



OPERATION INSTRUCTIONS

AC INVERTERS * SEE NOTES BELOW

MODELS 1XC93 thru 1XC98

FORM # 553272
SUPPLIER # P43C
0891/216/1M

PARTS SHOWN BELOW ARE THE ONLY REPLACEMENT PARTS AVAILABLE.

READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

Description

Features include: • Totally enclosed construction • Compact size • Keypad or terminal operation • Inverter self-protection (short circuit, overcurrent, overvoltage, and inverter overheat).

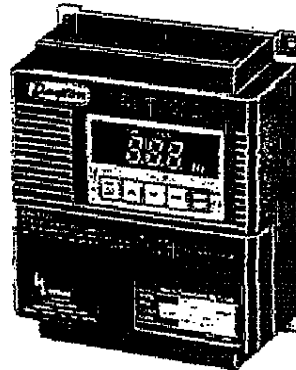
Dayton AC Inverter Adjustable Speed Motor Controls are available for motor capacities ranging from 1/3 to 5.0 HP with 200-230 VAC, 3 phase, 60/50 Hz ratings. They are intended for use with 3 phase induction motors only as a means of providing variable speed operation. When selecting, please make certain that motor nameplate full load ampere rating does not exceed inverter continuous current value as listed in the Specification section of this manual.

AC inverters incorporate advanced 32-bit Digital Signal Processors (DSP) for fast control response and flexibility in general purpose motor speed control applications. Inverter adjustments are made digitally from the keypad panel eliminating the need for complicated internal potentiometers and/or switches.

Unpacking

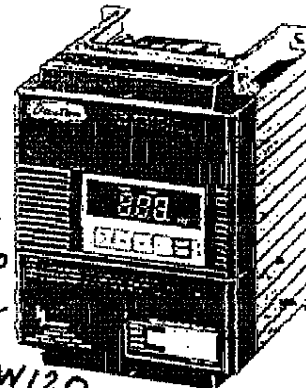
Individual cartons should be handled with care to avoid damage from dropping, etc. Store cartons in a clean, dry location within a temperature range of -10°F to +150°F. After unpacking the inverter, inspect carefully for any damage that may have occurred during transit.

MODELS 1XC93 THRU 1XC95



* THE ONLY PART AVAILABLE FOR MODELS 1XC93 THRU 1XC95 IS THE FRONT COVER, PART NUMBER SA514586-41.

MODELS 1XC96 THRU 1XC98



* FOR MODELS 1XC96 THRU 1XC98:
• FRONT COVER, PART NUMBER SA514586-51.
• RESISTOR, ALSO CALLED DYNAMIC BRAKE, PART NUMBER TKBOW120.

Figure 1

ADDITIONAL INFORMATION ON RESISTOR IS SHOWN ON PAGE 19 OF THIS MANUAL.

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General Safety Information

READ AND FOLLOW SAFETY INSTRUCTIONS!

"Danger," "Warning," "Caution" and "Note" paragraphs contained within this instruction manual list some general safety reminders and recommendations to be followed when operating or installing this equipment. These safety precautions will be repeated throughout this instruction manual where applicable. The following is an explanation of terms.

▲ This is the safety alert symbol. When you see this symbol on your inverter or in this manual, look for one of the following signal words and be alert to the potential for personal injury:

DANGER warns about hazards that will result in immediate serious personal injury or death if ignored.

WARNING warns about hazards that could result in severe personal injury or death if ignored.

CAUTION warns about hazards that could result in minor personal injury, product or property damage if ignored.

The word **IMPORTANT** indicates factors concerned with operation, installation, assembly or maintenance which could result in damage to the machine or equipment if ignored.

The word **NOTE** indicates special instructions which simplify procedures or increase efficiency but are not related to hazards.

Carefully read and follow all safety instructions in this manual and on inverter.

▲ DANGER ▲

INVERTER SYSTEMS CAUSE MECHANICAL MOTION. IT IS THE RESPONSIBILITY OF THE USER TO INSURE THAT ANY SUCH MOTION DOES NOT RESULT IN AN UNSAFE CONDITION.


WITH 120 HZ INVERTER OUTPUT POSSIBLE, THE INVERTER COULD CAUSE THE MOTOR TO RUN AT UP TO 2 TIMES ITS BASE SPEED. NEVER OPERATE THE MOTOR OR ITS CONNECTED MACHINERY ABOVE ITS TOP MECHANICAL SPEED OR A CATASTROPHIC FAILURE MAY RESULT.

▲ WARNING ▲

DO NOT USE THIS CONTROLLER IN AN EXPLOSIVE ATMOSPHERE EVEN IF MOTOR IS LISTED FOR THIS TYPE OF CONDITION.

ALL MOTOR BASES AND EQUIPMENT ENCLOSURE HOUSINGS SHOULD BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 250 OR EQUIVALENT.

▲ WARNING ▲



Hazardous voltage. Can shock, burn or cause death.
Ground inverter before connecting to power supply.

- ▲ Wire inverter to correct voltage. See "Installation" section of this manual and inverter nameplate.**
- ▲ Ground motor before connecting to inverter.**
- ▲ Meet National Electrical Code and local codes for all wiring.**
- ▲ Follow wiring instructions in this manual when connecting inverter to power lines.**

Make workshops childproof; use padlocks and master switches; remove starter keys.

▲ CAUTION ▲

Do not connect a power supply voltage which exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the inverter, damage to the internal components will result.

Do not connect power supply to the output terminals (U,V,W). Connect power supply only to power terminals (L1, L2, L3).

Do not connect any wires to terminals marked N and P. Terminals P and DB are used for external dynamic braking resistors only.

Do not connect any voltage source to the control circuit terminals (except 30A, or 30C; not to exceed 250 VAC, 0.3 A. max.).

Avoid using a power supply contactor (ON/OFF) installed on the line side of the inverter for RUN and STOP. Use the FWD-CM and REV-CM terminals only as shown in the installation wiring diagrams.

Do not use a switch on the output side of the inverter for ON/OFF operation. Use this type of switch only as required by code for safety lockout during maintenance.

Do not connect filter capacitors on the output side of the inverter.

Do not operate the inverter without the ground wire connected.

General Safety Information (Continued)

CAUTION

If the inverter's protection function (Fault Display and Alarm) is activated, consult the TROUBLE-SHOOTING section of this manual. After correcting the problem, normal operation can be resumed. Do not reset the fault condition by automatic means or external sequence.

Ambient temperature conditions greatly affect inverter life and reliability. Do not install the inverter in any location which exceeds the allowable temperature rating. Do not remove the ventilation covers if temperatures are 40°C and below. Remove ventilation covers if temperature is between 40°C and 50°C. Note that if the covers are removed, another type of enclosure may be required for safety purposes.

Do not perform a megger test between the inverter power or control circuit terminals.

Inverter protection features are intended to protect the inverter. Separate motor thermal protection is recommended.

Installation

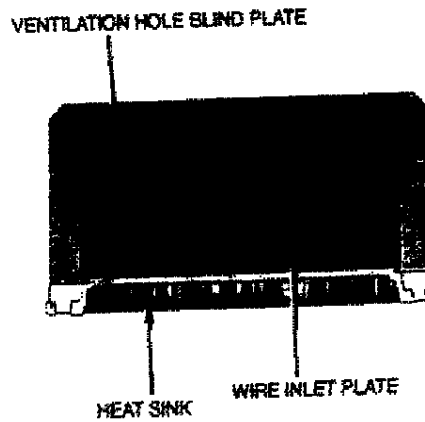
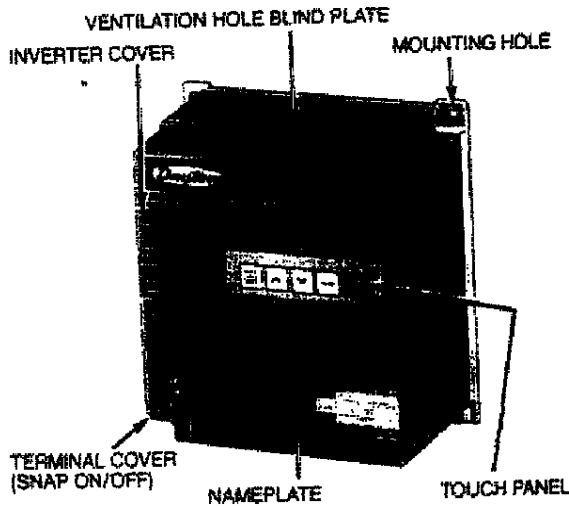


Figure 2 — Models 1XC93 thru 1XC95

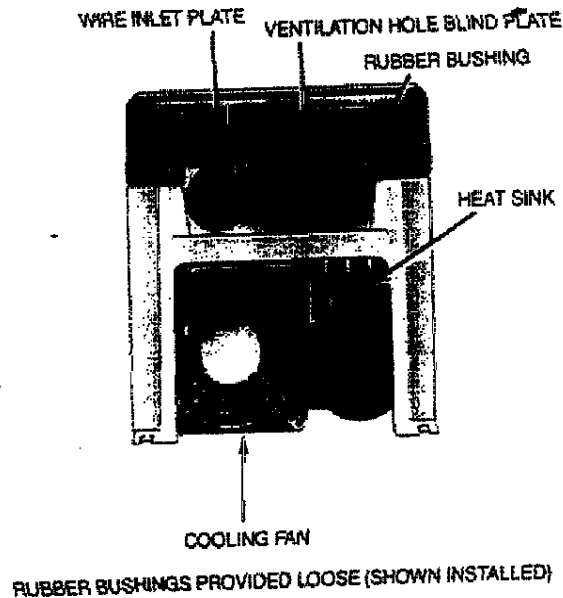
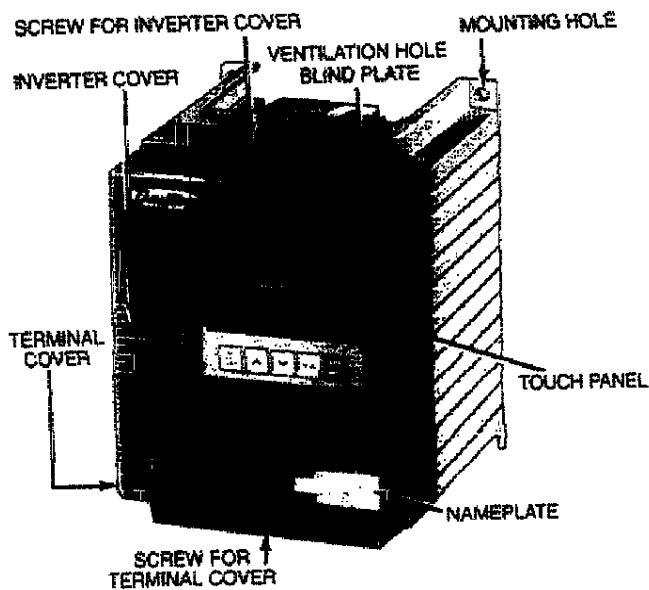


Figure 3 — Models 1XC96 thru 1XC98

Installation (Continued)

ENVIRONMENT

Install the inverter to satisfy the following conditions:

1. Ambient temperature: -10°C to +50°C. (Please take off ventilating hole blind plates above +40°C.)
2. Relative humidity: 20% to 90% (non-condensing, non-freezing).
3. Altitude: not more than 3300 feet.
4. Vibration: not more than 0.6G.
5. Avoid locations where the inverter is exposed to the direct sunlight, dust, corrosive fumes, oil mist, or inflammable gases.

MOUNTING

1. **Direction**
Install the inverter vertically so that "DAYTON AC INVERTER" can be seen in front. Any other position will cause overheating.
2. **Space**
The inverter will generate heat during operation. Allow sufficient space around the unit as shown in Figure 4.
3. **Mounting plate**
Heat sink temperature will reach around +90°C during operation. Use thermostable (non-combustible) material for inverter mounting plate.
4. **Multi-mounting**
When 2 or more inverters are installed within a common enclosure, arrange them side by side. Keep spacing between each inverter as shown in Figure 4.
5. **Mounting screws**
 - a. Use #10-32 mounting screws to install the inverter (4 required).
 - b. Refer to "DIMENSIONS" to find position of mounting holes. (page 21).

▲ WARNING ▲

DO NOT USE THIS CONTROLLER IN AN EXPLOSIVE ATMOSPHERE EVEN IF MOTOR IS LISTED FOR THIS TYPE OF CONDITION.

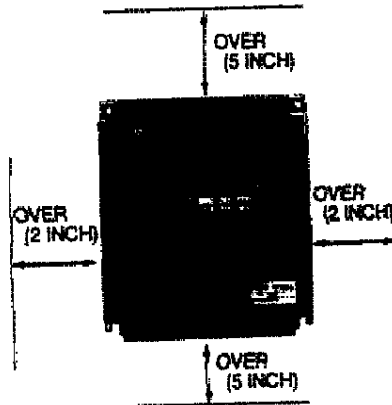


Figure 4 — Mounting Direction and Space

Basic Wiring

1. Remove terminal cover (see Figure 5).
2. Remove knockouts on wire inlet plate (see Figure 2).
3. Cut bushing center to allow wires to pass through.

Bushings provided loose.

4. Install three rubber bushings on wire inlet plate (see Figure 3).

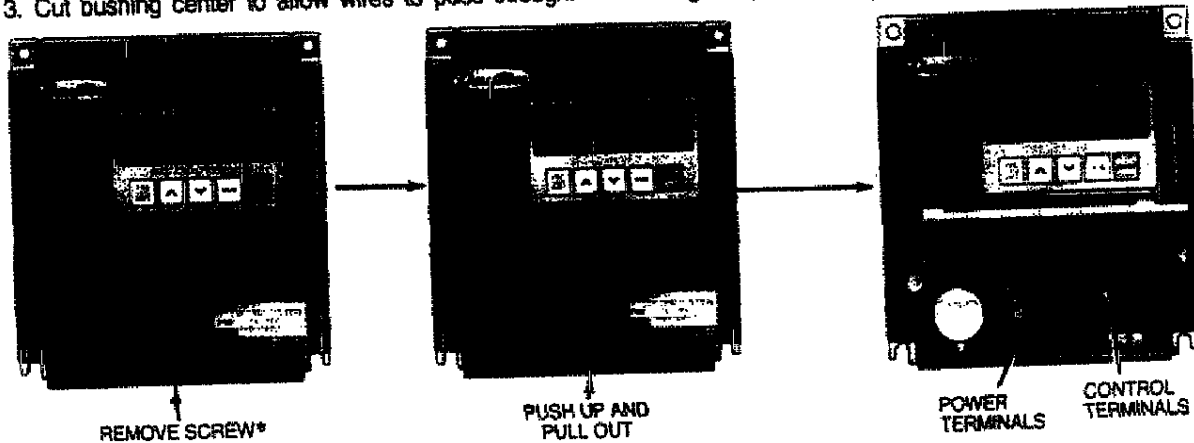


Figure 5 — Removing Front Cover for all Models

(*) 1XC93 THRU 1XC95 DOES NOT HAVE SCREW.

Installation (Continued)

5. Use of a circuit breaker or fuses in the inverter power supply may be required by the NEC and local codes. See Recommended AC Line Fuse Chart.
 6. Connect 200-230VAC three-phase input power supply to power terminals L1, L2 and L3 in any order. (Direction of motor rotation is determined by output wiring.)
 7. Connect 230VAC, three-phase motor to power terminals U, V and W. If motor rotation is reversed, interchange any two motor connections at the U, V and W terminals.
 8. Ground terminal connections [E(G)]. Be sure to ground the inverter so as to prevent malfunctions due to external noise. See Figure 6 and 7.
- NOTE: The motor chassis should be grounded to earth through a separate ground lead from all other equipment ground leads to prevent noise coupling.
9. If motor is provided with built-in pilot duty thermostat, remove jumper between THR and CM on the control terminal strip, and connect the thermostat wires to these terminals.

RECOMMENDED AC LINE FUSE

MODEL	1XC93	1XC94	1XC95	1XC96	1XC97	1XC98
Description	6 amp, 600VAC		10 amp, 600 VAC	20 amp, 600VAC		30 amp, 600VAC
Gould Part No.	A4J6		A4J10	A4J20		A4J30
Bussman Part No.	KTS6		KTS10	KTS20		KTS30
Grainger Part No.	4XF09		4XF10	4XF12		4XF14

MODELS 1XC93 THRU 1XC95



MODELS 1XC96 THRU 1XC98

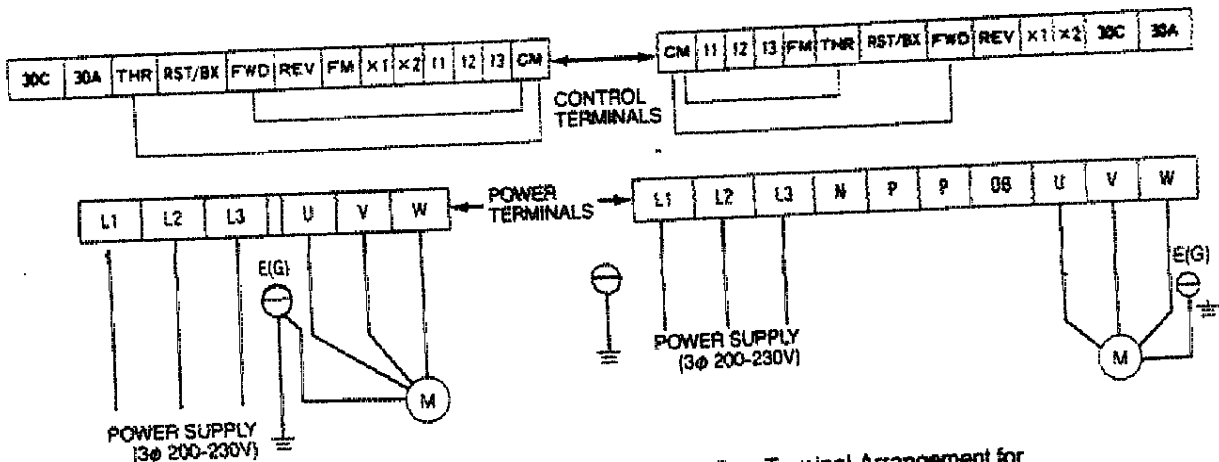


Figure 6 — Terminal Arrangement for Models 1XC93 thru 1XC95

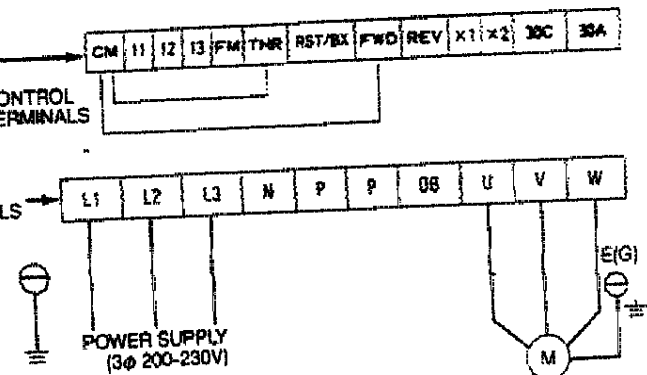


Figure 7 — Terminal Arrangement for Models 1XC96 thru 1XC98

Basic Operation

INSPECTION PRIOR TO OPERATION

IMPORTANT: When the installation and wiring have been completed, carry out the inspection regarding the following items before applying power supply.

1. Double check for proper wiring.
2. Remove all wire or drilling chips.
3. Make sure all screws are tight.

4. Make sure that wire strands on crimp terminals are not in contact with other terminals.

▲ CAUTION

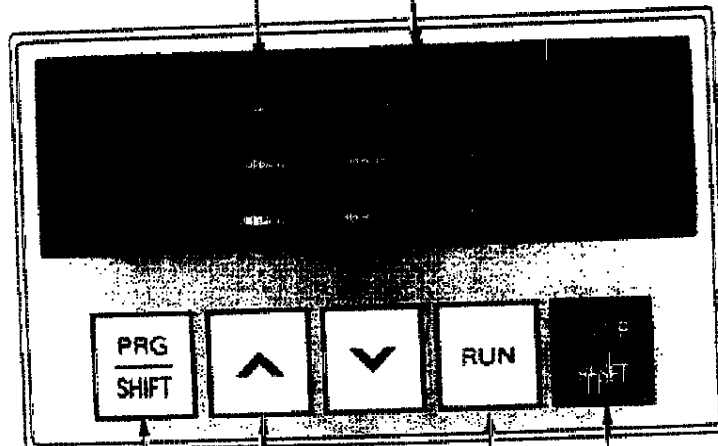
Do not perform dielectric megger test on control terminals or between power circuit terminals.

Function Indication

- Function code is indicated by the 1st and 2nd digit (programming mode)
- Setting frequency, output frequency, alarm messages are indicated (operating mode)

Data indication

- Data code is indicated by the 2nd and 3rd digit (programming mode)
- Setting frequency, output frequency, alarm messages are indicated (operating mode)



Program key (Shift key)

- Programming
- Select & set function

Up/Down keys

- Individual data value setting (programming mode)
- Frequency setting (operating mode)
- Touch panel start/speed control/stop (preset at factory)

Stop key (Reset key)

- Stopping (Keypad operation only)
- Reset trip mode

Run (Start) Key

- Running (keypad operation only)

Figure 8 — Digital Display and Keypad Description

Basic Operation (Continued)

START-UP

1. Turn on power supply. Digital display will flash 0.0.
2. Push Run key. Digital display will stop flashing and indicate 0.0. (See Figure 9.)
3. Push and hold Up key until motor shaft is rotating. Verify direction of rotation is correct.
 - a. If rotation is incorrect, push Stop key. Turn off power to the inverter, and interchange wires connected to power terminals V and W.
 - b. Turn power back on. Digital display will flash the last frequency setting prior to shutdown.
 - c. Push Run key. Inverter will automatically accelerate to this last frequency setting.
4. Push and hold UP key until motor is running at desired speed. (See Figure 10.)
5. To change speed, use Up/Down keys.
6. To stop, push Stop (Reset) key. Digital display will flash last frequency setting.

NOTE: Next time Run key is pushed, inverter will automatically accelerate to this last frequency setting.

7. If at any point during operation one of the alarm messages is displayed (Figure 11), the inverter will shut down. See Troubleshooting Chart, page 23.

8. After fault is corrected, push Stop (Reset) key to clear alarm message. Display will flash the last frequency setting prior to shut down.

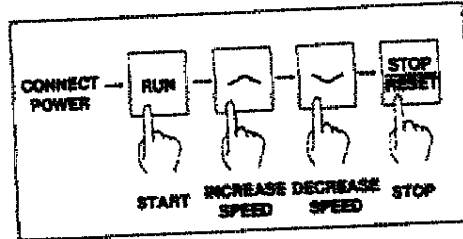


Figure 9 — Operation/Run Diagram

Relationship of motor speed to digital display frequency setting:

Basic formula:

$$\% \text{ of Speed} = \frac{\text{Frequency Setting}}{60 \text{ Hz}} \times 100$$

Example: Digital display indicates 45.0.

$$\% \text{ of Speed} = \frac{45.0}{60} \times 100 = 75\%$$

NOTE: 60.0 Hz equals 100% motor speed.

Figure 10 — Basic Formula

ALARM MESSAGE	INDICATION	DESCRIPTION
Overcurrent Output short line to line	OC1	Overcurrent or output short line to line during acceleration.
	OC2	Overcurrent or output short line to line during deceleration.
	OC3	Overcurrent or output short line to line during steady state running.
Overvoltage	OU	DC bus voltage reaches the overvoltage protection level.
Inverter heat sink overheating	OH1	Overheating of the inverter heat sink due to overload, cooling fan malfunction or abnormal ambient temperature.
External alarm function	OH2	THR-CM terminal open due to external fault.
CPU error	Err	CPU malfunction due to noise
Low voltage	LU	Under voltage of power supply
Instantaneous power failure		

Figure 11 — Alarm Messages

FORM 5S3272

MODELS 1XC93 THRU 1XC98

04303

Advanced Operation

The Inverter has 20 programmable functions as shown in the following function code list.

FUNCTION CODE LIST

FUNCTION CODE		ABILITY TO CHANGE DATA
Digital Display	Function	
000	Data protection	Stop Mode Only
010	Operating method/ Frequency setting selection	Stop Mode Only
020	Auto-restart after instantaneous power failure	Stop Mode Only
03_	Fault memory	Stop Mode and Run Mode
041	V/Hz characteristics	Stop Mode Only
100	Maximum output voltage	Stop Mode Only
275	Frequency meter adjust	Stop Mode and Run Mode
308	Torque boost	Stop Mode and Run Mode
412	Acceleration time	Stop Mode and Run Mode
512	Deceleration time	Stop Mode and Run Mode
612	No. 2 acc/dec time	Stop Mode and Run Mode
710	Multi-frequency setting No. 1	Stop Mode Only
820	Multi-frequency setting No. 2	Stop Mode Only
930	Multi-frequency setting No. 3	Stop Mode Only
A00	DC injection brake	Stop Mode Only
b00	DC injection brake starting frequency	Stop Mode Only
C00	DC injection brake time	Stop Mode Only
d00	Upper limiter	Stop Mode Only
E00	Lower limiter	Stop Mode Only
F00	Bias	Stop Mode Only

Figure 12 — Function Code List

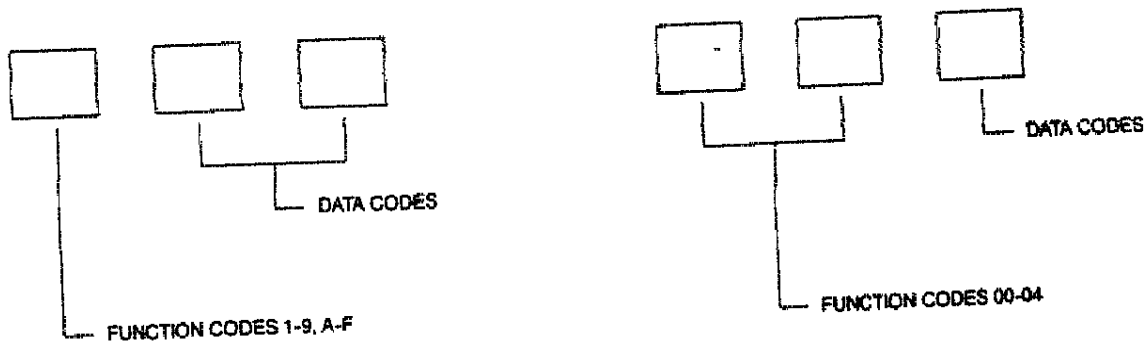
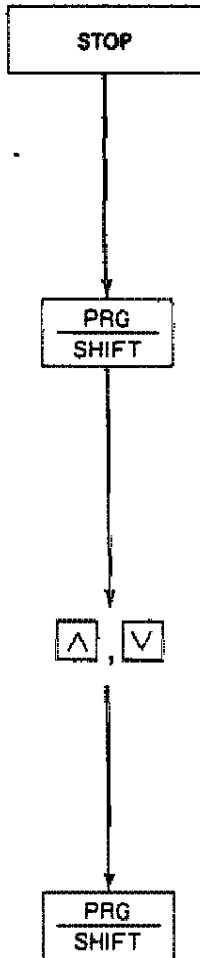


Figure 13 — Display Digits

Advanced Operation (Continued)

PROGRAMMING SEQUENCE

Use flow chart as outlined below to select function codes and change data settings.



STEP 1

- Push Stop key, frequency setting will be displayed and flashing.

NOTE: If programming in run mode (see Function Code List, Figure 12) omit this step.

STEP 2

- When Prg/Shift key is pressed, function code will advance one step (flashing first digit only) $\boxed{0110}$.
- Stop pressing when you reach desired function.

STEP 3

- Change the data by pressing $\boxed{\Delta}$, $\boxed{\nabla}$ (Up-Down) key.

STEP 4

- Press Prg/Shift key to enter data setting into memory and to proceed to next function code.
- When you are done programming, keep pressing Prg/Shift key until display returns to flashing frequency setting.

NOTE: Function codes can be accessed in sequence only. See Function Code List, Figure 12.

Figure 14 — Programming Sequence

Advanced Operation (Continued)

FUNCTION CODE	DESCRIPTION			FACTORY SETTING
<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">00</div> Data protection	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">000</div>	Not protected		<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">000</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">001</div>	Protected		
<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">01</div> Operating method/ frequency setting selection	Data Run/Stop Frequency setting			<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">010</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">010</div>		key	
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">011</div>		Potentiometer or analog signal	
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">012</div>	Terminal FWD, REV	key	
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">013</div>	Terminal FWD, REV	Potentiometer or analog signal	
<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">02</div> Auto-restart after instantaneous power failure	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">020</div>	Inactive If power supply reappplies during LU indicating fault alarm signal (30) comes out and the inverter will coast-to-stop.	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">020</div>	
	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">021</div>	Active If power supply reappplies during LU indicating the inverter automatically recovers prior operating condition very smoothly.		
<p>1 In the case where function code 010 or 011 is selected, this function will not activate (active mode only).</p> <p>2 This function will only activate when power supply reappplies during LU indication (active mode only).</p>				
<p>▲ WARNING ▲</p> <p>SELECTION OF FUNCTION CODE 021 DATA 011 (AUTO RESTART AFTER POWER INTERRUPTION) AUTOMATICALLY RESTARTS THE INVERTER WITHOUT WARNING AND WITHOUT REQUIRING PERSONNEL TO REGENERATE THE START SEQUENCE. THIS FUNCTION MUST BE APPLIED ONLY TO MACHINERY WITH ALL MOVING PARTS COMPLETELY UNACCESSIBLE TO PERSONNEL.</p>				
<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">030</div> Fault memory*	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">E n d</div>	Indicate present fault and prior 3 event		<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">- - -</div>
	<input checked="" type="checkbox"/>	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">- - -</div>	↑ Prior fault No. 3	
	<input checked="" type="checkbox"/>	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">00</div>	↑ Prior fault No. 2	
	<input checked="" type="checkbox"/>	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">002</div>	↑ Prior fault No. 1	
	<input checked="" type="checkbox"/>	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">003</div>	↑ Present fault	
	<input checked="" type="checkbox"/>	<div style="border: 1px solid black; padding: 2px; display: inline-block; font-family: monospace; font-size: 1.2em;">030</div>	↑	
	If there was no fault, mark will be indicated			

(*) See Troubleshooting Chart for alarm indication description, page 23.

Figure 15 — Function Code Description

Advanced Operation (Continued)

FUNCTION CODE	DESCRIPTION	FACTORY SETTING				
<p>04</p> <p>VHz Characteristics</p>	<p>The following 4 patterns are selectable</p> <table border="1"> <tr> <td data-bbox="430 357 574 400">040</td> <td data-bbox="574 357 719 400">041</td> <td data-bbox="719 357 863 400">042</td> <td data-bbox="863 357 1008 400">043</td> </tr> </table>	040	041	042	043	<p>041</p>
040	041	042	043			
<p>1</p> <p>Maximum output voltage</p>	<p>100</p> <p>115</p> <p>123</p> <p>Output voltage is according to input voltage</p> <p>150 V sec</p> <p>200 V sec</p> <p>230 V sec</p> <p>2nd and 3rd digit show maximum output voltage in 10V steps.*</p> <p>*Output voltage is limited by input voltage.</p>	<p>100</p>				
<p>2</p> <p>Frequency meter adjustment</p>	<p>The maximum voltage adjustment for analog frequency meter.</p> <p>200</p> <p>299</p> <p>Approx. 6.5 V</p> <p>Approx. 10.5 V</p> <p>Divided into 100 segments</p>	<p>275</p>				
<p>3</p> <p>Torque boost</p>	<p>The setting of torque boost can be made according to the load and the characteristics of the motor within the range as follows</p> <p>300</p> <p>308</p> <p>315</p> <p>minimum</p> <p>standard</p> <p>maximum</p> <p>16 patterns</p>	<p>308</p>				

Figure 15 — Function Code Description (Continued)

Advanced Operation (Continued)

FUNCTION CODE	DESCRIPTION	FACTORY SETTING																																																																																																																																																																																				
<p>4</p> <p>Acceleration time</p>	<p>The following table shows the acceleration time from zero to maximum frequency and/or deceleration time from maximum frequency to zero in seconds.</p> <p>No. 2 Acc./Dec. time is available when multi frequency setting is set as 800 900 and activate when X2-CM is closed.</p> <table border="1"> <thead> <tr> <th>f max</th> <th>00</th> <th>01</th> <th>02</th> <th>03</th> <th>04</th> <th>05</th> <th>06</th> <th>07</th> </tr> </thead> <tbody> <tr> <td>50 Hz</td> <td>0.17</td> <td>0.39</td> <td>0.50</td> <td>0.67</td> <td>0.83</td> <td>1.3</td> <td>1.7</td> <td>2.7</td> </tr> <tr> <td>60 Hz</td> <td>0.20</td> <td>0.40</td> <td>0.60</td> <td>0.80</td> <td>1.00</td> <td>1.5</td> <td>2.0</td> <td>2.5</td> </tr> <tr> <td>100 Hz</td> <td>0.33</td> <td>0.67</td> <td>1.00</td> <td>1.33</td> <td>1.67</td> <td>2.5</td> <td>3.3</td> <td>4.2</td> </tr> <tr> <td>120 Hz</td> <td>0.40</td> <td>0.80</td> <td>1.20</td> <td>1.60</td> <td>2.00</td> <td>3.0</td> <td>4.0</td> <td>5.0</td> </tr> <tr> <th>f max</th> <th>08</th> <th>09</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> </tr> <tr> <td>50 Hz</td> <td>2.5</td> <td>2.9</td> <td>3.3</td> <td>3.8</td> <td>4.2</td> <td>5.0</td> <td>5.8</td> <td>6.7</td> </tr> <tr> <td>60 Hz</td> <td>3.0</td> <td>3.5</td> <td>4.0</td> <td>4.5</td> <td>5.0</td> <td>6.0</td> <td>7.0</td> <td>8.0</td> </tr> <tr> <td>100 Hz</td> <td>5.0</td> <td>5.8</td> <td>6.7</td> <td>7.5</td> <td>8.3</td> <td>10</td> <td>12</td> <td>13</td> </tr> <tr> <td>120 Hz</td> <td>6.0</td> <td>7.0</td> <td>8.0</td> <td>9.0</td> <td>10</td> <td>12</td> <td>14</td> <td>16</td> </tr> <tr> <th>f max</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> <th>21</th> <th>22</th> <th>23</th> </tr> <tr> <td>50 Hz</td> <td>7.5</td> <td>8.3</td> <td>13</td> <td>17</td> <td>25</td> <td>33</td> <td>42</td> <td>50</td> </tr> <tr> <td>60 Hz</td> <td>9.0</td> <td>10</td> <td>15</td> <td>20</td> <td>30</td> <td>40</td> <td>50</td> <td>60</td> </tr> <tr> <td>100 Hz</td> <td>15</td> <td>17</td> <td>25</td> <td>33</td> <td>50</td> <td>67</td> <td>83</td> <td>100</td> </tr> <tr> <td>120 Hz</td> <td>18</td> <td>20</td> <td>30</td> <td>40</td> <td>60</td> <td>80</td> <td>100</td> <td>120</td> </tr> <tr> <th>f max</th> <th>24</th> <th>25</th> <th>26</th> <th>27</th> <th>28</th> <th>29</th> <th>30</th> <th>31</th> </tr> <tr> <td>50 Hz</td> <td>58</td> <td>67</td> <td>75</td> <td>83</td> <td>125</td> <td>167</td> <td>208</td> <td>250</td> </tr> <tr> <td>60 Hz</td> <td>70</td> <td>80</td> <td>90</td> <td>100</td> <td>150</td> <td>200</td> <td>250</td> <td>300</td> </tr> <tr> <td>100 Hz</td> <td>117</td> <td>133</td> <td>150</td> <td>167</td> <td>250</td> <td>333</td> <td>417</td> <td>500</td> </tr> <tr> <td>120 Hz</td> <td>140</td> <td>160</td> <td>180</td> <td>200</td> <td>300</td> <td>400</td> <td>500</td> <td>600</td> </tr> </tbody> </table>	f max	00	01	02	03	04	05	06	07	50 Hz	0.17	0.39	0.50	0.67	0.83	1.3	1.7	2.7	60 Hz	0.20	0.40	0.60	0.80	1.00	1.5	2.0	2.5	100 Hz	0.33	0.67	1.00	1.33	1.67	2.5	3.3	4.2	120 Hz	0.40	0.80	1.20	1.60	2.00	3.0	4.0	5.0	f max	08	09	10	11	12	13	14	15	50 Hz	2.5	2.9	3.3	3.8	4.2	5.0	5.8	6.7	60 Hz	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	100 Hz	5.0	5.8	6.7	7.5	8.3	10	12	13	120 Hz	6.0	7.0	8.0	9.0	10	12	14	16	f max	16	17	18	19	20	21	22	23	50 Hz	7.5	8.3	13	17	25	33	42	50	60 Hz	9.0	10	15	20	30	40	50	60	100 Hz	15	17	25	33	50	67	83	100	120 Hz	18	20	30	40	60	80	100	120	f max	24	25	26	27	28	29	30	31	50 Hz	58	67	75	83	125	167	208	250	60 Hz	70	80	90	100	150	200	250	300	100 Hz	117	133	150	167	250	333	417	500	120 Hz	140	160	180	200	300	400	500	600	<p>4 1 2</p> <p>5 1 2</p> <p>6 1 2</p>
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NOTE: Function Code 7_ _ , 8_ _ and 9_ _ : V/Hz characteristics function codes 040 and 041, display is actual frequency; 042 and 043, display is actual frequency divided by two.

Figure 15 — Function Code Description (Continued)

Advanced Operation (Continued)

FUNCTION CODE	DESCRIPTION	FACTORY SETTING	
A <input type="text"/> <input type="text"/> <input type="text"/>	A 0 0 inactive	A 0 0	
DC injection brake voltage	A 0 1 minimum	} 10 patterns	
	A 1 0 maximum		
	b 0 0 start at 0.5 Hz.		
b <input type="text"/> <input type="text"/> <input type="text"/>	b 0 1 1 Hz	} set by 1 Hz. step	
	b 5 0 50 Hz		
	c 0 0 100 ms		
DC injection brake starting frequency	c 0 1 1 sec	} set by 1 sec. step	
	c 1 0 10 sec		
	c <input type="text"/> <input type="text"/> <input type="text"/>		
DC injection brake time	d <input type="text"/> <input type="text"/> <input type="text"/>	d 0 0	
	e <input type="text"/> <input type="text"/> <input type="text"/>		e 0 0
	f <input type="text"/> <input type="text"/> <input type="text"/>		
Upper limiter	0 0 inactive	} Set by 1% step of maximum frequency according to the V/Hz characteristic <input type="text"/> <input type="text"/>	
Lower limiter	0 1		
Bas	9 9 99		

Figure 15 — Function Code Description (Continued)

FORM 5S3272

MODELS 1XC93 THRU 1XC98

04303

Advanced Operation (Continued)**SELECTION OF OPERATING METHOD**

Inverter will provide 5 (five) types of operating methods.

SELECTION OF OPERATING METHOD

METHOD	RUN - STOP OPERATION METHOD	FREQUENCY SETTING	FUNCTION CODE
1	<input type="checkbox"/> RUN <input type="checkbox"/> STOP <input type="checkbox"/> RESET	<input type="checkbox"/> A <input type="checkbox"/> V key	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 0 (factory set)
2	<input type="checkbox"/> RUN <input type="checkbox"/> STOP <input type="checkbox"/> RESET	potentiometer or analog signal	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 1
3	External FWD/OFF/REV Signal	<input type="checkbox"/> A <input type="checkbox"/> V key	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2
4	External FWD/OFF/REV Signal	potentiometer or analog signal	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 3
5	<p>Multi-frequency setting (maximum 4 steps)</p> <ul style="list-style-type: none"> Controllable frequency as programmed by function code <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> . No. 1, No. 2, No. 3 fixed frequencies as programmed by function codes <input type="checkbox"/> 1 <input type="checkbox"/> <input type="checkbox"/> , <input type="checkbox"/> 2 <input type="checkbox"/> <input type="checkbox"/> , <input type="checkbox"/> 3 <input type="checkbox"/> <input type="checkbox"/> respectively and selected by external signal combination of switches X1 and X2. 		

Figure 16 — Selection of Operating Method

▲ WARNING ▲

IF FUNCTION CODE 0 1 DATA 2 OR 3 IS SELECTED (RUN/STOP FROM TERMINAL) THE KEYPAD RUN AND STOP BUTTONS ARE INACTIVE. WHEN TERMINAL OPERATION FOR RUN/STOP IS SELECTED (FUNCTION CODE 0 1 IS SET AT 2 OR 3), THE 2-WIRE CONTROL METHOD IS UTILIZED. IF A FWD OR REV COMMAND REMAINS APPLIED TO THE INVERTER TERMINAL,

PLEASE EXERCISE EXTREME CAUTION UNDER THE FOLLOWING CONDITIONS:

1. FAULT RESET: INVERTER MAY RESTART AUTOMATICALLY AFTER PRESSING RESET BUTTON.
2. POWER OUTAGE: INVERTER WILL RESTART AUTOMATICALLY UPON RESTORATION OF INPUT AC LINE POWER.






































FORM 5S3272

MODELS 1XC93 THRU 1XC96

04303

Advanced Wiring

TERMINAL DESIGNATION

Symbol	Terminal name	Description															
Power Terminals	L1, L2, L3	Power input terminal Commercial power supply AC 200 - 230V															
	U, V, W	Inverter output terminal 3-phase induction motor															
	P, DB	External DB resistor terminal External DB resistor is connected between P and DB (Model 1XC95 through 1XC96)															
	E (G)	Grounding terminal Ground this terminal															
	P, N	External DC bus capacitor terminal															
Control Terminals (Input)	13	Frequency setting power supply terminal DC +10V															
	12	Frequency setting signal input terminal DC 0 - +10V SW 6  or DC 4 - 20 mA SW 6  *															
	11	Frequency setting common terminal Common terminal for voltage and current signal. Do not ground, since this terminal is not isolated from CM.															
	X1, X2	Multistep frequency operating command 4 kinds of frequency settings are available. <table border="1" data-bbox="844 825 1344 983"> <tr> <td>X1 - CM</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>X2 - CM</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>Selected Frequency</td> <td>Touch Panel terminal 12</td> <td>Multi frequency setting 1 </td> <td>Multi frequency setting 2 </td> <td>Multi frequency setting 3 </td> </tr> </table>	X1 - CM	OFF	ON	OFF	ON	X2 - CM	OFF	OFF	ON	ON	Selected Frequency	Touch Panel terminal 12	Multi frequency setting 1 	Multi frequency setting 2 	Multi frequency setting 3 
	X1 - CM	OFF	ON	OFF	ON												
	X2 - CM	OFF	OFF	ON	ON												
	Selected Frequency	Touch Panel terminal 12	Multi frequency setting 1 	Multi frequency setting 2 	Multi frequency setting 3 												
	No. 2 Acc./Dec. selecting (available when set as  )	<table border="1" data-bbox="844 1004 1344 1153"> <tr> <td>X1 - CM</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>X2 - CM</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>Selected Frequency</td> <td>Touch Panel terminal 12</td> <td>Multi frequency setting 1 </td> <td>Touch Panel terminal 12</td> <td>Multi frequency setting 1 </td> </tr> </table>	X1 - CM	OFF	ON	OFF	ON	X2 - CM	OFF	OFF	ON	ON	Selected Frequency	Touch Panel terminal 12	Multi frequency setting 1 	Touch Panel terminal 12	Multi frequency setting 1 
	X1 - CM	OFF	ON	OFF	ON												
	X2 - CM	OFF	OFF	ON	ON												
Selected Frequency	Touch Panel terminal 12	Multi frequency setting 1 	Touch Panel terminal 12	Multi frequency setting 1 													
Acc./Dec.	<table border="1" data-bbox="844 1174 1344 1238"> <tr> <td>Acc. 4 </td> <td>Acc. 4 </td> <td>No. 2 Acc./Dec. 6 </td> <td>No. 2 Acc./Dec. 6 </td> </tr> <tr> <td>Dec. 5 </td> <td>Dec. 5 </td> <td></td> <td></td> </tr> </table>	Acc. 4 	Acc. 4 	No. 2 Acc./Dec. 6 	No. 2 Acc./Dec. 6 	Dec. 5 	Dec. 5 										
Acc. 4 	Acc. 4 	No. 2 Acc./Dec. 6 	No. 2 Acc./Dec. 6 														
Dec. 5 	Dec. 5 																
FWD REV	Forward operation command Reverse operation command FWD - CM ON : forward run OFF, decelerate and stop. REV - CM ON : reverse run OFF, decelerate and stop. When both signal apply to the terminal the inverter will decelerate and stop.																
CM	Control circuit common terminal Common terminal for control input/output signal Do not ground since this terminal is not isolated from 11																
THR	External thermostat, external DB resistor thermostat terminal The inverter will coast-to-stop, when THR - CM is over																
RST/BX	External reset signal and/or coast-to-stop command 1 During stop due to fault Alarm reset 2 During Acc., stop to steady state running Inactive 3 During Dec. Coast-to-stop																
Control circuit (output)	30A_30C	Fault signal terminal N/O contact 250 V, 0.3 A, Cos φ = 0.3, activate when fault															
	FM	Analog frequency meter terminal DC 0--10 V/0--Top frequency Adjustable maximum voltage +6.5--10.5 V Input impedance 10kΩ meter can connect to the terminal (maximum 1w)															

*SW6 (Jumper plug) located on control circuit board just above control terminals.

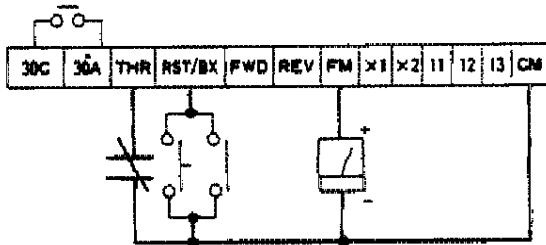
Figure 17 — Terminal Designation

Advanced Wiring (Continued)

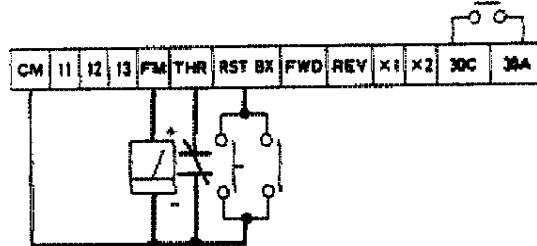
EXTERNAL TERMINAL OPERATION

1. Common wiring regardless of function code:

MODELS 1XC93 THRU 1XC95



MODELS 1XC96 THRU 1XC98



- 30A, 30C This normally open contact will close when any alarm function activates.
- FM Terminal for external analog frequency meter.
- THR Terminal for external thermal sensor. (Internal thermostat for motor, heat sensor for DB resistor, etc.) Please remove factory wiring and connect to normally closed contact of the sensor.

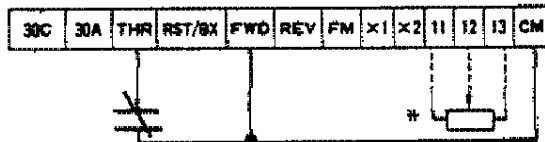
- RST/BX ... RST = Alarm reset. When any alarm function activates and motor has stopped, alarm reset accomplished by momentary contact closure.

BX = During deceleration operation. BX maintained contact closure will allow motor to coast-to-stop (bypass brake functions [a], [b], [c]).

- CM OV (zero volt) Terminal.

2. External Speed Control Potentiometer [0 1 2].

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MODELS 1XC96 THRU 1XC98



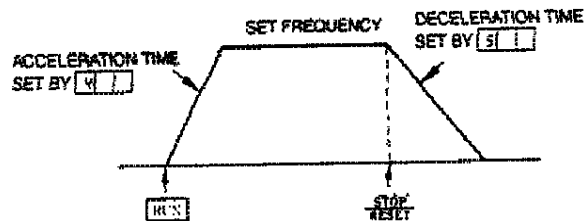
*1kΩ, 2 watt

A. Particular wiring for this operation is FWD to CM. Do not remove this wire. Inverter will not operate.

C. Operating pattern example:

B. In case the function code setting is [0 1 2], following three frequency setting methods are available.

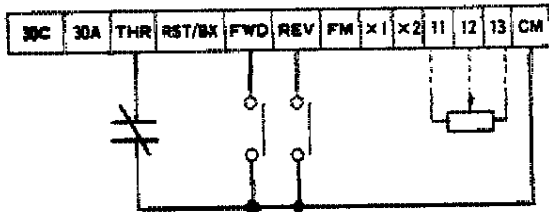
- Connect potentiometer (1kΩ, 2W) to terminal 13, 12 and 11.
- Connect analog voltage signal (DC 0 to +10V) to terminal 12 and 11. Terminal 12 is "+" polarity.
- Connect analog current signal (DC 4 to 20mA) to terminal 12 and 11. Terminal 12 is "+" polarity.



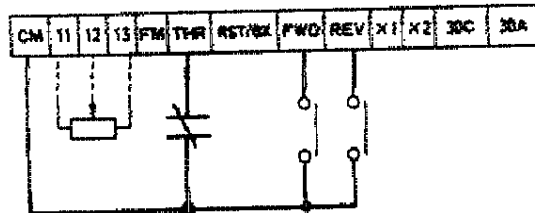
Advanced Wiring (Continued)

3. Forward/Reverse External Signal (0112, 0113)

MODELS 1XC93 THRU 1XC95



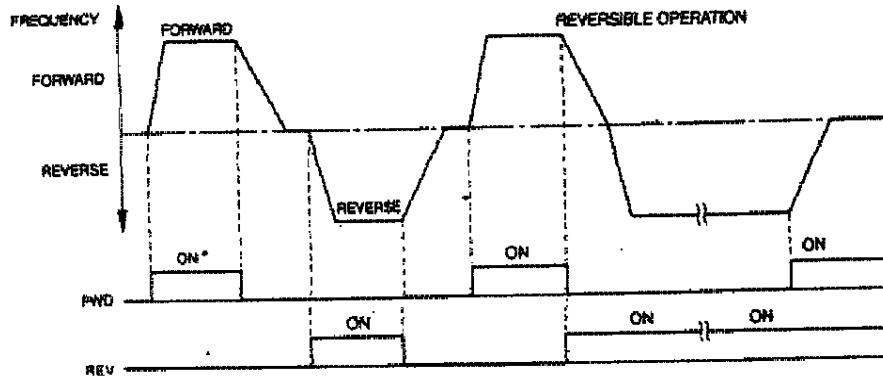
MODELS 1XC96 THRU 1XC98



A. Remove wire between FWD and CM.

B. In case the function code setting is 0113, three frequency setting methods are available. (Same as 0112, see above.)

C. Operating pattern example:



*ON = switch closed.

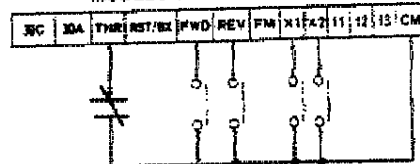
CAUTION

When FWD and REV signals are applied at the same time, the Inverter will stop.

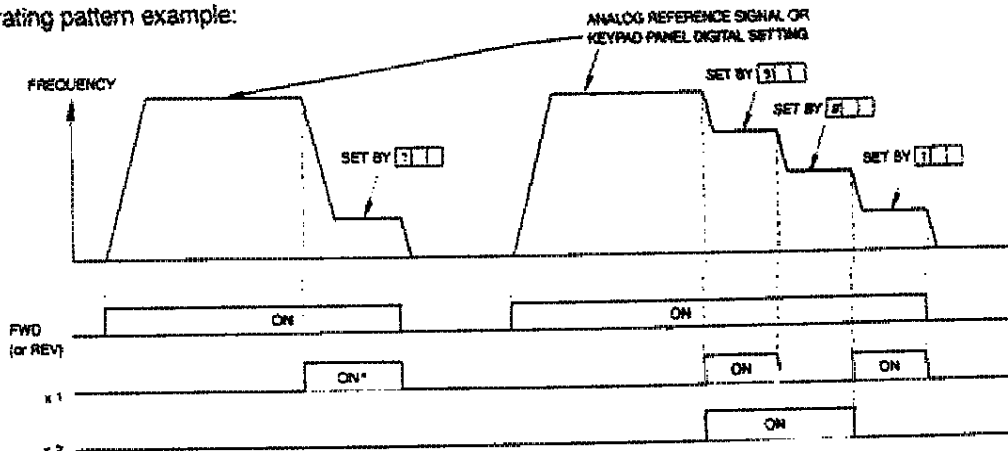
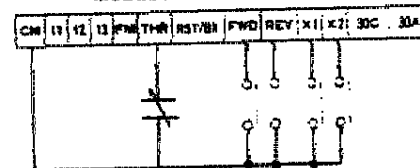
MULTIPLE-FREQUENCY SETTINGS (USING X1-X2)

- 1. Set operating method and controllable frequency by using function code 011. (Refer to Figure 15.)
2. Set No. 1, No. 2 and No. 3 fixed frequency by using function codes 711, 811 and 911 respectively.
3. Terminal arrangement. (See diagrams at right.)
4. Operating pattern example:

MODELS 1XC93 THRU 1XC95



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*ON = switch closed.

Advanced Wiring (Continued)

MULTIPLE-FREQUENCY SETTINGS (USING X1-X2)
(Continued)

No. 2 acceleration/deceleration setting (with 2 step multi-frequency setting)

1. Set No. 1 acc. time by using function code

4		
---	--	--

 and No. 1 dec. time by using function code

5		
---	--	--

.

2. Set No. 2 acc./dec. time by using function code

6		
---	--	--

. (Acc./dec. time are same setting)

3. Set function code

9		
---	--	--

,

9		
---	--	--

 as

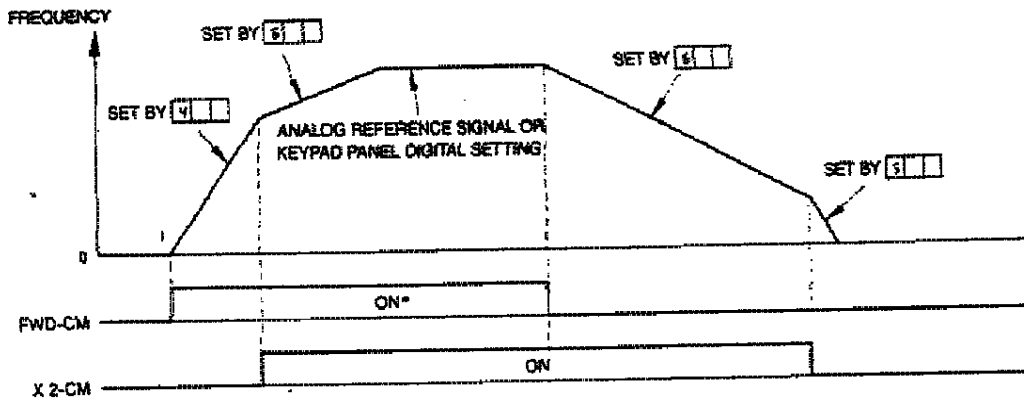
8	8	0
---	---	---

,

9	0	0
---	---	---

, so you can use terminal X2 as the selecting signal for No. 2 acc./dec.

The following figure is a typical operation pattern example:



*On = switch closed.

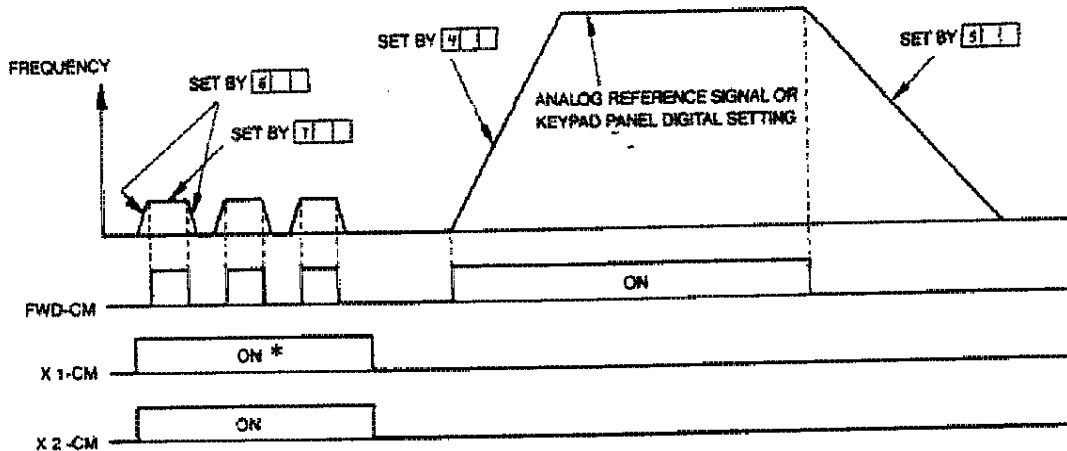
4. Combination of X1,

7		
---	--	--

 (No. 1 fixed frequency setting) and X2,

6		
---	--	--

 (No. 2 acc./dec. time setting) is also available.



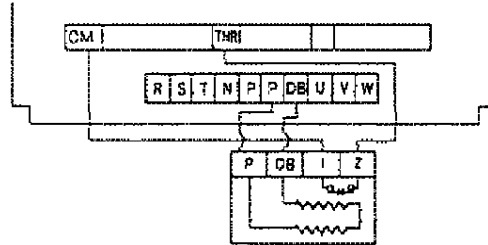
*ON = switch closed.

Advanced Wiring (Continued)

* DYNAMIC BRAKING

When frequent braking or high torque braking is required, connect an external DB (Dynamic Braking) resistor unit as shown. (1XC93 to 1XC95 are not provided with DB terminals.)

NOTE: Contact PCA at 1-800-323-0620 if use of a Dynamic Brake feature is required. Order Part No. TK80W120.



Maintenance

CHECKING POINT	INSPECTION ITEM	INSPECTION SUBJECT	REMEDY
Environment	Power supply	• Input voltage (170 ~ 253V)	
	Ambient temperature	• -10 ~ +50°C	Inspect the trouble and remove cause.
	Ambient humidity	• 90% RH or less without condensation	
	Vibration	• 0.5 G or less	
Others	Noise	• Check the bearing noise or cooling fan	Replace
	Smell	• Check scorching smell	Replace
	Dust	• Check for deposit of dust on cooling fan, heat sink, and control P.C.B.	Cleaning
	Connector	• Check loosening	Tightening
	Screw	• Check loosening	Tightening

CAUTION

When carrying out an inspection, be sure to remove the power supply and wait until the CRG lamp goes out.

MEGGER TEST

1. When carrying out a megger test of external circuit be sure to take off all inverter terminal wiring. In

case of inverter megger test, only perform it on main power circuit according to the following figure.

2. Do not perform megger test on control circuit.
3. Please use circuit tester (use high impedance range) for checking the wire connection. Do not use megger or buzzer.

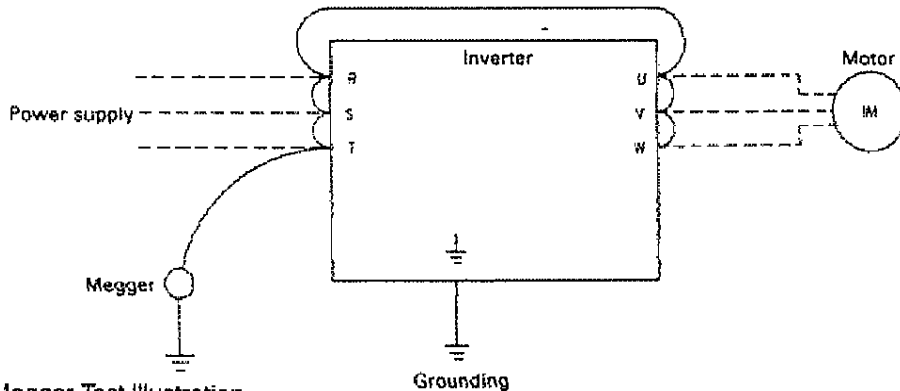


Figure 18 — Megger Test Illustration

FORM 5S3272

MODELS 1XC93 THRU 1XC98

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Specifications *

MODEL NO.		1XC93	1XC94	1XC95	1XC96	1XC97	1XC98	
Application motor output (HP)		1/3HP	1/2HP	1.0 HP	2.0HP	3.0HP	5.0HP	
Output ratings	Output capacity (KVA)	0.57	1.10	1.90	3.00	4.20	6.50	
	Output voltage (Max.) (V)	3-phase, 3 wire, 200-230V (limited by input voltage)						
	Output frequency (Hz)	50 Hz, 60 Hz, 100 Hz, 120Hz						
	Output current (A)	1.5	3.0	5.0	8.0	11	17	
	Overload capacity	150%, 1 min. (inverse time characteristics)						
Input ratings	Power supply (V)	3-phase, 3-wire, 200-230V, 50/60Hz						
	Allowable variation	Voltage: 170-253V, Frequency: $\pm 5\%$, Voltage unbalance phase to phase: $\pm 3\%$.						
Protective enclosure & cooling		NEMA 1 (self cooled)			NEMA 1 (forced air cooled)			
Weight (lbs)		2.9 lbs	3.5 lbs	4.6 lbs	7.3 lbs	7.5 lbs	7.7 lbs	
Control	Control system		Sinusoidal PWM control					
	Output frequency range		0.5 Hz - 120 Hz					
	Output frequency resolution		0.1 Hz					
	Frequency setting resolution		Digital setting: 0.1 Hz at up to 99.9 Hz			Analog setting: 0.02 Hz at 60 Hz		
	Frequency stability		Digital setting: $\pm 0.01\%$ at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$			Analog setting: $\pm 0.20\%$ at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$		
	Volt/Hz characteristic		4 patterns					
	Torque boost		16 patterns					
	Acceleration/Deceleration time		0.2 - 300 sec (at 60 Hz) independent adjustable					
	Braking torque	Regenerative	Regenerate to DC bus capacitor (external DB resistor required over 2.0 HP)					
DC injection		Time: 0.1-10 sec Voltage: 0-10% Starting frequency: 0.5-60 Hz						
Protection		Stall prevention, Overcurrent, Overvoltage, Undervoltage, instantaneous power failure, inverter heat sink overheating, External alarm.						
Operation	Frequency setting signal		Voltage input: DC 0-10V or Current input: DC 4-20 mA are selectable by using SW 6. (Located on control circuit board)					
	Input signal		Forward command, Reverse command, Multi-frequency setting, coast-to-stop command, External alarm signal, Alarm reset signal					
	Output signal		Fault: Between terminals 30A, 30C N.O. contact, AC250V, 0.3 A, $\text{Cos}\phi = 0.3$					
Indication	Output frequency monitor		DC 0-10V analog (max. voltage adjustment: 5.5-10.5V)					
	Touch panel 7-segment LED display	Running	Setting frequency, Output frequency					
		Setting	Function code and setting data					
		Fault	OC1, OC2, OC3, LU, OU, OH1, OH2, Err					
Charging lamp (CRG) [INTERNAL]		DC bus voltage level						
Condition	Installation location		Indoor not more than 3300 ft. [†] above sea level. Do not install in a dusty location or expose to corrosive gases or direct sunlight.					
	Ambient temperature		$-10^{\circ}\text{C} - +50^{\circ}\text{C}$ (Remove air ventilation hole cover plate more than $+40^{\circ}\text{C}$)					
	Ambient humidity		20-90% RH (without condensation)					
	Storage temperature		$-20^{\circ}\text{C} - +65^{\circ}\text{C}$					

(*) General data and product specifications for each individual inverter are listed on the nameplate attached to the front cover. Verify that the nameplate description is consistent with the individual product ordered prior to wiring and operation.

(†) For installations above 3300 ft contact Tech Service Department.

Dimensions

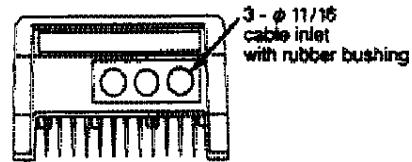
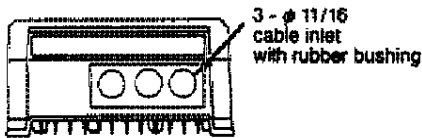
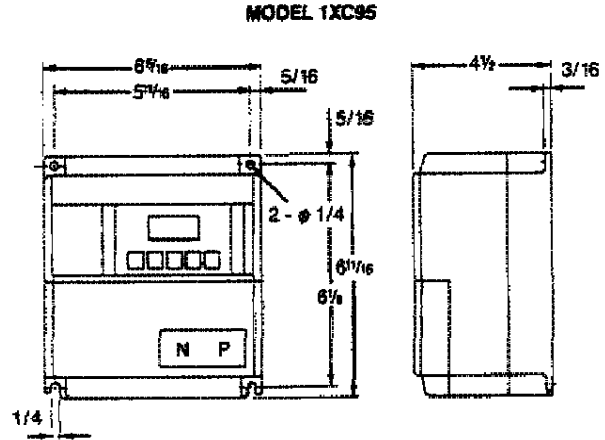
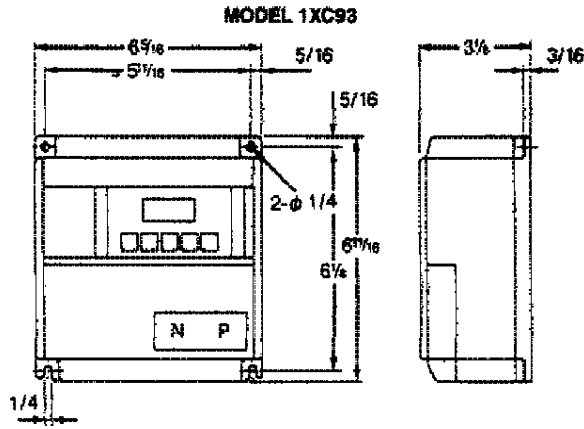


Figure 19

Figure 21

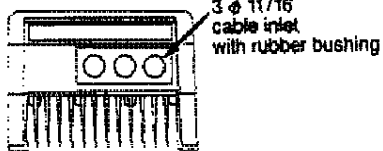
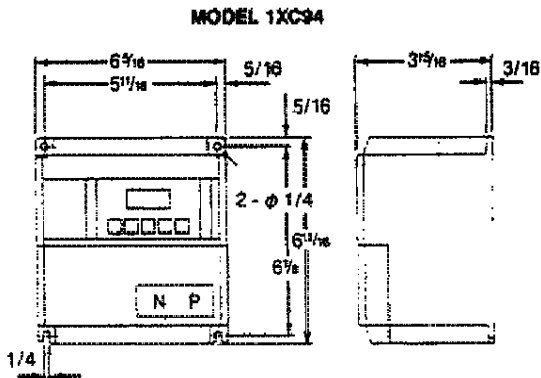


Figure 20

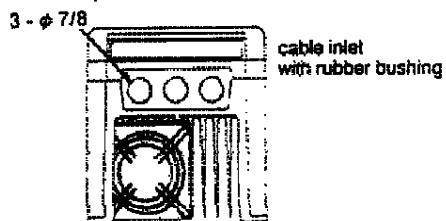
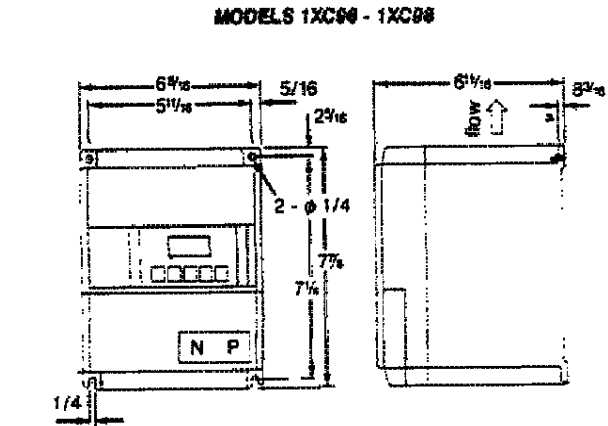
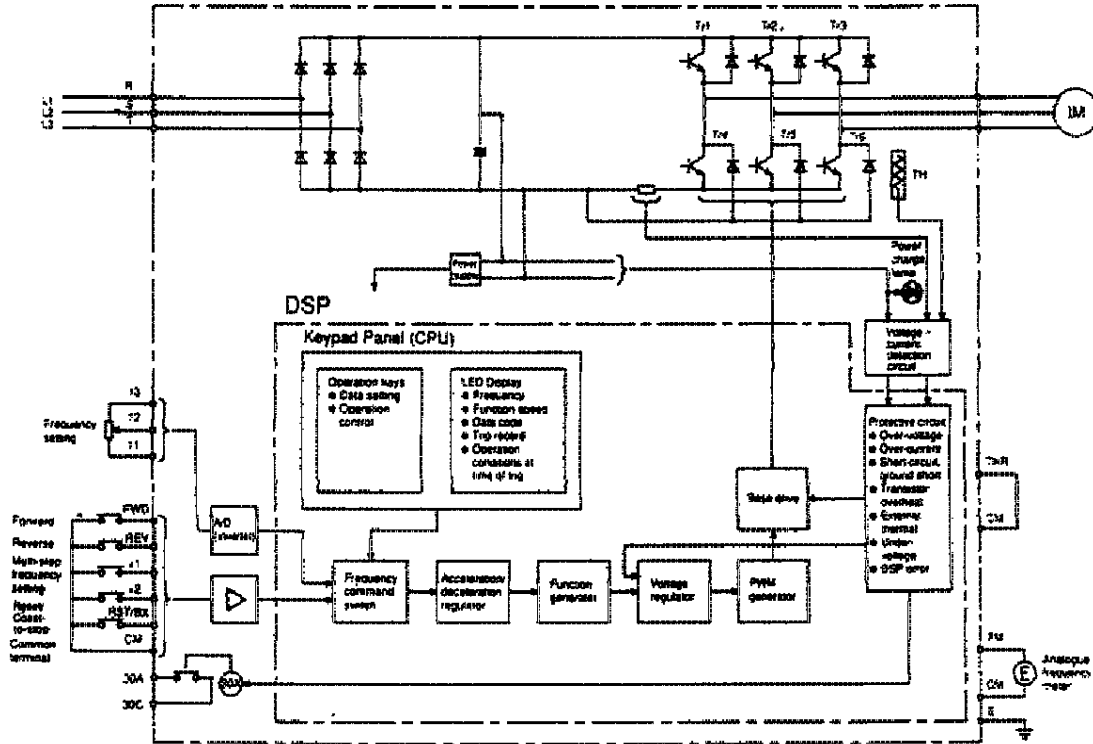
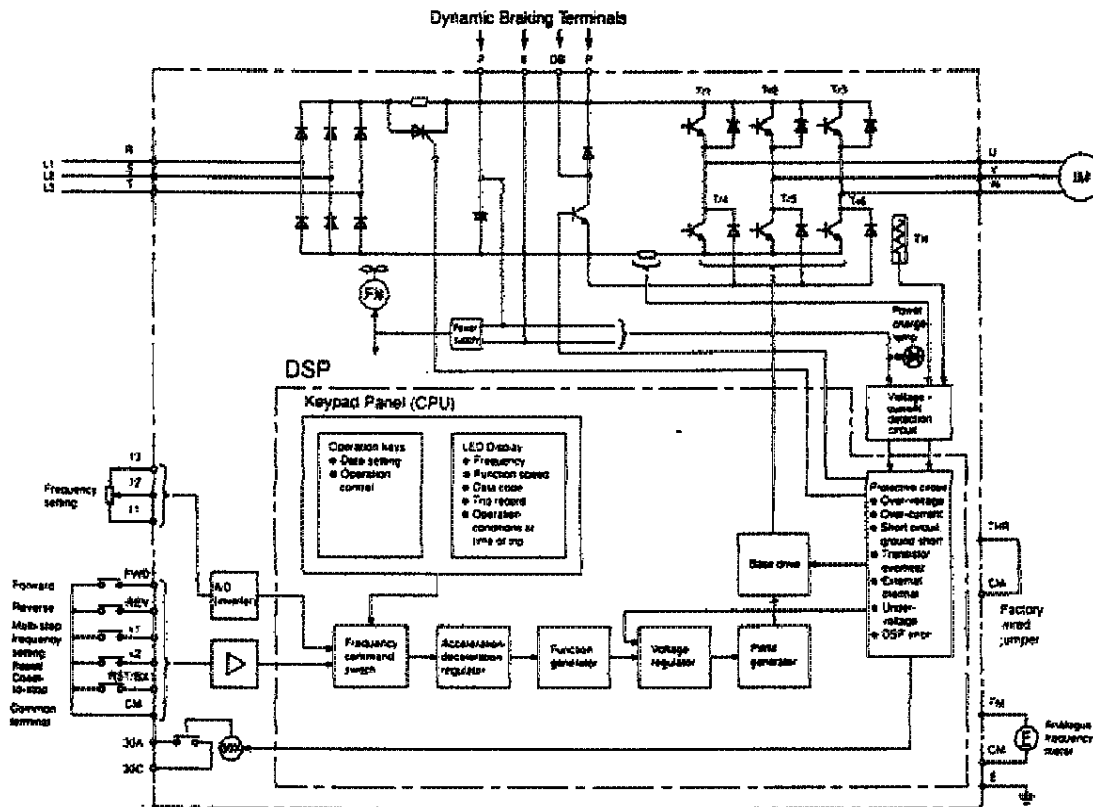


Figure 22

Typical Block Diagram for Models 1XC93 thru 1XC95



Typical Block Diagram for Models 1XC96 thru 1XC98



04303

PROTECTIVE FUNCTIONS

ALARM MESSAGE	INDICATION	DESCRIPTION	PROTECTIVE ACTION
Overcurrent Output short line to line	OC1	Overcurrent or output short line to line during acceleration	<ul style="list-style-type: none"> Shut off the inverter output. Alarm signal 1301 is activated. The inverter will hold alarm condition and signal until reset signal is applied to the inverter.
	OC2	Overcurrent or output short line to line during deceleration	
	OC3	Overcurrent or output short line to line during steady state running	
Overvoltage	OU	DC bus voltage reaches the overvoltage protection level.	
Inverter heat sink overheating	OH1	Overheating of the inverter heat sink due to overload, cooling fan malfunction or abnormal ambient temperature.	
External alarm function	OH2	THR-CM terminal open due to external fault.	
CPU error	Err	CPU malfunction due to noise	
Low voltage	LU	Under voltage of power supply	<ul style="list-style-type: none"> Shut off the inverter output.
Instantaneous power failure			<ul style="list-style-type: none"> NOTE: inverter operates continuously during power failures of 15 msec or less.

Troubleshooting Chart

INDICATION	CHECK POINT	REMEDY
OC1	① Power supply (within allowable variation)	• Adjust the supply voltage to suitable value.
	② Output circuit (short line to line)	• Check the wiring and motor winding.
	③ Torque boost (boost value too high)	• Adjust to suitable value.
	④ Acceleration time (time setting too short)	• Adjust to suitable value.
	⑤ Other than ① - ④	• Use larger size inverter.
OC2	① Power supply (within allowable variation)	• Adjust the supply voltage to suitable value.
	② Output circuit (short line to line)	• Check wire and motor winding insulation.
	③ Deceleration time (time setting too short)	• Adjust to suitable value.
	④ Other than ① - ③	<ul style="list-style-type: none"> Use larger size inverter. Adopt external DB resistor.
OC3	① Power supply (within allowable variation)	• Adjust the supply voltage to suitable value.
	② Output circuit (short line to line)	• Check wire and motor winding insulation.
	③ Abrupt change on the load	• Eliminate load fluctuation.
	④ Other than ① - ③	<ul style="list-style-type: none"> Use larger size inverter. Check noise pick up.
OU	① Power supply (within allowable variation)	• Adjust the supply voltage to suitable value.
	② Deceleration time (time setting too short)	• Adjust to suitable value.
	③ Other than ① - ②	• Adopt external DB resistor.
OH1	① Ambient temperature (within allowable variation)	• Put the inverter appropriate environment.
	② Cooling fan (malfunction)	• Replace.
	③ Load condition (load too heavy)	• Reduce the load or use larger size inverter.
OH2	① Motor protection circuit (Thermal overload relay)	• Determine fault and correct.
	② Brake resistor protection (Thermal switch)	• Extend cycle time.
	③ Wiring (THR-CM)	• Check the wiring and correct.
LU	① Power supply (within allowable variation)	• Adjust the supply voltage to suitable value.
	② Lack of phase	• Check the wiring and correct it.
	③ Magnetic contactor or MCCB	• Make it sure to turn on these equipment.
	④ Other than ① - ③	• Check power supply capacity.
Err	① Noise generating device near inverter	• Check noise pick up.

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. AC inverter, Models 1XC93 thru 1XC98, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

LIMITATION OF LIABILITY. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648