intel®

iSBC® 576
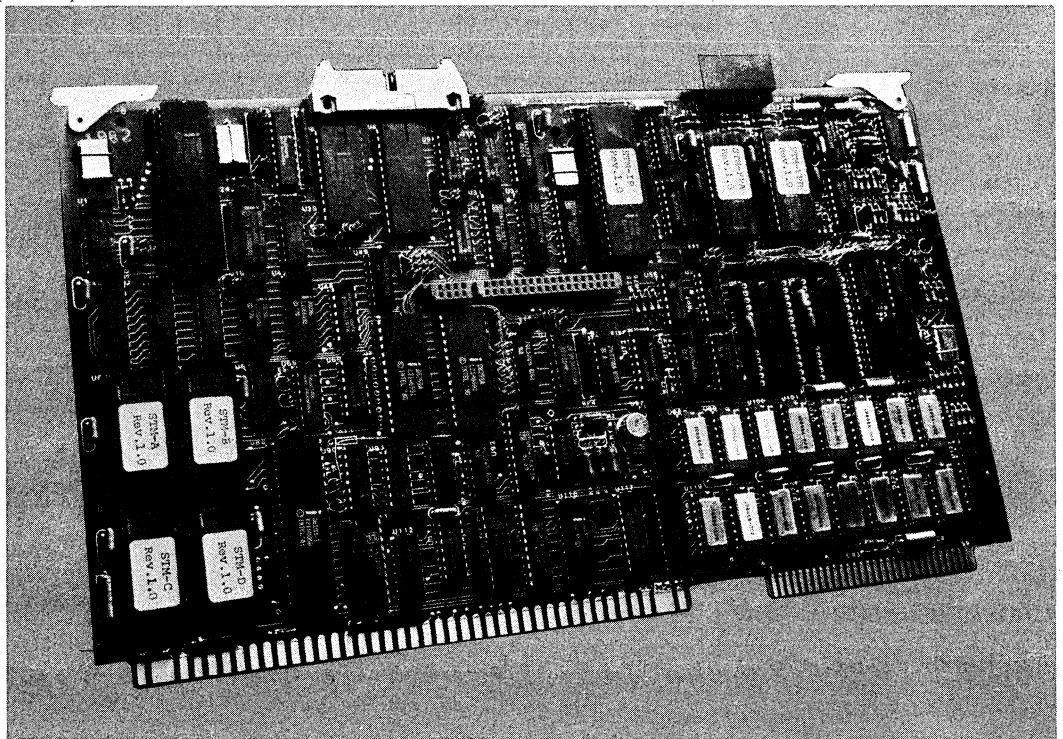# SPEECH TRANSACTION BOARD

- **Up to 200 recognition words or phrases**
- **Automatic ASR and ESS handling**
- **On-board Speech Transaction Manager**
- **8086, 16-bit CPU**

- **On-board diagnostic**
- **Multibus or serial host interface**
- **iSBX® interface**
- **Built-in buffer editing functions**

The iSBC® 576 Speech Transaction Board is the heart of a speech I/O system. Beside providing Automatic Speech Recognition (ASR) capabilities, a ROM-resident Speech Transaction Manager (STM) is included on the board. This provides a flexibile operating structure for the system designer with a fully buffered speech-generated input-transaction handling capability. Flexibility has been designed into the STM to allow integration into existing applications without a major rewrite/redesign of host application software and hardware. The Speech Transaction Manager accommodates a Speech Transaction File which configures the iSBC® 576 Speech Transaction Board for each application. Also included on the board are three selectable audio feedback tones, visual feedback/control via a CRT terminal or printer, and an optional Electronic Speech Synthesis (ESS) capability.

FUNCTIONAL DESCRIPTION

Figure 6 shows the functional structure of the Speech Transaction Board.

Input Signal Conditioning—Microphone input signal is amplified and low-pass filtered. The conditioned signal is then digitized and passed through 16 bandpass digital filters implemented by 2920/21 analog signal processors. The 2920/21s are synchronized and are operating in parallel. The bandpass filter information is then assembled by an 8048 microcomputer for algorithm processing by an 8086 processor. System-to-system portability is guaranteed by the usage of digital signal processing techniques.

ASR—Automatic Speech Recognition is accomplished by the 8086 processor in conjunction with two 2920/21 digital signal processors and an 8048 microcomputer. ASR handling is done completely under the control of the Speech Transaction Manager. This task is transparent to the system designers. Automatic statistics are also provided to track system performance.

Tone Generator—3 audio tones are available for use as a prompt. The tones are generated within a 2920 analog signal processor. The tone generator also generates test patterns for use by the diagnostic section.

Diagnostic—Under the control of the Speech Transaction Manager, a diagnostic check of the speech recognition hardware and software can be performed. System integrity is automatically determined to insure repeatable performance.

Output Signal Conditioning—Output amplifiers are provided to drive a speaker for the audio tones. Volume can be varied by a potentiometer.

Terminal Driver—Under the control of the Speech Transaction Manager, a CRT terminal/keyboard can be connected directly to the Speech Transaction Board. The terminal can be used for visual feedback as well as data entry/control. The interface is RS232 compatible.

Operator Control—Two LED lights to indicate recognition status and an operator attention button are provided. These functions are programmable under the control of the Speech Transaction Manager.

Operator Reference Patterns—Speech patterns for recognition are normally contained in RAM. The patterns are downloaded from the host processor under the control of the Speech Transaction Manager. The operator reference patterns are also generated under the control of the Speech Transaction Manager.

Speech Transaction Manager—The Speech Transaction Manager is the heart of the Speech Transaction Board. The Speech Transaction Manager controls all of the functions within the board. This firmware is
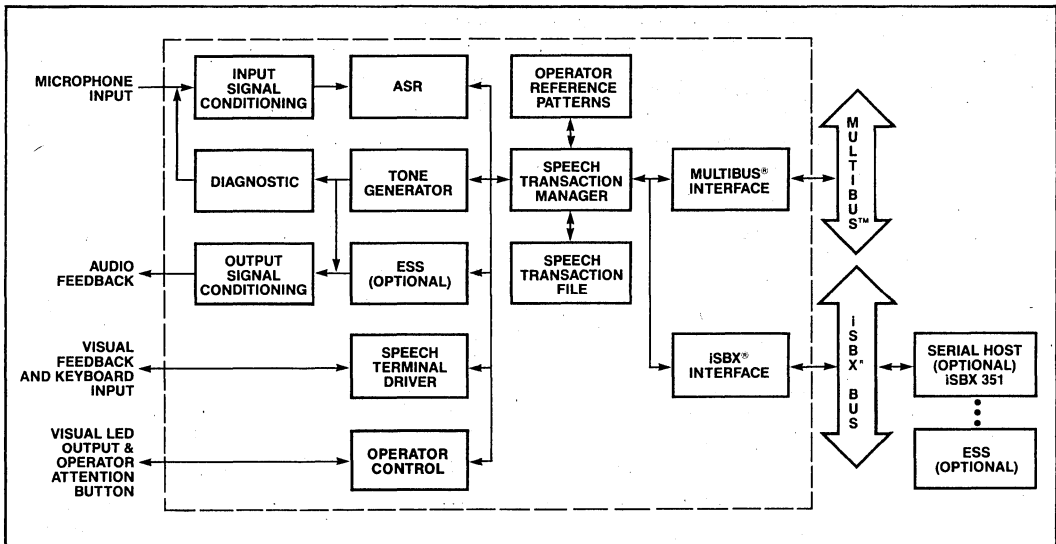
Figure 6. Functional Structure of the Speech Transaction Board

contained in 27128 EPROMs and is RMX®-88 (Real-Time Multi-Tasking Executive) based. Processing is provided by the 8086 processor.

Speech Transaction File—The Speech Transaction File determines the configuration of the board for each application. The Speech Transaction Manager executes this file which is normally downloaded from the host and–stored in RAM. The file can also be stored in ROM/EPROM on the Speech Transaction Board itself. These files are generated by the Speech Transaction Generator.

Multibus® Interface—A slave multibus® interface is implemented. On the multibus the Speech Transaction Board looks like a data port.

iSBX® Interface—One SBX® interface has been implemented. This interface is controlled by the Speech Transaction Manager. Interface with a non-Multibus® host can be implemented via this channel.

OPERATIONAL DESCRIPTION

The operation of the Speech Transaction Board is determined by the Speech Transaction Manager. The Speech Transaction Manager has several specific modes of operation as described below.

Speech Transaction Processing Mode—This mode enables the operator to enter by speech, or keyboard, a transaction message to a multibus or serial host.

File Mode—This mode supports file loading from the host through the multibus or serial interface. Loading and saving of operator reference patterns are also handled here.

Diagnostic Mode—This mode tests the hardware. The diagnostics will test the 2920/8048 interface and the 8048/8086 interface.

Terminal Mode—This mode provides for direct communication between the host and the Speech Transaction Board terminal. All response from the operator (through the terminal) is passed directly to the host. ALL host messages are passed directly to the terminal.

Parameter Mode—This mode lets the user define a limited set of configuration information and to set various other system parameters.

Evaluation Mode—This mode lets the user evaluate the recognition performance of an STF vocabulary or a vocabulary entered from the STB terminal. Use of this mode will facilitate evaluation of training strategies, vocabulary choices and parameter settings. In this mode statistics and automatic scoring of results are all standard features.

LIST OF COMMANDS

Monitor Mode Commands

STP—enter speech transaction processing mode
FIL—enter file mode
DIA—enter diagnostic mode
TER—enter terminal mode
PAR—enter parameter mode
MON—enter monitor mode
EVA—enter evaluation mode
HELP—list help commands
EXIT—exit current mode
INI—initialize statistics
RES—restores system status
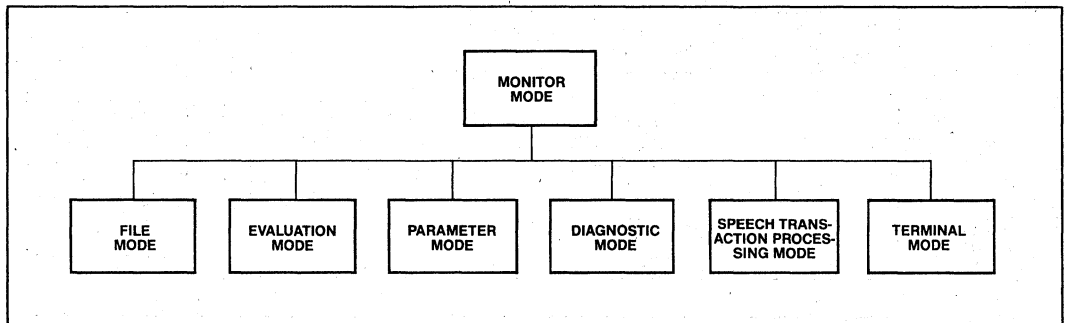
Speech Transaction Processing Mode Function

Buffer Editing Functions

Forward	Erase Field
Backup	Continue
Correction	Beginning
Replace	Cancel
Forward Field	Finish
Backup Field	

Utility Functions

Help—operator assistance at each field
Display—current transaction buffer
Next—go to next field
Detach—put terminal in "Terminal Mode"
Attach—get terminal out of "Terminal Mode"
Exit—exit STP mode
Up—raise rejection threshold
Down—lower rejection threshold
Relax—put system in not-ready state
Ready—first of two utterances to exit not-ready state
Attention—second of two utterances to exit not-ready state
Enable Transaction "N"—initiate transaction
Macro—performs a series of commands automatically in any mode

Operator Speech Pattern Maintenance Functions

Test Group	Train
Test All	Train Group
Retrain	Train All
Retrain Group	Update
Retrain All	Update Group
Delete	Update All
Delete All	Test

File Mode Commands

LST—load Speech Transaction File
SST—save speech transaction file
LRP—load operator speech patterns
SRP—save operator speech patterns
CRP—clear operator speech pattern RAM area
HELp—list help commands
CST—clear speech transaction

EXIt—exit current mode
LDI—load dictionary
SDI—save dictionary

Diagnostic Commands

FET—front end test
EXIt—exit mode
HELp—list help commands

Parameter Mode Commands

BLO—block size of transfer
CHS—communication header
CON—display all configuration parameters
DIS—discrimination level
DRE—small delta rejection
EST—display extended statistics
HOS—specifies host and characteristics
HTE—host terminator string
HTO—host time-out
INS—initialize statistics
MTP—minimum training passes
RPT—operator reference pattern names
SHC—serial host baud rate
STA—displays statistics
STF—STF name
STR—ROM STF name
TST—STB terminal status
WRD—word gap and word length
FEG—front-end gain
HELp—list help commands
EXIt—exit current mode

Evaluation Mode Commands

DEF—define
MVO—modify vocabulary
RVO—remove vocabulary
RRP—remove reference pattern
RET—retrain
LIS—list vocabulary
TRAin—train
UPDate—update
TESt—test
RECognition—recognition
STA—statistics
COR—cross correlation
INS—initialize statistics
HELp—list help commands
EXIt—exit current mode

SPECIFICATIONS

Operating Environment

Host Processor—any iSBC® Multibus® computer
            —any RS232 serial host interface
Audio Input—475Ω input impedence
        —50 m.v. p–p max.
        —differential or single-ended

Equipment Supplied

iSBC® 576 Speech Transaction Board with Speech Transaction Manager Firmware

Optional Equipment

iSBX®-351	RS232 Multimodule
iSBX®-342	EPROM expansion
	SBX synthesizer
iSBC®-575	Operator Control Unit

Performance Specifications

Recognition vocabulary—200 words or phrases
Utterance duration—user selectable > 100 msec.,
            minimum
            —user selectable < 2 sec.
            maximum
Rejection Threshold—user selectable
Word gap—user selectable > 50 msec., minimum
        —user selectable < 250 msec.,
        maximum
Recognition Accuracy (50 state names)—99+%
Response Time (for vocabulary up to 200 words
            with maximum node length 50
            words) — < 500 msec.

Physical Characteristics

Width—6.75 in. (17.15 cm)
Height—0.5 in. (1. 27 cm)
Length—12.0 in. (30.48 cm)
Shipping weight—TBD
Mounting—occupies one slot of iSBC® system
        chasis in cardcage/backplane. With
        iSBX® Multimodule™ board mounted,
        vertical height increases to 1.13 in.
        (2.87 cm)

Electrical Characteristics

Power Requirements
+5V DC @ 3 A
+10V DC @ TBD   *Multimodule™
−12V DC @ 0.02 A *Multimodule™
+12V DC @ 0.5 A

Environmental Characteristics

Temperature—0 to 55°C (operating): −55°C to 85°C
            (non-operating)
Humidity—up to 90% relative humidity without
        condensation (operating); all conditions
        without condensation or frost (non-
        operating)

Reference Manual

Speech Transaction Design Manual (supplied)

ORDERING INFORMATION

Part Number Description

iSBC® 576   Speech Transaction Board