

JUKI-732E

386SX with Ethernet & LCD/CRT SBC

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Introduction

Welcome to the JUKI-732E 386SX with Ethernet & LCD/CRT Single Board Computer. The JUKI-732E is an ISA with PC/104 form factor board, which comes equipped with ALI 6117 (includes 386SX 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 AT I/O chip Windbond W83877F is used in the JUKI-732E board. Both on-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 HMC HM86508 which can provide the LCD and CRT display at the same time. The LCD interface connector is a 44-pin 2.0mm pitch type.

On board 10Mbps Ethernet port is an add value for customer's field site automation. The Ethernet chipset is RTL8019 from Realtek company.

The most outstanding feature in the JUKI-732E 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. The JUKI-732E has external power connector that could let it connects with power supply directly. It is more suitable for your standalone applications.

1.1 Specifications :

The JUKI-732E 386SX with Ethernet & LCD/CRT Single Board Computer provides the following specification:

.. **System :**

- **CPU :** ALI 6117, includes 386SX CPU
- **DMA channels :** 7
- **Interrupt levels :** 15
- **Real-time clock/calendar :** powered by lithium battery for over 10 years of data retention.

.. **Memory :**

- **RAM memory :** 512KB to 32MB, only support single side 16-bit SIMM.
- **Shadow RAM memory :**
System BIOS : 0F0000h ~ 0FFFFFFh

.. **LCD/CRT Interface :**

- **Chipset :** HM86508
- **Resolution :** Support up to 800 x 600 resolution for STN and TFT LCD Flat Panel. And Support 1024x768 256 colors for CRT display.
- **Display Memory :** 1MB on board.

.. **Ethernet Interface :**

- **Chipset :** RTL8019
- **Type :** 10Mbps 16-bit Ethernet, Novell NE2000 compatible .

.. **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. Supports EPP and ECP model.

.. **Industrial features** :

- **Watch-dog 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 watch-dog 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** :

- **Power Consumption** : +5V @ 1.7A (40MHz,16MB RAM)
- **Operating Temperature** : 0° ~ 55° C
- **Humidity** : 5% ~ 95%, non-condense
- **Dimension**: 180mm(W) x 122mm(L), standard AT form factor

1.2 What You Have

In addition to this *User's Manual*, the JUKI-732E package includes the following items:

- JUKI-732E 386SX with Ethernet & LCD/CRT Single Board Computer
- RS-232/Printer Cable Cable
- FDD/HDD Cable

- 6-pin Mini-Din to 5-pin Din Keyboard/Mouse Adapter Cable

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Installation

This chapter describes how to install the JUKI-732E. At first, the layout of JUKI-732E is shown, and the unpacking information that you should be careful is described. The jumpers and switches setting for the JUKI-732E's configuration, such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port, are also included.

2.1 JUKI-732E's Layout

< reference next page >

2.2 CPU Setting for JUKI-732E

- **CPU SPEED SETTING:**

The system clock is generated by the AV9155C-02, and the different CPU clock frequency can be selected by JP1 and shown as following table:

JP1	1-2	3-4	5-6
8MHz	OPEN	CLOSE	CLOSE
16Mhz	CLOSE	OPEN	CLOSE
20MHz	OPEN	OPEN	CLOSE
25MHz	CLOSE	CLOSE	OPEN
40MHz	CLOSE	OPEN	OPEN

2.3 Watch-Dog Timer

The Watch-Dog 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 Watch-Dog Timer is disable by reading port 043H.

- **JP11 : Watch-Dog Active Type Setting**

JP11	DESCRIPTION
2-3	RESET WHEN WDT TIME-OUT
1-2	ACTIVATE NMI TO CPU WHEN WDT TIME-OUT
OPEN	DISABLE WDT

- **JP12 : WDT TIME-OUT PERIOD**

JP12	1-2	3-4	5-6	7-8
1sec	OPEN	OPEN	CLOSE	OPEN

2sec	OPEN	OPEN	CLOSE	CLOSE
10sec	OPEN	CLOSE	OPEN	OPEN
20sec	OPEN	CLOSE	OPEN	CLOSE
110sec	CLOSE	OPEN	OPEN	OPEN
220sec	CLOSE	OPEN	OPEN	CLOSE

2.4 DiskOnChip™Flash Disk

The 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. Customer don't need any extra software utility. It is just "plug and play", easy and reliable. Right now the DOC is available in 2MB to 72MB capacity.

• JP10 : DiskOnChip™Memory Address Setting

Address	1-2	3-4	5-6
CE000	CLOSE	OPEN	OPEN
D6000	OPEN	CLOSE	OPEN
DE000	OPEN	OPEN	CLOSE

2.5 BIOS Flash Chip Vpp Setting

There have two type of Flash chip are possible to be installed,one is 5V Vpp and another one is 12V Vpp. The Vpp is supplied when do the programming function.

Function	JP2
5V Vpp	2-3
12V Vpp	1-2

2.6 Clear CMOS Setup

If want to clear the CMOS Setup(for example forgot the password you should clear the setup and then set the password again.),you should close the JP16 about 3 seconds, then open again. Then take Set back to normal operation mode take off the jumper.

- **JP16 : Clear CMOS Setup (Reserve Function)**

JP16	DESCRIPTION
1-2	Normal Operation
2-3	Clear CMOS Setup

3

Connection

This chapter describes how to connect peripherals, switches and indicators to the JUKI-732E 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-732E board comes equipped with a 34-pin daisy-chain driver connector cable. The detailed pin assignment of the connector is specified as following table:

- **CN7 : FDC CONNECTOR**

PIN NO.	DESCRIPTION	PIN NO.	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-732E 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:

• CN6 : IDE Interface Connector

PIN NO.	DESCRIPTION	PIN NO.	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, The JUKI-732E includes an on-board parallel port, accessed through a 26-pin flat-cable connector CN14. The detailed pin assignment of the connector is specified as following table:

• **CN14 : Parallel Port Connector**

PIN NO.	DESCRIPTION	PIN NO.	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

The JUKI-732E 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 the 10-pin headers are provided by the JUKI-732E. The detailed pin assignment of the connectors are specified as following tables:

• **Serial Port1(CN20) : Serial Port Connector**

PIN NO.	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)

• **Serial Port2(CN17) : 2x5-pin Header**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND	10	N/C

3.5 IrDA Infrared Interface Port

The JUKI-732E built-in IrDA port which support Serial Infrared(IR) or Amplitude Shift Keyed IR(ASKIR) interface. When use the IrDA port have to set SIR or ASKIR model in the BIOS' s Serial Port2 setup. Then the normal RS-232 Serial Port2 will be disabled.

• **CN9 : IrDA Connector**

PIN NO.	DESCRIPTION
1	5V
2	N/C
3	IR-RX
4	GND
5	IR-TX

3.6 Keyboard/Mouse Connector

The JUKI-732E provides two keyboard connectors. A 5-pin header connector CN16 supports passive backplane applications.

Another one is a 6-pin Mini-DIN connector CN22 on the board mounting bracket for single board computer applications.

• **CN16 : 5-pin Header Keyboard Connector**

PIN NO.	DESCRIPTION
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	N/C
4	GROUND
5	+5V

• **CN15 : 5-pin Header Mouse Connector**

PIN NO.	DESCRIPTION
1	MOUSE DATA
2	N/C
3	GROUND
4	+5V
5	MOUSE CLOCK

• **CN22 : 6-pin Mini-DIN Keyboard/Mouse Connector**

PIN NO.	DESCRIPTION
1	KEYBOARD DATA
2	MOUSE DATA
3	GROUND
4	+5V
5	KEYBOARD CLOCK
6	MOUSE CLOCK

3.7 External Switches and Indicators

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

• **CN10 : RESET BUTTON**

PIN NO.	DESCRIPTION
1	EXTERNAL RESET
2	GROUND

• **CN13 : IDE LED connector**

PIN-NO	DESCRIPTION
1	HDD ACTIVE#
2	+5V

• **CN1 : POWER LED & KEYLOCK**

PIN NO.	DESCRIPTION
1	POWER LED ANODE
2	KEY
3	GROUND
4	KEYLOCK
5	GROUND

3.8 External Power Connector

The JUKI-732E has an on-board external power connector CN18. You can connect power directly to the CPU board for some single-board-computer(without passive backplane) application.

• **CN18 : EXTERNAL POWER CONNECTOR**

PIN NO.	DESCRIPTION
1	+5V
2	+12V
3	-12V
4	GROUND
5	GROUND
6	-5V
7	+12V
8	+5V

3.9 External Speaker

The JUKI-732E has its own buzzer, you also can connect to the external speaker through the connector CN4.:

• **CN4 : SPEAKER**

PIN NO.	DESCRIPTION
1	GROUND
2	SPEAKER SIGNAL

3.10 PC/104 Connection Bus

The JUKI-732E's PC/104 expansion bus let you attach any kind of PC/104 modules. The PC/104 bus is already become the 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-732E allows directly plug in PC/104 module,don't need PC/104 Connection Kit.

3.11 LCD/CRT Interface Connector

- **CN19 : 15-pin VGA/CRT Connector**

1	RED	2	GREEN
3	BLUE	4	NC
5	GROUND	6	GROUND
7	GROUND	8	GROUND
9	NC	10	GROUND
11	NC	12	NC
13	HSYNC	14	VSYNC
15	NC		

- **CN5: LCD Interface Connector**

PIN NO.	DESCRIPTION	PIN NO.	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

3.12 Lan RJ45 Connector

The ROCKY-732E built-in a RJ45 Lan connector for 10Mbps Ethernet(NE-2000 compatible) operation.

- **CN2 : Lan RJ45 Connector**

1	TX+	5.	NC
2	TX-	6.	RX-
3.	RX+	7.	NC
4.	NC	8.	NC

- **CN23 : LED Connector(4-pin header) for Lan**

1	LED Link	2	+5V
3	LED RX	4	+5V

4

AMI BIOS Setup

The JUKI-732E use AMI BIOS for system configuration, and the 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 Start

When the system is powered on, the 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 :

- i Date/Time,
- i Hard Disk Type,
- i 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 the Advanced CMOS Setup, you may find the following setting,

- i On-board IDE : The IDE hard disk drive can be **Enable** or **Disable** by this item. When you do not need hard disk, the IDE controller can be disabled.
- i On-board FDC : The floppy disk drive can be **Enable** or **Disable** by this item. When you do not need floppy disk, the FDD controller can be disabled.
- i Serial Port 1 : The options are **Disable**, **3E8,2F8** ,or **3F8**. You can set the I/O address of the serial port (COMA) or disable it.
- i Serial Port 2 : The options are **Disable**, **2E8,3F8**,or **2F8**. You can set the I/O address of the serial port 1 (COMB) or disable it.
- i Parallel Port : The options are **Disable**, **3BC**, **378** or **278**. You can set the I/O address of the parallel port or disable it.
- i Parallel Port Mode : JUKI-328E provides **EPP**,**ECP**,**ECP+EPP**, and **Normal Mode**.

Appendix A. E² Key™ Function

The JUKI-732E provides an outstanding E²KEY™ function for system integrator. Based on the E²KEY™ you could free to store the ID Code, Pass Word, or Critical Data in the 1Kbit EEPROM. Because the EEPROM is nonvolatile memory, you don't have to worry the losing of the very important data.

Basically the E²KEY™s based on a 1Kbit EEPROM which is configured to 64 words (from 0 to 63). You could access (read or write) each word at any time.

When you start to use the E²KEY™ you should have the utility in the package. The software utility will include four files as follows,

README.DOC
E2KEY.OBJ
EKEYDEMO.C
EKEYDEMO.EXE.

The E2KEY.OBJ provides two library function for user to integrate their application with E²KEY™function. These library (**read_e2key and write_e2key**) are written and compiled in C format. Please check the following statement, then you will know how to implement it easily.

unsigned int read_e2key(unsigned int address)

/* This function will return the E²KEY™s data at address. The address range is from 0 to 63. Return data is one word,16 bits */

void write_e2key(unsigned int address,unsigned data)

/* This function will write the given data to E²KEY™at address. The address range is from 0 to 63. The data value is from 0 to 0xffff. */

To easy start to use the function, please refer the include EKEYDEMO.C code at first.

Please note the E²KEY™function is based on the working of parallel port. So you should enable the JUKI-732E' s parallel port, otherwise will be not working.

Appendix B. Watch-Dog Timer

The Watch-Dog 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.

The Watch-Dog Timer is controlled by two I/O ports.

443 (hex)	Read	Enable the refresh the Watch-Dog Timer.
043 (hex)	Read	Disable the Watch-Dog Timer.

To enable the Watch-Dog 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 JP11. To ensure that this reset condition does not occur, the Watch-Dog Timer must

be periodically refreshed by reading the same I/O port 433H. This must be done within the time out period that is selected by jumper JP12.

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: when exiting a program it is necessary to disable the Watch-Dog Timer, otherwise the system will reset.

Appendix C. Panel Support List

The JUKI-732E supports a wide range 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, then power on again.

07MLCD.ROM – BIOS for MONO DSTN 640x480

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

07DSTN.ROM – BIOS for Color DSTN 640x480

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

07TFTS1.ROM – BIOS for TFT 640x480-SYNC (16-bit)

07TFT_S2.ROM – BIOS for TFT 640x480-SYNC (18/24-bit)

For example : HITACHI TX26D60/TX24D55
TOSHIBA LTM09C015A

SHARP LQ10D321

07TFTLP1.ROM – BIOS for TFT 640x480-LP(16-bit)

07TFTLP2.ROM – BIOS for TFT 640x480-LP(16/24-bit)

For example : TOSHIBA LTM09C015A

07TFT861.ROM – BIOS for TFT 800x600-SYNC(16-bit)

07TFT862.ROM – BIOS for TFT 800x600-SYNC(18/24-bit)

For example : NEC NL8060AC26-05

NEC NL8060AC26-04

NEC NL8060BC31-02

07EL.ROM – BIOS for EL 640x480

For example : PLANAR EL640.480-A

07PLASMA.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 (**FLASH634.COM**) and directly re-program the BIOS under DOS.

For example :

C:>FLASH634 MLCD.ROM

Appendix D. I/O Information

IO Address Map

I/O address Range	Description
000-01F	DMA Controller #1
020-021	Interrupt Controller #1, Master
022-023	M6117C Corelogic Config Register Port
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
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	Watch dog timer enable
043	Watch dog timer disable

1st MB Memory Address Map

Memory address	Description
00000-9FFFF	System memory
A0000-BFFFF	VGA buffer
C0000-C7FFF	VGA BIOS
C8000 – DFFFF	Free for customer application
E0000-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
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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