GenRef
v1.00

MDOS Reference guide.

TIPI Library

TIPI - CONTENTS

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TIPI Overview

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All TIPI management routines in MDOS are provided to aid a programmer in writing applications requiring TIPI operations beyond the immediate instruction set of the TMS 9995 microprocessor. The following TIPI operations are currently supported within the operating system.

Type	Extension	Description
0x20	Mouse	Read USB mouse data
0x22	TCP	Client/Server socket connections
0x23	UDP	Client UDP socket connections
0x24	TLS	Client TLS socket connections
0x25	LOG	Add message to /var/log/tipi/tipi.log

Opcodes within the TIPI XOP Library 12 support access to the USB mouse, as a wired or wireless connection. In addition, both client and server based TCP, UDP, and TLS connections are supported. The TIPI is a continually evolving hardware and software solution for the TI-99/4A and Geneve 9640 computers.

For more information on the TIPI, please visit `https://github.com/jedimatt42/tipi/wiki`

CALLING TIPI FUNCTIONS

The MDOS TIPI Library must be called from within a machine code program running as a task under MDOS. You pass arguments to the TIPI Library via the calling registers.

The MDOS TIPI Library is invoked from a machine code program when software trap number zero (XOP 0) is called with a library number of 12. The calling program's R0 must contain the 16-bit subprogram at the time of the XOP. The following code fragment will open a TCP connection to a hostname or IP address.

```
                LI    R0,>0002    Open hostname
                LI    R1,HOST     Hostname to open with port number
                LI    R2,22       Length of Hostname String
                LI    R3,>0100    TCP Socket Handle Byte (MSB)
                XOP   @TIPI,0     Access subprogram

        TIPI   DATA  12
        HOST   TEXT  "Heatwave.ddns.net:9640"      HOST to open
               EVEN
```

In the preceding example, two hidden assumptions were made. First it is assumed that Hostname or IP address is located on a page which is currently mapped into a memory page which has the same 16-bit address page number as its Virtual address page number (read the section on Memory Management). The second assumption is the TIPI label is currently mapped into a memory page which has the same 16-bit address page number as its Virtual address page number.

TIPI Library

Reset TIPI

Function　　　　Sends a command to the TIPI to kill the TipiService on the Raspberry PI and restarts it asynchronously. When this command is issued, allow time for the TipiService to resume.

Parameters　　　R0 = >0000 (opcode)

Results　　　　N/A -

Parameter Description

Not applicable

Example Code

```
        LI    R0,>0000    Reset TIPI opcode
        XOP   @TIPI,0     Access subprogram

TIPI    DATA  12          TIPI Library
```

Identify CRU of the TIPI

Function   Returns the CRU address of the TIPI.

Parameters   R0 = >0001

Results   R0 = Result code

Parameter Description

Result code   CRU address of the TIPI

                     CRU = >0000, no TIPI present

Example Code
```
         LI    R0,>0001    CRU address opcode
         XOP   @TIPI,0     Access subprogram
         MOV   R0,@CRU     Store CRU Address of TIPI

   TIPI  DATA  12          TIPI Library
   CRU   DATA  0           CRU of TIPI
```

Open Hostname

Function   Opens a TCP socket to a Hostname or IP address at a specified port.

Parameters   R0 = >0002
R1 = Hostname or IP address
R2 = Length of R1
R3 = Socket handle (MSB)

Results   R1 = Result code

Parameter Description

Hostname or IP   The hostname or IP address is a string in the form of "hostname:port" without the quotes.

Length   The length of the string Hostname:Port

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Result code   >FFFF if connect

>0000 for no connection

Example Code

```
        LI    R0,>0002    Open Host opcode
        LI    R1,HOST1    Host or IP address to open with port number
        LI    R2,22       Length of Host String
        LI    R3,>0100    TCP Socket Handle Byte (MSB)
        XOP   @TIPI,0     Access subprogram
        MOV   R0,R0       Test for connection
        JEQ   NOCONCT     No connection,

TIPI    DATA  12          TIPI Library

HOST1 TEXT  "Heatwave.ddns.net:9640"    Host to open
      EVEN
HOST2 TEXT  'localhost:23"              Host to open
      EVEN
HOST3 TEXT  '192.168.1.79:9640'         Host to open
      EVEN
```

Receive TCP Message

Function   Receive a single character from the TIPI TCP Socket Messaging system

Parameters   R0 = >0003
                      R1 = Socket handle (MSB)

Results   R0 = Result code
                      R1 = Received character (MSB)

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Result code   >0000 no character received

                      >FFFF if character received

Received character   Received character from >00 to >FF received from the socket handle

Example Code

```
        LOOP
                LI      R0,>0003    Receive a single character
                LI      R1,>0100    TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0     Access subprogram

                MOV     R0,R0       Test for status
                JEQ     LOOP        No character, run through loop again
                MOVB    R1,CHAR     Move character to buffer

        TIPI    DATA    12          TIPI Library
        CHAR    DATA    0           Character to receive
```

Send TCP Message

Function   Send a single character from the TIPI TCP Socket Messaging system.

Parameters   R0 = >0004
                     R1 = Character to send (MSB)
                     R2 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Character to Send   A single byte from >00 to >FF to send via the TIPI messaging system.

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
        LI    R0,>0004     Send single character
        MOV   @CHAR,R1     Character to send
        LI    R2,>0100     Socket handle
        XOP   @TIPI,0      Access subprogram


TIPI    DATA  12           TIPI Library
CHAR    DATA  >0D00        Character to send (MSB)
```

Close TIPI Connection

Function   Close an open TIPI TCP Socket.

Parameters   R0 = >0005
                      R1 = Socket handle (MSB)

Results   N/A

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                      arbitrarily by the code it passes in the open command. Multiple sockets can be
                      managed by the TIPI XOP within a single program or with several programs in a
                      multitasking state.

Example Code

```
        LOOP
                LI      R0,>0005    Close TIPI TCP Socket
                LI      R1,>0100    TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0     Access subprogram

        TIPI    DATA  12            TIPI Library
```

Receive TIPI String

Function   Receive multiple characters from the TIPI TCP Socket Messaging system.

Parameters   R0 = >0006
                          R1 = String Pointer
                          R2 = String length
                          R3 = Socket handle (MSB)

Results   R0 = Result code

Parameter Description

String Pointer   An address in memory where data will be returned to a buffer in the program's
                          physical 64K memory space.

String length   The length of the buffer in memory to be processed. The Raspberry PI maintains a
                          larger buffer passing up to the maximum amount of characters in the program's
                          buffer. Upon return from the TIPI XOP call, the actual number of characters retrieved
                          will be passed.

                          The string length shall not exceed the boundary of a 2nd page mapped in memory
                          from the first physical page as only 2 x 8K pages are mapped into use during the TIPI
                          XOP opcode call.

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                          arbitrarily by the code it passes in the open command. Multiple sockets can be
                          managed by the TIPI XOP within a single program or with several programs in a
                          multitasking state.

Result code   >0000 no character

                          >0001 or greater, characters returned to the buffer.

Example Code

```
        LOOP
                LI      R0,>0006        Receive string
                LI      R1,BUF          Buffer containing the characters
                LI      R2, 8192        Length of buffer
                LI      R3,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

                MOV     R0,R0           Test for status
                JEQ     LOOP            No character(s) received, run through loop again

        TIPI    DATA    12              TIPI Library
        BUF     BSS     8192            Buffer
```

Send ANSI String (Up Arrow Key)

Function   Send an ANSI sequence for the Down Arrow key.

Parameters   R0 = >0007
R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
LOOP
        LI      R0,>0007    Send ANSI Sequence for Up-Arrow keypress
        LI      R1,>0100    TCP Socket Handle Byte (MSB)
        XOP     @TIPI,0     Access subprogram

TIPI    DATA  12            TIPI Library
```

Send ANSI String (Down Arrow Key)

Function   Send an ANSI sequence for the Down Arrow key.

Parameters   R0 = >0008
                      R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                      arbitrarily by the code it passes in the open command. Multiple sockets can be
                      managed by the TIPI XOP within a single program or with several programs in a
                      multitasking state.

Example Code

```
        LOOP
                LI      R0,>0008        Send ANSI Sequence for Down-Arrow keypress
                LI      R1,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

        TIPI    DATA    12              TIPI Library
```

Send ANSI String (Left Arrow Key)

Function   Send an ANSI sequence for the Left Arrow key.

Parameters   R0 = >0009
                        R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                       arbitrarily by the code it passes in the open command. Multiple sockets can be
                       managed by the TIPI XOP within a single program or with several programs in a
                       multitasking state.

Example Code


```
LOOP
        LI      R0,>0009        Send ANSI Sequence for Left-arrow keypress
        LI      R1,>0100        TCP Socket Handle Byte (MSB)
        XOP     @TIPI,0         Access subprogram

TIPI    DATA    12              TIPI Library
```

Send ANSI String (Right Arrow Key)

Function   Send an ANSI sequence for the Right Arrow key.

Parameters   R0 = >000A
                      R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                     arbitrarily by the code it passes in the open command. Multiple sockets can be
                     managed by the TIPI XOP within a single program or with several programs in a
                     multitasking state.

Example Code

```
        LOOP
                LI      R0,>000A        Send ANSI Sequence for Right-Arrow keypress
                LI      R1,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

        TIPI    DATA    12              TIPI Library
```

Send ANSI String (PageUp Key)

Function   Send an ANSI sequence for the PageUp Arrow key.

Parameters   R0 = >000B
                      R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                      arbitrarily by the code it passes in the open command. Multiple sockets can be
                      managed by the TIPI XOP within a single program or with several programs in a
                      multitasking state.

Example Code

```
LOOP
        LI    R0,>000B    Send ANSI Sequence for PageUp-Arrow keypress
        LI    R1,>0100    TCP Socket Handle Byte (MSB)
        XOP   @TIPI,0     Access subprogram

TIPI    DATA  12          TIPI Library
```

Send ANSI String (PageDown Key)

Function   Send an ANSI sequence for the Up Arrow key.

Parameters   R0 = >000C
                        R1 = Socket handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                        arbitrarily by the code it passes in the open command. Multiple sockets can be
                        managed by the TIPI XOP within a single program or with several programs in a
                        multitasking state.

Example Code


```
        LOOP
                LI      R0,>000C        Send ANSI Sequence for Up-Arrow keypress
                LI      R1,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

        TIPI    DATA    12              TIPI Library
```

Server Bind Port

Function   Bind a listening server socket to a listening port.

Parameters   R0 = >000D
                      R1 = Interface address (IP:Port) string
                      R2 = Interface address String length
                      R3 = Server handle (MSB)

Results   R0 = Result code

Parameter Description

Interface Port String   An address in memory containing the Interface Port to be binded.   An interface port can be specified by the address such as "*:9640" excluding quotes to bind port 9640 on the Raspberry PI.

Interface length   The length of the interface port in memory to be binded. The Raspberry PI maintains a larger buffer passing up to the maximum amount of characters in the program's buffer. Upon return from the TIPI XOP call, the actual number of characters retrieved will be passed.

The string length shall not exceed the boundary of a 2nd page mapped in memory from the first physical page as only 2 x 8K pages are mapped into use during the TIPI XOP opcode call.

Server handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple server sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state. This handle should not be confused with the client socket handle.

Result code   >0000 binding not successful

>FFFF binding successful

Example Code

```
          LI    R0,>000D    Bind Server Port
          LI    R1,SERVR    Buffer containing the characters for the interface port
          MOV   @LEN,R2     Length of the interface port string to be binded
          LI    R3,>0100    TCP Socket Handle Byte (MSB)
          XOP   @TIPI,0     Access subprogram

          MOV   R0,R0       Test for status
          JNE   FOUND       Server binded, let's go
          BLWP  @0          Server not binded, let's exit

TIPI      DATA  12          TIPI Library
LEN       DATA  6
SERVR     TEXT  ':9640"
```

Server Unbind

Function   Unbind a previously binded server.

Parameters   R0 = >000E
                      R1 = Server handle (MSB)

Results   Not applicable

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                      arbitrarily by the code it passes in the open command. Multiple sockets can be
                      managed by the TIPI XOP within a single program or with several programs in a
                      multitasking state.

Example Code

```
        LOOP
                LI      R0,>000E        Unbind server
                LI      R1,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

        TIPI    DATA    12              TIPI Library
```

Server Accept

Function   Accept an incoming connection on a previously binded server interface address.

Parameters   R0 = >000F
           R1 = Server handle (MSB)

Results   R0 = Result code (MSB)

Parameter Description

Server handle   Server handles will have a server handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple server handles can be managed by the TIPI XOP within a single program or with several programs in a multitasking state. This server handle should not be confused with the socket handle.

Result code   >0000 no incoming socket

           >FF00 error on server handle

           >0100 to >FE00, Socket handle of the MSB

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
        LOOP
                LI    R0,>000F    Accept incoming connection
                LI    R1,>0100    Server handle
                XOP   @TIPI,0     Access subprogram

                MOV   R0,R0       Test for status
                JEQ   LOOP        No connection, loop again as still waiting
                MOV   R0,SOCK     Store socket handle

        TIPI    DATA  12          TIPI Library
        SOCK    DATA  0           Socket handle
```

TIPI Mouse Movement

Function   Get Mouse release data. This data call mimics the Video XOP opcode call >32.

Parameters   R0x = >0010

Results   R1x = Returned X displacement
R2x = Returned Y displacement
R3x = Button State

Parameter Description

Returned X displacement   Returns the x direction displacement from the last call.

Returned Y displacement   Returns the y direction displacement from the last call.

Button State   The button state will return the left, middle, and right button status.

b1 b2 b3 0 xxxx xxxx xxxx (MSB bits)

b1 = left   1 = down
b2 = middle   1 = down
b3 = right   1 = down

Example Code

```
        LI    R0,>0010    Send single character
        XOP   @TIPI,0     Access subprogram

        MOV   R1,@XDIS    X distance movement
        MOV   R2,@YDIS    Y Distance movement
        MOV   R3,@BUT     Mouse button status

TIPI    DATA  12          TIPI Library
XDIS    DATA  0           X Distance movement
YDIS    DATA  0           Y Distance movement
BUT     DATA  0           Button status
```

Send TCP String

Function   Send TIPI TCP message, maximum 10 characters. Useful when sending a response sequence when a single byte one at a time has timing issues with the receiving system.

Parameters   R0 = >0011
                    R1 = String length contained in R2,R3,R4,R5,R6 (max 10 bytes)
                    R2 = Chars
                    R3 = Chars
                    R4 = Chars
                    R5 = Chars
                    R6 = Chars
                    R7 = Socket handle (MSB)

Results   R0 = >0000 no character, greater than or equal to >0001 or more characters returned to the buffer.

Parameter Description

String length   The length of the buffer in the registers in the current workspace in registers R2 to R6 to be processed. The maximum length of the buffer is 10 characters.

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
        LI      R0,>0011    Send String
        LI      R1,8        Length of string to send
*       Build string containing "Client#1"
        LI      R2,'Cl'     Two characters, "Cl"
        LI      R3,'ie'     Two characters, "ie"
        LI      R4,'nt'     Two characters, "nt"
        LI      R5,'#1"     Two characters, "#1"
        CLR     R6          Clear register, but not required to be cleared
        LI      R7,>0100    TCP Socket Handle Byte (MSB)
        XOP     @TIPI,0     Access subprogram

TIPI    DATA   12    TIPI XOP Library
```

Send TCP String

Function   Send TCP TCP message, maximum 8K characters. Useful when sending a response sequence when a single byte one at a time has timing issues with the receiving system.

Parameters   R0 = >0012
                      R1 = String pointer to write
                      R2 = String length beginning after first three bytes of the string pointer destination.

Results   R0 = >0000 no character, greater than or equal to >0001 or more characters returned to the buffer.

Parameter Description

String length   String length is defined as:

                      1st Byte   >22
                      2nd Byte   Socket handle byte >01 to >FF
                      3rd Byte   >03 (write command)
                      4th Byte to 8K   String up to 8K

Socket handle   Socket handles will have a socket handle of a single byte from >01 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
         LI      R0,>0013     Send String
         LI      R1,HELLO     String Pointer
         LI      R2,7         String length
         XOP     @TIPI,0      Access subprogram

HELLO BYTE >22      Write
         BYTE >00      Socket handle
         BYTE >03      Write
         TEXT  'Hello'
         BYTE >0D,>0A    cr/lf


TIPI     DATA   12    TIPI XOP Library
```

Open UDP URL

Function   Opens a TIPI UDP socket to a Hostname or IP address at a specified port.

Parameters   R0 = >0013
                      R1 = Hostname or IP address
                      R2 = Length of R1
                      R3 = Socket handle (MSB)

Results   R1 = Result code

Parameter Description

Hostname or IP   The hostname or IP address is a string in the form of "hostname:port" without the
                      quotes.

Length   The length of the string Hostname:Port

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                      arbitrarily by the code it passes in the open command. Multiple sockets can be
                      managed by the TIPI XOP within a single program or with several programs in a
                      multitasking state.

Result code   >FFFF if connect

                      >0000 for no connection

Example Code

```
          LI    R0,>0013    Open Host opcode
          LI    R1,HOST1    Host or IP address to open with port number
          LI    R2,22       Length of Host String
          LI    R3,>0100    TCP Socket Handle Byte (MSB)
          XOP   @TIPI,0     Access subprogram
          MOV   R0,R0       Test for connection
          JEQ   NOCONCT     No connection,

TIPI      DATA  12          TIPI Library

HOST1 TEXT  "Heatwave.ddns.net:9640"      Host to open
      EVEN
HOST2 TEXT  'localhost:23"                Host to open
      EVEN
HOST3 TEXT  '192.168.1.79:9640'           Host to open
      EVEN
```

Close UDP Connection

Function   Close an open TIPI UDP Socket.

Parameters   R0 = >0014 (opcode)
        R1 = Socket handle (MSB)

Results   N/A

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Example Code

```
LOOP
        LI      R0,>0014    Close TIPI TCP Socket
        LI      R1,>0100    TCP Socket Handle Byte (MSB)
        XOP     @TIPI,0     Access subprogram

TIPI    DATA  12            TIPI Library
```

Send UDP Message

Function   Send TIPI UDP message, maximum 8K characters.

Parameters   R0 = >0015
                        R1 = String pointer to write
                        R2 = String length beginning after first three bytes of the string pointer destination.

Results   R0 = >0000 all characters sent, not >0000 then error on sending string.

Parameter Description

String length   String length is defined as:

                        1st Byte   >23
                        2nd Byte   Socket handle byte >01 to >FF
                        3rd Byte   >03 (write command)
                        4th Byte to 8K   String up to 8K

Socket handle   Socket handles will have a socket handle of a single byte from >01 to >FF, assigned
                        arbitrarily by the code it passes in the open command. Multiple sockets can be
                        managed by the TIPI XOP within a single program or with several programs in a
                        multitasking state.

Example Code

```
        LI      R0,>0015    Send String
        LI      R1,HELLO    String Pointer
        LI      R2,7        String length
        XOP     @TIPI,0     Access subprogram

HELLO   BYTE >23    Write
        BYTE >00    Socket handle
        BYTE >03    Write
        TEXT  'Hello'
        BYTE >0D,>0A    cr/lf


TIPI    DATA   12    TIPI XOP Library
```

Receive UDP Message

Function   Receive a single character from the TIPI UDP Socket Messaging system

Parameters   R0 = >0016
                            R1 = String Pointer
                            R2 = String length
                            R3 = Socket handle (MSB)

Results   R0 = Result code

Parameter Description

String Pointer   An address in memory where data will be returned to a buffer in the program's physical 64K memory space.

String length   The length of the buffer in memory to be processed. The Raspberry PI maintains a larger buffer passing up to the maximum amount of characters in the program's buffer. Upon return from the TIPI XOP call, the actual number of characters retrieved will be passed.

                            The string length shall not exceed the boundary of a 2nd page mapped in memory from the first physical page as only 2 x 8K pages are mapped into use during the TIPI XOP opcode call.

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Result code   >0000 no character

                            >0001 or greater, characters returned to the buffer.

Example Code

```
        LOOP
                LI      R0,>0016        Receive string
                LI      R1,BUF          Buffer containing the characters
                LI      R2, 8192        Length of buffer
                LI      R3,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

                MOV     R0,R0           Test for status
                JEQ     LOOP            No character(s) received, run through loop again

        TIPI    DATA    12              TIPI Library
        BUF     BSS     8192            Buffer
```

Open TLS URL

Function   Opens a TIPI TLS socket to a Hostname or IP address at a specified port.

Parameters   R0 = >0017
R1 = Hostname or IP address
R2 = Length of R1
R3 = Socket handle (MSB)

Results   R1 = Result code

Parameter Description

Hostname or IP   The hostname or IP address is a string in the form of "hostname:port" without the quotes.

Length   The length of the string Hostname:Port

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Result code   >FFFF if connect

                                >0000 for no connection

Example Code

```
        LI    R0,>0017    Open Host opcode
        LI    R1,HOST1    Host or IP address to open with port number
        LI    R2,22       Length of Host String
        LI    R3,>0100    TCP Socket Handle Byte (MSB)
        XOP   @TIPI,0     Access subprogram
        MOV   R0,R0       Test for connection
        JEQ   NOCONCT     No connection,

TIPI    DATA  12          TIPI Library

HOST1 TEXT  "Heatwave.ddns.net:9640"     Host to open
      EVEN
HOST2 TEXT  'localhost:23"               Host to open
      EVEN
HOST3 TEXT  '192.168.1.79:9640'          Host to open
      EVEN
```

Close TLP Connection

Function   Close an open TIPI TLP Socket.

Parameters   R0 = >0018 (opcode)
                          R1 = Socket handle (MSB)

Results   N/A

Parameter Description

Socket handle   Socket handles will have a socket handle of a single byte from >00 to >FF, assigned
                          arbitrarily by the code it passes in the open command. Multiple sockets can be
                          managed by the TIPI XOP within a single program or with several programs in a
                          multitasking state.

Example Code

```
LOOP
       LI    R0,>0018    Close TIPI TCP Socket
       LI    R1,>0100    TCP Socket Handle Byte (MSB)
       XOP   @TIPI,0     Access subprogram

TIPI   DATA  12          TIPI Library
```

Send TLP Message

Function   Send a TIPI TLP message, maximum 8K characters.

Parameters   R0 = >0019
                             R1 = String pointer to write
                             R2 = String length beginning after first three bytes of the string pointer destination.

Results   R0 = >0000 all characters sent, not >0000 then error on sending string.

Parameter Description

String length   String length is defined as:

                             1st Byte   >24
                             2nd Byte   Socket handle byte >01 to >FF
                             3rd Byte   >03 (write command)
                             4th Byte to 8K   String up to 8K

Socket handle   Socket handles will have a socket handle of a single byte from >01 to >FF, assigned
                             arbitrarily by the code it passes in the open command. Multiple sockets can be
                             managed by the TIPI XOP within a single program or with several programs in a
                             multitasking state.

Example Code

```
LI     R0,>0019    Send String
LI     R1,HELLO    String Pointer
LI     R2,7        String length
XOP    @TIPI,0     Access subprogram

HELLO BYTE >24     TLP Extension
      BYTE >00     Socket handle
      BYTE >03     Write
      TEXT  'Hello'
      BYTE >0D,>0A    cr/lf


TIPI   DATA  12       TIPI XOP Library
```

Receive TLS Message

Function Receive a single character from the TIPI TLS Socket Messaging system

Parameters R0 = >001A
R1 = String Pointer
R2 = String length
R3 = Socket handle (MSB)

Results R0 = Result code

Parameter Description

String Pointer An address in memory where data will be returned to a buffer in the program's physical 64K memory space.

String length The length of the buffer in memory to be processed. The Raspberry PI maintains a larger buffer passing up to the maximum amount of characters in the program's buffer. Upon return from the TIPI XOP call, the actual number of characters retrieved will be passed.

The string length shall not exceed the boundary of a 2nd page mapped in memory from the first physical page as only 2 x 8K pages are mapped into use during the TIPI XOP opcode call.

Socket handle Socket handles will have a socket handle of a single byte from >00 to >FF, assigned arbitrarily by the code it passes in the open command. Multiple sockets can be managed by the TIPI XOP within a single program or with several programs in a multitasking state.

Result code >0000 no character

>0001 or greater, characters returned to the buffer.

Example Code

```
        LOOP
                LI      R0,>001A        Receive string
                LI      R1,BUF          Buffer containing the characters
                LI      R2, 8192        Length of buffer
                LI      R3,>0100        TCP Socket Handle Byte (MSB)
                XOP     @TIPI,0         Access subprogram

                MOV     R0,R0           Test for status
                JEQ     LOOP            No character(s) received, run through loop again

        TIPI    DATA    12              TIPI Library
        BUF     BSS     8192            Buffer
```

TIPI Log Extension

Function   Writes a message to the "tipi.log" file on the TIPI. Useful for Debugging purposes.

Parameters   R0 = >001B
                        R1 = String Pointer
                        R2 = String length

Results   Not Applicable

Parameter Description

String length   String length is defined as:

                        1st Byte   >25
                        2nd Byte to 8K   String up to 8K

Example Code

```
        LOOP
                LI      R0,>0025    Receive a single character
                LI      R1,HELLO    String Pointer
                LI      R2,7        String length
                XOP     @TIPI,0     Access subprogram

                HELLO BYTE >25      TLP Extension
                        TEXT  'Hello'
                        BYTE >0D,>0A   cr/lf


                TIPI    DATA   12      TIPI XOP Library
```