Enterprise IP Solutions

OfficeServ 500 Service Manual

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TRADEMARKS

Please read this guide before using the OfficeServ 500, and follow the instructions to use the OfficeServ 500 safely and correctly.

This manual may be changed for the product improvement, standardization and other technical reasons without prior notice.

For further information on the updated manual or the content contained in the manual, contact your Authorised Samsung Reseller.

INTRODUCTION

Purpose

This manual describes the functions of the OfficeServ 500 system as well as the circuits and major functions of each hardware of which the service staff of the OfficeServ 500 system must have knowledge. In addition, this manual describes how to address the problems that might occur while the OfficeServ 500 system is used and provides a list of materials, various diagrams necessary for product services, and analysis diagrams.

Document Content and Organization

This manual is composed of 4 chapters and an appendix. The contents are described below :

CHAPTER 1. Introduction to System

Describes the introduction to the OfficeServ 500 system.

CHAPTER 2. Circuits for Each Part

Describes the configuration and features of each part in the OfficeServ 500 system.

CHAPTER 3. Troubleshooting

Describes the problems that might occur while the OfficeServ 500 system is used and how to troubleshoot them.

CHAPTER 4. Programming for Maintenance

Describes how to program SmartMedia, Complex Programmable Logic Devices (CPLD), and offline.

APPENDIX A. System Specifications

Describes the general specifications as well as signal and device standards of the OfficeServ 500 system.

Conventions

The following special paragraphs are used in this document to point out information that must be read. This information may be set-off from the surrounding text, but is always preceded by a bold title in capital letters.

CAUTION

Indicates a potentially hazardous situation which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTE

Indicates additional information as a reference

Reference

OfficeServ 500 General Description Guide

This manual provides an overview of the Samsung OfficeServ 500 including system structure and hardware, features and facilities and specifications.

OfficeServ 500 Installation Manual

The OfficeServ 500 Installation Manual describes how to set up the OfficeServ 500 system.

OfficeServ 500 Programming Guide

The OfficeServ 500 Programming Guide describes how to perform the MMC programming, which means that a digital phone is used to set the functions of the OfficeServ 500 system.

DS-5012L Digital Phone User's Guide

The DS-5012L Digital Phone User's Guide describes how to use the large LCD digital phone(DS-5012L), which can be used by connecting to the OfficeServ 500 system.

ITP-5012L IP Phone User's Guide

The ITP-5012L IP Phone User's Guide describes how to use the large LCD IP phone (ITP-5012L), which can be used by connecting to the OfficeServ 500 system.

DS-5021D/5014D Digital Phone User's Guide

The DS-5021D/5014D Digital Phone User's Guide describes how to use the 2-line LCD digital phones(DS-5021D, DS-5014D), which can be used by connecting to the OfficeServ 500 system.

ITP-5021D/5014D IP Phone User's Guide

The ITP-5012D/5014D IP Phone User's Guide describes how to use the 2-line LCD IP phones(ITP-5021D, ITP-5014D), which can be used by connecting to the OfficeServ 500 system.

OfficeServ 500 Wireless LAN Service Manual (To be provided later)

The OfficeServ 500 Wireless LAN Service Manual introduces to Access Point(AP), cards, and mobile phones providing the wireless LAN function of the OfficeServ 500 system and describes how to install them and address their problems, and perform the MMC programming.

WIP-5000M Phone User's Guide (To be provided later)

The WIP-5000M Phone User's Guide describes how to use WIP-5000M, a wireless LAN mobile phone provided by the OfficeServ 500 system.

The manuals for OfficeServ 500 Wireless LAN and WIP-5000M Phone will be provided at the time of product release in later time.

Revision History

EDITION	DATE OF ISSUE	REMARKS
00	8. 2003.	First Version

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SAFETY CONCERNS

For product safety and correct operation, the following information must be given to the operator/user and shall be read before the installation and operation.

Symbols

Caution

Indication of a general caution

Restriction

Indication for prohibiting an action for a product

Instruction

Indication for commanding a specifically required action

CAUTION

Caution against Mounting the Daughter Board

More than 2 daughter boards of the same type cannot be mounted to the control card. That is, different type of daughter boards shall be mounted to the control card. If any inappropriate daughter board is mounted, the system might operate abnormally and cause damage. Therefore, a daughter board appropriate for the use shall be mounted.

Caution against Using the Smart Media Card

The SmartMedia card provided along with the system shall be used. If the third party product is used, Samsung shall not be liable for unstable system operation and not provide the after-sales service.

Caution on the Reset Button While the SVMi-8 Card is used

If the reset button is pressed during the operation of the SVMi-8 card, every call connection performed by the SVMi-8 card will be cleared. You shall take extra caution when using this button.

Caution on the Reset Button While the SVMi-16 Card is used

If the reset button is pressed while the SVMi-16 card is processing calls, every data or file will be damaged. You shall take extra caution when using this button.

Cautions when connecting PC to Target Board

Connect PC and the target board after turning off the power. Otherwise, the parallel port of PC or the target board may be damaged.

Check if the power supply card is mounted

If a line with more than 57 ports is installed to a cabinet, two power supply cards shall be mounted. If reasonable power is not supplied to the system, the system will be down or operate abnormally.

Caution against Using KDB-D/KDB-S

The KDB-D/KDB-S may be only used for the digital/DS phones connected to the DLI card by attachment. The KDB-D/KDB-S cannot be used for the digital/DS phones connected to the 16DLI card.

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CHAPTER 1

Introduction To System

This chapter describes the introduction to the OfficeServ 500 system.

1 GENERAL DESCRIPTION

The SAMSUNG OfficeServ 500(Enterprise IP Solutions System) is a digital telephone system designed for small to medium-sized businesses. It can operate with the functionality of a square button system, PABX or a combination of both(hybrid). The Enterprise IP Solutions System employs DSP(Digital Signal Processors) digital technology.
The OfficeServ 500 offers a variety of interface cards that allow connection to the public telephone network or to private networks. These are generally referred to as trunk cards. Two types of telephones can be connected to the system. Proprietary digital phones called 'phones' connect to Digital Line Interface cards(DLI). Standard telephones generally called 'single line sets' connect to Single Line Interface cards(SLI). In addition, DLI station ports are used to connect peripheral devices such as door phones, serial interface devices and add-on modules. Miscellaneous circuits are provided to allow such optional features as external paging, music on hold, background music, and common audible devices. All interface cards are encased in an anti-static plastic enclosure and most can be inserted or removed with power on to eliminate unnecessary service interruptions while performing maintenance.

All phones utilize a single PCB with surface-mounted components assuring the highest product quality and long life. Samsung's customary large, easy-to-read displays and LEDs in the button design make them much easier to use. In many instances, sophisticated features are made simple through the use of friendly display prompts or push-on/push-off feature buttons.
Expanding the OfficeServ 500 system is both economical and easy. Begin with a single cabinet configured as a basic Button Service Unit and then add up to two more cabinets as your business grows. Its low and medium density card design allows greater flexibility when configuring a system for the right combination of lines and stations. A removable software cartridge(SmartMedia card) makes it convenient to upgrade to future feature packages.

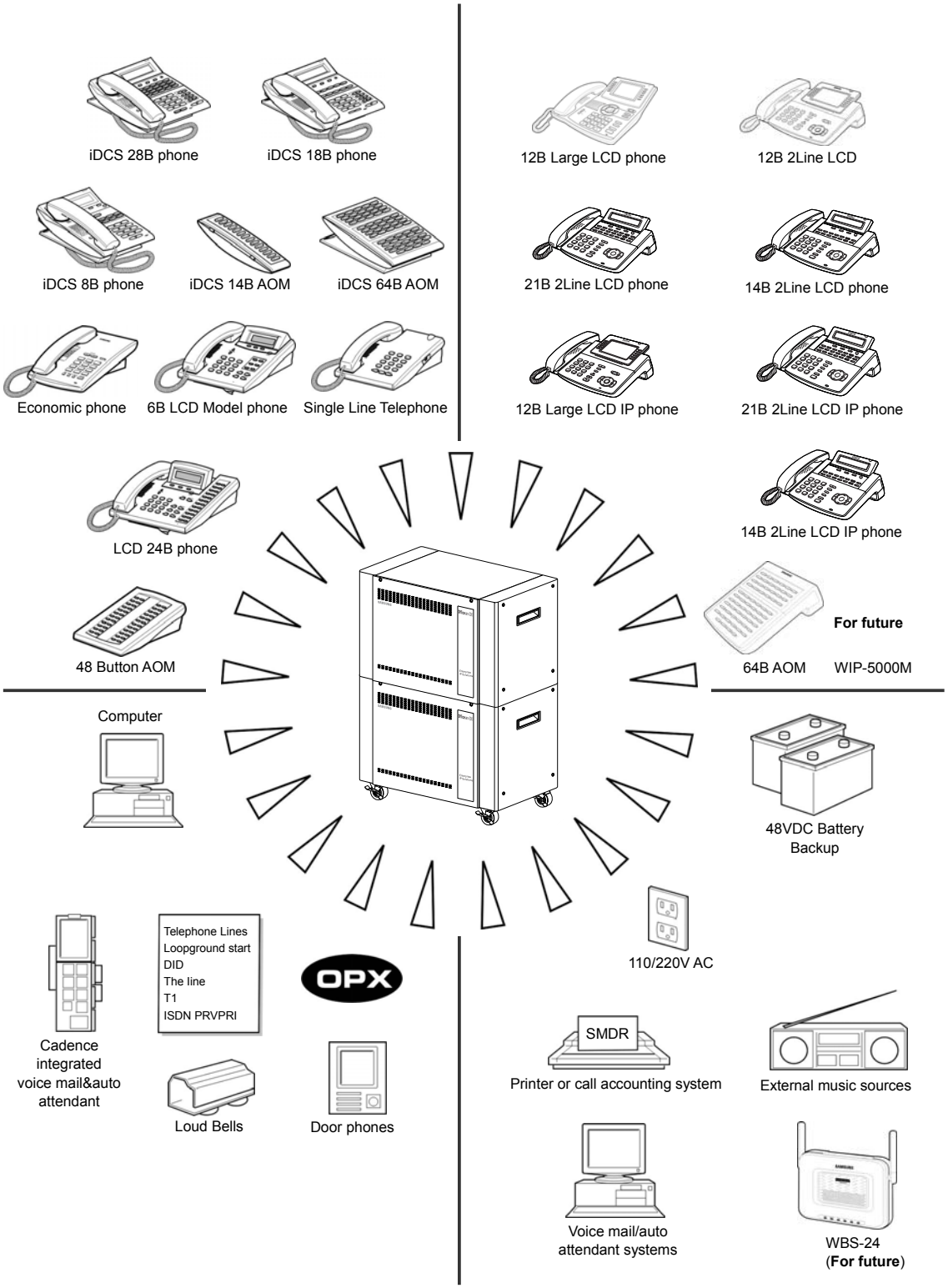


Figure 1.1 OfficeServ 500 General System Diagram

2 SIZE AND CONFIGURATION

The OfficeServ 500 is a fully modular system comprised of a single cabinet configured as a Button Service Unit, up to two additional cabinets, interface cards and electronic phones. A fully expanded system using the TEPRI cards can have a maximum of 352 lines or 360 stations. Without the TEPRI cards, the maximum number of lines is 208 and the maximum number of stations is 360. The maximum number of ports supported by the system is 488. Each cabinet of the system supports two power supply units, the first of which must be a PSU-B and can support up to 56 stations. When assisted by a second power supply unit(either PSU60 or PSU-B) the cabinet can support up to 120 station devices. Both power supply units are connected to the DC bus for external battery backup. Each cabinet also has four(4) Digital Signal Processor(DSP) channels for use as DTMF receivers or tone detectors.

2.1 Single Cabinet System

A single cabinet system has nine universal card slots, a processor slot and two power supply slots, the first of which must be occupied by a PSU-B. Station or trunk(line) cards can be installed in any of the nine universal slots. The TEPRI cards must be installed in slots 1, 2 or 3. This allows a maximum of 120 stations of any kind or 120 lines in a single cabinet system. Without using TEPRI cards, the maximum number of CO lines in the basic KSU is 72.

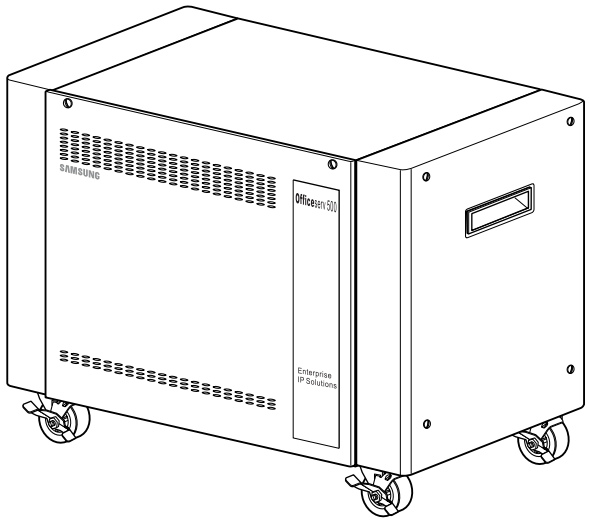


Figure 1.2 OfficeServ 500 Single Cabinet System

NOTE

The first power supply slot must be occupied by a PSU-B to supply sufficient power to all 10 slots(9 universal and a processor slot) and support up to 56 stations. The second power supply slot can be occupied by either a PSU60 or PSU-B. Do not use a PSU40 in either PSU slot.

2.2 Two Cabinet System

When it is required that the basic system be expanded to provide a capacity greater than that described above, the Signal Control Processor(SCP/SCP2) card must be installed in slot nine of the first cabinet. This card provides an intermediate level of processing to control the first cabinet therefore freeing resources on the Main Control Processor(MCP/MCP2) to control the entire system. Adding the SCP/SCP2 card therefore reduces the number of universal card slots in the first cabinet to eight.
In addition, the MCP card must be equipped with a ESM daughter board and a IPM daughter board. In case of MCP2 card, only ESM daughter board is required and IPM/LAN is not needed. Only a LAN daughter board may optionally occupy the remaining daughter board position on the MCP card. All other types of daughter boards must be installed on the SCP/SCP2 card or LCP/LCP2 card.

Adding one expansion cabinet makes the system a two cabinet system with 17 universal card slots(see Figure 1.2). This allows a maximum of 240 stations or 232 lines when using TEPRI cards. Without the TEPRI cards, the maximum number of lines is 136 while the maximum number of stations remains at 240. This second cabinet is controlled by a Local Control Processor(LCP/LCP2) in a similar manner to the SCP/SCP2 in the first cabinet and connects to the MCP/MCP2 via a 25 pair cable. The LCP/LCP2 processor card resides in a dedicated slot 10 of the second cabinet and therefore does not deplete the number of universal card slots.

The first power supply slot in each cabinet must be occupied by a PSU-B to supply sufficient power to all 10 slots(9 universal and a processor slot) and support up to 56 stations. The second power supply slot can be occupied by either a PSU60 or PSU-B. Do not use a PSU40 in either PSU slot.

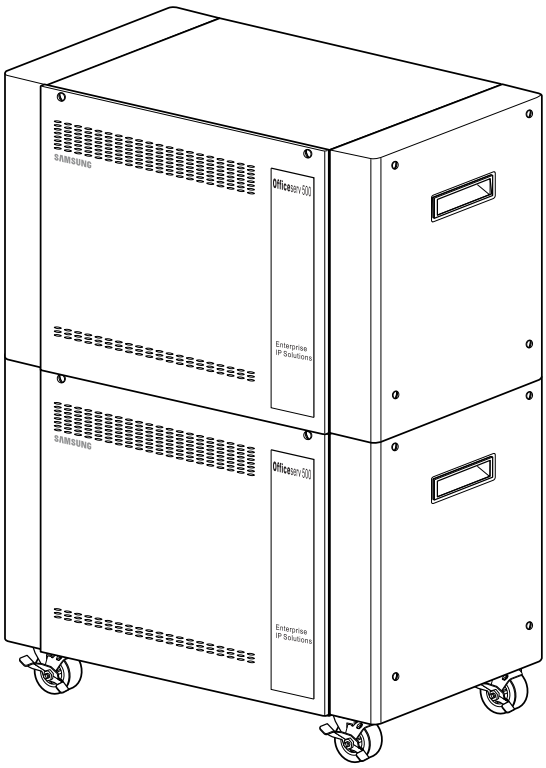


Figure 1.3 OfficeServ 500 Two Cabinet System

2.3 Three Cabinet System

In a fully expanded three cabinet system, there are 26 universal card slots(see Figure 1.3). This allows a maximum of 360 stations or 352 lines when using TEPRI cards. Without TEPRI cards, the maximum number of lines is 208 and the maximum number of stations is 360. The third cabinet is also controlled by a Local Control Processor (LCP/LCP2) in a similar manner to the LCP/LCP2 in the second cabinet and connects to the second cabinets' LCP/LCP2 via a 25 pair cable. This processor resides in a dedicated slot 10 and therefore does not deplete the number of universal card slots. In addition, the MCP card must be equipped with an ESM daughter board and an IPM daughter board. Only a LAN daughter board may optionally occupy the remaining daughter board position on the MCP card. All other types of daughter board must be installed on the SCP/SCP2 card or LCP/LCP2 card.

Figure 1.4 OfficeServ 500 Three Cabinet System

The first power supply slot in each cabinet must be occupied by a PSU-B to supply sufficient power to all 10 slots(9 universal and a processor slot) and support up to 56 stations. The second power supply slot can be occupied by either a PSU60 or PSU-B. Do not use a PSU40 in either PSU slot.

3 TYPES OF OFFICESERV 500 AND SYSTEM SPECIFICATIONS

The OfficeServ 500 system is classified into OfficeServ 500-M and OfficeServ 500-L by capacity, and the feature and performance are classified by the mounted main control card MCP and MCP2.

3.1 OfficeServ 500 Classification by Capacity

The OfficeServ 500 system is classified into OfficeServ 500-M for small capacity and OfficeServ 500-L for large capacity depending on configuration. The table below shows the difference between OfficeServ 500-M and OfficeServ 500-L.

Table 1.1 OfficeServ 500 Configuration Type

Item	OfficeServ 500-M	OfficeServ 500-L
Construct	- SIngle cabinet	- Single cabinet - Two cabinet - Three cabinet
Universal Slot	- 16 channel : 6 - 32 channel : 3	- 16 channel : Max. 17 - 32 channel : Max. 9
Basic Cards Mounted	- MCP/MCP2 card - PSU-B card	- MCP/MCP2, SCP/SCP2, LCP/LCP2 card - ESM, IPM board(used with MCP) - PSU-B card
Daughter Board	- SCM : Max. 1 - RCM : Max. 1 - MISC : Max. 1 - LAN : Max. 1(for MCP) - TOTAL : Max. 3	- SCM : Max. 1 - MFM : Max. 3 - RCM : Max. 3 - MISC : Max. 3 - LAN : Max. 1(for MCP) - TOTAL : Max. 10
Input/Output Port (IOM board)	- Basic : 2 port(basic 19.2Kbps, Max. 38.4Kbps) - Option : 2 port(basic 19.2Kbps, Max. 38.4Kbps) (available only for MCP+LAN)	

3.2 OfficeServ 500 Classification by Performance/Function

The OfficeServ 500 system is classified into MCP based system and MCP2 based system by performance and function.
IP phone, Large LCD phone service, and services related to wireless LAN are only available in the MCP2 based OfficeServ 500 system. Refer to Table 2.1(Differences between the MCP Card and the MCP2 Card) for the button differences between MCP and MCP2.
The function and performance of the OfficeServ 500 system is classified by the mounted main control card MCP and MCP2. IP phone, Large LCD phone service, and wireless LAN related services are only available on configurations using the MCP2 card. Refer to Table 2.12(Differences between MCP and MCP2 cards) for button differences between the main control parts MCP and MCP2.

3.3 System Specifications

Table 1.2 OfficeServ 500 Specifications

Item		Specifications
Supported Cards	Trunk Line card	8TRK, DID, E/M, TEPRI, BRI
	Station Card	SLI, 8SLI, 16SLI, 8MWSLI, 16MWSLI, DLI, 16DLI
	Service Card	AA, SVMi-8, SVMi-16, VDIAL, 8WLI, ITM3, MGI1, MGI2, MGI3
	Daughter Board	ESM, IPM(MCP only), LAN(MCP only), MISC, SCM, MFM, RCM, ITM3D, MODEM
	Service Board	IOM, MDF, PFT
Additional Equipment		Hold/Background sound source External broadcasting device Common bells PC for programming(PCMMC) SMDR computer, CTI computer
Connectable Terminal		General phone(SLT-A, SLT-C) Digital phone - DS-4000 phone(DS-4028E, DS-4018E, DS-4008E, DS-4014 AOM, DS-4064 AOM, DS-4000 KDB-D, DS-4000 KDB-S, DS-4000 KDB-F, DS-4000 EXTMIC) - DS-24SE phone(DS-24SE, DS-24SE AOM, DS-24SE KDB-D, DS-24E KDB-S) - DS-2024E phone(DS-2024E, DS-2012E, DS-2024 AOM, DS-2024 KDB-D, DS-2024 KDB-S) - DS-3020S phone(DS-3020S, DS-3020S AOM) - DS-24D phone(S phone) - DPIM

Item	Specifications
Connectable Terminal	- Large LCD phone(available when using MCP2) (DS-5012L) - 2 Line phone(available when using MCP2) (DS-5021D/14D) IP phone(available when using MCP2) - ITP-5012L(Large LCD) - ITP-5021D/14D(2 Line LCD) Wireless LAN phone(available when using MCP2 : For Future) - WIP-5000M

3.4 Syetem Configuration

The OfficeServ 500 system is classified into small capacity OfficeServ 500-M and medium, large capacity OfficeServ 500-L by line capacity, and the function/performance is classified upon the mounted MCP and MCP2 control cards. The system configuration there of are shown below.

Table 1.3 OfficeServ 500 System Configuration

Classification	Component	MCP		MCP2		Remarks
		OfficeServ 500-M	OfficeServ 500-L	OfficeServ 500-M	OfficeServ 500-L	
SYSTEM	CABINET	■	■	■	■	
	MCP	■	■			
	MCP2			■	■	
	SCP		■			
	LCP		■			
	SCP2				■	
	LCP2				■	
	IOM	■	■	■	■	Not mounted on expansion cabinets.

Classification	Component	MCP		MCP2		Remarks
		OfficeServ 500-M	OfficeServ 500-L	OfficeServ 500-M	OfficeServ 500-L	
System	SCM	■	■	■	■	Common resource daughter boards are mounted in MCP/MCP2 for OfficeServ 500-M configuration, and in SCP/SCP2/ LCP/LCP2 for OFFICESERV 500-L Configuration.
	MFM	■	■	■	■	
	RCM	■	■	■	■	
	MISC	■	■	■	■	
	ESM		■		■	Used for line expansion
	IPM		■			Not used when configuration the system as MCP2 card.
	LAN	■	■			
	MODEM	■	■	■	■	Mounted in IOM
VoIP	ITM3	■	■			8 channels
	ITM3D	■	■	■	■	8 channels, shared in MGI3/ITM3
	MGI1			■	■	Supports G.711
	MGI2			■	■	Supports G.711, G.729
	MGI3			■	■	Supports G.711, G.729, G.723, T.38
WLAN (For Future Application)	8WLI			■	■	1card per system supported. Accommodates eight WBS24
	WBS24			■	■	Wireless LAN BTS

Classification	Component	MCP		MCP2		Remarks
		OfficeServ 500-M	OfficeServ 500-L	OfficeServ 500-M	OfficeServ 500-L	
WLAN (For Future Application)	WIP5000M			■	■	Wireless LAN MS
DECT	8BSI	■	■	■	■	Accommodates eight DBS Max. 1 card for M system Max. 3 card for L system supported
	DBS	■	■	■	■	DECT BTS
	0D8000	■	■	■	■	DECT MS
Phone	DPIM	■	■	■	■	
	DS-5012L			■	■	Large LCD
	DS-5021D/ 14D			■	■	2 Line LCD
	ITP-5012L			■	■	Large LCD
	ITP-5021D/ 14D			■	■	2 Line LCD
	DS-4000 Series	■	■	■	■	
	DS-24E Series	■	■	■	■	
Phone	DS-3020 Series	■	■	■	■	
	DS-24D Series	■	■	■	■	
D TRK	TEPRI	■	■	■	■	
	BRI	■	■	■	■	
A TRK	TRK_B	■	■	■	■	
	8TRK	■	■	■	■	
	DID	■	■	■	■	
	E & M	■	■	■	■	
	B & W	■	■	■	■	
	R & D	■	■	■	■	

Classification	Component	MCP		MCP2		Remarks
		OfficeServ 500-M	OfficeServ 500-L	OfficeServ 500-M	OfficeServ 500-L	
A TRK	4WE & M	■	■	■	■	
Subscriber	16SLI	■	■	■	■	16 Channels
	16MWSLI	■	■	■	■	Message Waiting function
	8SLI	■	■	■	■	8 Channels
	8MWSLI	■	■	■	■	Message Waiting function
	16DLI	■	■	■	■	
	DLI	■	■	■	■	
Service	AA	■	■	■	■	
	SVMi-8	■	■	■	■	
	SVMi-16			■	■	
	VDIAL			■	■	
Smart Media Card	OfficeServ 500 MP S/W	■	■	■	■	Separate management for M/L and MCP/MCP2

4 TECHNOLOGY

4.1 MCP Card

4.1.1 Memory

The system operates using stored program control. This program is stored on a SmartMedia card inserted into the Main Control Processor card(MCP) and contains a minimum of eight Megabytes of NAND-Flash memory. Optional, larger capacity, SmartMedia cards are also available to provide a backup customer database and a backup operating program. The system boots from a 256 Kbytes boot ROM and downloads the operating program into four megabytes of DRAM on the Main Control Processor(MCP) card. The four megabytes of DRAM are increased to 8 megabytes with the addition of the Inter Processor communications Module(IPM) in an expanded system. The customer database is stored in 1.0 Mbytes of non-volatile SRAM for a single cabinet system. This expands to 2.5 Mbytes with the IPM installed and to 3.0 Mbytes with the addition of the optional LAN interface module(LAN).

4.1.2 Microprocessors

The OfficeServ 500 uses distributed processing. Its primary processor is a 16 bit (32 bit core) Motorola MC68302 operating at a clock speed of 25 MHz on the MCP card. This provides all the processing necessary for a single cabinet system. In a multi cabinet system the secondary level of processing is on the SCP card for the first cabinet and on the LCP cards for the expansion cabinets. These secondary processors are MC68302 processors running at 16 MHz and provide local control of each cabinet. Messaging between the primary and secondary processors is handled by a MC68302 processor running at 25 MHz located on the Inter Processor communications Module(IPM) PCB. The tertiary level of processing is done in the phones. The digital phones use a Hitachi H8 processor for data communication within the system.

4.2 MCP2 Card

4.2.1 Memory

The system operates using stored program control. This program is stored on a SmartMedia card inserted into the Main Control Processor card(MCP2) and contains a minimum of 16Megabytes of NAND-Flash memory. Optional, larger capacity, SmartMedia cards are also available to provide a backup customer database and a backup operating program. The system boots from a 512 Kbytes boot ROM and downloads the operating program into 64 megabytes of DRAM on the Main Control Processor(MCP2) card. The customer database is stored in 4 Mbytes of non-volatile SRAM for a single cabinet system.

4.2.2 Microprocessors

The OfficeServ 500 uses distributed processing. Its primary processor is a 32 bit Motorola MPC860 operating at a clock speed of 80 MHz on the MCP2 card. This provides all the processing necessary for a single cabinet system. In a multi cabinet system the secondary level of processing is on the SCP2 card for the first cabinet and on the LCP2 cards for the expansion cabinets. These secondary processors are MC68302 processors running at 16 MHz and provide local control of each cabinet. The Inter Processor communications Module(IPM) PCB is not supported.
The tertiary level of processing is done in the phones. The digital phones use a Hitachi H8 processor for data communication within the system.

5 PROGRAMMING

The OfficeServ 500 is a self-configuring system. This means that immediately after applying power, the OfficeServ 500 reads the types and locations of all installed interface cards and phones and assigns default data to them. This data provides for system operation within a few minutes after applying power. All trunks and stations are assigned three or four digit numbers according to the settings of the switches on the MCP card and the default numbering LAN. This numbering LAN is flexible and may be changed to suit customer requirements. The installing technician customizes this default data to meet the end user’s requirements.

The system can be programmed from any LCD display phone without interrupting system operation. There are three levels of programming: technician, customer and station. The technician level has access to all programs and can allow the customer access to system programs as needed. Technician and customer access levels are controlled by a different security passcodes and access procedure.

The OfficeServ 500 also allows the use of a proprietary computer program called DPAP-PCMMC. This permits a technician to program the system using a personal computer. DPAP-PCMMC can be used on-site to modify the customer database or to download(save) the entire customer database to a file. This file can then be saved as a backup and be uploaded when required to restore the database.

Through the use of modems, DPAP-PCMMC can access the OfficeServ 500 system remotely(off-site) to make database changes or perform uploads or downloads of the customer database as if the technician were on-site.

CHAPTER 2

Circuits for Each Part

This chapter describes the configuration and major functions of the circuits in each part of the OfficeServ 500 system.

1 SYSTEM

Learn about the architecture and communication structure of the OfficeServ 500 system.

1.1 Physical System Architecture

The physical architecture of the OfficeServ 500 system that uses the MCP card based on the OfficeServ 500-L system is shown below :

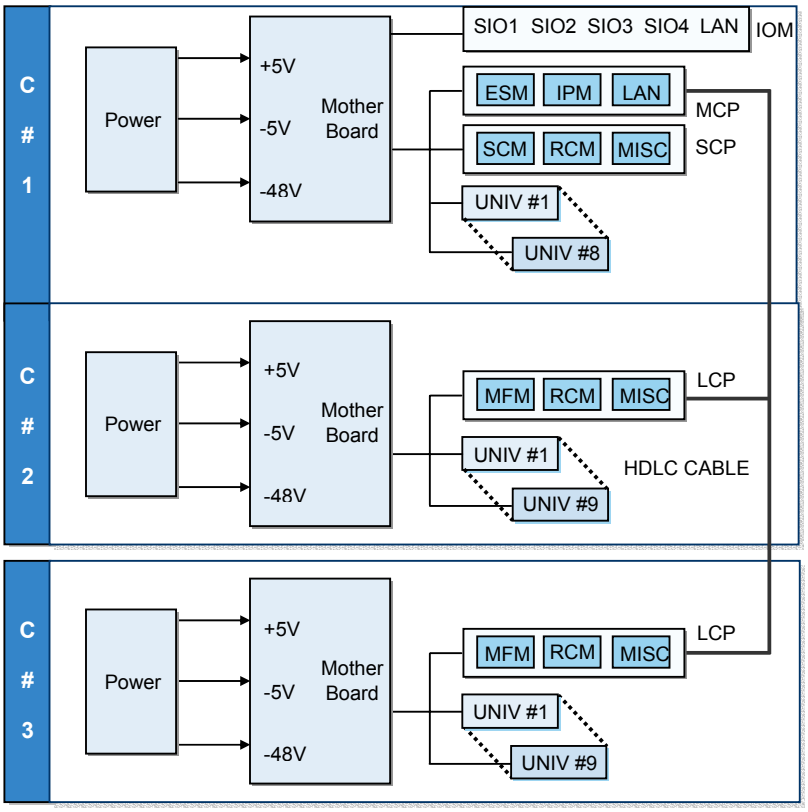


Figure 2.1 Physical Architecture of the OfficeServ 500-L System to which the MCP Card is Mounted

The physical architecture of the OfficeServ 500 system that uses the MCP2 card based on the OfficeServ 500-L system is shown below :

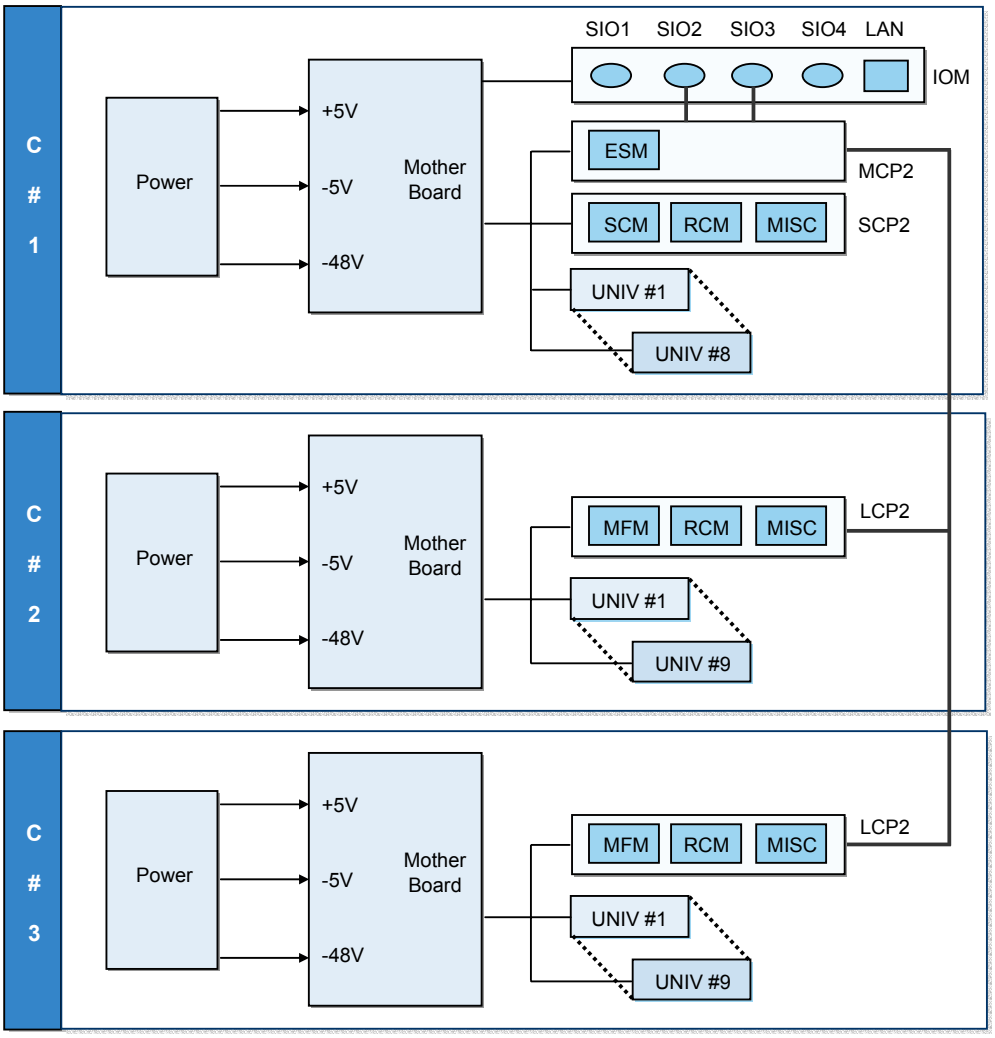


Figure 2.2 Physical Architecture of the OfficeServ 500-L System to which the MCP2 Card is Mounted

1.2 Structure of Communications between Cabinets

The structure of communications between cabinets of the OfficeServ 500-L system that uses the MCP card is shown below :

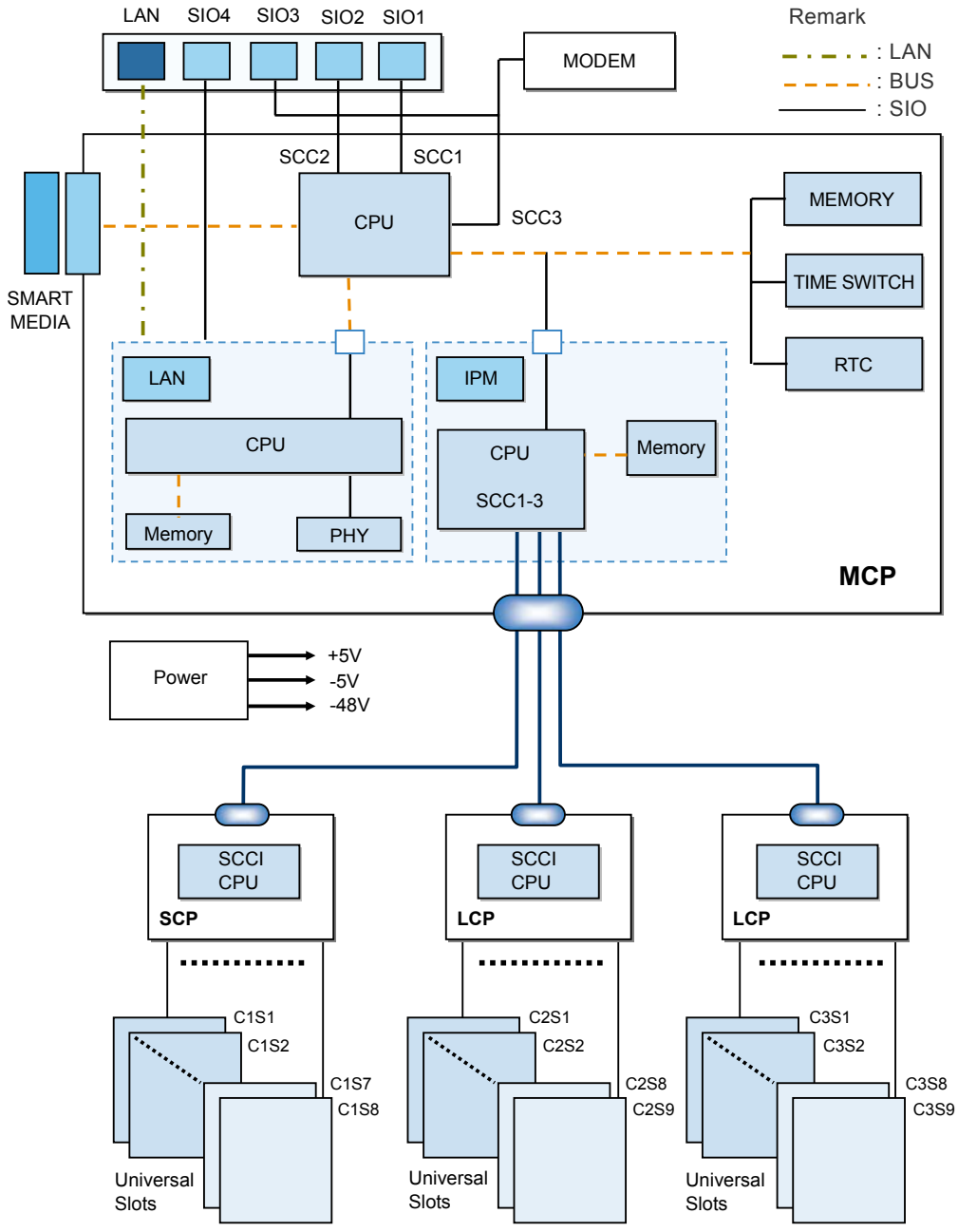


Figure 2.3 Structure of Communications Between Cabinets of the OfficeServ 500-L System to Which the MCP Card is Mounted

The structure of communications between cabinets of the OfficeServ 500-L system that uses the MCP2 card is shown below :

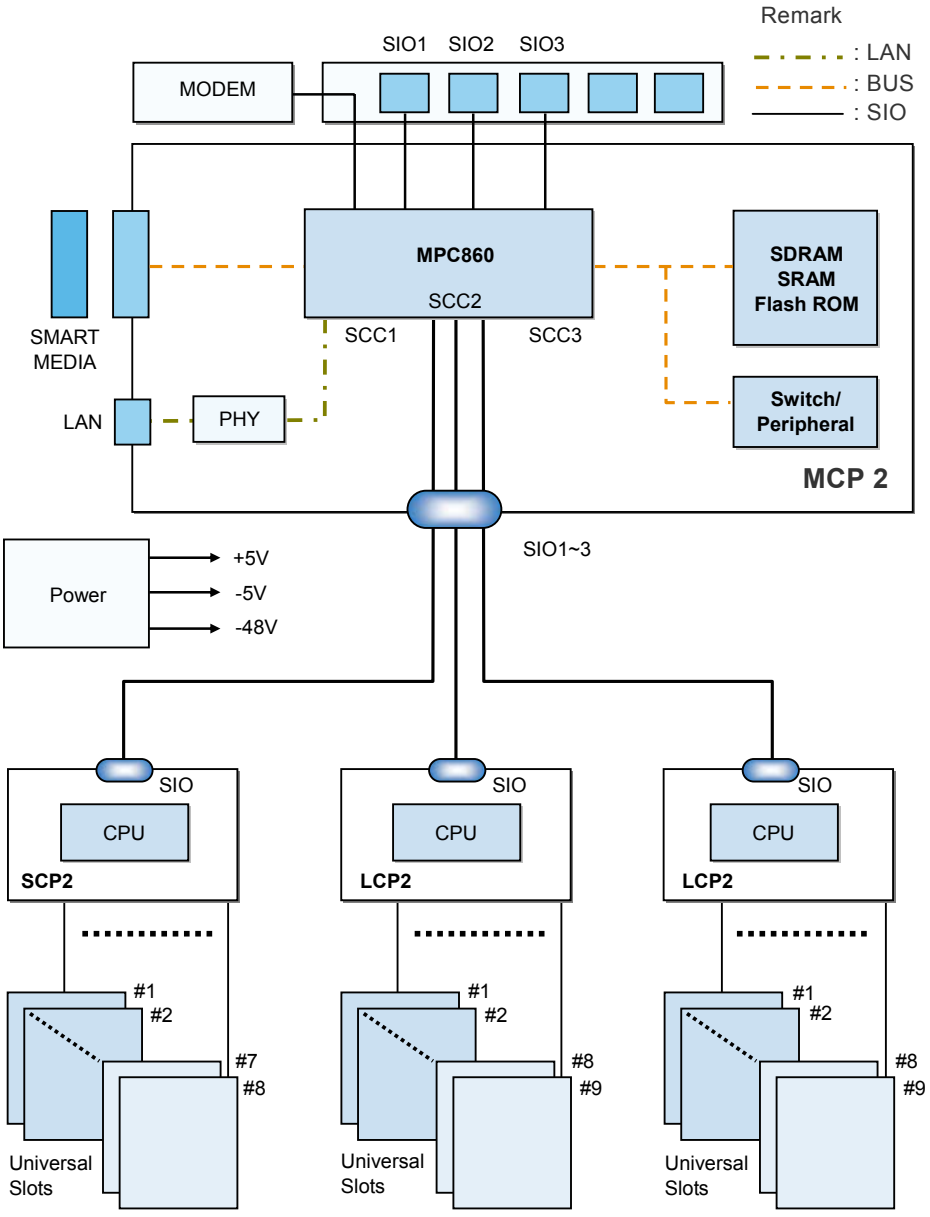


Figure 2.4 Structure of Communications Between Cabinets of the OfficeServ 500-L System to Which the MCP2 Card is Mounted

The features of communication system between modules used in the OfficeServ 500 system are described below :

SmartMedia Card Applied

- The CPU of the MCP/MCP2 cards is connected with the SmartMedia card in 8-bit parallel bus mode.
- The OfficeServ 500 system uses the standard SmartMedia interface so that the SmartMedia card can be easily upgraded to the SmartMedia card of higher capacity.
- The SmartMedia card of the OfficeServ 500 system uses 3.3V.

Caution against Using the Smart Media Card

The SmartMedia card provided along with the system shall be used. If the third party product is used, Samsung shall not be liable for unstable system operation and not provide the after-sales service.

- The SmartMedia card can be mounted to the front panel of the MCP/MCP2 cards. The card must be covered while it is mounted. It is recommended that the card is not touched unnecessarily.

CPU Interface

- The CPU of the MCP card is connected to SRAM and DRAM with the 16-bit bus. The CPU of the MCP2 card is connected to SRAM and SDRAM with the 32-bit bus.
- The SCC1 from the CPU of MCP card is assigned to System IO1. SCC2 is assigned to System SIO2. SCC3 communicates with the modem if LAN is not used. However, it is assigned to System SIO3 if LAN is used. Up to two system SIOs are provided in the MCP2 card. Since the communication port that enables communications between cabinets is provided by CPU, the IPM card is not necessary.

Ethernet Connection

The LAN board shall be mounted if you use the MCP card and want to make an Ethernet connection. However, if the MCP2 card is used, Ethernet connection shall be made by default and additional LAN boards shall not be necessary.

Use of the SIO1 Port

When the MCP2 card is used, a single debugger port that the system engineer uses to check the system is supported. The SIO1 port is used for this purpose. Note that the SIO1 port is not used for a system input/output port.

HDLC Communication Protocol

- The frame architecture of the HDLC communication protocol is as follows :
  - Opening Flag
  - Address Field
  - Control Field
  - Information Field
  - Frame Check Code(CRC-CCITT) Field
  - Closing Flag

- HDLC communication signals are converted to RS-422 mode and transmitted for proper operation.

Modularity Applied

Each cabinet operates independently and the operation of a cabinet does not affect another cabinet. Even if a cabinet does not operate, another cabinet will be able to provide services properly.

2 MAIN BOARD

The main board receives power of -48V from the power supply card and assigns the power to each slot. It consists of slots and the bus interface circuit.

2.1 Block Diagram

The block diagram of the OfficeServ 500 system main board is shown below :

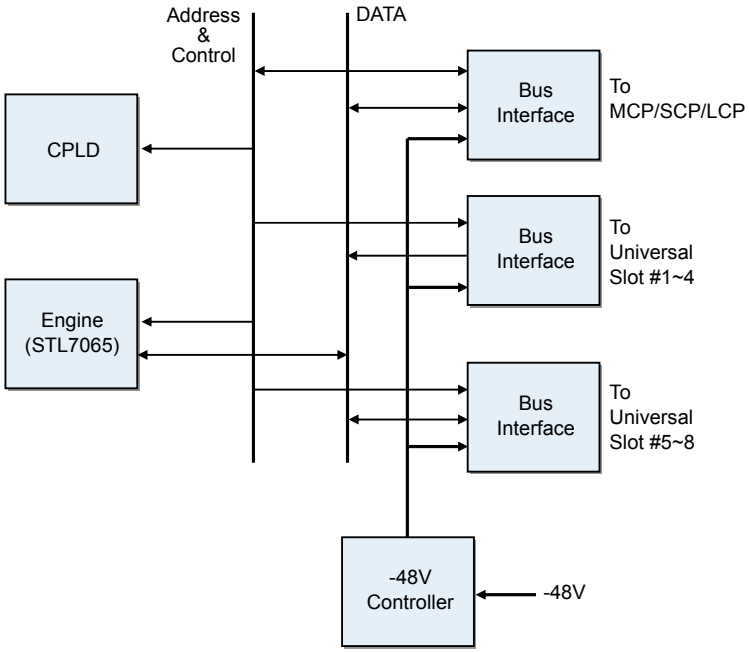


Figure 2.5 Block Diagram of the Main Board

2.2 Major Functions

Learn about the major functions of the OfficeServ 500 system main board.

2.2.1 Power Distribution

Each slot of the OfficeServ 500 system can receive power of -48V from the power supply card mounted to the cabinet. The software automatically determines a slot to which power is supplied during system initialization. Up to 48 ports are supported from the power supply card mounted to the first PSU-B. Up to 64 ports are supported from the power supply card mounted to the second PSU-B/PSU60.

For example, if 7 16DLI cards are mounted to the cabinet, 3 16DLI cards will receive power from the power supply card mounted to the first power card slot(PSU-B).
4 16DLI cards receives power from the power supply card mounted to the second power card slot(PSU-B/PSU60).

2.2.2 Bus Interface

The slot bus is physically connected by the 60-pin connector. The bus of Slots 1 to 4 is separated from that of Slots 5 to 8 for proper operation. Slot 9 is designed to be used for a SCP card or a universal card slot.

2.2.3 ENGINE (STL7065)

STL7065 is ASIC. It provides the conference of 5 characters and 6 groups, the DTMF sender, and the 4-channel DTMF receiver.

3 POWER SUPPLY CARD

The power supply card supplies power to the cabinet of the OfficeServ 500 system. Example of the card includes the PSU-B card. Each PSU-B card is mounted to the power card slot(PSU-B, PSU-B/PSU60), which is located in the most left of each cabinet.

The PSU-B card operates with AC input power or battery power and supplies -48 V, -5 V, or +5 V of power to the cabinet.
Let's assume that the system operates with AC power. If the battery is discharged and there is no remaining power, the PSU-B card will supply 0.45 A of power for battery charge.

Check if the power supply card is mounted

If a line with more than 57 ports is installed to a cabinet, two power supply cards shall be mounted. If reasonable power is not supplied to the system, the system will be down or operate abnormally.

3.1 Block Diagram

The block diagram of the power supply card for the OfficeServ 500 system is shown below :

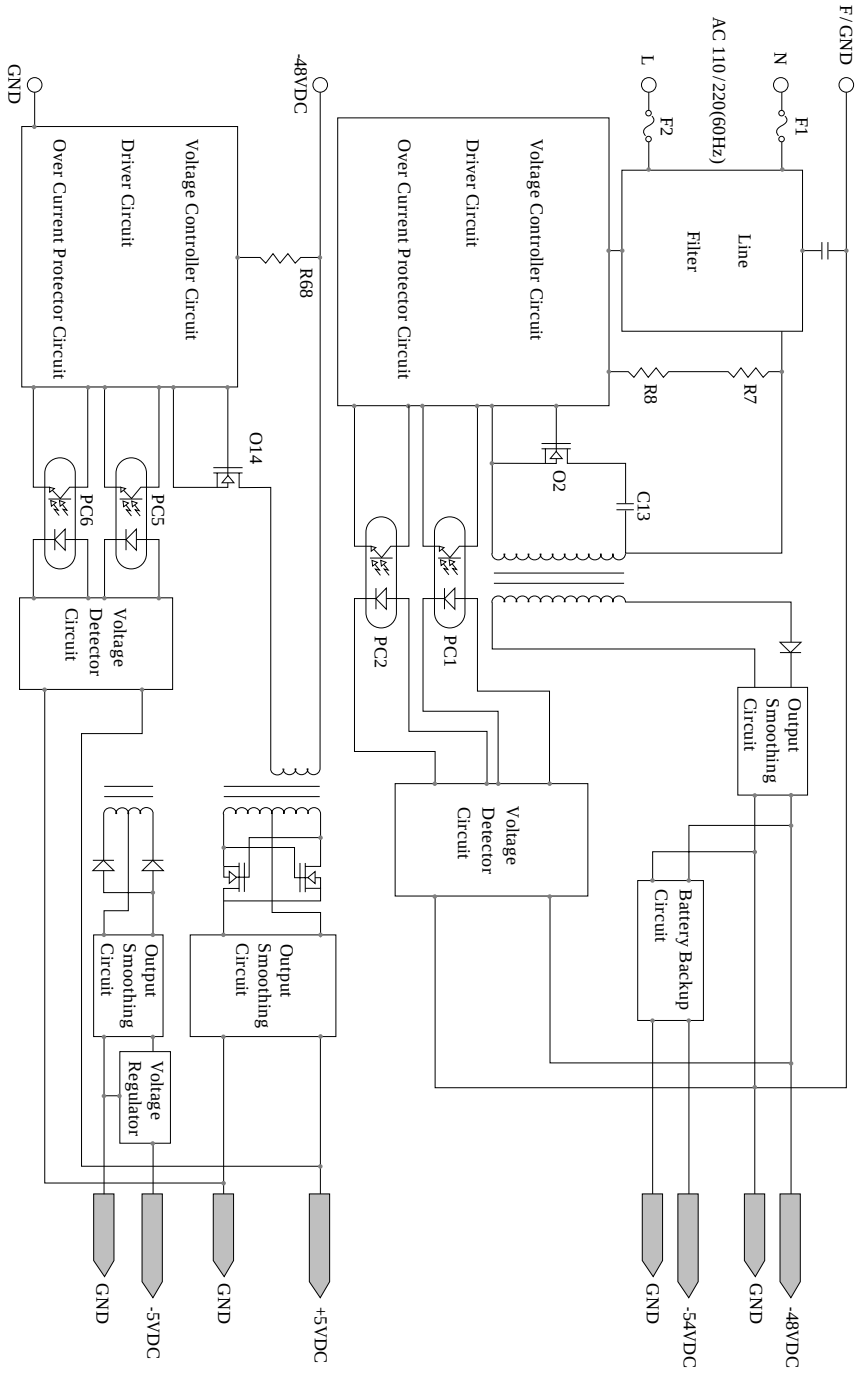


Figure 2.6 Block Diagram of the Power Supply Card

4 CONTROL CARD

A control card that controls the entire operation of the system, the default cabinet, and the expanded cabinet shall be mounted to the slot for mounting the control card in the OfficeServ 500 system. The types of control cards used for the OfficeServ 500 system is as follows :

Table 2.1 Types of the System Control Card

System	Control Card	Function
OfficeServ 500-M	MCP/MCP2	Controls the operation of the entire OfficeServ 500-M system.
OfficeServ 500-L	MCP/MCP2	Controls the operation of the entire OfficeServ 500-L system.
	SCP/SCP2	Controls the operation of default cabinet for the OfficeServ 500-L system.
	LCP/LCP2	Controls the operation of expanded cabinet for the OfficeServ 500-L system.

4.1 MCP Card

The Main Control Processor(MCP) card is a central processing card to which a 16-bit processor is mounted. It controls the operation of entire OfficeServ 500 system.
The MCP card is mounted to the MCP/LCP slot of the default cabinet for the OfficeServ 500-M system or the OfficeServ 500-L system. For the configuration of the OfficeServ 500-L system, the ESM board and the IPM board, which are daughter boards, must be mounted to the MCP card.

4.1.1 Block Diagram

The block diagram of the MCP card, the control card of the OfficeServ 500 system is shown below :

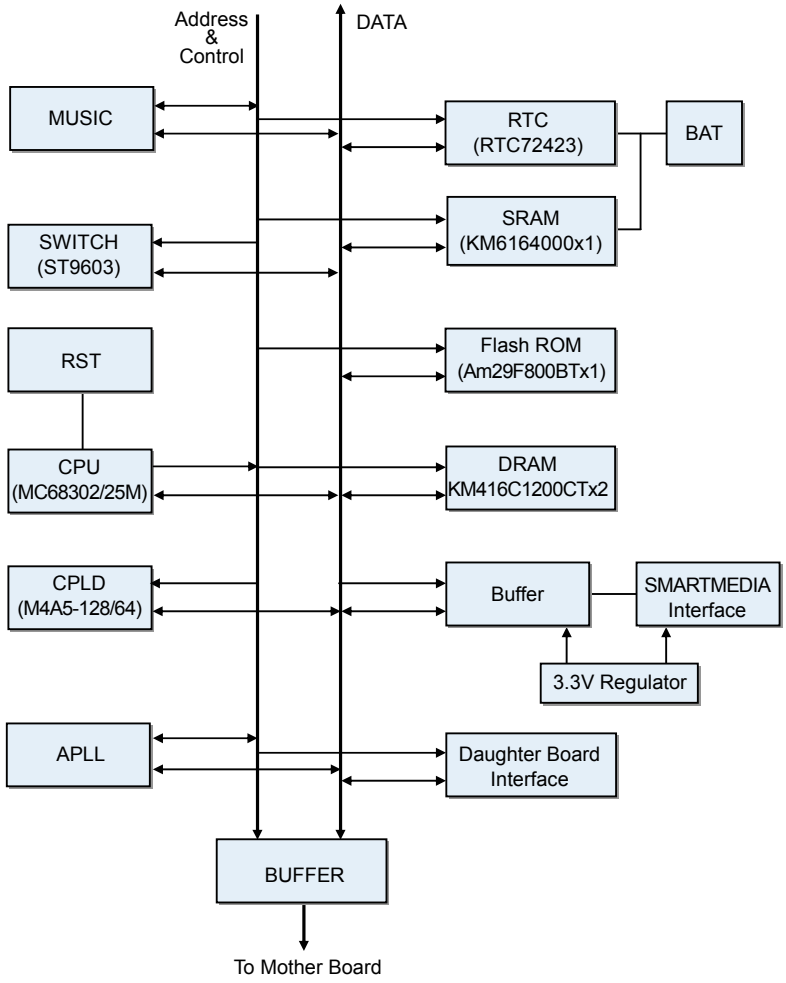


Figure 2.7 Block Diagram of the MCP Card

4.1.2 Major Functions

Learn about the major functions of the MCP card, the control card of the OfficeServ 500 system.

CPU (MC68302/25M)

This is the main processor where one MC68302 of Motorola is used. The MC68302 can use a data bus in 8-bit mode or 16-bit mode. The 16-bit mode is used in the MCP card.
The MC68302 consists of M68000 Microprocessor Core, System Integration Block (SIB), and Communication Processor(CP).

- M68000 Microprocessor Core
  - CPU Core of Motorola
  - On-Chip HCMOS MC68000/MC68008 Core Supported

- System Integration Block(SIB)
  SIB interfaces with the M68000 Core and provides 7 DMA channels. The SIB supports 3 Serial Communication Controllers(SCCs) by using 6 Serial DMA (SDMA) channels and supports an Independent DMA(IDMA).
  - IDMA Controller
  - Interrupt Controller
  - Parallel Input/Output(PIO)
  - 1152-byte Dual Port RAM
  - 3 Timers including a watch-dog
  - 4 Programmable Chip Select Lines including Wait State Generator Logic
  - Clock Generator
  - System Controller
  - DRAM Refresh Control

- Communication Processor(CP)
  CP is a RISC processor, which supports 3 SCCs, a Serial Communication Port (SCP), 2 Serial Management Controllers(SMCs).
  - Main Controller(RISC processor)
  - 6 SDMA Channels
  - A Command Set Register
  - Serial Channel Physical Interface
  - 3 Full-Duplex SCCs(Supported items : HDLC/SDLC, UART, BISYNC, DDCMP, Transparent Mode, V.110 Rate Adaption)
  - 2 SMCs that support IDL and GCI

SCC

- SCC1 : Used as the input/output port of the default cabinet, SIO1. This is an asynchronous mode and its maximum transmittance speed is 38.4 kbps.

- SCC2 : Used as the input/output port of the default cabinet, SIO2. This is an asynchronous mode and its maximum transmittance speed is 38.4 kbps.

- SCC3 : Used as the modem control port in the OfficeServ 500-M system and the input/output port of the default cabinet, SIO3 in the OfficeServ 500-L system. This is an asynchronous mode and its maximum transmittance speed is 38.4 kbps.

System Clock

49.152 MHz of main clock oscillator is used in the MCP card. 24.576 MHz of oscillator half-divided from EPLD is used for the main clock of the processor. The SIOs within the processor are controlled by software within CPU and then divided and used as the main clock.

BOOT ROM (Flash ROM)

1 MB of flash ROM is used as boot ROM. The boot ROM downloads the STARTUP.SYS program(system startup program) needed to operate the system on DRAM from SmartMedia. Once the STARTUP.SYS program runs, the boot ROM downloads the main program from SmartMedia and the system operates normally.

DRAM

4 MB(two elements of 2 MB) is provided for DRAM. The main program is resident in DRAM, which saves data needed to process the system.

SRAM

512 KB(an element of 512 KB) is provided for SRAM. Memory can be backed-up in SRAM, which saves a variety of database information. The database information needed to operate the system is saved in SRAM, however it shall be always saved to SmartMedia as well so as to secure data safely. Even if external fatal damage is caused to the system, the database information can be securely stored.

Real Time Clock (RTC)

RTC72423 of SEIKO is used as RTC, which supports the back-up of SUPER CAP.

SmartMedia

SmartMedia is the NAND flash memory card, which is used as the auxiliary memory unit of the OfficeServ 500 system. SmartMedia of 16 MB is currently used. Since SmartMedia is connected to the system in 8-bit parallel bus connection mode, the hardware does not need to be changed even if the capacity of the system gets higher. (Software needs to be changed.) SmartMedia shall be always mounted to the system while it operates. The card shall be stored within the vinyl package used for the release of the card.

Internal Music

A channel is provided as the internal music of the system. Both A-LAW CODEC and U-LAW CODEC are used simultaneously. The corresponding CODEC operates automatically by the hardware logic. To use music additionally, use the MISC board to connect with external music.

Analog Phase Locked Loop (APLL)

The OfficeServ 500 system uses analog PLL. The reference clock of 8 KHz is determined by the software. If the external reference clock source of 8 KHz is not specified, the clock generated from inside will be used.

WATCH DOG

WATCH DOG recovers the system automatically when an error occurs in the system. It is designed to reboot the system if the system abnormally operates for about a second.

Time Switch

512 x 512 channel of time switch is used for the MCP card. In the OfficeServ 500-L system, switch shall be expanded by mounting the ESM board to the system. The time switch can be expanded up to 1024 x 1024 channel. 3 32-channel slots are provided for each cabinet and remains are 16-channel slots.

PLD

CPLD of Lattice is used for PLD. PLD consists of most logics used for the MCP card. The logics can be changed by using PC from outside through the JTAG bus.

Daughter Board Interface

Up to 3 daughter boards can be mounted. The common resource board is mounted to the OfficeServ 500-M system. The ESM and IPM boards shall be mounted to the OfficeServ 500-L system by default.

Caution against Mounting the Daughter Board

More than 2 daughter boards of the same type cannot be mounted to the control card. That is, different type of daughter boards shall be mounted to the control card. If any inappropriate daughter board is mounted, the system might operate abnormally and cause damage. Therefore, a daughter board appropriate for the use shall be mounted.

4.2 MCP2 Card

The MCP2 card controls the operation of entire OfficeServ 500 system. The MCP card is mounted to the MCP/LCP slots from the default cabinet of the OfficeServ 500-M system or the OfficeServ 500-L system. If the OfficeServ 500-L system is configured, the ESM and IPM boards, daughter boards shall be mounted to the MCP card.

4.2.1 Block Diagram

The block diagram of the MCP2 card is shown below :

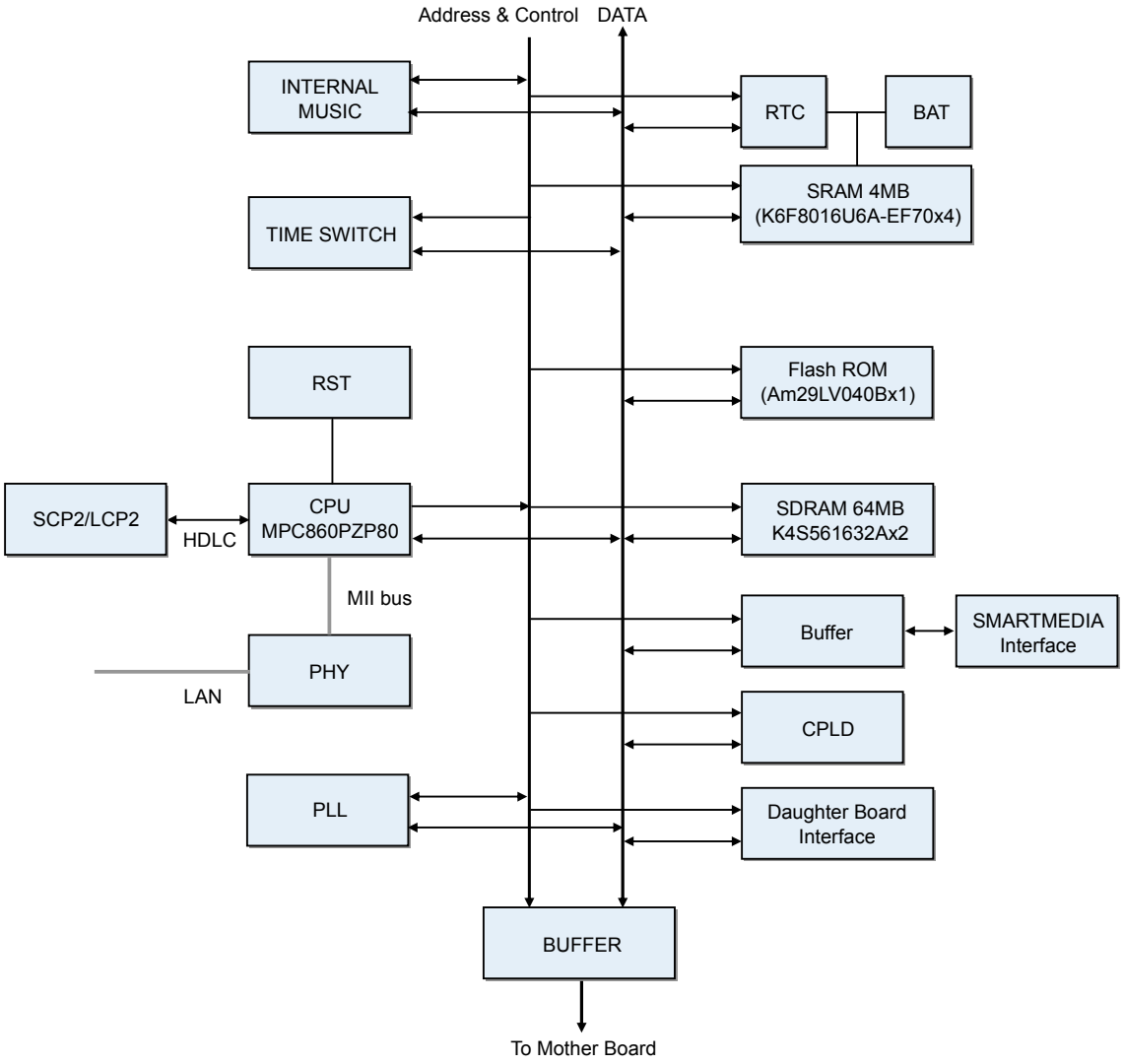


Figure 2.8 Block Diagram of the MCP2 Card

4.2.2 Major Functions

Learn about the major functions of the MCP2 card, the control card of the OfficeServ 500 system.

CPU (MPC860PZP80)

This is the main processor, which uses a MPC860 of Motorola. The MPC860 is a data bus that operates in 32-bit mode.

The major specifications of the MPC860 are as follows :

- Embedded Power PC core
- 4 KB of data cache and 4 KB of instruction cache
- Supports MMU
- 32-bit Dynamic Bus Controller
- 32-bit Address Lines
- Memory Controller(8 banks)
- 4 16-bit timers and 2 32-bit timers
- Built-in system integration unit
- 8 external interrupts and 23 internal interrupts
- High-performance SIO can operate due to the in-built communication processor
- On-chip 16 x 16 Multiply Accumulate Controller
- 4 baud rate Generators
- Supports 4 SCCs that enable the HDLC communication
- Supports 2 SMCs that enable the asynchronous communication
- In-built MAC that can support 10/100 Mbps of LAN

SCC

- SCC1 : Operates as a HDLC communication port to exchange messages with SCP2.
- SCC2 : Operates as a HDLC communication port to exchange messages with 2-tier LCP2.
- SCC3 : Operates as a HDLC communication port to exchange messages with 2-tier LCP2.
- SCC4 : Used as a communication port to control modems.
- SMC1 : Debugger port for system engineers.
- SMC2 : Used as a system SIO to enable you to use SMDR or PCMMC.

System Clock

50 MHz is used as the main clock oscillator in the MCP2 card.

BOOT ROM (Flash ROM)

512 KB of flash ROM is used as boot ROM. The boot ROM downloads the STARTUP.PRS program(system startup program) needed to operate the system on SDRAM from SmartMedia. Once the STARTUP.PRS program runs, the boot ROM downloads the main program from SmartMedia and the system operates properly.

SDRAM

64 MB(two elements of 32 MB) is provided for SDRAM. The main program is resident in the SDRAM, which saves data needed to process the system. In addition, the SDRAM is designed to operate as 'No Wait' to ensure the highest performance of the system.

SRAM

4 MB(4 elements of 1 MB) is provided for SRAM. Memory can be backed-up in SRAM, which saves a variety of information on database. The information on database needed to opeate the system is saved in SRAM, however it shall be always saved to SmartMedia as well so as to secure data safely. Even if fatal damage is caused to the system, database information can be securely stored.

Real Time Clock(RTC)

RTC72423 of SEIKO is used as RTC. SUPER CAP supports its back-up.

SmartMedia

SmartMedia is NAND flash memory card, which is used as the auxiliary memory unit of the OfficeServ 500 system. SmartMedia of 16 MB is currently used. Since SmartMedia is connected to the system in 8-bit parallel bus connection mode, the hardware does not need to be changed even if the capacity of the system gets higher. (Software needs to be changed.) SmartMedia shall be always mounted to the system while it operates. The card shall be stored within the vinyl package used for the release of the card.

Internal Music

A channel is provided as the internal music of the system. Both A-LAW CODEC and U-LAW CODEC are used simultaneously. The corresponding CODEC operates automatically by the hardware logic. To use music additionally, use the MISC board to connect with external music.

Analog Phase Locked Loop (APLL)

The OfficeServ 500 system uses analog PLL. The reference clock of 8 KHz is determined by the software. If the external reference clock source of 8 KHz is not

specified, the clock generated from inside will be used. The external reference clock of 8 KHz is automatically set to the system. If necessary, a specific card can be set by MMC. In this case, the card slot connected to the most stable digital line shall be set to the system.

WATCH DOG

WATCH DOG recovers the system automatically when an error occurs in the system. It is designed to reboot the system if the system abnormally operates for about 1.6 seconds.

Time Switch

512 x 512 channel of time switch is used for the MCP card. In the OfficeServ 500-L system, switch shall be expanded by mounting the ESM board to the system. The time switch can be expanded up to 1024 x 1024 channel. 3 32-channel slots are provided for each cabinet and remains are 16-channel slots.

CPLD

CPLD of Lattice is used. CPLD consists of most logics used for the MCP2 card. The logics can be changed by using PC from outside through the JTAG bus.

Daughter Board Interface

Up to 3 daughter boards can be mounted. The common resource board (SCM, MFM, RCM, or MISC)is mounted to the OfficeServ 500-M system. The ESM board shall be mounted to the OfficeServ 500-L system by default.

Caution against Mounting a Daughter Board

More than 2 daughter boards of the same type cannot be mounted to the control card. That is, different type of daughter boards shall be mounted to the control card. If any inappropriate daughter board is mounted, the system might operate abnormally and cause damage. Therefore, a daughter board appropriate for the use shall be mounted.

LAN Interface

The MCP2 card may be connected to LAN without a LAN card. MAC is built-in CPU and maximum connection speed is 10/100 Mbps. Once the LAN cable is mounted, the speed is automatically selected.

Universal Asynchronous Receiver & Transmitter (UART)

UART is an element, which enables the asynchronous serial communication and is used as a system input/output port(SMDR or PCMMC). UART is connected to outside through the DB9 connector and linked to the SIO3 of the IOM board. The default speed is 19.2 kbps and it can be changed.

4.3 LCP Card

The LCP card controls the universal cards mounted to the expanded cabinet(C#2/C#3) and uses the HDLC protocol to make an IPC communication with the MCP card.

4.3.1 Block Diagram

The block diagram of the LCP card is shown below :

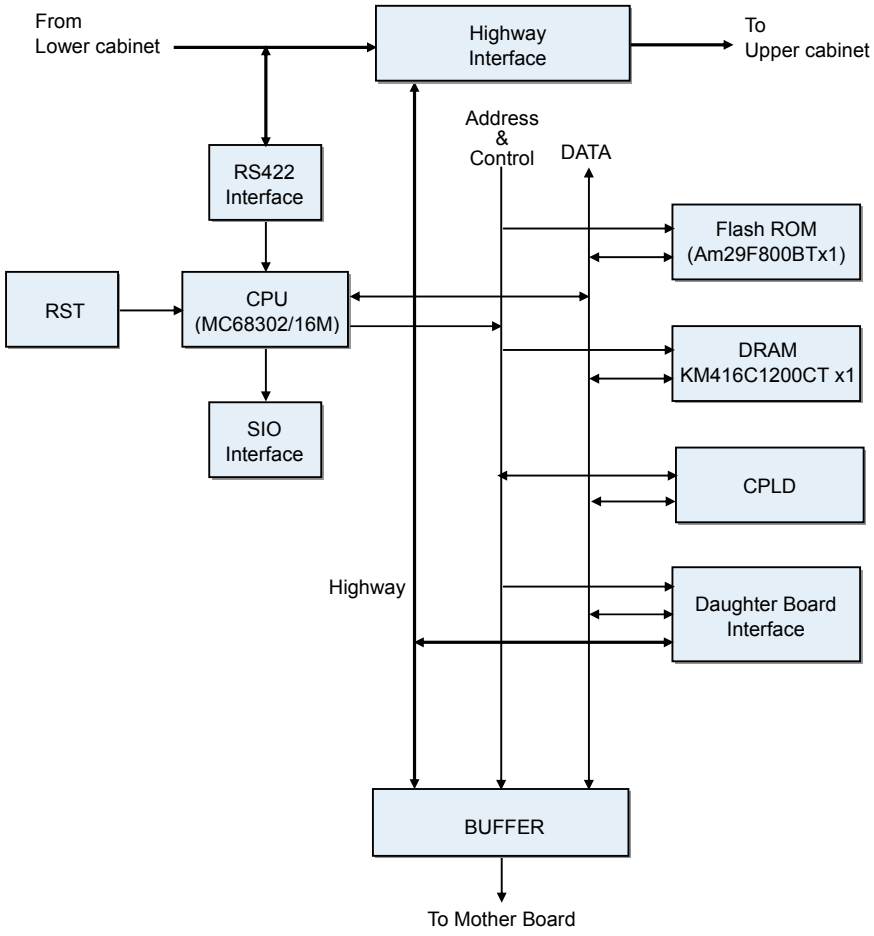


Figure 2.9 Block Diagram of the LCP Card

4.3.2 Major Functions

Learn about the major functions of the LCP card, the control card of the OfficeServ 500 system.

For detailed information about CPU(MC68302/16M) of the LCP card, refer to 'CPU(MC68302/25M)' of the MCP card.

BOOT ROM (Flash ROM)

The flash ROM of 1 MB is used as a boot ROM. The boot ROM is the memory where the program needed to start and operate the system is saved. The saved program can be upgraded by using SmartMedia. When the program is upgraded, save the program to be downloaded in SmartMedia and mount it to the MCP card. Use a phone to upgrade the program of the LCP card.

DRAM

DRAM is the memory in which the saved programs and data are deleted and cannot be backed-up when the system turns off. The DRAM capacity of the LCP card is 2 MB. When the system starts, the program of BOOT ROM runs and the main program saved in the boot ROM is moved to DRAM. The program runs in the DRAM.

PLD

M4A5-64/32 of Lattice is used as the PLD of the LCP card. In the PLD, logics such as decoding, DTACK generation, and DRAM controller are built.

Daughter Board Interface

Up to 3 daughter boards are mounted to the LCP card. Examples of available daughter boards include MFM, RCM, and MISC boards. The MISC board can be mounted to the LOC2 only. The rest can be mounted irrespective of location.

RS422 Interface

Important signals out of signals between cabinets are sent/received in RS422 mode.

- Receiver : clock for system reset, HDLC receipt, and HDLC communication
- Sender : Reference clock of 8 KHz, HDLC sending

4.4 LCP2 Card

The LCP2 card controls cards mounted to the expanded cabinet(C#2/C#3) and uses the HDLC protocol to make an IPC communication with the MCP/MCP2 cards.

The LCP2 card is the same as the LCP card except that the DRAM capacity of the

former is double as that of the LCP card in terms of hardware.

Therefore, the LCP2 card shall be used to perform functions that need much memory (e.g., large LCD phone, IP phone, and wireless LAN).

The LCP2 card shall be used in the configuration of OfficeServ 500 MCP2.

4.5 SCP Card

The SCP card controls the universal card mounted to the default cabinet(C#1) and uses the HDLC protocol to make an IPC communication with the MCP card.

4.5.1 Block Diagram

The block diagram of the SCP card, the control card of the OfficeServ 500 system is shown below :

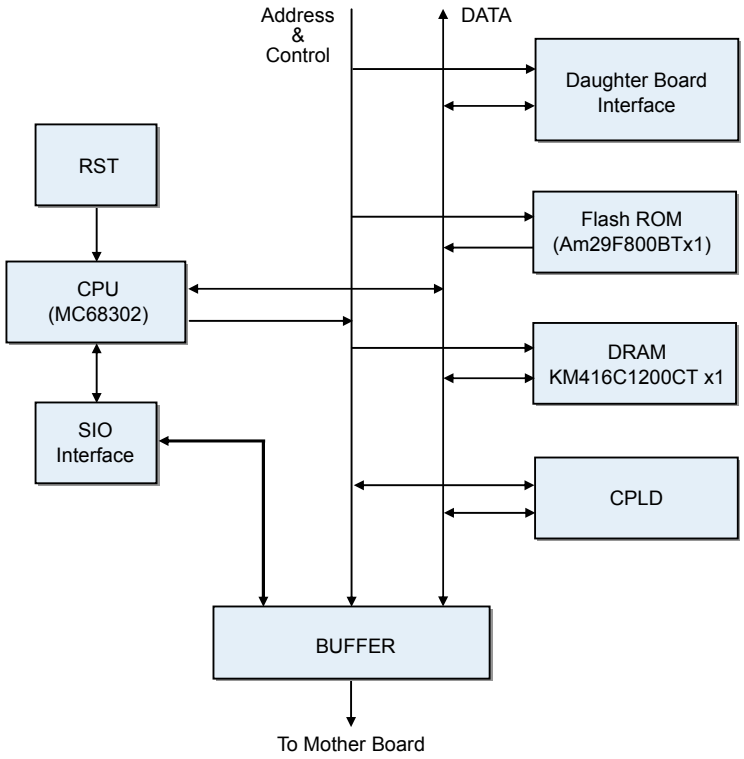


Figure 2.10 Block Diagram of the SCP Card

4.5.2 Major Functions

Learn about the major functions of the SCP card, the control card of the OfficeServ 500 system.

CPU (MC68302)

16 M clock is used for the SCP card. All the functions of the SCP card are the same as those of MC68302/25M except for clock speed.

NOTE

For detailed information about the CPU function (MC68302) of the SCP card, refer to 'CPU(MC68302/25M)' of the MCP card.

BOOT ROM (Flash ROM)

Boot ROM is the memory where the program needed to start and operate the system is saved. The program saved in the boot ROM can be upgraded by using SmartMedia. When the program is upgraded, save the program to be downloaded in SmartMedia and mount it to the MCP card. Use a phone to upgrade the program of the LCP card.

DRAM

DRAM is the memory in which the saved programs and data are deleted and cannot be backed-up when the system turns off. The DRAM capacity of the SCP card is 2 MB. When the system starts, the program of the boot ROM runs and the main program saved in the boot ROM is moved to DRAM. The program runs in the DRAM.

PLD

M4A5-64/32 of Lattice is used as the PLD of the SCP card. In the PLD, logics such as decoding, DTACK generation, and DRAM controller are built.

Daughter Board Interface

Up to 3 daughter boards are mounted to the SCP card. Examples of available daughter boards include SCM, MFM, RCM, and MISC boards. The MISC board can be mounted to the LOC2 only. The rest can be mounted to any location.

Up to 3 daughter boards are mounted to the SCP card. Examples of the available daughter boards include SCM, MFM, RCM, MISC boards. The MISC board can be mounted to LOC2 only. The rest can be mounted to any location.

SIO Interface

The HDLC communication with the MCP card is made in a TTL level. An asynchronous SIO port is supported to monitor the operation of the SCP card.

4.6 SCP2 Card

The SCP2 card controls cards mounted to the default cabinet(C#1) and uses the HDLC protocol to make an IPC communication with the MCP/MCP2 cards.

The SCP2 card is the same as the SCP card except that the DRAM capacity of the SCP2 card is double of that of the SCP card.

Thus, the SCP2 card shall be used to perform functions that need much memory (e.g., large LCD phone, IP phone, and wireless LAN).

The SCP2 card shall be used in the configuration of OfficeServ 500 MCP2.

5 UNIVERSAL CARD

A universal card that provides a variety of services can be mounted to the universal slot of the OfficeServ 500 system. The universal card can be categorized into Trunk line card, intercom card, and service card depending on services.

The types of the universal card is shown in Table 2.2 below :

Table 2.2 Types of the System Universal Card

Card Type		Card Name
Trunk line Card	Analog Card	8TRK, DID, E/M
	Digital Card	TEPRI, BRI
Intercom Card	Analog Card	SLI, 8SLI, 16SLI, 8MWSLI, 16MWSLI
	Digital Card	DLI, 16DLI
Service Card		ITM3, MGI1, MGI2, MGI3, AA, SVMi-8, SVMi-16, 8WLI, VDIAL

5.1 8TRK Card

The 8TRK card is a 8-port Trunk line card, which is mounted to the universal slot of the cabinet(Slot1 to Slot9). The regular Trunk line, PBX, or regular phone line of another digital phone system can be connected to each port. The real driver, ring detection, TSAC, and CODEC control are performed by TMC ASIC.

5.1.1 Block Diagram

The block diagram of the 8TRK card is shown below :

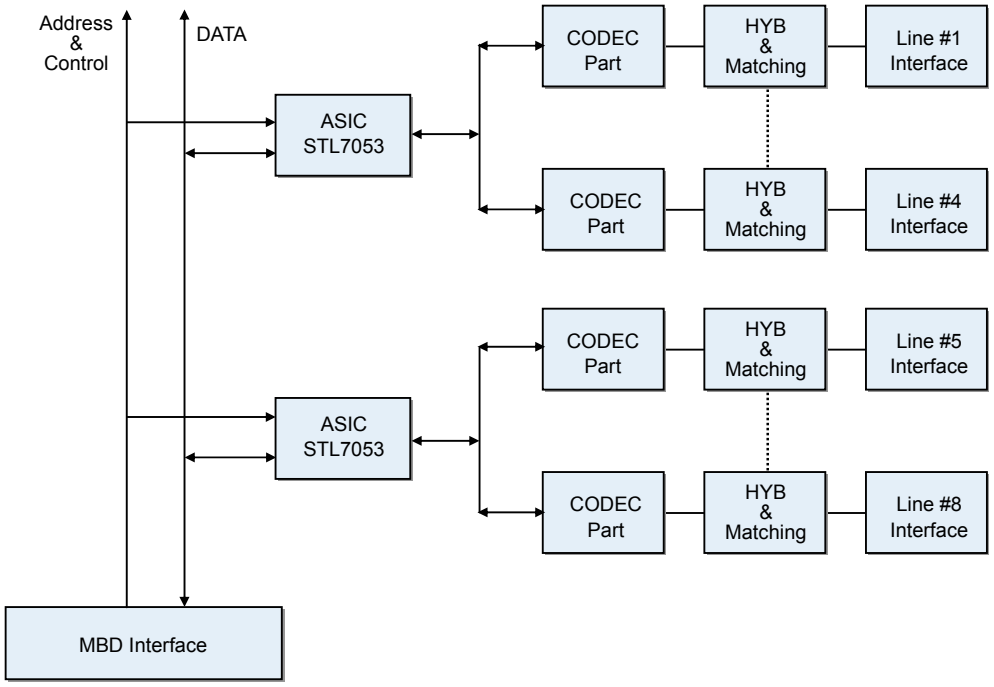


Figure 2.11 Block Diagram of the 8TRK Card

5.1.2 Major Functions

The major functions of the 8TRK card, the universal card of the OfficeServ 500 system are described below :

Configuration

The detailed block diagram of the Trunk line interface circuit is shown below :

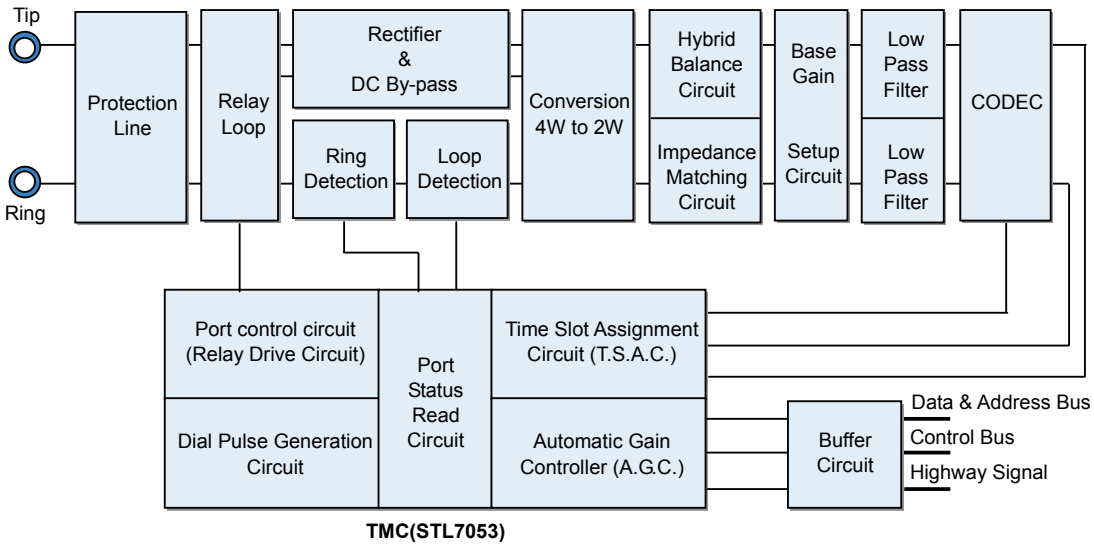


Figure 2.12 Block Diagram of the Trunk Line Interface Circuit

The 8TRK card consists of DC Current by-pass circuit, Matching Trans, Balance Network, hybrid circuit, channel assignment timing control, PCM CODEC, Digital Gain Circuit Logic to send/receive voice frequency(300 to 3400 Hz) to and from Trunk line. Separate DC By-pass circuit is configured to minimize transmittance for voice path.

The HOS and Ring Signal Detection circuits are mounted within this circuit.
The TSAC Enable signal generated from inside of TMC is used to control HC125, the highway buffer of the Time Slot Assign circuit. The hybrid circuit for impedance matching is designed for line impedance of 600Ω.

Voice Sending/Receiving Parts

The voice sending/receiving parts protects surge to prevent against high voltage provision between the tip lead and ring lead. Also, the parts configure the third protection circuit from within impedance matching circuit in the second stage of the Trans to the Zener diode. Two-way voices received from a central office are separated from line loop feeding power and supplied to the Trans for voice signals through the coupling capacitor.

Voice signals abandoned to the second stage of the Trans is divided into the Tx path and the Rx path in the circuit for impedance matching & balance. The parts set impedance to 600Ω in low frequency impedance matching & balance circuit and has the function of low frequency compensation. Currently, the parts are designed in Long Loop Impedance Matching mode.

The transformed Tx voice signal is modulated(PCM) to a digital coding by CODEC, obtains the corresponding channel, and is sent to the time switch through the digital gain control circuit. The Rx PCM data, which are a Rx voice signal, is transformed to an analog signal by CODEC.

The transformed voice signal is transmitted to the balancing circuit through the impedance matching circuit. Only received voice signals are re-supplied to the second stage of the Trans and loaded to the power of line feeding.
This signal is matched to the voice path of Trunk line I/F. The Rx voice signal is transmitted through a path different from the Tx path.

Ring Incoming Detection Circuit

The ring incoming signal transmitted from Trunk line is transmitted to an incoming signal when trunk I/F is on-hook. The DC voltage is cut-off after the ring signal passes 0.47uF/250V, a poly-capacitor through the normal contact of loop relay and ring signals of higher than a specific level are passed along with the bridge diode. This signal is entered to the photo-coupler(NJ5151M) through resistance to generate a signal of ring detection. The signal will be ‘H’ in a normal state and will be ‘L’ when a ring is transmitted.

DC Current Bypass Circuit

This circuit cuts-off the DC loop out of trunk circuits and passes the AC signal at the back-end. KP0039SA HYBRID IC is used for minimization. If the both ends of tip/ring form loop from -48V, set resistance to 33Ω so as to make a DC path and meet 30mA/6V, KTS SPEC.

If the loop is cut-off as an additional function, HOS output, the loop detection function, is supplied to the photo-coupler. The HOS output is detected from normal ‘H’ and ‘L’ signals. It is inverted and loaded to the CPU data bus.

5.2 DID Card

The Direct Inward Dialling(DID) card is a Trunk line interface for incoming only. The card enables a Trunk line subscriber to make a call to a subscriber of digital phone directly without the help from an operator. It is mounted to the universal slot(Slot1 to Slot9) of the cabinet.

5.2.1 Block Diagram

The block diagram of the DID card is shown below :

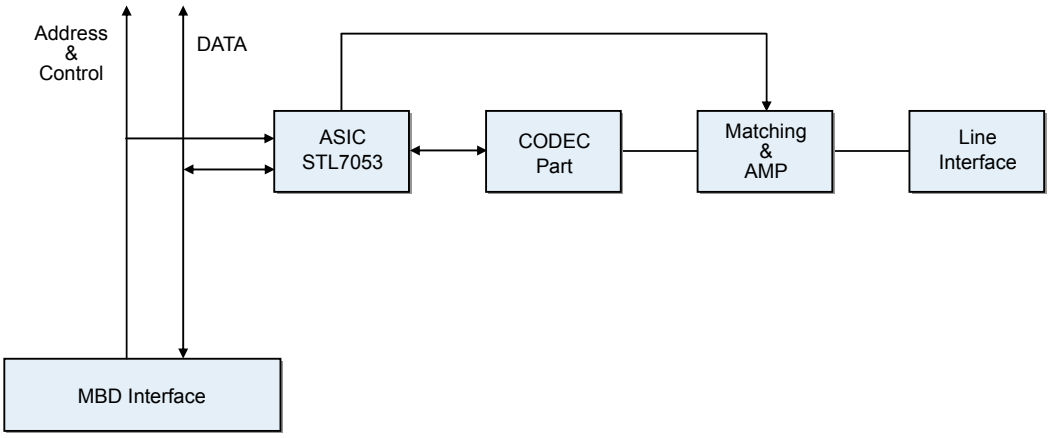


Figure 2.13 Block Diagram of the DID Card

5.2.2 Major Functions

The major functions of the DID card, the universal card of the OfficeServ 500 system, are described below :

Line Protection

In the surge protection circuit, poly-switch(PS1-8) for limiting varistors(DSS1-8, 300V) and high-power current between tip end and ground/ring end and ground is located at the end of tip or ring.

Polarity Reversal

Polarity reversal refers to reversing feeding battery, which means that the direction of the current that flows through line to Trunk line is changed by using the relay. This function is performed by the answer supervisor in the Trunk line. When the intercom subscriber hooks off after ring termination, polarity is changed and the subscriber notifies Trunk line of termination start.

Battery Feeding and Loop Detection Circuit

The battery feeding circuit is supplied through the Trans and consists of condenser for eliminating noises and resistance for limiting current. The loop detection circuit checks the state of receipt with the OPTO isolator and detects dial pulse.

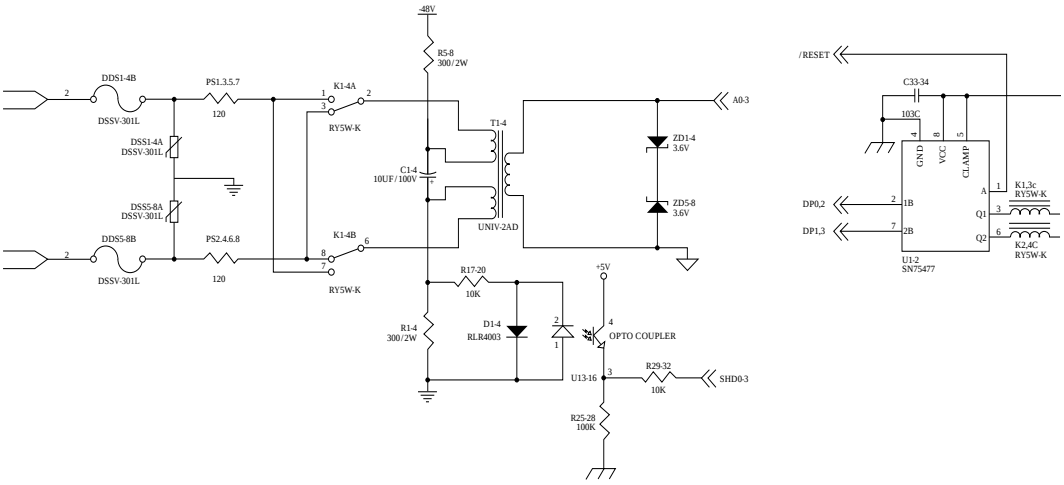


Figure 2.14 Circuit Diagrams of Battery Feeding and Loop Detection

Voice Signal Code Part

This is the second stage of Trans, which consists of impedance matching & gain adjustment circuit to send/receive voice signal, PCM CODEC, and highway input/output part. The voice signal of the line is divided into Tx and Rx in the second stage. Gain can be adjusted in a hardware level. This signal is converted to PCM by CODEC and sent to the time switch in the engine through the PCM highway. The Rx PCM data is converted to an analog signal by CODEC.

TMC Part

The control and channel of DID is assigned through TMC(STL7053), that is, relay control signal for sending a polarity reversal signal and HOS detection signal.

DID Signaling

The signaling of the DID card is illustrated in Figure 2.15 below :

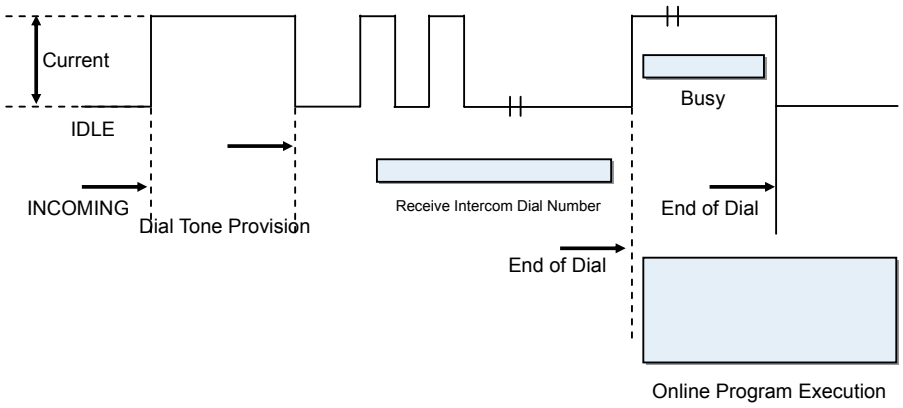


Figure 2.15 DID Signaling

5.3 E/M Card

The E/M board provides the E/M dedicated line for connection between the OfficeServ 500 systems. The internal structure of the board consists of line interface part, matching part, voice coding part, and TMC part. The E/M board is mounted to the universal slot(Slot1 to Slot9) of the cabinet.

5.3.1 Block Diagram

The block diagram of the E/M card is shown below :

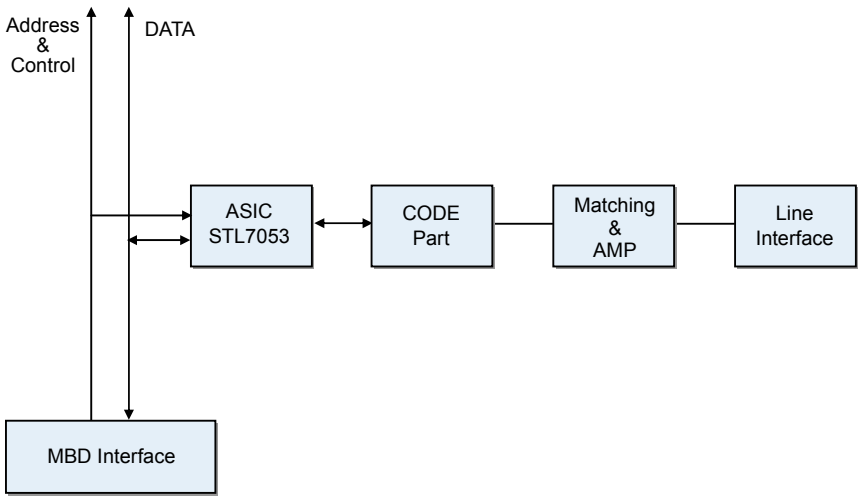


Figure 2.16 Block Diagram of the E/M Card

5.3.2 Major Functions

The major functions of the E/M card, the universal card of the OfficeServ 500 system is described below :

Line Interface

The line interface is connected to the second stage through the Trans after the tip and ring connected to the 50-pin champ connector are connected to the surge protection circuit of DSS. M-lead is intended for sending signals to surge protection circuit and relay and E-lead connects the 'E' signal detected from the surge protection circuit to TMC. The surge protection circuit is protected for the second time by diode from DSS in the second stage of the Trans.

Matching & AMD

The impedance matching circuit in the second stage of the Trans consists of the OP amplifier and passive elements. Thus, the gain can be adjusted in terms of hardware. This signal is converted to PCM by COMBO-CODEC and sent to the time switch through the PCM highway. The Rx PCM data is converted to an analog signal by CODEC and transferred to the first stage through the matching circuit.

TMC

The E/M board is controlled and its channel is assigned through TMC(STL7053). The relay control signal for the 'M' signal, the signal for detecting the 'E' signal, and the signal for assigning channels are processed by TMC.

Outgoing

The E/M card controls the relay in TMC and connects the 'M' lead to the ground. It seizes the TIE of a central office. Then, the 'E' lead receives the response from the TIE and controls the relay to the 'M' lead. In this way, dials are sent. The 'M' lead controls hook-on/off only. MFC is transferred to the voice path between the tip and the ring. The Destination Answer Supervision checks the port through the 'E' lead.

Incoming

The E/M card detects the signal terminated from the E-lead detector. Also, it detects if the DC loop is formed by using the OPTO-Coupler. The detected signal senses SP through TMC. Then, SP sends an incoming response signal to the M-lead through TMC.

5.4 TEPRI Card

The TEPRI card is used to connect a Trunk line, E1 or ISDN PRI with the OfficeServ 500 system. The TEPRI card can be mounted to only Slot1 to Slot3, which support 32 channels out of the universal slots of each cabinet.

5.4.1 Block Diagram

The block diagram of the TEPRI card is shown below :

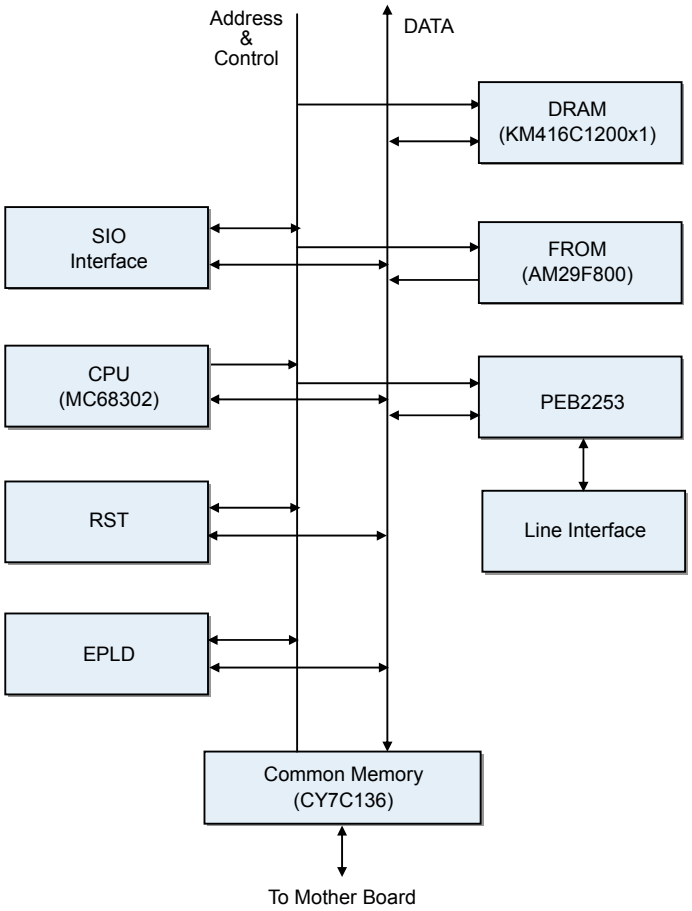


Figure 2.17 Block Diagram of the TEPRI Card

5.4.2 Major Functions

Major functions of the TEPRI card, the universal card of the OfficeServ 500 system are described below :

Line Interface

- T1/E1 signaling can be selected by programming.
- Impedance circuit that satisfies both T1(100Ω) and E1(120Ω) is used.
- Surge protection is provided to the level of ITU recommendation.
- Output port is protected by the line monitor.
- Characteristics of Jitter that satisfies ITU-T I.431 and G703 are provided.
- Selectable line code is provided(HDB3, AMI).
- Can be set to Loss of Signal(LOS) threshold.
- Local and Remote loops are provided.
- HDLC or Common Associated Signal(CAS) through CCS

CPU (MC68302)

- 68302FN16 is used.
- The CPU clock supplies 16.384 MHZ.
- The data bus is used as 16 bits.
- ROM uses 1 MB(AM29F800B, 512K x 16-bit flash ROM).
- RAM uses 2 MB DRAM(KM416C1200, 1M x 16-bit). RAM is not backed-up.
- Interrupt for timing reference uses the two general purpose timers within CPU.
- Reset uses DS-1232. Possesses the Reset button for tests and synthesizes the reset sent fromm the main board
- CPLD MACH4-64/32 is used to accommodate circuits around CPU.
- DPRAM is used to make an IPC communication with the MCP card or the SCP card(71C132Y). When IPC is used in the interrupt manner, the TEPRI card is connected to the MCP/SCP/LCP card through resistance, 0Ω. When IPC is used in the polling manner, the TEPRI card eliminates resistance, 0Ω. At the moment, it operates in the polling manner.
- The TEPRI card is connected to the CPU port so that the RY/BY signals of flash ROM can be read.

Clock

- DPLL exists within PEB2254.
- The system clock is synchronized by the PLL circuit of the MCP card.
- 4.096MHZ, CLKX, and FSX are provided by the main board.
- SCLKX/SCLKR of PEB2254 uses the Delay line to transform 4.096 MHz to 8.192 MHz and supplies the line.
- An active signal that shows the valid reference clock is sent by the CPU port.

SIO

- Uses the serial communication controller 3 of CPU to provide the serial port for tests
- The DB-9 connector can be connected from the front.
- The CPU master clock is used as baud rate source clock and up to 38,400 bps can be used. Its speed is determined by software.

5.5 SLI Card

The Subscriber Line Interface(SLI) card is used to connect with regular analog phones or another external device(answering machine, facsimile, or voice mailbox) and mounted to the universal slot of the cabinet(Slot1 to Slot9).
Each Trunk line port and its functions are adjusted by TMC ASIC. The ASIC is controlled by SP or LP. The SLI card has the default function, whose acronym is BORSHT in each subscriber, provided by HC5504 Subscriber Line Interface Circuit (SLIC) IC. Control circuit for SLIC and Time Slot Assignment(TSAC) is made through STL7053 of SEC, TMC.
Also, an analog DTMF Receiver(MT870) is assigned so that is can operate separately from the DTMFR of the main unit.

5.5.1 Block Diagram

The block diagram of the SLI card is shown below :

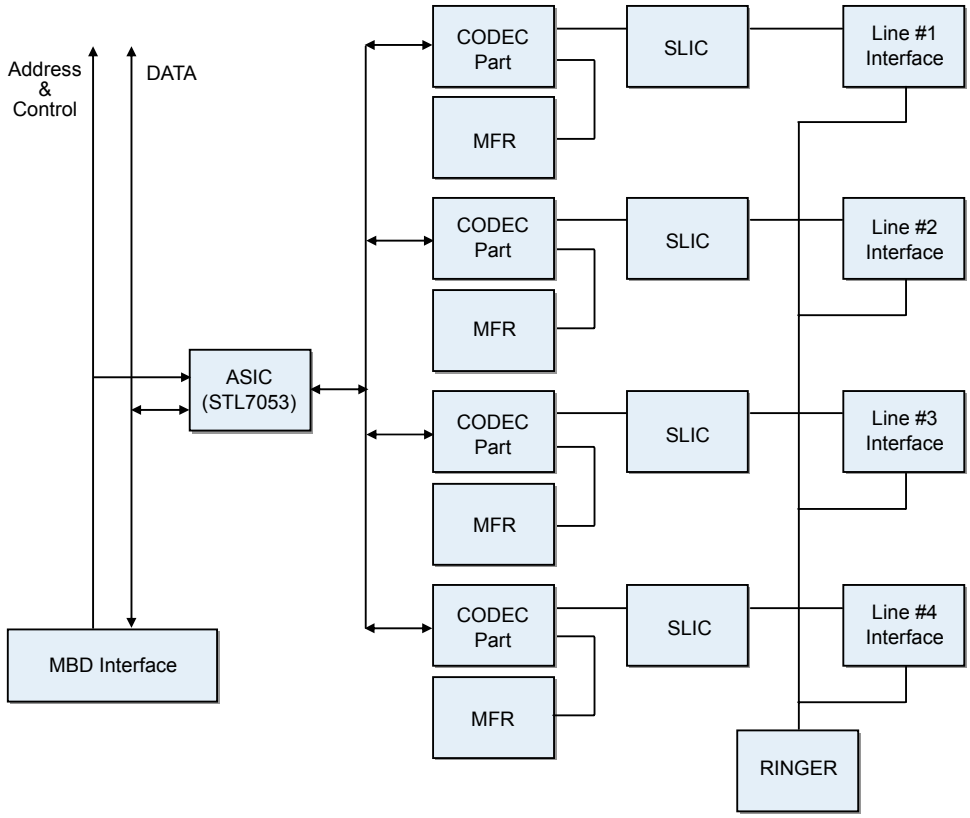


Figure 2.18 Block Diagram of the SLI Card

5.5.2 Major Functions

The major functions of the SLI card, the universal card of the OfficeServ 500 system are described below :

Overvoltage Protection Circuit

The SLI card protects external surge through subscriber line and provides the OPX function. The protection circuit in the first stage consists of 300V DSS(DSS1~4) and 400V DSS(DSS5~8) to prevent the voltage from being more than 700V.
The prevention circuit in the second stage is connected to the tip and ring ends of SLIC IC by the bridge diode(D5~D20).

SLIC Circuit

HC-5504(Harris), Subscriber Line Interface Circuit(SLIC) IC as well as CODEC have the default function whose acronym is BORSHT.

- Battery Feeding
  If loop resistance is less than a specific value(about 1 KΩ), the current limiting circuit is built-in and operates so that loop current can be saturated by about 40 mA.

- Overvoltage Protection
  DSS is used as the first phase method of protection against overvoltage abandoned from the line. Diode is used as the second phase method of protection.

- Ringing
  The Low signal is applied to the Ring Command(RC) terminal of SLIC and rising edge pulse is entered to Ring Sync(RS). The output of Relay Driver(RD) is Low and ring relay operates. 20Hz 80Vrms, ring signal is overlapped to DC -48V in ring generation circuit. The ringer of regular phones operates. Ring cycle is controlled by software.

- If the loop current of supervision subscriber line is more than 10mA, Switch Hook Detect(SHD) terminal of SLIC will be Low and the phone will be recognized as off-hook. If the loop current of supervision subscriber line is less than 5mA, the phone will be recognized as on-hook.

- Hybrid
  When a signal of 4W is transmitted to that of 2W, SPARE OP AMP is used in SLIC and balance network is configured to minimize signals returned to the transmitted output.

ASIC Circuit

Trunk Module Controller, STL7053(TMC) used as a controller in SLI consists of channel assignment generation part, relay control part, and other logics.

DTMF Receiver

Separate MFR(MT8870) exists in each port. The DTMF uses analog input signal entered from SLIC to report the value of DTMF to CPU through data(D0~D4).

Ring Generation (Ringer)

When you want to generate ring, a signal of 50 msec provided by STL7065 operates RELAY(TQ-5V) and rings of 80Vrms/40mA and 20Hz/25Hz are sent to the subscriber line. The Ringer circuit uses the DC/DC converter to make ±80V in the second stage of the Trans(T4652) and is configured by turning on/off PWM IC (KA3842) of 20 Hz/25 Hz. The second stage of the Trans uses TR to make a short circuit when the output is high and an open state when the output is low. Then, charged charge will be discharged to 68uF/100VC configured in parallel.

The RC filter consisting of resistance of 56Ω and a condenser of 100uF is used to eliminate low frequency ripple feedbacked from the ringer to the input end.

Also, ringer uses a condenser of 0.47uF/250V to smoothen the wave form of square wave by using the condenser of 0.47uF/250V to prevent electric noises generated during the operation of relay.

5.6 8SLI Card

The 8SLI card is mounted to the universal slots(Slot1 to Slot9) of the system and connects with 8 ports of a regular phone. Each Trunk line port and its functions are controlled by TMC ASIC, which is controlled by SP or LP. Each subscriber circuit consists of KPSLC-05 (DC -48V feeding, LOOP & PULSE detection and Ring Trip) and Hybrid IC(HIC) of KP-0070SA(TX/RX gain and Balance Network). The controller consists of ASIC(SBS9401) and R/G circuits. The 8SLI card is not used for OPX unlike the SLI card.

5.6.1 Block Diagram

The block diagram of the 8SLI card is shown below :

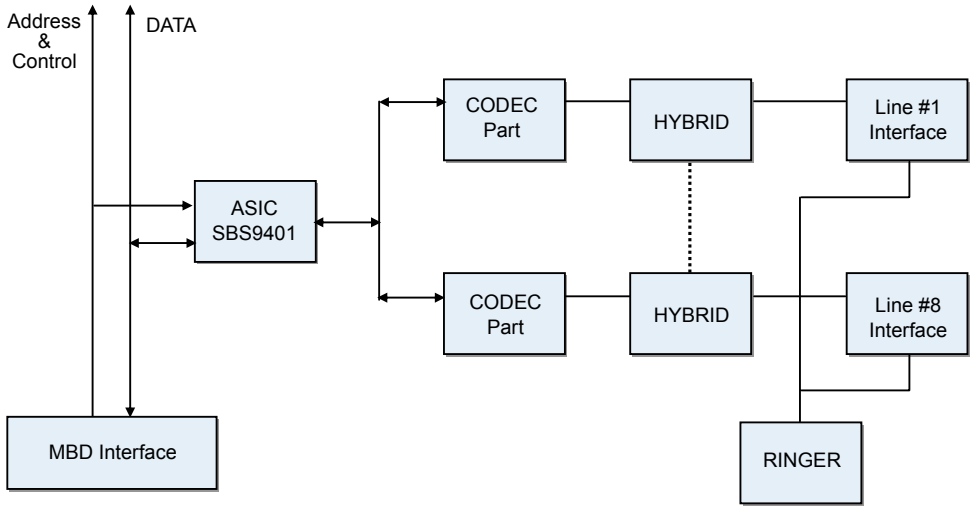


Figure 2.19 Block Diagram of the 8SLI Card

5.6.2 Major Functions

The major functions of the 8SLI card, the universal card of the OfficeServ 500 system are described below :

KPSLC-05 Hybrid IC

- Providing -48V
  PIN 2 and PIN 4 are connected to the ring and tip ends of the SLC line. -48V provided by PIN 1 passes TR and is supplied to the ring end of PIN 8, TR, PIN 2 through the resistance of 300Ω/2W. The -48V path connected to a phone is entered to the tip end of PIN 4, passes TR, and goes to PIN 10. Also, the -48V

path is connected to the ground through the resistance of 300Ω/2W. An average of resistance of 100Ω is inserted to mitigate noises or impulsive noise that might be left to power of -48V through PIN 2 or PIN 4. The average current supplied when the resistance of 200Ω is connected to PIN 2 or PIN 4 is about 45 mA.

- Loop Disconnection
  Power of -48V supplied from PIN 1 to PIN 3 is switched by TR. If PIN 11 is Low, TR will turn on and -48V will be supplied. If PIN 11 is High, TR will turn off and power of -48V will not be supplied. This function forcibly disconnects loop with VMS.

- Loop and Pulse Detection
  If external devices connected to PIN 2 and PIN 4 form loop, PIN 10 will be maintained to about -13 V and TR will turn off. (-) of the diode maintains about -0.7 V. Thus, as another TR turns off, the HOS output from PIN 5 is high. If the loop is not formed, the state of PIN 10 will be Ground and TR will turn off. (-) of diode is in a Floating state. The base end of another TR is pulled-up by +5V through resistance. Therefore, the HOS output of PIN 5 is Low. If the subscriber performs dial pulse, the state of digit will be detected in the manner above. As for the detection state within CPU, MAKE/BREAK rates are reversed.

- Ring Trip
  This function recovers ring relay to disconnect ring signal sending if the subscriber hooks off when a ring is transmitted to the subscriber's phone. If the subscriber hooks off when a ring is transmitted, PIN 5 will be displayed as High. The distributed voltage (-) between resistances is biased to + from the capacitor of 1uF/16V and TR turns off. In addition, PIN 5 will be displayed as High.

Gain Control and Balance Circuit

The 8SLI card uses KP-0070SA(TX/RX gain, Balance Network) and controls sending/receiving levels.
The balance circuit of two-way voice signals from the sending/receiving paths is built-in. A hybrid IC supports 4 subscribers.

ASIC Circuit (BS9401)

The 8SLI card controls 4-port RASL(DLI transmittance chip) through 8 ports of TSACS, 4 ports of UART, and micro channel controls. Also, it generates 4-port dial pulse and provides other functions.

For detailed information about the ring generation(ringer) of the 8SLI card, refer to 'Ring Generation(Ringer)' of the SLI card.

5.7 8MWSLI Card

The operation of the 8MWSLI card is the same as that of the 8SLI card except that the 8MWSLI card has the function of operating message waiting lamp of regular phones.

5.7.1 Block Diagram

The block diagram of the 8MWSLI card is shown below :

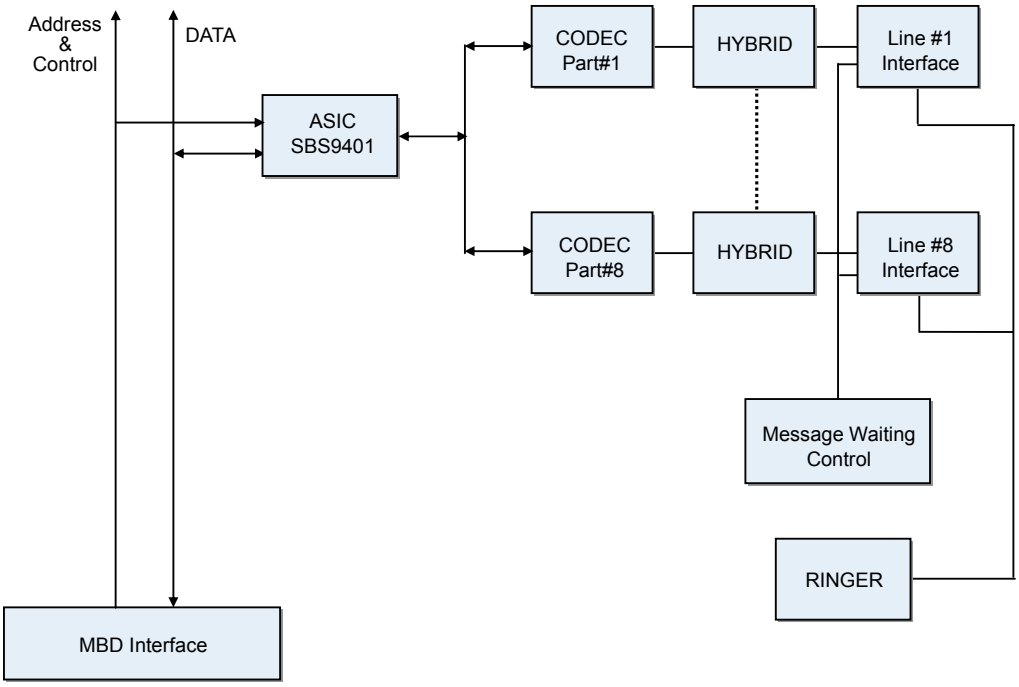


Figure 2.20 Block Diagram of the 8MWSLI Card

5.7.2 Major Functions

The major functions of the block diagram of the 8MWSLI card, the universal card of the OfficeServ 500 system are described below :

> NOTE
> For detailed information about the major functions of the 8MWSLI card, refer to the 'Major Functions' of the 8SLI card. Only added functions are described in this section.

Message Waiting

A subscriber can send up to 5 messages. Ring signals are used to generate a ring signal of message waiting. A phone supplies a signal of operating lamps in a hook-on state and its cycle is controlled by software.

5.8 16SLI Card

16SLI performs the same functions as 8SLI. Up to 16 lines can be used.

5.8.1 Block Diagram

The block diagram of the 16SLI card is shown below :

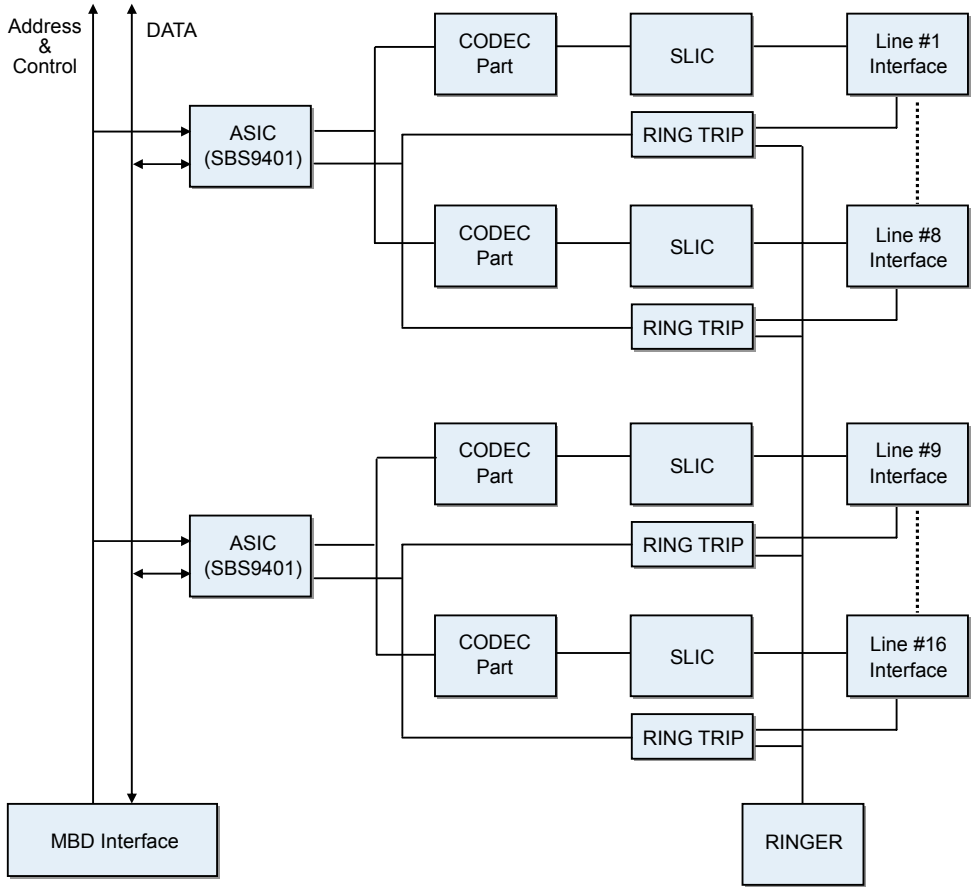


Figure 2.21 Block Diagram of the 16SLI Card

5.8.2 Major Functions

The major functions of the block diagram of the 16SLI card, the universal card of the OfficeServ 500 system are described below :

ASIC (SBS9401)

The 8SLI card controls 4-port Digital Adpator for Subscriber Loops(DASL) and generates 4-port dial pulse through 8 ports of Time Slot Assignment Control (TSACS), 4 ports of UART, and micro channel controls. Also, it generates 4-port dial pulse and provides other functions.

SLIC

SLIC uses 5503T of Harris and supplies current necessary for the subscriber's line.

- Battery feed Range : -22V~-58V
- Controlled Supply of Battery Feed Current for Short Loops : 30 mA
- Switch Hook Detection
- Low Power Consumption during Stand-by
- Off Hook Current at RL=200Ω : 30 mA(25.5~34.5)
- Off Hook Current at RL=1200Ω : 21 mA
- Longitudinal Balance : 58dB
- Tran Hybrid Loss : 40dB

CODEC

3054/3057 mounted to the existing 8SLI card are used as CODEC. CODEC is mounted to the daughter board because the PCB size of the 16SLI card is not large. The daughter board consists of TX(PIN 24) and RX(PIN21) of SLIC as well as highway circuit interfacing with the main board.

Balance Hybrid

Balance Hybrid is already implemented in SLIC. Since this is implemented for 600Ω only, circuit for the CONPLEX impedance as well as CODEC is mounted to the daughter board.

Protection

Protection is categorized into the first protection and the second protection.

- First Protection
  Varistor1 is connected between a tip and a ring and protects terminals connected between a tip and a ring. Varistor 2 is connected between a ring terminal and ground and protects the ringer circuit and the battery circuit.

- Second Protection
  The second protection consists of loop resistance and diode. Loop resistance is 150Ω and uses 1N4003, which can send more than 1A.

Ring Generator

- DC-DC Converter
  The DC-DC converter converts DC voltage of -48V to that of 75~80 V. If electric noises generated from ring generator are entered along with DC power of -48V, RC filter will be used to the input end to eliminate noises.

- Voltage Doubler
  The voltage doubler receives the current of 20 Hz and interrupts the circuit by the OPTO-Coupler. 4 MOSFETs convert the DC of 80 V to the ring signal of

160 VPP by using the interrupt signal.
2 MOSFETs operate when the MOSFETs are on and off. When a MOSFET operates, each pair operates another. This is aimed at ensuring stability in an error state.

- Message Waiting Source
  The message waiting source performs half wave rectification of ringer to convert it to 110VDC so as to provide the message waiting source. This message waiting source is provided to the daughter board for message waiting through protection resistance of 50Ω. It is sent to the ring terminal through termination register in the message waiting board.

Relay Driver

The Ringing Relay is controlled in Port 9401. The message waiting relay is located in the message waiting daughter board and the control port is located in the daughter board. For this, 8-bit data, 2 addresses, and a signal of chip enabling are provided.

Message Waiting Hook-off Checking

Since the message waiting circuit is mounted to the daughter board, the board is supposed to process hook-off while the message waiting signal is transmitted. However, the three types of hook-offs are identified as one. Thus, the combination of the signals is used.

5.9 16MWSLI Card

The 16 Message Waiting Subscriber Line Interface (MWSLI) card is used to connect with a regular phone supporting message functions. The 16MWSLI card provides the almost same functions as the 16SLI card described in the section above except that the MWSLI card provides the subscriber with the message waiting signal.

5.9.1 Block Diagram

The block diagram of the 16MWSLI card is shown below :

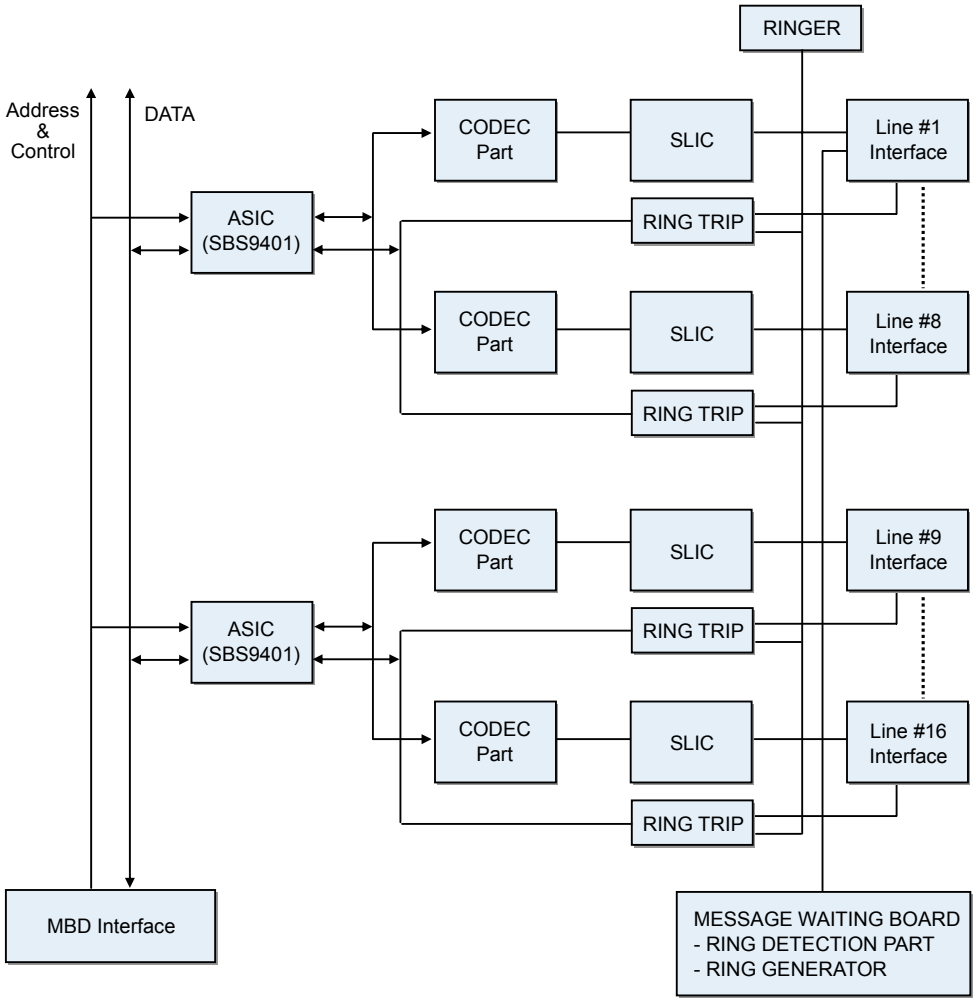


Figure 2.22 Block Diagram of the 16MWSLI Card

5.9.2 Major Functions

The major functions of the 16MWSLI card, the universal card of the OfficeServ 500 system are described below :

For detailed information about the functions of each module of the 16MWSLI card, refer to the 'Major Functions' of the 16SLI card.

5.10 DLI Card

The 8 Digital Line card Interface(DLI) card connects with a digital phone and accommodates 8 ports. A port uses RASL, which enables I/F of 2B+D(two voice channels of 64kbps and a signaling channel of 16kbps).
144 kbps of full-duplex Alternative Marking Inversion(AMI) code transmittance manner is used for signal transmittance. For end-to-end communications, 2 B can be used for the existing cabinet and only 1 B can be used for the expanded cabinet. Actual transmittance bit rate between the DLI card and a digital phone is 192 kbps. 16 kbps is used for sync and 32 kbps transmits null data out of 48 kbps in which 144 kbps of 2B+D is excluded.
AWG26 is used for the transmittance line between the DLI card and a digital phone and maximum transmittance distance is 400 M. The DLI card supplies the power of -48V to a phone and consists of the poly switch cutting off overcurrent and circuits for digital infrastructure.

5.10.1 Block Diagram

The block diagram of the DLI card is shown below :

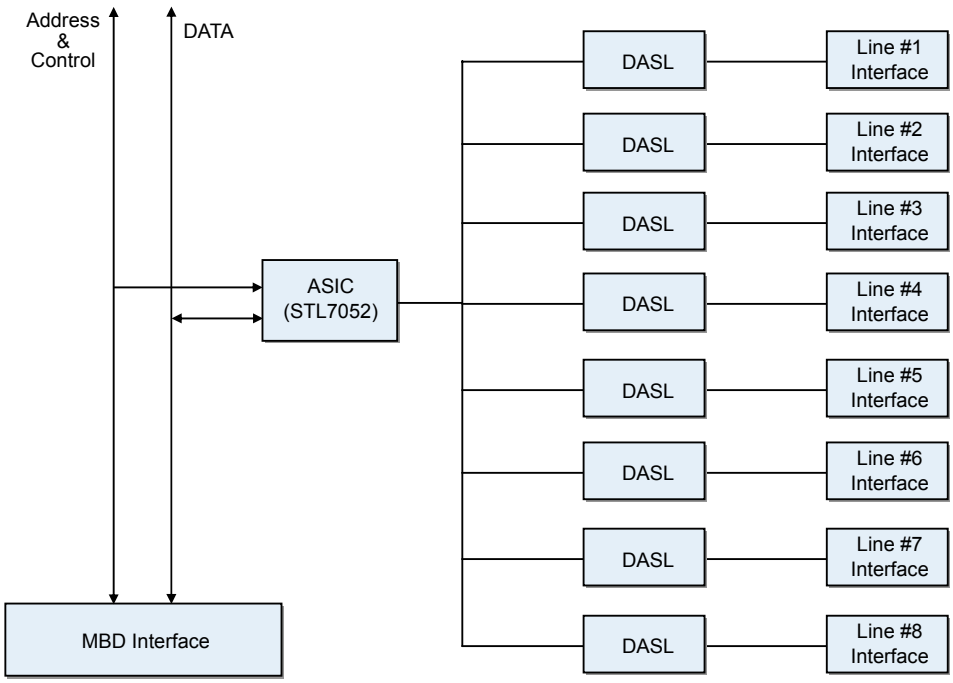


Figure 2.23 Block Diagram of the DLI Card

5.10.2 Major Functions

The major functions of the DLI card, the universal card of the OfficeServ 500 system are described below :

ASIC (STL7052)

Digital line interface Module Controller, STL7052(DMC), which is ASIC, controls signaling between existing cabinet and the system and assigns channels. Also, it controls RASL(transmittance chip of NS Co., Ltd.).

- Micro Processor Interface and DASL Interface
- 8-bit wide Data I/O Bus
- 4MHz Clock Source, CLKX, Reference Synch Clock(FS) Used
- 8-port Time Slot Assignment Control(TSAC)
- 8-port Universal Asynchronous Received & Transmitter(UART)
- Micro wire Control
- Interrupt Control
- 80 QFP Plastic Package, CMOS Type

Transmittance Part

This is the circuit part, which data(D-channel) and voice(B-channel) are transmitted between a digital phone and the DLI card in full duplex manner. The DLI card operates in master mode and the digital phone operates in slave mode. Once the Master sends data, Slave receives the data. After some guard time, once the Slave sends data, the Master receives the data. This manner is called PING-PONG.
The transmittance part supplies voltage of -48V DC to the Trans through the poly switch. The poly switch limits currents when a short circuit occurs in the line.
The Zener diode protects external high tension.

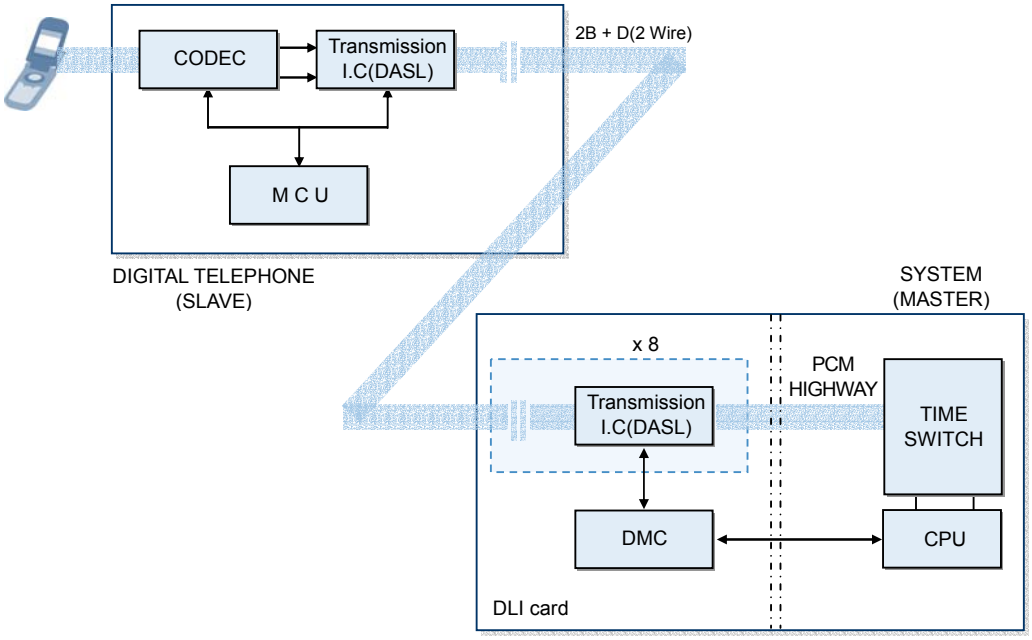


Figure 2.24 Basic Configuration Diagram between a Digital Phone and the System

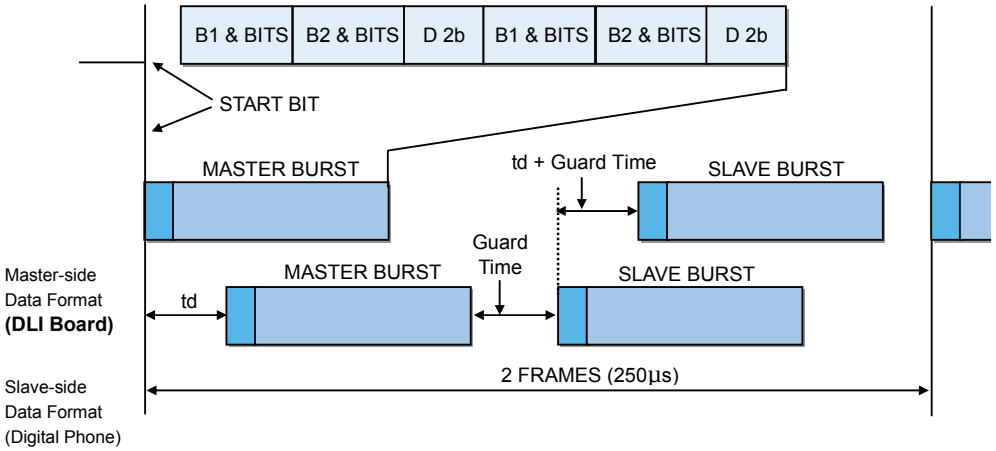


Figure 2.25 Format Diagram of Data Transfer

5.11 16DLI Card

The 16DLI card provides an interface circuit of 16 ports to digital telephone, DPIM, and CTM(system terminals), and each port of the card uses QDASL that can interface with 4 channels of 2B+1D(2 Voice Channels of 64kbps and 1 Signaling Channel of 16kbps).
Signaling transmission uses the Alternative Marking Inversion(AMI) mode from 144kbps transitions, and End-to-End communications support two Voice Channels (B1 and B2) and can connect two stations using one port.
The actual transmission rate between the 16DLI card and the digital telephone is 192kbps. 144kbps of 2B+1D is excluded, and from the rest 48kbps, 16kbps is used for SYNC and 32kbps is used for null data. The physical transmission route between the 16DLI card and the digital telephone uses a AWG #26 transmission route and guarantees up to 400M.
The control with the 16DLI card has 3 buffers composed of 1 byte Rx and Tx within UART inside the QDMC. If more than 3 buffers are used, data will be damaged. Thus, the data status must be checked before they are transmitted. That is, QDMC transforms the parallel data into serial data and sends to QDASL, and then QDASL converts them into the AMI code and sends to the digital telephone. Inversely, the signaling data generated from the digital telephone will be converted from the serial data into the parallel data at the UART Rx buffer inside the QDMC via QDASL and then sent to the CPU.

5.11.1 Block Diagram

The block diagram of the 16DLI card is shown below :

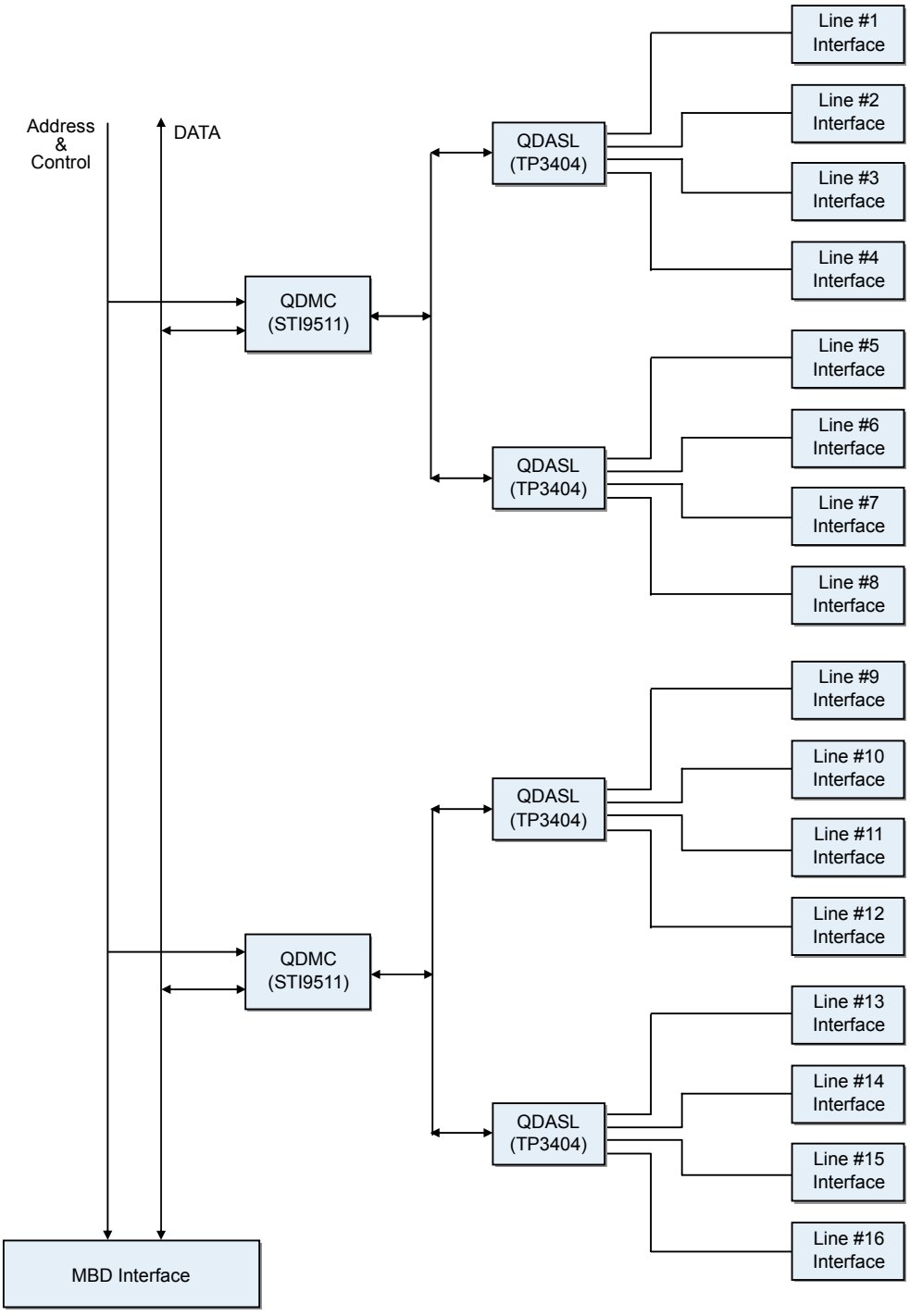


Figure 2.26 Block Diagram of the 16DLI Card

5.11.2 Major Functions

Learn about the major functions of the 16DLI Card, the universal card of the OfficeServ 500 system.

QDMC (STI9511)

QDMC(STI9511) is a specifically designed ASIC(Application Specific IC) used to control the TP3404, a QDASL(Quad Digital Adpator for Subscriber Loops) chip of N.S(NATIONAL SEMICONDUCTOR). The TP3404 is an expanded chip of TP3401/3402/3403. A single transceiver of channel TCM(Time Compression Multiplexed) transmission mode is expanded to 4 ports and the micro wired control and other control structures are modified.

The characteristic features of the QDMC are as follows :

- Reception/transmission of data in the UART(Universal Asynchronous Receiver and Transceiver) for the D-Channel
- Selectable UART data speed(2K/4K/8K/16kbps)
- B-Channel has a bypass interface feature
- Micro wired Serial Control(16 bit) interface
- Control of two TP3404 chips(a total of 16 Channels can be used.)
- Recognition of the card in used and identification
- 4.096MHz Master Clock
- 5V Operation
- 60 QFP

QDASL Interface

The QDASL is the D-Channel of each port, and there are RxD and TxD for transmission of serial data. The AMI code is made along with the B-Channel and sent to the line, and the D Channel is used to control the telephone and the B-Channel is used to make voice signals. The QDASL has /INTD for processing the channel interrupts to the microphone of the QDASL in each port. However, INT of the QADSL is generated only when the channel is accessed with a microphone and when the DASL is initialized. At this time, the INT generating conditions are NO SIGNAL (CO), OUT OF SYNC(C1), BIPOLAR VIOLATION(C7), etc.
Since INT is generated only when power is first turned up and when a QDASL status is changed due to an error from the telephone, UART Tx INT and AND GATE are used together in a combined form. INT is a clock of the μ-CH control part that sets up the QDASL's initial state. INT is configured of CCLK(1MHz), CI for control data entry, and CO for status print-out. Also, the B-Channel, which can allocate 8 bits and 32 channels per 8K(the same method as the system hardware allocation.), opens up the hardware buffer according to its own hardware frame SYNC and sends to the QDASL. The control data is transmitted to the sub time slot D-Channel, which can allocate 2 bit of 256 Channels. Here, the sub time slot means dividing 8 bits of the B-

Channel into 4 of 2 bits. Therefore, to receive 1 byte of D-Channel data from the QDASL, four frames of data should be received.
On the other hand, the QDMC provides 128 sub time slots.

Digital Telephone Interface

The digital telephone can be connected as a result of the following steps :
The QDASL(TP3404) generates the AMI code and sends it to the digital telephone through a Trans. Also, the AMI code received from the telephone via trans is demodulated and the serial data is sent to the QDMC. The QDMC converts the entered serial data into parallel data through UART and sent to the CPU. Also, the voice data will put PAL(22V10) data on a highway to /TSB of the QDASL.
Since one QDMC controls two QDASLs(a total of 8 ports), a /TSB signal generated from each QDASL will be used after ANDing.
DLT-1 is used as a matching trans. The resistance of 100Ω located at the QDASL LO layer is for adjusting impedance and 2 μF is for noise reduction. Also, two Zener diodes(3.6V), the trans input terminal is for protection against hazards. The power of -56V is supplied to the telephone through a poly switch in order to prevent excess current from coming into the telephone. The varistor at the input terminal of a trans is for protection against hazards.

5.12 ITM3 Card

The ITM3 card interworks with PSTN, an old switching system, PBX, and KTS via E1/T1, PRI, No.7, analogue Trunk line, etc. Also, the ITM3 card can be connected to the IP network through its Ethernet. At this time, the ITM3 card acts like a connector for both networks and receives/transmits data in the mode of G.723.1 or G729 of voice data ITU-T.

5.12.1 Block Diagram

The block diagram of the ITM3 card is shown below :

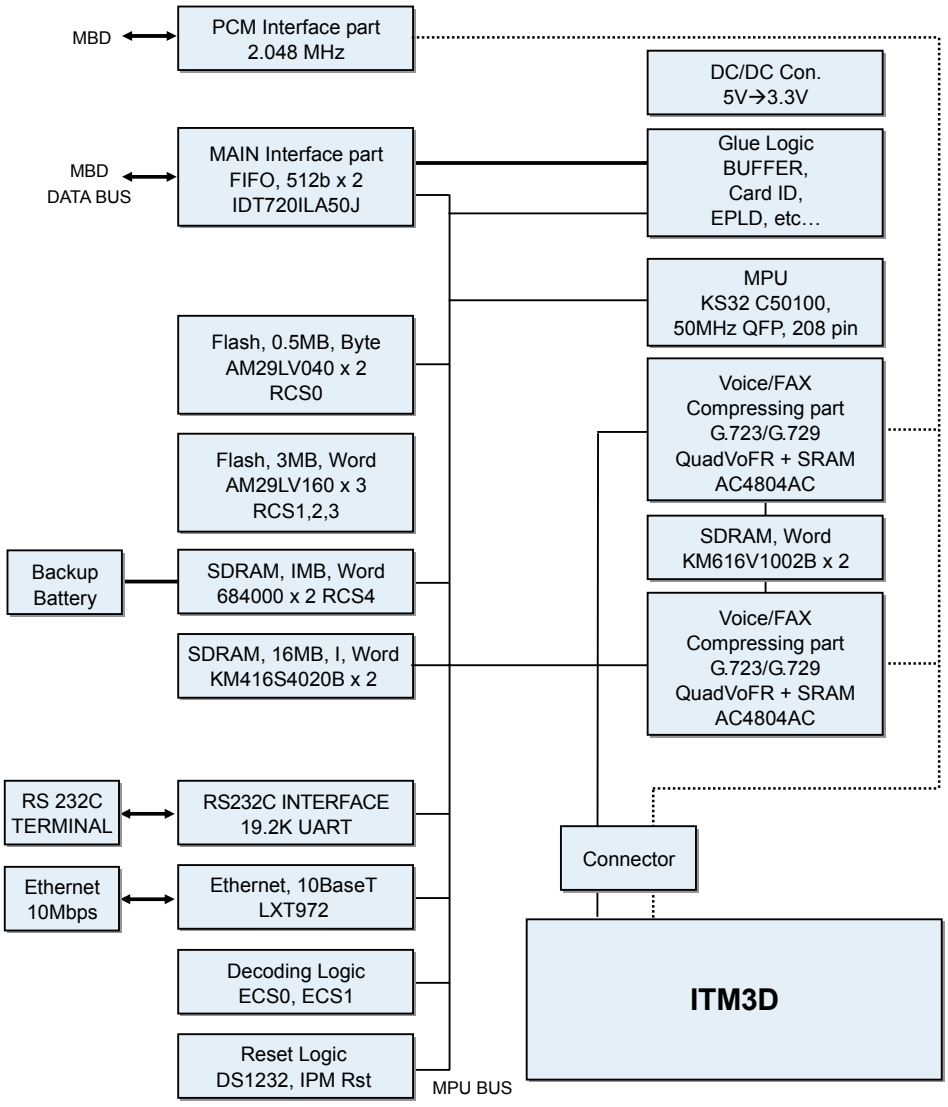


Figure 2.27 Block Diagram of the ITM3 Card

5.12.2 Major Functions

Learn about the major functions of the ITM3 card, the universal card of the OfficeServ 500 system.

G.723 CODEC

- Accommodation Channel : 4 CH/Chip x 4 EA=16 CH
- An interface between QuadVoFR and the host shall be all implemented with EPLD.
- QuadVoFR uses the product from AudioCodes.
- 4 independent voice and fax channel are supported for one chip.
- User Configurable H.323 Voice Coders :
  - G.723.1 MP-MLQ @ 6.3kbps and 5.3kbps
  - G.729A CS-ACELP @ 8kbps
- Non-standard lower bit rate MP-MLQ Derivatives
- 'Soft', Field-upgradeable Functionality
- Robust Bad Frame Interpolation(BFI)
- G.165 Adaptive Echo Canceller
- Toll Quality Voice that uses the silence compression to lower the bit rate down to an average of 3.2kbps
- TIA 464A DTMF Detection/Generation
- MF Detection/Generation
- Parallel Host Processor Interface
- Host Programmable Tone Signaling
- Configurable PCM I/F : PCM Highway or Parallel I/F
- On-chip PCM Highway I/F with host configurable time slot assignment and selectable G.711 mu-law/A-law PCM I/F
- Gain control

RS-232C Interface

- Use the UART0 inside the KS32C50100
- Maximum of 38.4kbps UART
- Used for debugging, Flash memory update, DSP program update, and test

MCP Interface

- FIFO IDT7201LA50J X 2
- 512 byte for each Tx and Rx
- Card ID : 7D(8CH) : 7C(16CH)
- If the daughter board is connected, the Card ID will be automatically changed to 7C(16 CH).

Power

- 3.3V is required(Even 2.5V is required at a later time.).
- 5V is received and 3.3V/1.5A is generated at the power module.

- A circuit is designed in advance to provide 2.5V at a later time.
- The connection between 5V and 3.3V devices is implemented by inserting the dedicated buffer-Reliability is obtained.
- CD74LVT16244, 16245 : IDT

Ethernet Interface

- LXT972 is used : Ethernet Interface PHY Transceiver
- RJ45 Connector is used.

CARD ID

The card ID of ITM3 is NORMAL 7DH(8CH) and 7CH(16CH).

Reset Logic

- POWER ON RESET
  - Use the DS1232 power monitor chip and reset when power is lowered below 4.75V.
  - Once power is turned on, wait for a while unit the system is stabilized. After assertion and a certain period of time have passed, a power-on reset is cancelled and the system starts operating normally.
  - /RESET of the KS32C50100 is asserted.

- DS1232 WATCHDOG Timer RESET
  - When WDT is not changed for more than 1.2 seconds, the timer is reset. (The TD pin is connected to VCC.)
  - /RESET is asserted.
  - There is a case when a test should be carried out even if /AS does not randomly appear. Therefore, WDT or CPUCLK are implemented as selectable by using a jumper at the status input terminal of the DS1232.

- MANUAL RESET
  - The manual reset detects if the reset switch is on and start operating.
  - The reset switch passes the detection logic of EPLD using a SR flip flop and get connected to /RESET of the KS32C50100.
  - Since the output of the reset switch is connected to the PUSH button reset input of the DS1232, the DS1232 gets connected to /RESET input of the KS32C50100.

- DSP RESET
  - For downloading the Kernel program when DSP is reset, S/W shall randomly control or maintain RESET. Therefore, it is designed to reset when a certain address is entered for each DSP.
  - The main software shall reset each DSP for booting after the Power On Reset.

5.13 MGI3 Card

The MGI3 card supports VoIP calls and used for MCP2 system configuration.
For the MCP system configuration, the ITM3 card is used.
The used configuration of the MGI3 is similar to MGI1 and MGI2 cards, and the MGI3 card supports certain coding methods such as G.711, G.723, G.726, G.729, T.38, etc.
The LED indicators of the MGI3 card are different from the usage of the ITM3 card, and the functions of each LED indicator are explained in the table below :

Table 2.3 LED Indicators of the MGI3 Card

LED	Colors	Functions	On/Off/Blink LED
RUN	Light Green	Indicates the operation status of the MGI1/2 card. - On : MGI1/2 Card is normally operating. - Off : MGI1/2 Card is not normally operating.	
TX	Light Green	Indicates the transmit status of data through Ethernet - Blink : Data is being transmitted. - Off : Data is not being transmitted.	
SRV	Light Green	Indicates that a voice service is available. - Blink : A service is available. - Off : A service is not available.	
IPC	Light Green	Indicates that IPC between the MGI1/2 card and the main processor. - Blink : A message is normally exchanged. - Off : A message is not normally exchanged with the main processor.	
PWR	Light Green	Indicates the power supply status of the MGI1/2 card. - On : Power is normally supplied to the MGI1/2 card. - Off : Power is not supplied to the MGI1/2 card.	
RX	Light Green	Indicates the data reception through Ethernet. - Blink : Data is being received. - Off : Data is not being received.	
DSP	Light Green	Indicates the efficiency of the DSP channel. - Blink : The DSP channels are being used. The 1~4Channels blink in 1 sec period, 5~8 channels are in 0.5 second period, 9~12 channels are in 0.25 sec period, and 13~15 channels are in 0.125 sec period. - On : 16 channels are all in use. - Off : No DSP channel is being used.	
MOD	Light Green	Indicates the receipt status of RTP data from LAN. - Blink : The MGI1/2 card is normally receiving the RTP data. - Off : No RTP data being received.	

5.14 MGI1/2 Card

There are two types of the media gateway card according to the range of service availability; MGI1 card and MGI2 card.

5.14.1 Block Diagram

The block diagram of the MGI1/2 card is shown below :

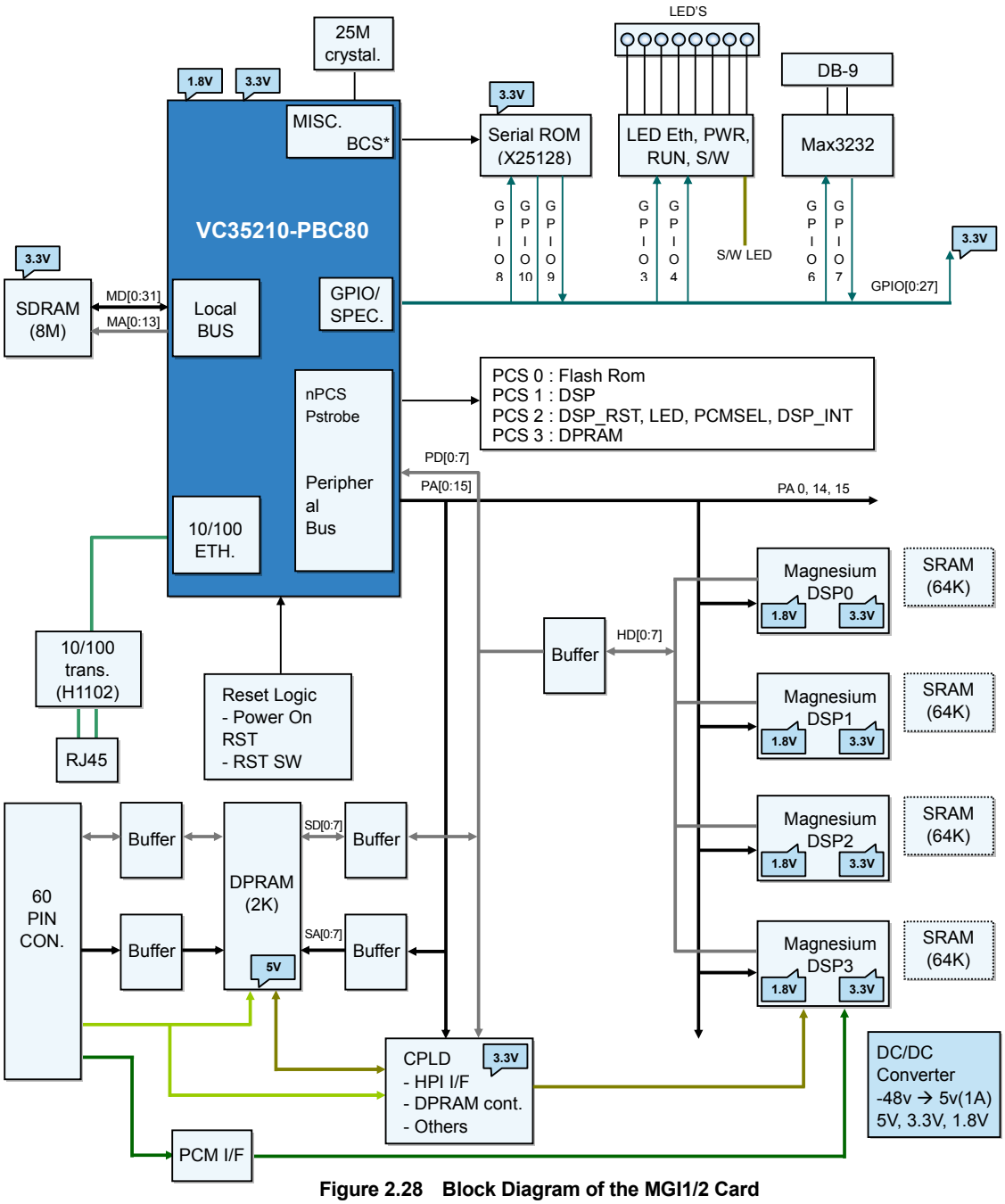


Figure 2.28 Block Diagram of the MGI1/2 Card

The MGI1/2 card supports the VoIP gateway feature in order to use a telephone by using the Internet service. The MGI1 card performs the gateway role that connects a call between the legacy terminal(SLI/DLI) and IP telephone and provides 16 channels of Internet telephone port(VoIP). The MGI2 card supports a remote system intercom call or IP telephone call for teleworking(telecommuting) and a Trunk line call, and provides 16 channels of Internet telephone port(VoIP).
The equipped slot of the MGI1 and MGI2 cards has no limitation. A VoIP call is supported by a maximum of 80 ports in case of OfficeServ 500-M and a maximum of 160 ports in case of OfficeServ 500-L.

5.14.2 Major Functions

Learn about the following major functions of the media gateway card :

- Flash memory and data memory for programming are basically equipped.
- The echo cancellation function is supported to suppress echoes.
- Silence suppression is supported in order to deliver no data over the networks during the silence state that is generated shortly from a word to word(silent gaps).
  - MGI1 : G.711 is supported
  - MGI2 : G.711 and G.729 are supported

CPU

- Nitrogen 210-80(Vendor : GlobespanVirata)
- Composed of NP(Network Processor) and PP(Protocol Processor)
- Core clock : 80Mhz(Source Clock : 25Mhz crystal)
- Core Power : 1.8V, I/O Power : 3.3V
- Type : 272-pin PBGA

Memory

1) 1 EEPROM

- A minimum memory required for saving the boot program in the initial operation.
- 16Kbyte of M95128 supplied by STM is used.
- Not used for booting Flash ROM.

2) Flash ROM

- Software codes and application codes related to booting are included
- 2MByte of Am29LV160B supplied by AMD is used.
- 8 bit access

3) SDRAM

- A memory that is used by the CPU to process various data and has a capacity of 8Mbyte.
- KM43S203BT Synchronous DRAM of Samsung is used.
- 32 bit access

VOICE CODEC Unit

- DSP(Digital Signal Processing) is used for processing voice codes
- MGI1 : Magnesium02(VC5402) x 4
  Supports 4 voice channels per DSP, and Coding Method : G.711
- MGI2 : Magnesium09(VC5409) x 4
  Supports 4 voice channels per DSP, and Coding Method : G.729
- CPU and HPI-8 bit I/F
- Core clock : 100Mhz(Source Clock : 20Mhz oscillator)
- Echo Cancellation
- External RAM [KM616V1002BT(32K x 16Bit)] x 4 are used.

IPC Unit

- Interface with the system board
- DPRAM(Dual Port RAM) is used for IPC with MCP.(Vendor P/N : CY7C136-55NC)
- 2Kx8 bit, QFP, 52P, 55nS
- Connector : 60PIN(95x12mm, 2R,2.54mm,ANGLE)

External Interface Unit

1) Ethernet Interface
- The transceiver H1102(Vendor : Pulse) is directly connected to the CPU to implement this external interface unit
- 10/100Mbps
- RJ45 Connector is used to connect an external device.

2) SIO
- RS-232C Interface
- TX/RX of the CPU UART are connected to the MAX3221
- Used for debugging and testing
- 9PIN Connector [745781(9P, 2R)] is used

CPLD and Other Logic Units

1) CPLD
- EPM3064ATC100-10(Macro cell 64) (Vendor : Altera) is used.
- HPI control signal processing
- (DSP chip select, DSP RESET, DSP READY, DSP Interrupt)
- DSP BIO signal(DSP Initial control)
- CPLD version check
- DPRAM peripheral signal processing(IPC Enable and Control)
- LED operation circuit that is controlled by S/W.
- HWEN signals are implemented for controlling the PCMTX highway signal.
- Other Glue logics

2) Reset

- Reset Source
  - Power Reset(Use MAX706)
  - Reset Switch
  - CDRST_(Card control Reset by MPC)
- Connect the sources above with AND and control the CPU Reset input.(RST_)
- CPU RESET OUT(P_RST) : CPU peripheral logic reset signal

3) LED

- PWR 3.3V : H/W implementation(Green)
- RUN : S/W implementation(Green)
- LAN TX : Connection to the CPU by H/W(Green)
- LAN RX : //(Green)
- Other 4 LEDs : S/W Control(Green)

4) Others

- CARD ID setting(This will be read when power is turned on)
  MGI1 : 7B
  MGI2 : 7A
- Board size : 285.00 x 100.00(mm)

Power

The MGI input power is +5V and -48V that are supplied from the main system. (-48V is used because the power shortage in the main system(+5V) needs to be resolved.)

The internally generated power in the MGI board are classified as follows :

- Power Generation
  - -48V→+3.3V(D3.3V) (by DC/DC converter : PKF4628PI)
    +5V→+1.8V(by Reg : LP3962ES-1.8)
  - Main System +5V→+3.3V(D3.3V_A) (by Reg. : MIC2940A-3.3BU)
- DC/DC Converter : Input -48V, Output 5V/3.3V Dual
- D3.3V : CPU, DSP(x4), Flash ROM, SDRAM
- D3.3V_A : CPLD, Buffer
- 1.8V : DSP core power(x4), Nitrogen210-80 core power

LED Indicators

The LED usage of the MGI1/2 card is summarized in the table below :

Table 2.4 LED Indicators of the MGI1/2 Card

LED	Colors	Functions	On/Off/Blink LED
RUN	Light Green	Indicates the operation status of the MGI1/2 card. - On : MGI1/2 card is normally operating. - Off : MGI1/2 card is not normally operating.	
TX	Light Green	Indicates the status of data transmission through Ethernet. - Blink : Data is being transmitted. - Off : Data is not being transmitted.	
SRV	Light Green	Indicates the voice service is available. - Blink : A service is available. - Off : A service is not available.	
IPC	Light Green	Indicates IPC between the MGI1/2 card and the main processor. - Blink : A message is normally being exchanged with MP. - Off : A message is not normally being exchanged with MP.	
PWR	Light Green	Indicates the power supply status of the MGI1/2 card. - On : Power is normally supplied to the MGI1/2 card. - Off : Power is not normally supplied to the MGI1/2 card.	
RX	Light Green	Indicates the receipt status of data through Ethernet. - Blink : Data is being received. - Off : No data is being received.	
DSP	Light Green	Indicates the efficiency of the DSP channel. - Blink : The DSP channel is being used. The 1~4Channels blink in 1 sec period, 5~8 channels are in 0.5 second period, 9~12 channels are in 0.25 sec period, and 13~15 channels are in 0.125 sec period. - On : 16 channels are all in use. - Off : No DSP channel is being used.	
MOD	Light Green	Indicates the receipt status of RTP data from LAN. - Blink : The MGI1/2 card is normally receiving the RTP data. - Off : No RTP data is being received.	

5.15 BRI Card

The BRI(Basic Rate Interface) card is used to connect the terminal for ISDN and the system. The BRI card is connected to BRI provided by the non-ISDN system and the station's ISDN switching system. And, the BRI card is composed of 2 B-Channels for transmitting voice and data, as well as 1 D-Channel for transmitting signals.
B-Channel or D-Channel, each transmits with a speed of 64kbps and each board is composed of 4 ports.

5.15.1 Block Diagram

The block diagram of the BRI card is shown below :

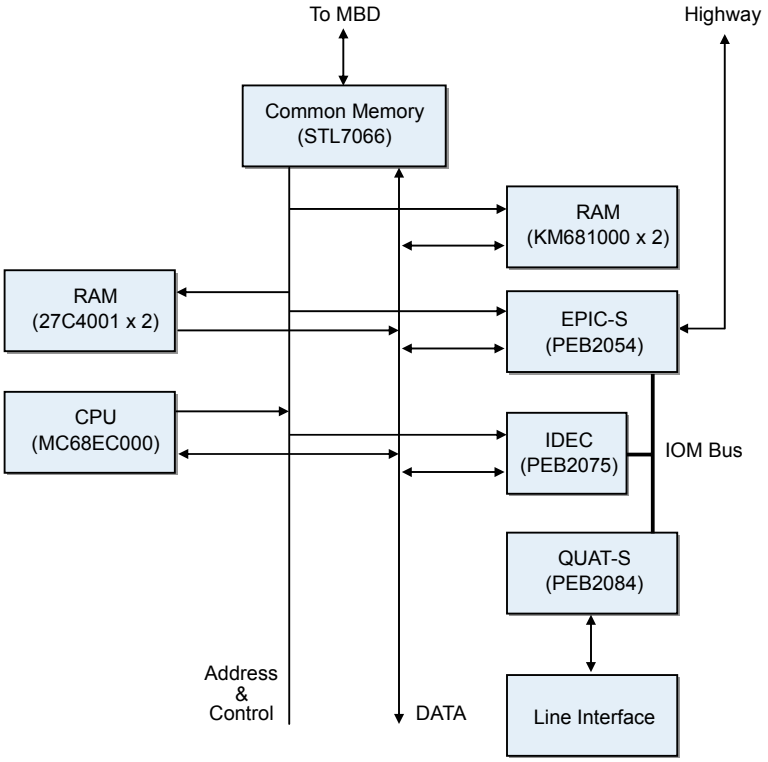


Figure 2.29 Block Diagram of the BRI Card

5.15.2 Major Functions

Learn about the major functions of the BRI card.

CPU and Memory

The CPU is for 16 bit. The 68EC000 of Motorola is used. It has a built-in serial transmission function. ROM is 512KB and SRAM is 256KB.

Reset Logic

The DS1232S chip is used, and it performs the POWER ON RESET, WATCH-DOG, etc.

IPC (Information Exchange Between SP↔PRI CPU)

The dual port memory inside the ASIC STL 7066 is used for IPC(Inter Processor Communication) between SP and the CPU inside BRI. The memory performs decoding logic, interrupt control, and priority adjustment simultaneously.

Interrupts

There are 7 interrupt sources, which are determined by the STL7066.

- LEVEL7 : NMI and VME for debugging.
- LEVEL6 : IDEC interrupt for D-Channel message and CIC(Command and Indication) handler
- LEVEL5 : EPICS interrupt for controlling the monitor channel between EPIC and QUAT-S
- LEVEL4 : PRAM interrupt for internal processor communications
- LEVEL3 : 1msec interval timer interrupt for periodic task generation
- LEVEL2 : Interrupt for prohibited memory-access
- LEVEL1 : SIO interrupt

Control Signal Latch of I/O Device

- D8(Layer1 Activated)
  The D8 bit activates or deactivates Layer 1, and if the D8 bit is set to 'Low', the port is activated. This bit is also used to provide a priority for PLL(Phase Locked Loop). After the Power-on-reset, the D8 bit shows up as 'Layer1 Deactivated'.

- D9(Enable 8KHz)
  The D9 bit orders to synchronizes(SYNC) the 8KHz generating circuit to the signal received at the line. If the previous port is deactivated, the D9 is set to 'High' to start generating the 8KHz clock that gives the successive frame sync signals. After activation, the D9 bit is set to 'low'.
  After the power-on-reset, the D9 bit shows up as 'Disable 8KHz'.

- D10(Watchdog disable)
  This bit is set to 'High' if the 0x520,000 address is accessed within 600Msec period. Otherwise, the card is reset. If the 1KHz signal is continuously supplied, the D10 bit is set to 'Low' and no more access is needed. After the power-on-reset, the D10 shows up as 'Disable Watch-dog'.

- D13(Confirm bit)
  This bit is used for stopping the load of the frame sync when the system clock and the successive sync are matched. If the frame sync signal from the system is given for generating 8KHz signals, the D13 bit is set to 'High'. This bit is used

to reduce the probability of clock slip. After the power-on-reset, the D13 bit shows up as 'Low'.

BRI (Basic Rate Interface) I/F Unit

In the BRI unit, 4 ports of the external line card are mounted for ISDN S interface. The BRI unit is composed of 2 x 64kbps B-Channels for voice or data transmission, as well as 16Kbps for signaling.

- EPIC-S(PEB2054, Extended PCM Interface Controller-small)
  This device switches the control route for 4 x 24 Channels, and is composed of two serial interfaces between the PCM highway and IOM2.
  - Allocates the controller for 8 subscribers and selectable time slots.
  - 2 types of I/F for PCM and IOM2.
  - 3 types of the state control signal for an external drive, and programmable clock shift
  - Buffer that accesses C/I and a monitor channel
  - B-Channel and D-Channel switching between PCM and IOM2
  - Standard micro processor I/F, and PCM/IOM2 Channel access
  - From the functions above, I/F of the SIEMENS chip between IOM2 and the PCM highway, B-Channel switching of 4 ports S Interface, control of the monitor channel for QUAT-S access, and control of the PCM highway, etc.

- IDEC(PEB2075, ISDN D channel Exchange Controller)
  IDEC has an independent 4 Channel HDLC FIFO that receives/transmits information of Layer2 through D-Channel. This chip is in charge of D-Channel that is designed for call control and signaling information.
  - 4 independent HDLC Channels
  - 64 byte FIFO for each channel direction
  - Basic HDLC functions such as flag detection/generation, bit stuffing, CRC monitoring/generation, and check for abort.
  - Address recognition
  - Command/Indication Channel Handler
  - Single connection and Quad connection mode
  - IOM2 Interface or PCM Interface
  - Selectable time slot
  - Standard micro processor I/F
  - Vector interrupt structure
    From the functions above, D-Channel DIFO handling of 4 ports and the physical state of QUAT-S, which is the status control of Layer1, commands for monitoring and status indication, are used.

- QUAT-S(PEB2048, Quadratic Transceivers for S/T Interfaces)
  This transport chip adjusts the specification of I.430 Layer1 for ISDN basic rate access.
  - 4 full duplex(B1+B2+D) S/T I/F Rx/Tx(Performs the I.430 function.)
  - IOM2 Interface
  - Supports the JTAG boundary scan test.

Operation of the BRI I/F Device

IOM2 is designed to operate devices at different ports. Using the PEB2084(QUAT-S), the physical interface(Layer1) of the I.430 frame(2B+D) is implemented, and using the PEB2075(IDEC), the Layer2 interface for LAPD packaging is implemented. IOM2 has a voice channel switching and data path within the PEB2054(EPIC-S). Each port of QUAT-S has 2B+D Channel and is connected by the IOM2 serial interface from S-Interface, as shown in Figure below :

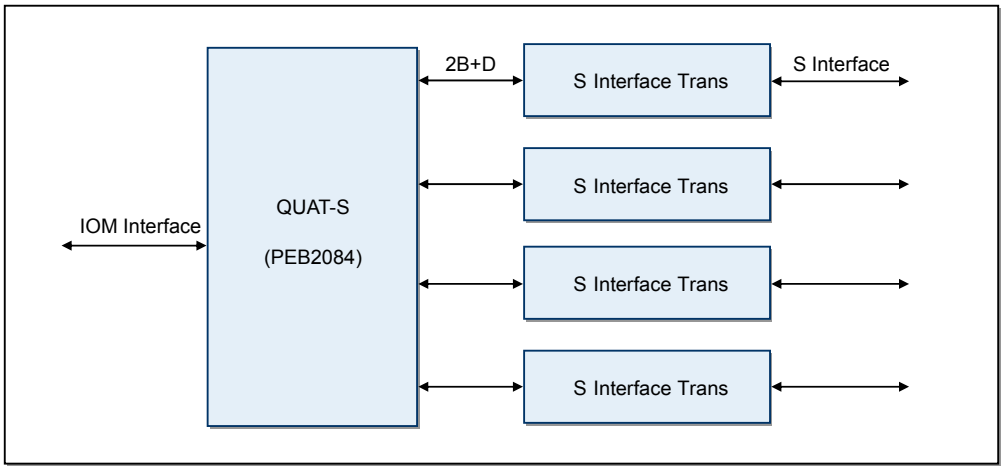


Figure 2.30 IOM2 Interface

IPC (Information Exchange Between SP↔PRI CPU)

The dual port memory inside the ASIC STL 7066 is used for IPC(Inter Processor Communication) between SP and the CPU in BRI. The memory performs other decoding logic, interrupt control, and priority adjustment simultaneously.

System Interface Clock Unit

The BRI trunk is composed of the LT-T mode and operates according to the system' standard clock based on the BRI line's clock. The synchronizing circuit synchronizes the entire system clock based on the 8KHz clock at the PLL of MCP/MCP2.

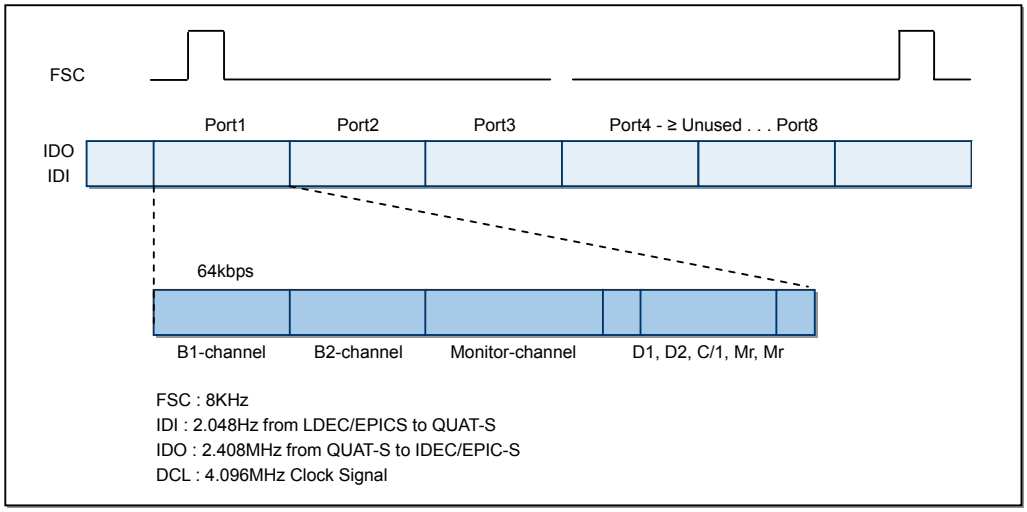


Figure 2.31 IOM2 Signal Definition

S0/T0 Feature

Basically, ISDN provides SO TRK(TE mode) of BRI and the intercom interface(NT mode) together. If TO interfaced by attaching the ISDN terminal to the intercom line, power feeding can be done.

5.16 AA Card

The AA card performs an automatic call forwarding for the external call received at the OfficeServ 500 system. The AA card is digitalized so that a recorded announcement can be broadcasted to the external call in place of the station operator. Also, the AA card allows a call to be automatically connected between an external caller and intercom user if the extension number is directly pressed at the external line. The voice message is a voice announcement that can be edited. A few basic sentences are used and various voices are edited, according to different situations. Then, one complete voice announcement is finished and broadcasted to the subscribers.

5.16.1 Block Diagram

The AA card is composed of the CPU, Memory, Data Conversion Unit, IPC Unit, and Channel Allocation Unit.
The block diagram of the AA card is shown below :

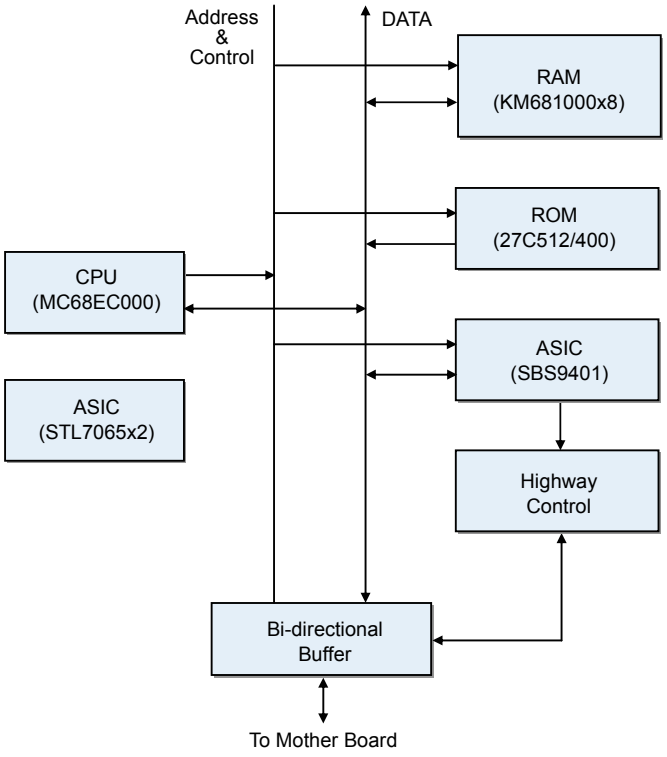


Figure 2.32 Block Diagram of the AA Card

5.16.2 Major Functions

Learn about the major functions of the AA card.

CPU and Memory

The CPU is for 8 bit. The 68EC000 of Motorola is used. The CPU and memory are composed of 32KB for the program and 992KB for voice recording/playing of the AA card. That is, the memory uses a total of 1MB SRAM, and is composed of ROM (27C512, 64KB) for the program and ROM(27C4001, 512KB) for a voice announcement.
The 8KHz frame sync is used as an external interrupt source. When an interrupt is generated, the CPU and memory read or write data of the corresponding port, and also remove the interrupt.

IPC (Inter Processor Communication)

This unit is used for IPC between the CPU and SP. Here, the reset, record and play data are exchanged and used as FLIP-FLOPs(74HC74).

DTMF Receiver

The DTMF receiver is recognized as two engine chips(STL7065), and uses the DSP function with 4 ports inside one engine chip.

Data Conversion Unit

The Data Conversion Unit converts the serial input of the highway into the parallel signal and simultaneously converts the parallel output of the memory into the serial signal. The PCM data of serial input is converted into the parallel signal in order to be saved in the memory, and HC595 is used for this purpose. The data saved in the memory need to be converted to serial data in order to be sent to the highway, and HC165 is used here.

Channel Allocation Unit

This unit is used for driving the output of each channel, and the SBS9401 ASIC is used. This can allocate 8 channels.

5.17 SVMi-8 Card

The SVMi-8 card is a module that provides a voice mail service. In the OfficeServ 500 System, one cabinet can accommodate a maximum of one SVMi-8 card.

5.17.1 Block Diagram

The block diagram of the SVMi-8 card is shown below :

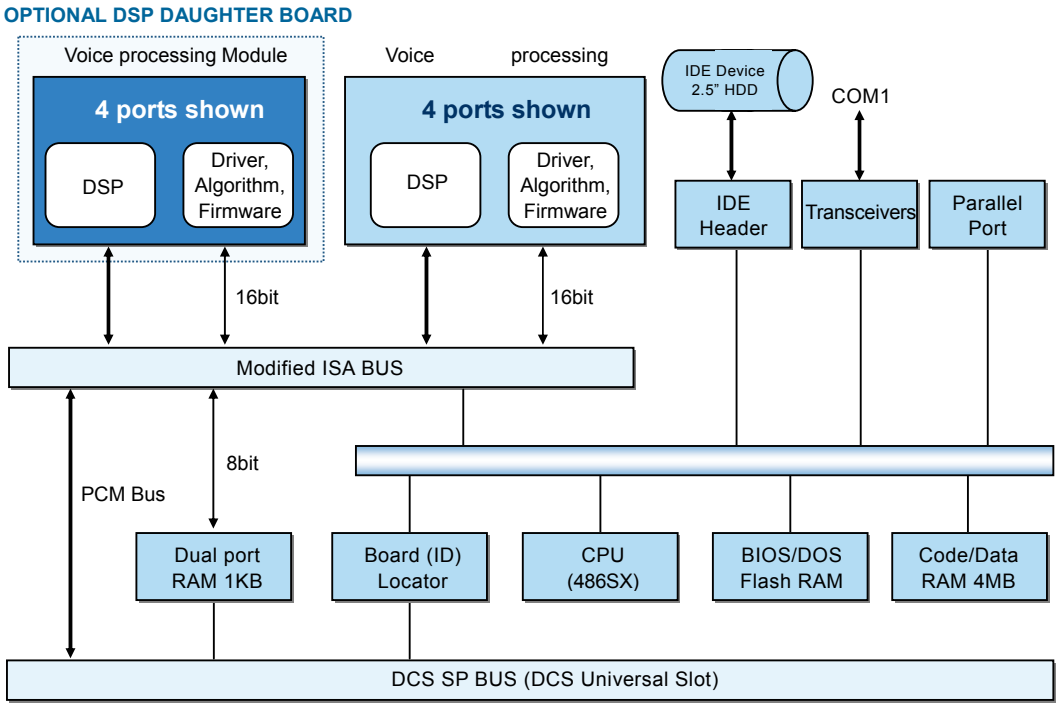


Figure 2.33 Block Diagram of the SVMi-8 Card

5.17.2 Major Functions

Learn about the major functions of the SVMi-8 card.

CPU

The AMD Elan SC410 Embedded PC, which is 486 CPU @33MHz, is used

DRAM

- 4MB DRAM, No SIMM or DIMM module is used.
- SAMSUNG K4E160812D-FC50 3.3V is used.

Auxiliary Memory Unit

A hard disk drive is used.

Peripherals and Connectors

- COM1 : DB9 Connector, Serial Port
- Usage : Terminal Emulation or External Modem Connection

LED

- D1(Green) : indicates the status of the hard disk drive. The green LED turns on while the hard disk drive is reading or writing. This LED is directly controlled by the hard disk drive.
- D2(Red/Green) : When the hard disk drive is abnormally operating or IOS initialization is failed, the red LED turns on. When it is normally operating, the green LED turns on.

Button

The S1 button is the reset button of the SVMi-8 board itself. If this button is pressed, the PC part of SBC and the BICOM DSP part will be reset.

Caution on the Reset Button While the SVMi-8 Card is Used

If the reset button is pressed during the operation of the SVMi-8 card, every call connection performed by the SVMi-8 card will be cleared. You shall take extra caution when using this button.

Real Time Clock

There is no self real time clock, but it receives time and other data from the system.

BIOS

- Phoenix PICO BIOS
- Embedded in Flash 128KB E-PROM(U2)

OS (Operating System)

Datalight DOS version 6.2 is used.

BICOM DSP

- 4 Channels per DSP are accommodated.
- Interface : BICOM DOS API version 3.06

System Interface

- The universal slot of the DCS Compact and DCS 50si are used.
- IPC for data exchanges is U20 CY7C131
- The time slot is SBC9401.

BICOM DSP Function

- BICOM Compression Rate
- DTMF Detection
- Audio Signal
  - AGC : selectable
  - Silence Threshold : below -40 dBm(Default). The value can be modified.
  - Average Transmit Level : controlled by AGC
  - Frequency Response : 300-2600Hz +/- 3dB(24kbps rate), 300-3400 Hz(32kbps rate)
- Volume control and message transfer : controlled by API.

5.18 SVMi-16 Card

Different from the previous PC-based voice mail/automatic switching systems, the SVMi-16 is built in the telephone system, and it operates as one of the telephone system components. The maximum number of the SVMi-16 cards to be mounted is 1 per system, and there is no limitation for the location.

5.18.1 Block Diagram

Refer to Figure 2.34 for the block diagram of the SVMi-16 card.

5.18.2 Major Functions

Learn about the major functions of the SVMi-16 card.

SBC (SVMi-16 Mother Board)

SBC means a single board computer, and it is the main circuit card that is connected to the OfficeServ 500 system. The disk drive and the voice-processing module are connected to this card. There are several connectors located in the front side of this card, but they do not have to be connected to execute the SVMi-16 card.

Serial Interface

The serial interface can be used to connect a modem or PC, and can be managed by a local or remote PC(This connector is called ‘SIO’).

Reset Button

The red button indicated with ‘RST’ is the Reset button. If this button is pressed, the SVMi-16 system is reset immediately, and every call that was being processed will be disconnected.
If the Reset button is pressed during the system operation, every caller will be disconnected and the SVMi-16 system will start again immediately.

In order to initiate SVMi-16 right after the SVMi-16 card is mounted and the power switch of the telephone system is turned on, this reset button must be pressed.

Caution on the Reset Button While the SVMi-16 Card is Used

If the reset button is pressed while the SVMi-16 card is processing calls, every data or file will be damaged. You shall take extra caution when using this button.

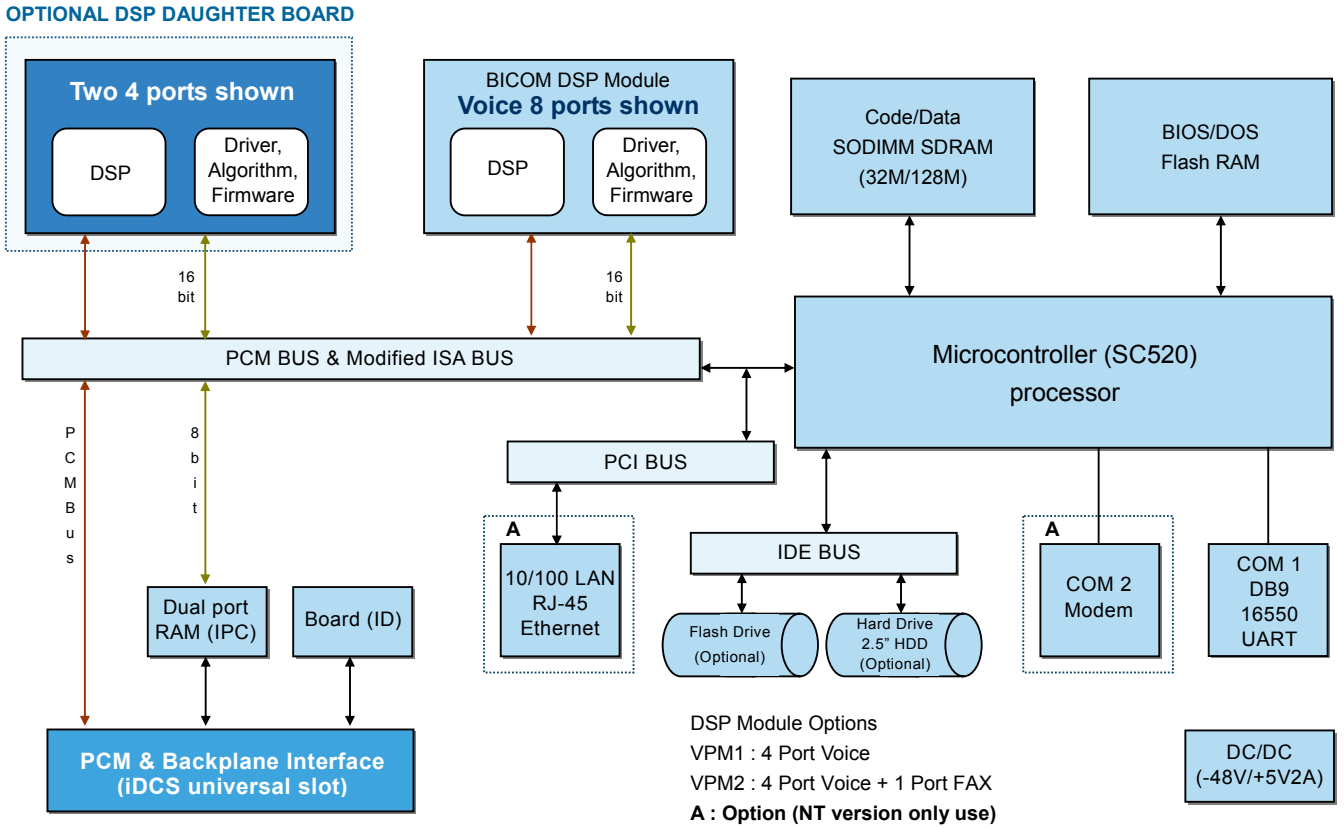


Figure 2.34 Block Diagram of the SVMi-16 Card

Back Plane Connector

The Back Plane Connector is a connector that goes to the telephone system.

LED Indicators

The SVMi-16 Mother Board has two LED indicators. The HDD will have a green light on when the hard disk drive is being accessed, and the ACT shows the operation status of the card.

- HDD connection LED
  When the HDD or Compact Flash connection LED memory is being accessed, a green LED turns on. This mode is similar to the hard disk connection LED of a desktop PC.

- Operation status LED
  The operation status LED indicates the operation status of the card. The green LED light means that the SVMi-16 is normally operating, and other statuses mean errors.
  - HD : flash on disk access.
  - LAN : The connector itself has the LAN activity LED.(for the NT version)
  - BI : indicates the operation status of BIOS.
  - PGD : Indicates the output status of DC/DC converter. When power supply is normal, ON.
  - PGR : Indicates the reset status. When resetting, ON.
  - SD : Indicates the status of Soft Shut Down Switch.(for the NT version)

VPM Connector

The VPM connector is the main connector for installing two voice-processing modules. This connector is used to install 4 ports of voice VPM or fax VPM.

Memory

This device is used to save not only every message and greeting but also the main system program. The amount of storage time that will be saved in the hard disk drive is in MB unit, and will be determined by the drive size.
This memory unit composes the hard disk. Currently, the size of this memory is 100 hours. The memory for SVMi-16 can be used only at Samsung.
The hard disk drive can be removed or replaced when a problem occurs or during an upgrade. The hard disk drive will be connected to SBC by using a ribbon cable.
The connector on the hard drive has 4 auxiliary pins, and these pins are usually not used.

- Memory(for replacement)
  To design the memory interface, an engineer must consider auxiliary memory formats(Compact Flash) that should be included in this design. For more details, ask the reseller where the product has been purchased.

Voice Processing Module (VPM)

Each VPM has 4 channels. This means that 4 callers can be simultaneously connected to the SVMi-16 card for each VPM. The VPM is attached to the SBC by using the end of the connector.
Each SVMi-16 basically has 8 channels without VPM. Therefore, the SVMi-16 card can process up to 16 calls simultaneously by installing two VPM boards.
The voice-processing module of 4 ports is a hardware board called VPM. If this is installed in the SVMi-16 card, the number of usable ports is increased from 8 to 16.

VPM Types

The two types of VPM are '4 Voice' VPM and '3 Voice + 1 Fax' VPM.

- 4 Voice VPM(VPM). 4 Port-Voice Processing Module
  The VPM installed in this card provides 4 voice channels or ports. This allows 4 callers to use the SVMi-16 service simultaneously.

- 3 Voice+1 Fax VPM(VPM). 4 Port-Voice Processing Module, of one port supports Fax.
  The VPM installed in this card provides 4 voice channels or ports. This allows 4 callers to use the SVMi-16 service simultaneously. One of these ports can be used for a Fax service of the SVMi-16 card. This module shall be installed in the SVMi-16 motherboard, which is on the fartherest position from where the dual connector is located from the memory module.

Data Modem Module (For the NT version)

The SIO port is supported for a remote programming or software maintenance.

Ethernet (LAN : For the NT version)

In the NT version, LAN can be connected for a remote programming or software maintenance.

5.19 8WLI Card (To be released at a later time)

The 8WLI card is a system card that is connected to the WBS24 BTS in order to provide a wireless LAN function. For the BTS, the WBS24 card(This will be released at a later time) will be used. A maximum of 8 base stations will be served from one 8WLI, and a maximum number of simultaneous calls are 32 channels. 48 terminals can be registered and used.

5.19.1 Block Diagram

The block diagram of the 8WLI card is shown below :

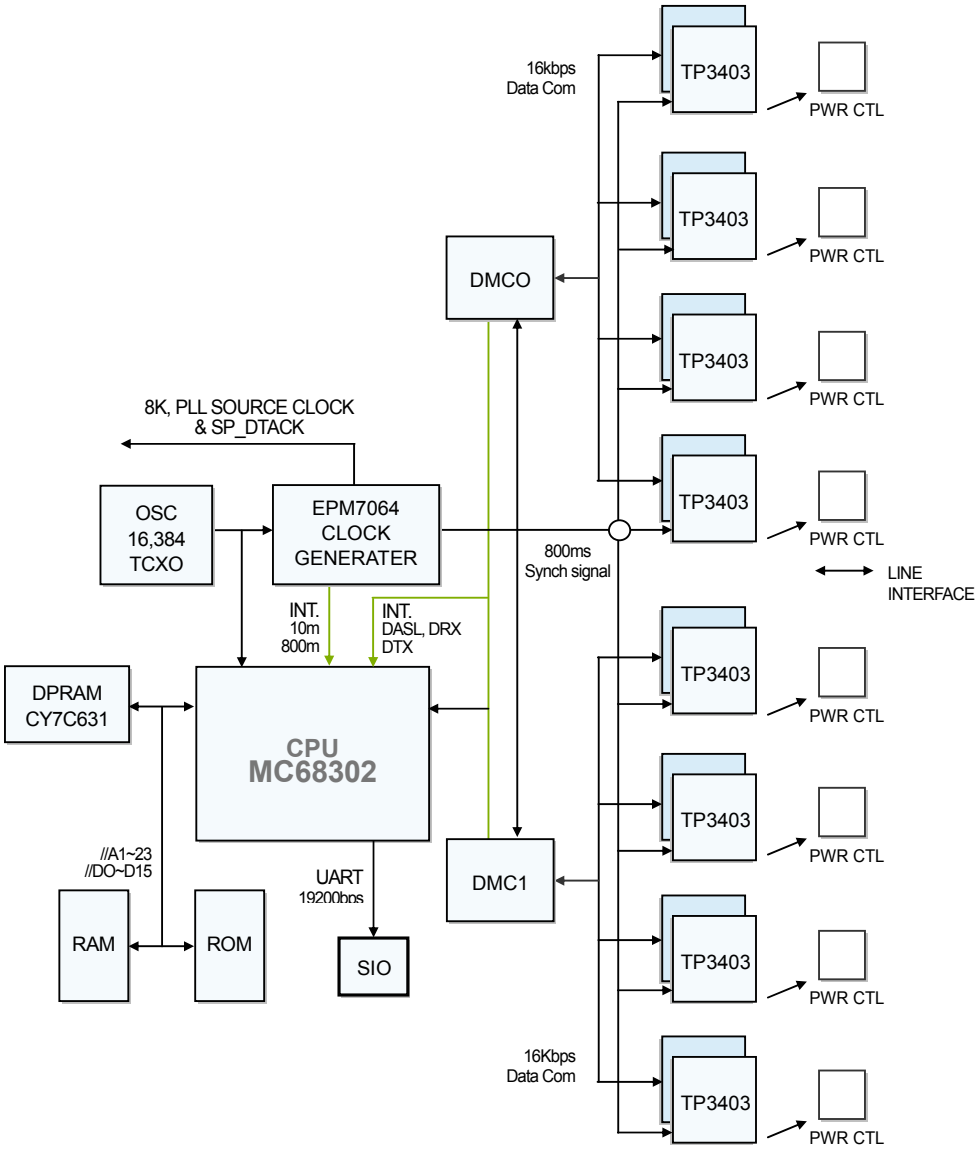


Figure 2.35 Block Diagram of the 8WLI Card

5.19.2 Major Functions

Learn about the major functions of the 8WLI card.

CPU

The MC68302 of Motorola is used, and the operation speed is increased using 16 bit Word Operation.

The dedicate-Interrupt mode is selected to used the followings :
LEVEL7 is ABORT,
LEVEL6 is DASL INT,
LEVEL4 is DASL UART Rx, Tx, 10ms INT, and
LEVEL1 is 800ms INT.

Using the I/O port, the time for DASL SYNCH data transmission is adjusted.
The I/O user interface uses SCC3 inside the processor, and the speed is 9600bps.
The modified program can be directly upgraded through a PC by using Flash memory of 8 Mbits(1MB) as the program memory. For the Word Operation, two of 4 MBits RAM(Total : 1MB) are used.

BTS Interface Unit

Two DMC ASIC chips perform the assignment of time slots for 16 DASL transport chips, UART data communications, and micro control.

Through MBS mode, the DASL transport chip receives the frame signals of identical timing from BTS terminals connected to each port. Also, two DASL chips are connected to each BTS. The first DASL supports UART interface between the BTS and the 8BSI board through 16kbps data communications. The second DASL uses the DEN mode and transports 800 ms multi-frame signals(within two clock periods of 2.048MHz B) to every BTS.
To obtain a space on the PCB, the EPLD board is used. At the output terminal of TTL Level, PULL_UP of 1.2KΩ is added to implement connection with the CMOS device.
Using the MOSFET, the power feeding control by S/W is available for each port.

Reset Unit

The reset unit uses the WATCH_DOG chip to prevent abnormal system operation due to voltage changes and obtain the power on reset timing margin. The manual reset switch and the NMI switch should be applied to this reset unit. Thus, the monitoring function for system operation can be enhanced.

5.20 WBS24 Repeater (To be released at a later time)

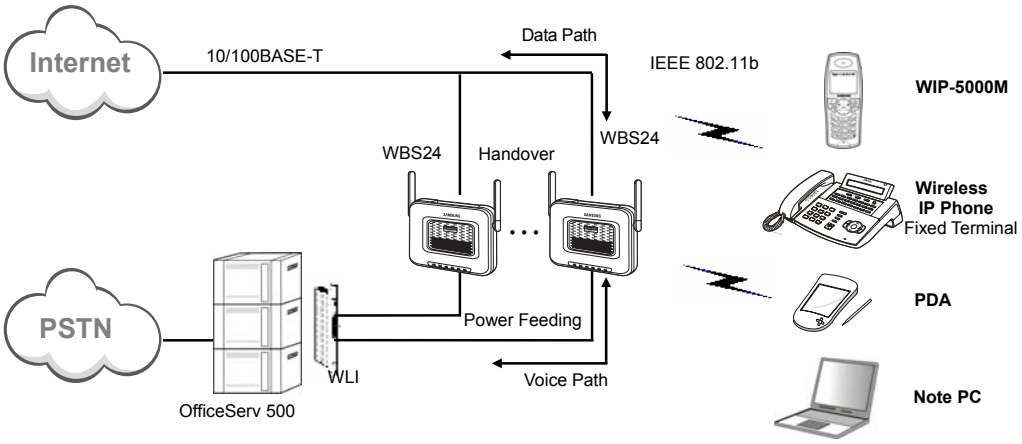
The WBS24(Wireless Base Station 2.4GHz) is a wireless LAN access point with the system.

5.20.1 Block Diagram

Refer to Figure 2.37 for the block diagram of the WBS24 card.

5.20.2 Major Functions

As shown in Figure 2.37, the WBS24 interworks with the system through the 8WLI installed in the keyphone system and provide wireless voice and data services to the system. Also, the WBS24 transmits voice data received from WIP-5000M(a wireless terminal dedicated for a voice service) to the keyphone system, and the data received from a notebook PC or PDA are transmitted to LAN.



WBS24 : Wireless Base Station 2.4GHz
WLI : Wireless LAN Interface card built – in system
WIP-5000M : Wireless IP Phone (WLAN + VoIP) as a portable terminal

Figure 2.36 Connection Diagram of the Keyphone System

After interworking with the system, the WBS24 has the following capacity and major functions :

A maximum of one 8WLI can be mounted on the OfficeServ 500 system.

- A maximum of 8 WBS24 cards can interwork with one WLI.
- A maximum of 4 voice channels(simultaneous calls) for one WBS24.
- Radio propagation : Indoor : 50M(may differ according to the interrupting objects in the office). Outdoor : greater than 200M(no interference within the visible area.)
- -48V is supplied from the system. The cable length can be extended up to 500M.
- Formation /maintenance of a speech path, and the handover function.
- Echo Cancellation, Voice CODEC(G.729, G.723.1) function

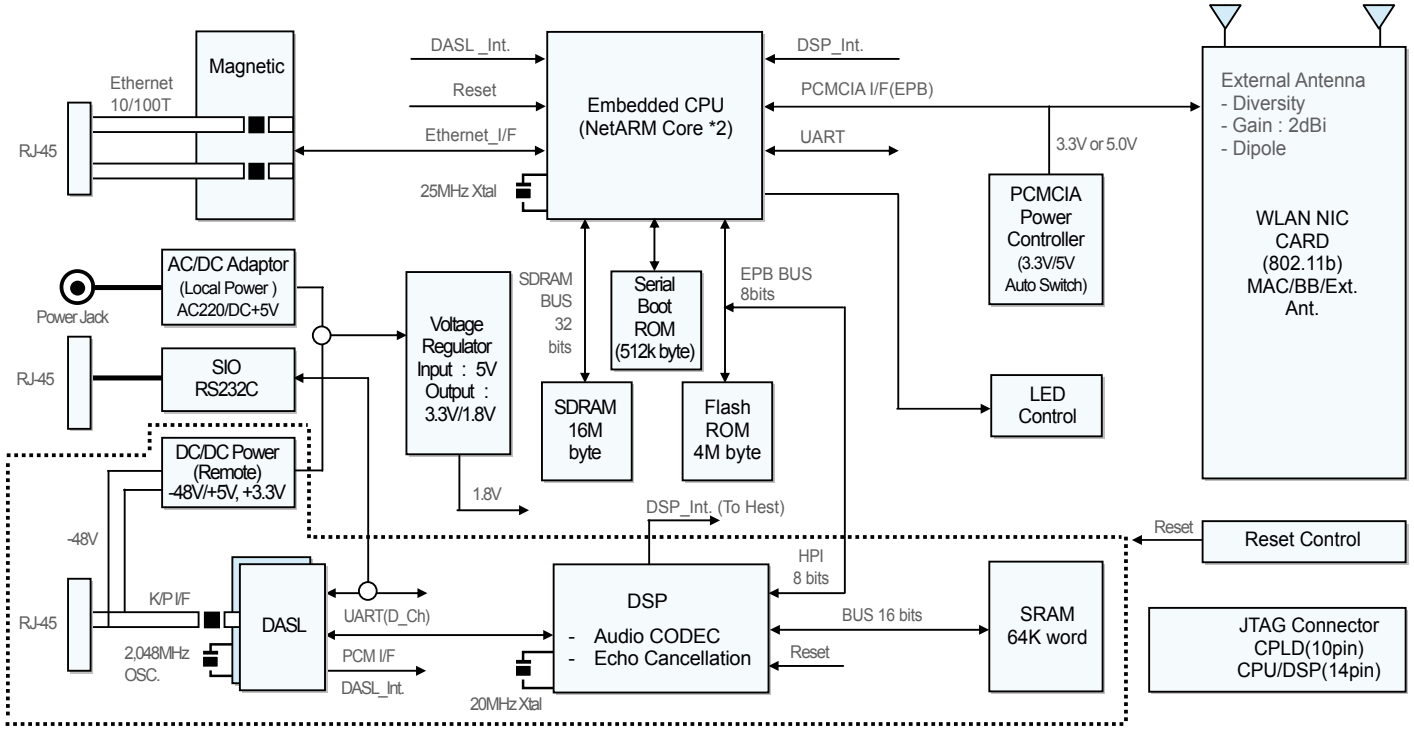


Figure 2.37 Block Diagram of the WBS24 Card

WBS24 Interface

As shown in Figure 2.37, the WBS24 is largely composed of wired and wireless interfaces. The wired interface has two types of interfaces : an interface with the system and an interface with LAN. The wireless interface is an air interface that complies with the IEEE802.11b standard.

Wired Interface 1 : Interworking with the keyphone system

This is the DASL(Digital Adpator Subscriber Loops), which is the digital transmission device at a speed of 144kbps(2B+1D), and interfaces with the 8WLI. One WBS24 supports two DASL lines, and one DASL line provides two voice channels. Therefore, one WBS24 can support a total of 4 channels simultaneously. Also, the D-channel information for a voice call formation is received/transmitted through the DASL at a speed of 16kbps. The device receives the voice packet data from a wireless interface device and exchanges it with the system, so a speech path is formed or maintained.

Wired Interface 2 : Interworking with LAN

10/100 Base-T. This is the Ethernet RJ-45 interface device that complies with the IEEE 802.3 standard. This is a processing channel that processes the Rx/Tx data from a wireless interface device to LAN. That is, this interface device processes certain data required for an Internet access, excluding voices.

Wireless Interface

2.400GHz-2.4835GHz of the radio frequency bandwidth is used, and the device complies with the IEEE 802.11b standard. The voice dedicated terminal, WIP-5000M is used to receive/transmit the voice packets through VoWLAN, and the wireless terminal such as a notebook PC or PDA is used to receive/transmit the data packets via an air interface.
As shown in the table below, the wireless channels used in Korea and the U.S.A are summarized. Korea uses 13 channels and the U.S.A uses 11 channels. One wireless channel occupies a bandwidth of 22MHz and the interval between the center frequencies is 5MHz. Therefore, 4 channels should be apart from each other to make a clear channel, not interrupting any neighboring wireless channel.

Major Specifications

- 4 channels of simultaneous calls can be supported for one WBS24.
- The cable length can be extended up to 500M between the system and WBS24. (Based on the AWG24 UTP cable)
- The transmission speed between wireless sections may be lowered slightly due to interruptions in short distances that use the bandwidth of 2.4MHz.
- Voice/data switching function

- Wireless voic and data can be processed simultaneously
- Supports various Voice CODECs.(G.729, G.723.1)
- Echo Cancellation
- Digital Modulation/Demodulation(CCK, BPSK, QPSK)
- Multi Data Rate(1, 2, 5.5, 11Mbps)
- Remote Power Feeding(From system -48V)
- SIO(RS-232C) for debugging
- PCMCIA interface function

Table 2.5 Specifications of the WBS24 Interworking Systems

Item	System Specifications	Remarks
RF Module	- Wireless Standard : IEEE 802.11b - Data Rate : a maximum of 11Mbps - Security Feature : WEB 64/128-bit encryption - Output Power : a maximum of 100mW(NIC Card 70mW) - Channel : 13 Channel(Non Overlap Channel : 3) - Interface : PCMCIA	
Ethernet	- 10/100Base-T(IEEE802.3) : RJ45 Connector	
Power Feeding	- Local Power : AC/DC Adpator(AC 220/DC 5V, 2A) - Remote Power : DC/DC Converter(-48V/+5V,3.3V1A)	
Antenna(External)	- Frequency : 2400-2500MHz - Antenna Gain : 2.0dB - Beam-Width : Omni directional(Dipole) - Diversity is supported	- Depending on the installation site, the directional antenna can be installed.
VoIP	- Audio CODEC. : G.711, G.726 - Echo Cancellation : 8msec-16msec - Voice Channel : 4 Channels are supported	
Keyphone Interface	- Digital I/F(DASL) supplied by NS : RJ-45 - Voice Channel : 4 Channels(DASL*2) - Power feeding function through the DASL line (Remote Power Supply) - DASL Line Extension : a maximum of 500M	
Others	- SIO for monitoring : RS232C	

WLAN NIC (IEEE802.11b Wireless LAN Card; PCMCIA I/F)

The wireless LAN RF unit for the WBS24 has adopted a commercial NIC of PCMCIA Interface, which received WIFI's authorization from WECA. The wireless data can be received/transmitted at the maximum speed of 11Mbps.
The wireless LAN NIC card is composed of 4 Prism2.5 chips supplied by Intersil,

and this card can have an external antenna installed on. The voice/data packets are first occupied in an air interface area via the CSMA/CA mode. Other BTSs can take a chance to receive/transmit the packets only after the previously occupied packets are done receiving/transmitting. Therefore, several terminals can receive/transmit packets in wireless zones.
But, since several terminals may occupy the air section through this mode, the air occupancy rate for receiving/transmitting packets is decreased and the wireless throughput is lowered. When a little bit of Internet access and email service is used in the wireless office, about 20 users can use data through wireless LAN with one AP, which accepted the IEEE802.11b DSSS mode.

- Wireless Standard : IEEE 802.11b
- Data rate : 11Mbps(Max), 5.5Mbps, 2Mbps, 1Mbps
- Modulation : CCK, BPSK, QPSK
- Network architecture : Ad-hoc, infrastructure
- Security Feature: WEB 64/128-bit encryption
- Output Power : Maximum output 100mW(NIC Card 70mW)
- Channel : 13 Channel(Non Overlap Channel : 3)
- Interface: PCMCIA
- Frequency : 2400-2483.5MHz
- Antenna Gain : 2.0dBi
- Beam-Width : Omni directional(Dipole)
- Diversity supported here

LED

Learn about the LED names and usage according to the LED numbers as summarized in a simple table below :

Table 2.6 LED Functions of the WBS24 Card

LED Number	Name	Usage
0	PWR	Indicates 'Power On'(no S/W control)
1	WLAN	WLAN link(OFF : Disconnected , ON : Connected)
2	LAN	Ethernet link(OFF : Disconnected, ON : Connected)
3	WLI	DASL link(OFF : Disconnected, ON : Connected)
4	LD1	Indicates B channel has been selected.(OFF : 0 channel is occupied, BLINK : 1 channel is occupied, ON : 2 channels are occupied)
5	LD2	Indicates B channel has been selected.(OFF : 0-2 channels are occupied, BLINK : 3 channels are occupied, ON : 4 channels are occupied)

6 DAUGHTER BOARD

Resource commonly applied to the system, the daughter board is mounted on specific cards. The table below shows each type of daughter boards with their applicable cards, slot location, and function.

Table 2.7 Types of Daughter Boards

Daughter Board	Mounted Card	Mounted Location	Function
ESM	MCP/MCP2	LOC 1	Time slot expansion
IPM	MCP only	LOC 2	Message transfer between cabinets and memory expansion
LAN	MCP only	LOC 2 LOC 3	10Mbps Ethernet LAN port
MISC	MCP/MCP2	LOC 3	Ports connectable to various external devices - Two Hold/BGM sound source port - One external page output port - One auxiliary loud bell port - One common bell port - Two dry contact port
	SCP/SCP2 LCP/LCP2	LOC 2	
SCM	MCP/MCP2 SCP/SCP2	LOC 1 LOC 2 LOC 3	Eighteen groups for conference expansion and twelve DSP circuits for DTMF and tone detection
MFM	MCP/MCP2 SCP/SCP2 LCP/LCP2	LOC 1 LOC 2 LOC 3	Twelve DSP circuits for DTMF and tone detection
RCM	MCP/MCP2 SCP/SCP2 LCP/LCP2	LOC 1 LOC 2 LOC 3	Fourteen channels for Caller ID detection circuit or eight channels for R2 signaling circuit
ITM3D	ITM3/MGI3	ITM3D	Eight channels for VoIP port
MODEM	IOM	MODEM	Board for additional 56Kbps modem

6.1 ESM Board

Used only in the OfficeServ 500-L system, the ESM board is the daughter board for time switch expansion that is mounted on LOC1 of MCP/MCP2. The maximum number of channels provided by the time switch is 1024 x 1024 channels, which is equivalent to 32 highways.

6.1.1 Block Diagram

The Block Diagram of the ESM board is illustrated below.

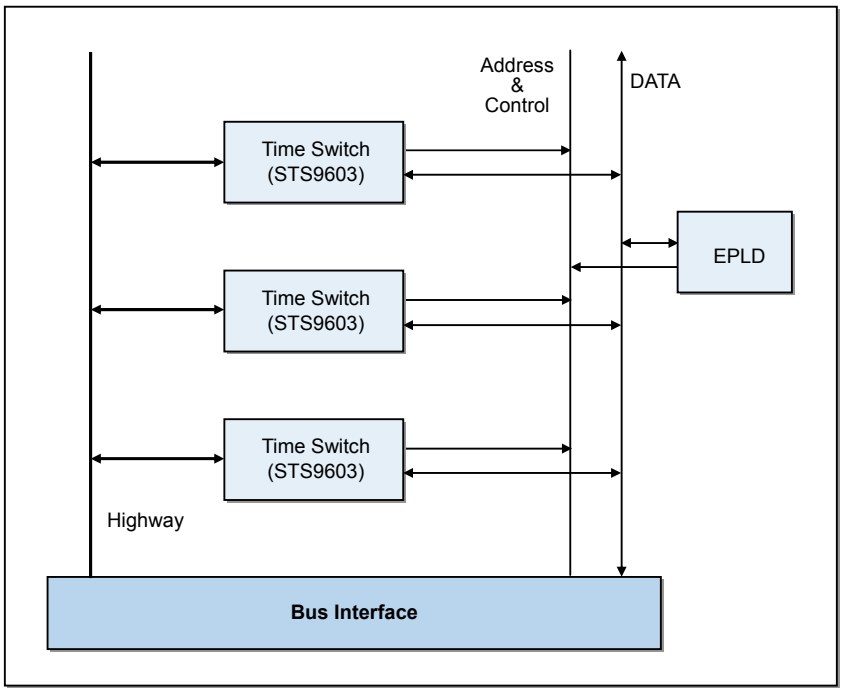


Figure 2.38 Block Diagram of the ESM Board

6.1.2 Highway Configuration

The number of channels assigned to each slot of OfficeServ 500-M and OfficeServ 500-L is described below. The highway channel configuration of MCP and MCP2 are identical.

Highway Allocation of OfficeServ 500-M

The number of PCM channels assigned to each slot is shown below.

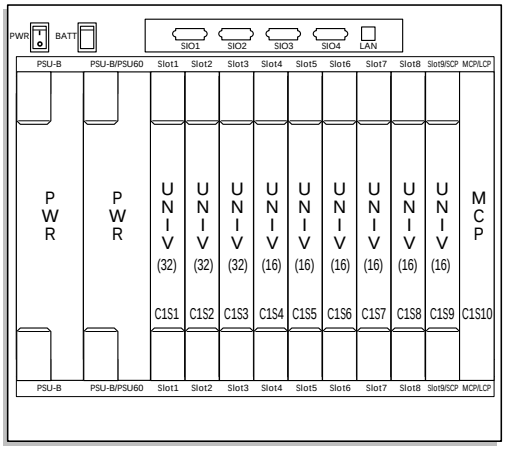


Figure 2.39 Number of Channels per Slot in OfficeServ 500-M

Table 2.8 Number of Channels in OfficeServ 500-M

Switch	Module				Highway			Remark
	Cabinet	Slot	PBA	Daughter Board	No.	Tx	Rx	
512 x512	C#1	C1S1	UNIV	-	Highway 10	ch00~ch31	ch00~ch31	
		C1S2	UNIV	-	Highway 11	ch00~ch31	ch00~ch31	
		C1S3	UNIV	-	Highway 12	ch00~ch31	ch00~ch31	
		C1S4	UNIV	-	Highway 13	ch00~ch15	ch00~ch15	
		C1S5	UNIV	-	Highway 13	ch16~ch31	ch16~ch31	
		C1S6	UNIV	-	Highway 14	ch00~ch15	ch00~ch15	
		C1S7	UNIV	-	Highway 14	ch16~ch31	ch16~ch31	
		C1S8	UNIV	-	Highway 15	ch00~ch15	ch00~ch15	
		C1S9	UNIV	-	Highway 15	ch16~ch31	ch16~ch31	
		CIS10	MCP	SCM/MFM	Highway 06	ch00~ch31	ch00~ch31	Conference
					Highway 05	ch00~ch31	ch00~ch31	Conference
					Highway 04	ch00~ch31	ch00~ch31	Conference
					Highway 01	-	ch00~ch11	MFR 12ch
				RCM	Highway 01	-	ch16~ch29	R2 8ch /CID 14ch
					Highway 01	ch00~ch29	-	R2 Tx 30ch
				MISC	Highway 01	ch30~ch31	ch30~ch31	MISC, 2ch
				MODEM	Highway 00	ch00	ch00	
				MUSIC	Highway 02	ch00	-	Internal Music 1
		M B'd		7065	Highway 03	ch00~ch31	ch00~ch31	Conference
					Highway 00	ch01~ch31	-	DTMF Sender 32ch
					Highway 01	-	ch12~ch15	MFR, 4ch

Highway Allocation of OfficeServ 500-L

The number of PCM channels assigned to each slot is shown below. Each cabinet features three 32 channel slots and six 16 channel slots. Therefore, the TEPRI card shall be mounted on the 32 channel slot.

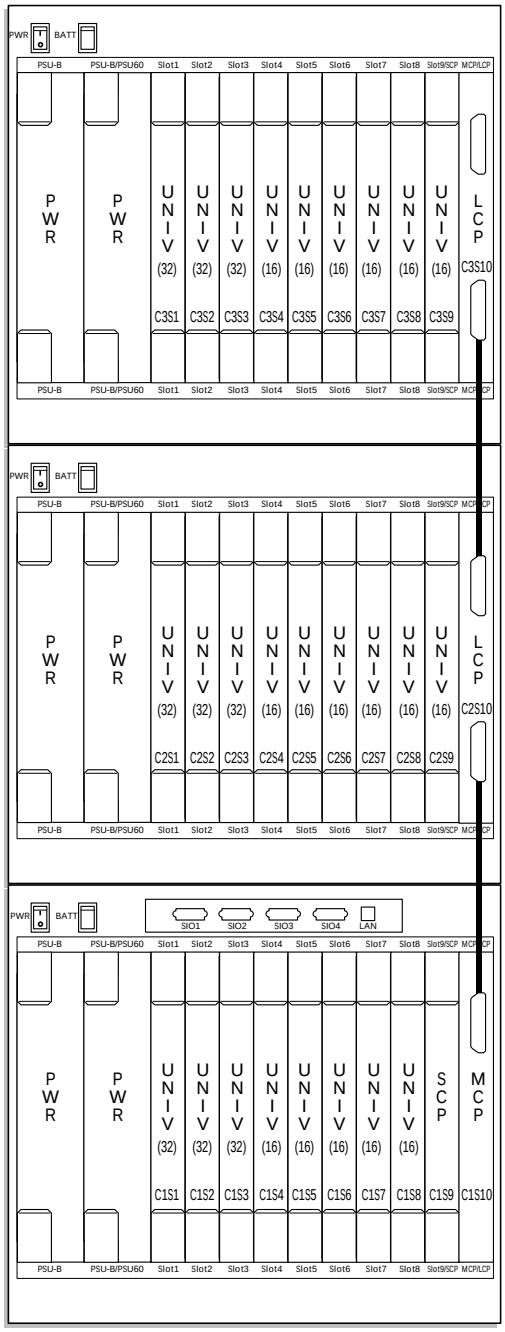


Figure 2.40 Number of Channels per Slot in OfficeServ 500-L

Table 2.9 Number of Channels in OfficeServ 500-L

Switch	Module				Highway			Remark
	Cabinet	Slot	PBA	Daughter Board	No.	Tx	Rx	
1024 x1024	C#1	C1S1	UNIV	-	Highway 10	ch00~ch31	ch00~ch31	
		C1S2	UNIV	-	Highway 11	ch00~ch31	ch00~ch31	
		C1S3	UNIV	-	Highway 12	ch00~ch31	ch00~ch31	
		C1S4	UNIV	-	Highway 13	ch00~ch15	ch00~ch15	
		C1S5	UNIV	-	Highway 13	ch16~ch31	ch16~ch31	
		C1S6	UNIV	-	Highway 14	ch00~ch15	ch00~ch15	
		C1S7	UNIV	-	Highway 14	ch16~ch31	ch16~ch31	
		C1S8	UNIV	-	Highway 15	ch00~ch15	ch00~ch15	
		CIS9	SCP	SCM/MFM	Highway 06	ch00~ch31	ch00~ch31	Conference
					Highway 05	ch00~ch31	ch00~ch31	Conference
					Highway 04	ch00~ch31	ch00~ch31	Conference
					Highway 01	-	ch00~ch11	MFR, 12ch
				RCM	Highway 01	-	ch16~ch29	R2 8ch /CID 14ch
					Highway 01	ch00~ch29	-	R2 Tx 30ch
				MISC	Highway 01	ch30~ch31	ch30~ch31	MISC, 2ch
		CIS10	MCP	ESM	Highway [00…31]	ch00~ch31	ch00~ch31	Switch
				IPM	-	-	-	IPC
				MODEM	Highway 00	ch00	ch00	
				MUSIC	Highway 02	ch00	-	Internal music 1ch
		M B'd		7065	Highway 03	ch00~ch31	ch00~ch31	Conference
					Highway 00	ch01~ch31	-	DTMF Sender 32ch
					Highway 01	-	ch12~ch15	MFR, 4ch
	C#2	C2S1	UNIV	-	Highway 16	ch00~ch31	ch00~ch31	
		C2S2	UNIV	-	Highway 17	ch00~ch31	ch00~ch31	
		C2S3	UNIV	-	Highway 18	ch00~ch31	ch00~ch31	
		C2S4	UNIV	-	Highway 19	ch00~ch15	ch00~ch15	
		C2S5	UNIV	-	Highway 19	ch16~ch31	ch16~ch31	
		C2S6	UNIV	-	Highway 20	ch00~ch15	ch00~ch15	
		C2S7	UNIV	-	Highway 20	ch16~ch31	ch16~ch31	
		C2S8	UNIV	-	Highway 21	ch00~ch15	ch00~ch15	
		C2S9	UNIV	-	Highway 21	ch16~ch31	ch16~ch31	

Switch	Module				Highway			Remark
	Cabinet	Slot	PBA	Daughter Board	No.	Tx	Rx	
1024 x1024	C#2	C2 S10	LCP	MFM	Highway 28	-	ch00~ch11	MFR, 12ch
				RCM	Highway 28	ch00~ch29	ch16~ch29	R2 8ch /CID 14ch
				MISC	Highway 28	ch30~ch31	ch30~ch31	MISC, 2ch
		M B'd		7065	Highway 28	-	ch12~ch15	MFR, 4ch
	C#3	C3S1	UNIV	-	Highway 22	ch00~ch31	ch00~ch31	
		C3S2	UNIV	-	Highway 23	ch00~ch31	ch00~ch31	
		C3S3	UNIV	-	Highway 24	ch00~ch31	ch00~ch31	
		C3S4	UNIV	-	Highway 25	ch00~ch15	ch00~ch15	
		C3S5	UNIV	-	Highway 25	ch16~ch31	ch16~ch31	
		C3S6	UNIV	-	Highway 26	ch00~ch15	ch00~ch15	
		C3S7	UNIV	-	Highway 26	ch16~ch31	ch16~ch31	
		C3S8	UNIV	-	Highway 27	ch00~ch15	ch00~ch15	
		C3S9	UNIV	-	Highway 27	ch16~ch31	ch16~ch31	
		C3 S10	LCP	MFM	Highway 29	-	ch00~ch11	MFR, 12ch
				RCM	Highway 29	ch00~ch29	ch16~ch29	R2 8ch /CID 14ch
				MISC	Highway 29	ch30~ch31	ch30~ch31	MISC, 2ch
		M B'd		7065	Highway 29	-	ch12~ch15	MFR, 4ch

6.1.3 Highway Configuration Diagram

The Highway Configuration Diagram of the ESM board is illustrated below.

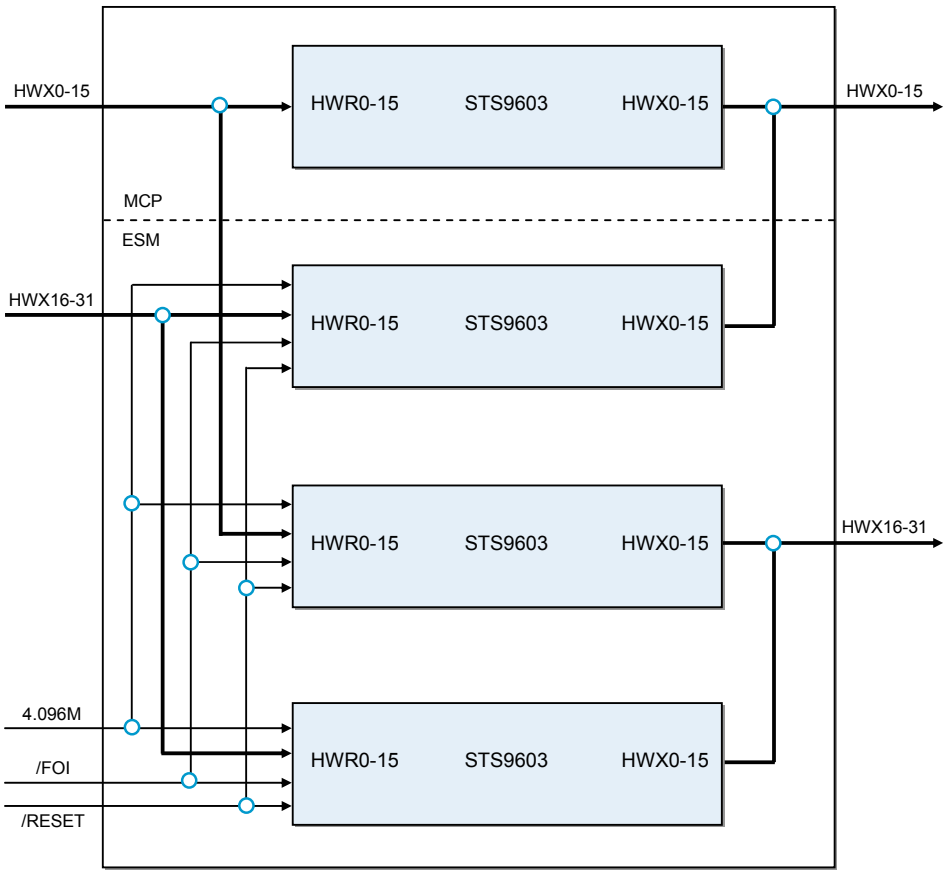


Figure 2.41 Highway Configuration Diagram of the ESM Board

6.2 IPM Board

Used only in the OfficeServ 500-L system, the IPM board, which is the daughter board for the message transfer between cabinets and for memory expansion, provides memory expansion and HDLC communication between cabinets.

> NOTE
> The IPM board is not used in systems configured with the MCP2 card.

6.2.1 Block Diagram

The Block Diagram of the IPM board is illustrated below.

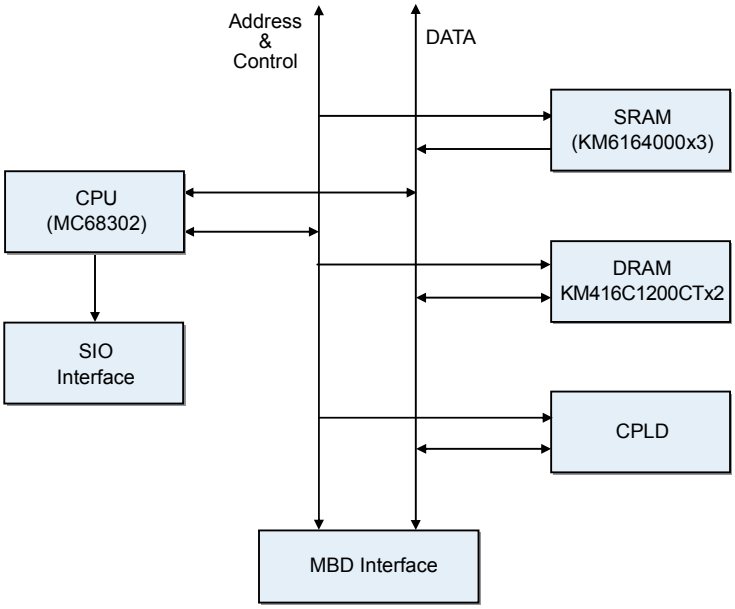


Figure 2.42 Block Diagram of the IPM Board

6.2.2 Main Features

The key functions of the IPM board are described below.

CPU (MC68302)

The MC68302/25M processor is used in the IPM board, which operates in the Disable CPU mode. Only the SIO, not the CORE processor inside the processor, is used in the Disable CPU mode. Thus, the processor of the IPM board is considered SIO Peripheral in the MCP card. The SCC1 of the processor performs HDLC communication with the SCP card mounted on the basic cabinet(C#1) while SCC2 performs HDLC communication with the LCP card of the first expansion cabinet (C#2) and SCCE performs HDLC communication with the LCP card of the second

expansion cabinet(C#3). All signal lines in the HDLC communication with the LCP card is transferred after being converted through the RS422 system. The Baud Rate Generation of SCC processes the values to the corresponding register inside the CPU through software.

DRAM

The DRAM of the IPM board consists of two 2MB DRAMs, thus 4MB of additional DRAM is provided when the IPM board is mounted. The Asynchronous DRAM is used and the DRAM controller is built in the PLD of the MCP card.

SRAM

The SRAM of the IPM board consists of three 512KB SRAMs, thus 1.5MB of additional SRAM is provided when the IPM board is mounted.

6.3 LAN Board

The LAN board is the daughter board mounted on the MCP card and provides the system SIO and the LAN network interface that is used for running applications.

> NOTE
>
> The LAN board is not used in systems configured with the MCP2 card.

6.3.1 Block Diagram

The Block Diagram of the LAN board is illustrated below.

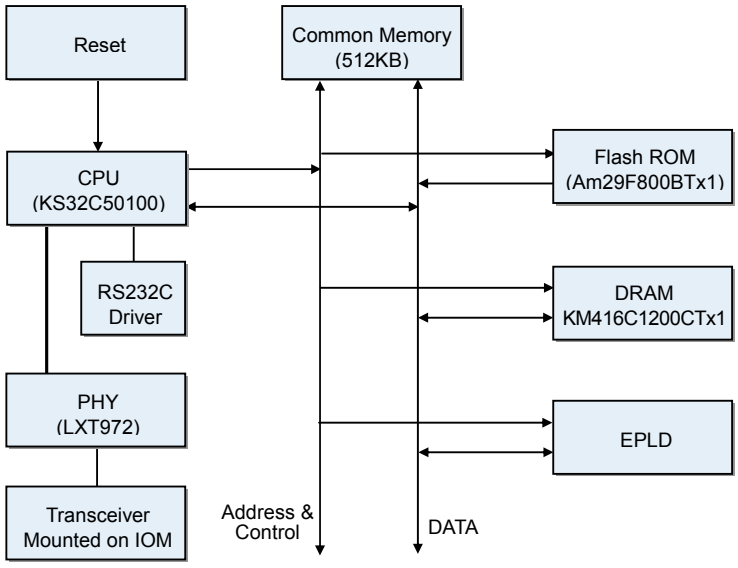


Figure 2.43 Block Diagram of the LAN Board

6.3.2 Main Features

Key functions of the LAN board are described below.

CPU (KS32C50100)

The Samsung network CPU is used as the processor. The CPU has a 32-bit bus architecture and the bus width complies with the register setting. The Boot ROM is driven in 8 bit when reset.

BOOT ROM (Flash ROM)

The BOOT ROM uses a 512KB flash memory and features an 8 bit data bus. Programs required for booting the LAN board is saved in the BOOT ROM, which can be downloaded from the MCP card for upgrade when necessary.

DRAM

A 16MB Synchronous DRAM is used and the data bus is configured to 32 bit.

MCP Interface

Messages are exchanged with the MCP card through the Common Memory system, using 512KB common memory. The hardware configuration logic, which enables both the MCP card and the LAN board to access the common memory, is configured inside CPLD.

PHY (LXT972)

The LEVEL ONE LXT972 is used as the physical interface for LAN connection. MAC is not separately configured externally since it is provided within the CPU. The RJ-45 connector for connecting the LAN cable is located on the IOM board and the LAN board does not provide routing functions.

6.4 MISC Board

The MISC board provides External Music, Paging, Loud Bell, and Dry Contact. The MISC board is mounted on the MCP card in the OfficeServ 500-M system and on the SCP or LCP card in the OfficeServ 500-L system, and the mounting locations are fixed for each board. The Frame SYNC and 2MHZ signals for transferring PCM voice data are generated from CPLD.

6.4.1 Block Diagram

The Block Diagram of the MISC board is illustrated below.

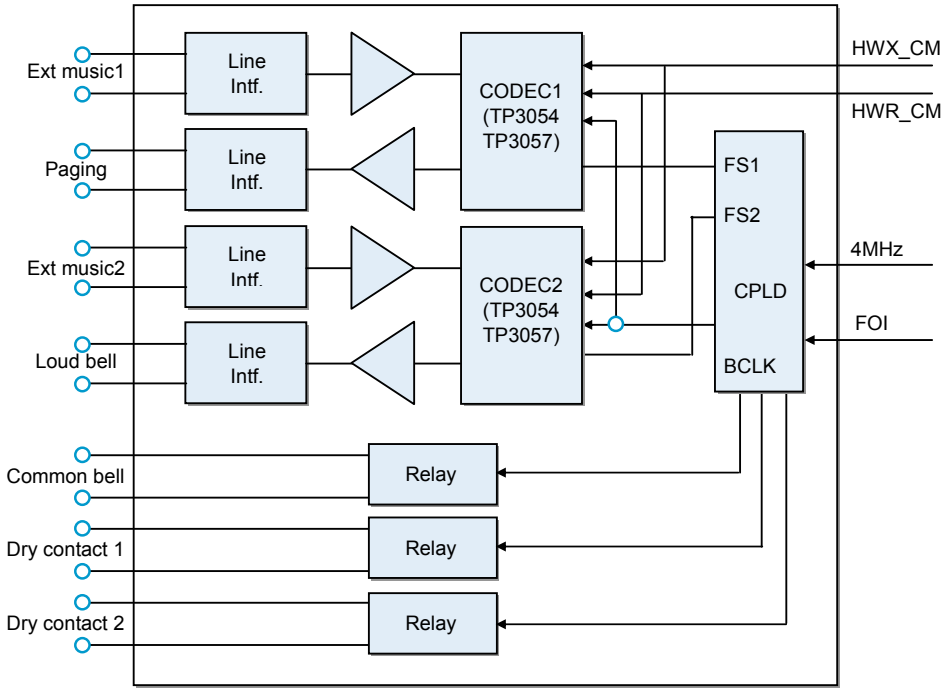


Figure 2.44 Block Diagram of the MISC Board

6.4.2 Main Features

The key functions of the MISC board are described below.

External Music

Two ports per a MISC board are provided for the external music. The A-LAW CODEC and U-LAW CODEC are both supported and selected automatically at CPLD. Therefore, you do not need to select the CODEC according to the corresponding system.

Paging

Paging allows you to make announcements to preset groups.

Loud Bell

Loud Bell alarms external areas of an incoming call.

Dry Contact

Three Dry Contacts are supported to control the power of external equipments.

6.5 SCM Board

The SCM board, which provides the 12-channel DTMF receiver feature and the conference feature that supports up to 18 groups with 5 characters, is mounted on the MCP card in the OfficeServ 500-M system and on the SCP card in the OfficeServ 500-L system.

6.5.1 Block Diagram

The Block Diagram of the SCM board is illustrated below.

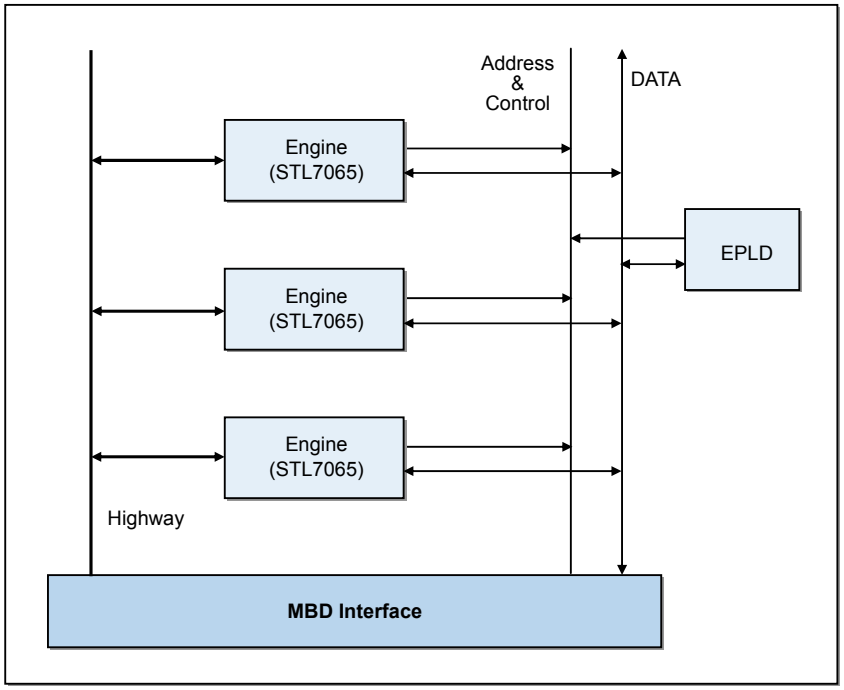


Figure 2.45 Block Diagram of the SCM Board

6.5.2 Highway Configuration Diagram

The Highway Configuration Diagram of the SCM board is illustrated below.

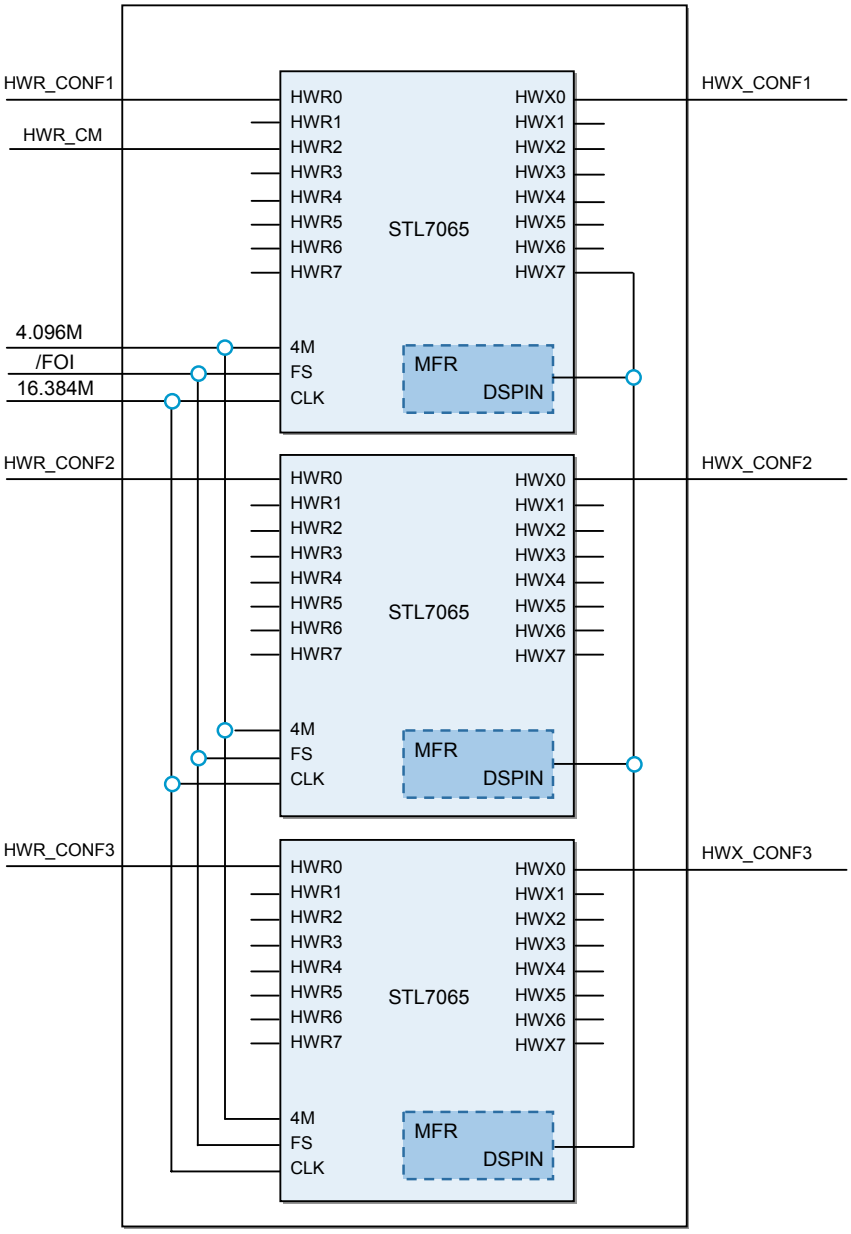


Figure 2.46 Highway Configuration Diagram of the SCM Board

6.6 MFM Board

The MFM board is built in an architecture that is identical to that of the SCM board but provides only the 12-channel DTMF receiver feature without the conference feature. The MFM board is mounted on the MCP card in the OfficeServ 500-M system and on the SCP or LCP card in the OfficeServ 500-L system.

6.6.1 Highway Configuration Diagram

The Highway Configuration Diagram of the MFM board is illustrated below.

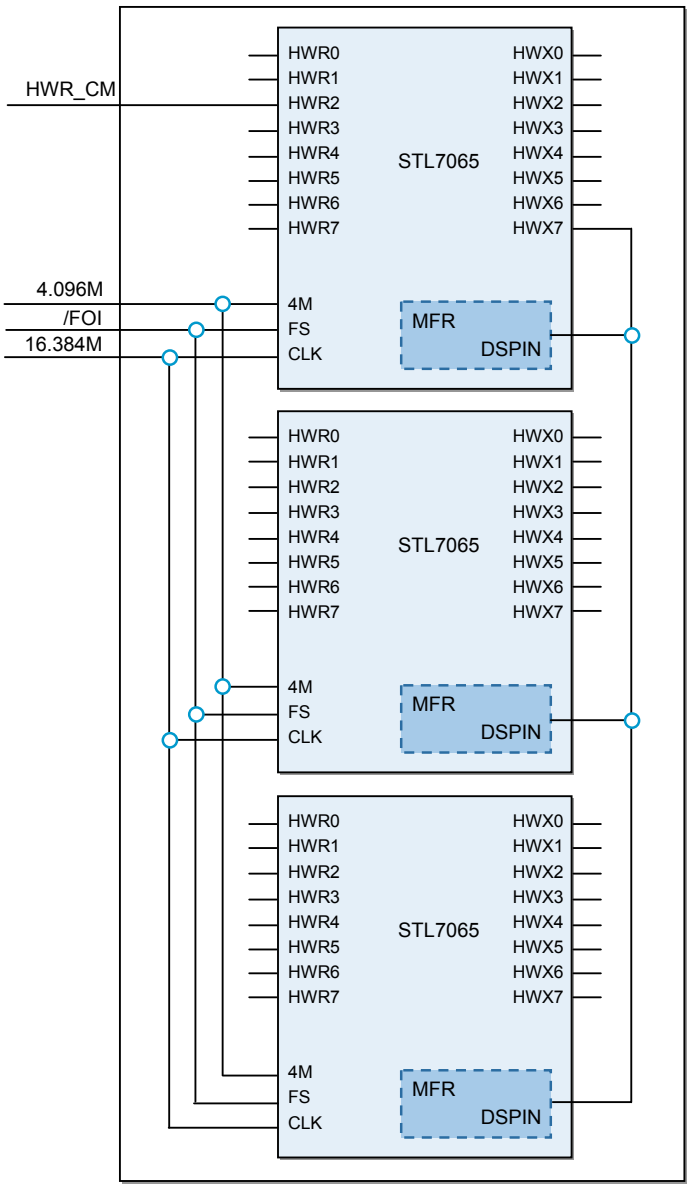


Figure 2.47 Highway Configuration Diagram of the MFM Board

6.7 RCM Board

The RCM board, which provides the R2 function or the Caller ID(CID) function, is mounted on the MCP card in the OfficeServ 500-M system and on the SCP or LCP card in the OfficeServ 500-L system.

The RCM board provides up to 8 channels for R2 and up to 14 channels for CID.
The switch on the RCM board is used for selecting between the R2 and CID function.
You shall check from the phone using MMC if the corresponding resources are assigned accordingly.

6.7.1 Block Diagram

STB9404 is the ASIC that provides R2 or CID detection.

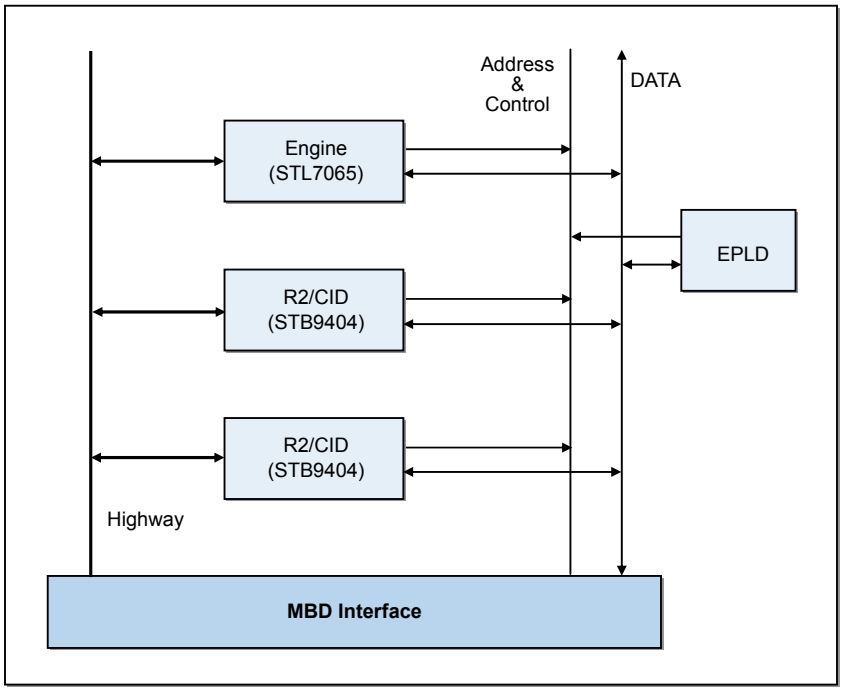


Figure 2.48 Block Diagram of the RCM Board

6.7.2 Highway Configuration Diagram

The Highway Configuration Diagram of the RCM board is illustrated below.

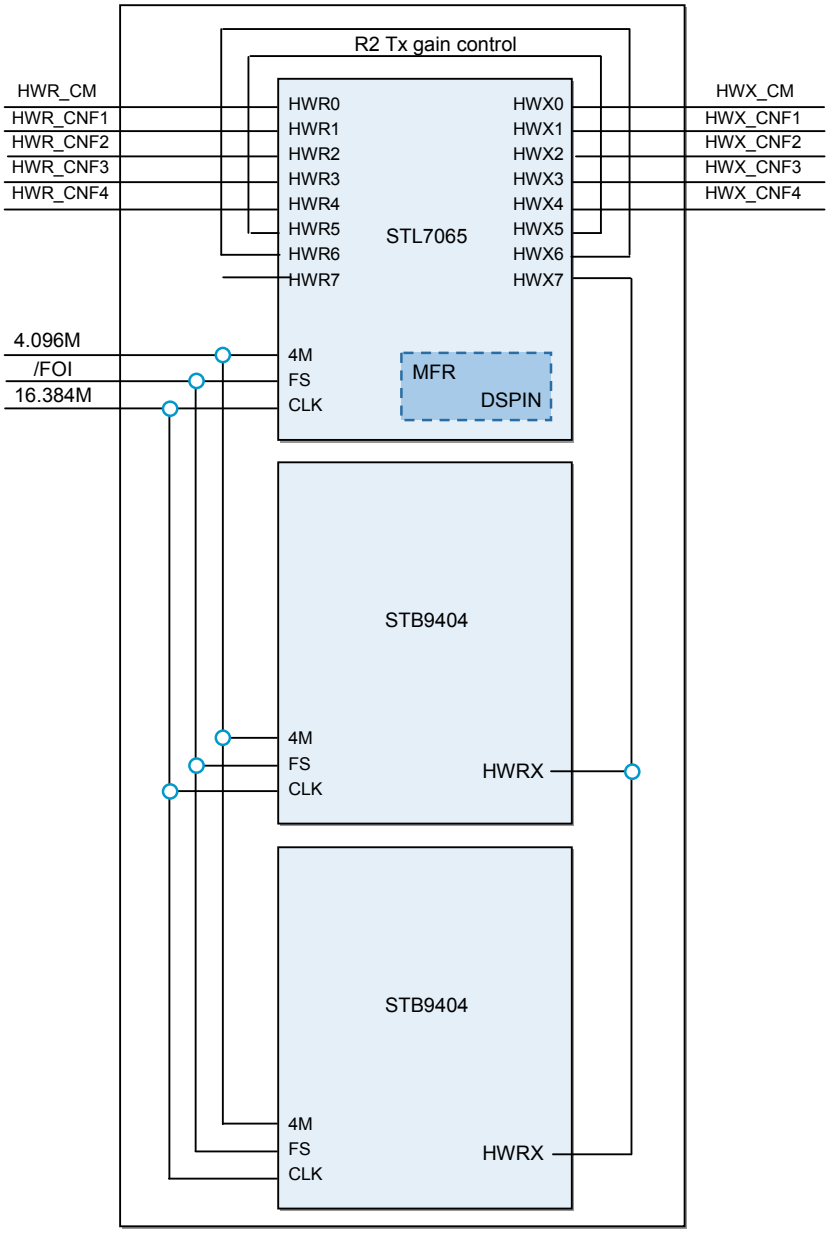


Figure 2.49 Highway Configuration Diagram of the RCM Board

NOTE

HWR_CNF1..4 and HWX_CNF1..4 are reserved highways.

6.8 MODEM Board

The modem used in OfficeServ 500 is a modem dedicated for OfficeServ 500 that supports 2 Wire Full Duplex. The direction of the MODEM board should be carefully examined when mounting the board on the IOM board.

The MODEM board features the V.24 interface with the OfficeServ 500 system and uses the Central Office modem chip that supports the PCM highway interface. In addition, the MODEM bard supports the V.90 protocol. The OfficeServ 500 system control the MODEM board through the serial communication using the standard AT commands. The SCC3 of the MCP card is allocated for the serial port that controls the modem when the LAN board is not mounted, while the UART0 of the LAN board is allocated instead when the LAN board is mounted.

6.8.1 Block Diagram

The Block Diagram of the MODEM board is illustrated below.

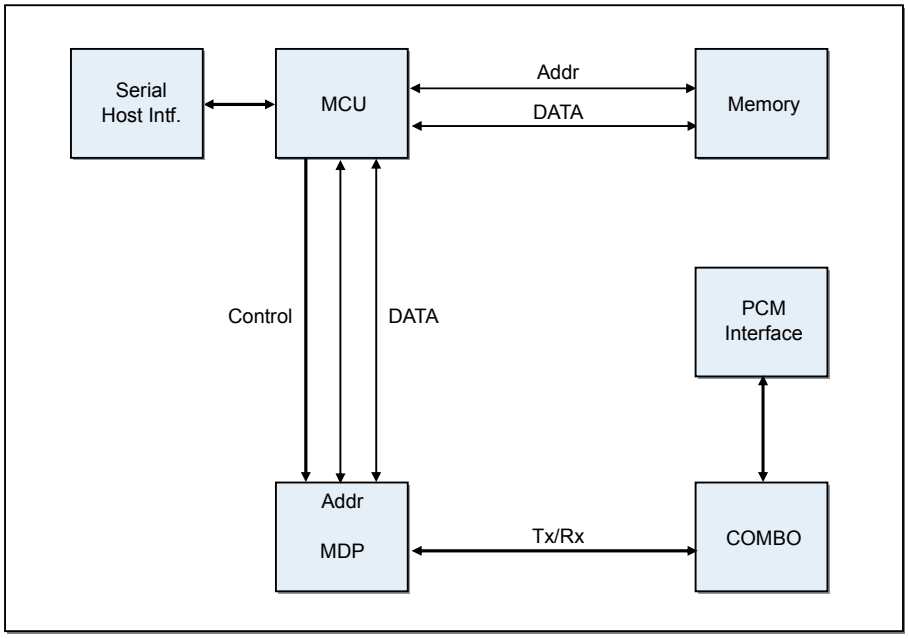


Figure 2.50 Block Diagram of the MODEM Board

6.8.2 Main Features

The main feature of the MODEM board is described below.

PCM Interface

Channel 0 is allocated for highway 0 as the MODEM channel. The PCM interface is shown below.

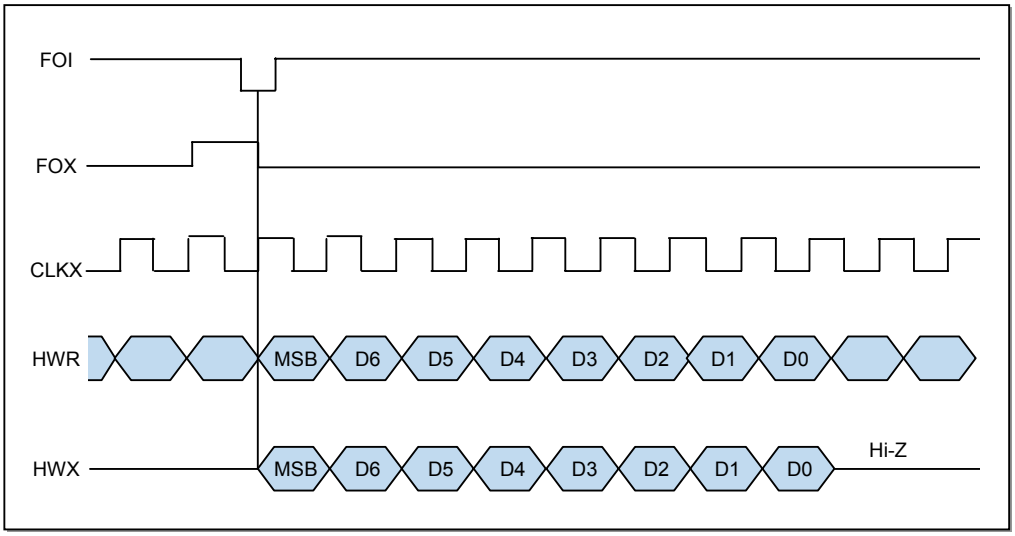


Figure 2.51 PCM Interface of the MODEM Board

6.9 ITM3D Board

The ITM3D board is the expansion board that supports the 8-channel VoIP port, which is mounted on the ITM3 card.

6.9.1 Block Diagram

The Block Diagram of the ITM3D board is illustrated below.

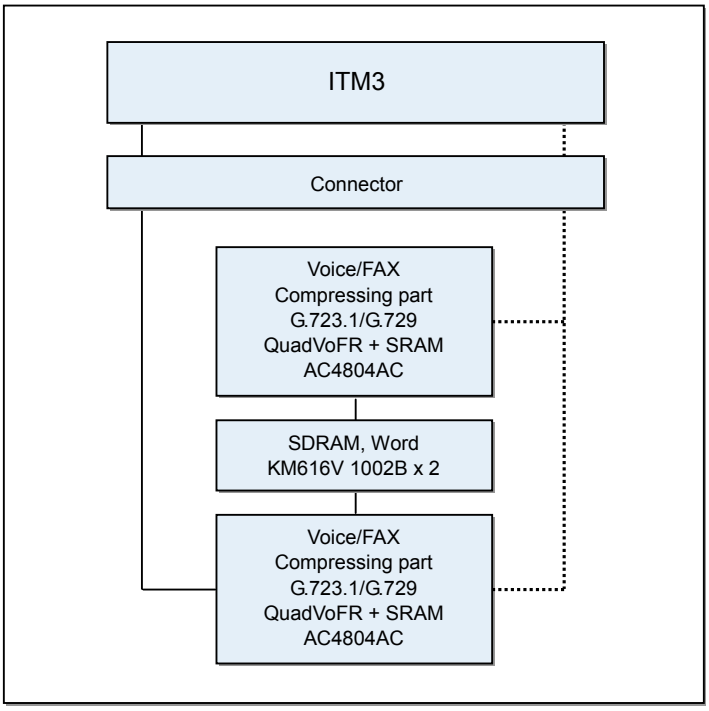


Figure 2.52 Block Diagram of the ITM3D Board

6.9.2 Main Features

The main feature of the ITM3D board is described below.

G.723 CODEC

Two G.723 CODECs are used and the DSP related specifications are identical to that of the ITM3 card.

7 SERVICE BOARD

The IOM board, which is the service board of the OfficeServ 500 system, provides the I/O function for the system.

7.1 IOM Board

The IOM board provides the SIO port and the LAN port for system I/O. In addition, the 56Kbps MODEM board can be mounted on the IOM board.

> NOTE
> Systems configured with the MCP2 card only support SIO2 and SIO3, not SIO4 and the LAN port. The SIO1, which the system engineer uses as the debugger port when checking the system, is not used as the I/O port.

7.1.1 Block Diagram

The Block Diagram of the IOM board is illustrated below.

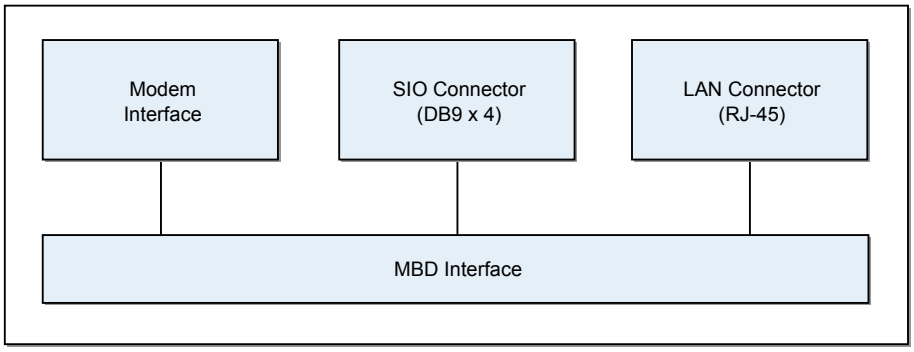


Figure 2.53 Block Diagram of the IOM Board

7.1.2 Main Features

The main features of the IOM board are described below.

SIO Port (DB9)

- Two SIO ports are basically provided while two ports are additionally provided when mounting the LAN board.
- The SIO port operates in asynchronous mode.
- The maximum transfer rate is 38.4Kbps and the basic transfer rate is 19.2Kbps.
- The pin configuration of the SIO port is shown in the table below.

Table 2.10 Pin Configuration of the SIO Port

No.	Name	Source	Destination	Note
1	-	-	-	Not Used
2	RXD	Ext Equip.	OfficeServ 500	Async, Max. 38.4 Kbps
3	TXD	OfficeServ 500	Ext Equip.	Async, Max. 38.4 Kbps
4	DTR	Ext Equip.	OfficeServ 500	DATA SET READY
5	GND	OfficeServ 500	OfficeServ 500	Ground
6	-	-	-	Not Used
7	-	-	-	Not Used
8	-	-	-	Not Used
9	-	-	-	Not Used

LAN Port (RJ-45)

The pin configuration of the LAN port is shown in the table below.

Table 2.11 Pin Configuration of the LAN Port

No.	Name	Source	Destination	Note
1	-	-	-	Not Used
2	RXD	Ext Equip.	OfficeServ 500	Async, Max. 38.4 Kbps
3	TXD	OfficeServ 500	Ext Equip.	Async, Max. 38.4 Kbps
4	DTR	Ext Equip.	OfficeServ 500	DATA SET READY
5	GND	OfficeServ 500	OfficeServ 500	Ground
6	-	-	-	Not Used
7	-	-	-	Not Used
8	-	-	-	Not Used
9	-	-	-	Not Used

8 TERMINALS

The block diagram and the main features of each terminal connected to the OfficeServ 500 system are described below.

8.1 DPIM

DPIM is a converting repeater equipment that converts the analog signal of the door phone into digital signals, and vice versa, to use the existing analog door phones connected to the OfficeServ 500 system.

The operable distance between the OfficeServ 500 system and DPIM is 400M. The call distance between the door phone and DPIM is 200M while the maximum distance to the main door phone is 600M.

8.1.1 Block Diagram

The Block Diagram of DPIM is illustrated below.

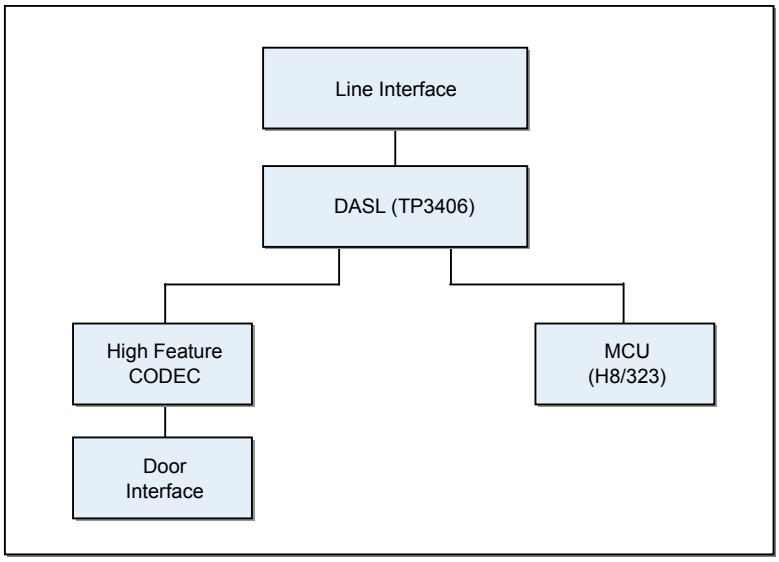


Figure 2.54 Block Diagram of DPIM

DPIM uses the existing door box that is used in the DCS 816 analog keyphone system, which is made up of the speaker, microphone, and the transfer section. DPIM provides the interface between the OfficeServ 500 system and the analog door box by converting the digital signal of the OfficeServ 500 system into the analog signal for the door box, and vice versa.

8.1.2 Main Features

The main features of DPIM are described below.

Microcontroller (MCU)

The TL084 that features superb audio characteristics is used to amplify the analog signals received from the door box and those from the High Feature CODEC(HFC) that converts digital signals sent from the DPIM PCM digital transfer section. The 100KΩ resistance is used since the TL084 requires high input resistance.

The T5692 is used in the matching section as in the transformer of the door box and 1KΩ(R14) is the resistance value when the two transformers show their best transfer characteristics. 100KΩ(R9, R10) is the balance resistance for reducing the input of signals, which are sent to the speaker, into the MIC Input(PIN 19) of HFC due to the hybrid of the signals transferred to the transformer.

Door Locker Control Section

A locker that opens the door for a visitor can be mounted on DPIM. The locker generally uses AC 100V for power, which is turned on/off by using the Relay as the switch. The Relay Control port of MCU, or P10(PIN 48), is the Key Scan port in the digital phone. The diode(1N4148,D6) at the output end of the Relay Control TR. (MMBT 2222,Q1) is used for eliminating the counter electro-motive force generated by the Relay, while the CAP and resistance at the both end of the Relay switch is used to bypass the spark generated in the Relay contact.

Switch DETECT Section

The visitor uses the switch in the door box to call the person inside. DPIM detects if the switch is press using the Photo Coupler and enters the result to the MCU port 46(PIN 15). The MCU sends the data to the D-channel of the PCM transfer chip(TP 3406,U5). Upon receiving this data, the main device signals the preset port to enable the call. This Detect signal is configurable using only 2 lines since the signal is transferred through the Center Tap of the matching transformer(T5692). The transformer can stand against +5V power.

+12V Generation Section

The Step Up DC converter(LT1109,U11) generates +12V using simple circuits from the received +5V. LT1109-12 generates +12V 60mA from +5V input.
The 33uH(L2) Inductor is used for generating the switching, 47uF/35V(C7) capacitor for the switching load, and the output 33uH(L1) Inductor for reducing the switching Ripple Noise. The Poly switch at the +12V output end prevents over-voltage when short circuit occurs in the +12V line connected to the door box.

PIN CONNECTION

- DOOR LOCK
  MODULAR(6P6C) PIN 1,6 : DRY CONTACT(relay), NORMAL OPEN.

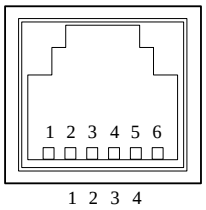


Figure 2.55 PIN Connection of DPIM

- DOOR PHONE
  MODULAR(6P4C) PIN 1 : L1(L1 and L2 line are limited to +5V for switch contact detection.)
  - PIN 2 : L2
  - PIN 3 : P+(+12V)
  - PIN 4 : P-(GND)

8.2 Door Phone

Features of the door phone connected to the OfficeServ 500 system are described below.

8.2.1 Block Diagram

The Block Diagram of the door phone is illustrated below.

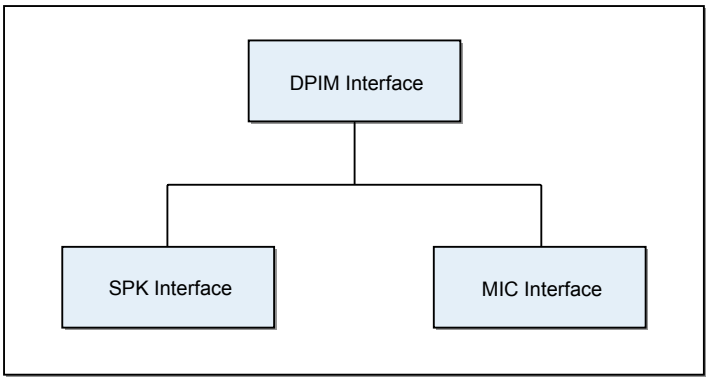


Figure 2.56 Block Diagram of the Door Phone

OfficeServ 500

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