




SYSTEMS S3000C

INDUSTRIAL CONTROLLER

S3016-505 COMMUNICATIONS CO-CPU BOARD

S3000 NETWORK PORT AND RS-232/RS-422 USER PORT (TI-505)

- **Communications CO-CPU Board with S3000 Serial Network Interface and RS-232/RS-422 USER PORT.**
 - **Built in Processor executes User application program independently of main TI 505 processor.**
 - **Resides on TI 505 Bus structure as a 3 word in / 5 word out Special Function module (similar to a TI Peerlink module).**
 - **Provided with "MCOM505" S3016-505 program and "NETCOM" MS-DOS based setup program which allows the TI 505 processor to communicate with up to 31 M4500 slave nodes with up to 120 words to/from each slave node.**
 - **Built in Real Time clock provides current time and date.**
 - **Extensive internal diagnostics/fault detection including watchdog timer, communications fault detection, hardware confidence test, etc.**
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- **Status LEDs on faceplate (Run, Serial Network Comm, and Fault)**
 - **Standard single width TI 505 module size.**

General Description

The S3016-505 is a version of the S3016 CO-CPU communications board that resides on the Texas Instruments 505 bus structure. With the exception of that difference, the S3016-505 provides all the same features as the standard S3016. The S3016-505 is a communications CO-CPU board which provides one S3000 serial network interface port and one RS-232/RS-422 USER PORT. The S3016-505 is a true CO-CPU with its own processor and program/data mem-

ory which executes a user application program independent of the TI 505 main processor. The primary use of the S3016-505 is to allow communications between the TI 505 family of processors to the M4500 line of processors via the S3000 serial network. The S3016-505 can be installed in any I/O slot of the TI 505 rack. In addition, any number of S3016-505s may be installed in one TI 505 rack (up to the number of I/O slots available).

S3000 SERIAL NETWORK

The S3000 serial network provides a means for the S3016-505 to communicate with other M4500 processors (nodes). The network operates in a master/slave topology. The S3016-505 is the master and controls all communications on the network. The remaining M4500 nodes act as slaves and simply respond to communications requests from the master. The master can transmit and receive up to 120 consecutive words from the slave in one command.

Up to 31 M4500 slave nodes can be connected to one S3016-505. Each node on the network is assigned a

unique address between 1 and 32. The S3016-505 master node is assigned address 1 while the slave nodes are assigned addresses 2 through 32. The network address is used to specify which slave the master is communicating to. The network addresses are set in the M4500 nodes from the SYSdev Target Board Interface Menu and is downloaded directly to the M4500 node from the IBM PC or compatible running SYSdev. The network address of the S3016-505 is automatically set to 1 when the "MCOM505" program is used.

TI 545 to S3016-505 Communication

Communications between the TI 505 processors (545, etc.) is accomplished over the TI 505 back plane. The S3016-505 reads and writes to the V memory of the TI processor using the TI task codes. From the TI processor point of view, the V memory is accessed transparently by the S3016-505. No special communications programming is implemented in the TI processor. The S3016-505 determines which V memory locations will be read and written to.

Note: Only the V memory is read and written to by

the S3016-505. No other TI memory type reads and writes are supported by the S3016-505.

On the S3016-505 side, the algorithm for implementing the task code communication to the TI processor is embedded in the S3016-505 firmware. The S3016-505 user program initiates the communication by specifying which addresses will be written to and how many words are to be transferred. Once initiated, the task code is executed transparently to the S3016-505 user program.

"MCOM505" and "NETCOM" Programs

The combination of the "MCOM505" and "NETCOM" programs turn the S3016-505 into a purely communications board which allows the TI 505 processor to communicate to up to 31 M4500 slave nodes, reading and writing up to 120 words from each node. The "MCOM505" program is a SYSdev program which is downloaded directly into the S3016-505. This program implements the task code communication to the TI 505 processor as well as implementing the serial network communication to the M4500 slave nodes.

The "NETCOM" program is a menu driven program which runs on any IBM PC or compatible. "NETCOM" is used to configure which slave nodes are to be communicated to, which V memory addresses in the TI 505 are to be used to read/write to, which addresses in the M4500 slave nodes are to be written and read from, and how many words are to be transferred from each slave node. This information is downloaded to the S3016-505 at which time the com-

munication between the TI processor and the S3000/M4000 slave nodes is performed automatically.

Most applications of the S3016-505 will use "MCOM505" and "NETCOM". The primary purpose of the S3016-505 is to allow TI 505 based processors to communicate to M4500 processors and the "MCOM505"/"NETCOM" programs allow the user to do just this in very easy and user friendly way. No SYSdev programming of the S3016-505 is required by the user when the "MCOM505" and "NETCOM" programs are used.

The operation of the "MCOM505" program is as follows:

The "MCOM505" program continuously writes the data that was read from the slave node on the previous network communication to the TI-505 processor. This is performed in a sequential fashion for all



“MCOM505” and “NETCOM” Programs (cont'd)

nodes (2 thru 32) that are enabled for communications.

Note: No data task code communication occurs for any nodes that are disabled. Once the data for all the enabled nodes is updated, the communications status stack is then written to the TI-505 processor. The communications status stack contains a variable for each node that defines the communications status for that node (Comm OK, Time-out, etc).

Once this is done the process is then started over with the data for the first node being transferred to and from the TI-505, etc.. This communication between the TI-505 and S3016-505 is performed continuously.

Asynchronously to the TI-505 to S3016-505 communications, the communications to the slave nodes over the network is performed. The data for the first enabled node to be read is read from the slave. This data is saved in an internal buffer of the S3016-505. Communications to the next enabled node is then performed and so on for all enabled nodes. This is repeated continuously for all enabled nodes.

Note: Communications for any disabled nodes is not attempted. This communication is occurring concurrently with the communication between the TI-505 processor and the S3016-505, thus optimizing the total through-put of the system.

Interface Ports

The S3016-505 contains three interface ports: the PROGRAMMING PORT, USER PORT, and the Serial Network Comm Port.

PROG Port: The PROG PORT is an RS-232 port dedicated for online monitoring and program download when connected to an IBM PC or compatible running SYSdev.

USER Port: The USER PORT is available as a general RS-232/RS-422 port for use as defined by the user. Under software control of the user application program, communications to any other RS-232/RS-

422 based device can be established. Typical applications are communications to operator workstations or ASCII displays for system status or data acquisition.

Serial Network: The S3000-N1 network is a high speed (344KBPS), twisted pair, serial network configured in a master/slave topology. Communications between the S3016-505 and other M4500 modules on the network is controlled via commands in the user application program resident in the master S3000 board. Data is transferred over the network using the sfunc13 system function in the master S3016-505 or M4500.

LED Status Indications

The following three status LEDs are located on the S3016-505 faceplate: RUN, COMM, and FLT. The definitions of these LEDs are as follows:

RUN: On steady when the S3016-505 is running a valid users application program. Off when an internal fault is detected or when a valid user's program has not been loaded. The RUN LED is flashed during program download and also when the S3016-505 hardware confidence test is executed.

COMM: This LED is flashed every time an access to the S3000 serial network is made by any S3000/M4500 board on the network. If the LED is on solid, continuous communications is occurring on the net-

work. If the LED is off, no communications is occurring. This is not a fault LED, but simply an indication of activity on the S3000 network.

FLT: "On" when an internally detected fault has occurred in the S3016-505. When a fault is detected, the following fault routine is executed:

- 1) User program execution is suspended.
- 2) "RUN" LED on S3016-505 is extinguished.
- 3) "FLT" LED on S3016-505 is illuminated.
- 4) Fault code representing the detected fault is saved in internal S3016-505 memory for viewing with SYSdev.



S3016-505: COMMUNICATIONS CO-CPU (TI-505)BOARD

Specifications

Board Size:

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|---------|-------|
| Length: | 9.15" |
| Height: | 6.30" |
| Width: | 0.80" |

Processor Memory:

| | |
|----------|-----------------------------------|
| Program: | 24K bytes battery backed CMOS RAM |
|----------|-----------------------------------|

Data:

| | |
|---------------|----------------------------------|
| Non-volatile: | 2K bytes battery backed CMOS RAM |
|---------------|----------------------------------|

Volatile:

| | |
|------------|-----------|
| Flags (F): | 104 bits |
| Bytes (B): | 185 bytes |
| Words (W): | 92 words |

Interface Ports:

PROG PORT:

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|------------|-----------|
| Type: | RS-232 |
| Comm Rate: | 9600 BAUD |

USER PORT:

| | |
|-------------|---------------------------------------|
| Type: | RS-232/RS-422 |
| Comm Rate: | 300, 600, 1200, 2400, 4800, 9600 BAUD |
| Start Bits: | 1 |
| Data Bits: | 8 |
| Stop Bits: | 1 or 2 |
| Parity: | None, Odd or Even |

Serial Network:

S3000-N1:

| | |
|-------------------|------------------------------------|
| Type: | RS-485 |
| Comm Rate: | 344KBPS, 229KBPS, or 106KBPS |
| # of Nodes (Max): | 32 |
| Isolation: | 2,000 VRMS |
| Distance: | 1,000 ft., 2,000 ft., or 4,000 ft. |
| Protocol: | Proprietary |

Power Requirements:

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|---------------|-----------------|
| Icc (+5VDC): | 1.00 amps (MAX) |
| Icc (+12VDC): | 0.10 amps (MAX) |
| Icc (-12VDC): | 0.10 amps (MAX) |

Temperature Range:

| | |
|------------|-------------------|
| Storage: | 0 to 70 degrees C |
| Operating: | 0 to 60 degrees C |

Relative Humidity:

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|---------------------------|
| 5 to 95% (non-condensing) |
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