# PC 40 DSR

# ISA DAQ Boards User's Manual for

PC 40 Channel Digital to Synchro Converter Card PC 40 Channel Digital to Resolver Converter Card

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# Synchro-Resolver Boards

Data Acquisition and Process Control

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# 1. Introduction

The PC40 is a versatile, full size ISA based card. It supports up to 4 channels of Digital to Synchro or Digital to Resolver channels.

#### Features

- 8-bit ISA bus compatible.
- 12 or 14-bit outputs.
- 90V L-L or 11.8V L-L available.
- High power output up to 5VA.
- Easy to program drivers supplied.
- Support for Labview.

#### Applications

The PC40 is designed for high performance control and simulation applications.

- AC Motor control.
- Antenna positioning.
- Robot axis control.
- Automation robotics.
- Fire control systems.

#### **Key Specifications**

- Synchro or Resolver Support
- 12-bit or 14-bit outputs.
- Accuracy of 4 ARC minute @ 14-bits and 6 ARC minutes @ 12-bit.
- 1 to 4 channels.
- Transformer isolated outputs.
- Short circuit and overload protection.
- Power supply protection circuitry.
- Up to 5VA output.

#### **Software Support**

The PC40 is supported by EDR Enhanced and comes with an extensive range of examples. The software will help you to get your hardware going very quickly. It also makes it easy to develop complicated control applications. All operating system drivers, utility and test software are supplied on the EDR Enhanced CD-Rom. The latest drivers can also be downloaded from the Eagle Technology website. For further support information see the Contact Details section.

#### **Contact Details**

Below are the contact details of Eagle Technology.

#### Eagle Technology

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# 2. Installation

This chapter describes how to install and configure the PC40 for the first time. Minimal configuration is necessary; almost all settings are done through software. The base address needs to be set before first time operation.

#### Package

PC40 package will contain the following:

- PC40 based board
- Eagle Technology Software CD-Rom.

#### **Operating System Support**

The PC40 series support the Windows NT and Windows Driver Models (WDM) driver types. The operating systems are listed in the table below.

Board Type	Revision	Operating Systems	Driver Type
PC40	Revision 1	Windows NT/2000/98/ME	NT Sys, WDM PnP

Table 2-1 Operating System Support

#### Hardware Installation

This section will describe how to install your ISA board into your computer.

• Switch off the computer and disconnect from power socket.



Failure to disconnect all power cables can result in hazardous conditions, as there may be dangerous voltage levels present in externally connected cables.

- Remove the cover of the PC.
- Choose any open ISA slot and insert the ISA board
- Insert bracket screw and ensure that the board sits firmly in the ISA socket.
- Replace the cover of the PC.
- Reconnect all power cables and switch the power on.
- The hardware installation is now completed.

#### Dipswitch Settings – (I/O Base Address)

The table below shows some possible switch settings. The factory setup is at 300H.

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Address
(OFF)	(400H)	(200H)	(100H)	(80H)	(40H)	(20H)	(10H)	
OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	300H
OFF	OFF	ON	ON	OFF	OFF	OFF	ON	310H
OFF	OFF	ON	ON	OFF	OFF	ON	OFF	320H
OFF	ON	ON	ON	OFF	OFF	OFF	OFF	700H
OFF	ON	ON	ON	OFF	OFF	OFF	ON	710H
OFF	ON	ON	ON	OFF	OFF	ON	OFF	720H

Table 2-2 Dipswitch Settings

#### **Software Installation**

#### Windows 98/2000/ME

Installing the Windows 98/2000 device driver is a very straightforward task. The board does support plug and play so Windows needs to be told that a new device was installed. The *Add New Hardware Wizard* will be used for this task.

Click Start-> Settings-> Control Panel-> Add New/Remove Hardware.



Figure 2-1 Step 1

Choose a Hardware Task Which hardware task do you want to perform?
<ul> <li>Select the hardware task you want to perform, and then click Next.</li> <li>Add/Troubleshoot a device Choose this option if you are adding a new device to your computer or are having problems getting a device working.</li> <li>Uninstall/Unplug a device Choose this option to uninstall a device or to prepare the computer to unplug a device.</li> </ul>

Figure 2-2 Step 2

#### Select Add a new device.

Which hardware device do you	u want to troubleshoot?
The following hardware is alrea	ady installed on your computer. If you are having problems
If you are attempting to add a d	device and it is not shown below, select Add a new
device, and then click Next.	
Default Monitor	
ATAPI CD-ROM 40X	
ATAPI CD-ROM 40X	
ATAPI CD-ROM 40X WDC WD102AA	
ATAPI CD-ROM 40X WDC WD102AA ISAPNP Read Data Port Realtek BTI 8139(A) PCI F	Fast Ethernet Adapter
ATAPI CD-ROM 40X WDC WD102AA ISAPNP Read Data Port Realtek BTI 8139(A) PCI F	Fast Ethernet Adapter
ATAPI CD-ROM 40X WDC WD102AA ISAPNP Read Data Port Realtek BTI 8139(A) PCI F	Fast Ethernet Adapter

Figure 2-3 Step 3

Select No, I want to select the hardware from a list

Add/Remove Hardware Wizard	
Find New Hardware Windows can also detect hardware that is i	not Plug and Play compatible.
When Windows detects new hardware, it c and installs the correct driver.	hecks the current settings for the device
Do you want Windows to search for your n	ew hardware?
$\odot$ Yes, search for new hardware	
No, I want to select the hardware from the select the select the hardware from the select the sel	m a list
	< <u>B</u> ack <u>N</u> ext> Cancel
When Windows detects new hardware, it c and installs the correct driver. Do you want Windows to search for your n	hecks the current settings for the device w hardware? <u>m.a.list</u> <u>&lt; Back</u>

Figure 2-4 Step 4

#### Select Other Device or Eagle Data Acquisition if it exists.

Hardware Type What type of hardware do you want to ins	:tall?	Star 1
Select the type of hardware you want to in	ıstall.	
Hardware types:		
Network adapters		<b></b>
INT Apm/Legacy Support		
Ports (COM & LPT)		
@ Printers		
SCSI and RAID controllers		
Sound, video and game controllers		•
	11 (1 <u>14</u>	-

Figure 2-5 Step 5

#### Select Have Disk.

Add/Remove Hardware Wizard	
Select a Device Driver Which driver do you want to ir	nstall for this device?
Select the manufacturer and have a disk that contains the Manufacturers:	d model of your hardware device and then click Next. If you ie driver you want to install, click Have Disk. Models:
[Standard IDE ATA/ATAPI cor         [Standard Infrared Port]         [Standard Modem Types]         [Standard port types]         [Standard system devices]	Standard Dual Channel PCI IDE Controller Standard IDE/ESDI Hard Disk Controller
	<u>H</u> ave Disk
	< <u>B</u> ack <u>N</u> ext > Cancel

Figure 2-6 Step 6

Use the browse dialog to search for the file *pc40.inf*.



Figure 2-7 Step 7

Locate File					<u>?</u> ×
Look in:	🔁 inf		•	🗢 🗈 💣 🎟•	
Kistory	🗟 eagleboad				
Desktop My Documents					
My Computer					
Mu Nahurah B	File name:	eagleboad.inf		•	Open
My Network P	Files of type:	Setup Information (*.inf)		<b>*</b>	Cancel

Figure 2-8 Step 8

The next dialog will display the model name of the board you are trying to install.

iele	<b>ctaD</b> ⊮hich o	<b>evice D</b> Iriver do	) river you wan	t to install fo	r this dev	ice?				X
>	Selec have	t the ma a disk th	nufacture iat conta	er and mode ins the drive	l of your r you wa	hardware d nt to install,	levice , click l	and ther Have Di:	n click Ne sk.	ext. If you
dels:										
igle	Board	х С								
agle	Board								U.	up Disk-
agle	Board								На	ve Disk

Figure 2-9 Step 9

#### Select the Next button.

Add/Remove Hardware Wizard	
Start Hardware Installation Windows is ready to install drivers for your new hardware	
Eagle Board Windows will use default settings to install the software for install the software for your new hardware, click Next.	or this hardware device. To
< Back	Next > Cancel

Figure 2-10 Step 10

#### Select the *Finish* button to complete the installation.

Add/Remove Hardware Wiza	nd
	Completing the Add/Remove Hardware Wizard The following hardware was installed: Eagle Board Check your hardware documentation to see whether you have to manually configure your new hardware. For the hardware to work, you will have to restart the computer.
	To view or change the resources for this device, click Resources. To close this wizard, click Finish. <u>&lt; Back</u> Finish Cancel

Figure 2-11 Step 11

#### **Post installation**

When done with the driver installation the device manager can be open to make sure the installation was a success.

- First make sure that the driver is working properly by opening the Device Manager.
- Check under the Eagle Data Acquisition list if your board is listed and working properly. The picture below shows a typical board that is installed.

📮 Device Manager	-OX
$]$ Action View $] \leftarrow \rightarrow   \cong \blacksquare   2   2  $	
Computer     Disk drives     Disklarives     Disklarives     Disklarives     Disklarives     Disklarives     Disklarives     Disklarives     Petrol A/D Board     Petrol A/D Board     Petrol A/D Board     De ATA/ATAPI controllers     Mice and other pointing devices     Mice and other pointing devices     Monitors     Network adapters     Ports (COM & LPT)     Petrol Sound, video and game controllers     System devices     Universal Serial Bus controllers	

Figure 2-12 Device Manager

- Clearly you can see that the PCI device is listed and working properly.
- Further open the control panel and then the *EagleDAQ* folder. This dialog should list all installed hardware. Verify your board's properties on this dialog. See picture below

	EDR Enhanced S	Software Development Kit
EDR	Eagl	e Technology
NHANCED	Copyrigh	it (c) 1994 - 2000
SDK	Cape To	wn, South Africa
(http://www.	http://w	/ww.eagle.co.za
agle Technology	email: ea	igle@eagle.co.za
EDRE API Ver Opering Syster	sion  3. n W	1.44 /indows 2000 WDM
EDRE API Ver Opering Syster Installed Boards	sion  3. n ∫₩ ┌─Board Information	1.44 /indows 2000 WDM
EDRE API Ver Opering System Installed Boards	sion  3. n  W  Board Information   PCI7C	1.44 /indows 2000 WDM 
EDRE API Ver Opering Syster Istalled Boards 00000101 0000001	sion  3. n  W Board Information PCI7C Board Type	1.44 /indows 2000 WDM 3 16Ch A/D, 2Ch D/A 81
EDRE API Ver Opering System Installed Boards 00000101 0000001	n J3. n W Board Information PCI70 Board Type Driver Version	1.44 /indows 2000 WDM 3 16Ch A/D, 2Ch D/A 81 1.1.3
EDRE API Ver Opering Syster Installed Boards 100000101	n 3. n W Board Information PCI70 Board Type Driver Version Manufactured Or	1.44 /indows 2000 WDM 3 16Ch A/D, 2Ch D/A 81 1.1.3 5/6/2001

Figure 2-13 EAGLE DAQ Dialog

Now the first part of your installation has been completed and ready to install the EDR Enhanced Software Development Kit.

• Run edreapi.exe found on the Eagle CD-Rom and follow the on screen instructions

#### Windows NT

The Windows NT driver supports both Windows NT4.0 and Windows 2000. It does not require any special setup. To install the Windows NT drivers simply run *edrewinnt.exe* on the Eagle CD-Rom. This will automatically install the device drivers. Restart your computer when done. Open the *EagleDAQ* folder in the control panel to check if your installation was successful.

If you are running on Windows 2000 and it detects a new device simply install a default driver, or so called placeholder. This will disable the device in the plug and play manager. The NT driver will take control of the device.

#### Changing your resources

The plug and play manager manages the board's resources. To change a resource settings simply open the device manager and select the device. Select the properties and then the resource TAB of the properties dialog. Now you can change the settings. The picture below shows the resources of a typical device.

60 milli volt board P	roperties		?
General Driver Reso Pc60 milli vo	burces   It board		
Resource settings:			
Hesource type	ge 0300 - 030F		
Setting based on:	urrent configuration	Chang	▼ e Setting
Conflicting device list:			
No conflicts.			×
		ок	Cancel

Figure 2-14 Device Properties

#### Testing your board for the first time

To test you board for the first time, install and run the demo application found in the EDRE\APPS directory on the Eagle Technology CDROM.

<CDROM>:\EDRE\APPS\PC40DEMO



### 3. Architecture

The PC40 is a full size ISA based IBM compatible board that can have up to 4 output channels. The maximum resolution is 14-bits.

The digital information is converted to synchro or resolver when a channel is strobed. The data for each channel is arranged in two bytes. Once the data has been written, it has to be latched into the channel.

A power supply unit (PSU) protection circuit has been incorporated, which provides overvoltage protection and reverse power supply protection from the external PSU. The power supply status can be queried and controlled. The protection circuit inhibits control via software.

OFFSET (HEX 8-bit)	Name	Description	Access	
0x00	STB_CHAN0	Strobe channel 0	W	
0x01	STB_CHAN1	Strobe channel 1	W	
0x02	STB_CHAN2	Strobe channel 2	W	
0x03	STB_CHAN3	Strobe channel 3	W	
0x04	LO_DATA	Low byte latch	W	
0x05	HI_DATA	High byte latch	W	
0x06	PSU_CONTROL	PSU control	W	
0x07	PSU_STATUS	PSU status	R	

#### **Register Structure**

#### Table 3-1 PC40 Register Structure

#### **Register Descriptions**

#### STB\_CHAN0-3 (0x00-0x03)

Writing a '0' to any of these registers latched the appropriate channel data.

#### LO\_DATA (0x04)

Write the low byte of data to this register.

#### HI\_DATA (0x05)

Write the high byte of data to this register.

#### PSU\_CONTROL (0x06)

#### FIFO\_DATA Register (0x0006)

Writing a '1' to this register will enabled the power supply, Writing a '0' will disable the power supply.

#### PSU\_STATUS (0x07)

Read this register will give you the status of the power supply protection circuit. A '1' means an error condition and a '0' means circuit is OK.

#### **Programming Examples**

#### Setting an angle

- 1. Check PSU status.
- 2. If no error continue
- 3. Write high data byte.
- 4. Write low data byte.
- 5. Strobe the relevant channel.
- 6. Delay for 20us.

#### **Calculating an Angle**

HIGH BYTE = ( (ANGLE / 360) X 65536 ) DIV 256

LOW BYTE = ( (ANGLE / 360) X 65536 ) MOD 256

#### Byte weights

BIT	Byte	Shaft Angle
MSB 14	HIGH	180.0000
13	HIGH	90.0000
12	HIGH	45.0000
11	HIGH	22.5000
10	HIGH	11.2500
9	HIGH	5.6250
8	HIGH	2.8125
7	HIGH	1.4063
6	LOW	0.7031
5	LOW	0.3516
4	LOW	0.1758
3	LOW	0.0879
2	LOW	0.0439
LSB 1	LOW	0.0220

#### Table 3-2 Bit Weights

Please note that for 12 bits systems D1 and D2 are not used.

E.g. 224 degrees = 1010000000000 binary = 2800 hex.



# 4. Interconnections

The PC40 makes use of a DB37.male connector

#### **Pin Assignments**

Pin	Name	Pin	
1	-15V	20	NC
2	-15V	21	NC
3	0V	22	NC
4	0V	23	NC
5	+15V	24	NC
6	+15V	25	NC
7	NC	26	DS4
8	CS4	27	DS3
9	CS3	28	DS2
10	CS2	29	DS1
11	CS1	30	DREFLO
12	CREFLO	31	DREFHI
13	CREFHI	32	BS4
14	AS4	33	BS3
15	AS3	34	BS2
16	AS2	35	BS1
17	AS1	36	BREFLO
18	AREFLO	37	BREFHI
19	AREFHI		

Table 4-1 PC40 External Connector – DB37 (M)

#### **Pin Descriptions**

#### -15V, +15V, 0V

External supply voltage

#### **XREFLO, XREFHI**

Reference input to synchro / resolver converters.

#### XS1-4

S1, S2, S3 and S4 outputs from the converters



# 5. Programming Guide

The PC 40 is supplied with a complete software development kit. EDR Enhanced (EDRE SDK) comes with drivers for many operating systems and a common application program interface (API). The API also serves as a hardware abstraction layer (HAL) between the control application and the hardware. The EDRE API makes it possible to write an application that can be used on all hardware with common sub-systems.

The PC 40can also be programmed at register level, but it is not recommended. A detailed knowledge of the PC40 is needed and some knowledge about programming ISA devices. We recommend that you only make use of the software provided by Eagle Technology.

#### **EDR Enhanced API**

The EDR Enhanced SDK comes with both ActiveX controls and a Windows DLL API. Examples are provided in many different languages and serve as tutorials. EDRE is also supplied with a software manual and user's guide.

The EDRE API hides the complexity of the hardware and makes it really easy to program the PCI800 board. It has got functions for each basic sub-system and is real easy to learn.



Figure 5-1 EDR Enhanced Design

#### Writing an angle

Depending on the version that you have the PC40 device can have up to 4 channels. Please refer to your particular version for specific details. To write an angle value, make use of the Digital I/O commands of EDR Enhanced.

#### Writing to the Digital Outputs

A single call is necessary to write to an angle value.

#### **API-CALL**

#### Long EDRE\_DioWrite(ulng Sn, ulng Port, ulng Value)

The serial number, channel, and a value must be passed by the calling function. A return code will indicate if any errors occurred.

#### ACTIVEX CALL

#### Long EDREDioX.Write(long Port, ulng Value)

The channel number and value to be written needs to be passed and the returned value holds an error or the value read. If the value is negative an error did occur.

#### To calculate an angle value

VALUE = (ANGLE / 360) \* 16384



# **A.Specifications**

Bus Interface				
Bus Type	IBM ISA Compatible Revision			
Controller	Slave			
Voltage	5V			
Power Requirements				
+5v supply	100 mA Board 80 mA per Module			
Dimensions				
PC40 base board	Full length ISA slot			
Connectors				
PC40	DB37 (M) External			



# **B.Configuration Constants**

#### **Query Codes**

Namo	Value	Description
	value 1	
	1	Query EDRE API minor version number
	2	Query EDRE API build version number
	4	
	+ 5	Query EDRE AI 100 type. Ouery number of devices installed
BRDTYPE	10	Query humber of devices installed.
BRDREV	10	Query a board's revision
BRDYEAR	12	Query a board's manufactured year
BRDMONTH	13	Query a board's manufactured year.
BRDDAY	14	Query a board's manufactured day
BRDSERIALNO	15	Query a board's serial number
	20	Query a driver's major version number
	21	Query a driver's minor version number
	22	Query a driver's huild version number
	100	Query number of ADC channel
ADNUMSH	101	Query number of ABO onamels
	102	Query maximum sampling frequency
ADBUSY	103	Check if ADC system is busy
ADEIEOSIZE	104	Get ADC hardware EIEO size
ADFIFOOVER	105	Check for FIFO overrun condition.
ADBUFFSIZE	106	Check software buffer size.
ADBUFFOVER	107	Check for circular buffer overrun.
ADBUFFALLOC	108	Check if software buffer is allocated.
ADUNREAD	109	Get number of samples available.
ADEXTCLK	110	Get status of external clock line – PCI30FG.
ADEXTTRIG	111	Get status of external trigger line – PCI30FG.
ADBURST	112	Check if burst mode is enabled.
ADRANGE	113	Get ADC range.
DANUMCHAN	200	Query number of DAC channels.
DAMAXFREQ	201	Query maximum DAC output frequency.
DABUSY	202	Check if DAC system is busy.
DAFIFOSZ	203	Get DAC FIFO size.
CTNUM	300	Query number of counter-timer channels.
CTBUSY	301	Check if counter-timer system is busy.
DIONUMPORT	400	Query number of digital I/O ports.
DIOQRYPORT	401	Query a specific port for capabilities.
DIOPORTWIDTH	402	Get a specific port's width.
INTNUMSRC	500	Query number of interrupts sources.
INTSTATUS	501	Queries interrupt system's status.
INTBUSCONNECT	502	Connect interrupt system to bus.
INTISAVAILABLE	503	Check if an interrupt is available.
INTNUMTRIG	504	Check number times interrupted

#### **Error Codes**

Name	Value	Description
EDRE_OK	0	Function successfully.
EDRE_FAIL	-1	Function call failed.
EDRE_BAD_FN	-2	Invalid function call.
EDRE_BAD_SN	-3	Invalid serial number.
EDRE_BAD_DEVICE	-4	Invalid device.
EDRE_BAD_OS	-5	Function not supported by operating system.
EDRE_EVENT_FAILED	-6	Wait on event failed.
EDRE_EVENT_TIMEOUT	-7	Event timed out.
EDRE_INT_SET	-8	Interrupt in use.
EDRE_DA_BAD_RANGE	-9	DAC value out of range.
EDRE_AD_BAD_CHANLIST	-10	Channel list size out of range.
EDRE_BAD_FREQUECY	-11	Frequency out of range.
EDRE_BAD_BUFFER_SIZE	-12	Data passed by buffer incorrectly sized
EDRE_BAD_PORT	-13	Port value out of range.
EDRE_BAD_PARAMETER	-14	Invalid parameter value specified.
EDRE_BUSY	-15	System busy.
EDRE_IO_FAIL	-16	IO call failed.
EDRE_BAD_ADGAIN	-17	ADC-gain out of range.
EDRE_BAD_QUERY	-18	Query value not supported.
EDRE_BAD_CHAN	-19	Channel number out of range.
EDRE_BAD_VALUE	-20	Configuration value specified out of range.
EDRE_BAD_CT	-21	Counter-timer channel out of range.
EDRE_BAD_CHANLIST	-22	Channel list invalid.
EDRE_BAD_CONFIG	-23	Configuration invalid.
EDRE_BAD_MODE	-24	Mode not valid.
EDRE_HW_ERROR	-25	Hardware error occurred.
EDRE_HW_BUSY	-26	Hardware busy.
EDRE_BAD_BUFFER	-27	Buffer invalid.
EDRE_REG_ERROR	-28	Registry error occurred.
EDRE_OUT_RES	-29	Out of resources.
EDRE_IO_PENDING	-30	Waiting on I/O completion

Digital I/O Codes						
Name	Value	Description				
DIOOUT	0	Port is an output.				
DIOIN	1	Port is an input.				
DIOINOROUT	2	Port can be configured as in or out.				
DIOINANDOUT	3	Port is an input and an output.				



**C.Layout Diagram** 



### **D.Ordering Information**

For ordering information please contact Eagle Technology directly or visit our website <u>www.eagle.co.za</u>. They can also be emailed at <u>eagle@eagle.co.za</u>.

Version	Module	Bits	Reference.	L-L Volt	Frequency	Output	Power
PC40-SA-M	192E501 4	12	115V rms	90V	400Hz	SYNCHRO	5.0VA
PC40-SA-O	192B802 6	12	115V rms	90V	400Hz	SYNCHRO	1.5VA
PC40-SB-M	192E500 4	12	26V rms	11.8V	400Hz	SYNCHRO	5.0VA
PC40-SB-O	192B800 <b>6</b>	12	26V rms	11.8V	400Hz	SYNCHRO	1.5VA
PC40-SC-M	192E503 4	12	115V rms	90V	400Hz	RESOLVER	5.0VA
PC40-SC-O	192B803 <b>6</b>	12	115V rms	90V	400Hz	RESOLVER	1.5VA
PC40-SD-M	192E502 4	12	26V rms	11.8V	400Hz	RESOLVER	5.0VA
PC40-SD-O	192B804 <b>6</b>	12	26V rms	11.8V	400Hz	RESOLVER	1.5VA
PC40-SE-M	192E504	12	115V rms	90V	60Hz	SYNCHRO	5.0VA
PC40-SE-O	192B806A 🛛 🗨	12	115V rms	90V	60Hz	SYNCHRO	1.5VA
PC40-TA-M	192E601 4	14	115V rms	90V	400Hz	SYNCHRO	5.0VA
PC40-TA-O	192B702 6	14	115V rms	90V	400Hz	SYNCHRO	1.5VA
PC40-TB-M	192E600 🔮	14	26V rms	11.8V	400Hz	SYNCHRO	5.0VA
PC40-TB-O	192B700 6	14	26V rms	11.8V	400Hz	SYNCHRO	1.5VA
PC40-TC-M	192E603 🔮	14	115V rms	90V	400Hz	RESOLVER	5.0VA
PC40-TC-O	192B703 6	14	115V rms	90V	400Hz	RESOLVER	1.5VA
PC40-TD-M	192E602 4	14	26V rms	11.8V	400Hz	RESOLVER	5.0VA
PC40-TD-O	192B704 6	14	26V rms	11.8V	400Hz	RESOLVER	1.5VA
PC40-TE-M	192E604 <b>00</b>	14	115V rms	90V	60Hz	SYNCHRO	5.0VA
PC40-TE-O	192B706A 🛛 🗨	14	115V rms	90V	60Hz	SYNCHRO	1.5VA
PC40-TF-N G	192F500 🛛 🕑	14	115V rms	90V	400Hz	SYNCHRO	4.5VA
PC40-TG-O O	192F501 🛛 🛛	14	115V rms	90V	60Hz	SYNCHRO	1.5VA

**Table D-1 Ordering Information** 

IMPORTANT! (notes about the above modules), each module:

**0** = Requires two external transformers (CSI 2049 and 2050).

 $\Theta$  = Requires NO external +/-15V power supply (it is drawn from the reference).

- = Requires a +/-15V power supply with a 450mA peak capability. {500mA suggested}
- Requires a +/-15V power supply with a 2A peak capability (with no current limiting). {2.5A suggested}
- S = Available only in 4.5VA!
- = Available only in 1.5VA!

ORDERING EXAMPLE: PC40-TG-O-3

NUMBER OF BITS = 14 REFERENCE VOLTAGE = 115V rms L-L VOLTAGE = 90V FREQUENCY = 60Hz O/P TYPE = SYNCHRO POWER = 1.5VA NUMBER OF MODULES = 3