Contents

Special Maintenance Procedures

Clearing NV RAM

Each day the nonvolatile RAM should be cleared to refresh the memory within the LGP. This can eliminate possible errors and LGP lockups that could occur due to memory errors. The LGP NV RAM can be cleared individually for each lane pair at the scorer console through the maintenance menu or for a range of 16 lanes via the Control Desk terminal. Perform the following steps to clear the nonvolatile RAM.

NOTE: *This procedure erases all current bowler information and scores. DO NOT PERFORM THIS PROCEDURE IF THERE IS BOWLING INFORMATION ON THE LANE PAIR THAT MUST BE RETAINED .*

Clearing the NV RAM from the Console

1. At the Frameworx logo (or special menu) enter the maintenance menu password. The default password is: 6167254966.

2. Using the down button, select the option "Clear NV RAM."

3. Press "OK" button. Upon selecting "OK," the console will reboot.

Clearing the NV RAM from the Control Desk Terminal

1. At the CenterMaster Main screen select the Office Page button (Desk Icon)

2. Select the *"Scorer Maintenance"* twist button.

3. Select *"Operations"*

4. Select the lanes that you want to clear. **DO NOT EXCEED 16 LANES.**

5. Select the *"CLEAR NV"* button.

Updating the Scorer Program from the Control Desk Terminal

1. At the CenterMaster main screen select the *"Office Page"* button (Desk Icon).

2. Select the *"Scorer Maintenance"* Twist button to view the Scorer Maintenance selections.

3. Select *"Operations"*.

4. Select the lanes that you want to clear. DO NOT EXCEED 16 LANES.

5. Select the Install button.

CMOS RAM Setup

NOTE: *This procedure is not required when using I/O PCB-Version B.*

Whenever the Motherboard or hard drive in the LGP is replaced, the CMOS RAM on the Motherboard must be reprogrammed. The CMOS RAM can be programmed; with the supplied CMOS Maintenance PCB.

CMOS Setup Using a CMOS Maintenance Board

To setup the Motherboard's CMOS RAM using the CMOS Maintenance Board, perform the following steps:

1. Turn off the power to the LGP or Instant Replay Processor that requires setup.

2. Insert the CMOS Maintenance Board into any open ISA slot on the Motherboard.

3. With the CMOS Maintenance Board plugged in, turn the power back on to the LGP or Instant Replay Processor.

4. Wait for the processor to boot normally.

NOTE: *Because of the setup procedure, it may take an additional 30-60 seconds longer for the system to boot.*

5. Once the system has booted up, turn the power off and remove the CMOS Maintenance Board.

6. Replace the unit's cover and turn the power on again. Verify that the system boots up normally.

SPECIAL NOTE: *If a system is having repeated problems with the CMOS settings, the CMOS Maintenance Board can be left in the system until the problem can be repaired.*

Changing the Scorer Maintenance Menu Password from the Control Desk Terminal

1. At the CenterMaster main screen select the *"Office Page"* button (Desk Icon).

2. Select the *"Scorer Maintenance"* twist button to view the Scorer Maintenance selections.

3. Select Password.

4. Select the lanes to recieve the new password. DO NOT EXCEED 16 LANES.

5. Enter the new scorer maintenance menu password in the *"New Password"* entry box.

***NOTE**: You must enter a numeric password using the numbers 1-9. The number 0 cannot be used! The pasword must also be atleast 5 characters with a maximum of 10 characters.*

6. Re-enter the password in the *"Confirm Password"* entry box.

7. Select the *"Send to Scorer"* button to download the new passworsd to the selected lanes.

Updating the CMOS Maintenance Board from the Control Desk Terminal

1. At the CenterMaster main screen select the *"Office Page"* button (Desk Icon).

2. At the CenterMaster main screen select the *"Office Page"* button (Desk Icon).

3. Select *"Operations"*

4. Select the lanes that you want to clear. DO NOT EXCEED 16 LANES.

5. Enter the filename *"LoadCMOS"* in the *"Other"* entry box.

6. Select the *"Other"* button.

System Switch and Jumper Definition

LGP I/O PCB-A

JPR1: Selects RS-485 Termination

Pins 1-2 = Terminated
Pins 2-3 = Unterminated (Default)

JPR2 & JPR4: Selects Parallel Port Configuration

JPR2	JPR4	
1-2	**1-2**	**Printer Mode (Default)**
1-2	2-3	EPP
2-3	1-2	ECP
2-3	2-3	ECP + EPP

JPR3: Hard Drive IDE Interface Enable

Pins 1-2 = Disabled, No Hard Drive
Pins 2-3 = Enabled (Default)

JPR5: Watchdog Timer

Installed = Enabled (Default)
Not Installed = Disabled

JPR6: FLASH and Static RAM Disable

Installed = Disable FLASH and Static RAM
Not Installed = Enabled Flash and Static RAM (Default)

JPR7: Powerfail Detection

Installed = Enable Powerfail Detection
Not Installed = Disable Powerfail Detection (Default)

JPR8: Connect logic and chassis grounds (PCB trace, not a micro-jumper)

Connected (Default)

JPR9: RS-485 Receiver Control

Pins 1-2 = Receiver controlled by RTS (Default)
Pins 2-3 = Receiver alsways enabled

JPR10: Hard Drive IOCHRDY Selection

Pins 1-2 = Direct Connection to Bus
Pins 2-3 = Indirect Connection Via Controller (Default)

When the Sound Blaster PCB is NOT present, jumpers will short the following pins on J6 and J7 connectors:

J6, Pins 1-2 (Default)
J7, Pins 1-2 (Default)

I/O PCB-B

JPR1: LLAN Termination

Pins 1-2 = Terminated
Pins 2-3 = Unterminated (Default)

JPR2: NVRAM Discharge

Pins 1-2 = Do not Discharge (Default)
Pins 2-3 = Discharge

JP6: CMOS Maintenance Disable

Installed = CMOS Maintenance Enabled (Default)
Not Installed = CMOS Maintenance Disabled

JP8: DOC (Disk on Chip) Disable

Installed = DOC Enabled
Not Installed = DOC Disabled (Default)

JP9: NVRAM Disable

Installed = NVRAM Enabled (Default)
Not Installed = NVRAM Disabled

JP10: IDE Disable

Installed = IDE Enabled (Default)
Not Installed = IDE Disabled

JP12: Battery Disconnect

Installed = On board battery connected (Default)
Not installed = On board battery disconnected

S1: Lane Assignment Switches

Switch On = Value Enabled
Switch Off = Value Disabled

Sw1 = 1
Sw2 = 2
Sw3 = 4
Sw4 = 8
Sw5 = 16
Sw6 = 32
Sw7 = 64
Sw8 = 128

Remote Video PCB Version - A

JPR1: Console Video Address Selection

Installed = Select Console Video Addresses (Install for Skyworx and Teamworx)

Not Installed = Select Remote Video Addresses (Remove for Skyworx, Powerworx and Touchworx)

Remote Video PCB Version - B

JP4: Video Select

Installed = Select Console Video Addresses (Install for all Teamworx installations and for the board connected to the lower screens in Touchworx flatscreen installations.)

Not Installed = Select Remote Video Addresses (Remove for Powerworx installations and for the board connected to the overhead screens in Touchworx flatscreen installations.

Console Video PCB - A

JPR1: Console Video Address Selection

Installed = Select Remote Video Addresses
Not Installed = Select Console Video Addresses (Default)

JPR2: Channel Reversal

Installed = Reverse Left and Right Video Channels
Not Installed = No Reversal (Default)

Console Video PCB - B

JP4: Video Select

Not Installed = Select Remote Video Addresses
Installed = Select Console Video Addresses (Default)

Console Controller PCB

JP1: Lane Selection

Pins 1-2 (R) = Right Lane Select
Pins 2-3 (L) = Left Lane Select (Default)

JP2: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

JP3: Selects RS=485 Termination

Pins 1-2 (U) = Unterminated (Default)
Pins 2-3 (T) = Terminated

J1: Keyboard Connection

Pins 21-22 = Install jumper if touchscreen is installed
Pins 21-22 = Remove jumper for standard keyboard (Default)

Console Audio PCB

JP2: Lane Selection

Pins 1-2 (L) = Left Lane Select (Default)
Pins 2-3 (R) = Right Lane Select

JP3: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

Video Receiver PCB

No Jumpers

CMS Handset PCB

No Jumpers

CMS Audio PCB

JP1: Connect logic and analog grounds (PCB trace, not a micro-jumper)

Connected (Default)

JP2: Connect logic and chassis grounds (PCB trace, not a micro-jumper)

Not Connected (Default)

JP3: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

Composite-to-RGB Converter PCB

JPR 1,2,3: Scorer Monitor Cable Length

Pins 2-4 = 100 Feet
Pins 1-2 = 200 Feet (Default)
Pins 3-4 = 300 Feet
Pins 5-6 = 400 Feet

JPR 5, 6, 7: TV-Only Monitor Cable Length

Pins 2-4 = 100 Feet
Pins 1-2 = 200 Feet (Default)
Pins 3-4 = 300 Feet
Pins 5-6 = 400 Feet

TV-Only PCB

JPR1: Selects RS-485 Termination

Pins 1-2: Unterminated
Pins 2-3: Terminated (Default)

JPR2: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

JPR3: Lane Selection

Installed = Right Lane Select
Not Installed = Center or Left Lane Select (Default)

Pinsetter Controller PCB

JP1, 2, 3: Select Scanner Type

Pins 1-2 = GS-92, AS90 Scanner Port
Pins 2-3 = CCD, 79, 86 Scanners or Pinsensors (Default)

JP4: Selects RS-485 Termination

Pins 1-2 = Terminated (Default)
Pins 2-3 = Unterminated

JP5: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

JP6: Connect logic and chassis grounds (PCB trace, not a micro-jumper)

Not Connected (Default)

S1: Configuration Setup

Switch No.	Settings	
1, 2	10 Pin Pinsetter 5 Pin Free Fall Pinsetter (Double Diamond) 5 Pin String Pinsetter Duck Pin String Pinsetter	No.1 No.2 Off Off On Off Off On On On
3-7	All Installations	No. 3 No. 4 No. 5 No. 6 No.7 Off Off Off Off Off
8	Scanner or Pinsensor Present Scanner or Pinsensor Not Installed	No. 8 Off On

Adaptor PCB

JPR1: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

JPR2: Connect logic and chassis grounds (PCB trace, not a micro-jumper)

Not Connected (Default)

Console Option PCB

JP1: Watchdog Enable

Installed = Watchdog Enabled (Default)
Not Installed = Watchdog Disabled

JP2: Lane Selection

Pins 1-2 (L) = Left Lane Select (Default)
Pins 2-3 (R) = Right Lane Select

JP3: Touchscreen Present

Installed = Touchscreen Present (Default)
Not Installed = No Touchscreen

JP4: Card Reader Present

Installed = Card Reader Present
Not Installed = No Card Reader (Default)

LGP Motherboard A

JP1: VESA Logic Bus ID3

Installed = VL Bus ID is 3
Not Installed = Disabled (Default)

JP2: VESA Logic Bus ID2

Installed = VL Bus ID is 2
Not Installed = Disabled (Default)

JP3: VESA Logic Bus ID1

Installed = VL Bus ID is 1
Not Installed = Disabled (Default)

JP4: VESA Logic Bus ID0

Installed = VL Bus ID is 0 (Default)
Not Installed = Disabled

JP5: Bus Speed

Installed = Bus Speed is greater than 33 MHZ
Not Installed = Bus Speed is equal to or less than 33MHZ (Default)

JP6: Cache memory size

Pins 1-2 = 128K Cache
Pins 2-3 = 64K Cache (Default)

JP7, JP8: Clock Speed

JP7 Installed, JP8 not Installed = 33MHZ Clock (Default)
JP7 Not Installed, JP8 Installed = 25MHZ Clock

JP9: CMOS Setup

Pins 1-2 = Clears CMOS Setup Information
Pins 2-3 = Normal CMOS Operation (Default)

JP10: BIOS Password

Installed = Enables Password protection for BIOS
Not Installed = Disables BIOS Password protection (Default)

LGP Motherboard B

CPU & Frequency Selection
CPU Selection (JP8, JP17, JP18, JP19, JP20, JP23, JP26, JP27, JP28, JP29, JP31, JP32, JP36)

CPU Type	*486SX*	***486DX/DX2 Default***	*SL - 486SX*	*SL - 486DX*
JP8	2-3	**2-3**	2-3	2-3
JP17	Open	**Open**	Open	Open
JP18	Open	**Open**	Open	Open
JP19	1-2	**1-2**	1-2	1-2
JP20	Open	**Open**	Open	Open
JP23	1-2	**1-2**	2-3	2-3
JP26	Open	**Open**	Close	Close
JP27	Open	**Open**	Close	Close
JP28	Open	**Open**	Open	Open
JP29	Open	**1-2**	Open	1-2
JP31	2-3	**1-2**	2-3	1-2
JP32	Open	**2-3**	Open	2-3
JP36	Open	**Open**	Open	Open

CPU Selection (JP8, JP17, JP18, JP19, JP20, JP23, JP26, JP27, JP28, JP29, JP31, JP32, JP36)

CPU Type	***AMD 3.3V CPU Default***	*Intel 486DX4*	*Cyrix 486DX*
JP8	**2-3**	2-3	5V CPU : 2-3 3V CPU : 1-2
JP17	**Open**	Open	1-2
JP18	**1-2 : 3X CLK** **2-3 : 2X CLK**	Open	Open
JP19	**1-2**	1-2	2-3
JP20	**Open**	Open : 3X CLK 1-2 : Reserved 2-3 : Reserved	Open
JP23	**1-2**	2-3	1-2
JP26	**Open**	Close	Open
JP27	**Open**	Close	Open
JP28	**Open**	Open	1-2 : M7 1X CLK 2-3 : M7 2X CLK
JP29	**1-2**	1-2	1-2
JP31	**1-2**	1-2	1-2
JP32	**2-3**	2-3	2-3
JP36	**Open**	Close	Open

Frequency Selection (JP34, JP35)

CPU Type	*JP34*	*JP35*
25MHz	Close	Open
33MHz/66MHz/100MHz	**Open***	**Close***
40MHz/80MHz	Open	Open
50MHz	Close	Close

Cache Size Selection (JP43, JP44, JP41, JP22)

Cache Size	*JP22*	*JP41*	*JP43*	*JP44*
128K	1-2	1-2	Open	Close
256K	**1-2**	**2-3**	**Close**	**Close**
512K	2-3	1-2	Close	Close

VESA Local Bus Selection (JP38, JP39) (not used)

Jumper	*Setting*	*Function*
JP38	Open* Close	OWS 1WS
JP39	Open* Close	<= 33MHz > 33MHz

Green Device Connector (JP13) (not used)

Pin Number	*Function*	
1	GND	
2	Connect to External Device for Green (AC Power, VGA etc.)	Normal = High Green Mode = Low

External Power Management Interface (JP12) (not used)

Pin Number	*Function*	
1	GND	
2	External Power Management Interface	Normal = High Green Mode = Low

On Board CPU Voltage Selection CPU (JP21)

JP21	*Function*
Open	**For 3.3 V CPU (DX4 etc.)**
Close	

Turbo Switch Connector (JP49)

Turbo	*Speed*	*Turbo LED*
Close	Low	Off
Open*	**High**	**On**

CMOS Power Source (JP10)

JP10	*Operation*
1-2	Clear CMOS
2-3*	**On Board Battery**

Mono/Color Display Selection (JP14)

JP14	*Display Adapter Type*
Open	Mono Display
Close*	**Color Display**

LGP Motherboard C

***NOTE**: Standard setting of production is AMD DX2-66 CPU (3.45 Volt)*

CPU Type Configuration

	INTEL/ A MD 486DX	*INTEL ENHANCE 486DX2*	*INTEL (P24C) (3 V)*	*INTEL P24T*	*INTEL P24D*	***AMD48 DX2-66 DX2-80 (3.45 V)***	*AMD48 DX4-10 (3.45 V)*	*AMD* / *DX2-80 DX5-13*	*ENHANCE 486(3.45 V)* / *DX4-100 DX4-120*	*CYRIX DX2-66 DX4-100 DX2-80 (3.45 V)*	*CYRIX CX586 (3.45 V)*
JP9	OPEN	OPEN	OPEN	OPEN	OPEN	**OPEN**	OPEN	OPEN	OPEN	CLOSE	CLOSE
JP10	OPEN	CLOSE	CLOSE	CLOSE	CLOS	**OPEN**	OPEN	CLOSE	CLOSE	CLOSE	CLOSE
JP11	1-2	1-2	1-2	2-3	2-3	**1-2**	1-2	2-3	2-3	2-3	2-3
JP12	OPEN	1-2	1-2	1-2	1-2	**OPEN**	OPEN	1-2	1-2	2-3	2-3
JP13	1-2	1-2	1-2	1-2	1-2	**1-2**	1-2	1-2	1-2	OPEN	OPEN
JP19	OPEN	OPEN	OPEN	OPEN	1-2	**2-3**	1-2	1-2	1-2	OPEN	1-2
JP20	OPEN	CLOSE	CLOSE	CLOSE	CLOS	**OPEN**	OPEN	CLOSE	CLOSE	CLOSE	CLOSE
JP21	OPEN	1-2	1-2	1-2	1-2	**OPEN**	OPEN	1-2	1-2	2-3	1-2
JP23	1-2, 3-4	1-2, 3-4	1-2, 3-4	1-2, 3-4	1-2, 3-4	**1-2, 3-4**	1-2, 3-4	1-2, 3-4	1-2, 3-4	1-2, 3-4	1-2, 3-4
JP29	1-3, 2-4	1-3, 2-4	3-5, 4-6	1-3, 2-4	1-3, 2-4	**3-5, 4-6**	3-5, 4-6	3-5, 4-6	3-5, 4-6	3-5, 4-6	3-5, 4-6
JP30	OPEN	OPEN	OPEN	OPEN	OPEN	**OPEN**	OPEN	1-2	OPEN	OPEN	OPEN
JP32	OPEN	OPEN	OPEN	2-3	2-3	**OPEN**	OPEN	2-3	2-3	1-2	2-3
JP45	OPEN	OPEN	1-2	OPEN	OPEN	**3-4**	3-4	3-4	3-4	3-4	3-4
JP46	OPEN	1-2	1-2	1-2	1-2	**OPEN**	OPEN	1-2	1-2	2-3	2-3

CPU Clock Frequency (Yellow Jumper Cap)

	25 Mhz	***33Mhz***	*40 Mhz*	*50 Mhz*
JP17	OPEN	**CLOSE**	CLOSE	OPEN
JP18	OPEN	**CLOSE**	OPEN	CLOSE

CACHE Memory Configuration (Blue Jumper Cap)

	64KB	*128KB*	***256KB***	*256KB*	*256KB*	*512KB*
JP8	2-3	1-2	**2-3**	2-3	1-2	1-2
JP27	OPEN	CLOSE	**CLOSE**	CLOSE	CLOSE	CLOSE
JP28	OPEN	OPEN	**CLOSE**	CLOSE	CLOSE	CLOSE
JP43	OPEN	OPEN	**OPEN**	OPEN	CLOSE	CLOSE
JP44	1-2	1-2	**2-3**	1-2	2-3	1-2
TYPE	8K*8	32k*8	**32K*8**	32K*8	64K*8	128K*8
TAG	8K*8	8K*8	**16K*8**	32K*8	16K*8	32K*8
BANK	2 BANKS	1 BANK	**2 BANKS**	2 BANKS	1 BANK	1 BANK

Jumper	*Setting*	*Function*
JP2	1-2	Discharge CMOS (Note: All Data in the CMOS will be erased.)
	2-3	**Charge CMOS**
JP5	**1-2**	**72 pin Simm Module As Bank0**
	2-3	30 pin Simm Module AS Bank0
JP30	OPEN	3xclk FOR INTEL P24X and ENHANCE AMD CPU
	1-2	**72pin Simm Module As Bank0**
JP36	OPEN	Normal Speed
	CLOSE	**Turbo Speed**
JP39		CRT Power Down
J1		Keyboard Connector
J2		External Battery Connector (Pin 1 For =, Pin 4 For-)
PL1		Power Supply Connector
JP46		(1-2) INTEL/AMD SMI.(2-3) CYRIX SMI.

Ethernet PCB

No jumpers are located on this board.

Repair Center Information

To contact the Brunswick Electronic Repair Center, call **1.800.323.8141**. Please have your center name and customer number ready. You will also need the name, part number, and software version of any assembly you wish to order. ***The Repair Center cannot provide technical troubleshooting and/or analysis.*** Please contact the Brunswick Customer Response Center for that assistance. They can also be reached at **1.800.323.8141**.

Shipping Defective Material to Brunswick Electronic Repair Center

1. Printed circuit boards must be individually wrapped in antistatic material.
2. Hard drive assemblies must be handled like *glass* at all times. Credit will be issued only for defective hard drives returned in the original shipping carton.
3. Proper packing material in a sufficient quantity must be used to prevent damage in shipping and handling. Please use bubble wrap, packing peanuts, or the original packing material. Old magazines, dirty rags, and clothing **are not** considered proper packing material!
4. Please put return address inside **and** outside all packages.
5. A completed Electronic Repair Form (Traveler) must be included. A reproducible blank form is included in this Guide and also on the back of the Repair Center price list. Be sure to keep a copy for your records.
6. Boards or assemblies that are received damaged due to insufficient or improper packing procedures will be returned to the customer as unrepairable.
7. Please handle the defective assemblies the way you would handle your repaired assemblies. Remember, the next customer to receive the assembly could be *you*!
8. Send defective boards or assemblies to:

   Brunswick Indoor Recreation Group
   Electronic Repair Center
   525 West Laketon Avenue
   Muskegon, MI 49441

   (Please be sure to include Electronic Repair Center in the address!)

Non-Repairable Conditions

Units with any type of the following conditions **CANNOT** be repaired and will be returned as unrepairable.

1. Assemblies and circuit boards with parts stripped off.
2. Missing circuit runs or gold contacts.
3. Cracked printed circuit boards.
4. Solder on gold contacts.
5. Multiple crushed or broken components
6. Burned printed circuit boards.
7. Assemblies with unauthorized center repairs

Exchange Depot Information

The Brunswick Electronic Repair Center also maintains supply depots for more convenient parts exchange. While these depots are not able to stock everything that the Muskegon Repair Center does, they maintain an adequate inventory of many Brunswick boards and assemblies. They also offer preship expedite service and next day air delivery. Inquiries regarding system problems or identification of individual assemblies should be directed to the Brunswick Customer Response Center.

For customers in the Western United States, the depot location is:
Western Pacific Bowling Supply Company
1216 West Grove Avenue
Orange, CA 92865
8:00 a.m. - 5:00 p.m. Pacific Time Phone: 800.595.2695 Fax: 714.974.2681

For customers in Canada, the depot location is:
Bowling Sales of Canada, Inc.
959 Kamato Road
Mississauga, ON L4W 2R5
8:00 a.m. - 5:00 p.m. Eastern Time Phone: 800.561.2695 Fax: 800.593.5666

Emergency Preshipments - Lane or Desk Down

1. The emergency preshipment program is not intended to replace an adequate spare parts inventory in the bowling center.

2. Targeted response time to *ship* your parts is 24 to 48 hours after receipt of order.

3. With an emergency preshipment, you will be invoiced for the *exchange price*, plus a $60.00 non-refundable preshipment handling charge. If Brunswick does not receive your defective assembly within *30 days* of the date the preship assembly left Brunswick, you will be charged the *full preshipment price*. Any assemblies received after 30 days will be processed as a regular customer exchange.

4. Customers are *solely* responsible for the correct identification of specific software and assemblies they are ordering. Assistance in determining or verifying your parts and assemblies is available from the Brunswick Customer Response Center.

Customer Response Center Information

Customer Support

The Customer Response Center is provided to assist you in resolving problems and answering questions on your Brunswick capital equipment. Please review these procedures to enable you to solve any problems quickly.

Response Center Hours and Telephone Numbers

The Customer Response Center can be reached 24 hours a day, seven days a week at **1.800.323.8141** (U.S. and Canada) or via email at CRC@brunbowl.com. If you leave a message after normal business hours, we will return your call the next morning.

Normal business hours:

Monday - Friday	8:00 a.m. - 5:00 p.m. Eastern	*Direct call to next available technician.*
Monday - Friday	5:00 p.m. - 8:00 p.m. Eastern	*Message only. Technician will call back..*
Saturday & Sunday		*Message only. Technician will call back on Monday.*

General Guidelines

These guidelines and suggestions will allow us to assist you in solving problems or answering questions in the fastest possible time.

- The Customer Response Center is currently able to offer assistance only in English.
- To obtain full value and functionality from Brunswick capital equipment products, all personnel who are responsible for using or maintaining this equipment should be fully trained in its proper use and operation.
- Please be sure you refer to all available documentation and manuals before calling the Customer Response Center. Most questions are effectively answered there.
- If an answer cannot be found, please call the Customer Response Center at **1.800.323.8141**. You will be given the choice of holding for a technician or leaving a message in our Waitless Queue©.

The following information is needed to return your call:

- Business or trade name of the bowling center.
- Center's Brunswick customer number.
- A brief description of the symptoms experienced.
- Other pertinent information, including any error codes.

If you choose to leave a message, providing the additional information listed below will insure we return your call promptly:

- Center phone number including area code and country code, if applicable.
- Name of contact person or persons.
- Best time and day to return your call.

If you choose to hold for a technician, the average hold time is about 6 minutes. However, there will be longer hold times during peak periods (between 11:00 a.m. and 2:00 p.m.) or peak season (August and September league start up). Shorter hold times are normal early in the day, late in the afternoon, or anytime during the evening.

Whichever choice you select - holding or leaving a message - the technician will work with you to determine the problem, probable causes, and possible solutions. Some problems may have multiple symptoms and multiple possible solutions. Not all problems will be solved with a single, simple answer.

If you choose to leave a message, our new Waitless Queue© will speed up the response. The message you leave will hold your place in the queue allowing the freedom to perform other duties instead of holding on the line. The more information you can provide when leaving a message, the greater the possibility the technician will be able to call back with a solution. There is no time limit on the length of the message. If insufficient information is left, the technician may have to call for more information and not be able to solve the problem right away.

When calling on Saturday or Sunday, we operate with reduced staffing and you will only be given the option of leaving a message for a technician. This is done to reduce hold time and allow you to perform other duties. If this is an emergency situation (center down, lanes down), please note that when you leave a message. If you contact the Customer Response Center via E-mail, you will receive an E-mail response within 24-48 hours.

The Brunswick Customer Response Center is pleased to be able to provide the best assistance in the industry. The assistance you need to keep the most important customer happy - the bowler.

Glossary

10Base2 The 58 ohm coaxial cabling used in an Ethernet network. This cable is use to wire the office computer to the hubs located on the curtain wall.

10BaseT A cable that consists of two wire twisted around one another to form what is referred to as a twisted pair. This is the type of cable that attaches the LGP to the Ethernet hubs.

27" C5 Monitor A monitor that is used to display the Scorer console video. It can also display VCR video if needed.

Adapter Also known as an add-on card, controller, expansion card, or I/O card. Adapters are installed in expansion slots to enhance the processing power of the computer or to communicate with other devices. Examples of adapters include asynchronous communication, floppy disk-controller, and expanded memory.

Address A unique memory location permitting reading or writing of data to/ from that location. Network interface cards and CPUs often use shared addresses in RAM to move data between programs.

Analog-to-digital converter (ADC) A device that converts analog input signals to digital output signals used to represent the amplitude of the original signal.

A/P Automatic Pinsetter

Application software A computer program designed to help people perform a certain type of work. An application can manipulate text, numbers, graphics, or a combination of elements. Some application packages focus on a single task and offer greater computer power while others, called integrated software, offer less power but include several applications, such as word processing, spreadsheet, and database programs. An application may also be referred to as software, program, instructions, or task. See also *software*

ASCII (American Standard Code for Information Interchange) The data alphabet used in the IBM PC to determine the composition of the 7-bit string of 0s and 1s that represents each character (alphabetic, numeric, or special). It is a standard way to transmit characters.

Asynchronous communication (ASYNC) A type of serial communication by which data is passed between devices. “Asynchronous” means that the timing of each character transmitted is independent of other characters.

Audio Electronic name for sound

Average access time The time (in milliseconds) that a disk drive takes to find the right track in response to a request (the seek time), plus the time it takes to get to the right place on the track (the latency).

Back up To make a copy of a file, group of files, or the entire contents of a hard disk.

Ball Detector An optical device that sends a signal to the scanner or pinsensor to start the scoring process whenever it senses the delivery of a ball.

Ball Passing Sensor A detector unit that caused the overhead to change from the form display to the Pin display. Used in the Instant Replay system.

Batch File A file containing commands that can cause several different programs to execute automatically.

Baud rate A measure of the actual rate of symbols transmitted per second, which may represent more than one bit. A given baud rate may have more than one bps (bits per second) rate. Baud rate is often used interchangeably with bps, although this is technically incorrect.

Binary A numbering system with two digits, 0 and 1, used by computers to store and process information.

BIOS (basic input/output system) A collection of primitive computer routines (stored in ROM in a PC) that control peripherals such as the video display, disk drives, and keyboard.

Bisynchronous (BISNYC) Computer communications in which both sides simultaneously transmit and receive data.

Bit A binary digit: the smallest piece of information that can be recognized and processed by a computer. A bit is either 0 or 1. Bits can form larger units of information called nibbles (4 bits), bytes (8 bits), and words (usually 16 bits). See also *data bit*

Bits per second (bps) The number of data bits sent per second between two modems. Used as a measure of the rate at which digital information is handled, manipulated, or transmitted. Similar, but not identical, to baud rate.

Bowler Entry Station The keyboard pedestal used in Solution 3 that allows the bowler to enter all the information and selections as a Full scorer console but does not have the lower monitors .

Bowler Function Pad The bower entry keyboard used in solution 2 that allows limited entry options.

Broadband Coaxial cable capable of carrying several signals simultaneously on different channels.

Broadcast Messages - Messages sent to all computers on a network.

Buffer An area of RAM (usually 512 bytes plus another 16 for overhead) in which DOS stores data temporarily. See also *frame buffer*

Bus A group of wires used to carry a set of related signals or information within a computer from one device to another. This term is also used to designate a simple linear-shaped local area network

Byte A sequence of adjacent binary digits that the computer considers a unit. A byte consists of 8 bits.

Cache An amount of RAM set aside to hold data that is expected to be accessed again. The second access, which finds the data in RAM, is very fast. (Pronounced like “cash.”)

Card A Printed Circuit Board that has terminals at one end so that it can plug into another PCB

CCD (Capacitor Charged Device) A device that is kept in a constant state of electrical charge. When the device is stimulated by an outside force, IE light, electrical energy is released.

CGA IBM’s first color graphics standard, capable of 320 by 320 resolution at four colors (or gray shades on laptops), or 640 by 200 at two colors (black and white). CGA-only laptops are behind the times.

Chip An integral part of the PC. These are very tiny, square or rectangular slivers of material (usually silicon) with electrical components built in. Some of the chips in a computer aid in memory, but the most important chip is the microprocessor. This is the “8088”, “286”, “386”, or “486” that is referred to when talking about a specific machine’s features.

Clock - A circuit used to set the speed of a computer, microprocessor , or other device.

Clone An IBM PC/XT- or AT-compatible computer made by another manufacturer.

Cluster A hard-disk term that refers to a group of sectors, the smallest storage unit recognized by DOS. On most modern hard disks, four 512-byte sectors make up a cluster, and one or more clusters make up a track.

CMOS (complementary metal oxide semiconductor) chip A type of memory chip that retains its data when power is turned off as long as it retains a trickle of power from a battery.

Coaxial Cable A 2-Conductor cable consisting of a single center wire surrounded by a tubular shield. Most coaxial cables use braided metal as the shield.

COM Communications port or serial port used by modems, mice, and some printers. These ports are assigned as COM1, COM2, COM3 and COM4.

Note: Some programs count communications ports starting with 0, so "Port 0" or "Communications Port 0" would be COM1, and "Port 1" would be COM2.

Communications parameters Settings that define how your communications software will handle incoming data and transmit outgoing data. Parameters include bits per second, parity, data bits, and stop bits.

Console Video PCB A circuit board located in the LGP that controls the video going to the lower monitors.

Convergence A video term that describes the way in which the three beams that generate the three color dots (red, green, blue) should meet. When all three dots are excited at the same time and their relative distance is perfect, the result is pure white. Deviation from this harmony (due to an incorrect relationship of the beams to each other) results in poor convergence. This causes white pixels to show bits of color and can decrease image sharpness and resolution.

CPU (central processing unit) A chip or circuit board that is the "brain" of the unit it reside in. The element that does the actual adding and subtracting of 0s and 1s and the manipulation and moving of data that is essential to computing.
It is responsible for processing and logical decision making.

CRT (Cathode Ray Tube) A video monitor or picture tube of a display.

CSMA/CD Carrier Sense Multiple Access with Collision Detection. A method of avoiding data collisions on a local area network.

Database A file consisting of a number of records or tables, each of which is constructed of fields (in column format) of a particular type, together with a collection of operations that facilitate searching, sorting, recombination, and similar acts.

Data bits The bits sent by a modem. These bits make up characters and don't include the bits that make up the communications parameters. See also *bit*

DC (Direct Current) Rectified AC or battery voltage. A type of current that is steady and free from fluctuation.

DCE Data Communication Equipment; generally refers to modems.

Deflection Coil - An electrical coil which directs the electrons generated inside a CRT to a particular location on the screen.

Device Any piece of computer hardware.

Digital-to-analog converter (DAC) A circuit that accepts digital input signals and converts them to analog output signals. Sometimes called DAC chips, they are used in VGA video cards, for example.

Directory A list of file names and locations of files on a disk.

Disk A circular metal platter or mylar diskette with magnetic material on both sides that stores programs and data. Disks are rotated continuously so that read/write heads mounted on movable or fixed arms can read or write programs or data to and from the disk. See also *floppy disk, hard disk*

Disk cache A portion of a computer's RAM set aside for temporarily holding information read from a disk. The disk cache does not hold entire files as does a RAM disk, but information that has either been recently requested from a disk or has previously been written to a disk.

Disk Caching A reserved area in RAM where often-requested files are stored. This allows for much faster retrieval than if the files were stored on the disk.

Disk defragmenter Defragmentation is the rewriting of all the parts of a file on contiguous sectors. When files on a hard disk drive are being updated, the information tends to be written all over the disk, causing delays in file retrieval. Defragmentation reverses this process, and is often achieved with special defragmentation programs that provide up to 75 percent improvement in the speed of disk access and retrieval.

Disk drive The motor that actually rotates the disk, plus the read/write heads and associated mechanisms, usually in a mountable housing. Sometimes used synonymously to mean the entire disk subsystem.

Disk format Refers to the method in which data is organized and stored on a floppy or hard disk.

Diskette See *floppy disk*

DOS (disk operating system) A set of programs that control the communications between components of the computer. Examples of DOS functions are: displaying characters on the screen, reading and writing to a disk, printing, and accepting commands from the keyboard. DOS is a widely used operating system on IBM-compatible personal computers (PCS).

Dot pitch A color monitor characteristic; specifically, the distance between the holes in the shadow mask. It indirectly describes how far apart the individual dots are on screen. The smaller the dot pitch, the finer the image's "grain." Some color monitors, such as the Sony Trinitron, use a slot mask (also known as an aperture grille) that is perforated by strips, not holes, in the shadow mask. In this case, the dots are arranged in a linear fashion, and their density is called striped dot pitch. (Monochrome monitors do not use a shadow mask and therefore do not have a dot pitch.)

Download To receive information from another modem and computer over the telephone lines. It is the opposite of upload.

DRAM (dynamic random-access memory) The most commonly used type of memory, found on video boards as well as on PC system boards. DRAM is usually slower than VRAM (video random-access memory), since it has only a single access pathway.

DSHD (double-sided, high-density) On PCS and laptops, DSHD means 1.44Mb 3 ½-inch diskettes or 1.2Mb 5 1/4-inch diskettes.

DTE Data Terminal Equipment; generally consists of terminals or computers.

EBCDIC The Extended Binary Coded Decimal Interchange Code. A character code used by IBM's larger computers.

EISA (Extended Industry Standard Architecture) Primarily a desktop specification for high-performance computers. Competes with IBM's Micro Channel architecture (MCA). EISA computers can use existing PC, XT, and AT add-in cards; MCA computers can't. See also Micro Channel architecture

Expanded memory Memory that can be used by some DOS software to access more than the normal 640K (technically, more than 1Mb). 80386, 80386SX, and 80486 computers can create expanded memory readily by using an EMS (expanded memory specification) driver provided with DOS, through Microsoft Windows, or through a memory manager such as Quarterdeck QEMM or Qualitas 386 To The Max. To use expanded memory, a program must be EMS-aware or run under an environment such as Microsoft Windows. 8088- and 80286-based computers often need special hardware to run expanded memory. See also memory

Extended memory Memory above 1Mb in 80286 and higher computers. Can be used for RAM disks, disk caches, or Microsoft Windows, but requires the processor to operate in a special mode (protected mode or virtual real mode). With a special driver, you can use extended memory to create expanded memory. See also *memory*, *RAM*, *ROM*

Error A computer generated message indicating a failure during operation.

Ethernet A communication protocol used by a group of computers to share information and transfer information to one another.

Extractor - A tool used to remove terminal from their housing.

FAT: File Allocation Table A table that helps a disk server or file server keep track of where particular files are located.

File A collection of related records treated as a unit. In a computer system, a file can exist on magnetic tape, disk, or as an accumulation of information in system memory. A file can contain data, programs, or both.

Floppy disk A removable, rotating, flexible magnetic storage disk. Floppy disks come in a variety of sizes, but 3 ½-inch and 5 1/4-inch are the most popular. Storage capacity is usually between 360K and 1.44MB. Also called flexible disk or diskette. See also *disk, hard disk*

Floppy drive A disk drive designed to read and write data to a floppy disk for transfer to and from a computer.

Form Display The video display of the bowler's approach and release of the ball. Used in Instant replay equipment.

Foot Sensor A detector unit near the foul line that causes the overhead to switch from the scoresheet to the form display (Bowler Image). Used in the instant replay equipment.

Frequency The rate at which a cycle repeats (Usually measured in HZ)

Fuse A component which protects electrical assemblies from current overload.

Global Audio The VCR audio that comes from the CMS Audio Box. It is called global audio because It is routed to all consoles.

Global Video The VCR Video that comes from the CMS Audio/Video box in an RGBS format. It is called global video because It can be displayed on any overhead monitor.

Graphics coprocessor Similar to a math coprocessor in concept, a programmable chip that can speed video performance by carrying out graphics processing independently of the microprocessor. Graphics coprocessors can speed up performance in two ways: by taking over tasks the main processor would lose time performing and by optimizing for graphics. Video adapter cards with graphics coprocessors are expensive compared to those without them, but they speed up graphics operations considerably. Among the coprocessor's common abilities are drawing graphics primitives and converting vectors to bitmaps.

Handshaking A modem term that describes the initial exchange between modems. It's like "are you there?" with the response "I am here."

Hard disk A mass storage device that transfers data between the computer's memory and the disk storage media. Hard disks are non-removable, rotating, rigid, magnetic storage disks. There are some types of hard disk with removable rigid media in the form of disk packs. See also *disk*

Hardware The physical components of a computer.

Head actuator In a disk drive, the mechanism that moves the read/write head radially across the surface of the platter of the disk drive.

Hertz Cycles per second. The unit of measure for frequency.

High-speed modem A modem operating at speeds from 9,600 to 19,200 bits per second.

Host system In telecommunications, the system that you have called up and to which you are connected, such as a BBS (bulletin board system) or an on-line service such as CompuServe.

Hub A device used in the Frameworx system that changes the 10Base-2 Ethernet cabling to 10Base-T so that it can route to the LGPs. Each hub splits the signal so that it can connect to 16 LGP (32 lanes)

Hz (Hertz) A unit of measurement. This used to be called cycles per second.

IDE (integrated drive electronics) A disk drive with its own controller electronics built in to save space and money. Many laptops use IDE drives.

IEEE The Institute of Electrical and Electronics Engineers.

IEEE 802.3 The industry standard for a bus local area network using CSMA/CD.

Instructions See *application software*

Integrated circuit (IC) A tiny complex of electronic components and their connections that is produced in or on a slice of material (such as silicon). A single IC can hold many electronic elements. Also called a chip.

Intel A major manufacturer of integrated circuits used in computers. Intel makes the 8086 family of microprocessors and its derivatives: the 8088, 80286, 80386SX and DX, and 80486SX and DX. These are the chips used in the IBM PC family of computers and all the computers discussed in this book.

Interface A device which connects two or more different devices together.

Interlaced and noninterlaced scanning Two monitor schemes with which to paint an image on the screen. Interlaced scanning takes two passes, painting every other line on the first pass and filling in the rest of the lines on the second pass. Noninterlaced scanning paints all the lines in one pass and then paints an entirely new frame. Noninterlaced scanning is preferable because it reduces screen flicker, but it's more expensive.

I/O (input/output) Input is the data flowing into your computer. Output is the data flowing out. I/O can refer to the parallel and serial ports, keyboard, video display, and hard and floppy disks.

Interrupt request (IRQ) A request for attention and service made to the CPU. The keyboard and the serial and parallel ports all have interrupts. Setting two peripherals to the same IRQ is a cause of hair pulling among desktop PC users; laptops don't suffer the problem as badly because they have few, if any, add-on products that need interrupts set.

ISA (Industry Standard Architecture) Computers using the same bus structure and add-in cards as the IBM PC, XT, and AT. Also called classic bus. It comes in an 8-bit and 16-bit version. Most references to ISA mean the 16-bit version. Many machines claiming ISA compatibility will have both 8- and 16-bit connectors on the motherboard.

ISA BUS Industry Standard Architecture Bus. The type of connections used on the motherboard in the LGP that allows the other boards to connect to Motherboard.

ISO International Standards Organization.

Isolated Ground A special component grounding system which connects directly to the electrical ground where the electrical service enters the building..

Jam - A signal sent through a network to indicate a data collision has occurred.

Kilobyte (KB) 1,024 bytes. Sometimes abbreviated as k (lowercase), K-byte, K, or KB for kilobyte and Kb for kilobit (1,024 bits). When in doubt about whether an abbreviation refers to kilobytes or kilobits, it's probably kilobytes, with these exceptions: the speed of a modem (as in 2.4 kilobits per second) and the transfer rate of a floppy disk (as in 500 kilobits per second).

LAN - Local Area Network - A tem used to describe the communication between the LGPs and the office computer. Also see *Ethernet.*

LCD (Liquid Crystal Display) - An alpha numeric or digital display consisting of a special fluid sealed between two clear plates (usually glass). When light passes through the plates the fluid becomes polarized causing it to become dark. By controlling the location of the dark spots, a display can be created.

LED (Light Emitting Diode) - A diode that produces light when electricity is applied to it. Because of their low operating power, they are usually used in applications where limited power is available: such as computer chip outputs. LED's are used to indicate on/off, yes/no, or stop/go functions. They are available in several different sizes, shapes, and colors and can be packaged in rows, arrays, or 7 segment displays.

LGP - Lane Group Processor - The electronic circuit board assembly that allows operation of a lane pair. This chassis is located on the curtain wall in installations that do not include a scorer console. If the installation includes a scorer console the LGP is located in the Primary (left lane) console.

LLAN - Local Local Area Network - A term used to describe the communication used by a LGP to communicate to the Circuits boards within a lane pair. It is referred to as a local LAN because it is exclusive to a lane pair. Another name for the serial communication used in a lane pair. Also referred to as RS-485.

Local Area Network (LAN) A small- to moderate-size network in which communications are usually confined to a relatively small area, such as a single building or campus.

MB See *megabyte*

Mega One million, but with computers it typically means 1,048,576 (1,024 times 1,024).

Megabyte (MB) 1,048,576 bytes (1,024 times 1,024). Used to describe the total capacity of a hard or floppy disk or the total amount of RAM. Sometimes abbreviated as Mb, M, MB, or meg for megabyte; and Mb, M-bit, or Mbit for megabit. When in doubt, it's probably megabyte, not megabit, with these exceptions: the capacity of a single memory chip (a 1-megabit chip; you need eight chips plus an optional ninth parity-checking chip to get 1 megabyte of memory), the throughput of a network (4 megabits per second), and the transfer speed of a hard disk (5 megabits per second).

Megahertz (MHZ) One million cycles per second, typically used in reference to a computer's clock rate. Both the clock rate and the processor type (80286, 80386, etc.) determine the power and speed of a computer.

Memory A device that stores data in a computer. Internal memories are very fast and are either read/write random-access memory (RAM) or read-only memory (ROM). Bulk storage devices are either fixed disk, floppy disk, tape, or optical memories; these hold large amounts of data, but are slower to access than internal memories. See also *expanded memory, extended memory, RAM, ROM*

MHZ See also *megahertz*

Microprocessor An integrated circuit (IC) that communicates, controls, and executes machine language instructions.
A circuit chip that performs the most of the calculations and processing of information for a computer.

Microsecond 1/1,000,000 (one-millionth) of a second.

Millisecond (ms) 1/1,000 (one-thousandth) of a second. Hard disks are rated in milliseconds. Modern laptop hard disks have drives of 20 to 40 milliseconds, meaning they can find the average piece of data in 1/25 to 1/50 of a second. Older hard disks were about 100 milliseconds. Higher numbers mean slower performance.

Modem A combination of the words modulate and demodulate. A device that allows a computer to communicate with another computer over telephone lines.

Multimedia The presentation of information on a computer using sound, graphics, animation, video, and text.

NAK - A Negative AcKnowledgement signal.

Nanosecond 1/1,000,000,000 (one-billionth) of a second. Memory chips are rated in nanoseconds, typically 80 to 150 nanoseconds. Higher numbers indicate slower chips.

NetWare A popular series of network operating systems and related products made by Novell.

Network A continuing connection between two or more computers that facilitates sharing files and resources.

Network Adapter Card Circuit card required in the expansion bus of a LGP that allows it to connect a Local Area Network (LAN).

Node An individual workstation on a local area network. Generally includes a monitor, keyboard, and its own microprocessor, as well as a network interface card; it may or may not have its own disk drives.

Online/offline When connected to another computer via modem and telephone lines, a modem is said to be online. When disconnected, it is offline.

Open Contacts in a switch or relay that are not connected; wire that is broken.

Operating system (OS) A set of programs residing in ROM and/or on disk that controls communications between components of the computer and the programs run by the computer. MS-DOS is an operating system.

Parallel port A port that transmits or receives 8 bits (1 byte) of data at a time between the computer and external devices. Mainly used by printers. LPT1 is a parallel port, for example.

PCB Printed Circuit Board.

Peripheral A device that performs a function and is external to the system board. Peripherals include displays, disk drives, and printers.

Pincushion A distortion of the screen of a CRT that causes the sides or top and bottom of picture to bend toward the center of the screen.

Pin Display A video display of the ball as it hits the pins.

Pixel A pixel is the smallest information building block of an on-screen image. On a color monitor screen, each pixel is made of one or more triads (red, green, and blue). Resolution is usually expressed in terms of the number of pixels that fit within the width and height of a complete on-screen image. In VGA, the resolution is 640 by 480 pixels; in SuperVGA, it is 800 by 600 pixels.

Port The channel or interface between the microprocessor and peripheral devices.

Power Supply An electrical assembly that converts ac voltage to a controlled DC voltage.

Primary Scorer Console The console in solutions 4 and 5 that contains the LGP in addition to its own circuitry. This is usually the Console for the left pinsetter.

Program See *application software*

Programming language Any artificial language that can be used to define a sequence of instructions that can ultimately be processed and executed by the computer.

PROM (programmable read-only memory) A (usually) permanent memory chip programmed after manufacture (unlike a ROM chip). EPROMs (erasable PROMs) and EEPROMs (electrically erasable PROMs) can be erased and reprogrammed several times.

Protocol Rules governing communications, including flow control (start-stop), error detection or correction, and parameters (data bits, stop bits, parity). If they use the same protocols, products from different vendors can communicate. A set of rules or procedures commonly agreed upon by industry-wide committees (such as IEEE and ANSI).

Ram Memory (Random Access Memory) - A short term storage area for information in a computer. Most computers have this type of memory install on small circuit boards call SIMMs. Also known as read-write memory; the memory used to execute application programs. See also *memory.*

Read-Only Files that can be read but cannot be changed.

Read/write head The part of the hard disk that writes data to or reads data from a platter. It functions like a coiled wire that reacts to a changing magnetic field by producing a minute current that can be detected and amplified by the electronics of the disk drive.

Receiver PCB A circuit board located on the lower access panel in regular monitors that adapts the incoming video so that the Video processor PCB can use it. The PCB also determined when to turn the monitor on/off.

Redisplay Sensor A switch that can be pressed by the bowler to repeat the continuous display of the last ball thrown. Used in the Instant Replay system.

Refresh rate See *vertical frequency*

Relay An electrically controlled switch**.**

Repeaters Devices on local area networks that rebroadcast a signal to prevent its degradation.

Remote Video PCB A circuiut board located in the LGP that is controls the video going to the overhead monitors.

RGB (red, green, blue) The triad, the three colors that make up one pixel of a color monitor. A format of video describing the way in which the video is sent over the cable. See also *triad*

ROM (read-only memory) The memory chip(s) that permanently store computer information and instructions. Your computer's BIOS (basic input/ output system) information is stored in a ROM chip. Some laptops even have the operating system (DOS) in ROM.

RS-232C An electrical standard for the interconnection of equipment established by the Electrical Industries Association; the same as the CCITT code V.24. RS-232C is used for serial ports.

Scanner An optical device that counts pins for a pair of pinsetters.

Score Display Sensor A detector unit that causes the overhead to change from the Pin or Form display back to the scoresheet display.

SCSI Small Computer Systems Interface. An interface used to connect additional disk drives, tape backup units, or other SCSI-based peripherals to a PC.

Secondary Scorer Console The console in solutions 4 and 5 the contains limited circuitry for its own use. One that does not contain the LGP. (See Primary Console)

Sector The basic storage unit on a hard disk. On most modern hard disks, sectors are 512 bytes each, four sectors make up a cluster, and there are 17 to 34 sectors in a track (newer drives may have a different number of sectors).

Serial port The "male" connector (usually DB-9 or DB-25) on the back of your computer. It sends out data one bit at a time. It is used by modems and, in years past, for daisy-wheel and other printers. The other port on your computer is the parallel port, which is a "female" connector. It is used for printers, backup systems, and mini-networking (LANs). See also *COM.*

SIMM (single in-line memory module) A small circuit board that is designed to plug into special connectors on the motherboard in a computer to provide the system with RAM memory. SIMMs come in various memory sizes (1Meg,2Meg etc) and operating speeds (60ns,70ns etc). Additionally they come in 30 pin and 72 pin styles. The ones used in the Frameworx system are 1 Meg 30 Pin 70NS SIMMs

Software Programming tools such as languages, assemblers, and compilers; control programs such as operating systems; or application programs such as electronic spreadsheets and word processors. Software instructs the computer to perform tasks. See also *application software*

Sound Blaster PCB A circuit board that converts the digitized sound exciter audio located on the hard disk so that it can be sent to the speaker.

Splitter A device that divides a signal into two different paths.

Star A network topology physically resembling a star. This network, built around a central computer, fails completely if the main computer fails.

Strobe Action Display A video display showing all the displays (Form, Pin and Scoresheet) in a continuous preset order. This is used for the Instant Replay equipment.

Sweep Switch See Take Data Switch

Sweep up Switch See Zero degree switch.

Sync A signal applied to a monitor which includes horizontal and vertical pulses. These pulses are used to properly write the picture to the screen

Synchronous communication Fixed-rate serial communication, eliminating the need for transmitting inefficient start-stop information. PC-to-mainframe communication may be synchronous; most PC-to-PC communication is asynchronous. Most laptop modems are asynchronous only.

Take Data An electronic signal, supplied by the automatic pinsetter switch cluster that causes the scanner to score.

Take Data Switch A switch mounted to the pinsetter that causes the scanner to score. Also referred to as the 44/144 degree switch for Brunswick A/A2 machines and the Sweep Switch in AMF machines.

Telecommunication Using your computer to communicate with another computer via telephone lines and your modem.

Topology The physical arrangement of a network. Topology describes how it is cabled. See Star topology, Bus topology

Track The circular path traced across the spinning surface of a disk platter by the read/write head inside the hard-disk drive. The track consists of one or more clusters.

Transfer rate The speed at which a disk drive can transfer information between its platters and your CPU. The transfer rate is typically measured in megabytes per second, megabits per second, or megahertz.

Transformer A device which changes the level of an incoming voltage to a more desirable level. It can either increase the voltage (step up transformer) or decrease it (step down transformer).

Transmission speed See *baud rate*

Triad Three phosphor-filled dots (one red, one green, one blue) arranged in a triangular fashion within a monitor. Each of the three electron guns is dedicated to one of these colors. As the guns scan the screen, each active triad produces a single color, which is determined by the combination of excited color dots and by how active each dot is. See also *RGB*

TV-Only Monitor A Monitor that is used to display only the VCR video. This monitor cannot display scorer console information.

TV-Only PCB A circuit board located on the lower access panel in the TV-only monitors that adapts the TV/VCR video so that the Video processor can use it. This PCB also determined when the turn the monitor on/off.

Twisted-Pair Wire Two insulated wires twisted together so that each wire faces the same amount of interference from the environment.

Utility program A program designed to perform maintenance work on a system or on system components, e.g. a storage backup program, a disk and file recovery program, or a resource editor.

Vertical frequency This is also called the vertical refresh rate, or the vertical scan frequency. It is a monitor term that describes how long it takes to draw an entire screenful of lines, from top to bottom. Monitors are designed for specific vertical and horizontal frequencies. Vertical frequency is a key factor in image flicker. Given a low enough vertical frequency (53 Hz, for example) nearly everyone will see a flicker because the screen isn't rewritten quickly enough. A high vertical frequency (70 Hz on a 14-inch monitor) will eliminate the flicker for most people.

VGA IBM's third (1987) and current mainstream graphics standard, capable of 640-by-480-pixel resolution at 16 colors or gray shades. SuperVGA (800 by 600) resolution is important on desktop PCS. A handful of laptops support SuperVGA when connected to an external monitor; they use regular VGA when driving the built-in display. Some laptop vendors use "text mode" VGA, which means the monitor displays only 400 pixels, not 480, vertically, and uses double-scan CGA (640 by 400) for graphics.

Video Processor PCB A circuit board located in the back of the monitor that adapts the video so that is can be displayed properly on the CRT. The Video Processor controls the Coils attached to the CRT and sends the video to the Video Output PCB so it can be shown on the picture tube.

VRAM (video random-access memory) Special-purpose RAM with two data paths for access, rather than the one path in conventional RAM. The two paths let a VRAM board handle two functions at once: display refresh and processor access. VRAM doesn't force the system to wait for one function to finish before starting the other, so it permits faster operation for the video subsystem.

Watchdog Timer A timing device in a computer or an a circuit board which monitors activity. If activity stops for a predetermine length of time. the timer will automatically reset the board or computer.

Wide Area Network (WAN) Usually a moderate to large network in which communications are conducted over the telephone lines using modems.

Write protection Keeping a file or disk from being written over or deleted. 3 ½-inch floppy disks use a sliding write-protect tab in the lower-left corner (diagonally across from the beveled corner of the disk) to keep the computer from writing to the disk. When the opening is hidden by the tab (no light passes), you can write to the disk; tab open, you can't write. This can be confusing because it's the exact opposite of how a 5 1/4-inch disk works. Most file management utilities allow you to write-protect individual files.

XMA (extended memory specification) Interface that lets DOS programs cooperatively use extended memory in 80286 and higher computers. One such driver is Microsoft's HIMEM.SYS, which manages extended memory and HMA (high memory area), a 64K block just above MB.

Zero Degree Switch A switch located on the pinsetter that signals the scanner that the pinsetter has returned to its home position. This signal allows the scanner to prepare for the next ball and accept another ball detect. In the AMF pinsetter this switch is referred to as the sweep up switch.