Ohms
MAXIMUM PICKUP VOLTAGE(LOW)	90 Vac
MINIMUM DROP OUT VOLTAGE(HIGH)	25 Vac

APPENDIX E: Examples Of Fax Report

The attached pages are actual FAX reports sent from a Microtel *Series 1000* dialer.

Notice the time/date stamp, custom system text message, and dialer's identifying telephone number printed at the top of each FAX report. Customized text messages must be configured using a local or remote computer.

The **Status Report** indicates any system errors, current alarm conditions, and current State, Runtime, and Counter data for each installed I/O module.

The **Setup Report** lists all configured System parameters, the System Telephone Directory, Call At Schedule, and I/O Module Programmed Configuration Data. The example shown here lists default system and I/O configuration data.

Appendix F: FCC Requirements

This equipment complies with Part 68 of the FCC rules. On the side of the *Series 1000* metal case is a label that contains the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be given to the telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of these devices ring when your number is called. In most but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5). To be certain of the number of devices you may connect to your line as determined by the REN, you should contact your local telephone company to determine the maximum RENs for your calling area.

If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact **MICROTEL** service at 1-504-276-0571 for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs. (Contact your state public utility commission or corporation commission for information.)

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone Fax machine unless such message clearly contains in a margin at the top or bottom of each transmitted page or on the first page of the transmission, the date and time it is sent and identification of the business or other entity, or other individual sending the message, and the telephone number of the sending machine of such business, other entity, or individual. Before sending a fax message, the sending telephone number must be programmed into the *Series 1000* Dialer. Refer to Chapter 3, *System Telephone Number*.

Appendix G: *Series 1000* Command Summary

Series 1000 Command Summary For v3.0

*000		Report system status
*001	**001~	Voice system name
*002	**002MM	Call spacing delay
*003	**003nn	Ring count
*004	**004nnnn	Access code (0000 = Disabled)
*005	**005nn	Message repeat count
*006	**006n	Keyboard/Voice feedback delay
*008	**008n	Callback Ack(n=1:Enable, 0:Disable)

*01n	**01np**	Telephone n (n=0 to 9)(0=System)
*02n	**02nDDHHMM	Telephone n disable timer
*03n		Alarms armed for telephone n

	050/051	Print status/Print config. report
	052/053	Enable/Disable printing
	054/055	Enable/Disable testset
	056n/057n	Fax status/configuration to phone n
	0580/0581	Answer Mode - Voice/Data

*060	**060HHMM	Time (24 hour format)
*061	**061MMDDYY	Date
*062	**062wHHMM	Call at time
*063	**063t*	Call at telephone list

	**070	End call
	**071	Acknowledge current alarms.
	**072c	Acknowledge alarm on channel c
*074	**074DDHHMM	Snooze delay

*c0	**c0	I/O c status/clear counters
*c1	**c1~	I/O c voice name
*c2	**c20n	I/O c TYPE of module
	(0=Spare, 1=DI NO, 2=DI NC, 3=DO, 4=AO, 5=AI, 6=DOL, 8=Follow)	
*c3	**c3nn	I/O c status REPORT format
	(00=None,01=Status,02=Counts,04=RunTime,08=TimeInAlarm)	
*c41	**c41t*	I/O c telephone list
*c5	**c5nMMSS	I/O c delay (n=1 On/n=2 Off)
	c60/c61	I/O c output force OFF/ON
*c7	**c70/**c71	I/O c report status Disable/Enable
*c8	**c8n	I/O c alarm configuration
	(0=None,1=Latch,2=COA,3=COA Latch,4=COA RTN,5=Power Latch)	
*c90	**c90aaa	I/O c analog input high setpoint
*c91	**c91aaa	I/O c analog input low setpoint
*c92	**c92aaa	I/O c analog output setpoint

Phone Number Escape Codes

*0	Tone dial (default)
*1	Pulse dial
*2	2 second pause
*3	Flash hook (go on hook for 100 milliseconds)
*4	Wait for voice or answer
*5n	Wait n seconds for tone
*6n	Wait n seconds for quiet
*7nn	Set wait time-out to abort call (nn seconds)
*8nn	Set wait time-out to continue (nn seconds)
*90	Auto acknowledge this call
*91	Dial '*' *92 Dial '#'
*93n	Turn ON output module n
*94n	Set this call alternate message repeat count
*95n	Set this call alternate voice interact delay
*96n	Turn OFF output module n
*980	Dial 'A' *981 Dial 'B'
*982	Dial 'C' *983 Dial 'D'
*984	Dial channel in alarm (Digital Pager)
*985	Dial all channels in alarm (Digital Pager)
*986	Dial all unacked alarm channels (Dig. Pager)
*990	Modem Call
*991	Fax Call

~	speech (# while recording - mic cut off)
MM	time value in minutes (00-99 minutes)
n	one digit numeric value (0-9)
nn	two digit numeric value (00-99)
nnnn	numeric value (0000-9999)
DDHHMM	time value in Days, Hours, Minutes format
MMSS	time value in Minutes, Seconds format
c	input/output channel number 1-8 (9=pf)
t	telephone selections (1-9) upto 9 digits
aaa	analog value 00.0% to 99.9%
w	day of week selection (1=Sunday-7=Saturday,0=all days)
p	0-60 digit phone number, with escape codes

Appendix H: Site Worksheet (Example and Blank)

Use the table on the next page as a worksheet when configuring the Series 1000 for your site. An example is included below.

MICROTEL Series 1000 Dialer - Site Worksheet				
Site Name:				
Site Telephone #:			Site Call List: 4,7,8,9	
Electrical				
Channel	**Name/Description**	**Alarm Delay**	**Module Type**	**Call List**
1	High Water - Wetwell	30 Sec	ISO. N/O Dry	1,2,4,7,8
2	Pump 2 Fail			
3	Pump 2 Fail			
4	Pump 1 Start			
5	Pump 2 Start			
6				
7				
8				
9				
Telephone Directory				
Phone Number		**Name**		**Type**
1.	*991 467 0261	J. Jones, Supervisor		FAX
2.	1-476-439-3303	R. Miller, Tech		Voice
3.				
4.				
5.				
6.				
7.				
8.				

MICROTEL Series 1000 Dialer - Site Worksheet

Site Name: GRATWICK - RIVERSIDE PARK

Site Telephone #: 695-8547 | Site Call List: 1

ACCESS CODE: 1234

Electrical

Channel	Name/Description	Alarm Delay	Module Type	Call List
1	WELL LEVEL ALARM	1 SEC		1
2	POWER LOSS / PUMP FAIL	1 SEC		1
3	INTRUSION	1 SEC		1
4				
5	PUMPS ON / OFF			
6	SITE LIGHTING ENABLE/DISABLE (AUTO)			
7	SITE LIGHTING ON / OFF			
8				
9				

Telephone Directory

Phone Number	Name	Type
1. 695 - 8560	WASTE WATER TREATMENT	VOICE
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		