

**SEGA®**

# Data Bus

Volume 4 Number 1

A Service Newsletter

March 1983

## Star Trek™ — The New Frontier

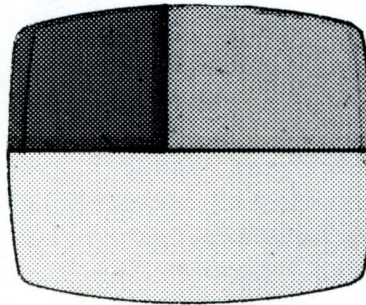
"These are the voyages of the Starship Enterprise," ... familiar words to millions of the series' fans, and soon to be as familiar to enthusiasts of the hot new video game from SEGA. Outstanding graphics, speech and a unique tactical data display come together in STAR TREK™ to produce game play that rivals the most active imaginations and challenges the most accomplished players.

STAR TREK is a one or two player Color X-Y game with computer synthesized speech, employing SEGA's highly successful G-80 modular card system for easy maintenance, high reliability. A Color X-Y monitor means exciting displays and an apparent 3-D perspective unmatched by conventional raster-scan video games. The Self-Test function is a complete electronics diagnostics sequence that greatly eases troubleshooting and repair. Additionally, STAR TREK has a unique method of displaying information vital to game play. This involves separation of the CRT into three completely independent "screens":

The Scanner projects a "top down" view of local space, the

STATUS

SCANNER



VIEWER

Status screen gives you Shield strength, Photon torpedo and Warp energy information, and the Viewer displays the view from the bridge of the Enterprise.

You find yourself the Captain of the Starship Enterprise; your mission — to defend the United Federation of Planets and her outposts from attack by the Klingon Empire. The game begins with an introduction to the Klingons, Federation Starbases and the Enterprise into the Scanner with a fascinating "shrink down" animation sequence. Armed with Phasers, Photon torpedoes and Warp Drive, you must use the available tactical data to

best advantage in countering enemy assaults. Though Phaser power is inexhaustable, both Photon torpedoes and Warp Drive energy are in limited supply, and as with Shield strength, can only be replenished by docking with a Starbase.

As rounds progress and the battle continues, supply levels can accumulate or be depleted, and as the action picks up you could be left vulnerable to elimination after several hits on

*(Continued on page 6)*



**STAR TREK™ by SEGA**

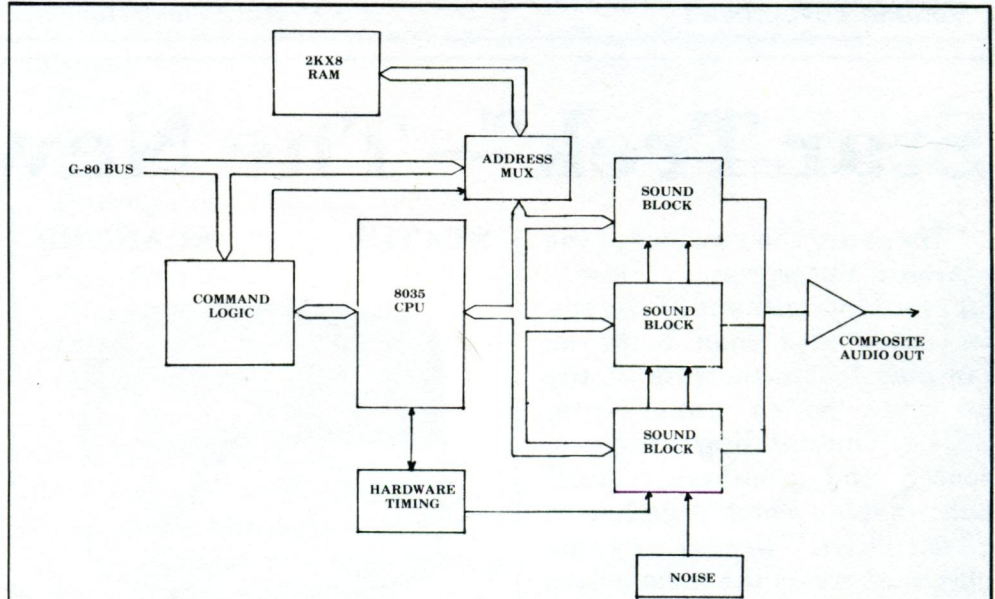
# Tech-Tips

## Universal Sound Board

Making its debut in TAC/SCAN™, and currently being employed in STAR TREK™ is SEGA's Universal Sound Board (P/N 800-0377). Designed to meet the considerable variety of sounds required of today's sophisticated video computer games, while at the same time meeting configuration changes from game to game, the Universal Sound Board simplifies production requirements. The following article details the operation of this unique and innovative game board:

The Universal Sound Board operates under control of stored program data. These digital signals are converted to an analog signal (clocked sinusoidal wave), by the use of digital-to-analog converters, summed together and fed through an output amplifier. This final output may or may not be filtered.

The sound board is subdivided into three independent and identical sound blocks or



**BLOCK DIAGRAM  
UNIVERSAL SOUND BOARD**

envelopes (CTC0, CTC1 and CTC2). Refer to the table for IC assignments for the individual blocks.

A sound block consists of (a) Programmable Interval Timer, an 8253; (b) a decode multiplexer which provides a WR signal for the D-to-A converters

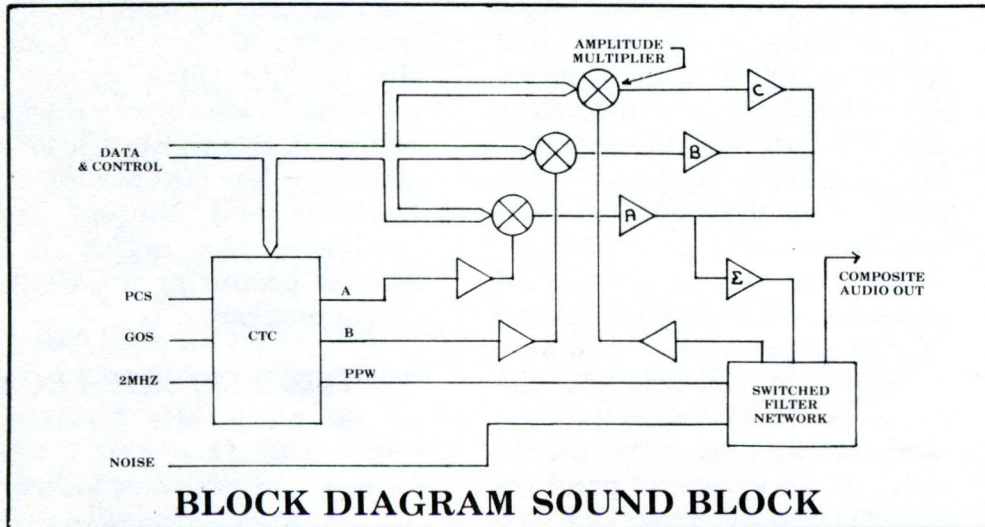
(74LS139's); (c) three independent and identical output channels (AD7524's); (d) a filtering network, made up of analog switches (4053's) and a controller IC (74LS74's); and (e) a summing amplifier (TL082's).

Under program control the sound data is simultaneously

	<b>SOUND BLOCK 0</b>	<b>SOUND BLOCK 1</b>	<b>SOUND BLOCK 2</b>
P.I. Timer (8253's)	U41	U42	U43
Channel A	U26, U19	U12, U3	U27, U20
Channel B	U25, U18	U13, U4	U28, U21
Channel C	U24, U17, U7	U14, U5, U16	U9, U22, U31
Filter Network	U8	U16, U9, U7, U15	U30, U23, U31
Controller IC for Filter Network	U38	p/o U2	p/o U2
Decoder Multiplexer	U10	p/o U11	p/o U11
Summing Amp	U6	U9	U23

# Tech-Tips

## Circuit Description



sent to the timing IC's (8253's) and the D-to-A converters. The Programmable timer generates three sine wave outputs (OUT 0, 1, 2) which provides a timing signal for the D-to-A converters and the filter network. Simultaneously, the decoder multiplexers (74LS139's) under program control develops a WR signal that allows the program data, already available, to be written into the D-to-A converters. The output of the D-to-A converters (pin 1) are fed into the op-amps (TL082's) which provides a sine wave output that varies between plus and minus two volts. The output of these three channels are then summed together by the op amps. The resulting output can then either be sent directly to the output amp or be re-routed and fed through the filtering network.

The filtering network is under control of the signal switch(s) which is developed by the controller IC's (74LS74). When the signal switch equals one (a HI), the filtering network is on, and the output is being filtered. The opposite is true when the signal switch equals zero (a LO). Circuit configuration in the analog switches are: xy to y for one (HI), and xy to x for zero (LO). The switch signal also allows development of a filtered or unfiltered noise output.

Finally, the analog sound output of the filters is then routed to the output amplifier TL082 (U1).

*The concluding part of the TURBO Troubleshooting article by Mario Hudson, begun in the last issue of Data Bus, will appear in the next issue. Mario has been traveling extensively, conducting Service Schools and*

*attending trade shows, and has, consequently, missed our "deadline."*

### CUSTOMER SERVICE NUMBERS

(As of Jan. '83)

#### Atari

800/538-1530

In CA: 800/538-1611

In NJ: 800/526-3849

#### Bally/Midway

800/323-7182

#### Bally Pinball

800/323-3555

#### Centuri

800/327-7710

#### Cinematronics

714/562-7710

#### Data East

800/538-5129

In CA: 408/727-4490

#### Exidy

800/538-8402

#### Game Plan

312/538-8402

#### Gottlieb

800/323-9121

#### Namco

800/538-1610

#### Nintendo

800/633-3236

#### Rock-Ola

800/621-4618

#### Rowe

201/887-0400

#### Sega

800/854-1938

In CA: 800/722-8576

#### Stern/Seeburg

800/621-6424

In IL: 800/572-1948

#### Taito

800/323-0666

#### Venture Line

800/528-1442

#### Williams

800/621-1253

In IL: 800/572-1324

# Story of Quality

Up to the early 1960s, the United States was known as second to none in innovations and quality standards of new products. The Japanese still believe that 85% of all the world's innovations come from the U.S., but other countries produce better quality and copy our ideas. With this in mind, we'd like to give you a short introduction into the Quality Circle concept, and how it came about. The phrase "Made in Japan," was once synonymous with poor quality and cheap goods. It is now a sign of good quality and an ability to market goods at competitive prices.

## 1950s — THE POST YEARS

Groups of Japanese industrialists flocked to the United States to learn how we achieve control and efficient production rates. They enlisted the aid of two Americans, Dr. W.E. Deming and Dr. J.M. Juran, who aren't that well known in the U.S. In today's industries in Japan, the highest award or merit one can receive is the "Deming Award" with his profile on it. With Deming & Juran, the Japanese formed Japanese Union of Scientists & Engineers, J.U.S.E., in order to train QC circle members and spread awareness of the need of quality control within the industry.

By the 1960s, Japanese firms had improved on the American quality control methods. Now employees were actively involved in Quality Control activities that previously were the concern of management and engineers. In the U.S., the belief was that 90% of total quality control potential lay with the managers and engineers, while the contributions of the "blue collar" workers were estimated at only 10%. The Japanese have found that the workers can play a significant role in improving product quality and increasing production. Since 1960, several hundreds of thousands of quality circles have been organized, embracing millions of workers in Japan.

A Quality Circle group is a group of up to 12 people who share the same job or are in the same department. They hold meetings once a week to input ideas on how to improve upon these areas; Quality, Cost, Productivity, Morale, and Safety. Once a problem is chosen, all members attempt to find out what is the major contributor or "cause" to the problem or "effect." The "cause" will usually fall in one of these categories: Man, Machine, Material, or Method. The next step is to collect data proving the problem does exist and come up with solutions to correct it. With all this

information gathered together, a presentation is made to management. In most instances, management is 100% behind the Quality Circle group. To give you an idea of why they are behind it, Sanyo Electric saved 39 Billion Yen (181 Million U.S. Dollars) and Nippon Steel attributes one fourth of its annual profits to the Quality Circle program.

## WHAT'S IN IT FOR SEGA?

Last year, the Customer Service Circle group was formed and began to look into the problem of getting the correct part to a customer for their game. If more than one type of that part was used in the production of that game, it was difficult to track exactly which assembly was used.

The solution we arrived at was to have someone stand at the end of the burn-in line and log in by game serial number the part numbers for the assemblies that make up that game. This log was then given to Data Processing for input to the computer. The parts people in Customer Service can now access this information and get you the right part the first time around. Management liked this idea so much that they placed a terminal at the end of the burn-in line which did away with the log and provided direct input of this information.

# Circles

By Bob Larkin

Customer Service Circle Leader

## WHAT'S IN IT FOR ME?

Through circle activity, everyone has the opportunity to expand their skills and get leadership training. Circles are based on a people-building philosophy and respects the ideas of each individual. Workers get the opportunity to find their own solutions and change by consensus, instead of by delegation. It helps build morale and pride, instead of apathy in the workplace. It helps establish good relationships between workers and gain recognition from the management. It opens new lines of communication between departments. Our goal in the Customer Service Circle is summed under three words:

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## UNITY COMMUNICATION SUPPORT

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## WHAT'S IN IT FOR YOU?

The project we're currently involved in is improving the standards for publishing the game owner's manuals. We tried to put a listing of not only what is covered in our manuals, but we also put some things we found in the other manufacturers'

manuals, keeping you, the customer, in mind. We hope that you will take the time to complete the questionnaire included in this issue and give us some constructive criticism on ways to improve our manuals. If more than one person would like to participate in this questionnaire, please either photocopy it or put the line number and answers on a separate sheet and put it inside the mailer. There is a place on the back of the questionnaire for comments, please make any comments you have there. What you write is going to be part of our data for presentation to management on formatting a standard for manual publications.

## CONCLUSION

The Circle concept is spreading to all the countries of the world. In the past year, over one hundred U.S. companies have formed groups. In China, last year, a conference was held where representatives of 300 circles met. Fourteen countries visited J.U.S.E. headquarters for training in 1981, and I'm sure that number increased for 1982. As we see it, being a circle member is a big plus for everyone's job. You'll hear about it wherever life takes you in your work environment. So please help our Circle to help SEGA produce the best owner's

manuals in the video game industry. Many thanks.

## WARNING FCC REQUIREMENTS

Many of you have noticed the FCC warning included in our manuals and in decals on the game. As of December 31, 1982, these are required to show that our games have been tested and comply with the requirements for a Class A computing device. These requirements are designed to provide protection against interference to radio communications when the game is operated in a commercial environment.

To comply with these requirements, we redesigned several assemblies used in our games such as providing enclosed cages around all electronics. To ensure continued compliance with these regulations, make sure when servicing that you replace every item you removed. Card cage covers have frequently been left off. We cannot stress too highly the importance of maintaining this compliance. If your game is not found to be in compliance with these rules and radio interference results, you will be required by the FCC at your own expense to make whatever changes are necessary to bring the game into compliance.

## Star Trek

(Continued from page 1)

your ship with no Shield strength remaining. Effective use of the long range, multi-kill Photon torpedoes and Warp Drive, combined with thoughtful use of Starbase replenishment (un-used Starbases are worth more bonus points at

rounds end) can greatly extend your playing time and final score.

STAR TREK is available in standard upright cabinet, and a "spacy" new cockpit. In the final analysis, the deep, colorful X-Y vector graphics, stimulating sound and speech, in addition to an intriguing game strategy, all combine to make STAR TREK truly a

video game "where no game has gone before ..."

SEGA is currently touring the major metropolitan areas of the United States to introduce STAR TREK to distributors, and promote the game concept to the public. This is just one more step in a continuing sales and marketing effort by SEGA to support our distributors.



*Data Bus* is a service newsletter published by SEGA Electronics, Inc. Customer Service, 16250 Technology Drive, San Diego, California 92127.

### Parts Order:

Inside California — (800) 722-8575  
Outside California — (800) 854-1900

### Technical Assistance:

Inside California — (800) 722-8576  
Outside California — (800) 854-1938

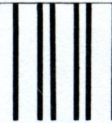
**Editor:** Richard Cortez  
**Writer:** Jim Bender

**Layout:** Cathy Britton  
**TLX:** 910-335-1621

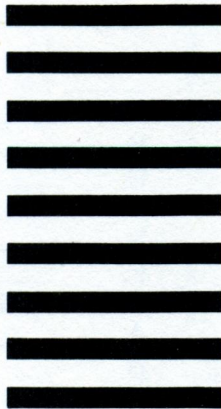


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**BUSINESS REPLY MAIL**

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**SEGA Electronics, Inc.**  
**16250 Technology Drive**  
**San Diego, California 92127-1985**

Attn: Customer Service

Second Fold

NAME: \_\_\_\_\_  
TITLE: \_\_\_\_\_  
COMPANY NAME: \_\_\_\_\_  
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# Service Notes

## MONSTER BASH™

• An error has been identified in the MONSTER BASH Owner's Manual (P/N 420-0807), page 124; please correct your documentation to read as follows:

*Item No.* 9

*Part No.* 151-0060-00

*Qty. Req.* 61

*Description:* CAP CER.10 UF  
16 V AX

*Ref. Des.:* C13-C53, C56, C58.

## MONITOR REPAIR

• RE: 19" Color X-Y Electrohome Monitor G08-003 (P/N 200-0025)

A higher than acceptable failure rate has been noted for the Thompson CSF version of the 1N4739 Zener Diode used in the Deflection Amp PCB Assembly. We recommend, therefore, that future replacements of ZD402 be made with the Motorola version (available through SEGA Customer Service Parts). Additionally, please amend the part description to specify manufacturer, as in the following example:

*Part No.:* 481-0179

*Description:* Zener Diode 9.1V  
1W 5%, Motorola 1N4739

*Ref. Des.:* ZD402

This addendum applies to the following games: SPACE FURY™, ELIMINATOR™, 4-PLAYER ELIMINATOR™, ZECTOR™, TAC/SCAN™.

• There has been a change made to the Electrohome 19" color monitor, model number G07-907. This monitor is Grem-

lin part number 800-0140 and 800-0165, having been utilized in ASTRO FIGHTER™, DIGGER™, SPACE FIREBIRD™, MOON CRESTA™, ASTRO BLASTER™, SPACE ODYSSEY™, FROGGER™, and ZAXXON™. In the event you may need the master power harness for this monitor, please note that:

*Part No.:* 280-0323

*Qty. Req.:* 2

*Description:* Electro Tap  
Splice AMP — is **deleted**.

*Part No.:* 800-0159

*Qty. Req.:* 1

*Description:* Assy Monitor  
Pwr Harn — is **deleted**.

*Part No.:* 800-0369

*Qty. Req.:* 1

*Description:* AC Harn Assy Z  
— is **added**.

Future part orders for this harness should use this number (P/N 800-0369).

## PENGO™

• There has been a re-designation of part number for the 4-Way Joystick Assembly. On page 31 of your PENGO Owner's Manual (P/N 420-0811), please correct Item No. 17 as follows:

*Item No.:* 17

*Part No.:* 510-0071

*Qty. Req.:* 1

*Description:* Joystick 4-Way  
Long Shaft

*Ref. Des.:* S5-S8.

• An error has been identified on page 17, Item No. 53 of your PENGO™ Owner's Manual (P/N 420-0811). Please correct your documentation to reflect the following:

*Item No.:* 53

*Part No.:* 420-0839

*Qty. Req.:* 1

*Description:* Graphic Interior.

## G-80 POWER SUPPLY

• It has been noted that an "in-house" modification of the G-80 Power Supply (P/N 800-0191) may not have been accomplished on all units in the field; the result of which distributes ground current return to an additional connector pin. We recommend that you verify and/or perform the following simple procedure. A list of games which utilize this power supply is below:

1. With the rear electronics compartment door open, remove the two phillips screws securing the power supply cover and set these and the cover aside.
2. Referring to the illustration below, inspect P4 pin-4 to see if this pin has been tied to ground, either by a "solder bridge" or jumper-wire to pin-6 of the same plug.
3. In the event your unit has not been modified, simply expose the "land" immediately adjacent to P4 pin-4, and solder a connection between the pin and the

(Continued on page 8)

# Service Notes

(Continued from page 7)

top of the PC board (P/N 800-0170); or if you prefer, simply solder a wire (14 AWG minimum) between pin-4 and pin-6 of P4. This completes the modification.

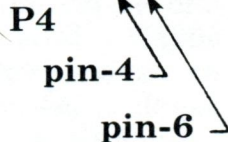
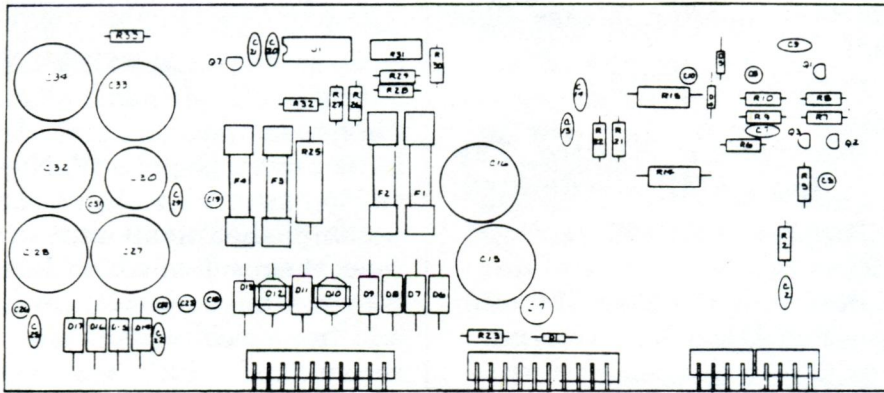
Ref. Des.: R12, 21, 49, 60, 68, 71  
 Item No.: 48  
 Part No.: 470-0473  
 Qty. Req.: 10  
 Description: Res 47K 1/4W  
 Ref. Des.: R14, 19, 25, 26, 28-30, 58, 66, 73.

• A discrepancy has been noted in the schematics on pages 94 and 95 of your FROGGER Owner's Manual (P/N 420-0647). Please make the corrections as indicated:

Page 94: Sub-Logic Board, Drawing No. 700-0069, Zone A-4;

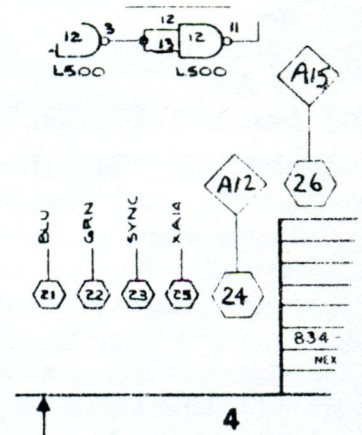
## G-80 Power Supply PC Assembly

800-0170

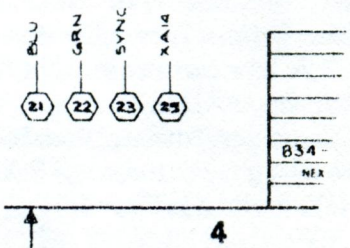
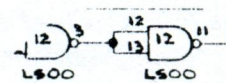


ASTRO BLASTER™  
 SPACE ODYSSEY™  
 SPACE FURY™  
 ELIMINATOR™  
 005™  
 ZEKTOR™  
 TAC/SCAN™  
 MONSTER BASH™  
 PENGOTM

IS:



WAS:



## SUPER ZAXXON™

• Due to an error at the printer, the initial run of SUPER ZAXXON Owner's Manuals (P/N 420-0838) have Ref. Designators obscured by binding holes. Please check your Manual page 191 to verify the listings below:

Item No.: 32  
 Part No.: 470-0104  
 Qty. Req.: 6  
 Description: Res 100K 1/4W 5%

## FROGGER™

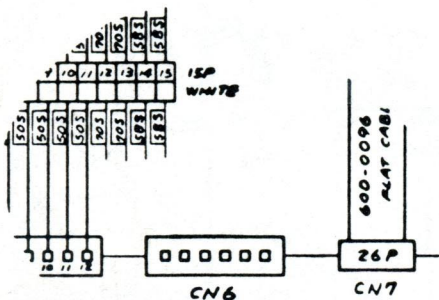
• A typographical error has been identified on page 70 of the FROGGER Owner's Manual (P/N 420-0647). Please correct the part number of Item 51 as follows:

Item No.: 51  
 Part No.: 314-0216  
 Qty Req.: 5  
 Description: IC 74S201  
 Ref. Des.: IC 56, 57, 58, 59, 60.



# Service Notes

WAS:



## SUBROC-3D™

• The following part numbers for the Coin Chute Door Assembly (Drawing No. 834-0087) in the Upright model, page 35 of your SUBROC-3D Owner's Manual (P/N 420-0822), were unavailable at "press-time":

- Item No.: 1  
Part No.: 601-0874  
Qty. Req.: 1  
Description: Service Door Frame B.
- Item No.: 2  
Part No.: 601-0875  
Qty. Req.: 1  
Description: Service Door BW.
- Item No.: 13  
Part No.: 280-0502  
Qty. Req.: 1  
Description: Hinge.
- Item No.: 21  
Part No.: 280-0503  
Qty. Req.: 2  
Description: Selector Stop Screw.

• An error has been noted on page 70 of your SUBROC-3D Owner's Manual (P/N 420-0322), Shutter Assembly Drawing Number 834-0346. Please correct your Manual as follows:

- Item No.: 1  
Part No.: 350-0183  
Qty. Req.: 1  
Description: Motor 3VDC CW.
- Item No.: 2  
Part No.: 350-0184  
Qty. Req.: 1  
Description: Motor 3VDC CCW.

• There have been some errors identified in the SUBROC-3D Owner's Manual (P/N 420-0833). Please correct your documentation as follows:

On pages 35 and 36, change the upper right-hand title to read: ASSY COIN CHUTE DOOR UPRIGHT: DRAWING NUMBER 834-0087.

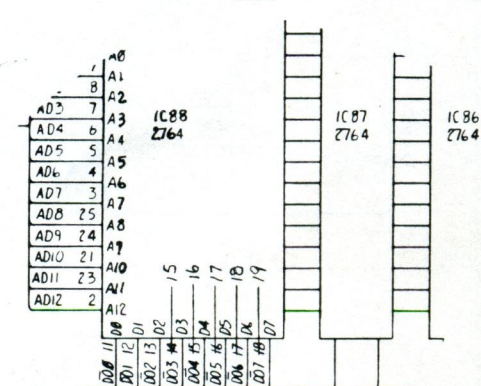
On pages 60, 61 and 62, change the upper right-hand title to read: COIN CHUTE DOOR ASSY COCKPIT: DRAWING NUMBER 834-0397.

On page 60, Item No. 15, correct the part number to read:

- Item No.: 15  
Part No.: 834-0413  
Qty. Req.: 1  
Description: Wire Harn Coin.

• An error has been found on page 140 of your SUBROC-3D Owner's Manual (P/N 420-0822), CPU board sheet 2, Drawing No. 834-0358, Zone C-3. Please correct your schematic as indicated:

IS:



WAS:

