

JUKI-752
DX4-100 with LCD/CRT SBC
Version 3.0

User Manual Version 3.0

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1 Introduction

Thank you for choosing JUKI-752 DX4-100 with LCD/CRT Single Board Computer. JUKI-752 is an ISA with PC/104 form factor board, which comes equipped with ACC Maple Chipset (includes DX4-100 CPU) and advanced high-performance multi-mode I/O, designed for the system manufacturers, integrators, or VARs that want to provide all the performance, reliability, and quality at a reasonable price.

An advanced high performance super I/O function is also in the Maple chipset. The in chip UARTs are compatible with the NS16C550. The parallel port and IDE interface are compatible with IBM PC/AT and XT architecture's, as well as EPP and ECP.

The LCD/CRT controller is TOPRO TP6508 which can provide the LCD and CRT display at the same time. The LCD interface connector is a 44-pin 2.0mm pitch type.

The most outstanding feature in the JUKI-752 is built-in PC/104 expansion bus. Based on the PC/104 bus, you could easily install over thousands of PC/104 modules from hundreds' vendors in the world. JUKI-752 has external power connector that can be connected to power supply directly. It is more suitable for your standalone applications.

1.1 Specifications

JUKI-752 DX4-100 with LCD/CRT Single Board Computer provides the following specification:

- **System**

CPU: ACC Maple, includes DX4-100 CPU

DMA channels: 7

Interrupt levels: 15

Real-time clock/calendar: DS12887/BQ3287 or equivalent chip and quartz oscillator, 128B CMOS memory, powered by lithium battery for over 10 years of data retention.

- **Memory**

RAM memory: 512KB to 32MB, only supports single side 16-bit SIMM.

Shadow RAM memory: System BIOS: 0F0000h ~ 0FFFFFh.

- **LCD/CRT Interface**

Chipset: TP6508

Resolution: Supports up to 800 x 600 resolution for STN and TFT LCD Flat Panel, and 1024 x 768 x 256 colors for CRT display.

Display Memory: 1 MB on board.

- **Input/Output**

IDE hard disk drive interface: Supports up to two IDE hard disk drives. Can be disabled by BIOS Setup.

Floppy disk drive interface: Supports two 2.88 MB, 1.44MB, 1.2MB, 720KB, or 360KB floppy disk drives. Can be disabled by BIOS Setup.

Two high speed Series ports: NS16C550 compatible UARTs with send/receive 16-byte FIFOs, data rates are independently programmable from 115.2K baud down to 50 baud. Modem control circuitry.

- **Multi-mode Parallel Port:**

Standard mode— IBM PC/XT, PC/AT, PS/2 compatible bi-directional parallel port.

Enhanced mode— Enhanced parallel port (EPP) compatible with IEEE 1284 specification.

High speed mode— Microsoft and Hewlett Packard extended capabilities port (ECP), compatible with IEEE 1248 specification.

- **Industrial features:**

Watchdog timer: Can be set by 1,2,10,20,110,or 220 seconds period. Reset or NMI was generated when CPU did not periodically trigger the timer. Your program use hex 043 and 443 to control the watchdog and generate a system reset.

PC/104 expansion bus: A 64-pin and 40-pin, industrial embedded-PC bus standard.

External power connector: 8-pin male connector (Molex 6410 series compatible).

Keyboard connector: A 5-pin header on board and 6-pin mini-DIN keyboard connector is located on the mounting bracket.

- **General information**

Power Consumption: +5V @ 1.55A (DX4-100MHz, 32MB RAM)

Operating Temperature: 0° ~ 60° C

Humidity: 5% ~ 95%, non-condense

Dimension: 180mm(W) x 122mm(L), standard AT form factor

1.2 Package Contents

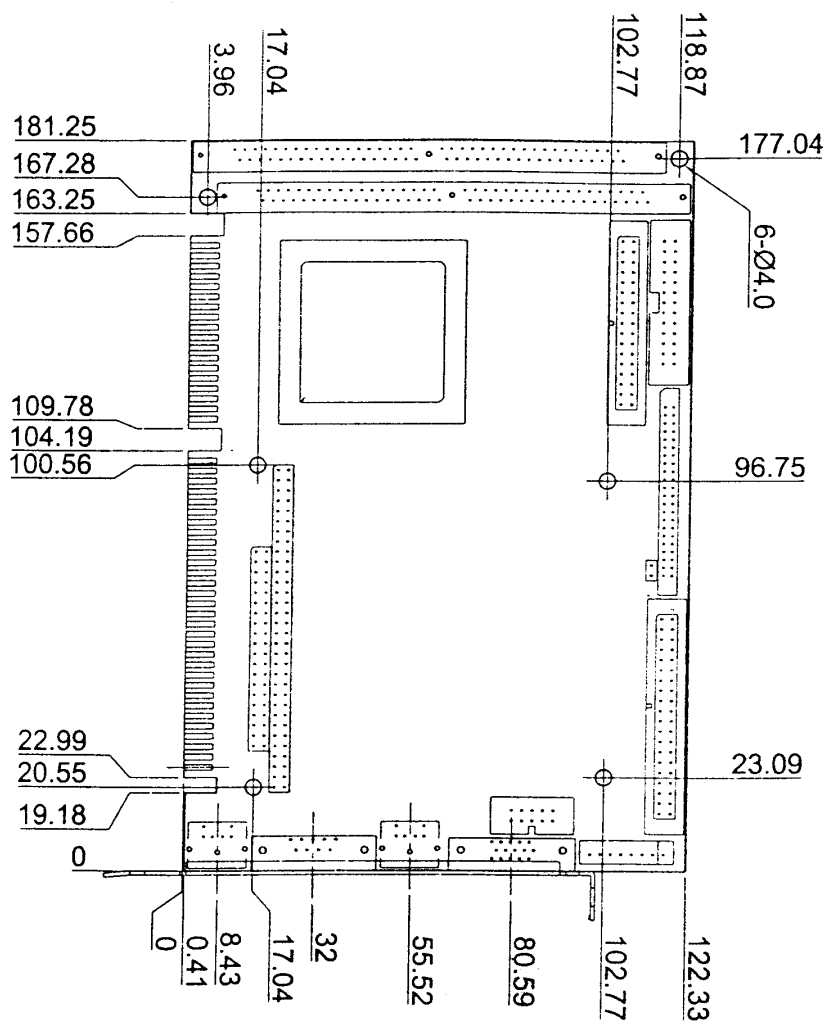
JUKI-752 package includes the following items:

- JUKI-752 DX4-100 with LCD/CRT Single Board Computer x 1
- RS-232/Printer Cable x 1
- FDD/HDD Cable x 1
- User Manual x 1

2 Installation

This chapter describes how to install the JUKI-752. The layout of JUKI-752 is shown below. Read carefully the unpacking information, the jumpers and switches setting for the JUKI-752's configuration, such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port.

2.1 JUKI-752 Layout



2.2 CPU Setting for JUKI-752

- **CPU Speed Setting**

The system clock is generated by the ICS650, and the different CPU clock frequency can be selected by JP2 and shown as following table:

JP2	1-2	3-4
75MHz	ON	ON
100MHz	OFF	OFF

2.3 Watchdog Timer

Watchdog Timer is enabled by reading port 443H. It should be triggered before the time-out period ends, otherwise it will assume the program operation is abnormal and will issue a reset signal to start again, or activate NMI to CPU. The Watchdog Timer is disabled by reading port 843H. The Watchdog Timer time-out period can be set 1,2,10,20,110 or 220 sec. by JP3.

- **JP4: Watchdog Active Type Setting**

JP4	Description
2-3	RESET WHEN WDT TIME-OUT
1-2	ACTIVATE NMI TO CPU WHEN WDT TIME-OUT
OPEN	DISABLE WDT

- **JP3: WDT Time-out Period**

JP3	1-2	3-4	5-6	7-8
1 sec	OFF	OFF	ON	OFF
2 sec	OFF	OFF	ON	ON
10 sec	OFF	ON	OFF	OFF
20 sec	OFF	ON	OFF	ON
110 sec	ON	OFF	OFF	OFF
220 sec	ON	OFF	OFF	ON

2.4 DiskOnChip™ Flash Disk

DiskOnChip™ Flash Disk Chip (DOC) is produced by M-Systems. The DOC (MD-2200-xMB) is 32-pin DIP package. Because the DOC is 100% compatible to hard disk and DOS, extra software utility is not necessary. It is just "plug and play", easy and reliable.

- **JP7: DiskOnChip™ Memory Address Setting**

JP7	Description
1-2	CE00H
3-4	D600H
5-6	DE00H

2.5 Clear CMOS Setup

To clear the CMOS Setup, close JP15 for about 3 seconds, and then open again. Take Set back to normal operation mode take off the jumper. If the RTC Chip is Dallas DS12B887 you should do the procedure when the board is power on.

- **JP15: Clear CMOS Setup (Reserved Function)**

JP15	Description
OPEN	Normal Operation
CLOSE	Clear CMOS Setup

2.6 Serial port 2 RI Pin Setting

The serial port 2 (CN11) can supply +5V or +12V power to the serial devices via RI pin (Pin 9) of the serial port connector. The maximum current is 1A with fuse protection for the total two connector's' 5V/12V output. If the output is set to 12V, make sure 12V is available to supply to the board.

- **JP11/JP12: Serial port 2 (CN11), Pin 9
RI signal or 5V/12V output selection**

Function	JP12	JP11
RI Signal	2-3	Any one is applicable
5V	1-2	2-3
12V	1-2	1-2

2.7 Free IRQ3 and IRQ4 Setting

To free IRQ3, IRQ4 for other application, disable serial port 2 (for IRQ3) or serial port 1 (for IRQ4) by BIOS setting. Close the jumper JP8 to free IRQ3 and close the jumper JP13 to free IRQ4.

Release IRQ	JP8	JP13
IRQ3	CLOSE Disable serial port2	
IRQ4		CLOSE Disable serial port1

3 Connection

This chapter describes how to connect peripherals, switches and indicators to the JUKI-752 board. You can access most of the connectors from the top of the board while it is installed in the chassis.

3.1 Floppy Disk Drive Connector

JUKI-752 board comes equipped with a 34-pin daisy-chain driver connector cable. The detailed pin assignment of the connector is specified as following table:

- **CN2: FDC Connector**

PIN	Description	PIN	Description
1	GROUND	2	REDUCE WRITE CURRENT#
3	GROUND	4	N/C
5	GROUND	6	N/C
7	GROUND	8	INDEX#
9	GROUND	10	MOTOR ENABLE A#
11	GROUND	12	DRIVE SELECT B#
13	GROUND	14	DRIVE SELECT A#
15	GROUND	16	MOTOR ENABLE B#
17	GROUND	18	DIRECTION#
19	GROUND	20	STEP#
21	GROUND	22	WRITE DATA#
23	GROUND	24	WRITE GATE#
25	GROUND	26	TRACK 0#
27	GROUND	28	WRITE PROTECT#
29	GROUND	30	READ DATA#
31	GROUND	32	SIDE 1 SELECT#
33	GROUND	34	DISK CHANGE#

3.2 IDE Disk Drive Connector

You can attach two IDE (Integrated Device Electronics) hard disk drives to the JUKI-752 internal controller. The board comes equipped with a 40-pin flat-cable connector. The detailed pin assignment of the connector is specified as following table:

- **CN7: IDE Interface Connector**

PIN	Description	PIN	Description
1	RESET#	2	GROUND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	GROUND	20	N/C
21	N/C	22	GROUND
23	IOW#	24	GROUND
25	IOR#	26	GROUND
27	N/C	28	BALE - DEFAULT
29	N/C	30	GROUND - DEFAULT
31	INTERRUPT	32	IOCS16#-DEFAULT
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GROUND

3.3 Parallel Port

This port is usually connected to a printer. JUKI-752 includes an on-board parallel port, accessed through a 26-pin flat-cable connector CN1. The detailed pin assignment of the connector is specified below:

- **CN1: Parallel Port Connector**

PIN	Description	PIN	Description
1	STROBE#	2	DATA 0
3	DATA 1	4	DATA 2
5	DATA 3	6	DATA 4
7	DATA 5	8	DATA 6
9	DATA 7	10	ACKNOWLEDGE
11	BUSY	12	PAPER EMPTY
13	PRINTER SELECT	14	AUTO FORM FEED #
15	ERROR#	16	INITIALIZE
17	PRINTER SELECT LN#	18	GROUND
19	GROUND	20	GROUND
21	GROUND	22	GROUND
23	IOW#	24	GROUND
25	GROUND		

3.4 Serial Ports

JUKI-752 offers two high speed NS16C550 compatible UARTs with Read/Receive 16 byte FIFO serial ports. These ports let you connect to serial devices or a communication network. One DB-9 connector and three 10-pin headers are provided by the JUKI-752. The detailed pin assignments of the connectors are specified below:

- **COM1 (CN14): Serial Port Connector**

PIN	Description
1	DATA CARRIER DETECT (DCD)
2	RECEIVE DATA (RXD)
3	TRANSMIT DATA (TXD)
4	DATA TERMINAL READY (DTR)
5	GROUND (GND)
6	DATA SET READY (DSR)
7	REQUEST TO SEND (RTS)
8	CLEAR TO SEND (CTS)
9	RING INDICATOR (RI)

- **COM 2(CN11): 2x5-pin Header**

PIN	Description	PIN	Description
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	N/C

3.5 Keyboard/Mouse Connector

JUKI-752 provides two keyboard connectors. A 5-pin header connector CN8 supports passive backplane applications. Another one is a 6-pin Mini-DIN connector CN15 on the board-mounting bracket for single board computer applications.

- **CN8: 5-pin Header Keyboard Connector**

PIN	Description
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	N/C
4	GROUND
5	+5V

- **CN15/13: 6-pin Mini-DIN Keyboard/Mouse Connector**

PIN	CN15 keyboard	CN13 Mouse
1	KEYBOARD DATA	MOUSE DATA
2	N/C	N/C
3	GROUND	GROUND
4	+5V	+5V
5	KEYBOARD CLOCK	MOUSE CLOCK
6	N/C	N/C

3.6 External Switches and Indicators

There are many external switches and indicators for monitoring and controlling your CPU board. These features are completely optional. The detailed pin assignment of the connectors is specified as following table:

- **CN4: Reset Button**

PIN	Description
1	EXTERNAL RESET
2	GROUND

- **CN9: IDE LED Connector**

PIN	Description
1	HDD ACTIVE#
2	+5V

- **CN17: Power LED**

PIN	Description
1	GROUND
2	+5V

3.7 External Power Connector

JUKI-752 has an on-board external power connector CN10. You can connect power directly to the CPU board for some single-board-computer (without passive backplane) application.

- **CN10: External Power Connector**

PIN	Description
1	+5V
2	+12V
3	-12V
4	GROUND
5	GROUND
6	-5V
7	+12V
8	+5V

3.8 External Speaker

JUKI-752 has its own buzzer, which can be connected to the external speaker through the connector CN16:

- **CN16: SPEAKER**

PIN	Description
1	+5V
2	SPEAKER SIGNAL

3.9 PC/104 Connection Bus

JUKI-752's PC/104 expansion bus lets you attach any kind of PC/104 modules. PC/104 bus has already become industrial embedded PC bus standard, so you could easily install over thousands of PC/104 modules from hundreds of venders in the world.

Note: JUKI-752 allows directly plug in PC/104 module and does not need PC/104 connection kit.

3.10 LCD Interface Connector

JUKI-752 provides a 2x22-pin connector for the LCD flat panel interface.

- **CN3: LCD Interface Connector**

PIN	Description	PIN	Description
1	+12V	2	+12V
3	GND	4	GND
5	+5V	6	+5V
7	FPVEE	8	GND
9	P0	10	P1
11	P2	12	P3
13	P4	14	P5
15	P6	16	P7
17	P8	18	P9
19	P10	20	P11
21	P12	22	P13
23	P14	24	P15
25	P16	26	P17
27	P18	28	P19
29	P20	30	P21
31	P22	32	P23
33	GND	34	GND
35	SHFCLK	36	FLM
37	M	38	LP
39	GND	40	ENABLK
41	GND	42	N/C
43	+5V	44	5V

4 AMI BIOS Setup

JUKI-752 uses AMI BIOS for system configuration. AMI BIOS setup program is designed to provide maximum flexibility in configuring the system by offering various options which may be selected for end-user requirements. This chapter is written to assist you in the proper usage of these features.

4.1 Getting Started

When the system is powered on, BIOS will enter the Power-On-Self-Test routines. These routines will be executed for System Test and Initialization and System Configuration Verification. After the POST routines are completed, the following message appears:

"Hit < Del >, if you want to run SETUP"

To access AMI BIOS Setup program, press key.

4.2 Standard CMOS Setup

Standard CMOS Setup is the first option on the main menu.

The standard CMOS setup utility is used to configure the following features:

- Date/Time
- Hard Disk Type
- Floppy Disk Type

All of these features are almost the same as common, so we do not describe more detailed in here.

4.3 Peripheral CMOS Setup

When you enter Advanced CMOS Setup, the following settings will be shown,

- On-board IDE: The IDE hard disk drive can be **Enabled** or **Disabled** by this item. When you do not need hard disk, the IDE controller can be disabled.
- On-board FDC: The floppy disk drive can be **Enabled** or **Disabled** by this item. When you do not need floppy disk, the FDD controller can be disabled.
- Serial Port 1: The options are **Disabled**, **3E8**, **2F8**, or **3F8**. You can set the I/O address of the serial port (COMA) or disable it.
- Serial Port 2: The options are **Disabled**, **2E8**, **3F8**, or **2F8**. You can set the I/O address of the serial port 1 (COMB) or disable it.
- Parallel Port: The options are **Disabled**, **3BC**, **378** or **278**. You can set the I/O address of the parallel port or disable it.
- Parallel Port Mode: JUKI-752 provides EPP, ECP, ECP+EPP, and Normal Mode.

Appendix A Watchdog Timer

Watchdog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that caused the CPU to crash. This condition may have occurred by external EMI or a software bug. When the CPU stops working correctly, hardware on the board will either perform a hardware reset (cold boot) or a non-maskable interrupt (NMI) to bring the system back to a known state.

Watchdog Timer is controlled by two I/O ports.

443 (hex)	Read	Enable the refresh the Watchdog Timer.
843 (hex)	Read	Disable the Watchdog Timer.

To enable Watchdog Timer, a read from I/O port 443H must be performed. This will enable and activate the countdown timer which will eventually time out and either reset the CPU or cause an NMI depending on the setting of JP4. To ensure that this reset condition does not occur, the Watchdog Timer must be periodically refreshed by reading the same I/O port 443H. This must be done within the time out period that is selected by jumper JP3.

A tolerance of at least 30% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time consuming. Therefore if the time out period has been set to 10 seconds, the I/O port 443H must be read within 7 seconds.

Note: Disable Watchdog Timer when exiting a program, otherwise the system will reset.

Appendix B Panel Support List

JUKI-752 supports a wide range of flat panels. The different flat panel will need different LCD drive BIOS. The default setting is for Color DSTN flat panel. The available BIOS for different panels are in the following list. Please note all the BIOS files already included the system BIOS and LCD drive BIOS, customer only need to re-program the BIOS flash chip with the file, and then power on again.

18MLCD.ROM – BIOS for MONO DSTN 640x480

For example: HOSIDEN HLM6667
HITACHI LMG5160XUFC
CASIO MD650TS00-01
OPTREX DMF_50260NFU-FW-8

18DSTN.ROM – BIOS for Color DSTN 640x480

For example: SANYO LCM-5331-22NTK
SHARP LM64C35P

18TFTS1.ROM – BIOS for TFT 640x480-SYNC (16-bit)

18TFTS2.ROM – BIOS for TFT 640x480-SYNC (18/24-bit)

For example: HITACHI TX26D60/TX24D55
TOSHIBA LTM09C015A
SHARP LQ10D321

18TFTLP1.ROM – BIOS for TFT 640x480-LP(16-bit)

18TFTLP2.ROM – BIOS for TFT 640x480-LP(16/24-bit)

For example: TOSHIBA LTM09C015A

18TFT861.ROM – BIOS for TFT 800x600-SYNC(16-bit)

18TFT862.ROM – BIOS for TFT 800x600-SYNC(18/24-bit)

For example: NEC NL8060AC26-05
NEC NL8060AC26-04
NEC NL8060BC31-02

18EL.ROM – BIOS for EL 640x480

For example: PLANAR EL640.480-A

18PLASMA.ROM – BIOS for PLASMA 640x480

For example: PANASONIC S817

How to update the BIOS by yourself?

1. Use EPROM Programmer setting the right Flash type and then write the file into the Flash. To use this method, you should carefully take the Flash chip out of socket and then put it back after finish the programming. Usually the flash type is: ATMEL AT29C010A

Or,

2. There also have a utility (FLASH631.COM) and directly re-program the BIOS under DOS. For example: C:>FLASH631 MLCD.ROM

Appendix C I/O Information

IO Address Map

I/O address Range	Description
000-01F	DMA Controller #1
020-021	Interrupt Controller #1, Master
040-05F	8254 timer
060-06F	8042 (Keyboard Controller)
070-07F	Real time Clock, NMI (non-maskable interrupt) Mask
080-09F	DMA Page Register
0A0-0BF	Interrupt Controller #2
0C0-0DF	DMA Controller #2
0F0	Clear Math Coprocessor Busy
0F1	Reset Math Coprocessor
0F2	Core logic programming configuration
0F8-0FF	Math Coprocessor
1F0-1F8	Fixed Disk
200-207	Game I/O
278-27F	Parallel Printer Port 2 (LPT3)
2E8-2EF	Serial Port 4
2F8-2FF	Serial Port 2
300-31F	Prototype Card
360-36F	Reserved
378-37F	Parallel Printer Port 1 (LPT2)
3B0-3BF	Monochrome Display and Printer Adapter (LPT1)
3C0-3CF	Reserved
3D0-3DF	Color/Graphics Monitor Adapter
3E8-3EF	Serial Port 3
3F0-3F7	Diskette Controller
3F8-3FF	Serial Port 1
443	Watchdog timer enable
843 or 043	Watchdog timer disable

1st MB Memory Address Map

Memory address	Description
00000-9FFFF	System memory
A0000-BFFFF	VGA buffer
C0000-C7FFF	VGA BIOS
C8000 – EFFFF	Free for customer application
F0000-FFFFF	System BIOS
1000000-	Extend BIOS

IRQ Mapping Chart

IRQ0	System Timer	IRQ8	RTC Clock
IRQ1	Keyboard	IRQ9	Unused
IRQ2	Cascade to IRQ Controller	IRQ10	Unused
IRQ3	COM2/COM4	IRQ11	Unused
IRQ4	COM1/COM3	IRQ12	PS/2 mouse
IRQ5	Unused	IRQ13	FPU
IRQ6	FDC	IRQ14	Primary IDE
IRQ7	Printer	IRQ15	Unused

DMA Channel Assignments

DMA Channel	Function
0	Available
1	Available
2	Floppy Disk
3	Available
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available