ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

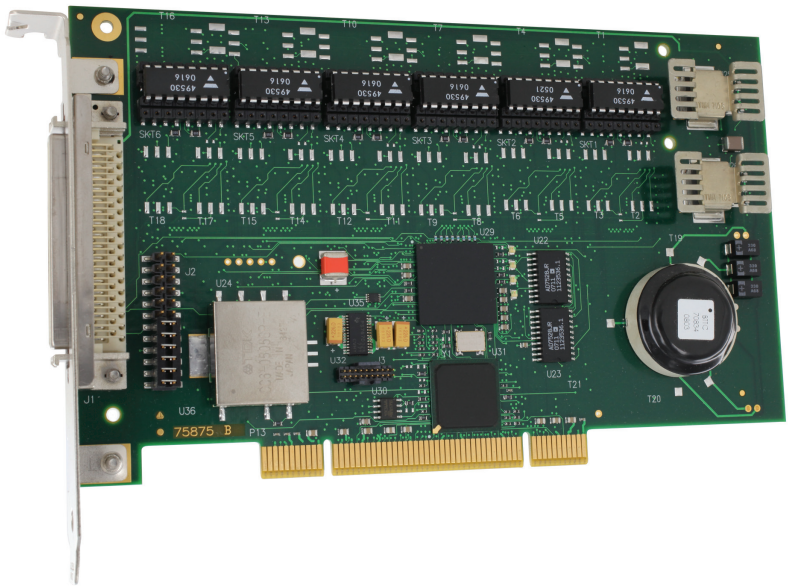
All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *DDC SB36243IA-3L0* at our website: *Click HERE*

Synchro/Resolver-to-Digital PCI Interface Card

Hardware Manual

Model: SB-3624XIX-3L0



Reliable and easy-to-use, DDC's half-size PCI card provides intelligent interfacing between a Synchro or Resolver's output and a PCI Bus.

Applications

- Motor Control
- Machine Tool Control
- Antenna Control
- Robotics
- Gimbal Control
- Process Control Systems

Custom Design Capability - DDC can customize designs for all cards, ranging from simple modifications of standard products to fully customized solutions for commercial, military, aerospace, and industrial applications.

For more information: www.ddc-web.com/SB-3624XIX

© 2013 Data Device Corporation. All trademarks are the property of their respective owners.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DDC's Synchro/Resolver Solutions

Synchro/Resolver-to-Digital | Digital-to-Synchro/Resolver

Since introducing the first synchro converter module in 1968, DDC has taken the lead role in the design and manufacture of modern data conversion products. Written by our expert staff, the Synchro/Resolver Conversion Handbook was the first integrated reference source on synchro/resolver data converters, and has served as a teaching aid for many engineers and operators over the years.

DDC offers a complete line of Synchro/Resolver instrument-grade cards and test equipment including angle position indicators and simulators, plus a variety of hardware and software to meet today's commercial, military, and COTS/MOTS requirements.

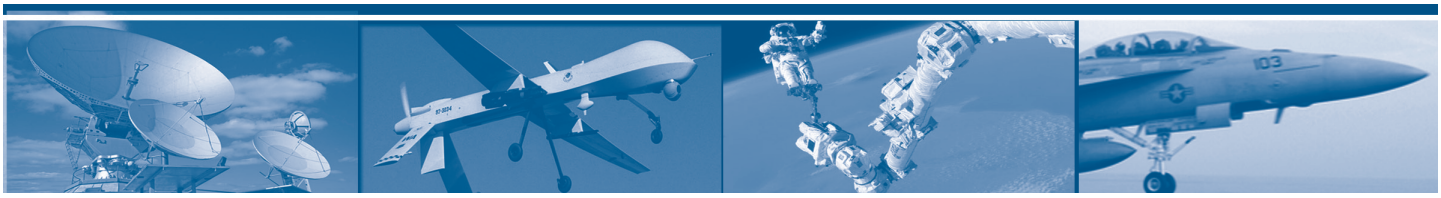
Moreover, DDC is the world's leading supplier of Synchro/Resolver-to-Digital and Digital-to-Synchro/Resolver components—the smallest, most accurate synchro/resolver-to-digital and digital-to-synchro/resolver converters available, today. Most of these single chip and hybrid converters are based on ASIC designs, yielding the most reliable converters ever offered, and are the building blocks for DDC's card-level products.

Military and industrial applications include radar, IR, and navigation systems, fire control, flight instrumentation/simulators, motor/motion feedback controls and drives, and robotics systems. MIL-PRF-38534 processing is available on many products.

Form Factors, Software, & Drivers

As the link between user and hardware, software determines the quality of the user's experience. DDC is committed to supplying the latest drivers and Graphical User Interfaces (GUIs) to support our hardware. GUIs are supplied with the SB-36240, our six-channel angle indicator PCI card, and the SB-3622X, our six-channel angle simulator PCI card. DDC provides support for high-levelfunction calls to support embedded test program development.

DDC supplies Synchro/Resolver board level products in a variety of form factors including multichannel and instrument grade USB, PCI-Express, PCI, cPCI, PMC, PC/104, ISA, and VME boards.



SB-3624XIX-3L0 SYNCHRO/RESOLVER-TO-DIGITAL PCI INTERFACE CARD HARDWARE/SOFTWARE MANUAL

MN-3624XIX-001

The information provided in this Manual is belived to be accurate; however, no responsibility is assumed by Data Device Corporation for its use, and no license or rights are granted by implication or otherwise connection therewith.

Specifications are subject to change without notice.
Please visit our Web site at http://www.ddc-web.com/ for the latest information.

All rights reserved. No part of this Manual may be reproduced or transmitted in any form or by any mean, electronic, mechanical photocopying recording, or otherwise, without the prior written permission of Data Device Corporation.

105 Wilbur Place
Bohemia, New York 11716-2426
Tel: (631) 567-5600, Fax: (631) 567-7358
World Wide Web - http://www.ddc-web.com

For Technical Support - 1-800-DDC-5757 ext. 7771
United Kingdom - Tel: +44-(0)1635-811140, Fax: +44-(0)1635-32264
France - Tel: +33-(0)1-41-16-3424, Fax: +33-(0)1-41-16-3425
Germany Tel: +49-(0)89-15 00 12-11, Fax: +49-(0)89-15 00 12-22
Japan - Tel: +81-(0)3-3814-7688, Fax: +81-(0)3-3814-7689
Asia - Tel: +65 6489 4801

DATA DEVICE CORPORATION
REGISTERED TO:
ISO 9001:2008, AS9100C:2009-01
EN9100:2009, JIS Q9100:2009
FILE NO. 10001296 ASH09

© 2010 Data Device Corp.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Revision	Date	Pages	Description
A	3/2008	All	Initial Release
B	7/2010	All	Added Linux/LabVIEW Software Installation Instructions and Overview of Package Contents. Updated in new format
C	10/12/2010	69	Figure 34 "Synchro or Resolver/Direct Input Signal Configuration", swap the two labels "Synchro" and "Resolver/Direct" Also on Pg. 69 Table 10, the "Location" for each "Input Type" changed to the following: 2V Direct - Lower Sockets 11.8V Resolver - Lower Sockets 11.8V Synchro - Upper Sockets 90V Synchro - Upper Sockets
D	10/2015	All	New software package release compatable with Windows Vista, Windows 7 and Windows 8.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1 SOFTWARE LICENSE AND POLICIES VIII

2 PREFACE 1
2.1 Text Usage 1
2.2 Standard Definitions 1
2.3 Special Handling and Cautions 1
2.4 Trademarks 1
2.5 Update Policy 1
2.6 Technical Support 2

3 OVERVIEW 3
3.1 Features 3
3.2 System Requirements 3
3.3 Supported Hardware 3
3.4 Applications 4
3.5 Specifications 5

4 HARDWARE INSTALLATION 7
4.1 Card Installation 7
4.2 Hardware Configuration 9
4.2.1 Connector Signal Configuration for Velocity or A quad B 12
4.2.2 Signal Input Configuration 12
4.2.3 Input and Output Options 13
4.3 Driver Installation 14
4.3.1 Windows Vista/7/8 Driver Installation 14
4.3.2 Windows 2000/XP Driver Installation 14
4.3.3 Windows NT Driver Installaltion 17
4.3.4 Linux Driver Installation 17

5 DETAILED ARCHITECTURE 21
5.1 Mechanical Outline 21
5.2 Synchro / Resolver to Digital Channels 22
5.2.1 Signal Connections 22
5.2.2 Bandwidth 23
5.2.3 Synthesized Reference 23
5.2.4 Incremental Encoder Emulation (A Quad B) 23
5.2.5 Velocity Output 24
5.2.6 Built-in-Test (BIT) Output 25
5.2.7 Two Speed 25
5.2.8 Self Test 25
5.2.9 On-board Reference Sine Oscillator 25

6 SOFTWARE INSTALLATION 26
6.1 Windows Software Overview 26

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.1.1 Motion Feedback Board Manager Application 26
6.1.2 Windows GUI 27
6.1.3 Synchro / Resolver Test System API Library 27
6.1.4 Windows Console Application 27
6.2 Linux Software Overview 27
6.2.1 DDC Card Manager Application 27
6.2.2 Sample Program 27
6.2.3 Synchro library header and binary files 28
6.3 LabVIEW Support Software Overview 28
6.3.1 API Library function VI's 28
6.3.2 Example VI's 28
6.3.3 Demo Application 28
6.4 Windows Software Installation 28
6.5 DDC Card Manager (Windows Vista/7/8) 29
6.6 DDC Card Manager (Windows 2000/XP) 31
6.7 Graphical User Interface (GUI) Application (Windows Vista/7/8) 36
6.7.1 Initialization 36
6.7.2 Parameter Setup 37
6.4 Graphical User Interface (GUI) Application (Windows 2000/XP) 40
6.5 Console Application 46
6.5.1 Read Angle Information 48
6.5.2 Set Oscillator Frequency 50
6.5.3 Set Amplitude 50

7 LIBRARY FUNCTION CALLS 51
char* WINAPI Initialize (int card) 51
int WINAPI End_SelfTest (int Card) 52
int WINAPI Get_Card_Type (int Card) 53
int WINAPI Get_DLL_Version (void) 53
int WINAPI Get_Last_Error (char *ErrorMsg) 54
int WINAPI Read_Bandwidth (int Card, int Channel) 55
int WINAPI Read_Bite (int card, int channel) 56
int WINAPI Read_Counter (int Card, int Channel) 57
int WINAPI Read_Direction (int Card, int Channel) 58
int WINAPI Read_Encoder (int Card, int Channel) 59
int WINAPI Read_Inhibit (int Card, int Channel) 60
int WINAPI Read_Resolution (int Card, int Channel) 61
int WINAPI SelfTest (int Card) 62
int WINAPI Start_SelfTest (int Card) 63
long WINAPI Read_Angle (int Card, int Channel) 64
void WINAPI Close (int Card) 65
void WINAPI Program_Amplitude (int Card, int Amplitude) 66
void WINAPI Program_Bandwidth (int Card, int Channel, int Bandwidth) 67
void WINAPI Program_Encoder (int Card, int Channel, int Encoder) 68

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Encoder_Resolution (int Card, int Channel, int Resolution) 69
void WINAPI Program_Frequency (int Card, int Frequency) 70
void WINAPI Program_Inhibit (int Card, int Channel, int Control) 71
void WINAPI Program_Resolution (int Card, int Channel, int Resolution) 72
void WINAPI Reset_Counter (int Card, int Channel) 73
void WINAPI Twospeed_Inhibit (int Card, int Channels) 74
WORD WINAPI Read_Angle_WORD (int Card, int Channel) 75
WORD WINAPI Read_Converter (int Card, int Channel) 76

8 ORDERING INFORMATION 78

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 1. SB-3624XIX-3L0 SYNCHRO/RESOLVER-TO-DIGITAL 4
Figure 2. SB-3624XIX-3L0X PCI Card Block Diagram 8
Figure 3. Mating Connector 10
Figure 4. J2 Jumper Configuration 12
Figure 5. Synchro or Resolver/Direct Input Signal Configuration 12
Figure 6. Resolver Signal Input Configuration 13
Figure 7. Add New Hardware Wizard Screen 15
Figure 8. Search for New Driver Screen 15
Figure 9. Search This Location for Driver Screen 16
Figure 10. Install Driver From Location Screen 16
Figure 11. Driver Installation Complete Screen 17
Figure 12. SB3624XIX-3L0 Mechanical Outline 21
Figure 13. SB-3624XIX-3L0 Card Assembly 22
Figure 14. Incremental Encoder Emulation Timing 24
Figure 15. DDC Card Manager Location 30
Figure 16. DDC Card Manager Device Number Assignment 31
Figure 17. Control Panel Window 32
Figure 18. Motion Feedback Devices Window 32
Figure 19. Modfy Device Window 33
Figure 20. Modify Pull-Down Menu 33
Figure 21. Device Number in Use! Warning 33
Figure 22. Modify Device Window (Close) 34
Figure 23. Motion Feedback Devices Window (Device # Assigned) 34
Figure 24. Motion Feedback Devices Window (Show all Devices) 34
Figure 25. Device Driver Information Window 35
Figure 26. Motion Feedback Devices Window (Close) 35
Figure 27. New GUI Workspace 36
Figure 28. Selecting Desired Card 37
Figure 29. One Speed Mode 38
Figure 30. Two Speed Mode 38
Figure 31. Channel Settings 39
Figure 32. Accessing the GUI Application 40
Figure 33. Select Card Screen 41
Figure 34. Self-Test Results 41
Figure 35. Options Screen - Oscillator Resolution Shown 42
Figure 36. Options Screen - Select Channel Shown 43
Figure 37. Options Screen - Resolution Shown 43
Figure 38. Options Screen - Encoder Output Resolution Shown 44
Figure 39. Angular Position Screen - One Speed 45
Figure 40. Angular Position Screen - Two Speed 46
Figure 41. Console Application Function Select Screen 47
Figure 42. Console Application Test Results for Read Operation 48

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1. SB-3624XIX-3L0 Specifications (Per Channel) 5
Table 2. SB3624XIX-3L0 Pin Out 11
Table 3. Signal Input Configuration 13
Table 4. Oscillator Type 13
Table 5. Input Type 14
Table 6. Dynamic Characteristics 23
Table 7. Velocity Characteristics 24
Table 8. BIT Fault Conditions 25
Table 9. Angular Position Screen 45
Table 10. Self-Test Result Codes 48
Table 11. Register Format 48
Table 12. Oscillator Frequency 50
Table 13. Oscillator Amplitude 50
Table 14. ErrorMsg Values 54

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1 SOFTWARE LICENSE AND POLICIES

IMPORTANT—READ CAREFULLY: This Software License Agreement (“SLA”) is a legal agreement between you (either an individual or a single entity) and Data Device Corporation (DDC) for this DDC software product, which includes computer software and may include associated media, printed materials, and “online” or electronic documentation (“Product”). YOU AGREE TO BE BOUND BY THE TERMS OF THIS SLA BY INSTALLING, COPYING, OR OTHERWISE USING THE PRODUCT. IF YOU DO NOT AGREE, DO NOT INSTALL OR USE THE PRODUCT; YOU MAY RETURN IT TO YOUR PLACE OF PURCHASE FOR A FULL REFUND.

GRANT OF LICENSE

DDC grants you the following rights provided that you comply with all terms and conditions of this SLA:

- Installation and use. You may install, use, access, display and run one copy of the Product on a single computer, such as a workstation, terminal or other device (“Workstation Computer”). The Product may not be used in conjunction with non-DDC devices. You may not use the Product to permit any Device to use, access, display or run other executable software residing on the Workstation Computer, nor may you permit any Device to use, access, display, or run the Product or Product’s user interface, unless the Device has a separate license for the Product.
- Storage/Network Use. You may also store or install a copy of the Product on a storage device, such as a network server, used only to install or run the Product on your other Workstation Computers over an internal network; however, you must acquire and dedicate an additional license for each separate Workstation Computer on or from which the Product is installed, used, accessed, displayed or run. A license for the Product may not be shared or used concurrently on different Workstation Computers.
- Reservation of Rights. DDC reserves all rights not expressly granted to you in this SLA.

UPGRADES

To use a Product identified as an upgrade, you must first be licensed for the product identified by DDC as eligible for the upgrade. After upgrading, you may no longer use the product that formed the basis for your upgrade eligibility.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ADDITIONAL SOFTWARE/SERVICES

This SLA applies to updates of the Product that DDC may provide to you or make available to you after the date you obtain your initial copy of the Product, unless we provide other terms along with the update.

TRANSFER

You may move the Product to a different Workstation Computer. After the transfer, you must completely remove the Product from the former Workstation Computer. You may not rent, lease, lend or provide commercial services to third parties with the Product.

LIMITATION ON REVERSE ENGINEERING, DECOMPILATION, AND DISASSEMBLY

You may not reverse engineer, decompile, or disassemble the Product.

TERMINATION

Without prejudice to any other rights, DDC may cancel this SLA if you do not abide by the terms and conditions of this SLA, in which case you must return all copies of the Product and all of its component parts.

EXPORT RESTRICTIONS

You acknowledge that the Product is of U.S. origin and subject to U.S. export jurisdiction. You agree to comply with all applicable international and national laws that apply to the Product, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments.

LIMITED WARRANTY FOR PRODUCT

DDC warrants that the Product will perform substantially in accordance with the accompanying materials for a period of one (1) year from the date of receipt. Except for the warranty made above, DDC makes no warranty or representation of any kind, express or implied, with respect to the Products, including warranty as to their merchantability or fitness for a particular purpose or as to any other matter. All claims based upon defects shall be deemed waived unless made in writing and received by DDC within one (1) year after your receipt of the Product. New Product updates are available without charge during this one (1) year term of this warranty.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ANNUAL MAINTENANCE CONTRACT

After the expiration of the one (1) year limited warranty period, a Maintenance Contract may be purchased from DDC to extend the Product warranty period for an additional one (1) year from date of expiration. With the purchase of a valid Annual Maintenance Contract, the clauses defined in Section 8 shall remain intact. Maintenance Contracts can be renewed annually and must remain valid, without any lapses, to extend the Product warranty period.

LIMITATION ON REMEDIES; NO CONSEQUENTIAL OR OTHER DAMAGES

Your exclusive remedy for any breach of this Limited Warranty is as set forth below. Except for any refund elected by DDC, YOU ARE NOT ENTITLED TO ANY DAMAGES, INCLUDING BUT NOT LIMITED TO CONSEQUENTIAL DAMAGES, if the Product does not meet DDC's Limited Warranty, and, to the maximum extent allowed by applicable law, even if any remedy fails of its essential purpose. The terms of Section 0 below ("Exclusion of Incidental, Consequential and Certain Other Damages") are also incorporated into this Limited Warranty. You may have others, which vary from state/jurisdiction to state/jurisdiction.

YOUR EXCLUSIVE REMEDY

DDC's and its suppliers' entire liability and your exclusive remedy shall be, at DDC's option from time to time exercised subject to applicable law, (a) return of the price paid (if any) for the Product, or (b) repair or replacement of the Product, that does not meet this Limited Warranty and that is returned to DDC. You will receive the remedy elected by DDC without charge, except that you are responsible for any expenses you may incur (e.g. cost of shipping the Product to DDC). This Limited Warranty is void if failure of the Product has resulted from accident, abuse, misapplication, abnormal use or a virus. Any replacement Product will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

DISCLAIMER OF WARRANTIES

The Limited Warranty that appears above is the only express warranty made to you and is provided in lieu of any other express warranties (if any) created by any documentation, packaging, or other communications. Except for the Limited Warranty and to the maximum extent permitted by applicable law, DDC and its suppliers provide the Product and support services (if any) AS IS AND WITH ALL FAULTS, and hereby disclaim all other warranties and conditions, either express, implied or statutory, including, but not limited to, any (if any) implied warranties, duties or conditions of merchantability, of fitness for a particular purpose, of reliability or availability, of accuracy or completeness of responses, of results, of workmanlike effort, of lack of viruses, and of lack of negligence, all with regard to the Product, and the provision of

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

or failure to provide support or other services, information, software, and related content through the Product or otherwise arising out of the use of the Product.

EXCLUSION OF INCIDENTAL, CONSEQUENTIAL AND CERTAIN OTHER DAMAGES

TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL DDC OR ITS SUPPLIERS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, PUNITIVE, INDIRECT, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFITS OR CONFIDENTIAL OR OTHER INFORMATION, FOR BUSINESS INTERRUPTION, FOR PERSONAL INJURY, FOR LOSS OF PRIVACY, FOR FAILURE TO MEET ANY DUTY INCLUDING OF GOOD FAITH OR OF REASONABLE CARE, FOR NEGLIGENCE, AND FOR ANY OTHER LOSS WHATSOEVER) ARISING OUT OF OR IN ANY WAY RELATED TO THE USE OF OR INABILITY TO USE THE PRODUCT, THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT OR OTHER SERVICES, INFORMATON, SOFTWARE, AND RELATED CONTENT THROUGH THE PRODUCT OR OTHERWISE ARISING OUT OF THE USE OF THE PRODUCT, OR OTHERWISE UNDER OR IN CONNECTION WITH ANY PROVISION OF THIS SLA, EVEN IN THE EVENT OF THE FAULT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, BREACH OF CONTRACT OR BREACH OF WARRANTY OF DDC OR ANY SUPPLIER, AND EVEN IF DDC OR ANY SUPPLIER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

LIMITATION OF LIABILITY AND REMEDIES

Notwithstanding any damages that you might incur for any reason whatsoever (including, without limitation, all damages referenced above and all direct or general damages), the entire liability of DDC and any of its suppliers under any provision of this SLA and your exclusive remedy for all of the foregoing (except for any remedy of repair or replacement elected by DDC with respect to any breach of the Limited Warranty) shall be limited to the amount actually paid by you for the Product. The foregoing limitations, exclusions and disclaimers (including Sections 0, 0, 0, and 0above) shall apply to the maximum extent permitted by applicable law.

U.S. GOVERNMENT LICENSE RIGHTS

All Product provided to the U.S. Government is provided with the commercial license rights and restrictions described elsewhere herein.

APPLICABLE LAW

This SLA is governed by the laws of the State of New York.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ENTIRE AGREEMENT

This SLA (including any addendum or amendment to this SLA which is included with the Product) are the entire agreement between you and DDC relating to the Product and the support services (if any) and they supersede all prior or contemporaneous oral or written communications, proposals and representations with respect to the Product or any other subject matter covered by this SLA. To the extent the terms of any DDC policies or programs for support services conflict with the terms of this SLA, the terms of this SLA shall control.

The Product is protected by copyright and other intellectual property laws and treaties. DDC or its suppliers own the title, copyright, and other intellectual property rights in the Product. The Product is licensed, not sold.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2 PREFACE

This manual uses typographical conventions to assist the reader in understanding the content. This section will define the text formatting used in the rest of the manual

2.1 Text Usage

- **BOLD**–indicates important information and table, figure, and chapter references.
- `Courier New`–indicates code examples.
- <…> - indicates user-entered text or commands.

2.2 Standard Definitions

USB Universal Serial Bus

2.3 Special Handling and Cautions

The ***SB-3624XIX-3L0 series*** uses state-of-the-art components, and proper care should be used to ensure that the device will not be damaged by Electrical Static Discharge (ESD), physical shock, or improper power surges and that precautions are taken to avoid electrocution.



Warnings: Turn off power to the computer hardware and unplug from wall.

NEVER insert or remove card with power turned on.

Ensure that standard ESD precautions are followed. As a minimum, one hand should be grounded to the power supply in order to equalize the static potential.

Do not store disks in environments exposed to excessive heat, magnetic fields or radiation.

2.4 Trademarks

All trademarks are the property of their respective owners.

2.5 Update Policy

We will update the product as new functions are developed, to the extent of the warranty period. Further information will be posted, as it becomes available.What is included in this manual?

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

This manual contains a detailed installation guide for the SB-3624XIX-3L0 PCI Card and a basic overview of the software supplied with the card. The Synchro API Library and Driver installations for Windows® 8, Windows® 7, Windows® Vista, Windows® 2000, Windows® XP, Windows NT®, and Linux will be covered in this manual. LabVIEW Support Software for Windows will also be covered.

The library software provides a level of abstraction such that it is not necessary to understand the operation of the chip set. This manual provides detailed documentation on the functions of the library.

2.6 Technical Support

In the event that problems arise beyond the scope of this manual, you can contact DDC by the following:

US Toll Free Technical Support:
1-800-DDC-5757, ext. 7771

Outside of the US Technical Support:
1-631-567-5600, ext. 7771

Fax:
1-631-567-5758 to the attention of Motion Feedback Techonologies Applications

DDC Website:
www.ddc-web.com/ContactUs/TechSupport.aspx

Please note that the latest revisions of Software and Documentation are available for download at DDC's Web Site, www.ddc-web.com.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3 OVERVIEW

The SB-3624XIX-3L0 provides intelligent interfacing between a Synchro or Resolver's output and a PCI Bus. The SB-3624XIX-3L0 is packaged as a half-size PCI card.

3.1 Features

- Plug-and-Play (PnP) compatible for easy installation
- Utilizes six RD-19230 converters
- Software Programmable Resolution (10,12,14 or 16 bits)
- Software Programmable Bandwidth
- On-Board Oscillator (optional voltage range)
- Transformer Isolation Available for 90 V Synchro, 60 Hz frequency
- Turns Counter
- Self Test

Application software has the capability to display position for either six channels of single speed or three channels of two-speed. Included with each SB-3624XIX-3L0 PCI Card is the Synchro API Library with example source code that allows users to easily write their own application software for the card.

3.2 System Requirements

The PC must be configured with a Windows 2000, XP, Vista, 7, 8, or Linux 32/64 bit operating system.

3.3 Supported Hardware

The ***SB-36040S0 SDK*** will support the following card series:

- SB-3624x – Half-size PCI Input Card Series
- SB-3621x– Full-size PCI Input Card Series
- SB-3641x– PMC Input Card Series

Note: *All screenshots in this manual may reference any of the cards listed above.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Figure 1. SB-3624XIX-3L0 SYNCHRO/RESOLVER-TO-DIGITAL

3.4 Applications

The SB-3624XIX-3L0 is designed for test applications involving angle position measurements from synchro and resolver sensors. Synchros and resolvers are used in applications such as motor control, industrial automation, robotics, antenna positioning, and valve control. This device is ideal for test engineers and developers to perform lab testing on these types of applications. Applications include modern, high performance industrial and military position feedback and control systems. Typical motion feedback applications include motor control, machine tool control, antenna control, robotics and process control systems. The SB-3624XIX-3L0 is supplied with a Graphical User Interface (GUI) to analyze position information, turns count, direction and BIT.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.5 Specifications

Table 1. SB-3624XIX-3L0 Specifications (Per Channel)

These specifications apply over the rated power supply, temperature, and reference frequency ranges; 10% signal amplitude

PARAMETER	UNITS	VALUE			
RESOLUTION	Bits	10, 12, 14, or 16 programmable			
ACCURACY (note 1, 3)	Minutes	**Input Frequency**			
		47- 1k (note 3)	**1k – 5k**	**5k – 7k**	
		1 + 1 LSB	1 + 1 LSB	2 + 1 LSB	
OSCILLATOR		**Transformer Isolation**			
Oscillator Option P/N		Option 1A	Option 1B		
Carrier Frequency	Hz	360 – 7k	54 – 440		
Voltage Range	Vrms	0 – 26	0 – 115		
Drive	mA max	60	13		
SIGNAL INPUT		**Solid State**			
Input Option P/N		Option 1, 2	Option 3, 4	Option 5, 6, 7, 8	Option 9
Synchro	Vrms L-L	2 direct	11.8	90	90
• Zin line-to-line	Ohms	10M || 20pF	105k	195k	250k
• Zin each line-to-ground	Ohms	—	70k	130k	125k
Resolver	Vrms L-L	2 differential	11.8	90	—
• Zin single ended	Ohms	140k	70k	195k	—
• Zin differential	Ohms	280k	140k	130k	—
Common-mode Range	V max	8	30	180	—
REFERENCE INPUT		**Solid State**			
Option P/N		Option 1, 2, 3, 4		Option 5, 6, 7, 8	Option 9
Carrier Frequency	Hz	47 – 7k		47 – 7k	60
Type		Differential		Differential	differential
Voltage Range	Vrms	2 – 40		50 – 130	115
Input Impedance					
• single ended	Ohms	130k		2M	619k
• differential	Ohms	260k		500k	916k
Common-mode Range	Vpeak	50		200	—
DIGITAL OUTPUTS DRIVE CAPABILITY					
A, B, Zero Index (ZI)		50 pF+ Logic 0: TTL load, 1.6 mA at 0.4 V max. Logic 1: 10 TTL loads, = 0.4 mA at 2.8V min. Logic 0: 100 mV max driving CMOS Logic 1: +5V supply minus 100 mV min driving CMOS			

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1. SB-3624XIX-3L0 Specifications (Per Channel) These specifications apply over the rated power supply, temperature, and reference frequency ranges; 10% signal amplitude			
PARAMETER	**UNITS**	**VALUE**	
POWER SUPPLY			
Voltage	Vdc	+5	+5
Current		0.655A min with oscillator, no load	1.725A max with oscillator loaded
TEMPERATURE RANGE			
Operating	°C	0 to +71	
Storage	°C	-40 to +85	
PHYSICAL CHARACTERISTICS		Short (half size) PCI format	
	in.	6.875 x 4.2 x 0.57	

Notes:
1. Add 1 minute to specified accuracy for transformer isolated cards.
2. || = “in parallel with”
3. Expect ±1 LSB jitter for frequencies between 47 and 1 kHz.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4 HARDWARE INSTALLATION

4.1 Card Installation

The SB-3624XIX-3L0 card is a PCI Target device and may be inserted into any PCI 2.1, or higher, compatible slot. Note that this card is capable of universal PCI signal and automatically defaults to 3.3V or 5V depending on the host bus. When installing the card, the following should be observed:

- **NEVER** insert or remove the card with the power turned on.
- **ALWAYS** take proper precautions to guard against static damage. Use a wrist strap if available, or ensure proper static grounding by touching the power supply cover **WITH POWER OFF**.
- Insert the card at a slight angle so that the connectors first protrude from the rear opening and then gently press the card into the motherboard connector. Secure with proper hardware.
- Make sure that adjacent cabling and wiring do not hinder the airflow around the card.
- This card is designed as a Plug-and-Play device and as such, there are no jumpers or switches to be set for address and interrupt selection. Figure 2 shows a block diagram for the Synchro/Resolver-to-Digital PCI Card.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

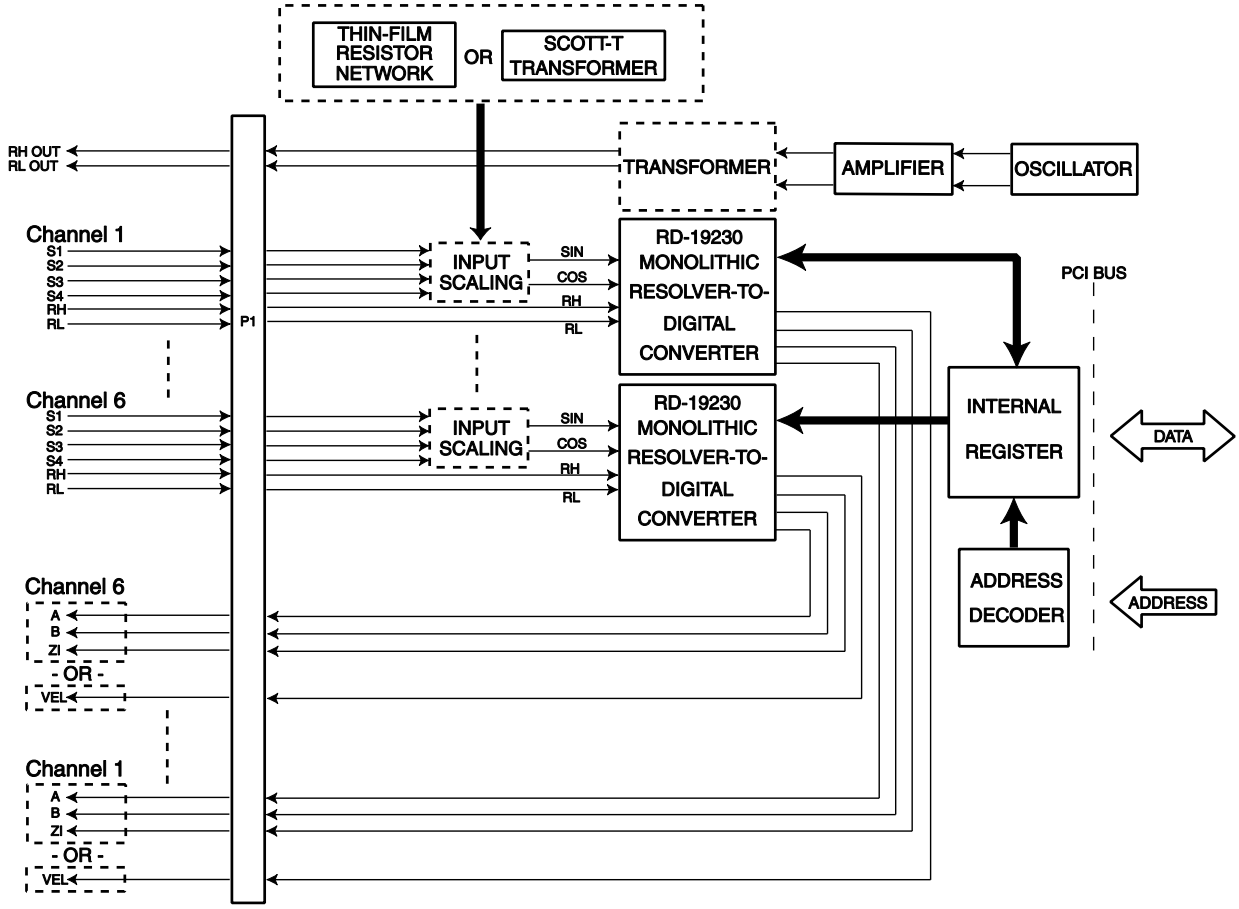


Figure 2. SB-3624XIX-3L0X PCI Card Block Diagram

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2 Hardware Configuration

The SB-3624XIX-3L0 is a PCI device, and as such does not require jumpers or switches to set the Base address or interrupt values. The job of configuration for Plug-and-Play PCI configuration is performed by the PC BIOS. During the initial power on boot process, the BIOS performs an enumeration of the PCI bus and provides a configuration in the system that satisfies the card requirements. The card provides the BIOS with details of how much memory it requires, and any other operating parameters that the system needs to know by way of configuration registers built into the card. These registers are configured at the factory to contain the optimum values for the operation of the SB-3624XIX-3L0. The SB-3624XIX-3L0 PCI card and software drivers allow for shared interrupts, thus simplifying the installation and reducing the risk of device conflicts.

Once the card has been properly installed, its configuration information is stored to the Windows Registry. The card information stored in the Registry is accessed and controlled through the use of the Motion Feedback Board Manager Application. The Motion Feedback Board Manager Application can be used to view the status of installed cards, and map an installed card to a device number. In order to access an installed card you must assign it a device number.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

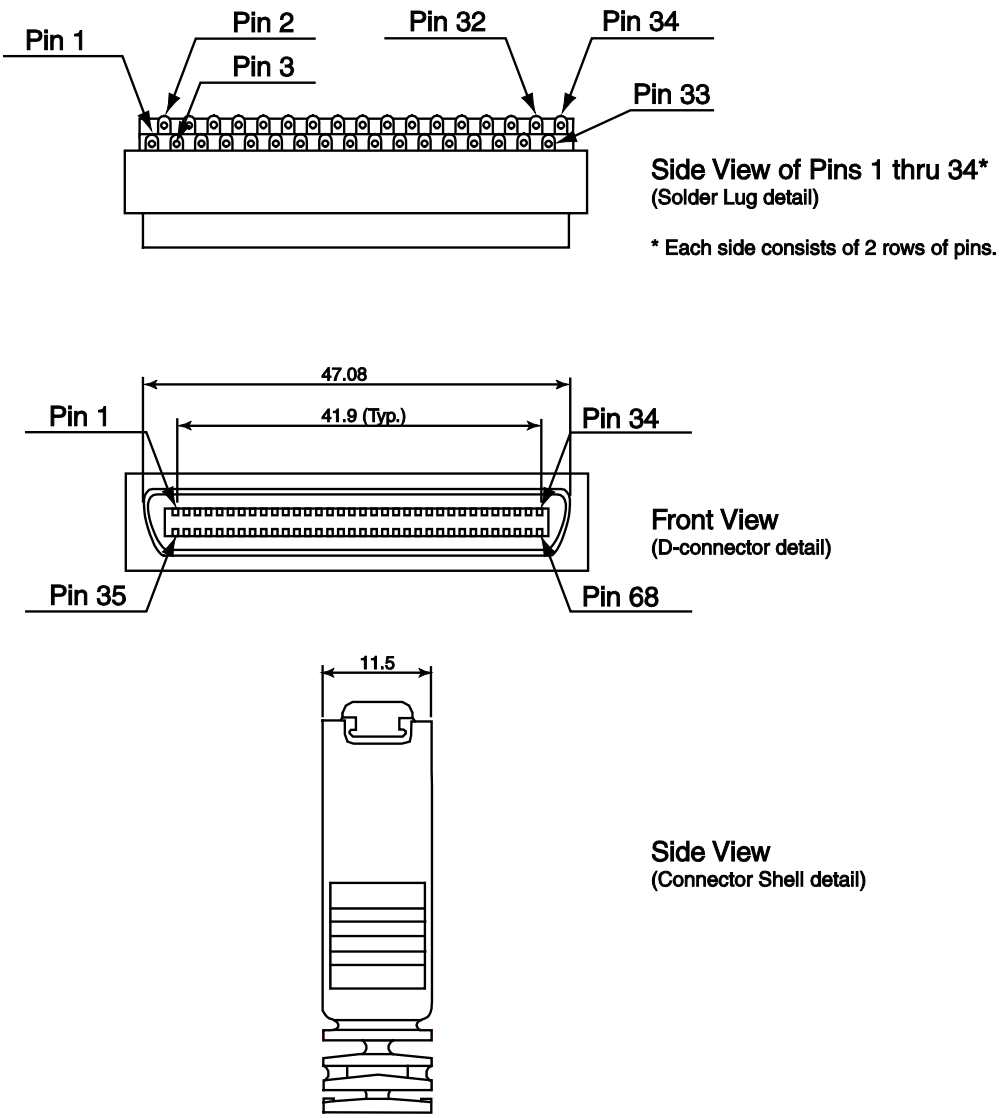


Figure 3. Mating Connector

Suggested Mating Connector:

- Solder Back : Acon HBW-3268K-3207 (includes hood and shell)
- Ribbon : 3M-10168-6000EC
- Card has 3M 68-pin connector N10268-5242 VC

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 2. SB3624XIX-3L0 Pin Out			
PIN	**NAME**	**PIN**	**NAME**
1	B ch 1 (VEL 5)	35	A ch 1 (VEL 3)
2	ZI ch 1 (VEL 4)	36	ZI ch 2(VEL 1)
3	B ch 2 (VEL 6)	37	A ch 2 (VEL 2)
4	B ch 3	38	A ch 3
5	ZI ch 3	39	ZI ch 4
6	B ch 4	40	A ch 4
7	B ch 5	41	A ch 5
8	ZI ch 5	42	ZI ch 6
9	B ch 6	43	A ch 6
10	N/C*	44	A GND 6
11	S1 6	45	S3 6
12	S2 6	46	S4 6
13	RL 6	47	RH 6
14	N/C*	48	A GND 5
15	S1 5	49	S3 5
16	S2 5	50	S4 5
17	RL 5	51	RH 5
18	N/C*	52	A GND 4
19	S1 4	53	S3 4
20	S2 4	54	S4 4
21	RL 4	55	RH 4
22	N/C*	56	A GND 3
23	S1 3	57	S3 3
24	S2 3	58	S4 3
25	RL 3	59	RH 3
26	PWR-GND	60	A GND 2
27	S1 2	61	S3 2
28	S2 2	62	S4 2
29	RL 2	63	RH 2
30	PWR-GND	64	A GND 1
31	S1 1	65	S3 1
32	S2 1	66	S4 1
33	RL 1	67	RH 1
34	RH OUT	68	RL OUT

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2.1 Connector Signal Configuration for Velocity or A quad B

The output D connector can be configured to output either velocity or Encoder (A, B, Z) signals by means of changing J2 Jumper position on the card. Depending on the application requirements, users can place the jumper block in either of the positions as shown in Figure 4. The board comes configured from the factory for velocity output.

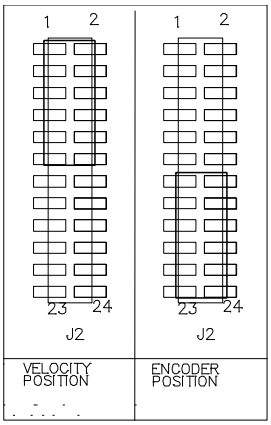


Figure 4. J2 Jumper Configuration

4.2.2 Signal Input Configuration

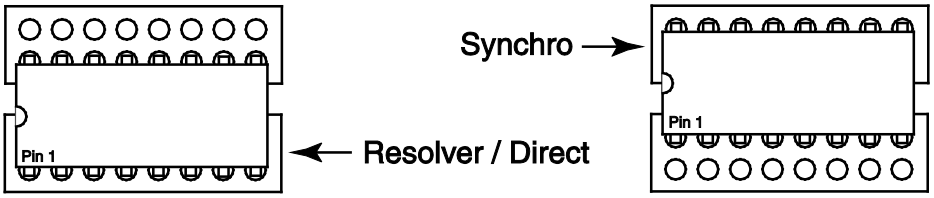


Figure 5. Synchro or Resolver/Direct Input Signal Configuration

The Synchro or Resolver/Direct input options are configured by factory installation of thin-film resistor networks within socket locations on the. Table 3 lists the resistor network and location for each input option.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 3. Signal Input Configuration		
INPUT TYPE	**THIN FILM RESISTOR NETWORK**	**LOCATION**
2V Direct	DDC – 55688-1	Lower Sockets
2V Differential	DDC - 76037	Lower Sockets
11.8V Resolver	DDC - 49530	Lower Sockets
11.8V Synchro	DDC - 49530	Upper Sockets
90V Synchro	DDC - 49590	Upper Sockets

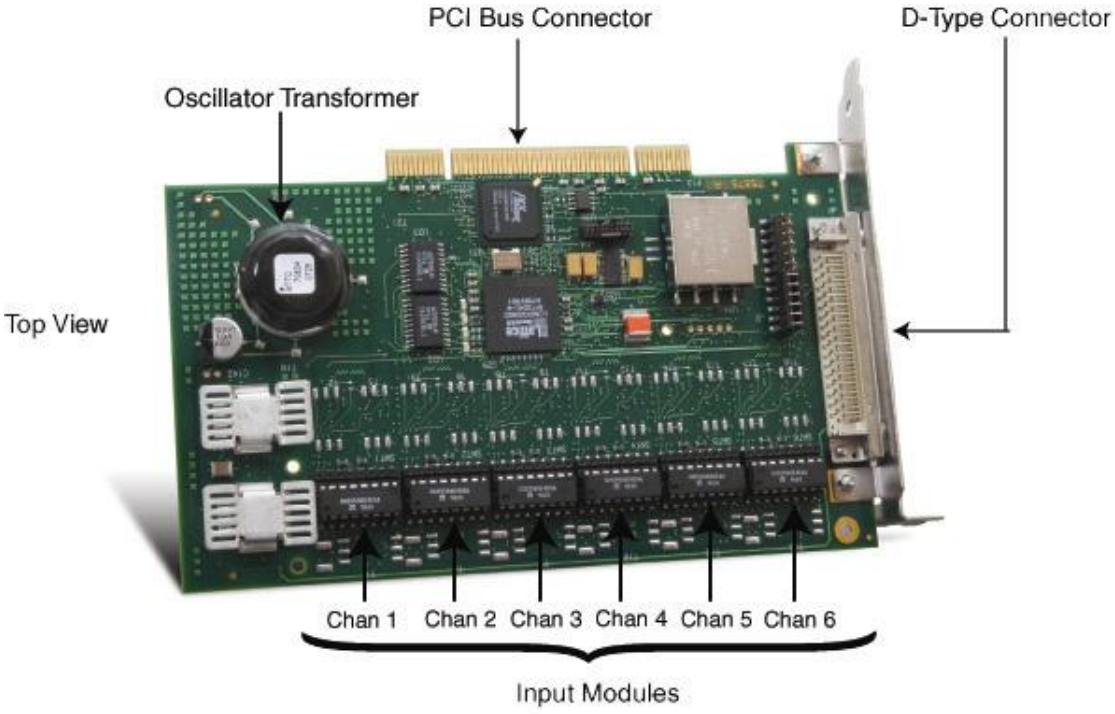


Figure 6. Resolver Signal Input Configuration

4.2.3 Input and Output Options

Table 4. Oscillator Type				
SB-3624XIX-3L0				
X	**Vrms Range**	**Frequency Range**	**Voltage**	**Type**
A	0 – 26 Vrms	360 – 7 KHz	1.5 VA	Transformer Isolated
B	0 – 115 Vrms	57 – 440 KHz	1.5 VA	Transformer Isolated

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5. Input Type				
SB-3624XIX-3L0				
INPUT #	**Type**	**Nominal Operating Frequency**	**Bandwidth**	**Oscillator Option**
1	2 Vrms Direct	400 Hz	100 Hz / 300 Hz	A
2	2 Vrms Resolver (differential)	400 Hz	100 Hz / 300 Hz	A
3	11.8 Vrms Resolver	400 Hz	100 Hz / 300 Hz	A
4	90 Vrms Synchro	400 Hz	100 Hz / 300 Hz	A
5	90 Vrms Synchro	400 Hz	100 Hz / 300 Hz	B
6	90 Vrms Resolver	400 Hz	100 Hz / 300 Hz	B
7	90 Vrms Synchro	60 Hz	15 Hz / 45 Hz	B
8	90 Vrms Resolver	60 Hz	15 Hz / 45 Hz	B
9	90 Vrms Synchro, Transformer Isolated	60 Hz	15 Hz / 45 Hz	B

4.3 Driver Installation

4.3.1 Windows Vista/7/8 Driver Installation

The software package **SB36040S0** must first be installed. Installation of this package is easily completed by following the Installshield Wizard, after opening the **SB36040S0.exe** file. Once the software has been installed, the hardware must be installed. After successfully installing both the software and hardware, the drivers will automatically be installed after the computer has been restarted.

4.3.2 Windows 2000/XP Driver Installation

After successfully installing the hardware, install the drivers. For a Windows 2000/XP operating system continue with the following installation instructions.

1. Turn on the computer.
2. The **Add New Hardware Wizard** window will appear after boot-up:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

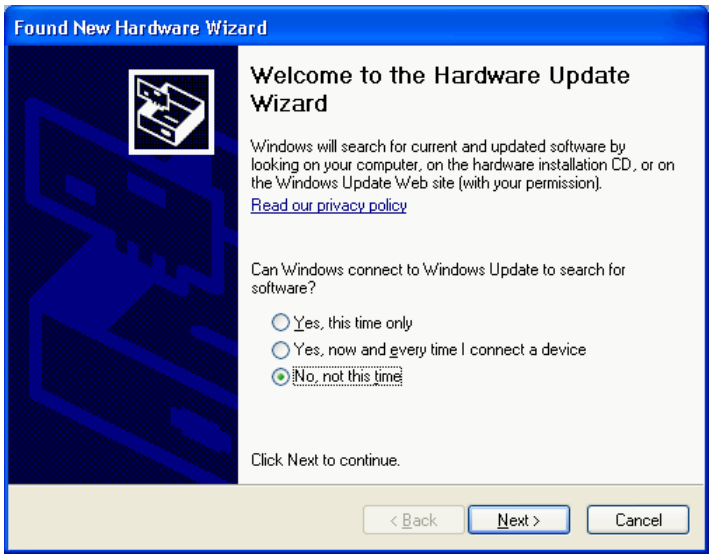


Figure 7. Add New Hardware Wizard Screen

3. Click on the **Next** button.

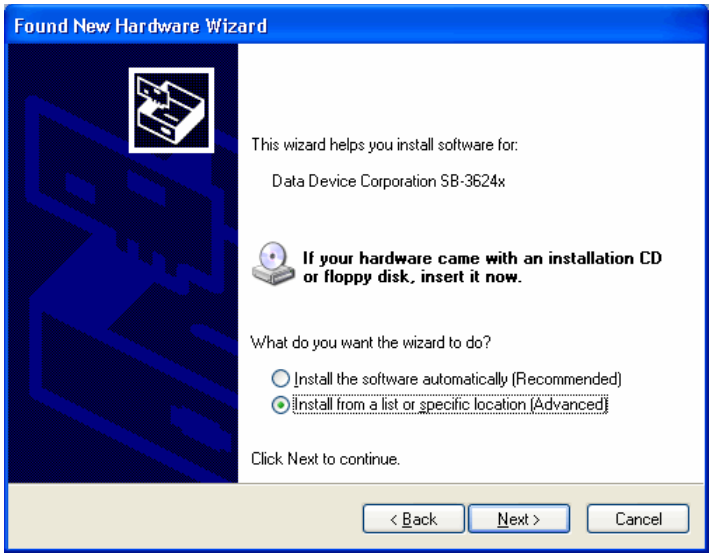


Figure 8. Search for New Driver Screen

4. Click on Search for the best driver for your device.
5. Click on the **Next** button.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

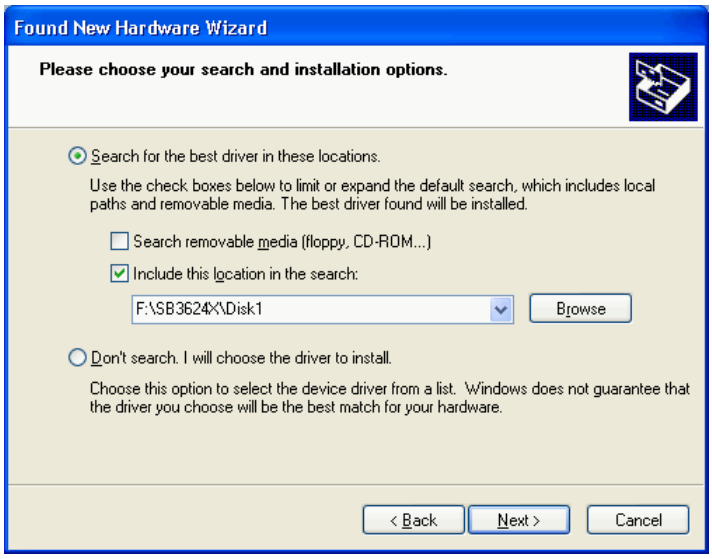


Figure 9. Search This Location for Driver Screen

6. Insert the DDC Product Catalog DVD into the DVD-ROM drive.
7. Select the **CD-ROM drive** option to install from CD-ROM.

—or—

Select the **Specify a location** option, and Browse DVD to locate the SB-3624XIX-3L0 folder.

8. Click on the **Next** button to locate the ***SB-3624XIX-3L0*** device driver.

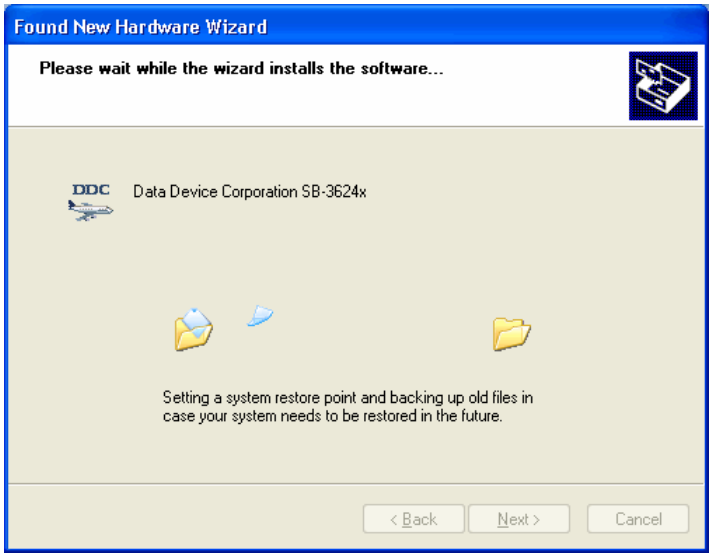


Figure 10. Install Driver From Location Screen

9. Click on the **Next** button to install the device driver.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

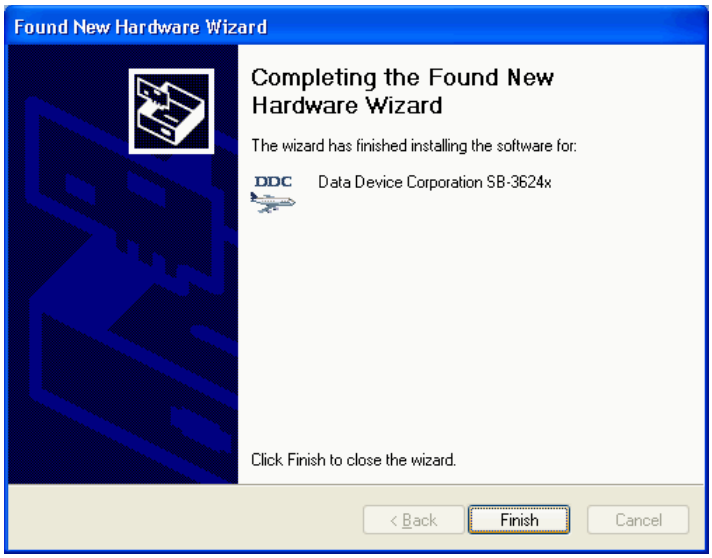


Figure 11. Driver Installation Complete Screen

10. Click on the **FINISH** button to confirm the installation.
11. Proceed to Hardware Configuration.

4.3.3 Windows NT Driver Installaltion

After successfully installing the hardware as described in Section 4.1, install the drivers. For a Windows NT operating system continue with the following installation instructions.

1. Turn on the computer.
2. Insert the DDC Product Catalog DVD into the DVD drive.
3. The DVD will auto start.
4. Select the SB3624XIX-3L0 card software to install.
5. Follow any instructions that may appear on the screen. The computer will need to be rebooted for the device driver to run.

4.3.4 Linux Driver Installation

Linux is a free Unix-type operating system developed under the GNU General Public License. The source code for Linux is freely available to everyone. Since it's inception in 1991, individuals, university students and companies began distributing Linux with their own choice of packages bound around the original kernel. This is

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

where the concept of the "distribution" was born. This also complicates providing Linux support for our hardware because there are over 150 distributions of Linux. Fedora Linux is one of the most popular distributions in the world. For this reason we have developed and tested our Linux support on one of the many Fedora distributions. **This guide was prepared using Fedora 12.**

To complete the Linux setup, the user should be familiar with basic Linux procedures and commands (mounting, compiling, etc.). If you are unfamiliar with Linux, try visiting some of these sites for helpful documentation:

- www.ora.com
- www.kernel.org
- www.linux.org
- www.linuxmall.com
- www.amazon.com
- www.ssc.com
- www.linuxhq.com

Documentation can also be found at any of the following major distribution sites for Linux:

- www.fedoraproject.org
- www.redhat.com
- www.caldera.com
- www.debian.org
- www.slackware.com
- www.suse.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.3.4.1 Package Installation

The following installation procedure is also described in the Install.txt file provided in the SB3624x_X_Y_Z.tgz archive:

1. Create a new (working) directory called '*synchro*' and go to it.

```
mkdir synchro
cd synchro
```

2. Become the super user 'su' (root).

```
su
```

3. Copy the synchro archive to the working directory and uncompress (TAR/G-ZIP) it.

```
tar –xzPpvf SB3624x_X_Y_Z.tgz
```

4. Create the shared library links and cache for runtime linking of the synchro library.

```
/sbin/ldconfig
```

5. Change ownership of all of the files to normal user and then exit superuser mode.

```
chown –R users.username *
exit
```

The driver, card manager and sample program will now be available in the selected working directory.

4.3.4.2 Device Driver

Upon installation, the device driver binary for the SB-3624x card must be compiled and placed in the common DDC directory. This can be done through the following steps:

1. Go to the working directory.

```
cd synchro
```

2. Go to the 'sb3624x' directory under the 'drivers' directory.

```
cd drivers/sb3624x
```

3. Become the super user 'su' (root).

```
su
```

4. Run the 'Makefile' script.

```
Make
```

Note: *The 'KVER' declaration found at the top of the 'Makefile' script will need to be modified to reference the base of the kernel source tree if it is not found*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

at '/lib/modules/$(shell uname -r)/build'.

5. Upon successful compilation of the driver, the sb3624x.ko module must be copied to the '/usr/lib/ddc' directory.

   ```
   cp sb3624x.ko /usr/lib/ddc
   ```

6. Exit superuser mode.

   ```
   exit
   ```

4.3.4.3 DDC Card Manager

Upon installation, the device driver binary for the SB-3624x card must be compiled and placed in the common DDC directory. This can be done through the following steps:

1. Go to the working directory.

   ```
   cd synchro
   ```

2. Go to the 'sb3624x' directory under the 'drivers' directory.

   ```
   cd drivers/sb3624x
   ```

3. Become the super user 'su' (root).

   ```
   su
   ```

4. Run the 'Makefile' script.

   ```
   Make
   ```

Note: *The 'KVER' declaration found at the top of the 'Makefile' script will need to be modified to reference the base of the kernel source tree if it is not found at '/lib/modules/$(shell uname -r)/build'.*

5. Upon successful compilation of the driver, the sb3624x.ko module must be copied to the '/usr/lib/ddc' directory.

   ```
   cp sb3624x.ko /usr/lib/ddc
   ```

6. Exit superuser mode.

   ```
   exit
   ```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5 DETAILED ARCHITECTURE

5.1 Mechanical Outline

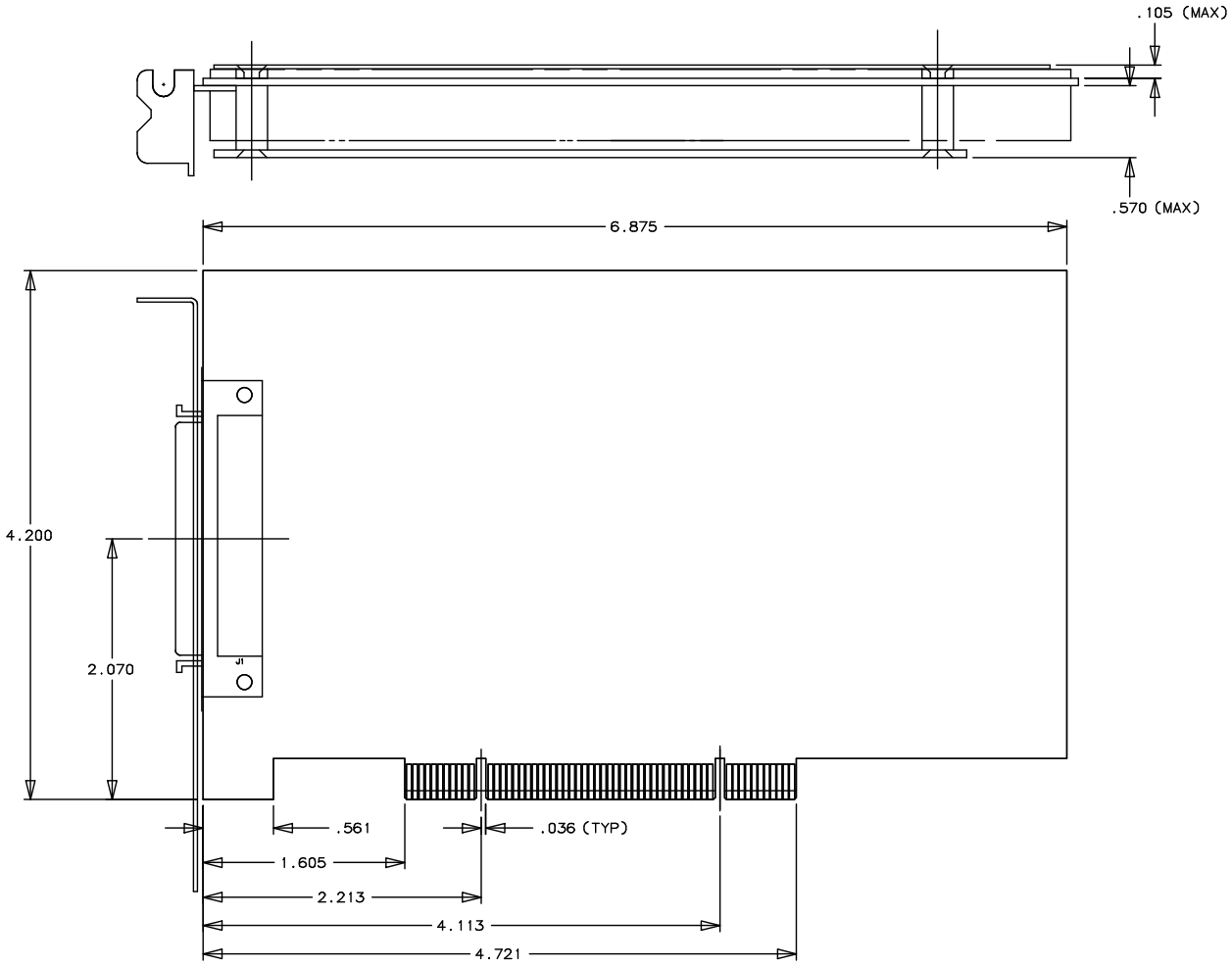


Figure 12. SB3624XIX-3L0 Mechanical Outline

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

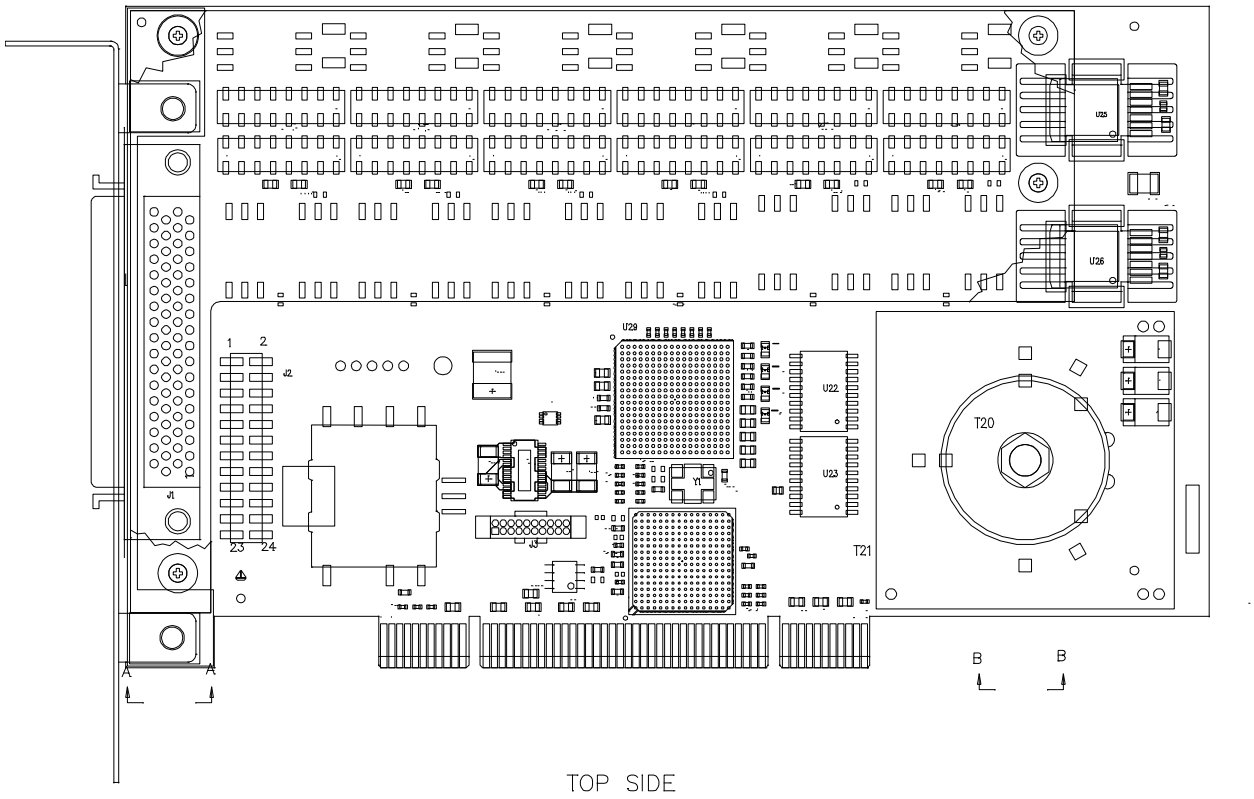


Figure 13. SB-3624XIX-3L0 Card Assembly

5.2 Synchro / Resolver to Digital Channels

5.2.1 Signal Connections

- Synchro Mode Connect S1, S2, S3
  - S1 = X
  - S2 = Z
  - S3 = Y

- Resolver Mode Connect
  - S3 = +SIN
  - S1 = -SIN
  - S2 = +COS
  - S4 = -COS

- Single ended mode connections.
  - When using 2v single ended configurations, S1 and S4 on card connector are no-connect. Use associated analog ground per output channel for S1 and S4 resolver outputs used.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.2.2 Bandwidth

The user can program the device through software for each input channel independently for Low bandwidth (15/45 Hz) or High bandwidth (100/300 Hz) depending on order selection. Refer to Table 6 for dynamic characteristics.

Use caution when operating in 10-bit and 12-bit modes. Large input steps can induce a high acceleration into the R/D converter that may cause the maximum velocity to be exceeded. If this occurs, the converter can enter a spin-around condition where it may never settle to an angle because of the low bandwidths at these resolutions.

Table 6. Dynamic Characteristics

TYPE		60 Hz NOMINAL				400 Hz NOMINAL			
RESOLUTION (bits)		10	12	14	16	10	12	14	16
BANDWIDTH (Hz)	Low	*	*	15		*	*	100	
	High	45		**	**	300		**	**
TRACKING RATE (rps)		32	8	2	.5	320	80	20	5
SCALE FACTOR (Volts/rps)		.125	.5	2	8	.0125	.05	.2	.8

*Not recommended - Low bandwidths in low resolutions may induce spin around and the part will not settle
**High bandwidths in high resolutions may be used with carrier frequencies above 1.5 kHz

5.2.3 Synthesized Reference

The synthesized reference eliminates errors due to phase shift within the synchro/resolver sensor of up to 45° between the reference and the signal inputs. This feature is built into both input channels of this device.

5.2.4 Incremental Encoder Emulation (A Quad B)

The device can also be used for incremental encoder emulation. The following outputs are readily available A, B, and ZIP (Zero Index Pulse). The timing of the A, B output is dependent on the rate of change of the synchro/resolver position (rps or degrees per second) and the encoder resolution latched into the converter (refer to Figure 14). The calculations for the timing are:

n = resolution of parallel data

t = 1 / (2n * Velocity(RPS))

T = 1 / (Velocity(RPS))

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

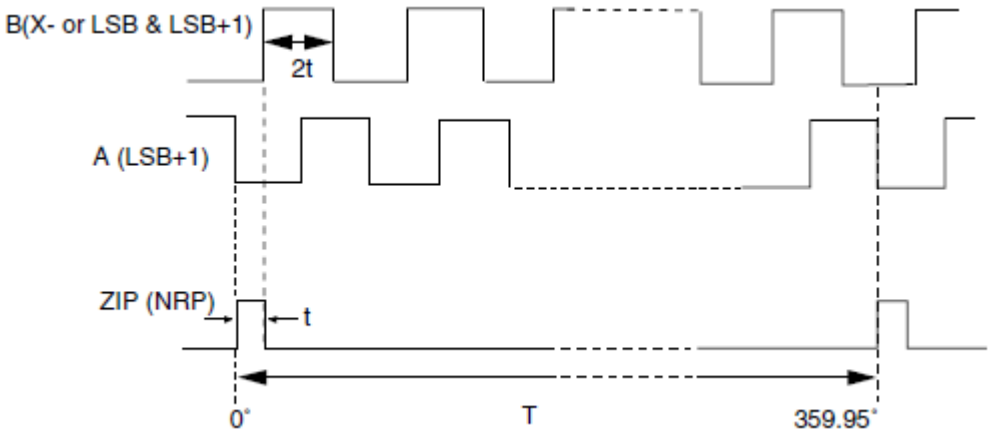


Figure 14. Incremental Encoder Emulation Timing

5.2.5 Velocity Output

Each input channel has an analog velocity output . The analog velocity output is accessible through connector P3. The voltage range is +/- 4V. The polarity indicates the direction of rotation where a positive voltage is for increasing angle. See Table 7 below for analog velocity characteristics.

Table 7. Velocity Characteristics

PARAMETER	UNITS	TYPICAL	MAX./MIN.
POLARITY Voltage Range	V	4.0	
VOLTAGE SCALING (resolution dependent)	RPS/V	Typical TR (See Table 6)	
SCALE FACTOR			
Error	%	10	20 (max.)
Scale Factor TC	PPM/ deg C	100	200 (max.)
Reversal Error	%	1	2 (max.)
Linearity	% output	0.5	1 (max.)
Zero Offset	mV	5	15 (max.)
Zero Offset TC	uV/ deg C	15	30 (max.)
Load	k Ohms		10 (min.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.2.6 Built-in-Test (BIT) Output

The Built-In-Test (BIT) will flag Loss-of-Signal (LOS), Loss-of-Reference (LOR), Loss-of-Tracking (LOT), and 180° phase error fault conditions. The BIT output is active low and a logical OR of these four conditions. Any one or combination of these conditions will assert the BIT output. These fault conditions are described in Table 8 below. Also, excessive error is detected when the difference between the analog input and the digital output exceeds approximately 100 LSBs of positive or 250 LSBs of negative error (in the selected resolution), the BIT will be asserted.

Table 8. BIT Fault Conditions

Fault Condition	Descritption
LOS	Both SIN and COS inputs (S1-S3, S2-S4) must fall below 0.5 Vrms.
LOR	The reference input (RH-RL) must fall below 0.5 Vrms.
LOT	This condition occurs when the difference between the anlog input and digital output exceeds 100 lsbs in the positive direction or 250 lsbs in the negative direction. This typically occurs when exceeding the maximum tracking rate or during power up.
180° Phase Error	180° phase error input signal to reference input (false null) causes a BIT plus kickstarts the converter counter to correct the error.

5.2.7 Two Speed

Two speed allows resolutions greater than 16 bits to be achieved. See “CalculateTwoSpeed” in Appendix A of the card manual for details. Also refer to the RD/RDC Applications manual (MN-19220XX-001) and the Synchro/Resolver Conversion Handbook. These documents are available at www.ddc-web.com.

5.2.8 Self Test

The device has a built-in self test capability which can run a simulated test angle of 0, 45, or 90 degrees on each channel. Any channel not reporting back an answer within ± 1° will fail.

5.2.9 On-board Reference Sine Oscillator

The on-board oscillator may be used to take the place of an external drive oscillator for the excitation signal. This oscillator is available in several options, see the ordering information page for details. Depending on oscillator selected, there are three programmable voltage ranges. Via software, the oscillator frequency and voltage are programmed. Voltage can be programmed up to max voltage selection ordered.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6 SOFTWARE INSTALLATION

There are software applications which are used in conjunction with the SB-3624XIX-3L0 device. A software package containing the following applications are included with your device.

For Windows:

- Motion Feedback Board Manager
- Console Application
- Graphical User Interface (GUI)
- Synchro.dll

For Linux:

- DDC Card Manager
- Sample Program
- Synchro Library header and binary files

For LabVIEW:

- API Library Function VI's
- Example VI's
- Demo Application

Note: *If you did not receive the application software described on the following pages with your card, please contact DDC customer service.*

6.1 Windows Software Overview

6.1.1 Motion Feedback Board Manager Application

A Motion Feedback Board Manager Application contained in the Control Panel is used to define each Synchro/Resolver card type in the system and the address for each Synchro/Resolver card. The Motion Feedback Board Manager Application is installed in the Control Panel during the setup.exe installation. The Motion Feedback Board Manager Application will route the information to the appropriate routine for the card type selected.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.1.2 Windows GUI

An executable GUI is included with the SB-3624XIX-3L0 device to demonstrate the full capabilities of the card.

6.1.3 Synchro / Resolver Test System API Library

The Synchro / Resolver Test System API Library DLL (Dynamic Link Library) has been created to provide the user with a hardware abstraction layer for the SB-3624XIX-3L0. This software layer includes routines that dramatically reduce software development time by providing a high level C functions for the application programmer to interface to the USB device. Section 7 of this manual describes the routines available from the DLL.

Both 32-bit and 64-bit versions of the DLL are included with the software package.

6.1.4 Windows Console Application

A basic CLI console application is also included along with its source code to provide a user with example code on how to create a simple application using the API library.

6.2 Linux Software Overview

6.2.1 DDC Card Manager Application

The Card Manager provides the capability to assign logical device numbers to installed DDC devices for access from application programs built against the Synchro library.

To build and install the program, type 'make' on the command line in the 'drivers' directory as the 'root' user. In the rare event that the Card Manager does not run due to system library incompatibilities, the source code for the application is included in the 'drivers' directory.

Ensure all drivers are loaded for all cards to be exercised, then run 'ddccm' as any user and follow the prompts displayed in order to associate a device with a logical device number.

6.2.2 Sample Program

A sample program is included with this package to demonstrate the building of an application program and the use of an SB-3624x card. To build the sample program, run 'make' on the command line in the 'sb3624x' directory under the 'samples' directory.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.2.3 Synchro library header and binary files

A user may develop custom code using the included Synchro Library header and binary files. See the Function Calls section of this manual for a list of the available routines. The header file associated with the Synchro library, 'synchro.h', is found in the typical system header tree under '/usr/include/synchro'. This file is to be included in any application source code that will make calls to the SB-3624x device, as shown:

#include <synchro/synchro.h>

The static and shared library binary files with associated links, 'libsynchro.*', are found in the typical system library directory '/usr/lib'. Linking an upper level application to the Synchro library typically involves including the '-lsynchro' option on the linker command line. Refer to the 'Makefile' found in the 'samples' directory for examples of how to build application programs.

6.3 LabVIEW Support Software Overview

6.3.1 API Library function VI's

The LabVIEW Support package includes VI's for every function call provided in the Synchro API Library for a user to develop a custom application in the LabVIEW environment.

6.3.2 Example VI's

A set of example VI's are included to demonstrate the usage of some of the library function VI's, or be used in a user application.

6.3.3 Demo Application

A demo application is included to demonstrate the building of a LabVIEW application as well as the usage of the SB-3624x card. The functionality of this application can be found similar to the Windows console program.

6.4 Windows Software Installation

If an existing version of the software is already installed, you must first uninstall it through the **Control Panel → Add or Remove Programs**.

The Windows software is available on the MFT Software CD included with the device. To ensure you have the latest version of the software, download it off our website at www.ddc-web.com.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Perform the following steps below to install the software package for Windows from the MFT CD:

1. Insert the MFT CD into the CD-ROM drive, and allow the CD to auto start.
2. Choose your product (i.e., SB-36240XIX).
3. Choose the appropriate software you wish to install (i.e., SB-36040S0).
4. Click on the Install Software icon.
5. Follow the on screen instructions to complete the installation.

Perform the following steps below to install the software package for Windows from the downloadable ZIP file:

1. Extract the .zip file.
2. Run the **Setup.exe** file for the operating system version that applies to you (x86 or x64 indicating 32-bit and 64-bit respectively).
3. Follow the on screen instructions to complete the installation.

6.5 DDC Card Manager (Windows Vista/7/8)

Once you have installed the hardware and software, you are now ready to configure the card. Device configuration is performed through the use of the DDC Card Manager Application.

1. To access the DDC Card Manager go to **Programs → Data Device Corporation → Synchro Library SDK → DDC Card Manager**.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

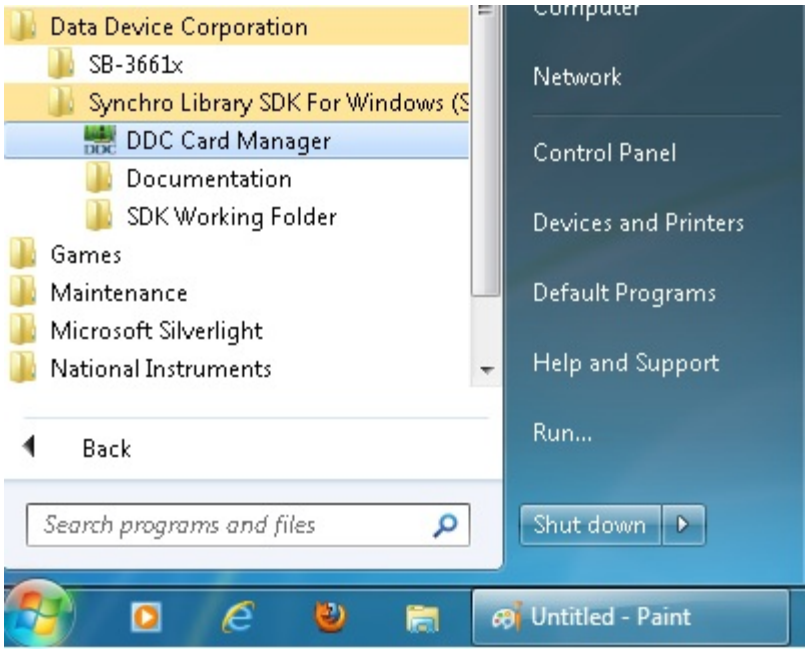


Figure 15. DDC Card Manager Location

2. On the left hand side of the DDC Card Manager, select “Synchro/Resolver Devices”. Confirm that the card is being read by the computer, then assign a device number by selecting the appropriate card then using the drop down menu to select a corresponding device number. Click “Ok” to finish device number assigning.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

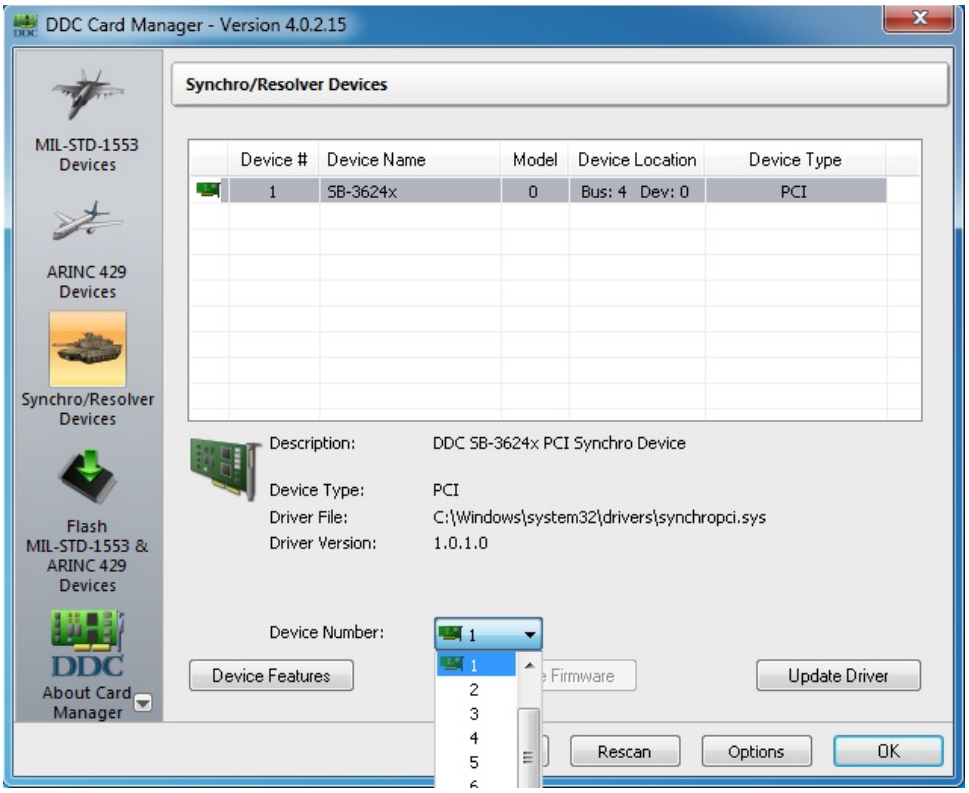


Figure 16. DDC Card Manager Device Number Assignment

6.6 DDC Card Manager (Windows 2000/XP)

Once you have installed the hardware and software, you are now ready to configure the card. Device configuration is performed through the use of the DDC Card Manager Application.

1. Turn on the computer.
2. Click on Windows START.
3. Click on SETTINGS.
4. Click on CONTROL PANEL.
5. Double-click on the DDC MFB Manager icon (circled in the screen image below).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

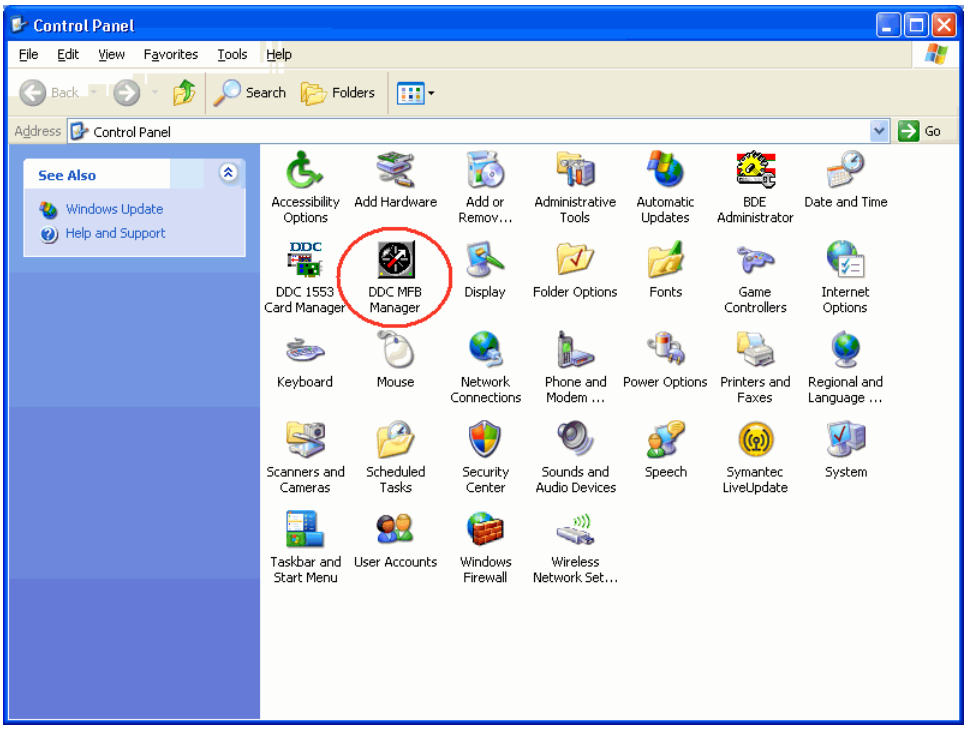


Figure 17. Control Panel Window

6. Select **Show installed devices** from the Motion Feedback Devices window to display status information for the installed card(s).

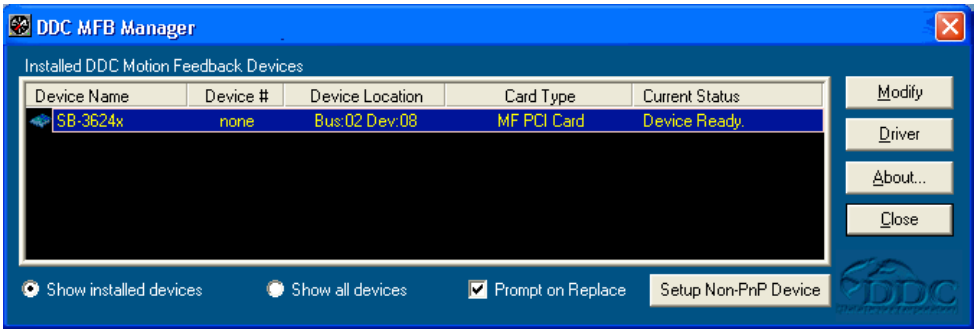


Figure 18. Motion Feedback Devices Window

Note: *The **Device** # will default to none. Each card must be assigned to a unique (unused) device number from 0 to 7. Card numbers cannot be shared.*

7. To assign the card to a new Device number, select **Modify** to open up the Modify Device window.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

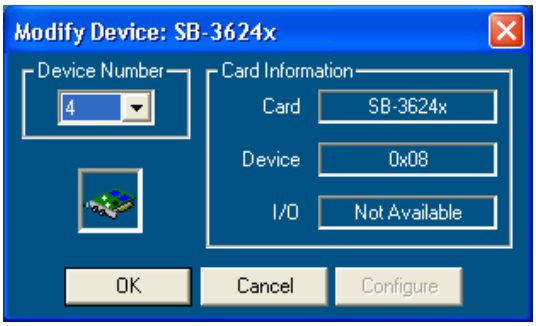


Figure 19. Modfy Device Window

8. Click on the **Device Number** arrow to open up a pull down window of device number selections.

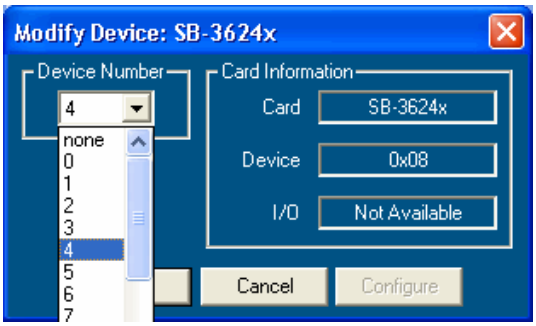


Figure 20. Modify Pull-Down Menu

9. Select an unused device number from the pull down menu (Currently only device numbers 0 to 7 can be selected).

Note: *If a previously assigned device number is selected, and the* ***Prompt on Replace*** *option is checked on the Motion Feedback Devices menu, the following warning will appear. Clicking on* ***Yes*** *will overwrite the previously assigned device number. If the* ***Prompt on Replace*** *option was not selected, a warning will not be displayed and the new device number will automatically overwrite the previously assigned device number.*

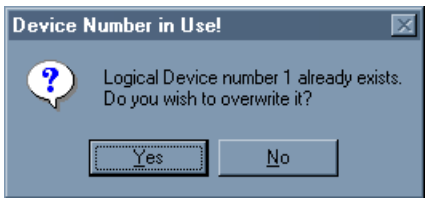


Figure 21. Device Number in Use! Warning

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

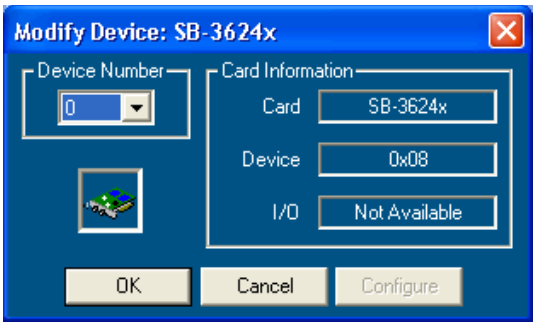


Figure 22. Modify Device Window (Close)

10. Select **OK** on the Modify Device window to return to the Motion Feedback Devices menu.

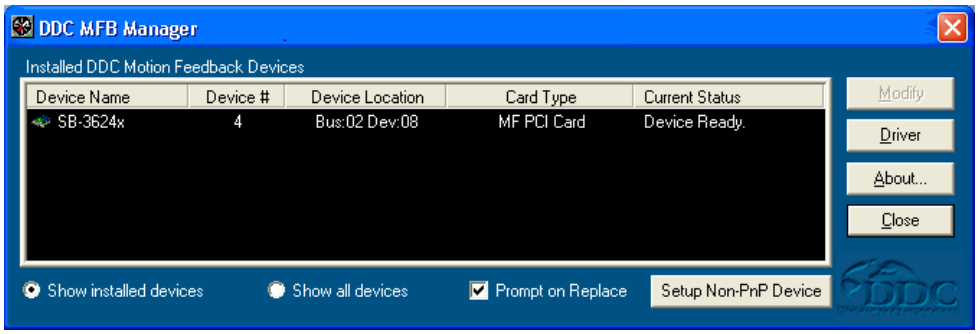


Figure 23. Motion Feedback Devices Window (Device # Assigned)

Note: *The **Motion Feedback Devices** window should display the device assigned to the selected device number.*

11. To show a log of all devices installed (even if the card is not currently inserted), select **Show all devices** from the **Motion Feedback Devices** window.

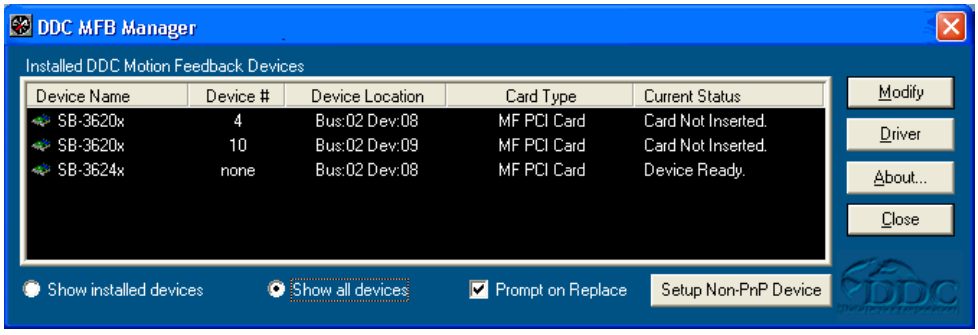


Figure 24. Motion Feedback Devices Window (Show all Devices)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

***Note**: The **Motion Feedback Devices** window will display all cards currently installed.*

12. To display the status of the device drivers, select **Driver** from the **Motion Feedback Devices** window. The following Device Driver Information window will be displayed.

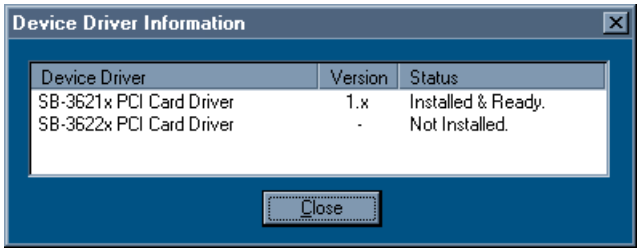


Figure 25. Device Driver Information Window

13. Select **Close** to close the Device Driver Information window and return to the Motion Feedback Devices window.

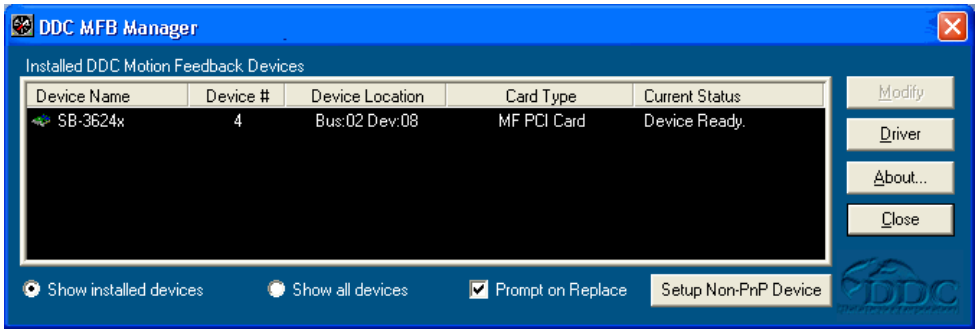


Figure 26. Motion Feedback Devices Window (Close)

14. Select **Close** to complete the card configuration and close the **Motion Feedback Devices** window. The card is now ready for use.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.7 Graphical User Interface (GUI) Application (Windows Vista/7/8)

The Graphical User Interface provides an environment for the user to display and set card parameters.

6.7.1 Initialization

1. Upon starting the GUI, select “New Workspace” from the panel on the left hand side of the screen to create a new instance of a workspace. Select the “Synchro-Resolver to Digital” icon when prompted to select which Motion Feedback Profile to use. Name the new workspace, then click “Next”.

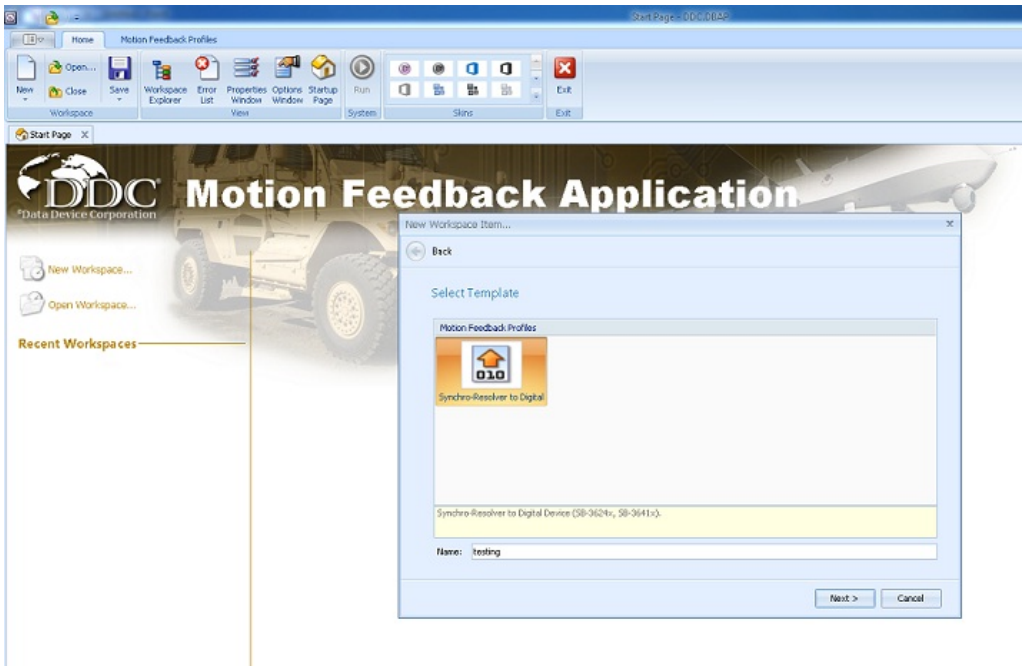


Figure 27. New GUI Workspace

2. All installed **SB3624x** devices that were assigned a device number and connected to the computer at the time of start up will appear. Select the device you wish to monitor, then click “Finish”.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

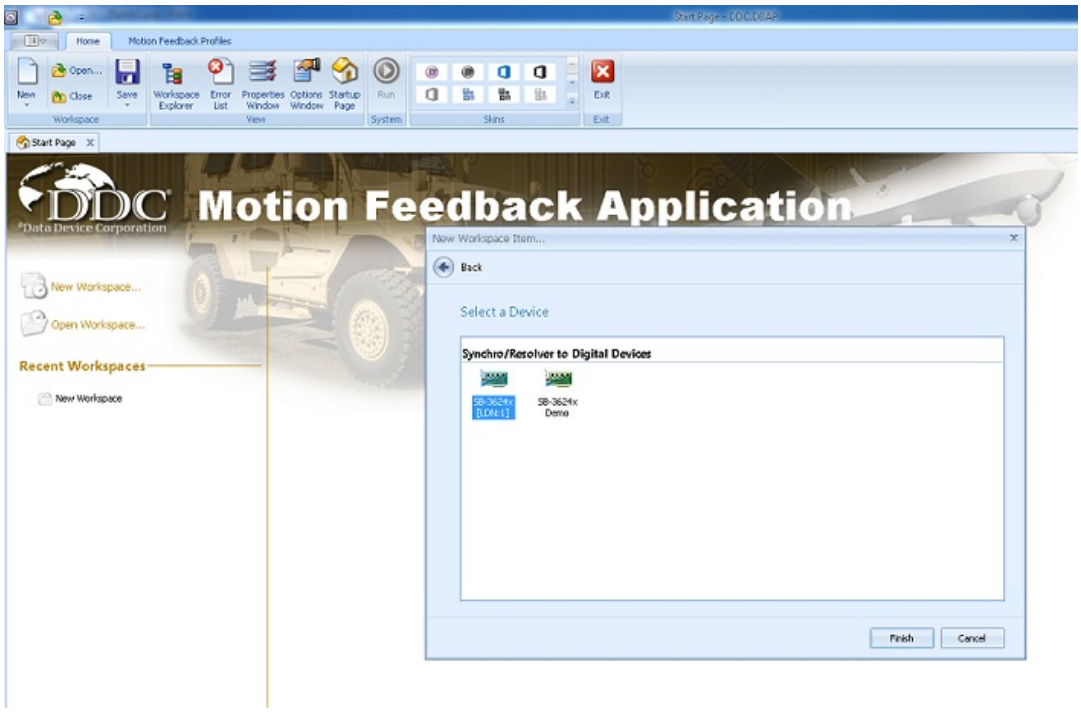


Figure 28. Selecting Desired Card

***Note**: A demo mode is also available to exercise the GUI without having an actual device installed in the system. The demo is labeled "SB-3624x Demo".*

6.7.2 Parameter Setup

To access the editing panel, first click on the "Properties Window" icon located in the "Home" list, which is spread across the top of the GUI. A properties window will appear on the left hand side of the GUI. To change the existing settings it is necessary that the system is not running (or PAUSED). To alter the parameters, first click on the "Edit" (paper with pencil) icon located on the upper left hand side of the "Properties" window. The parameters such as **Oscillator Resolution, Oscillator Settings, Sampling Rate, Speed, Ratio, Resolution** and **Bandwidth** may be changed.

1. Board Settings

***Note:** The sampling rate is only for aesthetics within the GUI. Changing the sampling rate will have **no** effect on the functionality of the card.*

a. **Two channels may be coupled together to form a group. This is done by selecting "Two Speed". The channels may be grouped as follows:**
   - **Channels 1 & 2**
   - **Channels 3 & 4**
   - **Channels 5 & 6**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note: *The odd channel is fine, and the even channel is coarse. The ratio between the two grouped channels may be set to integer values between 1:1 – 128:1*

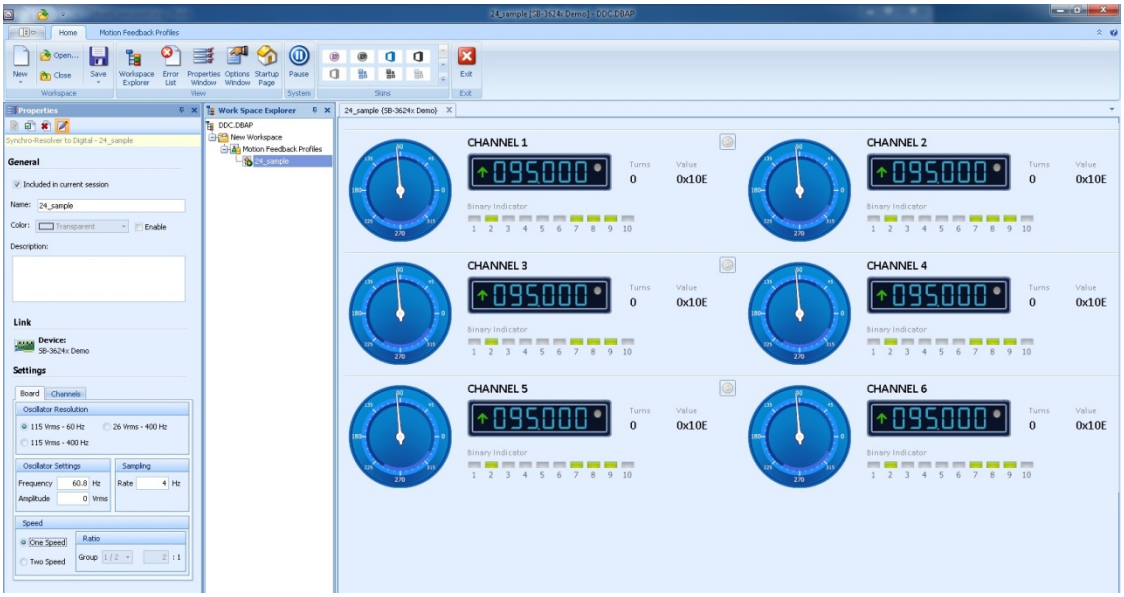


Figure 29. One Speed Mode

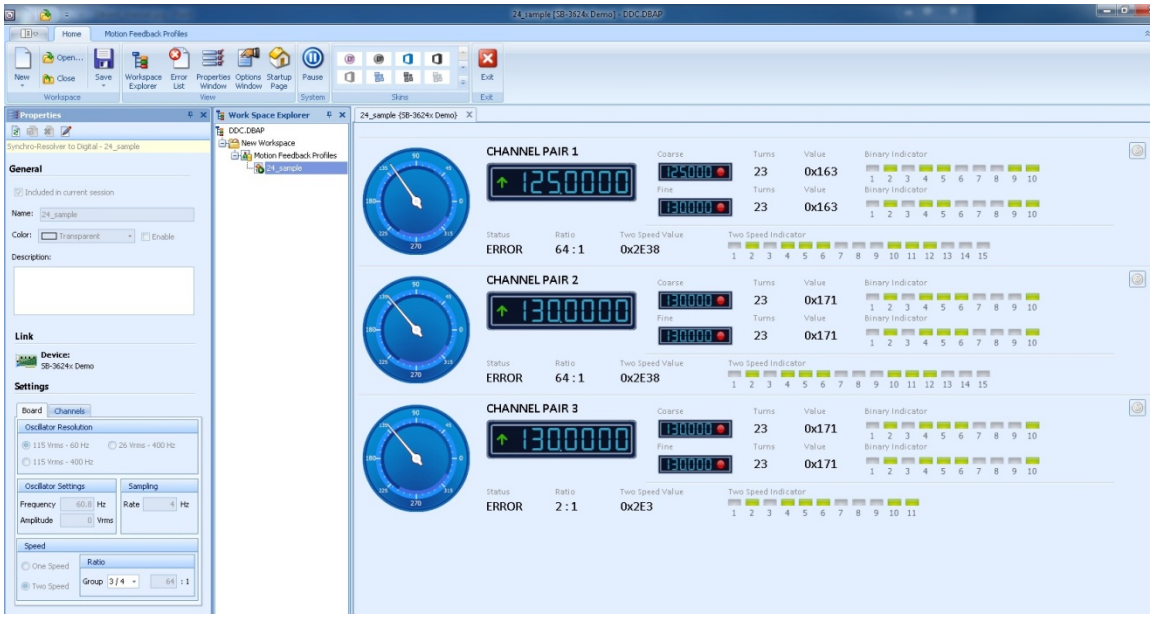


Figure 30. Two Speed Mode

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. Channel Settings
    a. Each channel may have it's own unique settings. To make changes to the bandwidth or resolution, select the "Channels" tab under the "Settings" label of the "Properties" window. Each individual channel's settings may be set by dragging the slider to select the appropriate channel, then selecting the desired settings from the drop down boxes.The bandwidth may either be set to High or Low.
    b. The resolution may be 10, 12, 14 or 16 bits.



Figure 31. Channel Settings

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.4 Graphical User Interface (GUI) Application (Windows 2000/XP)

The Graphical User Interface allows the user to display and set card parameters in analog, digital and binary formats. Parameters are set and display options are selected using a combination of keyboard and mouse commands according to the chosen format.

1. To access the Graphical User (GUI) Application Interface click on **Start → Programs → Data Device Corporation→ SB3624x → SB-3624x GUI Application**, as shown below.

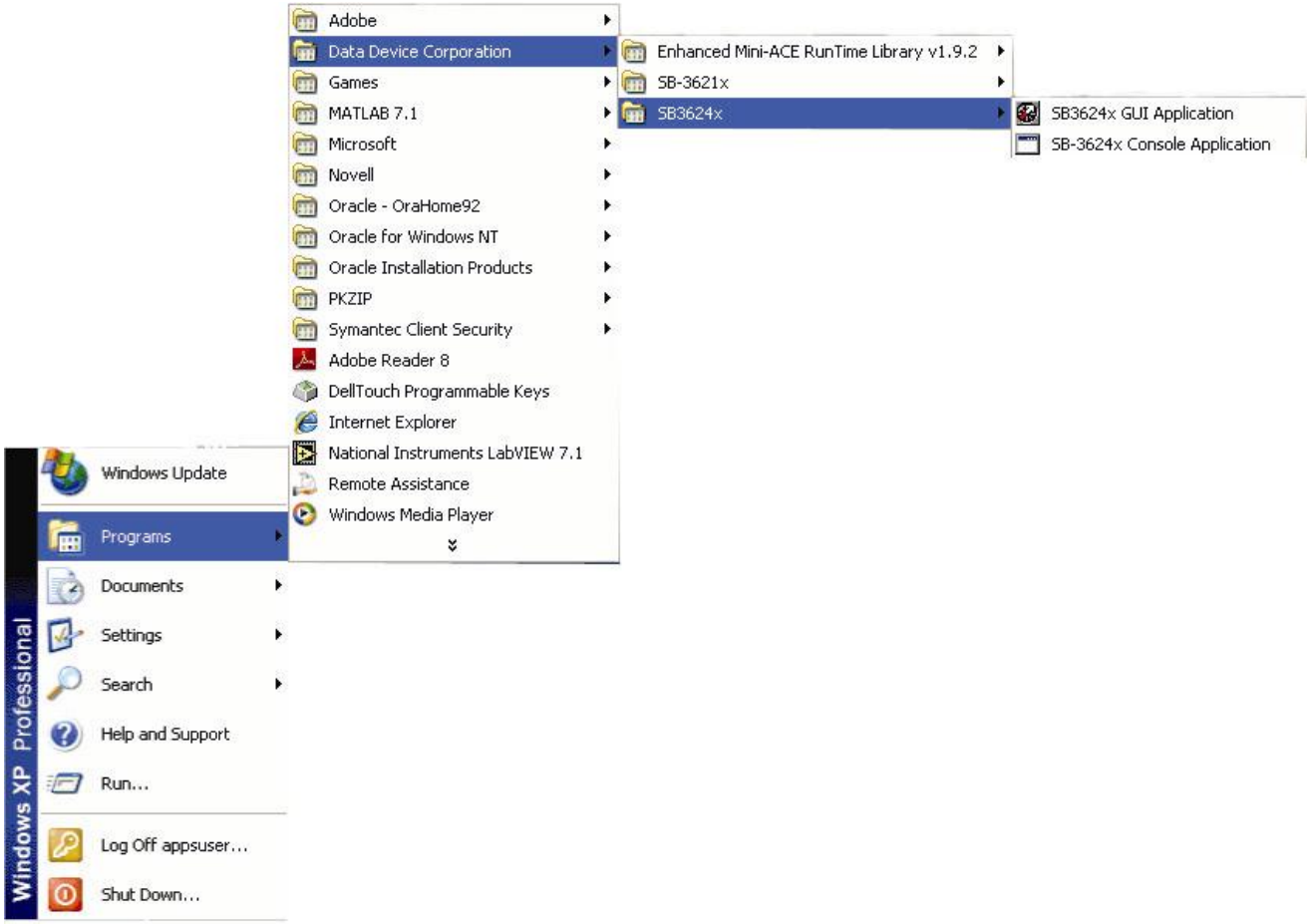


Figure 32. Accessing the GUI Application

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

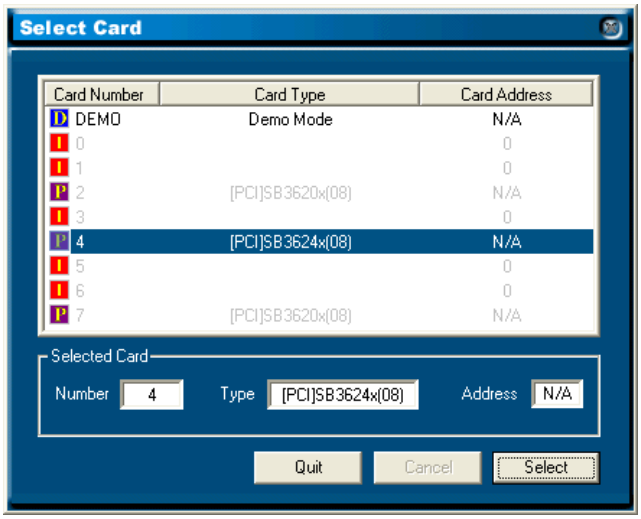


Figure 33. Select Card Screen

2. Select a card from the drop down list, then click **Select**.

Note: *Selecting Demo Mode will open up a demo application screen where input information can be simulated, even if a card is not installed.*

3. When the GUI application is initiated a 45-degree angle is simulated into each channel. If the digital output is correct the Self-Test results will indicate passed as shown below. If a channel is not functioning the Self-Test will return a failed indication.

Note*: If a channel fails Self-Test, the user can still use the Graphical Interface, but the failed channel will not be accessible.*

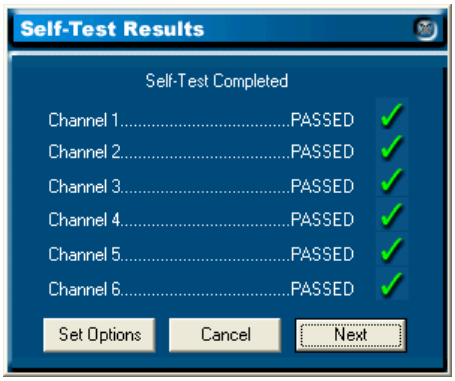


Figure 34. Self-Test Results

4. To set the oscillator amplitude and frequency click **Set Options,** this will open the menu shown below. From this menu the display information can be configured to correspond to the hardware configuration. The

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

model number purchased determines the oscillator range. See the appropriate mV/bit shown below. Select the model number of the card installed then select **OK**.

Note: *For Model # IC contact factory.*

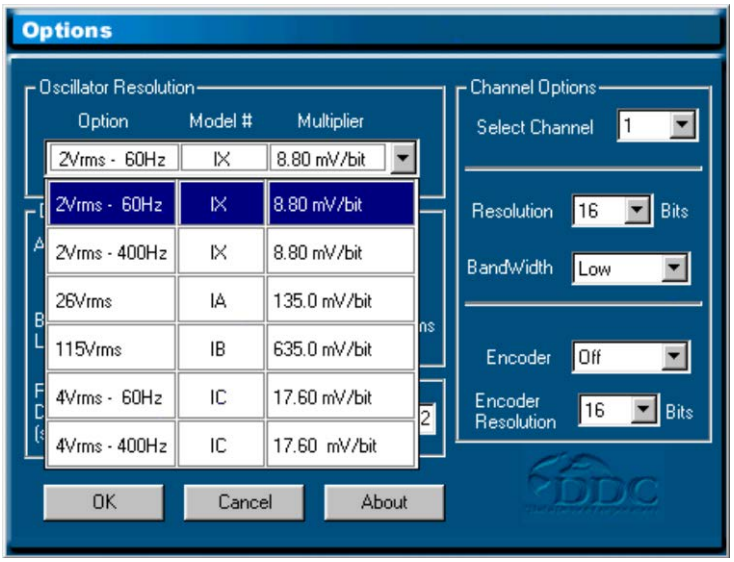


Figure 35. Options Screen - Oscillator Resolution Shown

5. Options for resolution, bandwidth and encoder emulation mode can be selected as shown in the menu below. Channels can be selected individually or they can all be selected. For two-speed applications select the pair of channels along with the two-speed ratio.
6. Once the appropriate oscillator is selected the oscillator amplitude and frequency can be programmed by inputting the values into the Oscillator Settings windows. The Amplitude and Frequency displays will update with the closest system values available.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

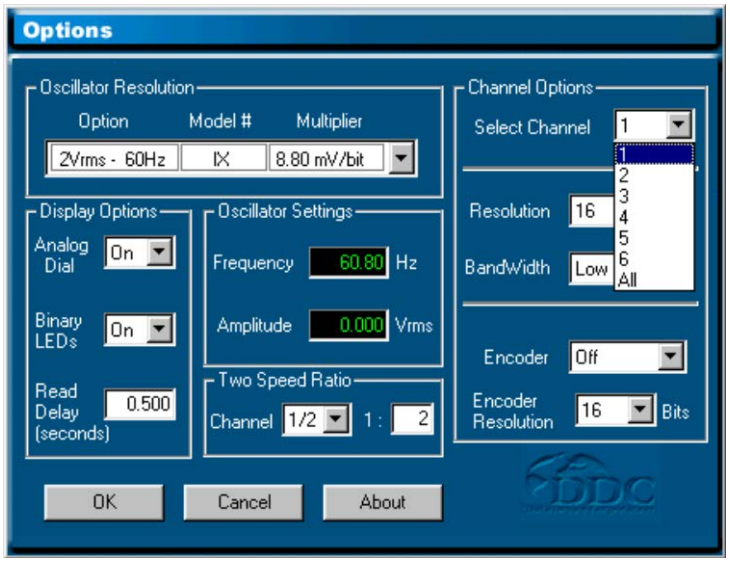


Figure 36. Options Screen - Select Channel Shown

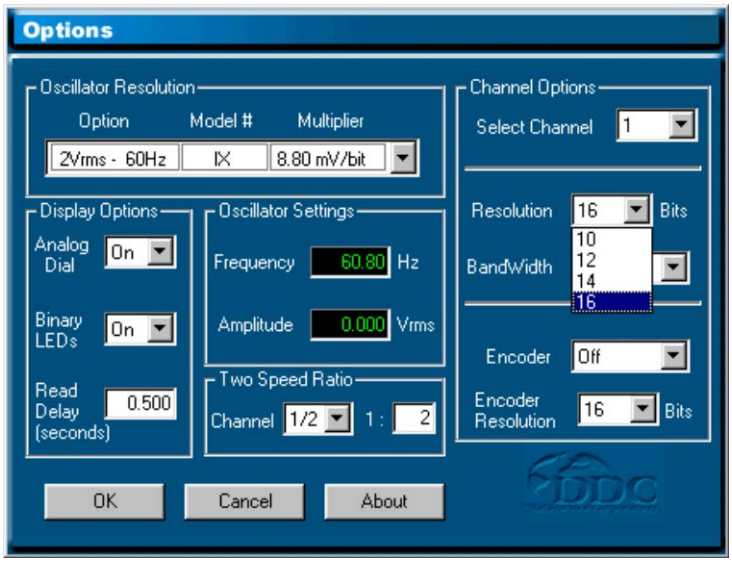


Figure 37. Options Screen - Resolution Shown

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

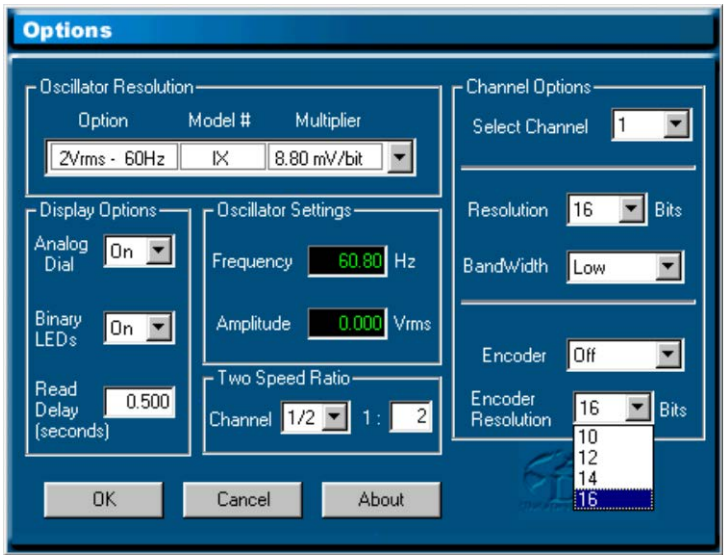


Figure 38. Options Screen - Encoder Output Resolution Shown

7. The Encoder Output Resolution can be set by selecting 10/12/14 or 16 Bit resolution from the drop down menu.

Note: *Encoder (A quad B) output resolution must be of equal or lesser value than the resolution set on the card. For example, if the resolution set on the card is 14 bits, the A quad B resolution must be set to 14 bits or less (not 16 bits).*

8. The Display Options section enables which type of display is shown in the main screen. The binary display represents the digital angle, (Bit 1 = 180°, Bit 2 = 90°, Bit 3 = 45° etc…). The read delay defines the display update rate.
9. Once the options are selected click on **OK.** The main screen will display angular position, turns count, direction and BIT information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

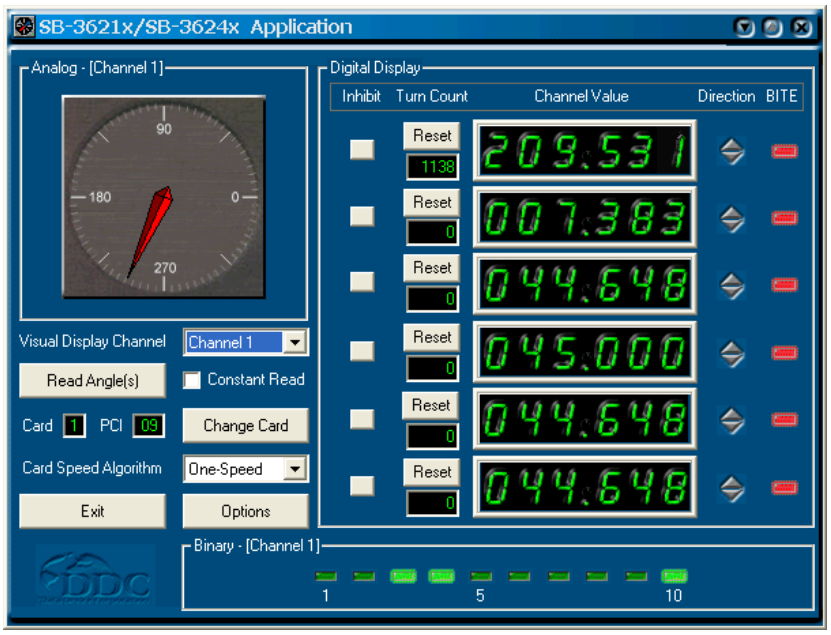


Figure 39. Angular Position Screen - One Speed

Table 9. Angular Position Screen	
DISPLAY OPTION	**EFFECT**
Visual Display Channel	Defines which channel is displayed on the Analog and Binary Displays.
Constant Read	Constantly updates all channels.
Card Speed Algorithm	Selects either One-Speed or Two-Speed input mode.
Inhibit	Inhibits the output display.
Turns Count*	Displays the turns count status for each channel. Reset will reset each individual channel's turn count to zero. (*See NOTE)
Direction	Displays the direction of rotation. Up is counterclockwise (angle increasing), Down is clockwise (angle decreasing).
BITE	Reads the status of the BIT output of the R/D converter. The reasons a fault may be indicated in a R/D converter are as follows: 1. The synchro or resolver signals have fallen below the specified voltage amplitude or there are no analog input signals connected to the R/D converter. ***Note:*** *Both SIN and COS signals of the R/D converter must fall below 0.5 Vrms, or else the BIT may only indicate a fault at certain angles.* 2. The synchro or resolver is moving at a rate greater than the R/D converter can accommodate. The dynamic capability of the R/D converter is determined by the bandwidth selection and the resolution (refer to hardware setup). 3. If the error exceeds approximately 100 LSB's. This condition will occur during a large step and reset after the converter settles out.

*** Note:** The Encoder must be enabled for the turns counter and the direction to work properly for both the DOS console and the Windows GUI. Encoder (A quad B) resolution must be of equal or lesser value than the resolution set on the card. For example, if the resolution set on the card is 14 bits, the A quad B resolution must be set to 14 bits or less (not 16 bits).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10. The ***SB-3624XIX-3L0*** series cards can also be used to interface with two-speed resolvers and calculate the combined position between the coarse and fine channels based on the two-speed ratio selected.
11. If the two-speed option is selected the main screen will display the Coarse, Fine and Combined position information on the Digital displays, and the Combined position information on the Analog display. Two-speed allows resolutions of greater than 16 bit to be achieved. For 2-Speed Theory review the following DDC documents:

The RD/RDC applications manual system design section, RD/RDC manual and the Synchro/Resolver Conversion Handbook. Both of these documents can be downloaded from the DDC website at www.ddc-web.com.

Note: *A quad B does not have any combining function when used in 2-speed mode.*

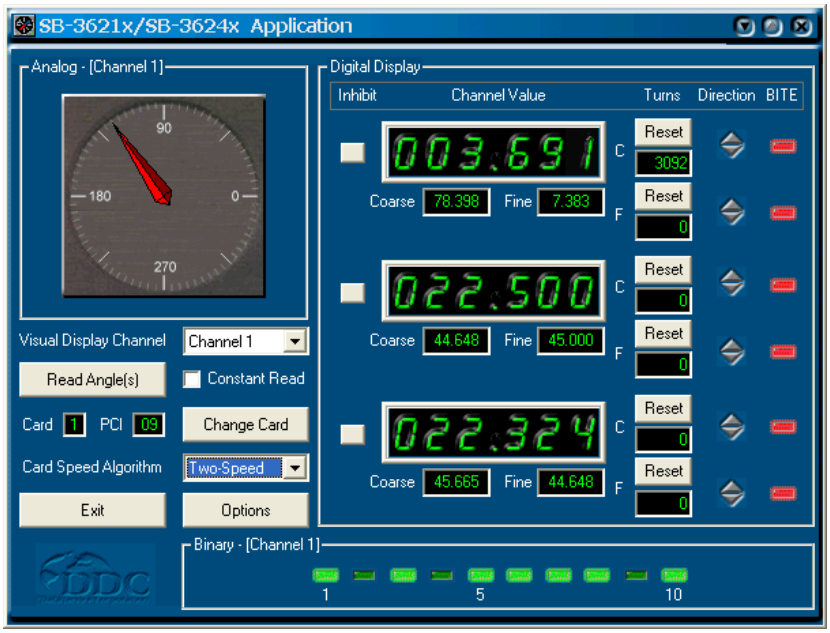


Figure 40. Angular Position Screen - Two Speed

6.5 Console Application

The Console Application is an easy to use application that enables engineers and maintenance personnel to test and maintain Synchro/Resolver systems. This program allows easy access to data analysis of Synchro/Resolver outputs. Some features include:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Self test
- Angle position data
- Inhibit data
- Change bandwidth and resolution
- Reset counters
- Change to encoder mode
- Change oscillator amplitude and frequency

The underlying source code for the Console Application is provided as an example program.

1. Launch the Console Application from the executable found in the Windows software install path. The console application provides an easy method to evaluate angle position information and run self-test.

2. Enter the card number of the ***SB-3624XIX-3L0*** card and hit **Enter**. This will start the self-test mode. The self-test results will indicate if the card is functioning properly.

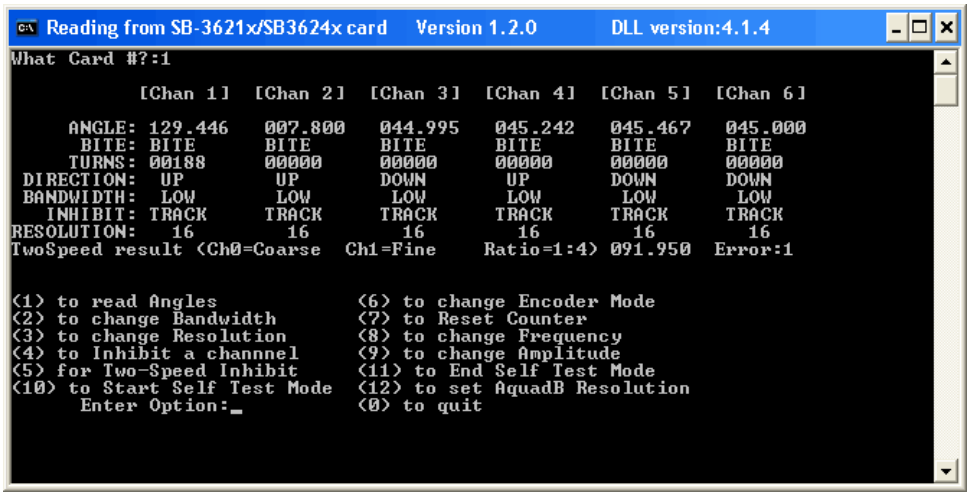


Figure 41. Console Application Function Select Screen

3. The self-test results will be displayed on the second line of text. A response of 0x0 indicates that the card has passed self-test, with a simulated input angle of 45 degrees and that each converter is working correctly.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 10. Self-Test Result Codes	
RESULT CODE	**DESCRIPTION**
0 x 99	Card did not initialize
0 x 20	Ch 1 failed
0 x 10	Ch 2 failed
0 x 08	Ch 3 failed
0 x 04	Ch 4 failed
0 x 02	Ch 5 failed
0 x 01	Ch 6 failed
0 x 3f	All channels on the card failed
0 x 0	All channels passed self-test on power up

Table 11. Register Format							
		Ch 1	**Ch 2**	**Ch 3**	**Ch 4**	**Ch 5**	**Ch 6**
0	0	0	0	0	0	0	0

6.5.1 Read Angle Information

1. Type the code for the desired operation in the **Enter Option:** field (1 to read Angles), and hit **Enter**.
2. The test results for the selected operation will be displayed in the console application screen.

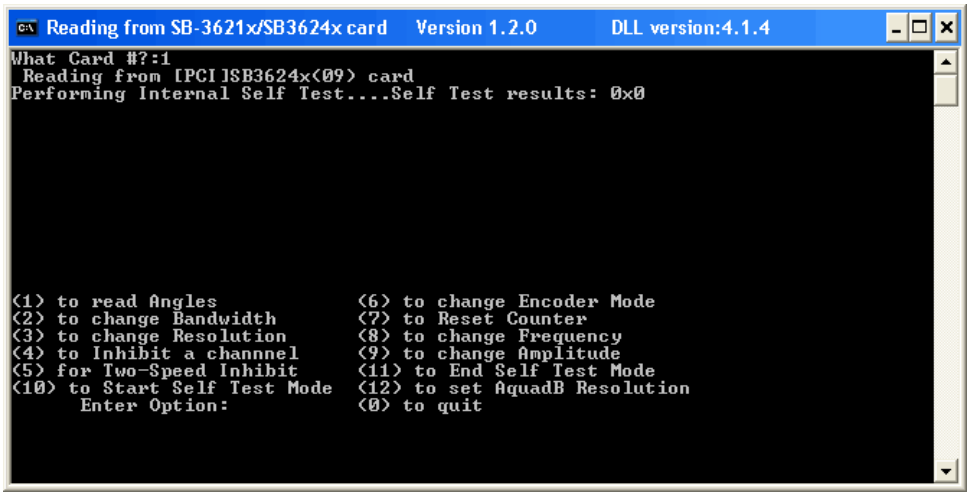


Figure 42. Console Application Test Results for Read Operation

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. The following information is displayed for a read Angles operation. This example is for a card with six channels installed.

ANGLE:
Channels 1 to 6 position information is continuously updated for monitoring. Enter (1) to read angles.

BITE:
Channels 1 to 6 BIT (Built-in-test) flag is displayed to insure data is valid. A BIT will occur if there is a Loss of Signal (ALL inputs), Loss of reference or if the error exceeds 100 LSB's.

TURNS:
Monitors number of turns for channels 1 to 6. Enter (7) to reset counters.

DIRECTION:
Monitors channels 1 to 6 ("Up" = increasing angle, and "Down" = decreasing angle).

BANDWIDTH:
Monitors channels 1 to 6 ("Low" = low bandwidth, and "High" = high bandwidth). Enter (2) to change bandwidth.

INHIBIT:
Monitors inhibit status for channels 1 to 6 ("Inh" indicates data inhibited, "Track" indicates data is tracking). Enter (4) to inhibit a channel.

RESOLUTION:
Monitors resolution for channels 1 to 6. Enter (3) to change resolution. (Options 10, 12, 14 or 16 bits).

Encoder Mode Information:
Provides A quad B outputs (0 for “On” and 1 for “Off”). Enter (6) to change encoder mode. Enter (12) to change A quad B (encoder) resolution.

Note: *The Encoder must be enabled for the turns counter and the direction to work properly for both the DOS console and the Windows GUI. Encoder (A quad B) resolution must be of equal or lesser value than the resolution set on the card. For example, if the resolution set on the card is 14 bits, the A quad B resolution must be set to 14 bits or less (not 16 bits).*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.5.2 Set Oscillator Frequency

1. Enter (8) to change frequency.
2. To change the Oscillator frequency, enter the bit multiplier. The bit multiplier, which is an integer, is determined by the following formula:

Frequency = (bit multiplier) X (Hz/bit)

Table 12. Oscillator Frequency

Board Type	Output Scaling (Hz/bit)	Examples	Bit Multiplier	Resultant Frequency	Bit Multiplier Range
60 Hz	7.6 Hz/bit	60.8 Hz = (8) X (7.6)	8	60.8 Hz	8 - 255
		402.8 Hz = (53) X (7.6)	53	402.8 Hz	
400 Hz	57.8 Hz/bit	404.6 Hz = (7) X (57.8)	7	404.6 Hz	6 - 255
		2023.0 Hz = (35) X (57.8)	35	2023.0 Hz	

6.5.3 Set Amplitude

1. Enter (9) to change Amplitude
2. To change the Oscillator amplitude, enter the bit multiplier. The bit multiplier, which is an integer, is determined by the following formula:

Amplitude = (bit multiplier) X (mV/bit)

Table 13. Oscillator Amplitude

Model Number	Output Scaling (mV/bit)	Examples	Bit Multiplier	Resultant Amplitude	Bit Multiplier Range
IA	135.0 mVrms/bit	26.0550 Vrms = (193) X (.135)	193	26.0550 Vrms	0 - 255
IB	635.0 mVrms/bit	115.5700 Vrms = (182) X (.635)	182	115.5700 Vrms	0 - 210

5.6 LabVIEW Support Software Installation

The SB-36240S0 Windows Software package is required to be installed prior to installation. Refer to the 'Install.txt' file contained in the LabVIEW Support package for complete installation instructions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7 LIBRARY FUNCTION CALLS

The following list contains all of the pertinent function calls required by the user. For any function call that returns an errorCode integer, refer to Table 14 for a detailed summary of the error codes. Any function calls contained within the SRTestSystemLib.h file that are not listed here are available from the factory upon request.

char* WINAPI Initialize (int card)

DESCRIPTION

Opens and reads from the REGISTRY to get the card type. Performs a string comparison with the card type to branch to the appropriate card-specific routine. Closes REGISTRY when finished. Returns the card type from the given card number, for error checking.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

RETURNED DATA

The routine will return a string of characters that are all caps.

EXAMPLE CODE

Code	Result/Returned Data
`char* CardName;` `CardName = Initialize(0);`	Returns card type for card #0

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI End_SelfTest (int Card)

DESCRIPTION

This function will exit the card from Self-Test mode, allowing the card to track angles normally.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

RETURNED DATA

This routine will return a 0x99 if the card was not initialized. Otherwise the card will return a (1) if Self-Test was successfully exited.

EXAMPLE CODE

Code	Result/Returned Data
`int End;` `End = End_SelfTest(1);`	Exits Self Test for card #1, and returns a 1 if properly exited Self Test mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Get_Card_Type (int Card)

DESCRIPTION

This routine reads the Registry and returns the value of the card at that location. Can be used to error check the card number a user has chosen.

INPUT DATA

Card = An integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

RETURNED DATA

This routine will return the type of card installed and assigned to Card.
Valid Values:
[PCI]SB3620x
[PCI]SB3621x
[PCI]SB3622x
[PCI]SB3624x

EXAMPLE CODE

Code	Result/Returned Data
`Get_Card_Type(0)`	Returns the card type of card 0.

int WINAPI Get_DLL_Version (void)

DESCRIPTION

This routine returns the current version of the synchro.dll. Can be displayed in applications, and helps to maintain version control.

INPUT DATA

There is no input data for this routine.

RETURNED DATA

This routine will return version number of the synchro.dll.

EXAMPLE CODE

Code	Result/Returned Data
`Get_DLL_Version(void)`	Returns the card version of the synchro.dll

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Get_Last_Error (char *ErrorMsg)

DESCRIPTION

This routine returns the last error that occurred, and clears the error code to 0. Can be called frequently, if needed.

INPUT DATA

ErrorMsg A char pointer that will hold the last error message.

RETURNED DATA

ErrorMsg A int that represents the last error message.

Table 14. ErrorMsg Values

Values	Description
0	No Error
1	Could not open registry
2	Card Type is invalid
3	Card no initialized
4	Invalid direction
5	Could not open device
6	Cound not close device
7	Invalid channel
8	Invalid option
9	Invalid range
10	Missing parameters
11	Invalid error code

EXAMPLE CODE

Code	Result/Returned Data
`Get_Last_Error(char *ErrorMsg)`	No Error

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Bandwidth (int Card, int Channel)

DESCRIPTION

Returns the bandwidth for given channel.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the Bandwidth as an integer. 0 = “High”, 1 = “Low”

EXAMPLE CODE

Code	Result/Returned Data
`int Bandwidth;` `Bandwidth = Read_Bandwidth(2,2);`	Reads the bandwidth (as an integer) of card #2, channel 2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Bite (int card, int channel)

DESCRIPTION

This routine will read the status of the BIT output of the R/D converter. The reasons a fault may be indicated in a R/D converter are as follows:
The synchro or resolver signals have fallen below the specified voltage amplitude or there are no analog input signals connected to the R/D converter.

Note: *Both SIN and COS signals of the R/D converter must fall below 0.5 Vrms, so the BIT may only indicate a fault at certain angles.*

The synchro or resolver is moving at a rate greater than the R/D converter can accommodate. The dynamic capability of the R/D converter is determined by the bandwidth selection and the resolution (refer to hardware setup).
The error exceeds approximately 100 LSB's. This condition will occur during a large step and reset after the converter settles out.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in Motion Feedback Board Manager.

RETURNED DATA

This routine returns the Bite as an integer.

EXAMPLE CODE

Code	Result/Returned Data
`int Bite;` `Bite = Read_Bite(2,1);`	Returns Bite status for card #2, channel 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Counter (int Card, int Channel)

DESCRIPTION

Reads the Turns counter of a channel and returns the value.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the turns count of a channel (range = 0x0000 to 0xFFFF).

EXAMPLE CODE

Code	Result/Returned Data
`int Counter;` `Counter = Read_Counter(0,2);`	Returns the turns count of card #0, channel 2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Direction (int Card, int Channel)

DESCRIPTION

Returns the direction for given channel.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the direction of a channel as an integer.
1 = “Up”, 0 = “Down”

EXAMPLE CODE

Code	Result/Returned Data
`int Direction;` `Direction = Read_Direction(6,4);`	Returns the direction (as an integer) for card #6, channel 4.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Encoder (int Card, int Channel)

DESCRIPTION

Returns the Encoder Mode for given channel.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the value of the Encoder for a given channel as an integer.
0 = “On”, 1= “Off”

EXAMPLE CODE

Code	Result/Returned Data
`int Encoder;` `Encoder = Read_Encoder(5,3);`	Returns the encoder mode (as an integer) for card #5, channel 3.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Inhibit (int Card, int Channel)

DESCRIPTION

Reads the channel specified, and returns either a “0” (inhibited) or a “1” (uninhibited). If a 9 is returned, the card was not initialized properly.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the status of the inhibit bit for a given channel. If the inhibit status is 9 then the card was not initialized.

EXAMPLE CODE

Code	Result/Returned Data
`int Inhibit;` `Inhibit = Read_Inhibit(0,5);`	Returns the status of the inhibit bit (as an integer) for card #0, channel 5.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Read_Resolution (int Card, int Channel)

DESCRIPTION

Reads the given channel, and returns the current resolution.
If bits are: 16 Resolution is 16
If bits are: 14 Resolution is 14
If bits are: 12 Resolution is 12
If bits are: 10 Resolution is 10

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns an integer that represents the current resolution of a channel as either 10,12,14, or 16 bits. If a 9 is returned than there was an error with the initialization of the card.

EXAMPLE CODE

Code	Result/Returned Data
`int Resolution;` `Resolution = Read_Resolution(4,3);`	Returns the current resolution (as an integer) for card #4, channel 3.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI SelfTest (int Card)

DESCRIPTION

The ***SB3624X*** card has a self-test feature. By setting a register to 1's, the card will go into Self-Test mode, and all angles should read 45 degrees. If any channel does not display 45 degrees (+/- 1 degree), that channel does not pass. If all channels fail, a 0x3F is returned. If only channel 0 fails, a 0x20 is returned. If a 0x99 is returned, the card was not initialized, and therefore the Self-Test was not performed.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in Motion Feedback Board Manager.

RETURNED DATA

This routine returns the Hex equivalent of the channels that fail as an integer. The "0" bit is the most significant bit, and the 6th bit is the least significant bit.
Register format:

		Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5
0	0	0	0	0	0	0	0

0 x 99 is returned if the card did not initialize.
0 x 20 = Ch 0 fails
0 x 10 = Ch 1 fails
0 x 08 = Ch 2 fails
0 x 04 = Ch 3 fails
0 x 02 = Ch 4 fails
0 x 01 = Ch 5 fails
0 x 3F = all channels on the card failed.
0 x 00 = all the channels passed the initialization of the card.

EXAMPLE CODE

Code	Result/Returned Data
`int Test;` `Test = SelfTest(0);`	Returns the Hex equivalent of which channels (if any) on card #0 fail self test.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

int WINAPI Start_SelfTest (int Card)

DESCRIPTION

For debugging and testing purposes, the Start Self Test routine allows the user to enter Self Test mode, without completing the entire test.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

RETURNED DATA

This routine will return a 0x99 if the card did not initialize. Otherwise the card will return a (1) if Self-Test is started.

EXAMPLE CODE

Code	Result/Returned Data
`int Start;` `Start = Start_SelfTest(1);`	Returns a 1 if in Self-Test.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

long WINAPI Read_Angle (int Card, int Channel)

DESCRIPTION

Using the given channel, the appropriate register is selected, and the thirty-two bits are read from the register. No conversion is done in this routine.

INPUT DATA

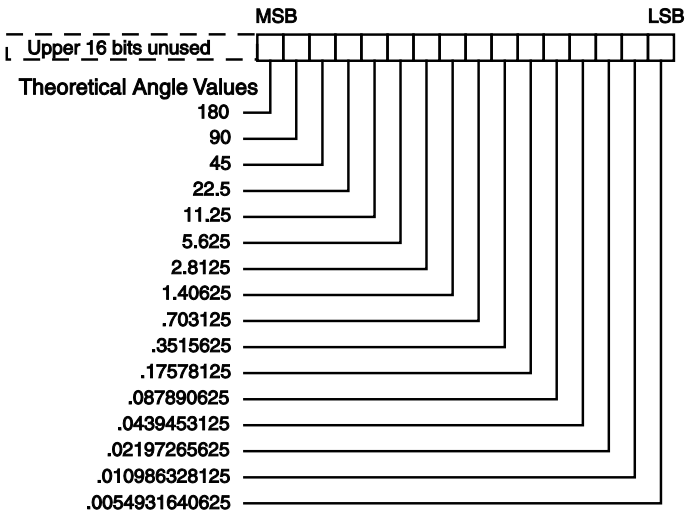
Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the angle of a given channel as a 32 bit long integer (range = 0x0000 to 0xFFFF).

EXAMPLE CODE

Code	Result/Returned Data
`Read_Angle(3,5);`	Returns the angle (as a 32 bit long integer) for card #3, channel 5.



$$\text{Angle} = \frac{\text{Reading X } 360}{2^{16}}$$

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Close (int Card)

DESCRIPTION

Closes the device driver. Writes default values to card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Close(7);`	Closes the device driver for card #7.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Amplitude (int Card, int Amplitude)

DESCRIPTION

This routine allows the user to change the amplitude of the oscillator. Since there is only one oscillator on the card, the channel does not have to be selected.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Amplitude = an integer between 0 and 255 that corresponds to a bit multiplier. The product of the bit multiplier and the output scaling represents the true amplitude.
To change the Oscillator amplitude, enter the bit multiplier. The bit multiplier, which is an integer, is determined by the following formula:

Amplitude = (bit multiplier) X (mV/bit)

Model Number	Output Scaling (mV/bit)	Examples	Bit Multiplier	Resultant Amplitude	Bit Multiplier Range
IX	8.8 mVrms/bit	1.0032 Vrms = (114) X (.0088)	114	1.0032 Vrms	0 - 255
IA	135.0 mVrms/bit	26.0550 Vrms = (193) X (.135)	193	26.0550 Vrms	0 - 255
IB	635.0 mVrms/bit	115.5700 Vrms = (182) X (.635)	182	115.5700 Vrms	0 - 210
*IC	17.6 mVrms/bit	4.0128 Vrms = (228) X (.0176)	228	4.0128 Vrms	0 - 255

**** Note:** Consult factory for IC option (minimum orders apply)*

Amplitude = (Bit Multiplier) X (mVrms/bit)
Amplitude = (114) * (8.80 mVrms/bit)
Amplitude = 1.0032 Vrms

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Amplitude(7,193);`	Assuming card #7 is a model type IA (135.0 mv/bit), the oscillator amplitude of card #7 will be set to 26.0550 V.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Bandwidth (int Card, int Channel, int Bandwidth)

DESCRIPTION

Programs channel bandwidth for either “High” or “Low”. Error checking is performed, appropriate bits are masked, and the new value is written to the card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

Bandwidth = an integer that is either a 0 or a 1.
0 = (High) and 1 = (Low)

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Bandwidth(6,0,1);`	Sets the bandwidth of card #6, channel 0 to low.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Encoder (int Card, int Channel, int Encoder)

DESCRIPTION

Turns the Encoder on a channel either “On” or “Off”. Error checking is performed, appropriate bits are masked, and the new value (0 or 1) is written to the card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

Encoder = an integer which is either a “0” (turns Encoder On), or a “1” (turns Encoder Off).

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Encoder(4,4,0);`	Turns the encoder of card #4, channel 4, on.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Encoder_Resolution (int Card, int Channel, int Resolution)

DESCRIPTION

Programs the A quad B resolution of a channel to 10,12,14 or 16 bits. Error checking is performed, appropriate bits are masked, and the new value is written to the card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Channel = an integer between 0 and 5 for the channel of interest.
***** Resolution:
10 = 10 bit resolution
12 = 12 bit resolution
14 = 14 bit resolution
16 = 16 bit resolution

> ***Note:*** *Encoder (A quad B) resolution must be of equal or lesser value than the resolution set on the card. For example, if the resolution set on the card is 14 bits, the A quad B resolution must be set to 14 bits or less (not 16 bits).*

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Encoder_Resolution(0,0,16);`	Sets the resolution of card #0, channel 0, to 16 bits.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Frequency (int Card, int Frequency)

DESCRIPTION

This routine allows the user to change the operating frequency of the card oscillator.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Frequency = an integer between 0 and 255 that corresponds to a bit multiplier. The product of the bit multiplier and the output scaling represents the true frequency.
To change the Oscillator frequency, enter the bit multiplier. The bit multiplier, which is an integer, is determined by the following formula.

Frequency = (bit multiplier) X (Hz/bit)

Board Type	Output Scaling (Hz/bit)	Examples	Bit Multiplier	Resultant Frequency	Bit Multiplier Range
60 Hz	7.6 Hz/bit	60.8 Hz = (8) X (7.6)	8	60.8 Hz	8 - 255
		402.8 Hz = (53) X (7.6)	53	402.8 Hz	
400 Hz	57.8 Hz/bit	404.6 Hz = (7) X (57.8)	7	404.6 Hz	6 - 255
		2023.0 Hz = (35) X (57.8)	35	2023.0 Hz	

Note: *Model IB uses 60 Hz multiplier*

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Frequency(5,53);`	Assuming card #5 is a 60 Hz type, the oscillator of card #5 will be set to 402.8 Hz.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Inhibit (int Card, int Channel, int Control)

DESCRIPTION

Programs the Inhibit mode of a channel to “0” or “1”. A “0” inhibits the channel, and a “1” uninhibits the channel. This function only inhibits one channel at a time. For multiple channel inhibiting, use the Twospeed_Inhibit routine. Error checking is performed, appropriate bits are masked, and the new value is written to the card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

Control = an integer that is either a “0” (for inhibit), or a “1” (for uninhibit).

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Inhibit(0,1,0);`	Inhibits Card #0, channel 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Program_Resolution (int Card, int Channel, int Resolution)

DESCRIPTION

Programs the resolution of a channel to 10,12,14 or 16 bits. Error checking is performed, appropriate bits are masked, and the new value is written to the card.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

Resolution:

10 = 10 bit resolution

12 = 12 bit resolution

14 = 14 bit resolution

16 = 16 bit resolution

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Program_Resolution(0,0,16);`	Sets the resolution of card #0, channel 0, to 16 bits.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Reset_Counter (int Card, int Channel)

DESCRIPTION

Resets the Turns counter of a channel to zero.

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Reset_Counter(0,2);`	Resets the turns count of card #0, channel 2 to zero.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

void WINAPI Twospeed_Inhibit (int Card, int Channels)

DESCRIPTION

This procedure allows the user to inhibit any combination of channels, simultaneously. The channels to be inhibited can be selected by OR'ing constants, that identify each channel, together (Inhibit0, Inhibit1, Inhibit2,… Inhibit5).

Note: Any channels not included in the inhibit string will be uninhibited.

Ch0 (0x04) = SB3624x_INHIBIT0
Ch1 (0x08) = SB3624x_INHIBIT1
Ch2 (0x10) = SB3624x_INHIBIT2
Ch3 (0x20) = SB3624x_INHIBIT3
Ch4 (0x40) = SB3624x_INHIBIT4
Ch5 (0x80) = SB3624x_INHIBIT5
All channels = SB3624x_INHIBITall

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Channels = an integer which represents the channels that will be inhibited.

RETURNED DATA

This routine does not return any data.

EXAMPLE CODE

Code	Result/Returned Data
`Twospeed_Inhibit(0,0x0C);`	Inhibits Card #0, channels 0 and 1, uninhibits channels 2 through 5.
`Twospeed_Inhibit(0, SB3624x_INHIBIT0|SB3624x_INHIBIT1);`	Inhibits Card #0, channels 0 and 1, uninhibits channels 2 through 5.
`Twospeed_Inhibit(0,0x0);`	Uninhibits Card #0, channels 0 through 5.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WORD WINAPI Read_Angle_WORD (int Card, int Channel)

DESCRIPTION

Using the given channel, the appropriate register is selected, and the sixteen bits are read from the register. No conversion is done in this routine.

INPUT DATA

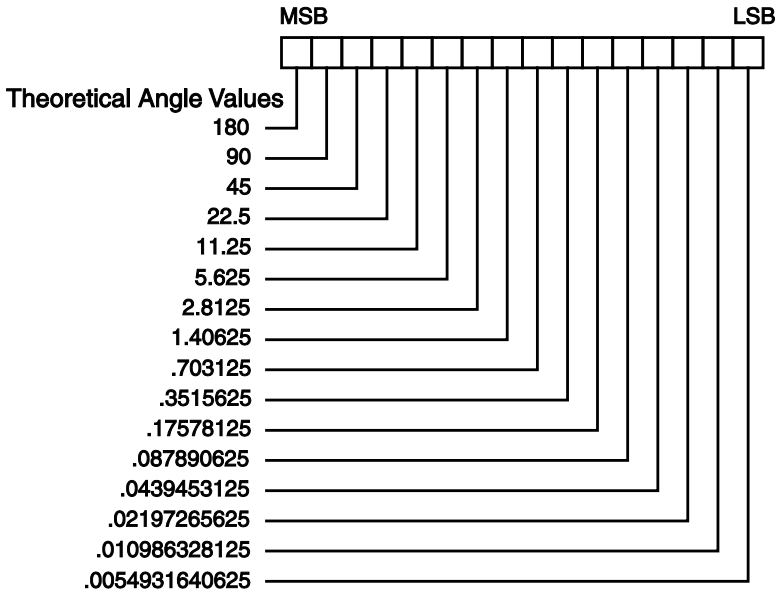
Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.
Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine returns the angle of a given channel as a WORD (range = 0x0000 to 0xFFFF).

EXAMPLE CODE

Code	Result/Returned Data
`WORD Angle;` `Angle = Read_Angle_WORD(3,5);`	Returns the angle (as a WORD) for card #3, channel 5.



$$\text{Angle} = \frac{\text{Reading X } 360}{2^{16}}$$

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

WORD WINAPI Read_Converter (int Card, int Channel)

DESCRIPTION

This routine will first set the inhibit of the channel to a logic "0" (freeze data), read the output of the R/D converter of the channel of interest, and then release the inhibit (set it to logic "1" - track data).

INPUT DATA

Card = an integer between 0 and 7 for the card of interest. The card number is set in the Motion Feedback Board Manager.

Channel = an integer between 0 and 5 for the channel of interest.

RETURNED DATA

This routine will return the digital data from the channel of interest in the form of a WORD (range = 0x0000 to 0xFFFF).

EXAMPLE CODE

Code	Result/Returned Data
`WORD Converter;` `Converter = Read_Converter(5,0);`	Returns the output (as a WORD) of card #5, channel 0.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8 ORDERING INFORMATION

SB-3624 X IX – 3 L 0

Number of Channels:
0 = 6 Channels

Ruggedness:
L = Lab, non-rugged

Operating Temperature Range:
3 = 0°C to +71°C

Oscillator Options:

Option Number	Voltage Range	Frequency Range	Output Power (max)	Output Type
A	0 – 26 Vrms	360 – 7 KHz	1.5 VA	Transformer Isolated
B	0 – 115 Vrms	57 – 440 Hz	1.5 VA	Transformer Isolated

Input Options:

#		Nominal Operating Frequency	Bandwidth	Oscillator Option
1	2 Vrms Direct	400 Hz	100 Hz / 300 Hz	A
2	2 Vrms Resolver (differential)	400 Hz	100 Hz / 300 Hz	A
3	11.8 Vrms Resolver	400 Hz	100 Hz / 300 Hz	A
4	11.8 Vrms Synchro	400 Hz	100 Hz / 300 Hz	A
5	90 Vrms Synchro	400 Hz	100 Hz / 300 Hz	B
6	90 Vrms Resolver	400 Hz	100 Hz / 300 Hz	B
7	90 Vrms Synchro	60 Hz	15 Hz / 45 Hz	B
8	90 Vrms Resolver	60 Hz	15 Hz / 45 Hz	B
9	90 Vrms Synchro – Transformer Isolated (note 4)	60 Hz	15 Hz / 45 Hz	B

Notes:
1. See TABLE 1 for accuracy vs. frequency.
2. Solid state input types use surface mount resistors, and the reference input has a voltage divider network. This voltage divider will allow for reference input ranges of 2.0 Vrms to 40 Vrms (for the 26 Vrms nominal option) or 50 Vrms to 130 Vrms (for the 115 Vrms nominal option). This is preset at the factory as specified by the ordering information. When the signal input is transformer isolated, the reference is also isolated.
3. Consult factory for switch on the fly option. See RD-19230 data sheet.
4. Add 1 minute to specified accuracy.
5. Oscillator output is programmable to max voltage of option selected. Frequency range is programmable per the Oscillator Options table above.
6. The above products contain tin-lead solder.
7. Ref configuration is by surface mount resistors, and is not customer configurable.
8. Synchro vs. Resolver configurations can be modified in the field via thin-film resistor socket locations.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Included Accessories:

- MN-3624XIX-001 Hardware/Software Manual
- Windows GUI, DLL's & Libraries, Software Provided (CD Format)
- 1 Mating Connector
- Slot Guide Hardware
- PCI Retainer and Screws

STANDARD DDC PROCESSING FOR DISCRETE MODULES/PC BOARD ASSEMLIES		
TEST	**METHOD(S)**	**CONDITION(S)**
INSPECTION/WORKMANSHIP	IPC-A-610	Class 3
ELECTRICAL TEST	DDC ATP	—

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data Device Corporation

Leadership Built on Over 50 Years of Innovation

Military | Commercial Aerospace | Space | Industrial

Data Device Corporation (DDC) is the world leader in the design and manufacture of high-reliability data bus products, motion control, and solid-state power controllers for aerospace, defense, and industrial automation applications. For more than 50 years, DDC has continuously advanced the state of high-reliability data communications and control technology for MIL-STD-1553, ARINC 429, AFDX®, Synchro/Resolver interface, and Solid-State Power Controllers with innovations that have minimized component size and weight while increasing performance. DDC offers a broad product line consisting of advanced data bus technology for Fibre Channel networks; MIL-STD-1553 and ARINC 429 Data Networking cards, components, and software; Synchro/Resolver interface components; and Solid-State Power Controllers and Motor Drives.

Product Families

Data Bus | Synchro/Resolver Digital Conversion| Power Controllers | Motor Controllers

DDC is a leader in the development, design, and manufacture of highly reliable and innovative military data bus solutions. DDC's Data Networking Solutions include MIL-STD-1553, ARINC 429, AFDX®, Ethernet and Fibre Channel. Each Interface is supported by a complete line of quality MIL-STD-1553 and ARINC 429 commercial, military, and COTS grade cards and components, as well as software that maintain compatibility between product generations. The Data Bus product line has been field proven for the military, commercial and aerospace markets.

DDC is also a global leader in Synchro/Resolver Solutions. We offer a broad line of Synchro/Resolver instrument-grade cards, including angle position indicators and simulators. Our Synchro/Resolver-to-Digital and Digital-to-Synchro/Resolver microelectronic components are the smallest, most accurate converters, and also serve as the building block for our card-level products. All of our Synchro/Resolver line is supported by software, designed to meet today's COTS/MOTS needs. The Synchro/Resolver line has been field proven for military and industrial applications, including radar, IR, and navigation systems, fire control, flight instrumentation/simulators, motor/motion feedback controls and drivers, and robotic systems.

As the world's largest supplier of Solid-State Power Controllers (SSPCs) and Remote Power Controllers (RPCs), DDC was the first to offer commercial and fully-qualified MIL-PRF-38534 and Class K Space-level screening for these products. DDC's complete line of SSPC and RPC boards and components support real-time digital status reporting and computer control, and are equipped with instant trip, and true I^2T wire protection. The SSPC and RPC product line has been field proven for military markets, and are used in the Bradley fighting vehicles and M1A2 tank.

DDC is the premier manufacturer of hybrid motor drives and controllers for brush, 3-phase brushless, and induction motors operating from 28 Vdc to 270 Vdc requiring up to 18 kilowatts of power. Applications range from aircraft actuators for primary and secondary flight controls, jet or rocket engine thrust vector control, missile flight controls, to pumps, fans, solar arrays and momentum wheel control for space and satellite systems.

Certifications

Data Device Corporation is ISO 9001: 2008 and AS 9100, Rev. C certified.

DDC has also been granted certification by the Defense Supply Center Columbus (DSCC) for manufacturing Class D, G, H, and K hybrid products in accordance with MIL-PRF-38534, as well as ESA and NASA approved.

Industry documents used to support DDC's certifications and Quality system are: AS9001 OEM Certification, MIL-STD-883, ANSI/NCSL Z540-1, IPC-A-610, MIL-STD-202, JESD-22, and J-STD-020.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



DATA DEVICE CORPORATION
REGISTERED TO:
ISO 9001:2008, AS9100C:2009-01
EN9100:2009, JIS Q9100:2009
FILE NO. 10001296 ASH09



The first choice for more than 50 years—DDC

DDC is the world leader in the design and manufacture of high reliability data interface products, motion control, and solid-state power controllers for aerospace, defense, and industrial automation.

Inside the U.S. - Call Toll-Free 1-800-DDC-5757

Headquarters and Main Plant
105 Wilbur Place, Bohemia, NY 11716-2426
Tel: (631) 567-5600 Fax: (631) 567-7358
Toll-Free, Customer Service: 1-800-DDC-5757

Web site: www.ddc-web.com

Data Device Corporation

Outside the U.S. - Call 1-631-567-5700

United Kingdom: DDC U.K., LTD
James House, 27-35 London Road, Newbury,
Berkshire RG14 1JL, England
Tel: +44 1635 811140 Fax: +44 1635 32264

France: DDC Electronique
10 Rue Carle-Hebert
92400 Courbevoie France
Tel: +33-1-41-16-3424 Fax: +33-1-41-16-3425

Germany: DDC Elektronik GmbH
Triebstrasse 3, D-80993 München, Germany
Tel: +49 (0) 89-15 00 12-11
Fax: +49 (0) 89-15 00 12-22

Japan: DDC Electronics K.K.
Dai-ichi Magami Bldg, 8F, 1-5, Koraku 1-chome,
Bunkyo-ku, Tokyo 112-0004, Japan
Tel: 81-3-3814-7688 Fax: 81-3-3814-7689
Web site: www.ddcjapan.co.jp

Asia: Data Device Corporation - RO Registered in Singapore
Blk-327 Hougang Ave 5 #05-164
Singapore 530327
Tel: +65 6489 4801

The information in this Manual is believed to be accurate; however, no responsibility is assumed by Data Device Corporation for its use, and no license or rights are granted by implication or otherwise in connection therewith. Specifications are subject to change without notice.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP