THE "SPHERE SYSTEM PHILOSOPHY"

The SPHERE 1 computer system was designed to provide an uncompromising computer system at minimal cost.

The keyword to our design is the word "SYSTEM". Every phase of the design has been influenced by the "SYSTEM" philosophy. To justify the system title, a "COMPUTER" must perform an application acceptably. Recently the cost of peripherals and software have substantially exceeded the cost of the computer, but without them, a computer can not perform much of anything acceptably.

With the onset of the micro-processor, real design innovations have been possible, but without the system philosophy, a micro-processor can only reduce the processor cost. Peripherals, memory, and software continue to be expensive.

The SPHERE 1 computer is uniquely cost effective because it utilizes real design innovations to reduce the amount of circuitry required throughout the system. The SPHERE add-on memory board will support 4, 8, 12, or 16K of dynamic random access memory (instead of four 4K memory boards and a mother board). Our power supply has been placed in a separate chassis to eliminate a common source of heat. This allows the system to run cooler and eliminates the need for an expensive fan. The system uses a standard TV for a 512 character display. The use of the TV and other common components has reduced the cost and allowed more machine versatility. Further cost reductions have been achieved by replacing the front console (lights and switches) with the TV terminal and a program in Read Only Memory (ROM) that performs the same function, only better. The CPU card is packaged to provide all of the basic functions required by a useful system, thereby eliminating unnecessary extra PC BOARDS.

In order to insure a full offering of high quality peripherals from the onset, we have selected manufacturers who already have peripherals which interface to our product. This philosophy has allowed us, in the case of our disk, to select already running software (namely a disk operating system) which we may offer to our users immediately. Other peripherals that are available with our system include a low cost line printer and a paper tape reader/perforator. These devices are interfaced to the system via a single interface module which also serves as a programmable digital Input/Output port. The SPHERE system also supports its own set of terminals, the lowest cost terminals available today.

The Program Development System (PDS) includes an EDITOR, and MINI ASSEMBLER, and a debugging package. It also includes CRT display and audio cassette software drivers, plus a cassette loader and dumper. Although most computer processing occurs at the character (8 BIT) level, it is sometimes desirable to use 16 bit arithmetic so we have provided an extended 16 bit instruction set in the PDS system. This package rounds out the "SYSTEM" concept for our smallest systems.

There are proponents of various computer languages everywhere. Each language is suited more or less to a specific group of applications. Although the advent of the micro-processor really dictates some new philosophies in computing language, the BASIC language seems to come closest to this philosophy. Because of its widespread use we have selected it to be our first computer language.

The FLOPPY DISK OPERATING SYSTEM (FDOS) is supplied on all systems purchased with a disk unit. FDOS is an extended PROGRAM DEVELOPMENT SYSTEM. It provides for named files, an extended editor, a full assembler, and debugging system. This system includes a comprehensive 300 page programming manual.

The software supplied to make the Sphere System a useful "SYSTEM" is attractive; however, the real contribution that SPHERE offers is one of commitment. The SPHERE "SYSTEM" concept demonstrates only the surface of the real technological advances that are possible when true design innovation is combined with foresight and state-of-the-art technology. The SPHERE "SYSTEM" concept is the commitment. Watch and see.
Program Development System

PDS represents a unique approach to the software of a low cost computer system. By the addition of software routines located in a 1K PROM even the smallest system is capable of doing useful work as well as performing all of the functions of a switch panel and display lights. The software, consisting of a debugger, assembler, editor, 16 bit arithmetic, and ASCII conversion routines, allows for development of user software in much the same way as large disk based systems.

The SPHERE Debugging Aid (SDA) is designed to aid in program development, as well as replace the usual switch panel and display lights function. It allows the user to easily view and alter the contents of memory or CPU registers from the keyboard - CRT display.

The Mini-Assembler allows the user the ability to input source assembly language programs and output un relocatable binary object code. It can handle up to 62 symbolic addresses, different operand sizes and octal, decimal and hexadecimal operands. The operation codes are entered in hexadecimal (i.e. ADDA immediate is “8B”).

Included are instructions to perform 16 bit multiply and divide as well as BINARY - ASCII conversion. It also includes instructions to perform I/O from the CRT - keyboard or the audio cassette or modem. The input-from-keyboard instruction includes a built in CRT based editor allowing scrolling and text insertion and deletion based on a cursor, allowing easy text manipulation.
THE ONE CARD COMPUTER

The logical approach to the solution of any problem is to determine the minimum requirement for a satisfactory result. In the case of a small computer, an absolute minimum would include a reasonable amount of memory, a capable CPU, Input/Output capability, a real-time clock, read only memory program which if used in conjunction with a terminal can replace the computer's switch panel and display lights, and finally it ought to have a convenient Bus structure to easily attach other modules.

The SPHERE ONE CARD COMPUTER includes all of the above features plus a few that also deserve attention. Below each of the principal features are listed:

1) The CPU
The MOTOROLA 6800 microprocessor is the most advanced microprocessor available today. It reduces the necessity for support components and includes features not found on computers of many times the size. The IBM 370 for example will not store all of its registers automatically upon receipt of an interrupt as the 6800 will. The 6800 system resembles the architecture of the Digital PDP - 11 in many ways. These include instructions that "PUSH" data onto a STACK temporarily and when temporary storage is no longer required the data may be "POPed" off of the stack. The 6800 doesn't have as many registers as the 8080; however, the 6800 has several addressing modes which in most cases completely outweigh its lack of registers. These modes are particularly advantageous when tables are processed. However, when three or four counters are being incremented or decremented the 8080 is faster, but in either case the 6800 is easier to program.

2) Memory
This system uses the 2107A type 4K by 1 dynamic random access memory. This memory was used because it is the least expensive memory available and would lower the cost of the system. All refresh circuitry for the system is included on the CPU board.

3) I/O
If this board is used in a stand alone situation a CPU must communicate to the outside world. Therefore, the system is supplied with 16 programable I/O lines as an option. Four additional lines which may be used as programed interrupts are also supplied on the board.

4) Real-time clock
A stand alone process control system and many other systems require the capability of monitoring the progress of an activity. The SPHERE system has a real-time clock which will interrupt the system at a set interval. This interval is a function of the refresh clock which is set at 1 ms. The interrupt may occur at 1x, 2x, 4x, 8x, or 16x the refresh rate. The interval may also be set externally. The rate is determined by a wire strap.

5) EPROM
The Erasable Programmable Read Only Memory used by the system is the 1702 A. Programers for this EPROM are commonly available so that users may find programming the system for a stand alone application a reasonable task. When delivered with a SPHERE system the EPROM contains a Program Development System (PDS) which is described under "SOFTWARE".

6) BUS structure
The BUS is driven by tri-state TTL buffers which are capable of driving 35 standard TTL devices. The BUS is connected to this board via three 14 pin dual-in-line connectors which will transmit and receive information over 3 14 conductor flat ribbon cables. Eight data, 16 address, BUS and control lines are transmitted bidirectionally to and from the CPU, memory, and peripherals. I/O devices, buffer, and status registers are addressed as memory locations at the top (HIGH ORDER LOCATIONS) of memory in much the same as the digital PDP-11. This means that about 35,000 devices could be attached to the system (theoretically). It also means that any machine instruction may operate on device buffer and status registers as they would to memory.
This limits the maximum memory on SPHERE systems to 56K instead of the theoretical 64K because the high order 8K is reserved for device status and buffer registers.

7) Power-on reset

When power is applied to this board, circuitry forces a reset to the processor until the system power has had time to stabilize. The system will immediately thereafter jump to a specific location in the read only memory (EPROM) to begin meaningful processing.
SYS 1/KIT HOBBIES ($860)

This computer system is capable of satisfying the needs of the user who wishes to program, develop, and debug programs for light process control, experimenting, and some educational purposes. As with all SPHERE "SYSTEMS", the computer was designed to perform a useful function. It was not intended to be a useless computer with a lot of money spent on front console.

All SPHERE systems are shipped with software and a commitment that software developed in the future by SPHERE or one of its users will be available at minimal cost. The PDS SYSTEM in included in the read only memory of this system. It and other software which is available is described under the heading "SOFTWARE".

Expandability has been considered from the onset. Some of these considerations include additional memory to 64K, inter-computer communications, a full line of peripherals, home and industry utility, and lowering cost while increasing performance in the future. Below are listed the modules contained in the system:

1) **CPU1**
   This module contains all of the features listed under "THE ONE CARD COMPUTER".

2) **KBD1**
   This module includes a standard typewriter style alph-numeric keyboard layout with an adding machine style numeric keypad located to the right. Above the numeric keypad is a star shape cursor control keypad which includes HOME and ERASE functions. The keyboard module also includes 2-key rollover (single key read until released, regardless of other keys pressed), complete interface from keyboard to CPU bus with additional interfacing to the bus for 10 general purpose digital I/O lines which may be used at the user's discretion. This module includes an attractive keyboard chassis. This chassis houses the keyboard and all of the modules in this system plus 3 slots for future expansion. A maximum of seven additional KBD1 modules may be added later.

3) **CRT1**
   This module contains the necessary electronics to display 512 characters on a television or video monitor. The 64 character ASCII character set is displayed in a matrix of 32 characters by 16 lines. Each character is displayed in a matrix of dots, 5 dots wide and 7 dots high. To display a character a computer program simply moves the desired character into a memory position which is also the display refresh buffer. The refresh buffer is located in the high-order 8K of memory. It consists of 512 bytes of static RAM that is organized to be accessed by the CPU and CRT simultaneously without degrading the access time to either CPU or CRT (dual port memory). Output from this module to the video monitor appears as a composite video signal or separate horizontal, vertical, and video signals. Etches for RF modulator (adjustable from channels 1-3) have been left on the PC board, and schematics have been provided; however, components have not been supplied because this type of circuit requires FCC testing and approval. Instructions for TV modification are included with purchase.
4) PWR 1  The power supply has been designed expressly for the SPHERE 1 system. It produces 5 volts at 5 amps, 12 volts at 3 amps, -5 volts at 400 mA, and -12 volts at 400 mA. Ratings may be improved with the addition of capacitors. The circuits are highly under rated which should allow the system to run cooler. The power supply includes zener over voltage and reverse voltage protection. All supplies are current-limited, however over current-protection for the 5 volt supply may allow a power transistor ($1.50) to burn out. The 12 volt supply also allows this to happen. This occurs because of a cost trade-off ($40.00 to protect $3.00 in transistors) vs performance (will probably never occur). The power supply is contained in a separate chassis which includes a 3 prong wall plug, power cord, cable to the rest of system, and a fuse to protect the system.

5) BCB1  Each of the system modules is connected via a system bus. The bus consists of 3 flat ribbon cables containing 14 conductors each. Every other conductor is grounded to eliminate cross talk (electrical noise). Each cable is connected to each board via a 14 pin dual-in-line (DIP) connector. Each board has 3 standard 14 pin IC sockets where each of the three bus cables attach.

6) PCB1  Power is bussed to each of the boards of the system via a separate 14 conductor ribbon cable. This cable is attached to each board via a 14 pin dual-in-line connector.

7) OPR1  The operator/reference manual set is designed to introduce the SPHERE 1 system to the new computer user. It describes in detail how each instruction works. It also describes in detail, interrupts, stack operations, Input/Output, peripheral device characteristics, memory organization, projected device reserved locations and limited characteristics, and execution timing. Programming examples are included to illustrate various hardware features and a section is included to introduce programming concepts to the first time computer user. Appendixes are included to aid program development. Although this manual set is comprehensive, some users may require further information so references are amply provided. The manual set is loose bound to receive updates and includes sections where SWAP newsletters, kit assembly instructions, manuals, and maintenance manuals may be kept. Kit assembly instruction manuals are a part of the package; however, each module in kit form contains an associated kit assembly manual which may be kept in this binder. SPHERE has introduced its user group to promote interchanges of ideas, useful circuits, comments, gripes, software (from games to statistical packages), announcements (i.e. user has 10 Amp 5 volt power supply for $15.00 type I). The SWAP newsletter will not be governed by the marketing arm of the company. Hopefully the users will completely govern this group in the future. SWAP membership is included with any "SYSTEM" purchase or with the purchase of the OPR1 manual set. Future membership fees will be determined by users.
SYS 2/KIT INTELLIGENT

This system was specifically designed to solve the needs of three different users.

1) The user who wishes to communicate to other devices over serial lines such as a telephone.

2) The user who wishes to utilize this device as a stand alone computer, and use the communications facility to save and restore programs and data using a standard teletype.

3) The user who wishes to use a standard audio cassette to save and restore programs.

This system includes all of the features found in SYS 1/KIT plus the following:

1) COM1

This module contains the ability to accept data in 8 bit parallel format from the CPU and transmit it serially with 1 or 2 start bits and a stop bit. Seven or eight data bits may be transmitted with optional even or odd parity. At the same time data in similar format may be received serially. The data will be checked for proper parity (if desired) and false start bits will be rejected. Communications may occur at several standard rates. These rates are strap-selectable with each board pre-strapped at 300 bits per second. Although other rates are available on this module, the standard rates are 110, 150, 300, 600, 1200, 2400, 4800, and 9600 Baud. Baudot Code teletypes can be supported with minor modification if 20% speed degradation is acceptable. X-on and X-off functions are provided by an on board relay. No cables are supplied.

2) MOD1

This module contains a complete ORIGINATE/ANSWER modem. The device has additionally been adapted to operate with an audio cassette. The modem will operate at a maximum speed of 600 Baud. It has been designed with particular emphasis on acoustically coupled lines rather than Direct Access Arrangements (DAA's). The SH, RING, +V DH, DA, DR, and GND signals are provided for the CBT type of DAA, however. A speaker and a microphone are all that are required to complete the acoustic coupler. No cableing is provided with this unit.

3) CAS1

This module contains the interface for an audio cassette. The cassette's AUX or MIC jack may be used as computer output and the AUX SPKR jack may be used as computer input. When used with a COM1 module, this unit will enable the use of a cassette as a non-volatile data storage system.
To Prospective SPHERE 1 Users:

SPHERE CORP. is now delivering their product line of reliable, high quality, low cost computer system. From the ground up, the SPHERE 1 system is a new breed of beast. We emphasize the word system because that is the byword and the key to our philosophy here at SPHERE.

We have not sacrificed quality at any point in our design to lower the cost of our system. Low cost has been achieved in two ways, true design innovation, and high volume.

To insure a full peripheral offering from the onset, we are using tested peripherals and interfaces manufactured by ourselves and other firms, products which have met our performance criteria in the field. Here we have judged the manufacturers reputation and the significant cost/performance ratio to be worth our confidence in their peripherals. Although not mentioned in this brochure, several exciting developments are under way. From software there is a network operating system, RPG II, and an integrated data base system. From hardware there are unique developments in process control for the home and industry and an ultra low – cost mass storage system. These developments will be out by the first quarter of 1976.

60 to 90 day delivery may be expected on all orders, however, the tremendous interest in this product may delay future orders somewhat.

It is possible that you will have questions after reading the enclosed information. Feel free to call us at (801) 292-8466.

We are looking forward to your order.

Best wishes for your future.

Michael D. Wise
President

MDW:dlm
The SPHERE I computer system was designed to provide an uncompromising computer system with low cost achieved by true design innovation.

Some cost reductions were achieved by replacing hardwired logic functions with the microprocessor. For example, the control console (switch panel and lights) is not needed when the user can inspect or change memory and start or halt programs using a terminal attached to the computer. By elimination of the slow and costly console on the computer, a low-cost terminal was attached directly to the system making it usable for about the same price as an unusable computer with a console. The console entails far more logic to implement than the microprocessor itself, therefore its elimination not only lowers costs but increases reliability. The terminal and other peripherals also utilize this same design philosophy to replace much of their hardwired logic with microprocessor intelligence. This further lowers the SPHERE I system cost while maintaining highest quality.

In development, the system hardware, software, expansion, maintenance, appearance, utility, and cost were considered in concert. As a result, the system can support direct memory access devices, intercomputer communications and memory sharing, prioritized vectored interrupts, slow memories, and much more. It has been designed wherever possible with common components to reduce cost. This will also allow the owner who does not select a maintenance plan to easily find these parts locally if any should fail.

The SPHERE system is based on the Motorola 6800 microprocessor which is the most technologically advanced, readily available microprocessor on the market today.

The peripheral selection includes floppy disks, printers, paper tape punches and readers, additional terminals, digital I/O, and more are being added on a regular basis. All of the peripherals and their interfaces are first quality industry-compatible devices with appropriate checking circuitry and associated software. A 650 page applications, systems & interfacing manual plus supplement is available for interface requirements. As the system was designed with great concern for the environment in which it might operate, options such as more protected power supplies and sealed environment cabinets have been included as well.

All systems are supplied with concise manuals and software built into the basic price. With the basic system, read-only memory contains drivers for peripherals, and an expanded instruction set including multiply, divide, and binary to base (octal, decimal, and hexadecimal), and base to binary conversion. The read-only memory also contains a debugging system and a mini-assembler. When the disk system is purchased, the user will receive FDOS which is a disk operating system that has been delivered and is in operation. FDOS includes an editor, file structuring, and a full assembler with an operators manual and a 300 page programming manual. Also available by September with any processor purchase is a full extended BASIC language with documentation.

For those who might desire to gain entry into the world of general purpose computing at the very lowest cost, various configurations of the systems will be provided in kit form.
PROCESSOR MODULE (CPU1) The SPHERE I processor module is designed to perform all of the basic functions required by a computer system. The module also has the capability to operate in stand-alone mode in process control applications or as a component in intelligent terminals, word processing terminals, communication devices, and other hardware requiring intelligence. To more easily facilitate this stand-alone capability, 16 digital I/O lines have been supplied as an option on this board. The board also has a Motorola M6800 microprocessor, 1K of reprogrammable read-only memory, 4K of dynamic random access memory with refresh circuitry for all dynamic memory on the system, and a real-time clock. The instruction time varies from 2 to 12 microseconds, the longest saves all machine registers and transfers control to a designated subroutine. The system has a single bus structure with peripherals accessed as memory locations which simplify hardware design, eases interfacing, and reduces cost. It allows the processor or any device to communicate directly with memory or any other device which greatly expands the system's flexibility. The bus power and control lines are connected between modules or peripherals by flat ribbon cable with 14 PIN dual-in-line connectors.

DISPLAY MODULE (CRT1) Up to eight display modules may be connected directly onto the SPHERE I processor bus. Each display board contains 512 characters of memory for data which is displayed in a 16 line by 32 character format. The display's memory is accessed from the computer as if it were the computer's memory therefore display is instantaneous and unique effects can be achieved. Each module is independent of the other and may display different information. The display module uses a standard television set as its display device. Provisions have been made to connect the module with a standard antenna and avoid tampering with the internal circuitry of the TV.

KEYBOARD (KBD1) Up to eight keyboards may be connected to the central processor bus. Each keyboard has 73 keys which include all special characters, upper case alphabet, all control functions (via the control key), a numeric key pad and cursor control pad. The keyboard encoding scheme includes two key rollover. All keys are a new high reliability type. In addition to its normal functions, the keyboard, eight digital I/O lines, and two control lines are contained on the keyboard and are interfaced directly to the processor bus.

SERIAL COMMUNICATIONS AND CASSETTE MODULE (COM1, CAS1) The communications module is designed to provide asynchronous communications for the computer system. This communication may occur on any standard frequency. Frequency may be either constant or it is the peripheral interface module is purchased, the rate may become programmable. Up to eight of these units may be connected to the processor bus. An option on the COM module is the cassette module. This option allows the system to communicate directly to an audio cassette unit and includes a full modem. This modem may take place at rates to 500 kbps in BIA, TTL, or current loop mode. If a cassette is being used as an input or output device on this modem a signal is provided which will turn on the cassette prior to operation and turn it off within 1/2 second of any transmission completed.

POWER SUPPLY (PWR1, PWR2) These power supplies are fully regulated with foldback current limiting and overvoltage protection. PWR2 is a high reliability supply.

MEMORY (04K, 08K, 16K) These memories are based on a popular and available 4K dynamic RAM. Each is based on the 16K board which allows memory to be implemented in 4K increments. The board may be addressed on any 4K boundary.
THE FLEXIBLE DISK SUBSYSTEM  The SPHERE I floppy disk subsystem contains numerous unique features which have been designed to provide capability uncommon even in much larger systems. It interfaces to the SPHERE I system via the peripheral interface module and disk cable assembly and is fully supported by the Flexible Disk Operating System (FDOS) package. The flexible disk used is media and format compatible to the IBM 3940 and 3740 with a maximum data storage capacity of 256,256 bytes per diskette. A single controller handles up to four drive units which may be individually write-protected. This controller contains two 128-byte input and output buffers which enable asynchronous byte transfers to or from the CPU. Hardware track seek and seek verification as well as CRC generation and verification insure data validity.

LINE PRINTER  The SPHERE I line printer produces 30 columns of 5 X 7 dot matrix characters at 110 characters per second or 65 lines per minute. The impact head prints bidirectionally on 8½ inch roll paper using a conventional teletype ribbon. The line printer was designed for reliability and extremely low cost required by small scale data handling systems. This system features the ability to print double wide characters for headings and other applications. An adjustable width tractor feed mechanism is available for use with fan-fold forms. Up to four highly legible copies may be produced.

PAPER TAPE READER/PERFORATOR  This combination reader/punch photoelectrically reads up to 150 characters per second and perforates asynchronously up to 30 characters per second. Roll tape, chad box, controls, everything is conveniently out front; making this combo a truly inviting, low-cost I/O alternative.

32-CHARACTER TERMINAL  This is the lowest cost alpha-numeric terminal available on the market today. It includes our standard 73-key keyboard and 32-character plasma display. This terminal is interfaced in parallel to the SPHERE I processor.

512-CHARACTER TERMINAL  This terminal is effectively identical in appearance to the SPHERE I system; however, no processor module is included. This terminal is interfaced in parallel to the SPHERE I processor.
LOW-LEVEL SOFTWARE SUPPORT The system has been provided with an assembler, editor, debugging aid, and drivers for the CRT built into read-only memory. Even the smallest system that has no communications or cassette capability, is fully capable of supporting itself. But rather than leaving it at that, the system has been provided with additions to the language that make it as versatile as a 16-bit computer. These include 16-bit arithmetic (add, subtract, multiply, divide, and compare) as well as conversion from ASCII representations of numbers to binary and visa versa. When cassette capability is added, data and programs may be stored for later retrieval. All of these features make the system much faster and easier to work with as far as the programmer is concerned.

THE EXTENDED BASIC LANGUAGE The BASIC language is supplied to purchasers of the SPHERE I system whether or not they have purchased sufficient memory from us to support the BASIC language. SPHERE I BASIC includes many of the features found in popular BASIC languages, including string manipulation, matrix manipulation, machine language subroutine calls, trig functions, and disk file I/O.

FLEXIBLE DISK OPERATING SYSTEM (FDOS) SPHERE I FDOS is a complete program development system which provides those high-speed software development tools usually available only on larger mini-computer systems. Program storage and backup is maintained on low-cost, reusable, compact diskette cartridges which are readily available from a number of sources. FDOS contains such single command operations as disk-to-disk program editing and assembling, disk-to-memory program loading; named files; disk-to-remote or cassette; cassette or remote to disk; and disk to disk transferring. The resident portion of FDOS is located in PROM memory located on the CPU board. It contains a disk resident assembler and editor debugging system and basic language compiler. FDOS has been designed with simplicity as the keyword to insure continues reliability and uncomplicated use. FDOS is up and running now.

SWAP (SPHERE WORKING APPLICATION PROGRAMS) SPHERE recognizes the importance of application programs written by users and desires to provide a vehicle for distribution of these programs. Until users have gained enough numbers to determine their desires and needs, SPHERE will underwrite SWAP's operation on an interim basis.

SPHERE will distribute a quarterly SWAP newsletter. The newsletter will contain brief abstracts which have been submitted to SWAP at 96 East 500 South, Bountiful, Utah 84010. In addition, letters to SPHERE or SWAP will be considered for publication. An attempt will be made to publish representative letters on an impartial basis.

In an effort to stimulate application program submittal, SPHERE will reward exceptional submissions with up to $1,000 certificates to purchase SPHERE equipment and peripherals. These awards will be at SPHERE's discretion and according to SPHERE's judgement. Awards will be published in the quarterly newsletter. These award announcements will be made for exceptional work in the following areas: languages and operating systems, statistical and engineering packages, business applications, educational packages, and other applications including games.
<table>
<thead>
<tr>
<th>CATALOG NUMBER</th>
<th>DESCRIPTION</th>
<th>FULL</th>
<th>INTRO</th>
<th>P/R</th>
<th>MAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU1/KIT</td>
<td>CPU w/4K RAM, 1K Programmed EPROM &amp; Clock</td>
<td>$522</td>
<td>$421</td>
<td>$63</td>
<td></td>
</tr>
<tr>
<td>CPU1/ASM</td>
<td>Assembled CPU1/KIT</td>
<td>622</td>
<td>522</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CPU1/ASM</td>
<td>CPU1/ASM plus 16 digital I/O</td>
<td>652</td>
<td>552</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>16D/KIT</td>
<td>16 Digital I/O CPU add on</td>
<td>35</td>
<td>27</td>
<td>CPU1</td>
<td>4</td>
</tr>
<tr>
<td>CRT1/KIT</td>
<td>32 Char x 16 line std. TV Interface</td>
<td>161</td>
<td>141</td>
<td>CPU1</td>
<td>19</td>
</tr>
<tr>
<td>CRT1/ASM</td>
<td>Assembled CRT1/KIT</td>
<td>207</td>
<td>180</td>
<td>CPU1</td>
<td>19</td>
</tr>
<tr>
<td>KBD1/KIT</td>
<td>75 Key Keyboard &amp; Interface</td>
<td>100</td>
<td>86</td>
<td>CPU1</td>
<td>14</td>
</tr>
<tr>
<td>KBD1/ASM</td>
<td>75 Key Keyboard &amp; Interface Assembled</td>
<td>160</td>
<td>130</td>
<td>CPU1</td>
<td>14</td>
</tr>
<tr>
<td>8K1/KIT</td>
<td>4K Memory Board</td>
<td>242</td>
<td>232</td>
<td>CPU1</td>
<td>31</td>
</tr>
<tr>
<td>8K1/ASM</td>
<td>Assembled 4K Memory</td>
<td>312</td>
<td>300</td>
<td>CPU1</td>
<td>31</td>
</tr>
<tr>
<td>8K1/KIT</td>
<td>8K Memory Board</td>
<td>415</td>
<td>400</td>
<td>CPU1</td>
<td>48</td>
</tr>
<tr>
<td>8K1/ASM</td>
<td>Assembled 8K Memory Board</td>
<td>506</td>
<td>485</td>
<td>CPU1</td>
<td>49</td>
</tr>
<tr>
<td>16K1/KIT</td>
<td>16K Memory Board</td>
<td>764</td>
<td>740</td>
<td>CPU1</td>
<td>85</td>
</tr>
<tr>
<td>16K1/ASM</td>
<td>Assembled 16K Memory Board</td>
<td>894</td>
<td>850</td>
<td>CPU1</td>
<td>65</td>
</tr>
<tr>
<td>4K1/KIT</td>
<td>4K Memory expansion for 4K or 8K modules</td>
<td>180</td>
<td>170</td>
<td>CPU1</td>
<td>04K-08K</td>
</tr>
<tr>
<td>CON1/KIT</td>
<td>Asynchronous (EA, TTL, TTY) I/O</td>
<td>91</td>
<td>72</td>
<td>CPU1</td>
<td>12</td>
</tr>
<tr>
<td>CON1/ASM</td>
<td>Assembled CON1/KIT</td>
<td>151</td>
<td>112</td>
<td>CPU1</td>
<td>12</td>
</tr>
<tr>
<td>CON1/ASM</td>
<td>CON1/ASM + cassette I/O</td>
<td>219</td>
<td>172</td>
<td>CPU1</td>
<td>18</td>
</tr>
<tr>
<td>CAS1/KIT</td>
<td>Cassette I/O Interface</td>
<td>90</td>
<td>70</td>
<td>CPU1</td>
<td>6</td>
</tr>
<tr>
<td>PIM1/KIT</td>
<td>Interface Module (64 digital I/O lines)</td>
<td>120</td>
<td>100</td>
<td>CPU1</td>
<td>12</td>
</tr>
<tr>
<td>PIM1/ASM</td>
<td>Assembled PIM1/KIT</td>
<td>160</td>
<td>137</td>
<td>CPU1</td>
<td>12</td>
</tr>
<tr>
<td>DSK1/ASM</td>
<td>1 IBM compatible floppy disk</td>
<td>2399</td>
<td>2350</td>
<td>DBC1</td>
<td>190</td>
</tr>
<tr>
<td>DSK2/ASM</td>
<td>2 IBM compatible floppy disks</td>
<td>3099</td>
<td>3164</td>
<td>DBC1</td>
<td>250</td>
</tr>
<tr>
<td>DSK3/ASM</td>
<td>3 IBM compatible floppy disks</td>
<td>4114</td>
<td>4265</td>
<td>DBC1</td>
<td>391</td>
</tr>
<tr>
<td>DSK4/ASM</td>
<td>4 IBM compatible floppy disks</td>
<td>5114</td>
<td>4545</td>
<td>DBC1</td>
<td>460</td>
</tr>
<tr>
<td>LPT1/ASM</td>
<td>65 lpm line printer</td>
<td>1200</td>
<td>1100</td>
<td>LCBI</td>
<td>137</td>
</tr>
<tr>
<td>PFT1/ASM</td>
<td>Paper Tape reader (150 cps)/punch(30 cips)</td>
<td>1700</td>
<td>1600</td>
<td>PFM1</td>
<td>170</td>
</tr>
<tr>
<td>32T1/ASM</td>
<td>32 position ASCII terminal</td>
<td>630</td>
<td>566</td>
<td>CPU1</td>
<td>52</td>
</tr>
<tr>
<td>32T1/KIT</td>
<td>32 position ASCII terminal</td>
<td>525</td>
<td>466</td>
<td>CPU1</td>
<td>52</td>
</tr>
<tr>
<td>512T/ASM</td>
<td>512 position ASCII terminal to CPU</td>
<td>879</td>
<td>786</td>
<td>CPU1</td>
<td>75</td>
</tr>
<tr>
<td>RAG1/KIT</td>
<td>Attractive Desktop Display &amp; Chassis</td>
<td>252</td>
<td>240</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>ENV1/ASM</td>
<td>Environment Sealed Chassis</td>
<td>1032</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>P1/M1/KIT</td>
<td>System Power Supply (Hobby)</td>
<td>76</td>
<td>6</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>DBC1/ASM</td>
<td>Cable Assembly for disk</td>
<td>40</td>
<td>30</td>
<td>PFM1</td>
<td>1</td>
</tr>
<tr>
<td>LCB1/ASM</td>
<td>Cable Assembly for line printer</td>
<td>99</td>
<td>75</td>
<td>PFM1</td>
<td>1</td>
</tr>
<tr>
<td>PCS1/ASM</td>
<td>Power Cable (from power to 4 boards)</td>
<td>20</td>
<td>15</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DCB1/ASM</td>
<td>Bus Cable (2 required)</td>
<td>15</td>
<td>10</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>TCB1/ASM</td>
<td>Cable Assembly for Read/Punch</td>
<td>60</td>
<td>55</td>
<td>PFM1</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTES:**
- All prices are in U.S. Dollars.
- Subject to change without notice.
- Specifications and prices may vary.

**CABLES**
- DBC1/ASM: Cable Assembly for disk
- LCB1/ASM: Cable Assembly for line printer
- PCS1/ASM: Power Cable (from power to 4 boards)
- DCB1/ASM: Bus Cable (2 required)
- TCB1/ASM: Cable Assembly for Read/Punch

**VAN**
- Application & Interfacing (650-2400 devices)
- Operator/Reference package

**OTHER**
- P743 5

**MEMORANDUM**
- Preliminary and subject to change without notice.
SYS/1/KIT  HOBBIES -- This computer system is capable of satisfying the needs of the user who wishes to program, develop, and debug programs for light process control, experimenting and some educational purposes. It is capable of full expansion as the user requires. The system consists of the following modules: CPU1, KBD1, PW1, EGB1(3), CRT1, PB1, OPR1/WAN, and membership in SWAP.

SYS1/ASM  This is SYS1 in assembled form. It also includes an attractive desk chassis with TV and other hardware.

SYS2/KIT  INTELLIGENT -- This system includes all the features found in SYS1 plus the additional feature of serial communications and audio cassette capability. The software contained in read-only memory provided the user with full stand alone programming capabilities. Users may easily implement remote loading, polling, data editing, data entry, and other functions found in intelligent terminals.

SYS2/ASM  SYS2 in assembled form also includes attractive desk-top chassis with TV and other hardware.

SYS3/KIT  "BASIC" language system includes all the features found in the above systems plus an additional 16K of memory which provides ample space for the BASIC compiler and user programs. BASIC is a fully extended language which includes matrix operators and the capability of CALLing assembler subroutines.

SYS3/ASM  SYS3 in assembled form. Also includes attractive desk-top chassis with TV and other hardware.

SYS4/KIT1  A REAL "CLASSIC" This system includes all of the features found in the above kits plus a 65 line-per-minute, 80 column printer, 2 IBM compatible floppy disks, and a disk operating system which handles file maintenance and provides an editor, assembler, debugging facility, and the BASIC language with file handling extensions. This system is operational now and BASIC will be available in September.

SYS4/KIT2  Same as kit 1 except attractive desk-top display (RCA1) with TV added.

SYS4/ASM  This is SYS4/KIT2 in assembled form. This is the lowest cost dual disk system ever offered to the public and will out perform systems many times more expensive.

1. Prepaid systems ordered by September 1975.
2. Prerequisite column.
3. Plan 2 maintenance cost (Plan 1 is 65% of amount).
# SPHERE CORP. ORDER FORM

## SOLD TO:  

<table>
<thead>
<tr>
<th>QTY</th>
<th>CATALOG NUMBER</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## SHIPPING INSTRUCTIONS:

ZIP

CUSTOMER PHONE NO.

## PRICE

TOTAL

## UTAH RESIDENTS

ADD 4.5% SALES TAX

SHIPPING

TOTAL

AMOUNT ENCLOSED

OR TO BE CHARGED TO MY CREDIT CARD.

## PAYMENT

INDIVIDUALS: Must include cashiers check, money order, or complete bank card information below. Other checks will clear before shipment.

COMPANIES: Special offers are available on a quantity OEM basis in kits, assembled units, or our one card computer. All orders are subject to credit approval. Invoices older than 10 days will be charged at .05% per calendar day on invoice amount (18% per year max.).

## SHIPMENT

All costs of shipment are to be paid by purchasing party. Shipment will be made according to shipment instructions on a "best efforts" basis. No claims for lost or damaged shipments will be accepted by this corporation.

## BANK CARD INFORMATION

Sign your name as it is on your credit card. 

BankAmericard

Master Charge

Credit Card Number Interbank Expiration

Number Number Date

MAIL TO: SPHERE CORP. 791 South 500 West, Bountiful, Utah, 84010
WARRANTY AND MAINTENANCE PLANS

WARRANTEE (Assembled Units) Warrantee units which fail due to defects in material or workmanship within 90 days of shipment will be repaired or replaced at our option when delivered at 791 South 500 West, Bountiful, Utah with return shipment prepaid. Suspect modules may be sent.

KITS WARRANTYE (All Expensive Repairs) Any part which fails due to defect within 90 days of shipment will be replaced. Replacement parts will be sent when failing parts are sent with $5 handling fee. User must fill out and mail warrantee registration upon delivery or warrantee will be voided.

KIT MAINTENANCE Assembled kits may qualify for assembled maintainance plans after qualification requirements are met. A qualification fee will be required.

MAINTENANCE PLAN 1 (Warrantee Extension) Units which fail will be repaired in accordance with warrantee conditions.

MAINTENANCE PLAN 2 (Site Repair Plan) Designated site personell will be trained to work with our personell over the phone to resolve failures using minimal tools and spare boards kit. Your personell will not require electronics background. Parts required to repair units that do not appear in spares kit will be shipped immediately upon availability. Spares kit must be purchased.

TIME AND MATERIALS MAINTENANCE Time and material maintainance is available and will be billed as indicated below:

1. Any system under warrantee or maintainance plan:
   Transportation at actual cost plus $15 an hour.

2. All other systems and expenses:
   Transportation at actual cost plus $35 an hour (min. $200)
CONTINUES TO GROW...
After talking to thousands of potential and existing computer users like you, we have found that what you want is a computer that has these features:

- **A KEYBOARD** to input your programs.
- **A PROCESSOR** with software that lets you program immediately with power-on.
- **A CRT** to **DISPLAY** your programs so you can see what you are doing.
- **MEMORY** for rapid access of **STORED DATA** and **PROGRAM OPERATIONS**.
- An **AUDIO CASSETTE** to save for **FUTURE** access all of the data you have generated.
- **INPUT/OUTPUT** (serial and parallel) for communication with the outside real-world devices such as printers, teletypes, telephones, security devices, security monitoring, etc.

These same people say they like a SPHERE COMPUTER SYSTEM because of the **complete COMPUTING POWER** that the **SYSTEM** has to offer.

The advantage of a SPHERE SYSTEM is that in one package you can get all the fundamental Computer Features that will allow you to input your programs through the keyboard, process your information, and produce meaningful output.

**ALL YOU NEED** for your desired computing power FROM ONE SUPPLIER. COMPATIBLE, RELIABLE, POWERFUL.

We have at SPHERE even more options for even greater computing power. See the price list for the details.

As we were conversing with you we found that there are about four general categories of computer users. The categories and the SPHERE SYSTEMS developed to accommodate them are the following:

**KIT BUILDER:** SPHERE SYSTEM 310: you are the one who wants to put a computer together to learn all about it and save some money, too.

**HOBBIEIST:** SPHERE SYSTEM 320: the one who wants a spare time challenge with ample programming power to do fun, constructive things.

**PROGRAMMER:** SPHERE SYSTEM 330: you are interested in programming for fun or profit. You receive full language, and complete hardware. No kidding around for you.

**DATA HANDLER:** SPHERE SYSTEM 340: to store, retrieve and process mass amounts of information. You mean business.
THE SPHERE 300
SERIES OF SYSTEMS:

THIS IS THE SYSTEM 340 WITH PRINTER AND FLOPPY DISC

SYSTEM 310 (Formerly System 1)
• CPU/2 Module
• CRT Module
• KEYBOARD
• METAL BASE
• Low Profile Kit Cover
• ALL Hardware and cables included
• POWER SUPPLY
• PDS — Program Development System

SYSTEM 320 (Formerly System 2)
• CPU/2 Module
• CRT Module
• KEYBOARD
• SIM Module
• METAL BASE — attractive desk top metal chassis with card rack
• POWER SUPPLY

SYSTEM 330 (Formerly System 3)
• All of the above in System 320
• 16K of Memory (Total 20K Memory)
• BASIC Language on cassette tape

SYSTEM 340 (Formerly System 4)
• All of System 310 plus the following:
• PIM Module
• LINE PRINTER 80 column — 110 characters per second
• DUAL FLOPPY DISC MEMORY (256,256 bytes Memory on each disc)
• Disc Operating System
• Basic Language
• 16K Memory (Total 20K Memory)

NOTE: All assembled systems come with 9” video monitor installed. Kit prices do not reflect a 9” video monitor and housing.
MODULES

Central Processing Module (CPU/2)
- Uses Motorola or AMI 6800 microprocessor
- Contains 1K bytes of Programmable Read Only Memory (PROM)
- Contains 4K bytes of semi-conductor memory (RAM)
- 8 lines of Digital I/O and 2 interrupt lines
- RS232 and Teletype (20 mil) serial interface
- Real Time Clock
- Power-On reset
- High drive buffered bus (30 TTL loads)
- All of the above on one 8" by 10" board for Reliability, Simplicity, and Low Cost.

Cathode Ray Tube Module (Video Interface) (CRT)
- Single printed 8" by 10" circuit board
- Display 16 Lines of 32 Characters (5 by 7 dot matrix forms each character)
- Contains 512 ASCII coded characters of buffered memory for display buffer
- Up to 8 Modules may be used on a single system
- Accesses own memory without slowing the processor.
- Can operate with Video Monitor or R.F. (T.V.)

KEYBOARD (KBD/2)
- 63 Character fully decoded ASCII
- Mechanical shift Lock
- Single connector tie in to all other CPU/2 boards
- Newly developed, with guaranteed high reliability.
MEMORY (MEM)
- Maximum 16K Dynamic RAM possible (Positioned in 4K increments)
- Starting address is strap selectable on 4K Boundaries.
- 8" by 10" Board can be populated in 4K, 8K, 12K and 16K increments

Printer Interface Module (PIM)
- 4 PIA chips provide 64 Lines of Digital I/O
- Provides Line Printer and Floppy Disk interface
- Each I/O Line has addressing for Real world Devices
- 8" by 10" Board

SERIAL INTERFACE MODULE (SIM)
The Serial Interface Module is another link from the Computer to the outside world. It is designed to accommodate many interfaces in several different combinations. The SIM also allows you to select which options best fill your communication needs and you pay for only those capabilities you desire.

You can order any of the following:
OPTION 1 Dual Cassette
OPTION 2 Cassette & Serial Interface
OPTION 3 Cassette and Modem
OPTION 4 Modem Alone
OPTION 5 Serial Interface Alone
OPTION 6 Single Cassette Alone

Note: Serial Interface Consists of TTY, or TTL, or RS232
## PRICE LIST

### SYSTEM 300 SERIES COMPUTERS

<table>
<thead>
<tr>
<th>System</th>
<th>Price</th>
<th>System</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>310A*</td>
<td>$1590.00</td>
<td>310K*</td>
<td>$1019.00</td>
</tr>
<tr>
<td>320A</td>
<td>$1769.00</td>
<td>320K</td>
<td>$1190.00</td>
</tr>
<tr>
<td>330A</td>
<td>$2579.00</td>
<td>330K</td>
<td>$1925.00</td>
</tr>
<tr>
<td>340A</td>
<td>$7995.00</td>
<td>340K</td>
<td>$6100.00</td>
</tr>
</tbody>
</table>

*ON SALE $999.00 UNTIL APRIL 20, 1976*

### OPTIONAL MODULES

<table>
<thead>
<tr>
<th>Module</th>
<th>Price</th>
<th>Module</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU/2A</td>
<td>$750.00</td>
<td>CPU/2K</td>
<td>$525.00</td>
</tr>
<tr>
<td>CRT/A</td>
<td>$259.00</td>
<td>CRT/K</td>
<td>$169.00</td>
</tr>
<tr>
<td>MEM (A only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4K</td>
<td>$260.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8K</td>
<td>$480.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12K</td>
<td>$660.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16K</td>
<td>$790.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIM/A</td>
<td>$280.00</td>
<td>PIM/K</td>
<td>$220.00</td>
</tr>
<tr>
<td>KBD2/A</td>
<td>$220.00</td>
<td>KBD2/A</td>
<td>$140.00</td>
</tr>
</tbody>
</table>

SIM Several configurations of the SIM Module are available. These are the Available Options.

<table>
<thead>
<tr>
<th>Option</th>
<th>ASSEMBLED</th>
<th>KIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUAL CASSETTE</td>
<td>$310.00</td>
<td>$189.00</td>
</tr>
<tr>
<td>ONE CASSETTE &amp; SERIAL</td>
<td>$490.00</td>
<td>$240.00</td>
</tr>
<tr>
<td>INTERFACE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ONE CASSETTE &amp; MODEM</td>
<td>$560.00</td>
<td>$290.00</td>
</tr>
<tr>
<td>MODEM ONLY</td>
<td>$388.00</td>
<td>$189.00</td>
</tr>
<tr>
<td>SERIAL INTERFACE only†</td>
<td>$290.00</td>
<td>$125.00</td>
</tr>
<tr>
<td>ONE CASSETTE ONLY</td>
<td>$255.00</td>
<td>$150.00</td>
</tr>
<tr>
<td>LINE PRINTER w/roller feed</td>
<td>$1325.00</td>
<td></td>
</tr>
<tr>
<td>w/tractor feed</td>
<td>$1575.00</td>
<td></td>
</tr>
<tr>
<td>LCB cables</td>
<td>$99.00</td>
<td></td>
</tr>
<tr>
<td>DUAL FLOPPY DISC</td>
<td>$3099.00</td>
<td></td>
</tr>
<tr>
<td>extra discs</td>
<td>$15.00</td>
<td></td>
</tr>
<tr>
<td>DBC Cables</td>
<td>$99.00</td>
<td></td>
</tr>
<tr>
<td>DISPLAY CABINET 1: 32 x 16 Monitor mounted,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal top, back, front, Plexiglas Front Cover</td>
<td>$390.00</td>
<td></td>
</tr>
<tr>
<td>POWER SUPPLY 2:</td>
<td>$220.00</td>
<td></td>
</tr>
</tbody>
</table>

*A = Assembled; K = Kit Form
†Serial Interface = TTL, RS232, TTY (20ma Current Loop)*
MOST POPULAR COMPUTER BOOK LIST

<table>
<thead>
<tr>
<th>Book Title</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 Basic Computer Games by Digital Equipment</td>
<td>$7.50</td>
</tr>
<tr>
<td>What To Do After You Hit Return by P. C. C.</td>
<td>$6.95</td>
</tr>
<tr>
<td>My Computer Likes Me When I Speak Basic by Bob Albrecht</td>
<td>$2.00</td>
</tr>
<tr>
<td>BASIC by Albrecht, Finkel, and Brown</td>
<td>$3.95</td>
</tr>
<tr>
<td>Introduction to Microcomputers by Adam Osborne</td>
<td>$7.50</td>
</tr>
<tr>
<td>Motorola 6800 Programming manual</td>
<td>$12.00</td>
</tr>
<tr>
<td>Motorola 6800 Applications manual</td>
<td>$25.00</td>
</tr>
<tr>
<td>Motorola 6800 Introduction to Microprocessors</td>
<td>$2.00</td>
</tr>
<tr>
<td>Micro-Computer Dictionary and Guide by Charles Sippl</td>
<td>$17.95</td>
</tr>
<tr>
<td>Computer Chess by Monroe Newborn</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

DISTRIBUTORS:

Please Contact One Of Our Distributors

Computer Way — Huntington Beach, California
Bargain Electronics — LaMeda, California
 Comput-O-Mat Systems — Rye, New York
The Computer Workshop, Inc. — Montgomery County, Maryland
Computer Mart Corporation — Boston, Massachusetts
The Computer Mart of New York — New York City, New York
Communicaciones S.A. — San Jose, Costa Rica
Computer Country — Denver, Colorado

WARRANTEE

WARRANTEE (Assembled Units)
Warranty units which fail due to defects in material or workmanship within 90 days of shipment will be repaired or replaced at our option when delivered at 940 North 400 East, North Salt Lake, Utah, with return shipment prepaid. Suspect modules may be sent. Send all correspondence to P.O. Box 213, Bountiful, Utah 84010.

KITS WARRANTY (All Expensive Repairs)
Any part which fails due to defect within 90 days of shipment will be replaced. Replacement parts will be sent when failing parts are sent with $5.00 handling fee. Warranty period begins 10 days after shipment from factory.

ORDER FORM

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Price/Each</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NAME ___________________________ please print clearly
STREET ____________________________
CITY _____________________________ STATE ______ ZIP ______
PHONE NO. ________________________
BANK CARD NO. ____________________ EXP. DATE: ____________
MC ______ BAC __________
SIGNATURE _______________________

A. Item Purchase Total
B. Utah Residents add 4.75% tax
C. Postage, handling, shipping and insurance add 2% of A
E. Order Total

Sphere generally offers 60-90 day delivery after full payment is received. (Cashier’s check clears immediately; personal check 1-2 week delay.) Parts availability may possibly delay delivery beyond the normal time.

Orders may be cancelled after 120 days without penalty. Sphere’s only obligation is to deliver the product.
Special to
April 20, 1976
A Sphere System 320
at Old System 2 Price.
$999.00

SAVE – SAVE – SAVE