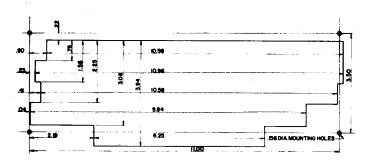
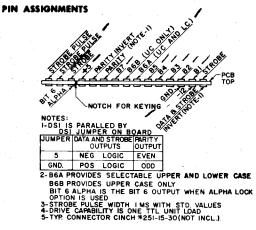


GEORGE RISK INDUSTRIES, INC. TECHNICAL DATA

SUGGESTED PANEL CUTOUT





ASCII CODE REFERENCE CHART

ASCIT SINARY OCTAL DECIMAL HEX ASCIT SINARY OCTAL HEX ASCIT SINARY OCTAL HEX ASCIT SINARY OCTAL HEX ASCIT SINARY OCTAL DECIMAL HEX ASCIT SINARY OCTAL HEX O		ASCII CODE REFERENCE CHARI																		
Solid 00000010 001 001 001 001 1	ASCII		OCTAL	DECIMAL		_	I BÎNARY	OCTAL	DECIMAL	HEX	ASC1	I BINARY	OCTAL	DECIMAL	HEX	ASC1	I BINARY	OCTAL	DECIMAL	HEX
STX 00000010 002	NUL	00000000	000	000	00	SP	00100000	040	032	20	.0	01000000	100	064	40	,	01100000	140	096	69
STA	SOH	00000001					00100001	041	033	21	A	01000001	101	065	41	a	01100001	141	097	61
ENT 00000100 004 004 04 8 00100100 044 036 24 D 01000100 104 668 44 d 01100100 114 100 64 ENQ 0000011 005 005 05 05 0010010 045 037 25 E 01000101 105 069 45 e 01100101 145 101 65 669 ACK 0000011 006 006 6 a 00100110 046 038 26 F 01000101 106 070 46 f 01100110 146 102 66 BEL 0000011 007 007 07 ' 0010011 047 039 27 G 0100011 107 071 47 q 01100111 147 103 67 BE 0000111 007 007 07 ' 0010011 057 040 28 H 01001000 110 072 48 h 01101000 150 104 68 HT 00001001 010 008 08 (00101000 050 040 28 H 01001000 110 072 48 h 01101000 150 104 68 HT 00001001 011 009 09) 00101001 051 041 29 I 01001001 111 073 49 i 01101001 151 105 69 WT 0000101 012 010 0A * 00101010 052 042 2A J 01001010 112 074 4A j 01101001 152 106 6A WT 0000101 013 011 08 + 0010101 053 043 28 K 0100101 113 075 48 k 01101011 153 107 68 FF 0000110 014 012 0C ' 0010110 054 044 2C L 0101100 114 076 4C I 01101100 155 106 6A WT 0000110 015 015 014 22 M 0100101 113 075 48 k 01101011 155 109 6D SO 0000110 015 015 014 02 . 0010110 055 045 2D M 0100110 115 077 4D m 01101101 155 109 6D SO 0000111 015 015 015 045 2D M 0100110 115 077 4D m 01101101 155 109 6D SO 0000110 015 013 0D - 0010110 055 045 2D M 0100110 115 077 4D m 01101101 155 109 6D SO 0000111 016 014 0E . 0010110 056 046 2E N 0100110 116 078 4E N 01010110 155 106 6D SO 0000111 016 014 0E . 0010111 056 045 2D M 0100110 116 078 4E N 01010110 155 109 6D SO 0000111 017 015 0F / 00101111 057 047 2F 0 0100111 117 079 4F 0 0110111 157 111 6F DLE 00010000 020 016 10 0 00110000 060 048 30 F 01010000 120 080 50 P 0110000 160 112 79 DC1 00010001 021 017 11 1 0011000 060 049 31 Q 01010000 120 080 50 P 01110000 160 112 79 DC2 0001001 022 018 12 2 00110010 062 050 32 R 0101001 123 083 53 S 0111001 165 117 75 DC2 0001001 025 018 12 2 0011001 066 054 38 X 0101001 122 085 55 U 01110101 166 117 75 DC3 0001010 025 018 12 2 0011010 066 054 38 X 0101001 122 085 55 U 0111001 166 117 75 DC4 0001010 032 024 18 8 0011000 070 056 38 X 0101001 120 086 56 V 0110101 166 117 17 17 70 DC4 0001010 032 024 18 8 0011000 070 056 38 X 0101001 130									034	22	В	01000010	102	066	42	ь		142		62
ENC 00000101 005 005 05 \$ 00100101 045 037 25 € 01000101 105 069 45 € 0110010 145 101 65 AcK 0000011 006 006 06 \$ 00100101 046 038 26 F 01000110 106 070 46 f 01100110 146 102 66 BEL 0000111 007 007 07 ' 00100111 047 039 27 G 01000111 107 071 47 q 01100110 147 103 67 BS 0001000 010 008 08 (0010100 050 040 28 H 01001000 110 072 48 h 01101000 150 104 68 HT 0000101 011 009 09) 00101010 051 041 29 I 01001000 110 072 48 h 01101000 150 104 68 UT 0000101 011 009 09) 00101010 051 041 29 I 01001001 111 073 49 i 01101001 151 105 69 LF 0000101 012 010 0A	ETX							043	035	23	C	01000011	103	067	43	c	01100011	143	099	63
REL DODOO110 DOG DOG DOG DOG S DO100100 DOG DO	EOT					\$		044	036	24	D	01000100	104	068	44	d	01100100	144	100	
BEL								045	037	25	E	01000101	105	069	45	e	01100101	145	101	65
BS 00001000 010 008 08 (00101000 050 040 28 16 8 00101000 110 072 48 h 01101000 150 104 68 HT 00001001 011 009 09) 00101001 051 041 29 I 01001001 111 073 49 i 01100101 151 105 69 LF 00001001 012 010 0A * 00101010 052 042 2A J 01001001 111 073 49 i 01101001 152 106 6A VT 0000101 012 010 0A * 00101010 052 042 2A J 01001010 112 074 4A j 01101001 152 106 6A VT 0000101 013 011 0B + 0010101 053 043 2B K 0100101 113 075 4B k 01101011 153 107 68 CR 0000110 015 015 014 02 0C ' 0010100 054 044 2C L 0100100 114 076 4C I 01101010 155 109 65 6A 0000110 015 013 0D - 0010110 055 045 2D M 0100110 115 077 4D m 0110110 155 109 65 SO 0000111 016 014 0E . 0010110 056 046 2E N 0100110 116 078 4E N 0110110 155 109 65 SO 0000111 017 015 0F / 0010111 056 046 2E N 0100110 116 078 4E N 0110110 155 116 6E N 0000101 017 015 0F / 0010111 056 046 2E N 0100110 116 078 4E N 0110110 156 110 6E N 0100100 020 016 10 0 00110000 060 048 30 P 0100100 120 080 50 P 01110000 160 112 79 DC1 00010001 021 017 11 1 00110010 061 049 31 Q 0101000 120 080 50 P 01110000 160 112 79 DC2 0001001 022 018 12 2 00110010 062 050 32 R 0101001 123 083 53 S 01110011 163 115 71 DC2 0001010 024 020 14 4 0011010 066 052 34 R 0101001 123 083 53 S 0111001 163 115 73 DC3 0001110 025 021 15 S 0011001 066 052 34 R 0101001 125 086 55 L 0111010 166 116 174 72 DC3 0001010 025 021 15 S 0011010 066 052 34 R 0101001 125 086 56 L 0111010 166 116 174 72 DC3 0001010 025 021 15 S 0011010 066 052 34 R 0101001 125 086 55 L 0111010 166 116 174 72 DC3 0001010 025 021 15 S 0011010 066 053 35 U 0101011 127 087 57 W 0111010 166 116 174 72 DC4 0001010 026 022 16 6 0011010 066 054 36 V 0101010 126 086 56 V 0110101 166 116 76 TE SYN 0001010 026 022 16 6 0011010 070 056 38 X 0101001 120 086 56 V 0111010 170 170 170 170 170 170 170 170									038	26	F	01000110	106	070	46	f	01100110	146	102	66
FT 00001001 011 009 09 00101001 051 041 29 1 01001001 111 073 49 1 01101001 151 105 69						,			039		G	01000111	107			q	01100111	147		
LF 00001010 012 010 0A * 0010101 052 042 2A J 01001010 112 074 4A j 0110101 152 106 6A VT 0000101 013 011 0B + 0010101 053 043 2B K 0100101 113 075 4B K 0110101 153 107 6B FF 00001100 014 012 0C * 00101100 054 044 -2C L 01001100 114 076 4C 1 0110100 154 108 6C CR 0000110 015 013 0D - 0010110 055 045 2D M 0100101 115 077 4D m 0110110 155 109 6D SO 0000110 016 014 0E . 00101110 055 045 2D M 0100101 115 077 4D m 0110110 155 109 6D SO 00001110 016 014 0E . 00101110 056 046 2E N 0100110 116 078 4E n 0110110 155 109 6D SI 0000111 017 015 0F / 0010111 057 047 2F 0 0100111 117 079 4F 0 0110110 156 110 6E SI 0000111 017 015 0F / 0010111 057 047 2F 0 0100111 117 079 4F 0 0110110 157 111 6F DLE 00010000 020 016 10 0 00110000 060 048 30 F 01010000 120 080 50 F 01110000 160 112 78 DC1 0001001 022 018 12 2 0011001 061 049 31 0 0100000 120 080 50 F 01110001 161 113 71 DC2 0001001 022 018 12 2 0011001 062 049 31 0 0100000 120 080 50 F 01110001 161 113 71 DC2 0001001 022 018 12 2 0011001 062 050 32 R 0101001 122 082 52 r 0111001 162 114 72 DC3 0001001 023 019 13 3 0011001 063 051 33 S 0101001 122 082 52 r 0111001 162 114 72 DC3 0001001 023 019 13 3 0011001 063 051 33 S 0101001 123 083 53 S 0111001 163 115 73 DC4 0001010 024 020 14 4 0011010 064 055 053 35 U 0101010 125 085 55 U 0111010 164 116 74 NAK 0001010 026 022 16 6 0011010 065 053 35 U 0101010 125 085 55 U 0111010 166 118 76 EFB 0001011 027 023 17 7 0011010 066 054 36 V 0101010 125 085 55 U 0111010 166 118 76 CAN 0001010 030 024 18 B 0011000 070 056 38 X 0101010 130 088 58 X 0111000 170 170 170 170 170 170 170 170								050	040	28	Н	01001000	110	072	48	h	01101000	150	104	68
No.)			041	29	1	01001001	111	073	49	i	01101001	151	105	69
FF 00001100 014 012 0C ' 00101100 054 044 -2C L 01001100 114 076 4C 1 01101100 154 108 6C CR 00001101 015 013 0D - 00101101 055 045 2D M 01001101 115 077 4D m 01101101 155 109 6D						*		052	042	2A	J	01001010	112	074	4A	j	01101010	152	106	6A
CR 0000110 015 013 0D - 0010101 055 045 2D M 0100110 115 077 4D m 0110110 155 109 65 SO 0000111 016 014 0E . 0010110 056 046 2E N 0100110 116 078 4E n 0110110 156 110 6E ST 0000111 017 015 0F / 0010111 057 047 2F 0 0100111 117 079 4F 0 0110111 157 111 6F DLE 00010000 020 016 10 0 00110000 060 048 30 P 01010000 120 080 50 P 01110000 160 112 79 DC1 00010001 021 017 11 1 00110010 061 049 31 0 01010001 121 081 51 q 01110010 161 113 71 DC2 00010010 022 018 12 2 00110010 062 050 32 R 0101001 122 082 52 r 01110010 162 114 72 DC3 0001010 022 018 12 2 00110010 062 050 32 R 0101001 122 082 52 r 01110010 162 114 72 DC3 0001010 024 020 14 4 0011010 063 051 33 S 01010011 123 083 53 S 01110011 163 115 73 DC4 0001010 024 020 14 4 0011010 064 052 34 T 0101010 124 084 54 t 0111010 164 116 74 NAK 0001010 025 021 15 5 0011010 065 053 35 U 0101010 125 085 55 U 0111010 164 116 74 NAK 0001011 026 022 16 6 0011011 065 054 36 V 01101010 125 085 55 U 0111010 166 118 76 ETB 0001011 027 023 17 7 0011011 067 055 37 W 0110101 126 086 56 V 0110101 166 118 76 ETB 0001010 030 024 18 8 0011100 070 056 38 X 0101001 127 087 57 W 0111011 167 119 77 SUB 0001101 026 022 16 6 0011010 070 056 38 X 0101001 132 089 59 V 0111011 167 119 77 SUB 0001101 030 026 18 9 0011010 071 057 38 X 0101001 131 089 59 V 0111011 171 121 79 SUB 0001101 033 025 19 9 0011100 071 070 056 38 X 01011000 130 088 58 X 0111000 170 120 78 ESC 0001101 033 027 18 ; 0011101 073 059 38 X 0101100 134 099 59 V 0111010 171 121 79 ESC 0001101 035 029 1D = 0011101 075 061 3D J 0101110 135 099 55 C : 0111100 173 123 78 ESC 0001110 035 029 1D = 0011110 075 061 3D J 0101110 135 099 55 C : 0111110 175 125 7D RS 0001110 036 030 1E > 0011110 075 061 3D J 0101110 136 094 55 P 0111110 175 125 7D RS 0001110 036 030 1E > 0011110 075 061 3D J 0101110 136 094 55 P 0111110 175 125 7D RS 0001110 036 030 1E > 0011110 075 061 3D J 0101110 136 036 55 C : 0111110 175 125 7D RS 0001110 036 030 1E > 0011110 075 061 3D J 0101110 136 034 55 P 0111110 175 125 7D						+	00101011	053	043	2B	K	01001011	113	075	4B	k	01101011	153	107	6B
SO 00001110 016 014 0E . 0010110 056 046 2E N 01001110 116 078 4E N 01001110 156 110 6E SI 0000111 017 015 0F / 0010111 057 047 2F 0 0100111 117 079 4F 0 0110111 157 111 6F DLE 00010000 020 016 10 0 00110000 060 048 30 P 01010000 120 080 50 P 01110000 160 112 7B DC1 00010001 021 017 11 1 00110010 061 049 31 Q 0101001 121 081 51 Q 0111001 161 113 71 DC2 0001001 022 018 12 2 00110010 062 050 32 R 0101001 122 082 52 T 01110010 162 114 72 DC3 0001001 023 019 13 3 0011001 063 051 33 S 0101001 123 083 53 S 0111001 163 115 73 DC4 0001010 024 020 14 4 0011010 064 052 34 T 0101010 124 084 54 t 0111010 164 116 74 SYN 0001010 025 021 15 5 0011010 065 054 36 V 0101010 126 085 55 U 0111010 165 117 75 SYN 0001010 026 022 16 6 0011010 066 054 36 V 0101010 126 086 56 V 0111010 166 118 76 ETB 0001011 027 023 17 7 0011011 067 055 37 W 0101011 127 087 57 W 0111011 167 119 77 CAN 0001000 030 024 18 8 0011100 070 056 38 X 0101010 130 088 58 X 0111100 170 120 78 EM 0001001 031 025 02 18 S 0011010 072 056 38 X 0101100 132 098 59 V 0111010 170 120 78 EM 0001101 033 027 18 0011010 072 058 38 C 0101010 132 099 58 X 0111100 171 121 79 ESC 0001101 033 027 1B 0011101 073 059 38 C 0101101 133 091 58 C 0111110 177 173 175 ESC 0001110 035 029 1D = 0011101 074 060 3C / 0101101 133 091 58 C 0111110 173 123 78 ESC 0001110 036 030 1E > 0011110 076 062 3E 4 0101110 136 094 5E 0111110 175 125 7D	FF						00101100	054	044	-2C	, L	01001100	114	076	4C	1	01101100	154	108	6C
ST 00001111 017 015 0F / 0010111 057 047 2F 0 0100111 117 079 4F 0 0110111 157 111 6F DLE 00010000 020 016 10 0 00110000 060 048 30 F 01010000 120 080 50 F 01110000 160 112 78 001 0010000 120 080 50 F 01110000 160 112 78 001 0010000 120 080 50 F 01110000 160 112 78 001 0010000 120 080 50 F 01110000 161 113 71 001 001 001 001 001 001 001 001 001	CR .		015		0D		00101101	055	045	_2D	М	01001101	115	077	4D	m	01101101	155	109	6D
Die D0010000 O20 O16 10 O O0110000 O60 O48 30 P O1010000 120 O80 50 P O1110000 112 79	SO						00101110	056	046	2E	N.	01001110	116	078	4E	n	01101110	156	110	6E
DC1 00010010 021 017 11 1 00110010 061 049 31 0 01010001 121 081 51 q 01110001 161 113 71 022 00010010 022 018 12 2 00110010 062 050 32 8 01010010 122 082 52 r 01110010 162 114 72 083 00010011 023 019 13 3 00110011 063 051 33 S 01010011 123 083 53 S 01110011 163 115 73 004 0001010 024 020 14 4 00110100 064 052 34 T 01010100 124 084 54 t 0111010 163 115 73 004 0001010 025 021 15 5 00110101 065 053 35 U 0101011 125 085 55 U 01110101 165 117 75 0010101 025 021 15 5 0011010 066 054 36 V 01010110 125 085 55 U 0110101 166 118 76 001010 026 022 16 6 0010110 065 054 36 V 01010110 126 086 56 V 01101010 166 118 76 001011 027 023 17 7 0011011 067 055 37 W 0101011 127 087 57 W 0110111 166 118 76 001001 030 024 18 8 00111000 070 056 38 X 01011001 130 088 58 X 0111000 170 120 78 001000 030 024 18 8 00111000 070 056 38 X 01011001 131 089 59 Y 0111001 171 121 79 001001 031 025 021 18 (011001) 072 056 38 X 0101001 131 089 59 Y 0111001 171 121 79 001001 033 024 18 (011001) 072 056 38 X 0101001 131 089 59 Y 0111001 171 121 79 001001 033 025 19 9 0011001 072 056 38 X 0101001 131 089 59 Y 0111001 171 121 79 001001 033 024 18 (011001) 072 056 38 X 0101001 130 090 58 X 0111000 170 120 78 001000 030 030 030 030 030 030 030 030	SI					. /	00101111	057	047	2F	0	01001111	117	079	4F	0	01101111	157	111	6F
DC2 DO010010 DC2 D18 12 2 D0110010 D62 D50 32 R D010010 122 D62 52 r D110010 162 114 72 DC3 DC	DLE	00010000	020	016	10	0	00110000	060	048	30	P	01010000	120	080	50	р	01110000	160	112	79
DC3 0001011 023 019 13 3 0011011 063 051 33 S 01010011 123 083 55 S 01110011 163 115 73. DC4 0001010 024 020 14 4 0011010 064 052 34 T 0101010 124 084 54 t 0111010 164 116 74 MAK 0001010 025 021 15 5 00110101 065 053 35 U 01010101 125 085 55 U 0111010 165 117 75 SYN 0001011 026 022 16 6 0011011 066 054 36 V 0101010 126 086 56 V 0111010 166 118 76 ETB 0001011 027 023 17 7 0011011 067 055 37 W 0101011 127 087 57 W 0111011 167 119 77 CAN 0001000 030 024 18 8 0011100 070 056 38 X 0101000 130 088 58 X 0111000 170 120 78 EM 0001100 031 025 19 9 0011001 071 057 39 Y 0101001 131 089 59 V 0111001 171 121 79 ESC 0001101 032 026 1A : 0011010 072 058 3A Z 0101001 133 091 58 C 0111001 173 123 78 ESC 0001101 033 027 1B : 0011010 073 056 38 C 0101010 133 091 58 C 0111010 173 123 78 ESC 0001101 033 027 1B : 0011010 073 059 38 C 0101101 133 091 58 C 0111101 173 123 78 ESC 0001101 035 029 1D = 0011110 073 060 3C / 0101101 134 092 5C : 0111101 173 123 78 ESC 0001101 035 029 1D = 0011110 075 061 3D / 0101110 135 094 5E 0111110 175 125 7D RS 0001110 036 030 1E > 0011110 076 062 3E 4 0101110 136 094 5E 0111110 176 126 7E	DCl	00010001	021	017	11	1	00110010	061	049	31	Ω	01010001	121	081	51	a	01110001	161	113	71
DCC	DC2	00010010	022	018	12	2	00110010	062	050	32	R	01010010	122	082	52	T .	01110010	162	114	72
DC4 0001010 024 020 14 4 0011010 064 052 34 T 01010100 124 088 54 t 01110100 164 116 74 NAX 00010101 025 021 15 5 00110101 065 053 35 U 01010101 125 085 55 U 01110101 165 117 75 SYN 00010110 026 022 16 6 0011011 066 054 36 V 01010110 126 086 56 V 01110110 166 118 76 ETB 0001011 027 023 17 7 0011011 067 055 37 W 0101011 127 087 57 W 0111011 167 119 77 CAN 0001000 030 024 18 8 00111000 070 056 38 X 01011000 130 088 58 X 01111000 170 120 78 EM 00011001 031 025 19 9 00111001 071 057 39 Y 0101101 131 089 59 Y 01111001 171 121 79 SUB 0001101 032 026 1A : 00111010 072 058 3A Z 0101100 132 090 5A Z 01111010 172 122 7A ESC 0001101 033 027 IB : 00111010 073 059 38 [0101101 133 091 58 [0111101 173 123 78 FS 0001110 035 029 ID = 00111101 075 061 30 / 0101101 134 092 5C : 01111100 174 124 7C RS 0001110 036 030 1E > 0011110 076 062 3E 4 0101110 136 094 5E 01111110 175 125 7D						3	00110011	063	051	33	S	01010011	123	083	53	s	01110011	163	115	73.
SYN 0001010 026 022 16 6 0010110 066 054 36 V 01010110 126 086 56 V 01110110 166 118 76 ETB 0001011 027 023 17 7 0011011 067 055 37 W 01010111 127 087 57 W 01110111 167 119 77 CAN 00011000 030 024 18 8 00111000 070 056 38 X 01011000 130 088 58 X 01111000 170 120 78 EM 00011001 031 025 19 9 00111001 071 057 39 Y 01011001 131 089 59 X 01111001 170 120 78 EM 00011001 032 026 1A : 00111010 072 058 3A Z 0101100 131 089 59 Y 01111001 171 121 79 SUB 0001101 033 027 IB : 00111010 072 058 3A Z 01011010 132 090 5A Z 01111010 172 122 7A ESC 0001101 033 027 IB : 00111010 073 059 38 € 0101010 133 091 58 € 0111101 173 123 78 FS 0001110 034 028 1C € 00111100 074 060 3C / 0101100 134 092 5C : 0111101 173 123 78 ESC 0001101 035 029 ID = 00111101 075 061 3D / 0101101 136 094 5E 01111101 175 125 7D RS 0001110 036 030 IE > 00111101 076 062 3E € 01011101 136 094 5E 01111110 176 126 7E	DC4					4	00110100	064	052	34	T	01010100	124	084	54			164	116	74
ETB 0001011 027 023 17 7 0011011 067 055 37 W 0101011 127 067 57 W 0111011 167 119 77 CAN 00011000 030 024 18 8 00111000 070 056 38 X 01011000 130 088 58 X 01111000 170 120 78 EM 00011001 031 025 19 9 00111001 071 057 39 Y 01011001 131 089 59 Y 01111001 171 121 79 SUB 0001101 032 026 1A : 00111010 072 058 3A Z 01011010 131 089 59 Y 01111001 171 121 79 ESC 00011010 032 026 1A : 00111010 072 058 3A Z 01011010 132 090 5A Z 01111010 172 122 7A FS 00011010 033 027 1B ; 00111011 073 059 3B C 0101011 133 091 58 C 0111011 173 123 78 FS 00011010 034 028 1C C 00111100 074 060 3C / 01011010 134 092 5C : 01111010 173 123 78 ESC 00011101 035 029 1D = 00111101 075 061 3D J 01011101 135 093 5D J 01111101 175 125 7D RS 00011110 036 030 1E > 00111110 075 062 3E 4 01011110 136 094 5E 01111110 176 126 7E	NAK					5	00110101	065	053	35	υ	01010101	125	085	55	и	01110101	165	117	75
CAN 00011000 030 024 18 8 00111000 070 056 38 X 01011000 130 088 58 X 01111000 170 120 78 EM 00011001 031 025 19 9 00111001 071 057 39 Y 01011001 131 089 59 Y 01111001 170 120 78 SUB 00011001 032 026 1A : 00111010 072 058 3A Z 01011001 131 089 59 Y 01111001 171 121 79 ESC 0001101 033 027 1B : 0011101 073 059 3B C 01011011 133 091 58 C 0111101 173 123 78 FS 0001100 034 028 1C C 0011110 074 060 3C / 0101100 134 092 5C : 0111100 174 124 7C RS 0001110 035 029 1D = 00111101 075 061 3D 2 01011101 136 094 5E 0111101 175 125 7D RS 0001110 036 030 1E > 0011110 076 062 3E 4 01011110 136 094 5E 0111110 176 126 7E	SYN	00010110				6	00110110	066	054	36	V.	01010110	126	086	56	ν	01110110	166	118	76
EM 00011001 031 025 19 9 00111001 071 057 39 Y 01011001 131 089 59 Y 01111001 171 121 79 SUB 00011010 032 026 1A : 00111010 072 058 3A Z 01011010 132 090 5A Z 01111010 171 121 79 ESC 0001101 033 027 1B : 00111011 073 059 3B C 01011010 133 091 5B C 01111010 173 123 78 FS 00011100 034 028 1C C 00111100 074 060 3C / 01011100 134 092 5C : 0111100 174 124 7C 6S 00011101 035 029 1D = 00111101 075 061 3D / 01011101 136 094 5E	ETB	00010111	027	023	17	7	00110111	067	055	37	W	01010111	127	087	57	¥	01110111	167	119	77
SUB 00011010 032 026 1A : 00111010 072 056 3A z 01011010 132 090 5A z 01111010 172 122 7A ESC 00011011 033 027 1B ; 00111011 073 059 3B € 01011011 133 091 5B € 01111010 172 122 7A FS 0001100 034 028 1C < 00111100 074 060 3C / 01011101 134 092 5C : 01111100 174 124 7C GS 0001101 035 029 1D = 00111101 075 061 3D J 01011101 135 093 5D } 01111101 175 125 7D RS 00011101 036 030 1E > 0011110 076 062 3E 4 01011110 136 094 5E 1111100 176 126 7E	CAN	00011000	030	024		8	00111000	070	056	38	х	01011000	130	088	58	x	01111000	170	120	78
SUB 00011010 032 026 1A : 00111010 072 058 3A Z 01011010 132 090 5A Z 01111010 172 122 7A ESC 0001101 033 027 1B : 00111011 073 059 3B C 01011011 133 091 5B (01111011 173 123 7B FS 00011100 034 028 1C < 00111100 074 060 3C / 01011101 134 092 5C : 01111010 174 124 7C GS 00011101 035 029 1D = 00111101 075 061 3D J 01011101 135 093 5D } 01111101 175 125 7D RS 00011110 036 030 1E > 00111110 076 062 3E 4 01011110 136 094 5E ~ 0111110 176 126 7E	EM	00011001	031	025	19	9	00111001	. 071	057	39	Y	01011001	131	089	59	v	01111001	171	121	79
ESC 0001101 033 027 IB ; 0011101 073 059 3B [0101101 133 091 5B [0111101 173 123 7B] FS 0001100 034 028 IC	SUB	00011010	032	026	1A		00111010	072		3A	z	01011010	132	090	5A	Z				
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						>	00111110	076	062	3E		01011110	136	094	5E	~				
	US	00011111	037	031	1F	?	00111111	077	063	3F	- 1	01011111	137	095	5F	_	01111111			

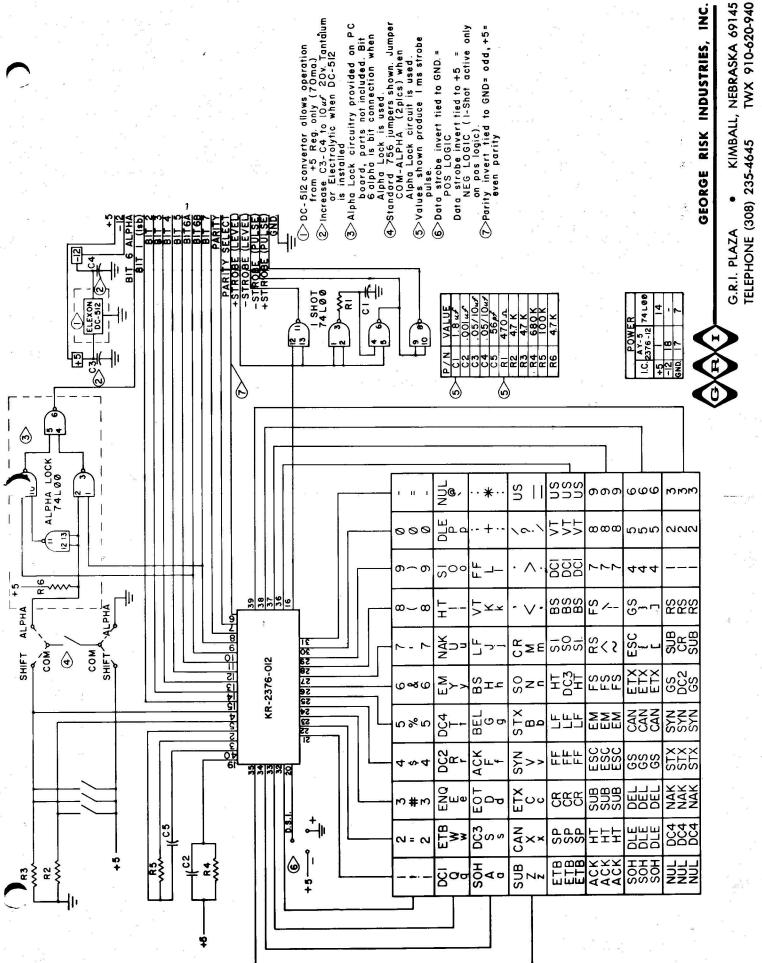
2376 KEYBOARD ENCODER PIN ASSIGNMENTS

Vcc (+5v)	21 Y 10
Freq. Control	22 Y 9
Freq. Control	23 Y 8
Shiftainput	24 Y 7
Control Input	25 Y 6
Parity Invert	26 Y 5
Parity Output	27 Y 4
Data Output B7 (MSB)	28 Y 3
Data Output B6B (UC)	29 Y 2
Data Output B6A (UC/LC)	30 Y 1
	31 Y Ø
Data Output B4	32 x 7
Data Output B3	33 X 6
Data Output B2	34 X 5
	35 X 4
	36 X 3
Vss (ground)	37 X 2
Vgg (-12v)	38 X 1
Strobe Control	39 x Ø
DSI (Data and	40 Freg.
Strobe Invert)	Contro
	Freq. Control Freq. Control Shiftainput Control Input Parity Invert Parity Output Data Output B7 (MSB) Data Output B6B (UC) Data Output B6A (UC/LC) Data Output B4 Data Output B3 Data Output B3 Data Output B2 Data Output B1 (LSB) Strobe Output (level) Vss (ground) Vsg (-12v) Strobe Control DSI (Data and

MOTE: G.R.I. Keyboards use a custom-programmed ROM, designed especially for your keyboard. Order replacements ONLY direct from G.R.I. Specify pln 2378-012 Encoder, \$7.50 ea.

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

×6				\Rightarrow	000	00,	0 1 0	0 1	100	101	1 1 0	1,
t a 64	b3 ↓	b2	b₁	Row J	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	Р	,	P
0	0	0	1	1	SOH	DC1	1	1	Α	Q		q
0	0	1	0	2	STX	DC2		2	В	R	b	r
0	0	1	1	3	ETX	DC3	#	3	С	S	С	
0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	υ	•	u
0	1	1	0	6	ACK	SYN	8	6	F	٧	f	٧٠
0	1	1	١,	7	BEL	ETB	,	7	G	w	g	*
1	0	0	0	8	BS	CAN	(,	8	Н	х	h	×
1	0	0	1	9	нт	EM)	9	_	Y	i	у
1	0	1	0	10	LF	SUB	•	:	J	z	J	z
1	0	1	i	11	VT	ESC	+	į	ĸ	ı	k	{
1	1	0	0	12	FF	FS	,	<	L	1	1	
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KIMBALL, NEBRASKA 69145

INTERFACING AND USING THE G.R.I. MODEL 756 KEYBOARD

READ CAREFULLY BEFORE ASSEMBLING OR USING YOUR KEYBOARD!

- The Model 756 Full ASCII Keyboard is designed to be used with almost any available micro-computer-related product which requires alphanumeric data input. Because of the lack of standardization among manufacturers of input-output boards, video display boards, TVT boards, etc., it is impossible to furnish step-by-step instructions for using our keyboards with a particular unit. What we will attempt to do, however, is to outline the basic procedure for interfacing keyboards, so that you will have a minimum of difficulty. We believe the 756 will work directly with most interfaces available today, but like any rule, there will almost surely be exceptions!
- 2. To begin with, get out your manuals, and study up on the keyboard input structure of your interfacing equipment. Pay close attention to the logic requirements of the "Strobe," "Data Ready," or "Key-pressed" inputs, since several options are available on the 756, and this area seems to be the most troublesome of all. A sketch, with the input port on one side and the keyboard output connector on the other is the best way to keep things straight.
- 3. Most interfaces use a keyboard strobe signal to indicate that keyboard data is ready. The 756 provides the following strobe signals:

Positive Strobe Level (goes high with any key depression)
Negative Strobe Level (" low " " " ")

Positive Strobe Pulse (a 1 ms. pulse following key depression, going high)

Negative Strobe Pulse (" " " " " " low)

Determine the correct strobe signal for interfacing with your equipment, and connect the keyboard connector pin associated with this signal to your interface.

- 4. Next select the appropriate data signals. The connector pins marked B1 through B7 correspond to the LSB through MSB of the ASCII code outputs. Attach your interface cable to the keyboard, making sure the LSB goes to B1, and so forth. You will notice there are two signals for bit 6, called B6A and B6B. This bit determines whether a character is upper case, or lower case, and B6A allows selection of the two by using the Shift key. B6B provides upper-case codes only. To further confuse the situation, you will notice another pin marked "Bit 6 Alpha" on the connector. You will connect the bit 6 signal from one of these three points to your bit 6 input. Here is how they differ.
 - -1. B6A provides upper-and-lower case, selectable by shift keys.
 - 2. B6B provides upper case only, with the shift keys selecting punctuation like (!) instead of numerals (1), etc.
 - 3. Bit 6 Alpha is an output from an optional Alpha Lock circuit provided on the keyboard PC board. Alpha lock or Caps lock differs from the standard Shift Lock in that it only shifts Alpha (A-Z) characters, without affecting punctuation, numerals, etc. The standard 756 keyboard PC board has jumpers (2) near the Shift Lock key, which connect the keyswitch as a Shift Lock key. As long as the keyboard is jumpered this way, the user may only select between B6A and B6B. A manual SPDT switch, like that supplied with our 702 enclosure, may be used to select between the two bit 6 outputs. Optionally, the shift lock key may be converted to an alpha lock key. This is done by adding two parts, changing two jumpers, and moving the bit 6 output connection. The added parts are a 7400 or 74LS00 IC, and a $4.7 \text{K}^{\frac{1}{4}}$ watt resistor. Change the jumpers by moving the jumper from COM-SHIFT to COM-ALPHA (change both jumpers). Finally, move the bit 6 interface lead from wherever it is to the pin marked Bit 6 Alpha. Now, the selection of upper-lower case is made electrically, on the keyboard, by the status of the Shift Lock latching type keyswitch. This is an Alpha Lock switch now, and this feature is much preferred by many users of electronic keyboards. When depressed, the keyboard will output upper case only, but the shift keys will still be active for selecting between numerals and punctuation. When released, the keyboard outputs normally shifted upper and lower case. In any event, the control key may be used to generate control codes and funtions.

ASCII is a seven bit code, with the eighth bit used for error-checking, called Parity. The 756 provides parity, and for inversion of the parity bit, but most interfaces ignore it anyway. Sometimes the strobe is connected to the eighth bit, or it is just tied high or low, or allowed to float. A check of the interface board schematic or manual will be the best

guide to determining how to treat bit 8. (If you are confused, a hardware-oriented friend will no doubt be able to shed some light on the darkness!)

5. The final step is to supply power to the keyboard. Two supply voltages are needed: +5 @ 20ma., and -12 @ 20ma. The current requirements are small enough the needed voltages can usually be "stolen" from an existing supply or board. Remember to connect the two supply leads, and ground to the keyboard connector. Above all, check the voltages at the IC socket, BEFORE inserting the chip. Encoder ROMs are an expensive way to discover a wiring error! Also, for those who don't have a source of -12 volts, GRI make available, a small DC-DC converter that plugs into the 756 PC board. No wiring changes are needed, however, to insure reliable operation, the .05uf bypass capacitors should be increased to lOuf, tantalum or electrolytic. Failure to do so can lead to erractic operation.

TROUBLESHOOTING

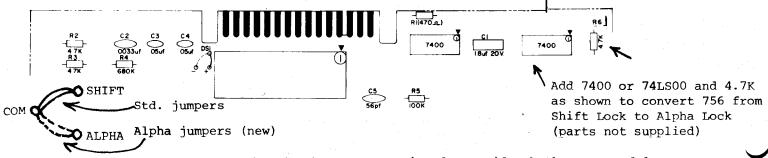
Because the keyboard is based upon a MOS LSI encoder, troubleshooting is largely a matter of checking the obvious (parts placement, wiring, voltages, connector insertion, etc), or replacing the chip. Most of the problems we have seen are attributable to the former, but the static-sensitive PMOS chip does get blown occasionally.

- 1. If you suspect the encoder, replacements are available from stock at GRI for \$7.50. Also, we offer a same-day checkout and repair service for \$15.00, for returned boards. If you are returning a board, please call or write for a Return Authorization first to assure prompt turnaround.
- 2. Chances are, the encoder is not to blame. We 100% test them just before shipping, and many problems can simulate a bad device. For instance, lack of a data-strobe invert jumper will cause sporadic outputs. Shorts between matrix scan lines will cause two or more outputs for a given key. Be sure to remove the encoder IC when measuring or you may damage it.
- 3. The designers of the 2376 encoder (G.I. or SMC) used PMQS technology, which is static sensitive. Use all normal precautions for handling and soldering. Also, please observe loading rules of one std. TTL load max. per output. Buffers like 7408s are suggested for driving heavy loads.
- 4. Normal cables of 5-6 feet pose no problem. Again, buffers or line drivers are suggested for longer cables.
- 5. The 2376 encoder is a scanning type device, which allows the data outputs to fluctuate between key depressions. Some systems see these fluctuations as rapidly changing data entries, and "glitch". The solution is to rewrite keyboard routines to first check for a valid strobe before reading any data from the keyboard. The strobe signals valid and debounced data. Alternatively, buffering each data line through a 7408 AND gate, with the strobe signal (buffered) gating each AND gate on will result in a stable output, resting low, and going true only with a valid strobe.
- 6. If everything seems right, but data just won't "take", perhaps the strobe pulse is too short. Increasing the value of the 1.8uf capacitor will stretch out the pulse, conversely, decreasing the value will shorten it.

If all else fails, remember our repair policy and/or replacement policy. Even with careful handling, static sensitive parts can get "blown".

Murphy's Law as applied to keyboards says "It can happen to anyone!"

NOTE: Use only 2376 encoders obtained from GRI in the 756, since this part contains a custom-programmed ROM. "Standard" parts WON'T work!



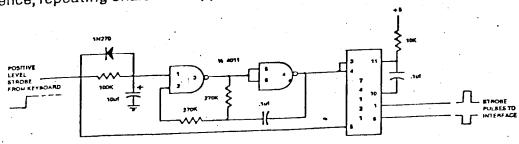
With Shift Lock option (STD) connector pin B6A provides both upper and lower case, B6B provides upper case only. Shift Lock key locks 756 into upper case shift mode. With Alpha Lock modification, connector pin Bit 6 Alpha becomes the new bit 6 output from the keyboard. Alpha Lock key locks 756 alpha keys (A-Z) only.

KEYBOARD TRICKS YOU CAN USE... (FREE!!!)

As an OEM keyboard vendor, GRI has accumulated a few little "tricks of the trade," which come in darned handy now and then. Here are a few:

AI'-O-REPEAT (usually found on only the maxl-buck equipment)

Repeat is neat, but ever try to generate a slew of control Q's? Using a separate repeat key can try one's patience, If not tie one's fingers in knots! This circuit uses two I.C.'s and provides control over the delay before auto-repeat begins, the repetition rate, and the strobe pulse width. It works by merely generating one pulse for each normal key depression, and outputting numerous pulses if the key is held down for a certain length of time. Each pulse signals valid data, hence, repeating characters appear!



NUMERIC PAD (decimal numerics, for people with 1x101 computers!)

Another premium feature in some equipment, is the numeric pad. Useful for entering numeric data (like for accounting or games uses) the pad usually shares the keyboard's encoder and data lines. Contrary to some stories, they do not output hexadecimal, etc., but just plain old ASCII. The key is, they are unaffected by the shift or control keys. For those who need or want one, GRI offers a numeric pad accessory for the 756 keyboard. Wires connect the Model 710 Numeric pad to the mother board, allowing use of the same input port. At \$9.95 from most stores, you won't mind coming up with a box or longer enclosure for it. (won't fit GRI 701 or 702 enclosures.)

What? No minus 12v supply? Never fear, because the clever guys at Elexon Power Systems have an under \$10 on to your problem which will not put more lead (Iron?) in your pants. The DC-512 dc-dc converter manufactures its own minus twelve volts, with just a little 5 volt input! And the best part is, it plugs right into the holes provided on the upper left hand corner of the pc board. Order model DC-512 (be sure to include the "dash") from GRI or:

Elexon Power Systems 3131 S. Standard Ave. Santa Ana, CA 92705

(714) 979-4440

Bure you can use a UART, but here is a little circuit which requires only 5 volts, is easily built with regular TTL parts, and is easily adjusted to any desired baud rate without crystals. The 555 oscillator is steady enough (1%) or most uses, and the output can drive either a 20 ma current loop, RS-232, or what have you.

