RS-232 Communications

“IS-C” and “IC3”

Users Manual

1.0 Introduction:

This manual is intended to explain the operation and communication protocol for the "IS-C" and "IC3" Emergency Lighting Central Inverter. Serial Communication can be established by means of a computer using Hyper-Link windows based software or using a Terminal device.

2.0 Connection:

The "IS-C" and "IC3" Central Inverter has a 9 pin Sub-D Female connector located inside the inverter. See the Installation Guide for the exact location of the connector.

The Connector between the computer and the Inverter is a straight connection. Do not use a Null Modem Cable that flips pins 2 and 3. Pin 2 and Pin 3 are the Data send and receive lines; Pin 5 is the Ground. Optical isolation on the Interface card provides galvanic isolation between the computers ground and the Inverters ground.

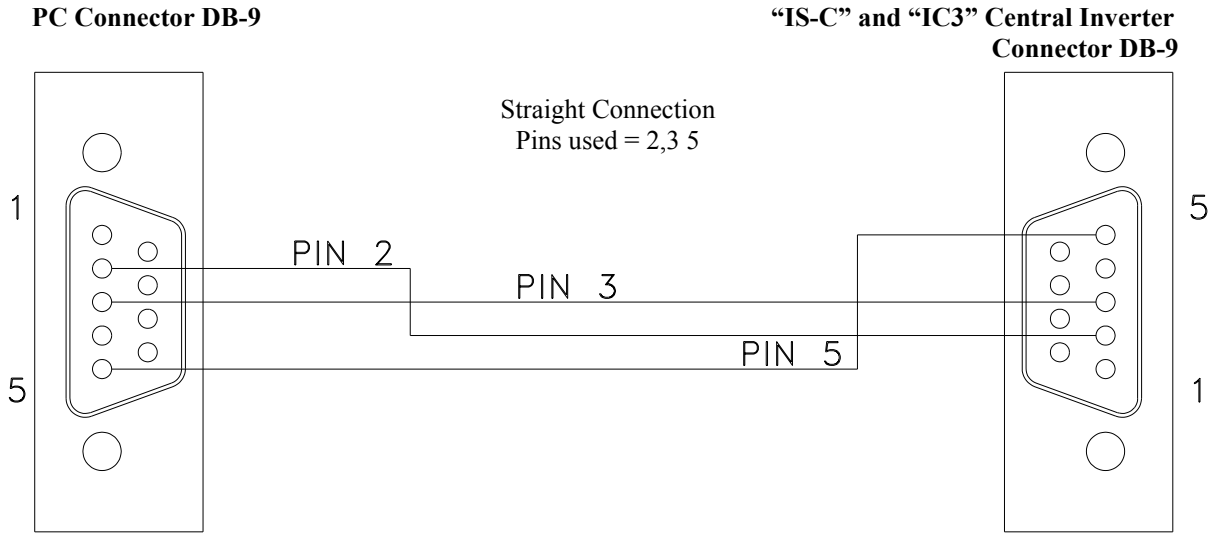


Illustration 1 – Interconnect Schematic for RS-232 Connection

Communication is established through a standard ASCII format of 8 Data bits, 1 Stop bit, No parity, No Flow Control, and a Baud rate of 9600 BPS.

3.0 Protocol:

The Protocol is the command architecture between the PC and the Central Inverter System. Information is exchanged between the two devices under this architecture.

The PC is the initiator of the communication. It sends out a command all in upper case letters like the following string.

***ACC[DDDD]S<CR>**

*:	Start Character, marks the start of a command.
A:	Character represents the System's node address range 0 – F. 0 to E is for address specific and F is for all nodes.
CC:	Two characters for command.
DDDD:	Data Field with variable length.
S:	Character for check sum hex representation.
<CR>:	Enter Key or character 0x0d.

When the System receives this string of characters, it must reply back. The System sends out all information back to the PC in lower case letters.
The System would respond to the above string in the following.

***acc[dddd]s<CR>**

*:	Start Character, marks the start of a command.
a:	Character represents the System's node address range 0 – E.
cc:	Two characters for command.
dddd:	Data Field with variable length.
s:	Character for check sum hex representation.
<CR>:	Enter Key or character 0x0d.

4.0 COMMANDS

Meter Functions

4.1 Get Alarm Status

PC Interface: *0AS0<CR>
System Interface: *0asdddd0<CR>
where dddd represents 16 bit status in HEX format.

Please refer to the Alarm Summary Table for detail definitions.

Alarm Summary Table

Bit	Description
0	Overload Alarm
1	Overload Shutdown Alarm
2	High AC Voltage Alarm
3	Low AC Voltage Alarm
4	High Ambient Alarm
5	Circuit Breaker Alarm
6	Load Variation Alarm
7	Near Low Battery Alarm
8	Low Battery Alarm
9	Inverter Failure Alarm
10	Charge Failure Alarm
11	Utility Failure Alarm
12	Fan Failure Alarm
13	Output Fault Alarm
14	Spare
15	Spare

The Alarm status is in Hex format. Since there are 16 different alarms (0-15) the individual alarm can be one bit. The conversion from hex to binary is as follows:

Hex	Binary
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

If there is an overload alarm, the Alarm status would read 0001 in hex, which would be 0000000000000001 in binary. As can be seen, the last bit (bit 0) is set, indicating an overload alarm.

4.2 Get Indicator Status

PC Interface: *0IS0<CR>
System Interface *0isdd0<CR>
where dd represents 8 bit data in HEX format

Please refer to Indicator Status Table for definitions

Indicator Status Table

Bit	Description
0	System Ready
1	AC Present
2	Battery Charging
3	Battery Power
4	Spare
5	Spare
6	Spare
7	Phase (0 is single phase, 1 is 3 phase)

This format is just like the Alarm status. Please read Hex format from Alarm Status.

4.3 Get Input Voltage

PC Interface: *0VIϕ0<CR>
System Interface *0vidddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0)
ϕ is the phase number = 1,2,3 for A,B,C.

4.4 Get Output Voltage

PC Interface: *0VOϕ0<CR>
System Interface *0vodddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0)
ϕ is the phase number = 1,2,3 for A,B,C.

4.5 Get Output Current

PC Interface: *0IOϕ0<CR>
System Interface *0iodddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0)
ϕ is the phase number = 1,2,3 for A,B,C.

4.6 Get Battery Voltage

PC Interface: *0BV0<CR>
System Interface *0bvdddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0)

4.7 Get Battery Current

PC Interface: *0B0I<CR>
System Interface *0bidddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0)

4.8 Get Ambient Temperature

PC Interface: *0TP0<CR>
System Interface *0tpdddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0).

4.9 Get Output Watts

PC Interface: *0WA0<CR>
System Interface *0wadddd0<CR>

Where dddd represents the value in decimal format (1200 means 120.0).

4.10 Get Output VA

PC Interface: *0VAϕ0<CR>
System Interface *0vadddd0<CR>
ϕ is the phase number = 1,2,3 for A,B,C.

Where dddd represents the value in decimal format (1200 means 120.0).

4.11 Get Elapsed run time (days)

PC Interface: *0ED0<CR>
System Interface *0etdddd0<CR>

Where dddd represents the value in decimal format (100 means 100).
Time is in hours.

4.12 Get Inverter Run time

PC Interface: *0RT0<CR>
System Interface *0rtdddd0<CR>

Where dddd represents the value in decimal format (100 means 100).
Time is in minutes.

5.0 Control Functions

5.1 Set Date

PC Interface: *0DAMMDDYYYY0<CR>
System Interface *0dae0<CR>

MM is month, DD is day, YYYY is year.
e is one character error code.

5.2 Get Date

PC Interface: *0DA0<CR>
System Interface *0dammddyyy0<CR>

5.3 Set Time

PC Interface: *0TMHHMMSS0<CR>
System Interface *0tme0<CR>

HH is hours, MM are minutes, SS is seconds. Time is based on the 24-Hour Standard.
e is one character error code.

5.4 Get Time

PC Interface: *0TM0<CR>
System Interface *0tmhhmmss0<CR>

5.5 Set Inverter Max Run Time

PC Interface: *0MTHHHHHH0<CR>
System Interface *0mte0<CR>

HHHHHH is hours in decimal format (100 means 100)
e is one character error code.

5.6 Get Inverter Max Tun Time

PC Interface: *0MT0<CR>
System Interface *0mthhhhhhe0<CR>

5.7 Set Output Current Load Reduction Fault

PC Interface: *0LFϕDDDD0<CR>
System Interface *0lfe0<CR>
DDDD: 4 characters represent amps, in decimal format (100 means 10.0)
Where ϕ is the phase letter = A,B,C.
e: error code

5.8 Get Output Current Load Reduction Fault

PC Interface: *0LFϕ0<CR>
System Interface *0lfdddd0<CR>
ϕ is the phase letter = A,B,C.

5.9 Set Low Battery Voltage Alarm

PC Interface: *0LBDDDD0<CR>
System Interface *0lbe0<CR>

DDDD: 4 characters represents Volts, in decimal format (100 means 10.0)
e: error code

5.10 Get Low Battery Voltage Alarm

PC Interface: *0LB0<CR>
System Interface *0lbdddd0<CR>

5.11 Set Low AC Voltage Alarm

PC Interface: *0LVDDDD0<CR>
System Interface *0lve0<CR>

DDDD: 4 characters represents Volts, in decimal format (100 means 10.0)
e: error code

5.12 Get Low AC Voltage Alarm

PC Interface: *0LV0<CR>
System Interface *0lvdddd0<CR>

5.13 Set High AC Voltage Alarm

PC Interface: *0HVDDDD0<CR>
System Interface *0hve0<CR>

DDDD: 4 characters represents Volts, in decimal format (100 means 10.0)
e: error code

5.14 Get High AC Voltage Alarm

PC Interface: *0HV0<CR>
System Interface *0hvdddd0<CR>

5.15 Set Ambient Temperature Alarm

PC Interface: *0ATDDDD0<CR>
System Interface *0ate0<CR>

DDDD: 4 characters represent degrees, in decimal format (100 means 10.0)
e: error code
Data is in degrees centigrade.

5.16 Get Ambient Temperature Alarm

PC Interface: *0AT0<CR>
System Interface *0atdddd0<CR>

5.17 Get Test Log

PC Interface: *0LTiij0<CR>
System Interface: *0ltdddd0<CR>
dddd is a character string containing the event number, field number and field data.

ii is a decimal number between 0 and 75 that represents the Event number.
j is a decimal number between 0 and 6 that represents the Field in the event.

Field 0 = Date (mm/dd/yy)
Field 1 = Time (hh:mm)
Field 2 = Duration (mmmm)
Field 3 = Voltage Output
Field 4 = Current Output
Field 5 = Load Reduction Fault (LRF: Yes/No)
Field 6 = Event or Month Test or Year Test

5.18 Dump Test Log

PC Interface *0DT0<CR>
Command for dumping all Tests to the RS-232 port.

5.19 Get Event Log

PC Interface: *0LEiij0<CR>
System Interface: *0ledddd0<CR>

dddd is a character string containing the event number, field number and field data.

ii is a decimal number between 0 and 19 that represents the Event number.
j is a decimal number between 0 and 6 that represents the Field in the event.

Field 0 = Date (mm/dd/yy)
Field 1 = Time (hh:mm)
Field 2 = Duration (mmmm)
Field 3 = Voltage Output
Field 4 = Current Output
Field 5 = Load Reduction Fault (LRF: Yes/No)
Field 6 = Event or Month Test or Year Test

5.20 Dump Event Log

PC Interface *0DE0<CR>
Command for dumping all Events to the RS-232 port.

5.21 Get Alarm Log

PC Interface: *0LEiij0<CR>
System Interface: *0ledddd0<CR>

dddd is a character string containing the event number, field number and field data.

ii is a decimal number between 0 and 19 that represents the Event number.
j is a decimal number between 0 and 6 that represents the Field in the event.

Field 0 = Date (mm/dd/yy)
Field 1 = Time (hh:mm)
Field 2 = Alarm Type

5.22 Dump Alarm Log

PC Interface *0DF0<CR>
Command for dumping all Logs to the RS-232 port.

5.23 Initiate Test

PC Interface *0TS0<CR>

6.0 Hyper Terminal Setup

Hyper Terminal is available with Windows through the Program Menu, Accessories Menu, and Communications Menu.

For most computers, the setup should be for a local connection through COM1.
The Local connection should be set to:

Bits Per Second:	9600
Data Bits:	8
Parity:	None
Stop Bits:	One
Flow Control	None

After the Local connection is established, the easiest way to communicate is through the Transfer Menu, Send Text File.

A File can be written in Notepad and saved as a text file. While Hyper Terminal is running this file can be transferred using the Send Text File located under the Transfer Menu.

Example:

Text File - *0DF0<CR>

When this text file is sent out the System will “Dump” all alarms back.

7.0 Configuring the ZOOM Modem

7.1 Connect the 9VDC Power Adapter

7.2 Connect the PC serial port to the modem's serial port

7.3 On the PC, bring up a terminal communications program such as HyperTerminal.

7.4 Configure HyperTerminal to the following:

9600 BPS
8 Data Bits
No Parity
No Stop Bits
No Flow Control

7.5 Make sure there is communication by typing AT<enter> until the message "OK" appears.

7.6 Type the following AT commands:

ATM1<enter> (speaker on until connected)
AT&D0<enter> (ignore DTR)
AT&K0<enter> (no flow control)
ATS0=1<enter> (auto-answer after one ring)
AT&W0 (store to non-volatile memory)

8.0 Dialing the ZOOM Modem

8.1 Type AT<enter> until the message "OK" appears

8.2 Type for example:

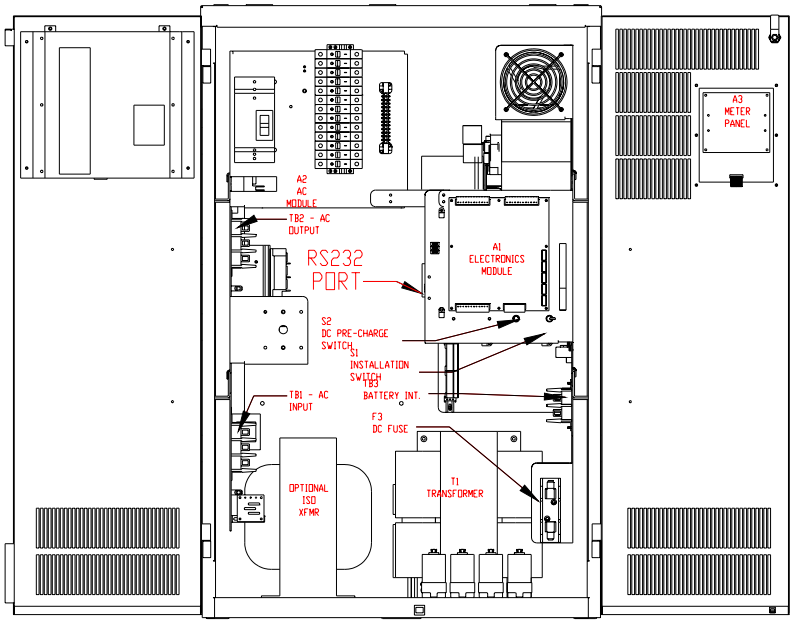
ATD9, 16109545224<enter>
ATD is the command
9,16109545224 is the phone number –9, for outside line.

8.3 Wait for the message "connected"

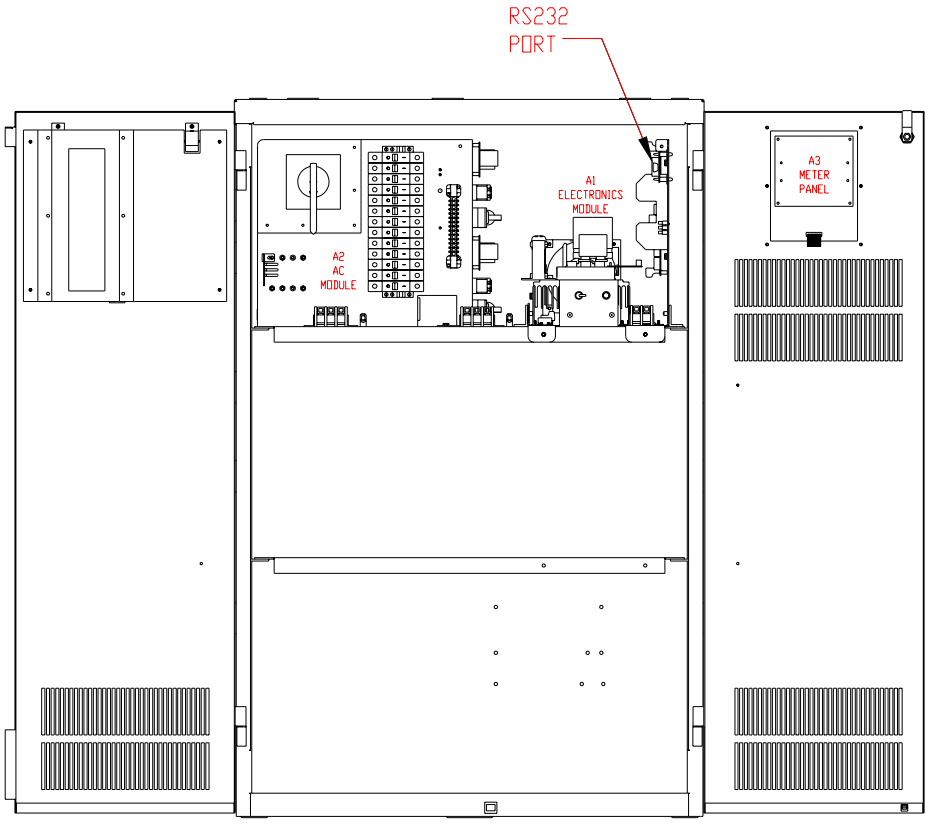
8.4 To hang up:

Type three plus signs (+++) and wait for the message "OK"
Type ATH0<enter> to hang up or,
Type ATO0<enter> to enter online mode again

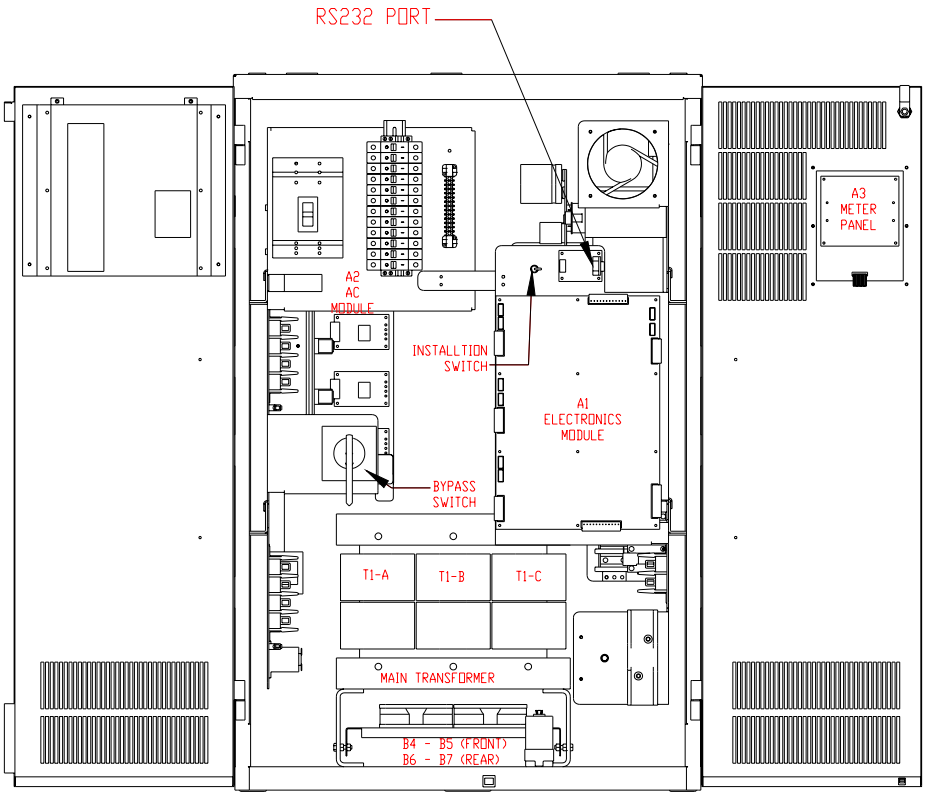
LOCATION OF THE RS232 PORT FOR "IS-C" 6-16.7k



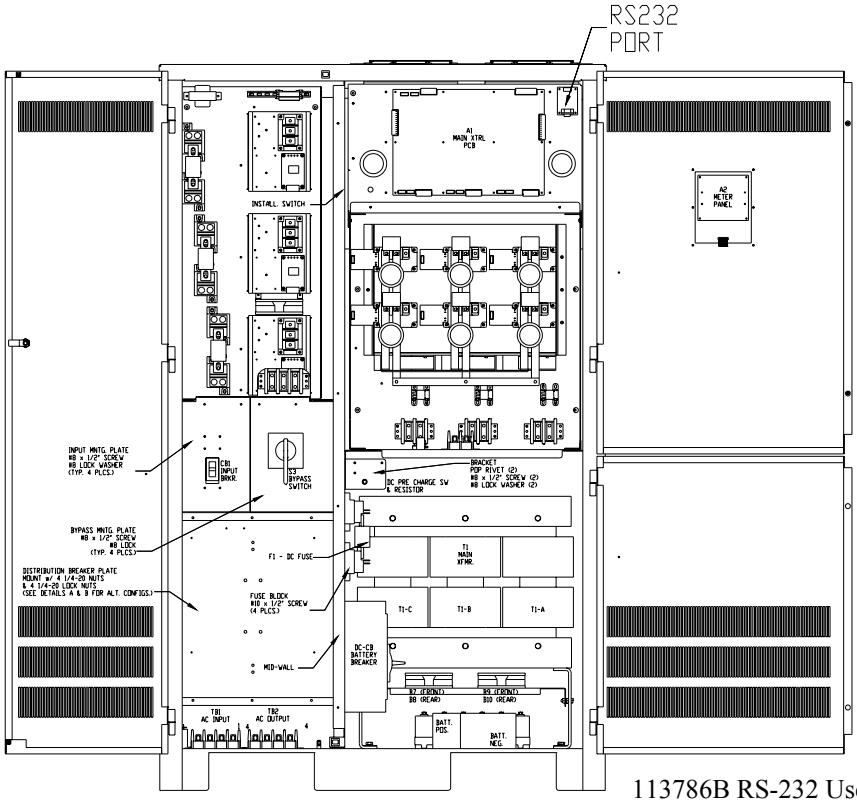
LOCATION OF THE RS232 PORT FOR "IS-C" 1.25 –4.8k



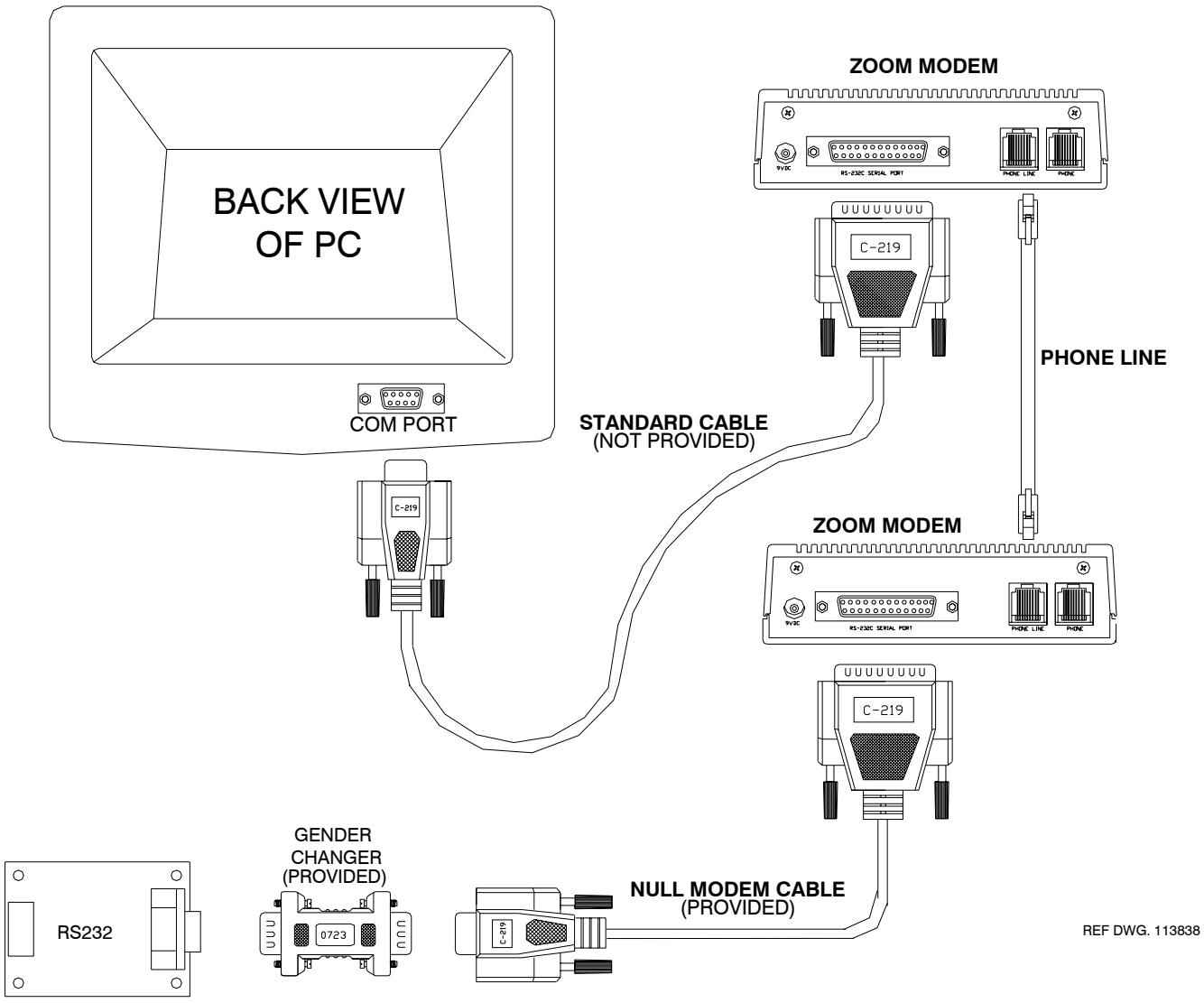
LOCATION OF THE RS232 PORT FOR "IC3" 4.8 –16.7k



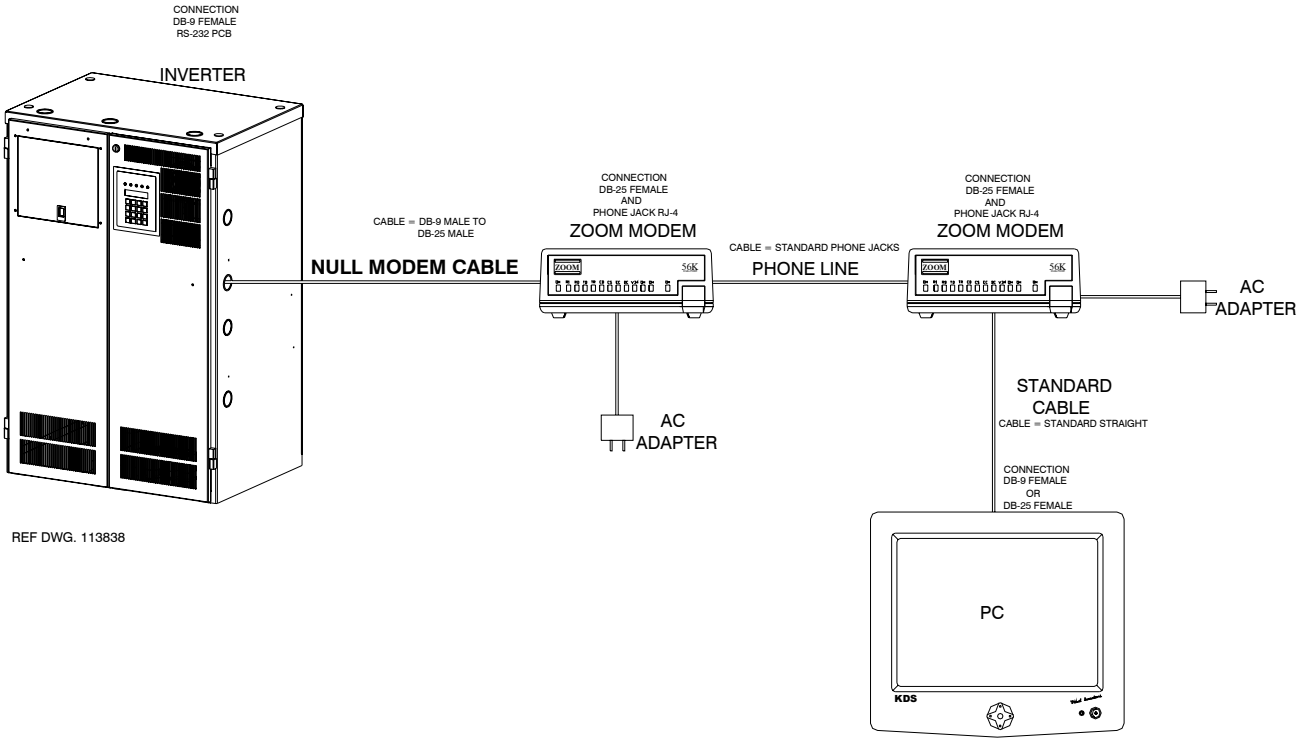
LOCATION OF THE RS232 PORT FOR "IC3" 20-50kVA



DETAILED WIRING DIAGRAM



ZOOM MODEM CONNECTION BLOCK DIAGRAM



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