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## User's Manual for

### **865**

Universal 48-pin drive Programmer,  
expandable up to 256.

### **866**

Universal 48-pin drive Programmer with USB/LPT interface and ISP  
capability

### **864**

Universal 48-pin drive Programmer

### **844USB**

Universal 40-pin drive Programmer with USB interface and ISP  
capability

### **844A**

Universal 40-pin drive Programmer with ISP capability

### **848**

Universal Memory Programmer

### **848A**

Universal Memory Programmer

### **849**

MCS51 Series and Atmel AVR Microcontrollers Programmer with ISP  
capability



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## ***How to use this manual***

This manual explains how to install the control program and how to use your programmer. It is assumed that the user has some experience with PCs and installation of software. Once you have installed the control program we recommend you consult the context sensitive HELP within the control program rather than the printed User's Manual. Revisions are implemented in the context sensitive help before the printed Users Manual.

**Note:** *Because this User's manual is common for more than one B+K Precision programmers, read section(s) respective programmer you have bought, please.*

This manual contains two main sections:

### ***Quick Start***

Read this section if you are an experienced user. You will find only specific information regarding installation of the control program and use of your programmer. For more detailed instructions you may read the **Description in detail** section or the **Troubleshooting** chapter for the respective programmer.

### ***Detailed description***

Read this section for the respective programmer if you are a less experienced user or if you need detailed information. You may find some less relevant features of programmer described here, but all programmer features are described in this section along with details regarding installation of the control program. Read this section to explore all of the features provided by your programmer.

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*Please, download actual version of manual from B+K Precision WEB site ([www.bkprecision.com](http://www.bkprecision.com)), if current one will be out of date.*



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## ***Conventions used in the manual***

References to the control program functions are in bold, e.g. **Load**, **File**, **Device**, etc. References to control keys are written in brackets <>, e.g. <**F1**>.

## ***Terminology used in the manual:***

- Device*** any kind of programmable integrated circuits or programmable devices
- ZIF socket*** Zero Insertion Force socket used for insertion of target device
- Buffer*** part of memory or disk, used for temporary data storage
- Printer port*** type of port of PC (parallel), which is primarily dedicated for printer connection.
- HEX data format*** - format of data file, which may be read with standard text viewers; e.g. byte 5AH is stored as characters '5' and 'A', which mean bytes 35H and 41H. One line of this HEX file (one record) contains start address, data bytes and all records are secured with checksum.

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# *Introduction*

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This user's manual covers some B+K Precision programmers: **865, 866, 864, 844USB, 844A, 848, 848A and 849.**

**865** is a universal programmer and logic IC tester with 48 powerful pindrivers in base configuration, expandable up to 256. This design allows to easily adding new devices to the device list. 865 provides very competitive price but excellent hardware design for reliable programming. Best "value for money" in this class.

**866** is a fast universal USB/LPT interfaced universal programmer and logic IC tester with 48 powerful pindrivers. Using build-in in-circuit serial programming (ISP) connector the programmer is able to program ISP capable chips in-circuit. This design allows easily add new devices to the device list. 866 is a true universal and a true low cost programmer, providing one of the best "value for money" in today's market.

**864** is a universal programmer and logic IC tester with 48 powerful pindrivers. This design allows to easily adding new devices to the device list. 864 is a true universal and a true low cost programmer, providing one of the best "value for money" in today's market.

**844USB** is a small, fast and powerful USB interfaced programmer of all kinds of programmable devices. Using build-in in-circuit serial programming (ISP) connector the programmer is able to program ISP capable chips in-circuit. It has design, which allows easily add new devices to the device list. Nice "value for money" in this class.

**844A** is a small, fast and powerful programmer of all kinds of programmable devices. Using build-in in-circuit serial programming (ISP) connector the programmer is able to program ISP capable chips in-circuit. It has design, which allows to easily adding new devices to the device list. Nice "value for money" in this class.

**848** is a small and powerful EPROM, EEPROM, Flash EPROM and serial EEPROM programmer and static RAM tester, designed for professional mobile applications. In addition, 848 programmer with auxiliary modules support also microprocessors (MCS48, MCS51, PIC, AVR), GALs, etc. Programmer can work with 'true LV' device too - from 2V.

**848A** is a little and powerful programmer for EPROM, EEPROM, Flash EPROM, NVRAM, serial EEPROM and static RAM tester.

**849** is little, powerful and very fast portable programmer for MCS51 series and Atmel AVR Microcontrollers with ISP

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capability. 849 enables also programming serial EEPROM with interface types IIC (24Cxx), Microwire (93Cxx) and SPI (25Cxx).

All our programmers work with almost any IBM PC Pentium compatible or higher, portable or desktop personal computers. No special interface card is required to connect to the PC, since programmers use the parallel (printer) port or USB port.

All programmers function flawlessly on systems running Windows 95/98/Me/NT/2000/XP.

All programmers are driven by an **easy-to-use, control program** with pull-down menus, hot keys and online help. Control program is common for all these B+K PRECISION programmers (865, 866, 864, 844USB, 844A, 848, 848A and 849).

Advanced design, including protection circuits, original brand components and careful manufacturing allows us to provide a **one-year warranty** on parts and labor for these programmers (limited 25,000 cycle warranty on ZIF socket).

#### **Free additional services:**

- free technical support (phone/fax/e-mail).
- free lifetime software update via Web site.

**Free software updates** are available from our Internet address **[www.bkprecision.com](http://www.bkprecision.com)**

We also offer the following new services in our customer support program: Keep-Current and AlgOR.

- **Keep-Current** is a service by which B+K PRECISION ships to you the latest version of the control program for programmer and the updated user documentation. A Keep-Current service is your hassle-free guarantee that you always have access to the latest software and documentation, at minimal cost.
- **AlgOR** (Algorithm On Request) service allows you to receive from B+K PRECISION software support for programming devices not yet available in the current device list.

**Note:** *We don't recommend use programmers 864, 848 and 848A for In-circuit programming.*



## Products configuration

Before installing and using your programmer, please carefully check that your package includes all next mentioned parts.

	865	866	864	844USB	844A	848A	848	849
programmer	•	•	•	•	•	•	•	•
LPT cable	•	•	•	-	•	•	•	•
USB cable	-	•	-	•	-	-	-	-
power supply	•	•	•	•	•	•	•	•
diagnostic POD	•	•	•	•	•	-	•	•
ISP cable	-	•	-	•	•	-	-	•
ZIF anti-dust cover	•	•	•	•	•	-	•	•
User's manual	•	•	•	-	•	-	-	-
Quick Guide	-	-	-	•	-	•	•	•
registration card	•	•	•	•	•	•	•	•
shipping case	•	•	•	•	•	•	•	•

If you find any discrepancy with respective parts list and/or if any of these items are damaged, please contact your distributor immediately.

## PC requirements

### Minimal PC requirements

- PC Pentium 166
- 32MB RAM
- one CD drive
- HDD, 40 MB free space
- operating system Windows 95/98/Me/NT/2000/XP
- one parallel (LPT) port with nothing attached (for programmers connected via LPT port)
- USB port ver. 1.1 or later (for programmers connected via USB port)

### Recommended PC requirements

- Pentium PC III 800 MHz or higher

- 
- 256 MB free RAM
  - one CD drive
  - HDD, 50 MB free space
  - operating system: Windows XP
  - LPT printer port supporting EPP/ECP modes (for programmers connected via LPT port)
  - USB port ver. 1.1 or later (for programmers connected via USB port)

**Note:** *For convenience, we suggest that you use a supplementary multi I/O card to provide an additional printer port (LPT2 for example), in order to avoid sharing the same LPT port between printer and programmer.*



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## *Quick Start*

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## ***Installing programmer hardware***

- switch off the PC and programmer
- connect the communication port of programmer to a printer port of PC using cable supplied
- switch on the PC
- connect the connector of the power supply adapter to the programmer

## ***Installing the programmer software***

Run the installation program from the CD (Setup.exe) and follow the on-screen instructions. Please, for latest information about the programmer hardware and software see [www.bkprecision.com](http://www.bkprecision.com) .

## ***Using programmer software***

Launch PG4UW.exe to enter the control program. The menu **Device** contains the device manipulation commands. The menu **File** contains commands for files and directories. The menu **Buffer** is to be used for buffer manipulation.

## ***Programming a device - the shortest way***

Use the hot key **<Alt+F5>** to input the device name and/or manufacturer to select the desired type of target device. If you want to copy an existing device, insert it into the ZIF socket of the programmer and then press key **<F7>**. If you want to program a target device with data from a disk press key **<F3>** and read the appropriate file into the buffer. Then insert your target device into the ZIF socket. To check if the device is blank - press key **<F6>**. Now you can program the device by pressing key **<F9>**. After programming you may perform additional verification by pressing key **<F8>**.



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## *Detailed description*

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**865**

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## Introduction

**865** is a new generation of Windows 95/98/Me/NT/2000/XP based B+K PRECISION universal programmers built to meet the rigorous demands of the leading engineers and programming centers.

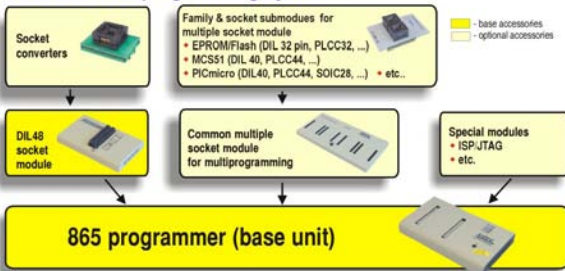
**865** supports all kinds of types and silicon technologies of programmable devices. It provides very competitive price but excellent hardware design for reliable programming. Best "value for money" in this class.

**865** interfaces with the IBM PC Pentium compatible or higher, portable or desktop personal computers. Programmer allows you to directly connect to your PC through **any standard parallel (printer) port** (no special interface card needed). We recommend use **parallel (printer) port on PCI bus, IEEE 1284 compatible (ECP/EPP)**. The 865 control program support standard IEEE1284 also.

**865** offer very fast programming due high-speed FPGA driven hardware and support of ECP/EPP parallel port. Consequently and due special protocol is communication between PC and 865 programmer fast and very reliable. The programming AT29C040A takes about 28 seconds it is faster than most its competitors. As a result, this programmer is optional solution for middle quantities programming in production or programming centers.

### Scheme of 865 programming system

#### Scheme of 865 programming system



#### 865, base configuration

- 865, base unit
- 865, DIL48 socket module

For following text, term 865 means 865 in base configuration.

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**865** has 48 powerful pindrivers in base unit, expandable up to 256 pindrivers using "pindriver expansion" modules. Advanced pin drivers incorporate high-quality high-speed circuitry to deliver programming and testing performance without overshoot or ground bounce for all device technologies. Pin drivers operate down to 1.8V so you'll be ready to program the full range of today's advanced low-voltage devices.

Modular design of 865 allows adapting the programmer according to customers needs either as very flexible universal programmer for laboratory or high efficient multi-programmer in production line. Multiprogramming capability for most of supported devices is accomplished by using "multiple socket" modules.

Powerful pindriver provides logic level, pull-up/pull-down, clock, ground, one VCC supply and two programming supply and, certainly read, on each of all 48 pins independently. This advanced design give it the ability to program almost every programmable device in DIL up to 48 pins without adapter or family specific module. Support for today and tomorrow programmable devices gives engineers the freedom to choose the optimum device for new design.

**865** isn't only programmer, but also **tester** of TTL/CMOS logic ICs and memories. Furthermore, it allows generate of user-definable **test pattern sequences**.

The programmer has on-board intelligence, comprise of powerful Microcontroller system and support devices. 865 has been designed for **multitasking operating systems** and is able to perform time-critical programming sequences independently of the PC operating system status and without being interrupted by any another parallel process running on the PC. Consequently, 865 works without any problem on systems running Windows 95/98/Me/NT/2000/XP.

The programmer performs **device insertion test** (wrong or backward position) and contact check (poor contact pin-to-socket) before it programs each device. These capabilities, supported by over current protection and signature-byte check help prevent chip damage due to operator error.

**Built-in protection circuits** eliminate damage of programmed device due to mains supply fluctuations, communication error or if PC is frozen. In event of such errors Microcontroller in programmer performs, independently on the PC, exactly specified sequence of steps, so that programmed target device remains intact. Programmer's hardware offers enough resources for **self test**, that control program is any time be able to check pindrivers, present and correct level of all



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voltages, check the timing and communication between programmer and PC.

An optimally designed printed circuit minimizes negative programming effects at the socket (such as ground bouncing, supply voltage instability). All the inputs of the 865 programmer, including the ZIF socket, connection to PC and power supply input, are **protected against ESD** to protect the programmer and programmed circuits against damage due ESD.

**865** performs programming **verification** at the marginal level of supply voltage, which, obviously, improves programming yield, and guarantees long data retention.

Various socket converters are available to handle device in PLCC, SOIC, PSOP, SSOP, TSOP, TSSOP, TQFP, QFN (MLF), SDIP, BGA and other packages.

Devices with more than 48 pins are supported by

- pindriver expansion module and universal single socket module
- simple special package converters

**865** programmer is driven by an **easy-to-use** control program with pull-down menu, hot keys and on-line help. Selecting of device is performed by its class, by manufacturer or simply by typing a fragment of vendor name and/or part number.

**Standard** device-related commands (read, blank check, program, verify, erase) are boosted by some **test functions** (insertion test, signature-byte check), and some **special functions** (autoincrement, production mode - start immediately after insertion of chip into socket).

All known data formats are supported. Automatic file format detection and conversion during load of file.

The rich-featured **autoincrement function** enables to assign individual serial numbers to each programmed device - or simply increments a serial number, or the function enables to read serial numbers or any programmed device identification signatures from a file.

The software also provide a many informations about programmed device. As a special, the drawing of all available packages are provided. The software provide also explanation of chip labeling (the meaning of prefixes and suffixes at the chips) for each supported chip.

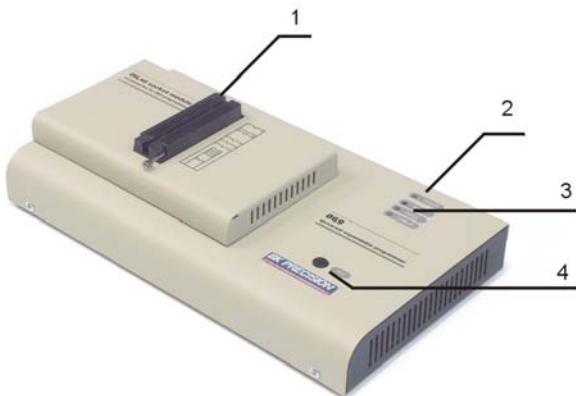
It is important to remember that in most cases new devices require **only a software upgrade** since the 865 has 48 true

pin drivers, which can perform as required under program control. With our prompt service new devices can be added to the current list within hours!

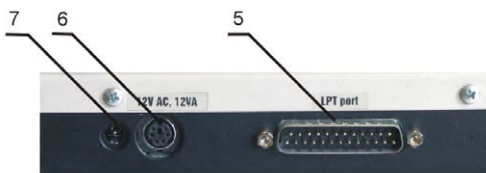
Advanced design including protection circuits, original brand components and careful manufacturing allows us to provide a **one-year warranty** on parts and labor for the 865 (limited 25,000-cycle warranty on ZIF socket).

## 865 elements

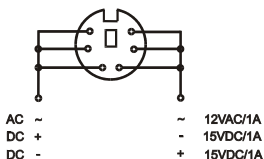
- ① DIL48 socket module with 48 pin ZIF socket
- ② LED indicator power/sleep
- ③ LED indicators for work result
- ④ YES! Button



- ⑤ Connector for PC <-> 865 communication cable
- ⑥ Power supply connector
- ⑦ Internal use connector



Power supply connector





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**Note:** Due to low power consumption of 865 in inactive mode, it doesn't require power switch. When the power LED indicator glows with a low intensity, the 865 is in inactive mode.

## Connecting 865 to the PC

Switch off PC and programmer. Insert the communication cable included with your 865 programmer package to a free printer port on your PC. If your computer is equipped with only one printer port, substitute the programmer cable for the printer cable. Connect the opposite cable end to the programmer. Screw on both connectors to counter-connectors. This is very important. It may be uncomfortable to switch between printer cable and programmer cable, though it is not recommended to operate the 865 programmer through a mechanical printer switch. Use of an electronic printer switch is impossible. But you can install a second multi-I/O in your computer, thus obtaining a supplementary printer port, says LPT2. So your printer may remain on LPT1 while the programmer on LPT2.

Switch on the PC.

Connect the mains connector of the power supply (or the wall-plug power supply itself) to a mains plug, and then connect the mini-DIN connector to the programmer's connector labeled "12VAC". At this time all 'work result' LEDs (and 'POWER' LED) light up successive and then switch off. Once the POWER LED lights with low brightness then the 865 programmer is ready to run.

Next run the control program for 865.

**Caution!** If you don't want to switch off your PC when connecting the 865, proceed as follows:

- **When connecting** the programmer to the PC: **FIRST** insert the **communications cable** and **THEN** the **power-supply connector**.
- **When disconnecting** the programmer from the PC: **FIRST** disconnect the **power-supply connector** and **THEN** the **communication cable**.

From 865's point of view the connecting and disconnecting sequence is irrelevant. Protection circuits on all programmer inputs keep it safe. **But think of your PC please.**

## Problems related to the 865 ⇔ PC interconnection, and their removing

If you have any problems with 865 ⇔ PC interconnection, see section **Common notes** please.

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## ***Manipulation with the programmed device***

After selection of desired device for your work, you can insert into the open ZIF socket (the lever is up) and close socket (the lever is down). The correct orientation of the programmed device in ZIF socket is shown on the picture near ZIF socket on the programmer's cover. The programmed device is necessary to insert into the socket also to remove from the socket when LED BUSY light off.

**Note:** *Programmer's protection electronics protect the target device and the programmer itself against either short or long-term power failures and, partly, also against a PC failure. However, it is not possible to grant the integrity of the target device due to incorrect, user-selected programming parameters. Target device may be not destroyed by forced interruption of the control program (reset or switch-off PC), by removing the physical connection to the programmer, but the content of actually programmed cell may remains undefined. Don't unplug the target device from the ZIF socket during work with devices (LED BUSY shine).*

## ***In-system serial programming by 865***

For ISP programming by 865 is **necessary change DIL48 socket module by ISP module.**

ISP module attached to 865 programmer is manual operated ISP programming solution, suitable for development and low/middle volume production application.

Optimized advanced pindriver deliver programming performance without overshoot or ground bounce for all device technologies. Pin drivers operate down to 1.8V so you'll be ready to program the full range of today's advanced low-voltage devices.

The ISP programming solution performs programming verification at the marginal level of supply voltage, which, obviously, improves programming yield, and guarantees long data retention.

The ISP programming solution provide also the power supply for the target system.

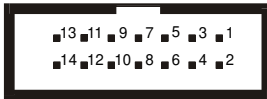


This ISP programming solution provides very competitive price but excellent hardware design for reliable programming.

This ISP programming solution is driven by the same software as the 865 programmer. The software provide full information for ISP implementation: Description of ISP connector pins for currently selected chip, recommended target design around in-circuit programmed chip and other necessary information.

For general definition, recommendation and direction about ISP see section **Common notes / ISP** please.

### **Description of ISP connector**

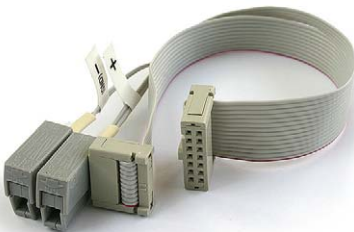


Front view at ISP connector.

Specification of ISP connector pins depends on the device, which you want to program. You can find it in the control SW for programmer (PG4UW), menu **Device / Device Info (Ctrl+F1)**. Be aware, the ISP programming way of respective device must be selected. It is indicated by (ISP) suffix after name of selected device.

These specifications correspond with application notes published of device manufacturers. Used application notes you may find on [www.bkprecision.com](http://www.bkprecision.com), section application notes.

**Note:** Pin no. 1 is signed by triangle scratch on ISP cable connectors.

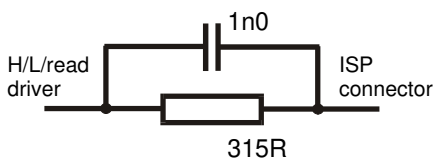


865 ISP cable

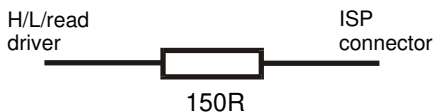
**Warnings:**

- Use only **attached ISP cable**. When you use other ISP cable (other material, length...), programming may occur unreliable.
- **865 can supply** programmed device (pin 1 of ISP connector) and target system (pin 5, 13, 14 of ISP connector) with limitation (see Technical specification / ISP connector), but target system **cannot supply 865**.
- 865 apply programming voltage to target device and checks his value (target system can modify programming voltage). If the programming voltage is different as expected, no action with target device will be executed.

**Note:** H/L/read driver on pins 3 and 10

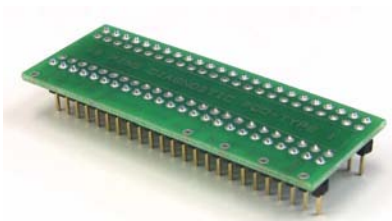


H/L/read driver on pins 2, 4, 6 and 8



## Self test and Calibration

If you feel that your programmer does not react according to your expectation, please run the programmer self test using Diagnostic POD, enclosed with the standard delivery package. For optimal results with programmer we recommend you undertake every 6 months, an extended test and to check the calibration. See instructions for self test in the **Diagnostics** menu of PG4UW.



## Technical specification





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## **HARDWARE**

### **Base unit, DACs**

- FPGA based IEEE 1284 slave printer port, up to 1MB/s transfer rate
- on-board powerful microprocessor (20MHz) supported by FPGA based state machine, 20MHz powered
- three D/A converters for VCCP, VPP1, and VPP2, controllable rise and fall time
- VCCP range 0..8V/1A
- VPP1, VPP2 range 0..26V/1A
- auto calibration
- self test capability
- protection against surge and ESD on power supply input, parallel port connection
- banana jack for ESD wrist straps

### **Socket, pindriver**

- pin drivers: 48 as standard max. 256
- 1x VCC, 2x VPP can be connected to each pin
- perfect ground for each pin
- FPGA based TTL driver provides H, L, CLK, pull-up, pull-down on all pindriver pins
- analog pindriver output level selectable from 1.8 V up to 26V
- current limitation, over current shutdown, power failure shutdown
- ESD protection on each pin of socket (IEC1000-4-2: 15kV air, 8kV contact)
- continuity test: each pin is tested before every programming operation

### **Socket, base configuration**

- 48-pin DIL ZIF (Zero Insertion Force) socket accepts both 300/600 mil devices up to 48-pin

## **DEVICE SUPPORT**

### **865 with DIL48 socket module**

- EPROM: NMOS/CMOS, 2708\*, 27xxx and 27Cxxx series, with 8/16 bit data width, full support for LV series
- EEPROM: NMOS/CMOS, 28xxx, 28Cxxx, 27EExxx series, with 8/16 bit data width
- Flash EPROM: 28Fxxx, 29Cxxx, 29Fxxx, 29BVxxx, 29LVxxx, 29Wxxx, 49Fxxx series, from 256Kbit to 32Mbit, with 8/16 bit data width, full support for LV series

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- Serial E(E)PROM: 24Cxxx, 24Fxxx, 25Cxxx, 45Dxxx, 59Cxxx, 25Fxxx, 25Pxxx, 85xxx, 93Cxxx, NVM3060, MDAxxx series, full support for LV series
  - Configuration (EE)PROM: XCFxxx, XC17xxxx, XC18Vxxx, EPCxxx, AT17xxx, 37LVxx
  - 1-Wire E(E)PROM: DS1xxx, DS2xxx
  - PROM: AMD, Harris, National, Philips/Signetics, Tesla, TI
  - NV RAM: Dallas DSxxx, SGS/Inmos MKxxx, SIMTEK STKxxx, XICOR 2xxx, ZMD U63x series
  - PLD: Altera: MAX 3000A, MAX 7000A, MAX 7000B, MAX 7000S, MAX7000AE
  - PLD: Lattice: ispGAL22V10x, ispLSI1xxx, ispLSI1xxxEA, ispLSI2xxx, ispLSI2xxxA, ispLSI2xxxE, ispLSI2xxxV, ispLSI2xxxVE, ispLSI2xxxVL, LC4xxxB/C/V/ZC, M4-xx/xx, M4A3-xx/xx, M4A5-xx/xx, M4LV-xx/xx
  - PLD: Xilinx: XC9500, XC9500XL, XC9500XV, CoolRunner XPLA3, CoolRunner-II
  - other PLD: SPLD/CPLD series: AMI, Atmel, AMD-Vantis, Gould, Cypress, ICT, Lattice, NS, Philips, STM, VLSI, TI
  - Microcontrollers 48 series: 87x41, 87x42, 87x48, 87x49, 87x50 series
  - Microcontrollers 51 series: 87xx, 87Cxxx, 87LVxx, 89Cxxx, 89Sxxx, 89LVxxx, all manufacturers, Philips 87C748..752 series, Philips LPC series, Cygnal/Silicon Laborat. C8051 series
  - Microcontrollers Intel 196 series: 87C196 KB/KC/KD/KT/KR/...
  - Microcontrollers Atmel AVR: AT90Sxxxx, ATtiny, ATmega series
  - Microcontrollers Cypress: CY8Cxxxxx
  - Microcontrollers ELAN: EM78Pxxx
  - Microcontrollers Microchip PICmicro: PIC10xxx, PIC12xxx, PIC16xxx, PIC17Cxxx, PIC18xxx, dsPIC series
  - Microcontrollers Motorola: 68HC05, 68HC08, 68HC11 series
  - Microcontrollers National: COP8xxx series
  - Microcontrollers NEC: uPD78Pxxx series
  - Microcontrollers Scenix (Ubicom): SXxxx series
  - Microcontrollers SGS-Thomson: ST6xx, ST7xx, ST10xx series
  - Microcontrollers TI: MSP430 and MSC121x series
  - Microcontrollers ZILOG: Z86/Z89xxx and Z8xxx series
  - Microcontrollers other: EM Microelectronic, Fujitsu, Goal Semiconductor, Princeton, Macronix, Winbond, Hitachi, Holtek, Infineon(Siemens), NEC, Samsung, Toshiba, ...

### ***I.C. Tester***

- TTL type: 54,74 S/LS/ALS/H/HC/HCT series
- CMOS type: 4000, 4500 series
- static RAM: 6116.. 624000
- user definable test pattern generation