

ACMEXEC Talking COM1 via USB

In the previous article "Running GRiD ROM Files from a Hard Drive" we took the files we extracted from the GRiD laptop to a Floppy Diskette and moved them to a Hard Drive on a modern computer. In that article we also saw how to run the ACMEXEC application by substituting A: drive for the drive\directory location of the files. The only thing it couldn't do at the time was talk to COM1. This article will explore how we can get the application to see COM1 and pass it's data out the USB port converting it to RS232C serial compatible with the 25-pin D-SUB serial connector in the AN/TSC-60(V)9 HF Communications facility.

In the perfect world, the ACMEXEC wants to see a 25-in RS232C serial COM port on the back of the GRiD laptop as seen in this photo, upper right, connection number 4.

ompliance SIM 5100A use only ad shielded		100-240 V~ 50,
	0.4	
	CONNECTORS 3 PARALLEL 4 SERIAL 5 GPIB 6 SERIAL 7 INPUT POWE CENTRONICS RS 232C IEEE-488 RS232C/R5422 16VDC	

Although serial ports appear to have gone the way of most extinct animals, there are in fact a few computer manufacturers who still supply 9-pin serial ports. To my knowledge many Panasonic ToughBook laptops, ToughPad tablets and some Dell laptops (probably the rugged line) can be ordered with a 9-pin serial port. However most modern laptops only come with USB ports.

If a person has a desktop computer, they can order a serial port adaptor to plug into an available card slot on the motherboard, though 25-pin serial cards are becoming more difficult to find. For our purposes we could either try to find a suitable laptop with a 25-pin serial port (unlikely) or build a desktop system with a serial card. Or, since I want to keep the computer footprint small inside the facility, I could try using a USB-to-Serial adapter cable and Virtual Serial Port drivers. If I could make it work, not only would it help me, but it would also help any others who wished to run similar GRiD software on modern computers, but didn't want to try and find something with an old 25-pin serial port. I was successful in this endeavor; this article will outline how it's done.

How to make USB look like RS232C Serial

At this point in my efforts to make the ACMEXEC application work from a modern computer to the system in the TSC-60(V)9, I had two problems left to overcome; how to get serial RS232C out a USB port and hooked to a 25-pin serial cable, and how to make that port look like COM1. I took each of these in turn, but ended up having to solve them both simultaneously. The first thing to do was get the hardware to make USB look like serial.

About five years ago a friend gave me a Garmin GPS III Plus. It has a connector on the back with four pins; power, ground, serial transmit and serial receive. I could get a cable for it, but it terminated in a 9-pin serial connector, which none of my normal use computes had, and my single laptop with a 9-pin serial port was woefully inadequate to run the necessary software to talk to the Garmin. I had no choice but to research USB-to-Serial adapters.

In my work with hardware and software products, I had become familiar with the FTDI chipset and how it works with USB and serial communications. I went to <u>Amazon.com</u> and did a search for USB-to-Serial cables and found plenty to choose from. I selected one which claimed to use the FTDI chipset and therefore would use the FTDI drivers.

This is the cable I selected:

http://www.amazon.com/gp/product/B003N9TYW0?psc=1&redirect=true&ref_=oh_aui_detailpage_o00_s01

When I first received it and plugged it into my 64-bit Microsoft Windows desktop computer, it was immediately recognized and downloaded the appropriate drivers from the Internet. However, if a computer isn't hooked to the internet, a person might need the right drivers to install on their own.

I know from experience that what I need to do is make the USB port look like a serial port; in other words, it needs to be a Virtual COM port.

FTDI maintains their own web site where you can download the latest Virtual COM Port (VCP) drivers:

http://www.ftdichip.com/Drivers/VCP.htm

The same driver package is used for both 32-bit and 64-bit Windows systems. At some point in the future (another article perhaps) I will explore running the same ACM Executive on a Linux based computer. For now, grab a copy of the VCP drivers and save them to a safe place. After obtaining the cable, you are ready for the next steps.

This article won't step through how to install the VCP drivers or the USB-to-serial cable. Plugging the cable into your Windows-based computer should trigger it to find the right drivers. If it doesn't, then you will need to point the driver installation dialog to the VCP drivers you downloaded earlier.

With the cable and drivers installed, it's time to see what COM port it was assigned.



The ACMEXEC application wants to talk to COM1, and there is no setting that I was able to find to change it. The application was designed to run on a GRiD laptop computer, and although the GRiD has more than one serial port, the one needed for the TSC-60(V)9 is addressed as COM1. On our modern computer, we need to make our USB-to-Serial cable appear to be COM1.

🚂 Computer Management File Action View Help (= =) 🖄 🗊 🗒 📓 🔢 🖬 🖄 🙀 📢 Computer Management (Local) 🔺 🛁 Alpha-Ardente Actions ▲ Notest Apple b 💵 Computer Device Manager ۰ Disk drives Task Scheduler More Actions ۲ Event Viewer Display adapters DVD/CD-ROM drives Shared Folders Icocal Users and Groups Human Interface Devices Non-state IDE ATA/ATAPI controllers 📇 Device Manager Keyboards ▲ Marcel A Storage Mice and other pointing devices 쿌 Disk Management Monitors Services and Applications Network adapters Non-Plug and Play Drivers Portable Devices Ports (COM & LPT) USB Serial Port (COM5) Processors Sound, video and game controllers Storage volume shadow copies Storage Volumes System devices Universal Serial Bus controllers USB Virtualization

In this example, from my 64-bit computer, the USB-to-Serial cable shows up in the Device Manager as COM5.

This means if I try to run the ACM application it won't find the COM port and will fail to control the radios. I had to find a way to change the COM port. It turns out there is a way to do that. Searching the Internet I found a page that helped me understand what to do:

http://plugable.com/2011/07/04/how-to-change-the-com-port-for-a-usb-serial-adapter-on-windows-7

This was a good start. However, you might find the COM port you want to use is unavailable or is already assigned to some other device, even if it's not currently plugged in. Reading in the comments section of the aforementioned web site I found someone who showed how to turn on all registered COM ports so you could see what the operating system had previously assigned even if they weren't currently showing up. By making them all visible, it would allow you to remove those assignments you might not be using anymore. At first thought, you might think that going into the Device Manager and clicking on the View menu and selecting Show hidden devices would do the same thing, but it doesn't. For example, on my 64-bit Windows 7 computer, the previous screenshot shows the Device Manager listing for COM ports when my FTDI USB-to-Serial cable is plugged in. Let's see what's there if I enable non-present devices with the following procedure.

First we need to open a Command prompt window as an Administrator. The easiest way to do this is to click on the Start menu and type "cmd" in the Search box but DO NOT press [Enter], instead, wait for cmd.exe to pop up at the top of the menu, then right-click and select "Run as Administrator."



You will have to answer [Yes] to the User Account Control that pops up, then a new Command prompt window with elevated right will open up.



At the prompt, type "set devmgr show nonpresent devices=1?" and press [Enter]



Next, enter "start devmgmt.msc" and press [Enter]



A new Device Manager window will automatically open. From the View menu, select "Show hidden devices."



Now if you expand the section on COM ports, all the COM ports that have ever been attached are listed. You'll note that some are grayed out, these are not currently plugged in or being used. In my case, you can see COM3 was assigned to a Crystalfontz display and COM73 is for a Hardware Virtual Serial Port used with AGW Express, an Amateur radio application used with packet radio. Since there is no COM1 that has ever been assigned to anything, it should be easy for me to assign the USB Serial Port (COM5) to actually be COM1. Note: If you had a COM1 that was assigned to something you no longer used, you can delete that device, or reassign it to another unused port.



Even though I can't easily take this desktop computer out to the TSC-60 facility, I'll show how to reassign COM5 to be COM1. This is the same process I used on my 32-bit computer to reassign the USB-to-Serial cable to COM1.

From the Device Manager, double-click on the COM port you want to change, or right-click and select Properties. Once the dialog box comes up, click on the Port Settings tab.

USB Serial	Port (COM5) Prop	perties	×
General	Port Settings Driv	ver Details	
	USB Serial Port (C	COM5)	
	Device type:	Ports (COM & LPT)	
	Manufacturer:	FTDI	
	Location:	on USB Serial Converter	
	device is working pr		Ť
		OK	Cancel



From the Port Settings tab, click on the button labeled [Advanced...] to open up more options.

Advanced Settings for COM5		8 ×
COM Port Number: COM5 USB Transfer Sizes Select lower settings to correct performance problems at low Select higher settings for faster performance. Receive (Bytes): 4096 Transmit (Bytes): 4096	<u>]</u>	OK Cancel Defaults
Transmit (Bytes): 4096 🔻		
BM Options	Miscellaneous Options	
Select lower settings to correct response problems.	Serial Enumerator	
Latency Timer (msec):	Serial Printer	
	Cancel If Power Off	
Timeouts	Event On Surprise Removal	
Minimum Read Timeout (msec):	Set RTS On Close	
Minimum Write Timeout (msec):	Disable Modem Ctrl At Startup	

Click on the drop-down arrow for COM Port Number: and select COM1. You may need to scroll the list up a little to see the top.

Advanced Settings for COM5				? ×
COM <u>P</u> ort Number:	COM5 COM1	Ţ		OK
USB Transfer Sizes	COM2	ĥ		Cancel
Select lower settings to corr	COM4	Е	d rates.	Defaults
Select higher settings for fa	COM5 S COM6 COM7			
Receive (Bytes):	COM8 COM9			
Transmit (Bytes):	COM10 COM11 COM12			
BM Options	COM13 COM14		Miscellaneous Options	
Select lower settings to corr	COM15 COM16 COM17		Serial Enumerator	
Latency Timer (msec):	COM18 COM19		Serial Printer	
	COM20 COM21		Cancel If Power Off	
Timeouts	COM22		Event On Surprise Removal	
Minimum Read Timeout (mse	COM23 COM24 COM25		Set RTS On Close	
Minimum Write Timeout (ms			Disable Modem Ctrl At Startup	
	COM28 COM29			
	COM29	-		

After Selecting COM1 you can leave all the other settings alone and click [OK].

Ivanced Settings for COM5		2
COM Port Number:		ОК
USB Transfer Sizes		Cancel
Select lower settings to correct performance prob	lems at low baud rates.	
Select higher settings for faster performance.		Defaults
Receive (Bytes): 4096	•	
Transmit (Bytes): 4096	•	
BM Options	Miscellaneous Options	
Select lower settings to correct response problem	s. Serial Enumerator	
Latency Timer (msec): 16	▼ Serial Printer	
	Cancel If Power Off	
Timeouts	Event On Surprise Removal	
Minimum Read Timeout (msec):	▼ Set RTS On Close	
Minimum Write Timeout (msec):	Disable Modem Ctrl At Startup	

The Advanced dialog will close and the original Properties dialog should now have changed to indicate COM1 in the title bar of the dialog window.

Although the radios in the TSC-60(V)9 facility operate at 2400 baud, I discovered it's not necessary to change the settings in the Windows operating system. When running the ACMEXEC file, it apparently sets the COM port to the appropriate baud rate. I tested this using an oscilloscope to compare to the actual GRiD laptop (another separate article).

It is now safe to close this dialog with the [OK] button as well as the Command prompt window previously opened. The Device Manager dialog should also now show the USB-to-Serial port as COM1.

	USB Serial Port (COM1) Properties
f	General Port Settings Driver Details
ty	<u>B</u> its per second: 9600
	Data bits: 8
м	Parity: None ▼ <u>S</u> top bits: 1 ▼
e e).	Hardware
	Advanced <u>R</u> estore Defaults
ок]	
	OK Cancel



Performing this same work on my 32-bit laptop, I first deleted a prior COM1 device and then reassigned the FTDI USB-to-Serial converter to COM1. Now when I started the ACM application on my 32-bit laptop I no longer got the COM1 error.

There was just one thing left to do. The USB-to-Serial cable terminated in a 9-pin connector, but the facility terminated in a 25-pin. I needed an adapter to go from 9-pin to 25-pin. What I was looking for was a simple small adapter.

Unfortunately, all mine were the wrong sex; I needed a female 9-pin and male 25-pin. A search on <u>Amazon.com</u> will lead to several potential options (one shown here).



In my case, I had an old 9-pin to 25-pin serial cable once used with a US Robotics 56K modem. It may have been a little long, but it worked just fine.

I assembled my 32-bit laptop, along with the FTDI USB-to-Serial cable and my 9-pin to 25-pin serial adapter cable and headed out to the facility. After plugging in the adapter cable to the facility serial port where the GRiD laptop normally plugs in, I turned on all the radio equipment and started the ACMEXEC application on my 32-bit Windows 7 laptop. Remember from the previous article I was substituting A: for C:\TSC using the DOS SUBST command in order for the application to think it was in the A: drive.

A	dministra	ator: C:\Wind	dows\sy	stem32\a	md.e	exe - a	icmexe
Dis Dis	play: play:	Modify St 1 radio	tatus	Confi	jure	e 02 16	2/07 5:57
I D	Name	Transm: Freq	itter Mde	Rece Free		er Mde	Sts
	RADØ1 RADØ2 RADØ3						BUS BUS BUS
04 05 06	RADØ4 RADØ5 RADØ6	 29999.9 29999.9		29999	2.9		BUS FLT RDY
	RADØ7 RADØ8 RADØ9					 	BUS BUS BUS
10 11	RAD10 RAD11						BUS BUS BUS BUS
13 14	RAD12 RAD13 RAD14 PAD15					 	BUS BUS
15 16	RAD15 RAD16						BUS BUS

From the previous screenshot, you can see the ACM has recognized two radios on the system; RAD05 and RAD06. One of them has a fault in the radio (that I need to fix), but the other is in a Ready state (RDY). To make sure the control program can actually send commands and they are recognized by the radio, we'll perform a frequency change on the RAD06 receiver.

a A	dministra	ator: C:\Wind	dows\s	/stem32\a	:md.e	exe - a	icmex	c 📃 🗖 🗾 🗾
Dis Edi	play it rad:	lodify St io parame	tatus eters	Confi	yure	· 02 10	2/07 5:58	
I D	Name	Transm: Freq	itter Mde				Sts	
01	RADØ1						BUS	
03	RADØ2 RADØ3			-			BUS BUS	
04 05	RADØ4 RADØ5	 29999.9 29999.9	ISB	0 2999	9.9	ISB	BUS FLT	
06 07	RADØ6 RADØ7	29999.9		0 29999	7.9		BUS	
	RADØ8 RADØ9		 	-			BUS BUS	
	RAD10 RAD11						BUS BUS	
	RAD12 RAD13						BUS BUS	
14	RAD14						BUS	
	RAD15 RAD16			-			BUS BUS	

First we want to change to the Modify Menu, to do so we simply arrow over to "Modify" and press [Enter].

Here is the Modify screen.

Administr	ator: C:\Win	dows\s	sys	tem32\cmd.e	exe - a	cmex
Name Xmt: Edit rad	r Rcvr Q io name	uit			Ø2 16	2/07 5:58
ID Name	Transm Freq	itter Mde		Receive Freq	er Mde	Sts
RAD02 02 RAD02 03 RAD03 04 RAD04 05 RAD05 06 RAD06 07 RAD07 08 RAD08 09 RAD09 10 RAD10 11 RAD12 13 RAD13 14 RAD15 15 RAD16 16 RAD16	299999.9 299999.9 	ISB ISB ISB 		299999.9 299999.9 299999.9 	 ISB ISB 	BUSS BUSS BUSS FLDY BUSS BUSS BUSS BUSS BUSS BUSS BUSS BUS

Nar Ed i	ne Xmti it Rovi	r <mark>Reun</mark> Qu r paramet	lit ters			Ø: 1	2/07 6:58
I D	Name	Transm: Freq	itter Mde		Receive Freq		Sts
	RADØ1 RADØ2			-			BUS BUS
04 05	RADØ3 RADØ4 RADØ5	29999.9	ISB	_ 0	 29999.9 29999.9	ISB	BUS BUS FLT
07 08	RADØ6 RADØ7 RADØ8	29999.9 	1SB 	0 - -	29999.9 	ISB 	BUS
09 10 11	RADØ9 RAD1Ø RAD11	 	 	_ _	 	 	BUS BUS BUS
12	RAD12 RAD13 RAD14			-			BUS BUS BUS
$14 \\ 15 \\ 16 \\ 16 \\ 16 \\ 16 \\ 10 \\ 10 \\ 10 \\ 10$	RAD15 RAD15 RAD16			_			BUS BUS BUS

Next we want to modify the receiver so we arrow over to the "Rcvr" menu item and press [Enter]

This is the modify receiver menu.

C=4.	Administ	ator: C:\Win	dows\s	yst	em32\cmd.e	exe - a	cmex
Fr	eg Mod it Rev	e Quit r freque	ncy			02 16	2/07 5:58
ID	Name	Transm Freq	itter Mde		Receive Freq	er Mde	Sts
023 034 056 067 099 111 1134 115	RAD02 RAD03 RAD04 RAD06 RAD05 RAD07 RAD07 RAD09 RAD10 RAD11 RAD12 RAD14 RAD13 RAD14 RAD15 RAD14	29999.9 29999.9 	ISB ISB ISB ISB ISB ISB ISB ISB ISB ISB		29999.9 29999.9 	 ISB ISB 	BUSSELTY BUSSELTY BUSSELTY BUSSELSS BUSSELS BUSSELS BUSSELSS BUSSELSS BUSSELSS BUSSELSS BUSSE

Next we want to modify the frequency. The default selection is already on "Freq" so we don't need to move it any; however, we do want to modify RAD06 so we need to arrow down the list to select RAD06 before we press [Enter].

I complexent 1 2 3 4 5 6 7 8 9 0 Set 02/07 Uiew/NoUiew preset frequency lis 16:59 ID Name Transmitter Freq Mde K Preq Mde K 01 RAD01 02 RAD02 03 RAD03 04 RAD04 05 RAD05 29999.9 06 RAD05 29999.9 ISB 07 RAD07	A IA	dministra	ator: C:\Win	dows\sy	/stem32\cmd	exe - a	cmexe
ID Name Freq Mde K Freq Mde Sts 01 RAD01 - BUS 02 RAD02 - BUS 03 RAD03 BUS 04 RAD04	Vie Vie	1 2 w∕NoV:	3456 iew pres	789 et fre	9 0 Set equency 1	02 is 16	∕07 :59
02 RAD02	I D	Name					Sts
06 RAD06 29999.9 ISB 0 29999.9 ISB RDV 07 RAD07	02 03 04	RADØ2 RADØ3 RADØ4				 ISB	BUS BUS BUS
11 RAD11 BUS 12 RAD12 BUS 13 RAD13	06 07 08	RADØ7 RADØ8 RADØ9	29999.9		0 29999.9	ISB	BUS BUS BUS
	12	RAD11 RAD12 RAD13	 			 	BUS BUS BUS
16 RAD16 BUS		RAD15					BUS

Once on the modify receiver frequency screen, we want to set a specific frequency. The numbers 1 through 9 indicate pre-saved frequency settings; those that might typically be saved to a floppy disk as part of a mission configuration. We just need to arrow over to the "Set" option and then press [Enter].

en A	dministra	ator: C:\Wind	lows\s	yst	em32\cmd.e	exe - a	icmex	ec 💼 💼 👘 👘
Vie Set	w 1 2 ; frequ	3456 Jency mar	78 1uall	9 .y	5 Set	02 16	2/07 5:59	
ID	Name	Transm: Freq	itter Mde		Receive Freq	r Mde	Sts	
02 03	RADØ1 RADØ2 RADØ3 RADØ4			-		 	BUS BUS BUS BUS	
Ø5 Ø6	RADØ5 RADØ7 RADØ8	299999.9 299999.9	ISB ISB	0	29999.9 29999.9	ISB ISB	FLT RDY BUS	
09 10 11	RADØ9 RAD1Ø RAD11		 	_ _		 	BUS BUS BUS BUS	
14 15	RAD12 RAD13 RAD14 RAD15		 	_ _ _		 	BUS BUS BUS BUS	
16	RAD16			-			BUS	

	_			-	tem32\cmd.e	Ø	2/07
	Name	Transm:		•	Receive		
02 03 04	RADØ1 RADØ2 RADØ3 RADØ4 RADØ5	 29999.9	 ISB	- - 0	 29999.9	 ISB	BUS BUS BUS BUS FLT
08 09	RADØ7 RADØ8 RADØ9 RADØ9 RAD1Ø	29999.9	ISB		29999.9	ISB	BUS BUS BUS BUS
11 12 13 14 15	RAD11 RAD12 RAD13 RAD14 RAD14 RAD15 RAD16	 	 			 	BUS BUS BUS BUS BUS BUS

Once we enter the set frequency screen, it allows us to enter the frequency in Khz.

We'll just do a quick change to 10Mhz and see if it takes.

0	a A	dministra	ator: C:\Wind	dows\:	sys	tem32\cmd.e	exe - a	cmex	c	
ſ	Fre Ent	equency ter the	y: [1000] e desired	0.0] 1 fre	edi	uency	Ø2 16	2/07 5:59		
	I D	Name	Transm: Freq	itte: Mde		Receive Freq	er Mde	Sts		
	01 02 03 04 05 07 08 09 10 11 12 13 14 15	RADØ1 RADØ2 RADØ3 RADØ4 RADØ5 RADØ9 RADØ9 RADØ9 RADØ9 RAD10 RAD11 RAD12 RAD13 RAD14 RAD15	299999.9 2	ISB ISB 		299999.9 299999.9 	ISB ISB 	BUSS BUSS BUSS BUSS BUSS BUSS BUSS BUSS		
L	16	RAD16			-			BUS		

Once the frequency is input, we press [Enter] to send the command to the radios.

Ad	Iministra	ator: C:\Wind	dows\s	syst	tem32\cmd.e	exe - a	cmex
Free	Mode t Revi	e Quit r frequer	ncy			Ø2 10	2/07 5:59
ID	Name	Transm: Freq	ittei Mde		Receive Freq	er Mde	Sts
Ø2 I	RADØ1 RADØ2 RADØ3	 	 	-		 	BUS BUS BUS
04 J 05 J 06 J	RADØ4 RADØ5 RADØ6	299999.9 29999.9	ISB ISB	0	 299999.9 10000.0	ISB ISB	BUS FLT RDY
08 09	RADØ7 RADØ8 RADØ9 RAD1Ø	 	 	-	 	 	BUS BUS BUS BUS
11 12 13	RAD11 RAD12 RAD13		 	-		 	BUS BUS BUS
15 J	RAD14 RAD15 RAD16		 	- - -		 	BUS BUS BUS

In the above screenshot you can see that RAD06 has changed Receiver frequency to 10Mhz. Here is the same screen with the radio ID cursor moved out of the way so we can see it better.

re	Mode t Revi	e Quit r frequer	псу			Ø2 1 (2/07 5:59	,	
D	Name	Transm: Freq	itter Mde		eiv q	er Mde	Sts	\$	
) <u>1</u>]] 12	RA DØ1 RA DØ2			-			BUS BUS		
33 1	RADØ3 RADØ4						BUS	211	
05 I		29999.9 29999.9		0 2999 0 1000	9.9		BUS FLT RDY		
37 J	RADØ7 RADØ8		13B 			13B	BUS	sll	
19]	RAD09 RAD10						BUS BUS	311	
1	RAD11						BUS	s II	
13]	RAD12 RAD13						BUS BUS	S	
15 1	RAD14 RAD15 RAD16						BUS BUS BUS	311	

This showed me that the HF-80 radios, installed to the AN-TSC-60(V)9 facility could be remotely controlled by a modern day computer, with the ACMEXEC application running in a substituted A: drive and using a USB-to-Serial cable and appropriate adapter to mate with the 25-pin connector.

Success!

The final proof will of course come when I have fixed the faulted radios, installed some antennas and actually performed radio operations using the modern computer. However, a quick look at the radio rack in the facility showed the receiver had indeed changed to 10Mhz.



The final installment for this series of articles will see if we can get the same thing working on a 64-bit system using DOSBox, and a reassigned COM port through the same USB-to-Serial cable and adapter. If we are successful, then it should prove the system can be run with nearly any modern day laptop or desktop computer. Stay tuned for the next exciting episode.

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