



# Synertek Systems Single Board Computer with Keyboard/Display

SYM-1

- Assembled, Tested and Ready to Use
- Full Documentation — Two Manuals
- SY6502 NMOS 8-Bit Microprocessor
- 51 I/O Lines, Expandable to 71
- Five On-Board Programmable Interval Timers
- 28 Key Keypad
- Six Digit Display
- 4K Byte ROM SUPERMON Resident Monitor, User Expandable
- 1K Bytes of Static RAM provided, expandable to 4K Bytes On-Board with Sockets Provided
- User PROM/ROM for up to 28K Bytes of User Program
- Application Port — 15 Bi-directional TTL Lines, with Expansion Capability
- Expansion Port for Add-On Modules
- Requires Single +5V Supply
- Standard Interfaces:
  - Audio Cassette Recorder with Remote Control
  - Full Duplex 20mA TTY
  - System Expansion Bus
  - RS232 Compatible Interface
  - Four Strappable Relay Drivers or Input Buffers
- 32 Character Single-Line Oscilloscope Display
- Applications In
  - Training
  - Engineering
  - Prototyping
  - Instrumentation
  - Testing
  - Experimentation
- Same Hardware Interface Busses as KIM-1 (MOS Technology)
- Dimensions 8.25 in. x 10.72 in.

SYM-1 Versatile Interface Module is designed for future growth and expansion.

You can store your programs in the 1K Static RAM and debug by simply using the single-step feature of the monitor. User static RAM is easily expandable to 4K bytes on-board the basic unit. The 51 I/O lines which are available to control your custom applications can be expanded to a total of 71 I/O lines via an additional socket provided for Synertek's Versatile Interface Adapter — SY6522. Connect the SYM-1 to our KTM-2 Keyboard Terminal Module and your home TV (using an RF adapter) or monitor and you have a complete computer system with keyboard entry and video display.



# Synertek Systems

## OEM Version of SYM-1

**SM-100**

- Same Power, Features, and Performance as the SYM-1 Module at lower cost.
- Additional Economies for O.E.M. Applications Achieved by Supplying Board without the Keyboard, Display, Speaker and Associated Electronics

The SM-100 is designed especially for OEM controller or other applications where the microcomputer board is an integral part of a user's system. All the power and flexibility of the SYM-1 is retained but without the overhead of on-board keyboard and display.

## Port Expansion and Connector Kit

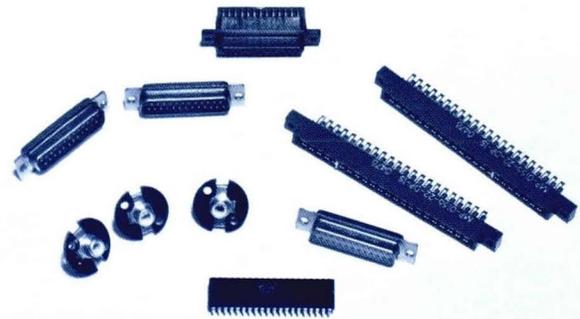
**PEX-1**

- Includes SY6522 Versatile Interface Adaptor
- Edge Connectors for Applications and Expansion Ports
- EIA Connector for RS-232 Interface
- Phono Connectors for Cassette Interface

The PEX-1 provides a SY6522 VIA which expands the SYM-1 I/O by an additional 20 lines. The SY6522 is plugged into socket U28 on the SYM-1 board.

Also provided are connectors to allow building a variety of interfacing cables. Included in the PEX-1 kit is a diagram for a suggested cable assembly which will provide complete connection to an EIA

(RS-232) terminal, an audio cassette recorder, and a TTY.



## Static RAM Memory Kits

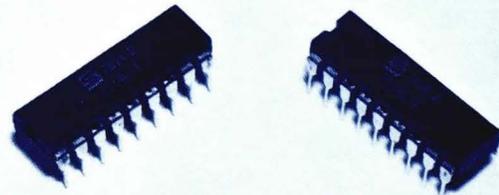
**SRM-1  
SRM-3**

- Expand SYM-1 Memory to 2K Bytes (SRM-1) or to 4K Bytes (SRM-3)
- Uses Synertek SY2114L Low Power Static RAMs

The static RAM memory kits provide for expansion of the on-board memory in the SYM-1 to 2K bytes or 4K bytes. The SY2114L low power RAM devices are plugged into existing on-board sockets per the following table.

| RAM Address | Sockets   | Comments        |
|-------------|-----------|-----------------|
| 0000-03FF   | U12, U13* | Lowest 1K bytes |
| 0400-07FF   | U14, U15  | 2nd 1K bytes    |
| 0800-0BFF   | U16, U17  | 3rd 1K bytes    |
| 0C00-0FFF   | U18, U19  | 4th 1K bytes    |

\*The SYM-1 microcomputer is shipped with 1K bytes of RAM inserted in sockets U12 and U13.



SINGLE BOARD COMPUTERS - SM100

# Synertek Systems

## Resident Assembler/Editor/Loader

**RAE-1**

- Resides in ROM, always available
- I/O Supported by SUPERMON

### Assembler

- Macro Capability
- Conditional Assembly
- Source Input from RAM or Tape
- Produces Relocatable Object Code
- Relocating Loader
- Assemble with Source Listing or Errors-Only Listing
- Hex, Binary, Decimal or Mixed Data Types
- 16 Assembler Pseudo-Ops
- 23 Error Codes
- Storage of Hex or ASCII Bytes

### Text Editor

- Edits Line Numbered Text
- Upper and Lower Case
- Character String Search with Optional Replace, Display or Show Number of Occurrences
- Line Edit

- Block Insert
- Delete Line(s)
- Delete File
- Renumber Text File
- Tabbing
- Free Format Command Input
- Output to Hard Copy Device With or Without Line Numbers
- Load and Record in High Speed Format; Entire File or Range of Lines
- Automatic Cassette Motor Control or Manual Control through ON and OFF Commands

RAE-1 is a full features Resident Assembler/Editor. Many powerful text editing functions are available with error messages giving error type and location. The user has complete control over all editor and assembler functions as well as editor controlled entry to SYM BASIC or SYM SUPERMON. The user also has control over cassette recorders for file I/O, or control may be left to software. The relocating loader may store executable code in memory during assembly or may store object code offset from its proper execution address.

## BASIC For SYM-1

**BAS-1**

- Resides in ROM, Always Available
- I/O Supported by SUPERMON
- Full Floating-Point 9-Digit, Extended BASIC
- Standard Dartmouth BASIC Statements  
LET READ PRINT DATA IF  
THEN FOR NEXT DIM END  
GOTO
- Extended BASIC Statements  
RESTORE REM STEP GOSUB DEF  
RETURN STOP INPUT FN  
ON...GOTO ON...GOSUB
- Scientific Functions  
SGN INT ABS SQR RND  
LOG EXP
- Logical Operators  
AND OR NOT
- Operation Commands  
RUN NEW CLR LIST CONT FRE

- Formatting Functions (TAB, POS, SPC)
- Peek, Poke, JSR to Machine Code Subroutines
- String Functions
- Cassette SAVE and LOAD Statements
- Decimal, Hexadecimal and String Constants
- Real, Integer and String Variables

BAS-1 is a full function BASIC developed for Synertek Systems by Microsoft Corporation. BASIC provides higher level language capabilities to the SYM-1 user, always instantly available from ROM.

### Custom

For large volume requirements, Synertek Systems has the capability to do custom microprocessor and memory designs to meet OEM requirements. Contact your Synertek Systems sales representative to obtain a factory quotation.

# Synertek Systems

## SUPER JOLT

### Single Board Computer

CP110

- SY6502 NMOS 8-Bit Microprocessor
- 1K Bytes of Static RAM Memory
- 64 Bytes of Interrupt Vector RAM
- 28 Bi-Directional Programmable I/O Lines
- 1 MHz Crystal Controlled Clock
- Interval Timer
- Four Interrupts, Including a Timer Interrupt and a Non-Maskable Interrupt
- Three Serial Interfaces — 20 mA Current Loop, RS-232 and TTL
- Buffered Address and Data Lines

- 1,024 Bytes of Resident ROM Program Memory Containing DEMON Debug Monitor Program
- Dimensions 4.25 in. x 7.00 in.

The CP110 SUPER JOLT CPU board is the most versatile microcomputer on a single PC board. Connected to a terminal, the CP110 provides everything necessary to begin writing, debugging, assembling and executing microcomputer programs. Stand-alone, the CP110 is a single board OEM microcomputer suited to a wide range of dedicated applications.

## 4K RAM Card For SUPER JOLT

MM100

- 4K x 8 Static RAM
- Uses 32 SY2102 RAMs
- Fully Compatible with CP110 SUPER JOLT
- Jumper Selectable Addresses
- On-Board Write-Protect Switch

- Buffered Address/Data Lines
- Dimensions 4.25in x 7.00 in.

The 4K RAM card allows memory expansion in 4K byte blocks, up to 32K bytes. Address, data and control signals are available from the CPU card through an edge connector.

## Universal Card For SUPER JOLT

AS200

- Ideal for Experimental/Prototype Circuits
- Accepts 14-Pin to 40-Pin Wirewrap Sockets
- Power and Ground Busses Provided for Each Row of Holes
- Accepts up to 50 14-Pin Sockets
- Dimensions: 4.25 in. x 7.00 in. Card Compatible with SUPER JOLT

Universal Card is ideal for constructing experimental and prototype circuits. Holes are provided for mounting connectors for mating cables to interconnect the AS200 to other boards in the SUPER JOLT family.

## Combined Tiny BASIC/ Resident Assembler Program Plug-Ins

SW101

### SUPER JOLT Tiny BASIC

- Subset of Dartmouth BASIC
- Occupies 2,304 Bytes of ROM

### Resident Assembler Program

- Occupies 1,750 Bytes of ROM

- Single Pass Operation
- Source Input Accepted from Tape or Keyboard
- Accepts Free Format Input

# Synertek Systems Keyboard Terminal Module

## KTM-2

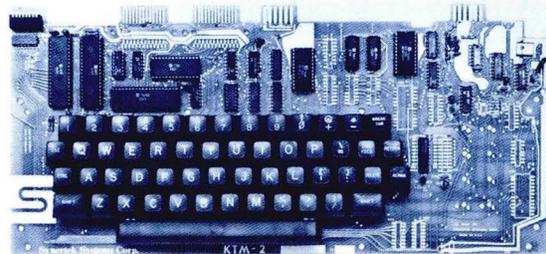
- 24 x 40 Character Screen Size
- Full ASCII Upper and Lower Alphanumeric Character Set with Descenders
- Control and Special Characters
- 128 Graphics Characters
- Reverse Video
- Scrolling
- Cursor Blanking
- Full Cursor Control
- Absolute and Relative Cursor Addressing
- Auto CR at End of Line (Switch Selectable)
- 110 to 9600 Baud
- Even, Odd, or No Parity
- Complete RS232 Handshaking
- Auxiliary RS232 I/O Port
- Typewriter Style Keyboard 54 Keys
- Automatic Character Repeat
- Alpha Lock
- Erase — Partial Line, Partial Screen, Full Screen
- Programmable Bell Output
- Programmable Device Control Output
- Interlaced Screen (Switch Selectable)

- European (50Hz) Compatible (Switch Selectable)
- Requires Single +5V Supply

The KTM-2 provides a keyboard and all the logic circuitry for a full keyboard terminal. The display interface provides composite video for user provided monitor or for a standard TV set equipped with an RF modulator.

The design of the KTM-2 incorporates 8 MOS-LSI integrated circuit chips, including two dedicated microprocessors. Twenty TTL devices are used, resulting in a total chip count of 28 devices.

The use of standard LSI devices results in a highly cost effective design with great flexibility allowing modifications for custom OEM applications. More features are available at lower cost than if a CRT controller chip or other approach had been used.



## Keyboard Terminal Module

### KTM-2/80

- 24 x 80 Character Screen Size
- All Other Features Identical to KTM-2

## Keyboard Terminal Module — Custom \* KT-200

- Same Basic Features as KTM-2 plus many Enhancements
- 24 x 80 Character Screen Size
- 8 x 10 Dot Field Size
- Character Blinking
- Character Intensity Control
- Underline
- Character Protect
- Addressable Data (Absolute or Relative)
- 8 Key Edit Pad
- Block Mode Operation
  - Line Transmit — Page Transmit
  - Transmit to Main or Auxiliary Port

- Local Editing
  - Character Insert/Delete
  - Line Insert/Delete
- Half or Full Duplex Mode

\*Available in OEM volume quantities only.

### Custom

For large volume requirements, Synertek Systems has the capability to customize the keyboard terminal modules to meet OEM terminal subsystem requirements, offering flexibility over screen size, character size, scan rate, character set, and keyboard function and definition.

# Synertek Systems

## 16K Static RAM Module —

### Motorola and System 65 Compatible

**MBC016**

- **Two Speed Versions**
  - 500 ns Access
  - 300 ns Access
- **Two Power Versions**
  - Standard 5V @ 4.5A Max.
  - Low Power 5V @ 3.5A Max.
- **16K Bytes of Random Access Memory, in Two Independent Sections**
- **Separate Write Protect for Each 8K Section**
- **Compatible with Motorola Bus**
- **System 65 Compatible**
- **Static — No Clocks or Refresh Required**
- **6.00 in. x 9.75 in Module Size**
- **Single +5V Supply**

The MBC 016 RAM module is directly compatible with Motorola's Bus as well as the System 65 Microcomputer Development System. The module can also be used in user-designed equipment or in Motorola Bus compatible card cages.

The RAM module contains 16K bytes of read/write memory implemented with 32 SY2114 1024x4 static RAM Memory devices. The module includes address decoding, write protection and data buffering circuitry.

Address select switches allow each 8K memory section to be independently placed in any 8K address range. Also each 8K section can be independently write-protected through the write-protect lines.

#### SPECIFICATIONS:

| Memory Size | Word Length |
|-------------|-------------|
| 16K         | 8 Bits      |

#### Module Components

32 SY2114 Static RAM devices  
1024x4-Bit each

#### Max. Access Time

500 ns (using SY2114)  
300 ns (using SY2114-2)

#### Interface

System 65 compatible  
Motorola bus compatible  
All interface signals are TTL compatible

#### Module Dimensions

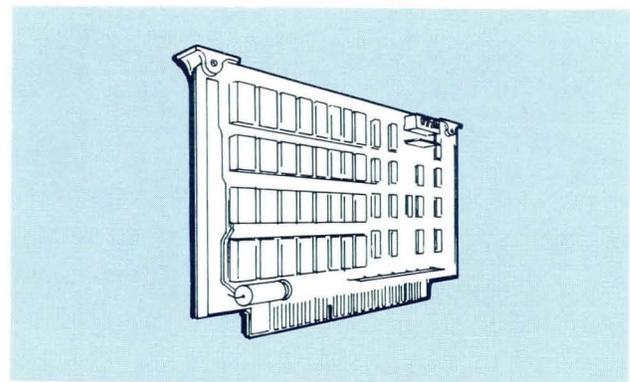
6.00 inches wide x 9.75 inches high

#### Connector

Dual 43/86 pins on 0.156 inch centers

#### Operating Temperature

0°C to 55°C



#### Power Requirements

Standard +5Vdc  $\pm$  5% @ 4.5A max.  
Low Power +5Vdc  $\pm$  5% @ 3.5A max.

#### Part Number Designation

| Power Consumption | Speed-nsec |           |
|-------------------|------------|-----------|
|                   | 500        | 300       |
| 3.5 Amps (Typ.)   | MBC016     | MBC016-3  |
| 2.5 Amps (Typ.)   | MBC016L    | MBC016L-3 |

#### LOGIC LEVELS $T_A = 0^\circ\text{C}$ to $+55^\circ\text{C}$ , $V_{CC} = +5V \pm 5\%$

| Characteristic   | Symbol              | Min.     | Max. | Unit     | Condition                  |
|--|---------------------|----------|------|----------|----------------------------|
| Inputs ( $\overline{D0}$ - $\overline{D7}$ ),<br>A0-A15,<br>WP1-WP7, $\phi_2$ , R/ $\overline{W}$<br>Input Low Voltage | $V_{IL}$            |          | 0.8  | V        | $I_{IL} = 400 \mu\text{A}$ |
|  | Input High Voltage  | $V_{IH}$ | 2.0  | $V_{CC}$ | V                          |
| Outputs ( $\overline{D0}$ - $\overline{D7}$ )<br>Output Low Voltage  | $V_{OL}$            |          | 0.5  | V        | $I_{OL} = 48 \text{ mA}$   |
|  | Output High Voltage | $V_{OH}$ | 2.4  | $V_{CC}$ | V                          |

APC-IN MEMORY

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ready and easy to use microcomputer systems, but also an experienced development and manufacturing organization willing and able to help you incorporate microcomputers into your products. We solicit your development business and follow-on product manufacturing.

For more information on how Synertek Systems Corporation can help you, contact your area representative in the accompanying list or SSC directly.



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| <u>Reference No.</u> | <u>Title</u>  | <u>Qty.</u> | <u>Price</u> | <u>Total</u> |
|----------------------|---|-------------|--------------|--------------|
| MNA-1                | SYM Single Board Computer Reference Manual (over 200 pages)               | _____       | \$7.00       | _____        |
| MNA-2                | 6500 Programming Manual (over 200 pages)                                  | _____       | 7.00         | _____        |
| MNA-3                | 6500 Hardware Manual (over 200 pages — covers 6500 Microprocessor Series) | _____       | 7.00         | _____        |
| SRC-1                | SYM Reference Card  | _____       | N/C*         | _____        |
| MNA-4                | SYM BASIC Manual  | _____       | 5.00         | _____        |
| SPT-1                | SUPERJOLT (CP110) Single Board Computer Manual                            | _____       | 5.00         | _____        |
| KMM-1                | KTM-2 Keyboard Terminal Module Reference Manual                           | _____       | 5.00         | _____        |
| RMN-1                | Resident Assembly/Editor Manual   | _____       | 5.00         | _____        |
| TNP-1                | Package of all Technical Notes (over 40 pages)                            | _____       | 3.00         | _____        |
|                      |   |             | Sub Total    | _____        |
|                      |   |             | Sales Tax**  | _____        |
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 474 Thurston Rd.  
 Rochester, NY 14619  
 Tel: (716) 464-8636  
 TWX: 510-253-3841

Ontec, Inc.  
 P.O. Box 206  
 Grand Island, NY 14072  
 Tel: (716) 464-8636  
 TWX: 510-253-3841

Ontec, Inc.  
 P.O. Box 91  
 Fayetteville, NY 13066  
 Tel: (716) 464-8636  
 TWX: 510-253-3841

**New York (Cont.)**

Ontec, Inc.  
P.O. Box 24  
Camillus, NY 13031  
Tel: 716-464-8636  
TWX: 510-253-3841

Trionic Associates Inc.  
320 Northern Blvd.  
Great Neck, NY 11021  
Tel: 516-466-2300  
TWX: 510-223-0834

**North Carolina**

Macro Marketing  
3512 Vest Mill Rd.  
Winston Salem, NC 27103  
Tel: 919-768-8740

**North Dakota**

Peterson Electronics  
9001 Bloomington Fwy.  
Bloomington, MN 55420  
Tel: 612-884-3483

**Ohio**

Kimconics Sales Inc.  
16 W. Wenger Rd.  
Englewood, OH 45322  
Tel: 513-836-9677  
TWX: 810-450-2164

**Ohio (Cont.)**

Kimconics Sales Inc.  
3864 Center Rd.  
Suite 10-C  
Brunswick, OH 44212  
Tel: 216-225-6111

Kimconics Sales Inc.  
201 Penn Center Blvd.  
Pittsburgh, PA 15235  
Tel: 412-824-9860

**Oklahoma**

Ion Associates, Inc.  
9726 E. 42nd St.  
Suite 125  
Tulsa, OK 74145  
Tel: 918-664-0186,7,8

**Oregon**

General Electronics Inc.  
320 Andover Park East  
Suite 170  
Tukwila, WA 98188  
Tel: 206-575-4030  
TWX: 910-444-2066

**Pennsylvania (Eastern)**

Sunday O'Brien  
15 Potter St.  
Haddonfield, NJ 08033  
Tel: 609-429-4013  
TWX: 710-896-0679

**Pennsylvania (Western)**

Kimconics Sales Inc.  
201 Penn Center Blvd.  
Pittsburgh, PA 15235  
Tel: 412-824-9860

**Rhode Island**

Dynasel Associates  
235 Bear Hill Road  
Waltham, MA 02154  
Tel: 617-890-6777  
TWX: 710-324-0202

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3512 Vest Mill Rd.  
Winston-Salem, NC 27103  
Tel: 919-768-8740

**South Dakota**

Peterson Electronics  
9001 Bloomington Fwy.  
Bloomington, MN 55420  
Tel: 612-884-3483

**Tennessee**

Macro Marketing  
3315 S. Memorial Parkway  
Suite 1  
Huntsville, AL 35801  
Tel: 205-883-9630  
TWX: 810-726-2230

**Texas**

Ion Associates Inc.  
2619 Electronic Lane  
Suite 303  
Dallas, TX 75220  
Tel: 214-357-9441  
TWX: 910-861-4562

Ion Associates Inc.  
9219 Katy Freeway  
Suite 103  
Houston, TX 77024  
Tel: 713-461-5311  
TWX: 910-881-3776

Ion Associates Inc.  
8705 Shoal Creek Blvd.  
Suite 213  
Austin, TX 78758  
Tel: 512-458-2108  
TWX: 910-874-1355

**Utah**

Checkmate Sales Inc.  
8000 E. Girard Ave.  
Suite 604  
Denver, CO 80231  
Tel: 303-752-2666

**Vermont**

Dynasel Associates  
235 Bear Hill Road  
Waltham, MA 02154  
Tel: 617-890-6777  
TWX: 710-324-0202

**Virginia**

Conroy Sales  
26 W. Pennsylvania Ave.  
Baltimore, MD 21204  
Tel: 301-296-2444

**Washington**

General Electronics Inc.  
320 Andover Park East  
Suite 170  
Tukwila, WA 98188  
Tel: 206-575-4030  
TWX: 910-444-2066

**West Virginia**

Kimconics Sales Inc.  
16 W. Wenger Rd.  
Englewood, OH 45322  
Tel: 513-836-9677  
TWX: 810-450-2164

Kimconics Sales Inc.  
3864 Center Rd.  
Suite 10-C  
Brunswick, OH 44212  
Tel: 216-225-6111

Kimconics Sales Inc.  
201 Penn Center Blvd.  
Pittsburgh, PA 15235  
Tel: 412-824-9860

**Wisconsin**

Key Enterprises Inc.  
850 Elm Grove Rd.  
Elm Grove, WI 53122  
Tel: 414-784-3390

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**Vice President Marketing/Sales**

3001 Stender Way, M/S 33  
Santa Clara, CA 95052  
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TWX: 910-338-0135

**International Sales Manager**

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Santa Clara, CA 95051  
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TWX: 910-338-0135

**Managing Director, European Mktg.**

Honeywell House  
Charles Square  
Bracknell Berkshire  
Rg 12 1 Eb  
Tel: Bracknell 24555  
TWX: (851) 847064

**Australia**

Ampec Engineering Co.  
1 Wellington St.  
Rozelle, N.S.W. 2039  
Australia  
Tel: 02-818-1166  
TLX: 790-AA27136

Cema Distr. Pty. Ltd.  
21 Chandos St.  
P.O. Box 578  
Crow's Nest, N.S.W.  
2065 Australia  
Tel: 02-439-4655  
TLX: 790-22846

**Austria**

FA. Ing. E. Steiner  
Geylinggasse 16  
1130 Wien  
Vienna  
Tel: 0222-82-26-74  
TLX: 847-135026

**Holland, Belgium**

Microtron  
edm. Machtenslaam  
75-B17, 1080 Brussels  
Belgium  
Tel: 085-23-22-17  
TLX: 846-22606

**Denmark**

C-88  
Uldvejen 10  
DK-2970 Horsholm  
Denmark  
Tel: 02-5708-88  
TLX: 37578 CEIGTY DK

**England**

Memec Limited  
Thame Park Industrial Estate  
Thame, Oxon  
England OX9 3RS  
Tel: 084-421-3146  
TLX: 851-837508

**Finland**

Finnmetric  
P1-6-02101 Tapiola  
Ahertajantie 6 D  
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75017 Paris  
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Tel: 755-88-40  
TLX: 842-640051F

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Astronic GmbH  
Winzererstr. 47 d  
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Tel: 089-304011  
TLX: 841-5216187

Bitronic GmbH  
Einsteinstrasse 127  
8000 Munich 80  
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Tel: 089-4702098  
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Electronic-2000 GmbH  
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Neumarkter Str. 75  
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TLX: 841-522561

**Hong Kong**

Conmos Products Ltd.  
Room 101 Austin Centre  
19 Austin Ave.  
Kowloon, Hong Kong  
Tel: 3-697241-5  
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**Israel**

Milchan Bros. Ltd.  
29 Karlbach Street  
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TLX: 922-341162

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20092 Cinisella Balsama  
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Leewood Intl. Inc.  
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2349 Charleston Rd.  
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Southmark Electronics Ltd.  
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Tel: 798-078  
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**Venezuela**

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