1. INTRODUCTION

The **B**asic **I**nterface to **R**emote **T**erminal, or **BIRT**, is an INCOM Network Master. **BIRT** gives users an economical way of getting information from their INCOM-compatible devices since it connects directly between a user's external MODEM or personal computer and the INCOM network.

BIRT can directly replace Westinghouse MINTs, talking to all INCOM-based communication devices. **BIRT**s also include a special high-speed mode for communicating with SADIs – allowing users to collect data from other manufacturer's relays more rapidly than ever before.

BIRTs are built to handle the abuse of substation environment; their "hardened" RS-232 serial port can handle surges and sustained high voltages that would destroy ordinary serial ports, and **BIRT**s can run on a wide range of voltages, from 48 to 250 Vdc or even 120 Vac, with no jumpers or adjustments needed.

2. FEATURES

BIRT is designed to be very flexible in its RS-232 communications options:

- Data Bit Length can be set to 5, 6, 7, or 8 bits.
- Even, Odd, or No Parity.
- 1 or 2 Stop Bits.
- Data Rates from 1200-9600 bps.
- Has a standard, 25 pin, DCE (Data Communication Equipment) serial port connector.

BIRT includes non-volatile memory for storing RS-232 settings, and responses from the host; more than 2 Kbytes of host data may be stored.

BIRT conforms to all applicable ANSI and IEC specifications.

Westinghouse MINTs can be upgraded to **BIRT**s without changing host computer software, cables, or power supply.

3. DESCRIPTION

3.1. Power Requirements

Range: 48 Vdc to 250 Vdc and 120 Vac

Burden:
3.5 W @ 48 Vdc
9 W @ 250 Vdc
5 W @ 120 Vac

3.2. Temperature Range

For Operation: 0˚ to +55˚ C
For Storage: -20˚ to +80˚ C

3.3. Physical Dimensions

The BIRT enclosure dimensions are identical to the ERNI and SADI, as shown in figure 1.

Dimensions and weight of chassis

Height: 5.26" (133.6) mm)
Width: 3.32" (84.3) mm)
Depth: 5.92" (150.4) mm)
Weight: 2.0 lbs (0.9 kg)

External Wiring: See figures 2 and 3.

Power Supply: 14-22 AWG stranded wire

INCOM Network: Belden Broadcast and Computer Cable, 20 AWG, part number: 9463

3.4. Front Panel Layout

The front panel contains:

– Status LED: indicates when the **BIRT** is operating normally, when it is transmitting on the INCOM network, and if there is a malfunction.

– Communications connector: a standard, female DB-25 connector, labeled "COM PORT", provides the serial interface to the user's computer or external MODEM.

– Power and INCOM interface connector: the battery or power supply is applied to pins 3 and 4, and the INCOM network twisted pair wire is connected to pins 1 and 2.

4. INSTALLATION

Installation and operation of the **BIRT** involves four steps:

1. Setting **BIRT** INCOM switches
2. Making electrical connections
3. Setting software parameters
4. Physically mounting **BIRT**

4.1. Setting BIRT's INCOM Switch

BIRT contains one internal, four position DIP switch, SW4, that specifies the INCOM network data rate and type of signal modulation. **BIRT**'s DIP switch configuration must match the configuration of your other network devices. There are two possibilities:

– Older, low speed INCOM networks are 1200 bps, ASK modulation,

– Newer, high speed networks are 9600 bps, FSK modulation.

Use **Table 1** to set DIP switch S4 to the correct configuration.

	INCOM NETWORK TYPE	
S4	1200 bps, ASK	9600 bps, FSK
1 2 3 4	closed (down) closed (down) closed (down) open (up)	open (up) closed (down) open (up) open (up)
Switch 4 settings for INCOM network parameters		

Table 1:

4.2. Making Electrical Connections

BIRT has three connection groups: power, the INCOM Network, and the RS-232 serial port.

4.2.1 Connecting Power

BIRT can be powered by 48-250 Vdc or 120 Vac. This power is connected to pins 3 and 4 of the green connector P3 on **BIRT**'s Front Panel; either polarity is ok. Use 14-22 AWG stranded wire for the power supply. About a second after applying power, you should notice **BIRT**'s LED slowly flashing green; this indicates it is passing all internal tests.

4.2.2 Connecting To The INCOM Network

For the twisted pair network wire, we recommend using Belden Broadcast and Computer Cable, 20 AWG, part number 9463. This cable will perform more reliably than many other types, especially when the network has many devices or is longer than a few dozen feet.

The INCOM network connections are directly above the power connections. Connect the twisted pair wire to pins 1 & 2 of the connector, P3. Polarity isn't important here either. Connect the twisted pair's shield to **BIRT**'s ground stud.

4.2.3 Connecting To BIRT's RS-232 Serial Port

RS-232 communication devices come in two varieties: DTE (Data Terminal Equipment) and DCE (Data Communication Equipment) types. Loosely speaking, DCE devices can be considered as "slaves" and DTE devices as "masters." You can usually tell whether a serial port is a DCE or a DTE type by glancing at the connector: DCE devices are always supposed to have female connectors, and DTE devices are supposed to have male connectors. Personal computers (PCs) are normally DTE devices or masters, and external modems are DCE devices or slaves. The original intent was to allow DTE devices, like computers, to plug directly into DCE devices, like modems, with a straight cable – that is, pin 1 of the computer to pin 1 of the modem, pin 2 to pin 2, and so on.

BIRT is a DCE device: it will connect directly to your host Personal Computer using a standard, straight cable with a 25 pin female connector at one end and a 25 pin male connector at the other. These cables are probably the most common communication cables around and can be found in computer and electronic stores.

Sometimes personal computers have a 9 pin DTE connector instead of a 25 pin connector. In this case simply buy a cable with a female 9 pin connector at one end and a male 25 pin connector at the other.

4.2.4 External MODEM Connection

External modems are stand-alone boxes that have a

telephone connection and an RS-232 serial port connection. External modems differ from the more common internal modems which are just printed circuit boards that plug directly into your PC, eliminating the RS-232 serial port connection.

Since the **BIRT** needs to plug into a device with an RS-232 port, you must use an external modem. You'll also need an adapter called a Null modem. This simple device lets two DCE devices, like **BIRT** and a modem, talk together. Null modems swap input and output connections so that the outputs of one DCE device feed into the inputs of the other and vice-versa. Like straight cables, these are also very common and can be purchased at any computer store. Try to buy a null modem that has male connectors on both ends. Then you can use the same cable as you would with a direct computer to **BIRT** connection.

To use the Null modem, simply plug it into the **BIRT** or the modem, in either direction, then connect the cable between the Null modem and the other device. Remember the **BIRT** and modem are both DCE devices and have female connectors so your cable and Null modem combination must end up with the male 25 pin connectors on both ends.

Since RS-232 communications are susceptible to interference, keep the cable as short as possible, preferably ten feet or less. If you have to use a longer cable, you should use a shielded cable.

4.3. RS-232 Configuration

BIRT's RS-232 configuration specifies how the **BIRT** will communicate using its RS-232 serial port. You will need to set this configuration to match the modem or local computer to which **BIRT** will be connected. These settings are made with software rather than DIP switches, and are maintained in **BIRT**'s non-volatile memory even after power is removed.

4.3.1 BIRT RS-232 Configuration Options

You can set **BIRT**'s communication settings to enable it to talk with virtually any RS-232 host device. Since these devices are quite diverse in their communication parameters, **BIRT** enables you to set:

- Data Rate – the speed at which the host communicates through its RS-232 port. **BIRT** can handle all standard common data rates from 1200 to 9600 baud; default is 1200 baud.

- Number of Stop Bits – RS-232 communications break up bytes of data with a stop bit or bits. Allowable values are 1 or 2; default is 2 bits.

- Data Bits per character – using the complete or extended ASCII set requires 8 data bits, but some RS-232 devices use a subset of this set, and communicate with 5, 6, or 7 data bits. **BIRT** can be set from 5 to 8 bits to accommodate all lengths. Default is 8 bits.

- Parity bit – an error detection bit, known as a parity bit, is used by some RS-232 devices. This option can be set for even, odd, or no parity. The default is No Parity.

4.3.2 Setting RS-232 Configuration

BIRT's RS-232 configuration can be changed using a computer that has ABB's **R**emote **C**ommunications **P**rogram, **RCP**, installed. For details on how to use **RCP**, see the **RCP** instruction Leaflet, 40-603. If you are already familiar with **RCP**, you can perform the following steps:

1. Start **RCP** and ***Enter*** the initial ***Password***.
2. Enter ***ALT + C*** – this will display the communications options.
3. Configure **RCP**'s RS-232 port to match the current **BIRT** configuration. If this is a new **BIRT**, the default parameters are 1200 baud, 8 data bits, 2 stop bits, and no parity. To change **RCP**'s configuration, select "SETTINGS" then set the bit rate (baud); **RCP** automatically uses 8 data bits, 2 stop bits and no parity so normally you won't have to change these.
4. Select "Local Mode" – this will display the RS-232 and modem options.
5. Select "RS-232"
6. Type "***###***" – don't hit the carriage return or "***enter***" key. **BIRT** recognizes the "#" character sent three times as a signal to stop what it's doing and enter SETUP MODE. **BIRT** will then send its Setup Menu to your host's screen.

BIRT Setup Menu Ver. 1.00

set (B)aud	set (W)ord Length
set (P)arity	set (S)top bits
(R) eport NOVRAM settings	(I) nitiate NOVRAM settings
start SADI (A)scii mode toggle	Setup Menu (E)cho

<esc> to quit Setup Mode

Command: ___

To select a parameter to change, type the letter in parenthesis.
For example to change Baud, type ***"b"*** or ***"B"***.

Set **(B)**aud – prompts you for the data rate you want between the host computer or modem and the **BIRT**. Set **BIRT** for the highest data rate that works with your modem or computer. In general if you are using a modem, select the highest speed of the modem or 9600 baud, whichever is lower. If you're connecting directly to a computer, select 9600 baud.

Set **(W)**ord length – prompts you for the number of bits per ASCII character. Unless you know otherwise, select 8 bits.

Set **(P)**arity – most applications don't use parity so you'll usually select No Parity.

Set **(S)**top Bits – allows you to toggle between 1 and 2 stop bits. Most modern applications use 1 stop bit, but **RCP** and the original Westinghouse MINT use 2 stop bits, so the **BIRT** factory default is 2 stop bits. As a general rule, use 2 stop bits unless you have a good reason to use only 1 stop bit.

(R)eport NOVRAM settings – this option will display the latest setting changes you have entered. These settings will take effect when you select the **(I)**nitialize NOVRAM settings command.

(I)nitialize NOVRAM settings – settings you may have changed do not take effect until you select this option. This feature allows you to continue making all setting changes without having to reconfigure your host's RS-232 serial port after each change.

After you have selected this option, you may see garbled characters appear on your screen. At this point you'll need to change your host's communication configuration to match the changes made in the **BIRT**. If you're using **RCP**, back out to the RS-232 settings options, and change them to match **BIRT**. You can then re-enter local mode and continue making setting changes, or proceed to some other operation.

Start **(A)**SCII mode – selecting this will cause **BIRT** to leave Setup mode and enter ASCII mode. ASCII mode is used strictly by SADIs and allows a very rapid transfer of data between the SADI's host RS-232 device, like a GE DLP, and your host computer. See the section on ASCII mode for more information.

Toggle Setup Menu **(E)**cho – when the echo is "***on***" **BIRT** echoes back any Setup Menu Command you enter. If you see two characters for every one you enter, for example, "***BB***" instead of "***B***", turn the echo off, and if you don't see a character when you enter a command, turn the echo "***on***".

Note that if you do not enter any characters for fifteen (15) seconds,* BIRT *will automatically resume INCOM mode.

4.3.3 RS-232 Communication Problems

If you can't get the **BIRT** to communicate, set your local computer to 1200 Baud, 8 data bits, 2 stop bits, and no parity. Then power the **BIRT** off then on. **BIRT** will automatically set itself for this RS-232 configuration for ten seconds after power up. Immediately after power up, send "***###***" to **BIRT**. That will take you into Setup mode where you will see the Setup Menu.

BIRT will continue to communicate at this data rate until you either exit Setup mode or force a change in **BIRT**'s RS-232 configuration. You can now go ahead and make your setting changes.

If you miss the first seconds after power-up, the **BIRT** will take up to one minute to initialize the RS-232 port with its current NOVRAM settings.

Sometime in the future you may forget the settings in the **BIRT** and not be able to communicate with it. At that point you have two options:

1. You can power the **BIRT** on and off like above, then after you get the Setup Menu, type "R" to see **BIRT**'s current settings. You can then either change your **RCP** settings to match the **BIRT** or update the **BIRT** settings.

2. You can also experiment with different **RCP** serial settings, typing "***###***" after each trial, and observing if the **BIRT** sends its Setup Menu.

4.3.4 Recommended Settings

Although **BIRT**s can be set in a wide variety of ways, we have found good performance with most systems can be achieved by using the following settings:

BIRT Settings for Local Computer Connection

When you use **BIRT** with a local computer, we recommend setting **BIRT** for the fastest transfers possible; these settings are: 9600 Baud, 8 data bits, 2 stop bits, and no parity.

BIRT Settings for MODEM Connection

If you use **BIRT** with a modem, set **BIRT** to the highest data rate the modem can use or 9600 Baud, whichever is lower. For example, if you have a 2400 baud modem, set the **BIRT** to 2400 baud; if you have a 14.4 k baud modem, set **BIRT** to 9600 baud. In both cases the other settings can be 8 data bits, 2 stop bits, and no parity.

4.4. Mounting

BIRTs can be mounted in any position and just about any location that's clean and dry, and free from excessive vibration, corrosive fumes, and heat.

BIRT can either be panel mounted or installed on the back of FT-type cases using special mounting hardware kit #9656A94G01 (see figure 1).

Before performing acceptance tests make sure you have configured **BIRT**'s INCOM DIP switch and set the RS-232 configuration in software. The **BIRT** INCOM switch must be set the same as your INCOM network – either 1200 bits/sec, ASK modulation like the original INCOM network, or 9600 bits/sec, FSK modulation for high speed INCOM Networks. The RS-232 should be set to some known configuration, for example, 9600 baud, 8 data bits, no parity, and 2 stop bits.

5. GENERAL TESTS

Connect **BIRT** to power and the INCOM twisted pair. The twisted pair shield should be connected to **BIRT**'s ground stud. After power is connected you should see **BIRT**'s LED begin slowly flashing green; this shows **BIRT** is passing all its self-tests.

Connect the serial port of a local computer to the **BIRT** serial port – this is "COM PORT" on the front panel, using a straight 25 pin cable.

ABB's Remote Communications Program, RCP, will be used to test **BIRT** (for more details on using RCP, see the RCP I.L. 40-603).

To use RCP to communicate with **BIRT**:

1. Enter the password.

2. Select the Substation File (***ALT + S***).

3. Select the Device.

4. Select Communicate Initiate (***ALT + C*** – Initiate).

5. If you need to change the default Com Port or baud to match the **BIRT** (shown in lower-right corner of screen), then select Communicate-Settings (***ALT + C*** – Settings) to select Connect Settings, and change your Com Port or baud as needed.

6. For any device selected (e.g., MDAR, MMCO, RONI, etc.) press ***ALT + R*** – Relay Commands, and select commands from the menu that you want to execute.

RCP will communicate with the selected device through the **BIRT**; it sends commands formatted in INCOM's 10 byte ASCII protocol to **BIRT** which converts commands into a normal INCOM network message format and sends them to the network devices. The specific device selected by the command replies to **BIRT**, which translates the information back to the 10 byte protocol, and sends it back to RCP. RCP then displays the device's reply on your screen.

Communicate with your network devices using several commands to verify **BIRT** and RCP are operating properly.

5.1. MODEM Tests

If **BIRT** is connected to an external modem, you need to set the modem and make sure the **BIRT** is configured properly to work with the modem. Connect a PC, with RCP installed, directly to **BIRT** (no modem or telephone lines in between) to initially configure **BIRT**. See Section 4.3 for information on configuring **BIRT**.

BIRT should be configured at the highest modem data rate or 9600 baud, whichever is lower (see Section 4.3.4 Recommended Settings). Also make sure **BIRT** is set for 8 data bits, 2 stop bits, and no parity.

After you have configured **BIRT**, disconnect it from your PC, and connect the **BIRT** to its modem with a cable and a Null modem. Then connect this modem to the telephone line. For more information on how to connect **BIRT** to a modem, see Section 4.2.4.

Connect your RCP computer's modem to another telephone line; note that this modem can be either an external or internal modem since no direct **BIRT** connection is needed at this end.

Start up RCP in your PC and set your PC's modem or serial port to communicate at the same baud as the **BIRT**. For example if the **BIRT** is set to 2400 baud set your PC's modem the same.

Using RCP, call **BIRT**'s telephone number. From RCP, select the substation and device you want to communicate with. Initialize the Com port, then, following menu options, select "Communicate", "Local Mode", and "RS-232". The screen will clear, and allow typing in a telephone number, e.g. ATDT 5551212. The modem will then dial this number, and wait for a connection in **BIRT**'s modem.

Once this connection is established, you will be able to communicate through **BIRT** to your substation device in the same way as you would if your computer was connected directly to the **BIRT**. Send several commands to the device to confirm everything is working properly.

6. OPERATION

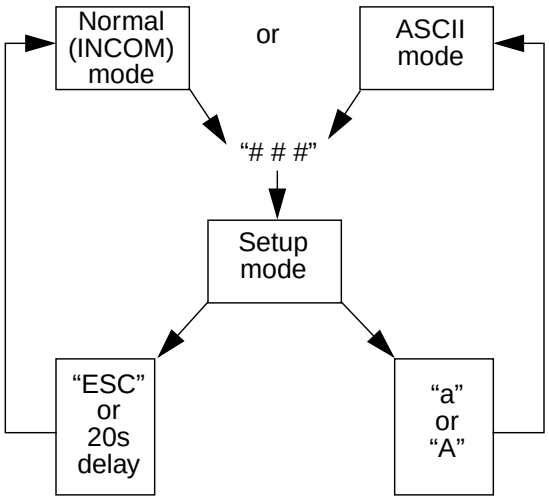
BIRT has four modes of operation: Power-up, Setup, INCOM, and ASCII mode.

6.1. Power UP

When power is first applied, the LED on the front panel should begin flashing green at a rate of about one second on and one second off; this shows that **BIRT** is passing all internal tests and is operating normally. A rapid flashing amber LED indicates a self-test failure.

BIRT remains in Power-up mode for ten seconds. During that time, the default RS-232 communication settings are in effect – 1200 baud, 8 data bits, no parity, and 2 stop bits. If you enter "###" using these default communication settings, **BIRT** will immediately enter Setup mode. Otherwise **BIRT** will take one minute to initiate the RS-232 port with its current NOVRAM settings. The **BIRT** will not necessarily power up to the normal (INCOM) mode. It will power up to either the normal or ASCII mode, whichever mode it was in when it was powered down.

POWER UP:



6.2. INCOM Mode

INCOM mode is the most commonly used **BIRT** mode. While in INCOM mode, **BIRT** functions much like a Westinghouse MINT: it will respond to RCP issued INCOM commands the same way the MINT does, however it has considerably larger memory dedicated to holding INCOM response messages from the slaves, thus eliminating the need to slow down the network during lengthy responses.

If you have used RCP and a MINT before, you can continue doing things the way you have been.

If you haven't used RCP, see the RCP manual on how to communicate on the INCOM network.

If you attempt to communicate to network relays is unsuccessful, it is possible the **BIRT**'s Setup mode (see section 4.3.2) and press the "ESC" key to allow the **BIRT** to communicate to network relays in the Normal mode.

6.3. Setup Mode

Setup mode lets you change the RS-232 settings in the **BIRT** or enter ASCII mode. Setup mode can be entered at any time by sending "###" to the **BIRT** while using the correct RS-232 settings. These three characters can be sent by RCP in Local mode. See Setting RS-232 Configuration 4.3.2 for more details on using Setup mode.

6.4. ASCII Mode

Many relay manufacturers are using RS-232 serial communications as a means of transferring information from their relays to host computers. Depending on the particular relay, there are two common ways that users access this RS-232 data: using a terminal emulation program like Procomm, BitCom, or Mirror, or by using an application program written by the relay manufacturer.

When users communicate with the Procomm method, they type specific commands like "EVENTS" to get target data from the relay, and when they are using the manufacturer's program, they may be selecting commands from menus with arrow keys, or some other method.

ASCII mode enables you to communicate with these relays as through you were connected directly to the relay. It will work with Procomm-type relays and many application programs as well.

ASCII mode requires that the host relay be connected to SADI so that RS-232 data can be converted into INCOM data. When ASCII mode is initiated, a transparent link is created between the **BIRT** and SADI, allowing data to free flow between the two devices. This link not only greatly increases the data rate, but it allows you to talk with the RS-232 relay as though you were connected directly to it. Figure 2 shows a typical BIRT/SADI connection.

To start ASCII mode:

1. Start RCP and select "Communications" (***ALT + C***) – "Local mode – RS-232"

2. Change **BIRT**'s mode to Setup mode by typing "***###***". After that you should see **BIRT**'s Setup Menu.

3. Select "A" for (A)SCII mode.

4. **BIRT** will then prompt you for the INCOM address of the specific SADI that you wish to link to. Enter this address.

BIRT will check and verify whether or not a SADI is at the address, and if one is found it will establish the link. If the **BIRT** cannot establish communications to the SADI address given, it will enter the ASCII mode anyway.

If the relay uses Procomm-type communications, you can simply enter commands as though you were connected directly to the relay. To break the **BIRT**-SADI link, type "***###***". That will return you to Setup mode. Cycling power while **BIRT** is in the ASCII mode, will not revert it to the Normal (INCOM) mode. It will power up in the ASCII mode.

If the relay uses an application program for communications:

1. Start RCP and start **BIRT**'s ASCII mode as above.

2. Press ***F2*** – "Return to Main Program".

3. **Select *SADI*** as the device.

4. Press ***ALT + R*** – Relay Commands, and select "Load an External Application Program". Be sure to include the full path name of the application program.

After the program is loaded, you should be able to communicate normally. If a problem occurs, like no returned data, check SADI settings to its host RS-232 device.

There are some limitations to this scheme – some application programs have a very rigid time frame in which to accomplish data transfers. They cannot accommodate the occasional delay introduced by this scheme, thus they cannot use this mode.

In some cases these relays are able to use “Procomm” type communications in addition to the relay manufacturer’s application program, and so you may still be able to take advantage of ASCII mode.

A second limitation is that the host relay must have left at least one “spare” ASCII character. There are 256 possible characters in the extended ASCII set; all the keys on a keyboard, graphics characters, and command codes have unique ASCII codes. Usually relays only use a portion of these, say the alphabet, all numbers, and some punctuation, to say everything they need. That leaves quite a few unused characters. The SADI and **BIRT** require at least one character, called the End of Command Character, to help control the flow of data on the twisted pair.

Some relays, particularly those that use a manufacturer’s application program, use many of these normally spare characters for their own data formatting and command codes. Finding a spare ASCII code can be trial and error, although we have often found that ***fe hex*** works well. If this code doesn’t work, you can usually find a spare character by starting with the code ***ff hex*** and working your way down.

To search for a spare character, use RCP to select the specific SADI you need to setup. Modify SADI’s settings to use the new End of Command byte, then attempt to communicate with SADI’s host using ASCII mode. No **BIRT** changes are needed for this new End of Command byte since it automatically gets the latest byte from SADI each time you start ASCII mode. For more information on updating settings like the End of Command Byte, see the RCP I.L., 40-603, and the SADI I.L., 40-609.

6.5. ABB Bulletin Board

The ABB Power Automation and Protection Division Bulletin Board (BBS) is now on line. To obtain the latest version of RCP software, please call the ABB BBS via modem at:

(800) 338-0581 or (954) 755-3250

Using configuration settings 300-14,400 bits/second, 8 data bits, 1 stop bit, no parity and full duplex. Once the connection is established and login is completed, choose L - Library of Files from the TOP menu. Next, Select D - Down Load File, from the Library of Files, RCPxxx.EXE (where xxx is the most recent version number e.g., 180 for version 1.80). RCPxxx.EXE is a compressed, self extracting file which is expanded and installed by simply typing RCPxxx and following the instructions.

7. COMMUNICATION

7.1 RS-232 SERIAL COMMUNICATION

Serial communication between Two RS-232 machines is done in a character by character fashion. To transmit one character, the transmitting machine first sends a start bit, then the bits of the character, followed by some number of stop bits. The number of bits per character and number of stop bits are somewhat variable, depending on the particular machine. In this fashion strings of characters may be transmitted, each character containing start, data, and stop bits.

In some schemes a parity bit is included immediately after the character’s bits. This parity bit is used to help catch errors in the transmission of the character. Parity is said to be either even or odd. In even parity, the sum of all data bits plus the parity bit must add up to an even number. The transmitting device adds up all the data bits of a character it is preparing to send; if they are odd, it will set the parity bit to one, otherwise it will set it to zero. At the receiving device all data bits and the parity are added, and if the sum is not even, the receiver knows an error has occurred during transmission. It can subsequently signal the transmitter to take some action such as “re-send the character”.

In odd parity the same technique is used except that the sum of all bits plus the parity bit must be an odd number.

Occasionally the receiving device may either not be ready to receive data or may be approaching the limit it can receive without overflowing the available storage space. To control these situations, the receiver is generally given a means of telling the transmitting device to stop sending data; this is called handshaking. Handshaking is done by two basic techniques: hardware handshaking and software handshaking.

In hardware handshaking one or more control lines are connected to the two devices. These lines tell the transmitting device when it’s ok to send more data, and when to hold. In software handshaking, there are no actual control lines linking the two machines. Instead, when the receiver feels it is about to be overwhelmed, it will transmit an XOFF character; this XOFF character can be any character so long as it is

understood by both machines to mean “Stop”. A second character, XON, is sent by the receiver when it is able to take more data.

Most manufacturers use the Extended American Standard Code for Information Interchange (ASCII) character set for their RS-232 devices. In Extended ASCII, every possible character has a unique code, and there are 256 different characters. It’s convenient to use base 16 when working with ASCII codes; for example the character ”A” has an ASCII code 41 base 16 or “hex”, usually written 41h – this is equivalent to 61 base 10, and XON and XOFF usually use the codes 11h and 13h, respectively.

The RS-232 standard specifies two types of communication devices: Data Terminal Equipment (DTE), and Data Circuit-Terminating Equipment (DCE). The original intent was to connect a DTE to a DCE: this was convenient because you could connect the two machines with a simple cable: pin 1 to pin 1, pin 2 to pin 2, and so on. Typically machines like computers are provided with DTE connectors, and modems with DCE connectors.

Frequently, however, we need to connect two DTE machines together such as when we want two computers to share data. Since both computers transmit on pin 2, we would have data collisions, and neither would receive anything. To correct that, we can connect the two computers with a null modem in between. A null modem is a simple device that routes the transmitting line to one machine into the receiving line of the other; usually handshaking lines are re-routed similarly (See **Table 4**).

7.2 PIN DEFINITIONS AND RS-232 CABLES

The RS-232 standard defines a standard connector for serial communications, the 25 pin D-shell connector or DB25 connector. These are made in both male and female versions, and according to the RS-232 standard, male DB25 connectors are used by DTEs, and female DB25 connectors by DCEs.

Pin	Name	DCE	Function
1	CG	---	Chassis Ground
*2	RD	input	Receive Data
*3	TD	output	Transmit Data
4	CTS	input	Clear to Send
5	RTS	output	Request to Send
6	DTR	output	Data Terminal Ready
*7	SG	---	Signal Ground
8	DCD	output	Data Carrier Detect
20	DSR	input	Data Set Ready
* **BIRT** supported pin			

Table 2:
Pinouts for a standard DB25 DCE connector. RTS, CTS, DSR, DCD, and DTR are handshaking lines.

Male DB25 Pin	Female DB25 Pin
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
20	20

Table 3:

Male DB25 Pin	Female DB25 Pin
1	1
2	3
3	2
4	5
5	4
6	20
7	7
8	8
20	6

Table: 4
Null Modem Connections

RS-232 Cable Connections. If constructing a cable, do not connect unused pins and try to keep cable length less than 10 feet; if longer cables are needed, use shielded cable.

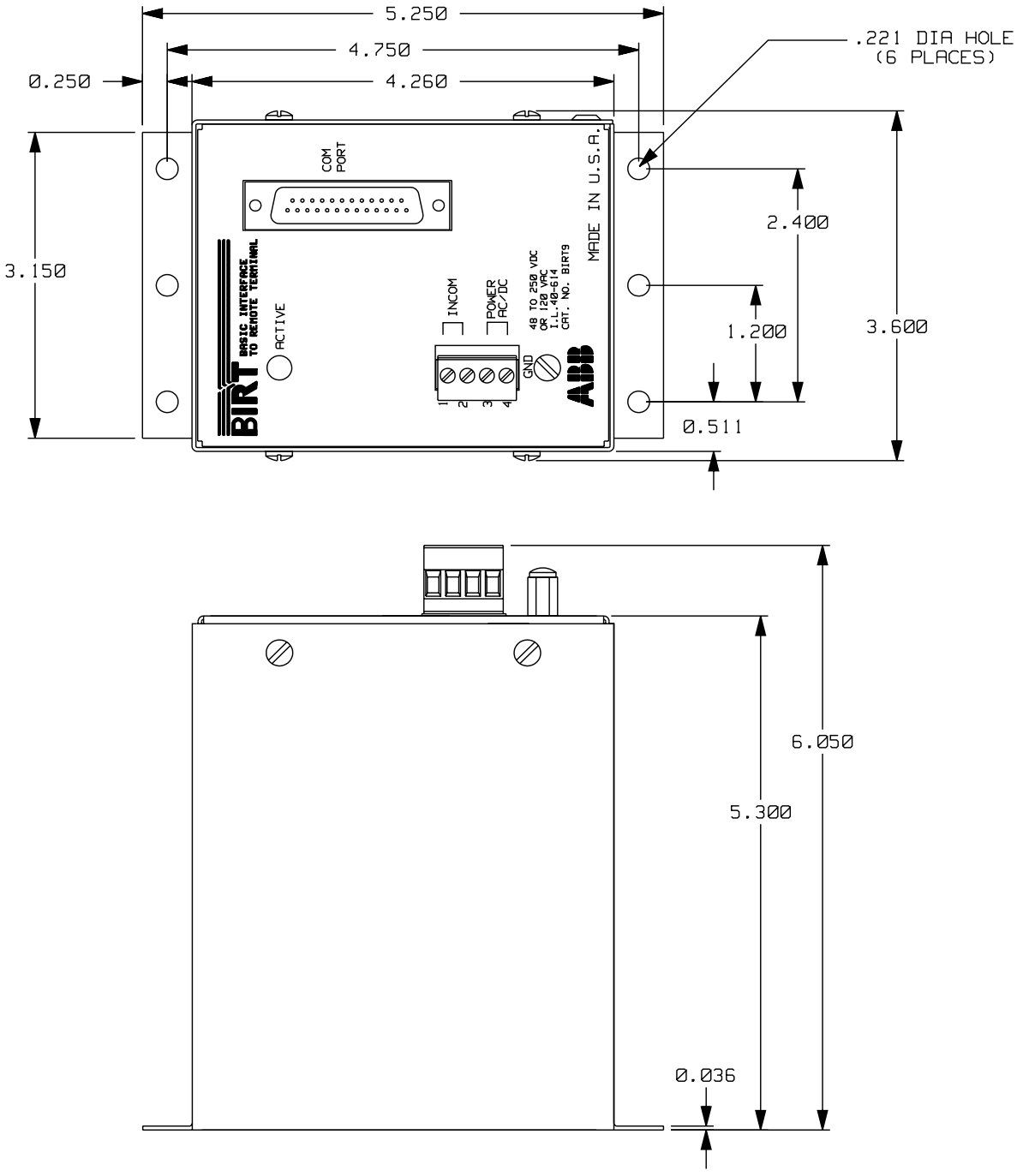


Figure 1. BIRT can be rear mounted to any FT case.

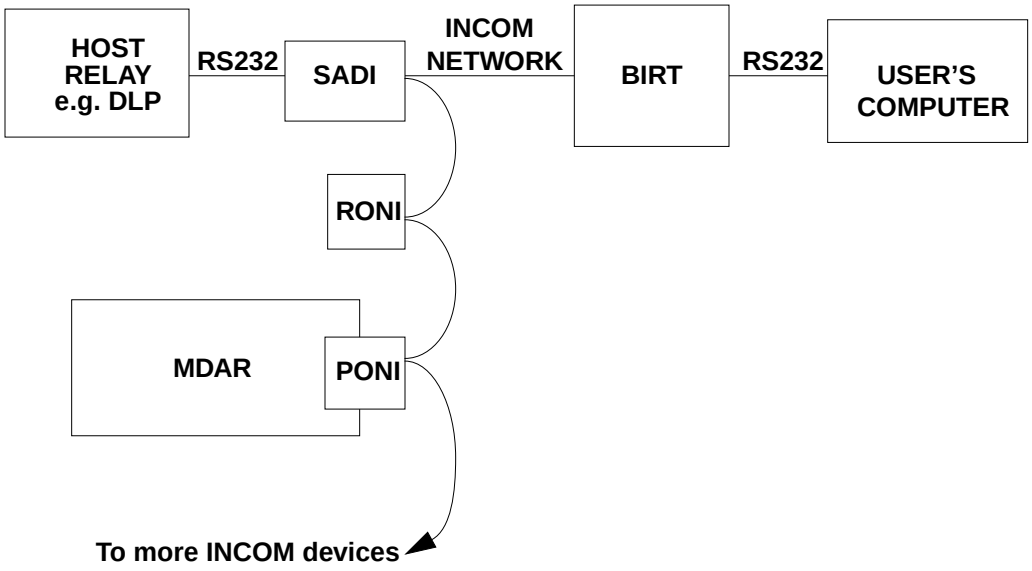


Figure 2. Typical BIRT Network

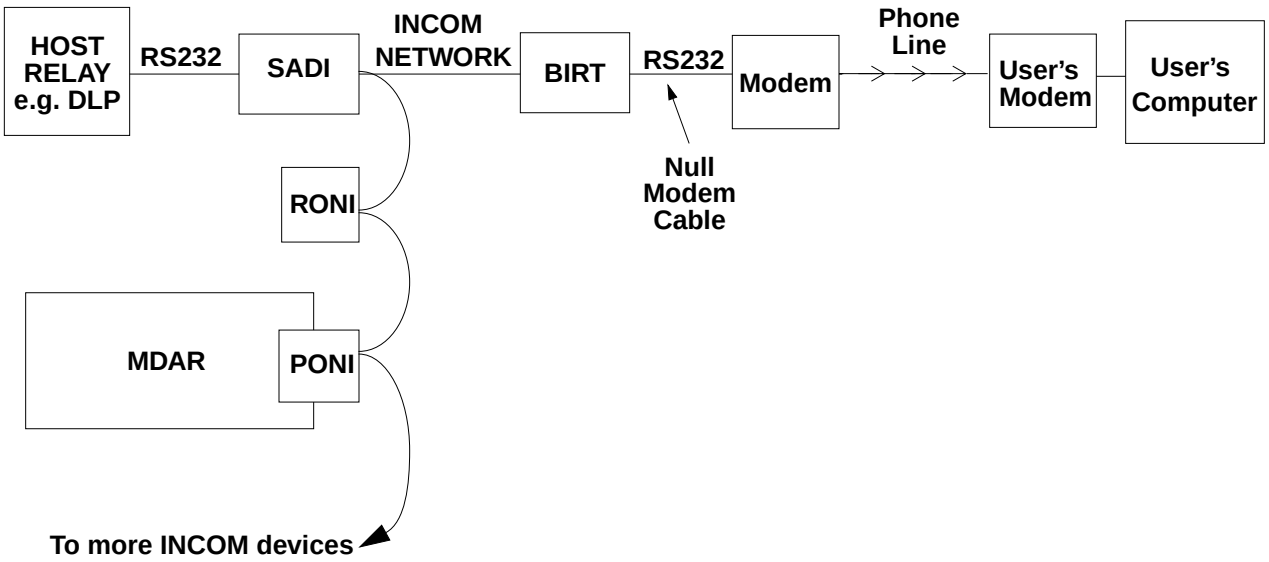


Figure 3. Typical BIRT Network with a modem

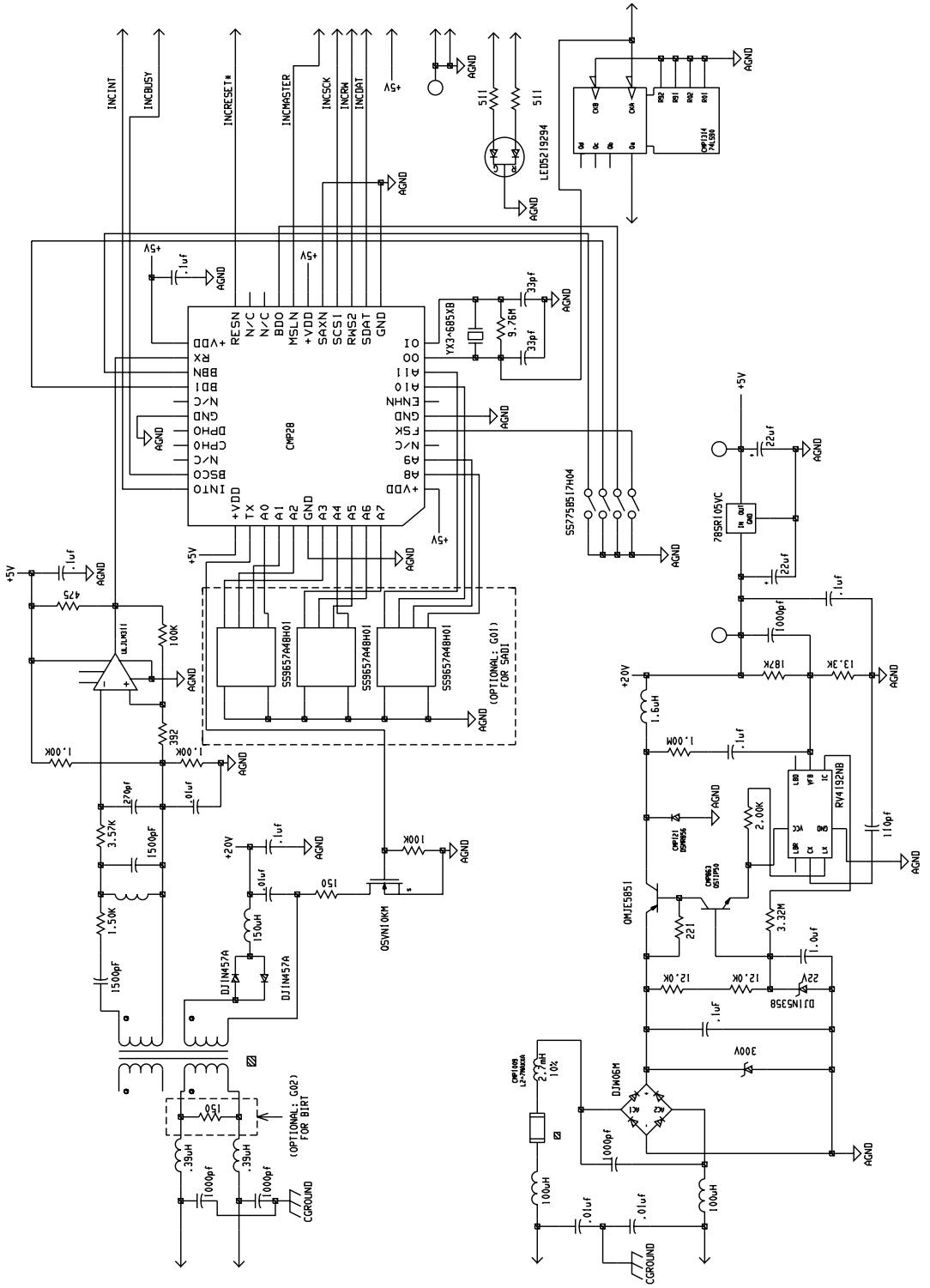
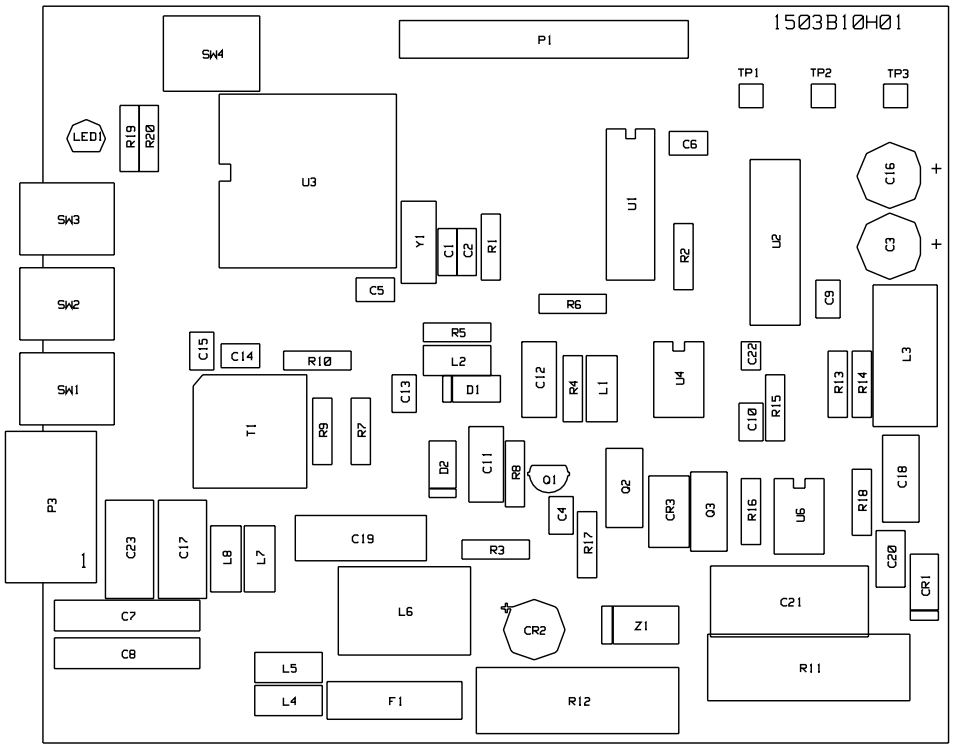


Figure 4. Power Supply and INCOM Circuit Board Schematic.

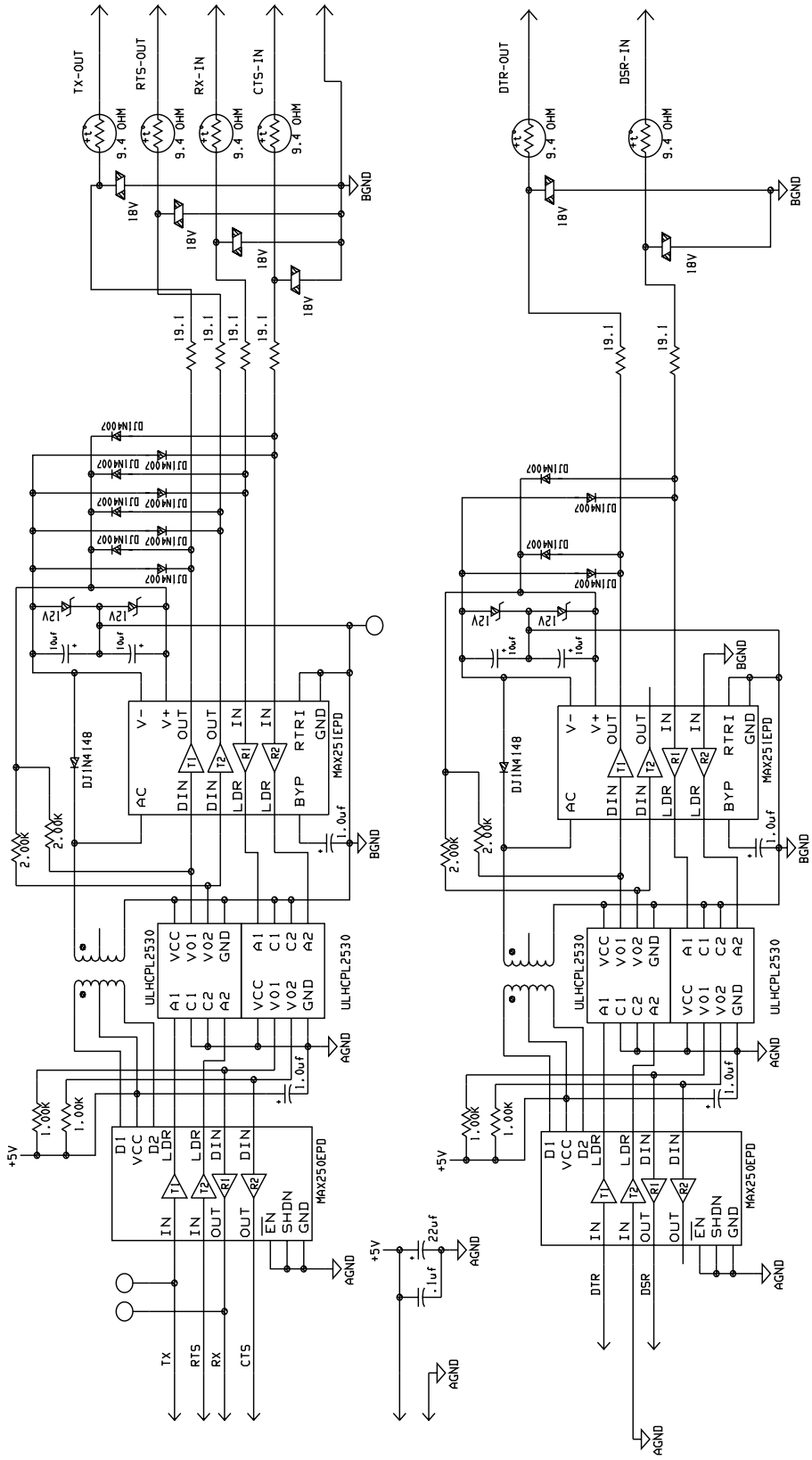
* Denotes change since previous issue



* Sub 4
1612C83

* Denotes change since previous issue

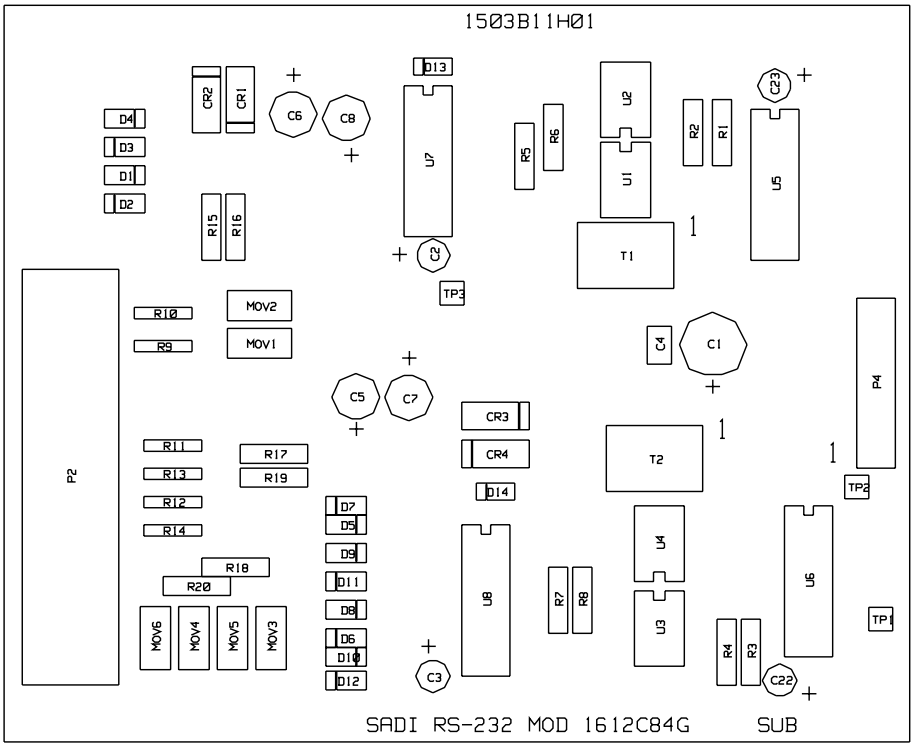
Figure 5. Power Supply and INCOM Component Location.



* Sub 2
1613C84

Figure 6. RS-232 Circuit Board Schematic

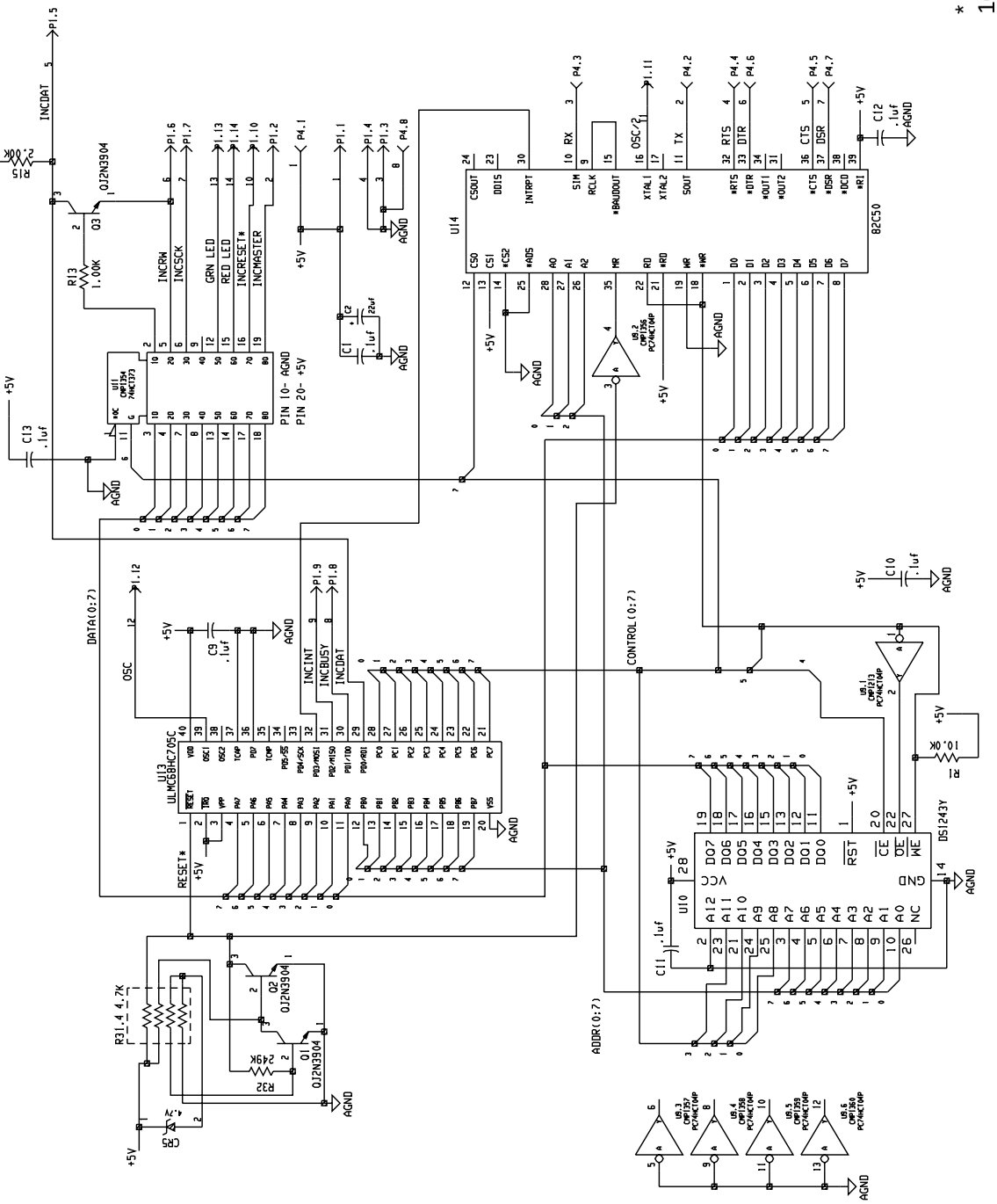
* Denotes change since previous issue



* Sub 2
1612C84

* Denotes change since previous issue

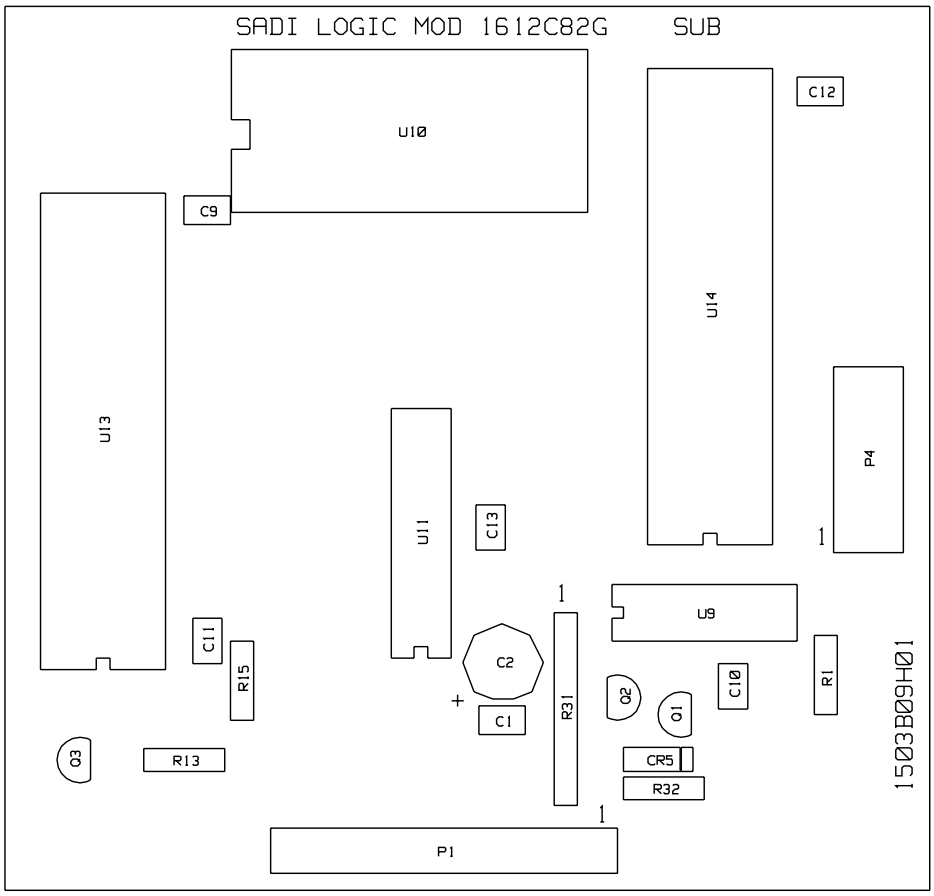
Figure 7. RS-232 Circuit Board Component Location.



* Sub 2
1613C82

Figure 8. Logic Circuit Board Schematic

* Denotes change since previous issue



*Sub 3
1612C82

* Denotes change since previous issue

figure 9. Logic Circuit Board component Location.

BIRT Ordering/Style Description

BASIC INTERFACE TO REMOTE TERMINAL

Supersedes MINT Style Number 1610C08G01

Typical Catalog Number

B I R T 9

BASE UNIT

Power Supply capable of 48/60/110/
125/250 Vdc, 120 Vac nominal supply voltages
RS 232C Port 300-9600 bps . . . . . BIRT

NETWORK INTERFACE

9600/1200 bps INCOM® 9

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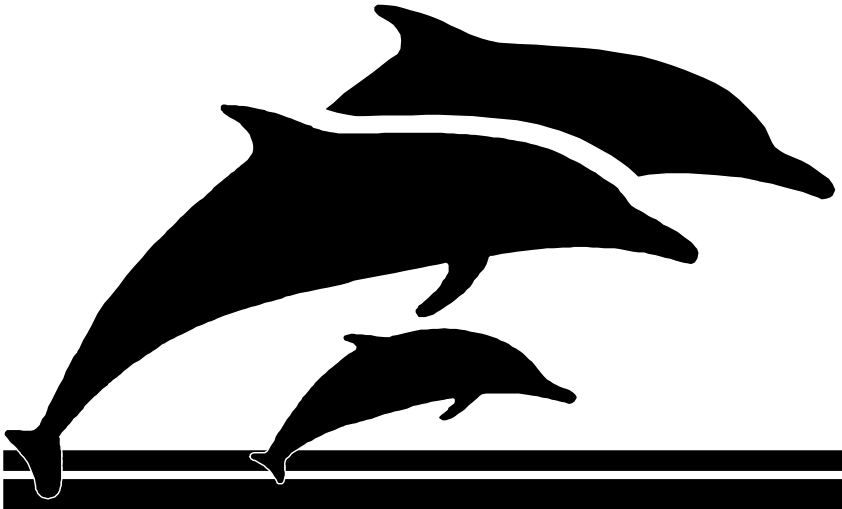
Instruction Leaflet

40-614A

BIRT Basic Interface to Remote Terminal

USER'S GUIDE



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Printed in U.S.A.

OCTOBER 1996

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All integrated circuits used on the modules are sensitive to and can be damaged by the discharge of static electricity. Electrostatic discharge (ESD) precautions should be observed when handling modules or individual components.

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