Zypcom Application Note

Product:
Z34-SX, Z34-RX, Z34-SE, Z34-RE, Z32t-SX, Z32t-SE, Z32t-RX, Z32b-SX, Z32b-SE, Z32b-RE and Z32b-RX

Application:

Leased Line Operation with Synchronous Data

Synchronous leased line operation can be set using DIP switches or AT commands. Two basic synchronous setups are described below, one using DIP switch setup and one using AT commands. Your application may require some additional commands.

When selecting speed it is important to remember that the serial port speed and the line speed are the same when using synchronous communications. When a modem changes speed during a retrain the synchronous clocks will also change speed to reflect the new line speed. Since this is the case, it is usually a good idea to force the line speed in synchronous leased line applications.

Synchronous leased line application considerations are:

Leased line type   4-wire (&L2) or 2-wire (&L1)
Note: SX-/RX-Series modems support 2-/4-wire and SE-/RE-Series are 2-wire

Transmit level (S35)   Set to -6dBm (S35=6)

Line speed (S37=nn)   Auto (S37=0) or selectable (S37=nn)
Note: For synchronous applications it is a good idea to fix the line speed (S37=nn N0) since synchronous computers usually are unpredictable when clocks SCR and SCT (pins 15 and 17) change speeds.

Line speed forced (Nn)   Yes (N0) or No (N1)
Note: N1 allows the modem to select the best line rate and allows the modem to lower speed if lines conditions change. The command N0 forces the line to a specific speed. It is a good idea to use N0 on line rates for synchronous applications.

Messages off (Qn)   On (Q0) or Off (Q1)
Note: After setup usually turn off (Q1)

Echo off (En)   On (E1) or Off (E0)
Note: After setup usually turn off (E0)

Synchronous modem (&Q)   Pure sync. (&Q3)
Note: Only use &Q3 synchronous modem for leased line applications

Sync. clocks &Xn)   Internal (&X0), external (&X1), slave (&X2)
Note: Most applications can have both modems with &X0 clock settings (two separate clocks).
Some applications like T1 muxes tail circuits and some routers require only one clock be used
hence one modem has to be in slave mode (&X2) and one in internal mode (&X0)

EIA signals: CXR (&Cn) Normal (&C1) or Forced (&C0)
                    DSR (&Sn)   Normal (&S1) or Forced (&S0)
                    CTS (&Rn)   On (&R1) or Follow CXR (&R2)
                    DTR should be forced ON (&D0)

Also, one modem will be the answer side (S0=1) and the other will be the
originate side (S0=0).

Hardware Jumpers:

The Zypcom modems need to have their leased line jumpers (one set of
jumpers for 2-wire, two sets of jumpers for 4-wire) installed per Leased
Line Operation Chapter section titled Mandatory Setup Procedures. Jump-
ers JP3 and JP4 should be in there default position which is no connec-
tion. If you ordered an "SXL" model then the jumpers are already installed.

Leased Line Telco Cable:

Zypcom has several different leased line cables depending on the modem
model. For all RX-/RE-Series modems use 91009-200 an octopus chassis
cable for 2-wire (&L1) or 4-wire (&L2) operation. For the SE-Series mo-
dems use cable 91009-202 for 2-wire operation. For SX-Series use 91009-
202 for 2-wire operation and use 15080-001 for 4-wire operation.   On
external modems all leased line telco cables are installed into the modems
modular phone jack labelled PHONE.

AT Command Setup

For complete control over all modem options use AT commands to setup
leased line operation.   The ability to fine tune the modem to your applica-
tion using DIP switch setup is limited. One would use AT commands for
leased line setup if the DIP settings didn't provide the needed selections for

your application. One uses an asynchronous device (PC or terminal) to send AT commands to the modem which will set it for synchronous leased line operation. Once you send the &Q3 command to the modem you can no longer send additional AT commands. If you need to start the setup over after sending the &Q3 command to the modem then do a power reset (Chapter 4) to return the modem to its default settings. Turn off the modem, press the Data and Test keys in, turn on the modem. Release the Data and Test keys after 5 seconds. The power reset was successful if the SYN LED goes OFF and the CTS/DSR/CXR/AA LEDs are ON.

19,200bps Leased Line with Synchronous Data—Answer Side

The following procedure explains how to setup synchronous leased line operation for an answer-side modem using AT commands. The following sample command strings might need to be changed slightly for your application. The command &W writes the command settings to memory.

1.   Set the EIA and speed options and any other options required for your application. For example, it is recommend that synchronous applications use CXR (&C1) and DSR (&S1) set to normal. Also, CTS should follow true carrier (&R2) for most applications but some may require CTS ON (&R1). Also, you probably want a fixed line speed (N0 S37=34) for your application.
19,200 Sync. Setup: Internal clock and a forced line rate of 19,200bps.

<div align="center">AT &C1 &S1 &R1 N0 S37= 34 &X0 &W<ENTER></div>

2.   Issue the data type command, leased line command (&L1 for 2-wire, &L2 for 4-wire), register S0 setting, turn off echo/messages and set transmit level (on most leased lines set S35=6 but back-to-back bench testing set S35=20) then write it to memory.

       For an asynchronous two-wire answer modem, type:
<div align="center">AT &Q3 &L1 S0=1 E0 Q1 S35=6 &W<ENTER></div>

       For an asynchronous four-wire answer modem, type:
<div align="center">AT &Q3 &L2 S0=1 E0 Q1 S35=6 &W<ENTER></div>

NOTE: The OK message is not sent after the command in step 2 due to Q1 command.

3.   Turn power off and then on. After about five seconds the commands take effect and the modem goes off-hook and begins sending answer tone.

19,200bps Leased Line with Synchronous Data—Originate Side
The following procedure explains how to setup synchronous leased line operation for an answer-side modem using AT commands. The following sample command strings might need to be changed slightly for your application. The command &W writes the command settings to memory.

1.   Set the EIA and speed options and any other options required for your application. For example, it is recommend that synchronous applications use CXR (&C1) and DSR (&S1) set to normal. Also, CTS should follow true carrier (&R2) for most applications but some may require CTS ON (&R1). Also, you probably want a fixed line speed (N0 S37=34) for your application.
19,200 Sync. Setup: Internal clock and a forced line rate of 19,200bps.

<div align="center">

AT &C1 &S1 &R1 N0 S37= 34 &X0 &W<ENTER>

</div>

2.   Issue the data type command, leased line command (&L1 for 2-wire, &L2 for 4-wire), register S0 setting, turn off echo/messages and set transmit level (on most leased lines set S35=6 but back-to-back bench testing set S35=20) then write it to memory.

For an asynchronous two-wire answer modem, type:
AT &Q3 &L1 S0=0 E0 Q1 S35=6 &W<ENTER>

For an asynchronous four-wire answer modem, type:
AT &Q3 &L2 S0=0 E0 Q1 S35=6 &W<ENTER>

NOTE: The OK message is not sent after the command in step 2 due to Q1 command.

3.   Turn power off and then on. After about five seconds the commands take effect and the modem goes off-hook and begins sending answer tone.

9600bps 2-wire Leased Line Example

9,600bps 2-Wire Leased Line with Synchronous Data—Answer Side
9600 Sync. Setup: Internal clock and forced line rate of 9,600bps.
AT &C1 &S1 &R1 N0 S37=17 &X0 &W<ENTER>

AT &Q3 &L1 S0=1 E0 Q1 S35=6 &W<ENTER>

9,600bps 2-Wire Leased Line with Synchronous Data—Originate Side
9600 Sync. Setup: Slave clock and forced line rate of 9,600bps.
AT &C1 &S1 &R1 N0 S37=17 &X2 &W<ENTER>

AT &Q3 &L1 S0=0 E0 Q1 S35=6 &W<ENTER>

DIP Switch Setup

DIP switches are a quick and easy way to setup leased line operation. Make sure that the modems jumpers are installed properly. This method only allows control over the basic leased line settings. The DIP switch block is found on the bottom of the modem. When selecting settings the modem should be powered off.

1.   Set SW1 to the ON position to enable the rest of the switches.

2.   For synchronous communication set SW2 to ON.

3.   Set the line speed using switches SW3 and SW4. The actual line speed will vary depending on the modem model. Only four synchronous speeds are selectable using the DIP switch. Refer to your User's Guide for which speeds your modem supports.

4.   Set SW5 to select which modem will originate and which modem will answer. Set SW5 to the OFF position on the originating modem and SW5 ON on the answering modem.

5.   Set switch SW6 to the ON position to enable leased line operation.

6.   Set switch SW7 to the OFF for two-wire leased line and to the ON position for four-wire leased line communication.

Once the switches have been set, reconnect the DTE's serial cable, leased line telco cable (remember that this cable installs into the PHONE jack on the modem) and return power to the modem.

When the leased line configured modem is powered up, it will automatically go off-hook in 5 seconds. The handshaking tone will be heard on the answer modem. Once the originate modem hears the answer modem's handshake tone it will respond with its own unique tone. After going off-hook and putting out answer tone for about 30-40 seconds, the answer modem then goes on-hook waits 4 or 5 seconds and repeats the process. The originate-side modem goes off-hook in originate mode, waiting to detect answer tone. If the leased line is installed properly, the modems will handshake and the speaker will shut off indicating carrier has been acquired.

Z32b-SX Modem

9600bps 4-Wire Leased Line with Synchronous Data—Answer Side
DIP SW1   ON
DIP SW2   ON
DIP SW3   ON
DIP SW4   OFF
DIP SW5   ON
DIP SW6   ON
DIP SW7   ON
DIP SW8   OFF
DIP SW9   OFF
DIP SW10   OFF

9600bps 4-Wire Leased Line with Synchronous Data—Originate Side
DIP SW1   ON
DIP SW2   ON
DIP SW3   ON
DIP SW4   ON
DIP SW5   OFF
DIP SW6   ON
DIP SW7   ON
DIP SW8   OFF
DIP SW9   OFF
DIP SW10   OFF

Z34-SX Modem (14.4Kbps is the lowest speed supported with DIP switch)

14400bps 4-Wire Leased Line with Synchronous Data—Answer Side
DIP SW1   ON
DIP SW2   ON
DIP SW3   ON
DIP SW4   ON
DIP SW5   ON
DIP SW6   ON
DIP SW7   ON
DIP SW8   OFF
DIP SW9   OFF
DIP SW10   OFF

14400bps 4-Wire Leased Line with Synchronous Data—Originate Side
DIP SW1   ON
DIP SW2   ON
DIP SW3   ON
DIP SW4   ON
DIP SW5   OFF
DIP SW6   ON
DIP SW7   ON
DIP SW8   OFF
DIP SW9   OFF
DIP SW10   OFF