



ATS
G2110L Iridium LITE/GPS Location Collar


User's Manual

IMPORTANT: Your G2110L LITE Collars HAVE NOT BEEN PROGRAMMED for operation. You must program each unit in order for them to function. The Iridium Data Service HAS NOT been activated. Contact ATS to activate your data service by collar serial number prior to deployment.

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Section 1 Introduction

Thank you for purchasing an ATS G2110L Iridium LITE/GPS Collar. The collar you have received has not had a fix schedule program downloaded to it. You will need to load a fix schedule program into the GPS Collar to control the collar's operation. The software you received with the GPS Collar, ATSFixes for Satellite Collars, will guide you through this process. Complete *help* documentation is available within the different software pages, indicated by the  icon. Click on the icon for *help* details.

The magnet you see attached to the GPS Collar keeps it running at a lower current. While you are not using your GPS Collar, leave the magnet attached.

The ATS G2110L Iridium LITE/GPS Collar is supplied with a PC/GPS Wildlink module, PN 17621 (Figure 1). The Wildlink module enables the GPS Collar to communicate with a PC for programming and data uploads.



Figure 1. ATS PC/GPS Wildlink module, PN 17621 (with USB cable)

IMPORTANT: Your G2110L LITE Collar HAS NOT BEEN PROGRAMMED for operation. You must program the collar for it to function. Also, the Iridium data service for the collar HAS NOT been activated. Contact ATS to activate the data service prior to deployment.

Section 2 Theory of Operation

The ATS G2110L Iridium LITE/GPS Collar model consists of five different assemblies:

1) the collar belting, or attachment mechanism, 2) an electronics housing, which is attached to the collar belting, 3) a VHF antenna, 4) a GPS antenna, and 5) an Iridium satellite modem antenna.

The electronics housing consists of a battery pack, a VHF transmitter, like those found on traditional VHF beacon collars, a GPS receiver chipset, and an Iridium satellite modem. Each has its own antenna, as noted above.

The collar is shipped with a magnet taped into place with yellow vinyl tape. While the magnet is attached to the collar, it is running at the lowest current drain possible. Removing the magnet from the collar will result in an automatic 5 minutes of VHF beeps regardless of the collar's program.

The GPS Collar stores all location data in the flash memory of the collar's electronics. Location data is sent periodically to the Iridium satellite system according to the schedule selected for the GPS Collar. The data is then down-linked automatically to the Iridium's ground based reception and processing center, thence sent via the web to ATS's Hosting Computer. After the data is processed, it is automatically emailed to the email address registered to the GPS Collar. The data may also be retrieved by PC via the Wildlink module.

The VHF transmitter is used to locate the animal in order to retrieve the collar. The collar may be refurbished at ATS's facility.

The G2110L LITE does not come standard with a drop-off mechanism to break the collar off of an animal. However, the optional Sure-Drop mechanism may be purchased separately from ATS and attached to the collar to provide a drop off capability.

Section 3 Using ATSFixes for Satellite Collars Software

Installing ATSFixes for Satellite Collars Software

To install ATSFixes for Satellite Collars Software, double click on the setup.exe file found on the CD supplied with your equipment. The software will be installed on your computer, and you can find it later under the programs list on your computer.

The installation for the ATSFixes for Satellite Collars software will create some folders on the C: (hard) drive of your computer. Once you have created a program and uploaded it to a collar, two files will be created and added to the folders. The files contain all the information for the program that was uploaded to a collar, including the serial number of the collar. If you ever have doubts about how you programmed a collar or what VHF frequency the collar is transmitting on, you can look up the information in these files. These files are stored in the C:/Advanced Telemetry Systems, Inc./GPS/GPS_COLLAR_PROGRAMS folder.

Wildlink Module Setup

The Wildlink module driver must be installed prior to using ATSFixes for Satellite Collars to program the LITE collar. To install the driver, double click on the executable found in the supplied CD that pertains to your PC:

- CP210xVCPInstaller_x86 (Windows XP, Windows Vista, Windows 7, and Windows 8 32bit systems)
- CP210xVCPInstaller_x64 (64 bit systems)
- CP210x_VCP_Win2K (Windows 2000)

Follow the instructions on the screen. Restart your computer if necessary.

Programming Your GPS Collar

The collar program you create for the GPS Collar will control the GPS fix schedule, VHF transmitter operation, and satellite transmission schedule. All settings are the same for each year i.e. different years cannot have unique program schedules.

Saving GPS Collar Programs

If you have several collars that need to be programmed using an identical program, you may compose and save a program, and load it into additional collars. Once a program has been saved, it is listed under the GPS Collar Programs. Simply choose the program that you wish to load into the collars.

Life Estimation

The ATSFixes for Satellite Collars Programming Software will estimate the life that you can expect from your GPS Collar. If you need more life from your GPS Collar than what is estimated, you can go back and adjust the program to give your GPS Collar a longer life. You might decide to take fewer fixes each day, or you might program the VHF beacon to operate on a limited basis, also called a transmitter duty cycle.

Note: Calculations for life estimates assume that the batteries are new.

Steps to Start GPS Collar Programming

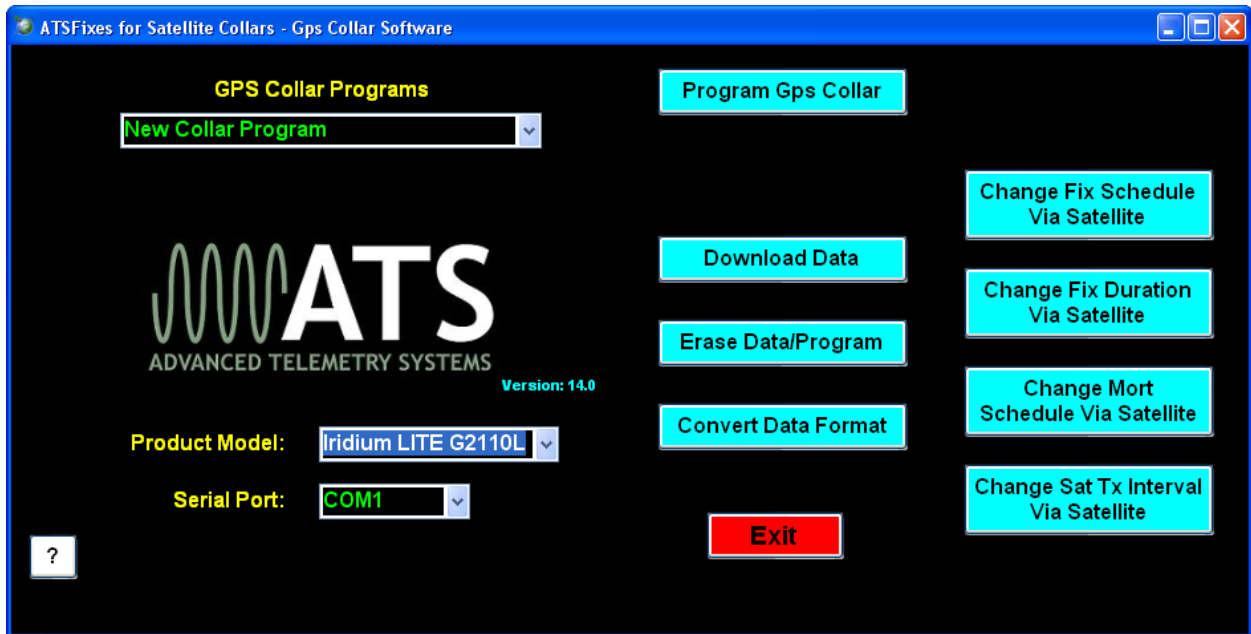


Figure 2. ATSFixes for Satellite Collars

To load a program into the GPS Collar, the Wildlink module will need to be connected (via USB port) to the PC running the *ATSFixes* for Satellite Collars software and the collar will need to be within one meter of the Wildlink module. If you will only be creating a program to be saved for later use, then having either/both device(s) is not necessary. Note: Remove magnet prior to programming.

1. Open the *ATSFixes* for Satellite Collars Software. It should look similar to Figure 2. The software will recognize all serial ports available when starting. Note: The software will not proceed without an available COM port.
2. For the Product Model listing, select the Iridium LITE G2110L option.
3. For the Serial Port option select the COM port associated with the Wildlink module. A guess and check may be used to determine the correct COM port to use (not preferred) or Windows' Device Manager tool can be used to determine which COM port should be selected. The Wildlink module will be associated with whichever port the 'Silicon Labs CP210x' COM port is listed under.

4. Click on the Program GPS Collar button to start creating a program for the GPS Collar. If you are copying a previously stored program then you will need to pick that program from the list of programs. Otherwise the GPS Collar Program should be New Collar Program for new collars.
5. Fill in the information in each step of the *ATSFixes* for Satellite Collars software. Each screen has a Help button, if needed. Note that no offset exists to distinguish between standard time and daylight savings time. Even if your study area has daylight savings time during all or part of your study, the resulting data results will be without daylight savings time taken into account.
6. After the fix schedule program has been configured with the *ATSFixes* for Satellite Collars Software, it will need to be loaded into the GPS Collar. To start this process, click on the Program Collar button in the Step 3: Life, Breakoff, Activity Data window. Click OK on the following dialog box and then touch the magnet to the collar at the location of the 2 white dots and remove. Touching the magnet to the collar tells the collar that the PC will be sending information to it.
7. When the GPS Collar is done loading up the user's program, there will be a beep and a message to the PC's screen.

Reprogramming a GPS Collar

If you want to change the program of a GPS Collar, you will need to first erase the current program (and any stored data). Use the Erase Data/Program button to erase the GPS Collar program and data before reprogramming it. **Be sure that you have first downloaded any stored data you wish to keep.**

Section 4 Operating the GPS Collar

Interpreting the VHF Beacon Beep Patterns

The GPS Collar includes a VHF transmitter that can be used to locate the collar and/or determine its status. The VHF transmitter can be scheduled to run continuously or only during certain hours of the day. It can be programmed to stay off for up to 23 hours each day in order to extend GPS Collar life. The VHF transmitter also has some obligatory beep patterns which you will hear regardless of whether the transmitter was scheduled to be active or not.

The different beep patterns the VHF transmitter uses are based on either a 48 pulses per minute (ppm) rate, or a 27 ppm rate. To your ear, 48 ppm will sound like one beep per second. The 27

ppm rate will sound like one beep per every two seconds. Some beep patterns have double or triple pulses, which are used to indicate various operating conditions to the listener.

If the VHF transmitter is scheduled to operate, the collar operating condition is indicated by the beep patterns below:

Normal VHF = 48 ppm.

Mortality VHF = 27 ppm (double pulse and then single pulse, repeating).

Last GPS fix successful = Normal VHF (48 ppm) with a double pulse on the 6th pulse.

Last GPS fix failed = Normal VHF (48 ppm).

Obligatory beep patterns (do not follow the scheduled duty cycle) indicate the following operating conditions:

Reset/Startup/Not programmed Collars = Slow triple pulse and then single pulse at 48ppm.

After pulling off magnet = Double pulse VHF at 48 ppm for a period of 5 minutes *only*. After the 5 minutes have elapsed, the collar will revert to its regularly scheduled VHF beep pattern.

Note: The VHF transmitter will not be operating while the collar is downloading a program, obtaining GPS fixes, transmitting data via satellite, or uploading data to a PC.

GPS Operation

During a GPS fix attempt, the VHF transmitter will be silent. A GPS attempt may last as long as the setting that was selected during programming but may also be shorter depending on the collar's view of the sky. Whether the fix attempt was successful or not will be indicated by the VHF beep pattern that follows the attempt. *You will only hear these beep patterns if the VHF transmitter was scheduled to beep during this time.*

Satellite Transmission Operation

During a satellite data transmission attempt, the VHF transmitter will be silent for up to 30 seconds. If the transmission was successful, an email will be sent to the email address registered for the collar. If the transmission is not successful, the collar will attempt another transmission in twelve minutes (provided that the transmission attempt does not conflict with a GPS fix attempt). If the collar fails to transmit data for ten consecutive attempts, the collar will enter **Satellite Transmission Suppression** (see Section 8 for more details).

Remote Scheduling

The GPS fix schedule of your GPS Collar can be adjusted remotely via satellite to a regular interval. Available intervals are (in minutes): 10, 20, 30, 90, 120, 360, 480, 720, and 1440. The schedule can also be adjusted from these intervals back to the original schedule. Note: Adjusting the fix schedule may interfere with the programmed frequency of the email transmissions.

The GPS fix attempt duration can be adjusted remotely via satellite to one of three options: 60 seconds, 120 seconds, or 180 seconds.

The mortality setting of the GPS collar can be adjusted remotely. Available settings are four hours, six hours, eight hours, ten hours, twelve hours, and mortality disabled.

The satellite email schedule can be changed remotely. Available intervals are every 4, 6, 8, 12, 24, 48, 72, 96, 120, 144, or 168 hours.

For all remote requests, the changes will take place after the next email transmission, not when the remote command is issued. See Section 9 for more details regarding remote programming.

Mortality

If you choose to use mortality when you program the collar with the *ATSFixes* for Satellite Collars software, the collar will immediately initiate an email transmission sequence if the collar goes into mortality. If successful, you will receive an email to let you know that the collar is in mortality. In the event of a false mortality, it is possible that the collar may get out of mortality before a successful transmission takes place. The email transmission will still be attempted until ten attempts are reached and if successful will indicate mortality was *not* reached. Also, if the satellite antennas do not have an adequate view of the sky, no email may be received.

NOTE: The aforementioned mortality transmission sequence applies to collars with serial numbers 032371 and higher or refurbished/repaired after 02/27/2013. For collars that do not meet either of these criteria, please contact ATS for exact mortality transmission operation.

In addition to mortality emails, the VHF will change to the Mortality VHF and, if a duty cycle was created during programming, will follow the duty cycle until activity is detected or a higher priority event occurs (such as a low battery or a collar release attempt).

In order for the GPS Collar to exit mortality mode, the collar must undergo thirty seconds of activity. (The thirty seconds of activity does not have to be consecutive but should be within the mortality period chosen.)

Section 5 Attaching the GPS Collar



Figure 3. Collar attachment

Your GPS collar has had its collar size optimized according to the animal subject(s) of your study. The size of the collar is determined by the collar adjustment bracket and the main collar holes (see Figure 3). To adjust the collar and/or attach the collar to an animal, the procedure is as follows:

1. First remove the collar adjustment bracket nuts and plate from the collar adjustment bracket and remove the collar adjustment bracket from the main collar.
2. Wrap the collar around the animal's neck so that the extra length (if any) of the main collar is tucked inside the main collar end with the VHF antenna. The extra length can also be cut if desired.
3. Observe where the set of holes on the VHF antenna end of the main collar line up with the holes on the other end of the main collar such as to maintain a desired tension level on the animal's neck.
4. Place the collar attachment bracket through both sets of holes and through the brass bracket and tighten the collar adjustment bracket nuts using the provided nut driver so that the finished result looks like Figure 2. Do not over-tighten as this may damage the collar adjustment bracket.
5. Finally ensure that the case nuts have been tightened before releasing the animal.

Section 6 Downloading Data from the GPS Collar

Once GPS position data have been stored in the GPS Collar memory, they can be downloaded to your computer. Data is grouped into two categories: originally programmed schedule data and email adjusted schedule data. You may only download one group of data at a time. Note that during data download, the VHF transmitter will be silent even if it was scheduled to beep.

Steps for Downloading Data

1. Connect the ATS Wildlink module to a USB port on the PC.
2. Open the *ATSFixes* for Satellite Collars Programming Software.
3. Click the Download Data button.
4. Choose between Degrees, Decimal Minutes and Decimal Degrees for the data format of the GPS data.
5. Choose between originally programmed schedule data and email adjusted schedule data.
6. Click the Continue button.

7. Touch the magnet to the GPS Collar to initiate communication.

After Downloading Data

Data files downloaded from the GPS Collar are stored on your computer in the C:/Advanced Telemetry Systems, Inc/GPS/ folder. The filename is Dxxxxxxx_dd_JJJ-HHmm.txt where xxxxxx is the serial number of the GPS Collar, dd indicates whether the data is originally programmed schedule data (FS) or email adjusted schedule data (VS), JJJ is the Julian date the data was downloaded, and HHmm is the hour and minutes data was downloaded. For instance, D030086_FS_313-1134.txt represents a data file for collar with SN 030086 for originally programmed schedule data. The date and time of download was on the 313th day of the year at 11:34 local computer time.

Data Block Formats

Degrees, Decimal Minutes ddm.mmmm,N/S,dddmm.mmm,E/W (d = deg, m = min)

Yr	Day	Hr	Mn	St	Act	T	Blk	Lat	N/S	Long	E/W
aa	bbb	cc	dd	e	ff	gg	hhhhh	iiii.iii	j	kkkkk.kkkk	l
09	001	10	21	2	00	30	00001	1743.7810	S	06309.8980	W

Cont..:

Hdop	#Sat	#sec	Dim
mm.m	nn	ooo	p
11.9	3	23	2

Decimal Degrees +/-dd.ddddd,+/-ddd.ddddd (d = degrees)

Yr	Day	Hr	Mn	St	Act	T	Blk	Lat	Long
aa	bbb	cc	dd	e	ff	gg	hhhhh	+/-iiii.iii	+/-kkkkk.kkkk
09	001	10	21	2	00	30	00001	-17.72968	-63.16497

Cont.:

Hdop	#Sat	#sec	Dim
mm.m	nn	ooo	p
11.9	3	23	2

Where:

aa = Year

bbb = Julian day (001-365, or 366 for leap year)

cc = Hour (00-23)

dd = Minute (00-59)

e = GPS fix status (0 = will never be logged, 1 = attempted but timed out, 2 = attempted and successful, 3 = next fix that will be taken, 4 = fix not taken, collar in low batt)
ff = Activity (00-99%)
gg = Temperature (degrees Celsius)
hhhh =Block Number of Data Stored (00000-16381)
iii.iii = Latitude (DDmm.mmmm, Degrees, minutes, decimal minutes) or (+/-dd.ddddd, Decimal degrees)
j = Direction of Latitude (N or S)
kkkk.kkkk = Longitude (DDmm.mmmm, Degrees, minutes, decimal minutes) or (+/-ddd.ddddd, Decimal degrees)
l = Direction of Longitude (E or W)
mm.m = HDop
nn = Number of satellites used in achieving GPS fix
ooo =Number of seconds needed to achieve GPS fix
p = Dimension of GPS fix (2 or 3)

Section 7 Receiving Data via Email

The GPS Collar transmits its data using the Iridium satellite system. This data will arrive to the user via email. The email will have three files attached to it. One file is a text file that contains all previous successful GPS fix locations and associated data. Another file is a text file that contains the GPS fix locations acquired since the previous email. This text file also contains information such as the GPS on time, the Iridium on time, mortality status, battery voltage, and any applicable warning messages. (The file also contains a note on the breakoff status of the collar which is irrelevant to the ATS G2110L Iridium LITE/GPS collar.) The last file attached is a .kml file which can be opened in Google Earth to get a visual look of the GPS fixes. Note: All location data is in decimal degree format.

The body of the email will contain some information which you can disregard including MOMSN, MTMSN, Time of Session and Unit Location. This information is provided by the Iridium Satellite System, not the GPS collar.

The data transmitted to the satellite in each transmission will only include successful GPS fixes and can contain a maximum of 22 fixes.

The transmission interval is programmed to the collar using the *ATSFixes* for Satellite Collars Software. The most frequent transmission rate is every 4 hours while the least frequent is every 7 days. **If the collar has accumulated 22 successful fixes, but is not scheduled for a satellite transmission, it will attempt a transmission at the next available opportunity.** On the other hand, if it is a scheduled transmission time and the collar has no successful fixes to send, the collar will still transmit on schedule.

Note: If a collar transmits an email containing GPS fix data more than 9 days apart, the Julian day and hour of the later data in the email may be incorrect. However, the data stored on the collar will be correct and the next email should have correct data. This situation may arise if you wish to test the collar and wait more than nine days after initial testing before deploying the collar. If this is a concern, deploy the collar as soon as possible after programming/ reprogramming the collar.

Section 8 Satellite Transmission Suppression

Sometimes a satellite transmission cannot be completed at the scheduled time due to satellite positioning and/or the current environment. In this case, the collar will keep attempting a transmission every 12 minutes. If a transmission cannot be completed for 10 consecutive attempts, the collar will enter Satellite Transmission Suppression (STS). In STS, normal satellite transmission attempts will not be performed. This includes the current scheduled attempt, future scheduled attempts, attempts due to full data buffers, and mortality transmissions (if applicable).

There are two ways a collar can exit STS. First, during STS, GPS fix attempts are still allowed. If a GPS fix is successful, then the collar will return to normal operation including resuming normal satellite transmission attempts. That is the primary mechanism and should work in most cases. If GPS is not functioning, a second method for exiting STS is via a satellite transmission: if the collar is currently in STS and the Julian Day is a multiple of thirty (e.g. Jan 30, Mar 1, Mar 30, etc), the collar will attempt a satellite transmission to determine if the collar's current environment has become more favorable. It will try a maximum of 10 times with attempts spaced 12 minutes apart. If it is successful, normal collar operation will resume, and if it is not, the collar will return to STS.

Note: The first email transmitted after the collar exits STS may contain GPS fix data points with an incorrect Julian day and hour. However the data is stored correctly on the collar and the next transmission should contain correct data. This error is a result of GPS data points in the transmission buffer that are more than nine days apart as may be the case with prolonged STS periods.

Section 9 Remote Scheduling

There are several scheduling options for the GPS Collar that can be changed remotely: GPS fix schedule, satellite transmission schedule, maximum GPS fix duration, and mortality. To change any of these settings:

1. From the ATSFixes for Satellite Collars main screen, click on the remote command option that applies:
 - Change Fix Schedule Via Satellite: change GPS collar's current GPS fix schedule
 - Change Fix Duration Via Satellite: change the maximum time that the GPS collar will attempt a GPS fix before timing out
 - Change Mort Schedule Via Satellite: change the length of inactivity before mortality is detected/declared
 - Change Sat TX Interval Via Satellite: change the schedule of email transmission attempts
2. Follow the instructions on the following screen and click on the Done button to proceed. Click on Cancel to cancel the request.
3. Enter the serial number of the GPS Collar you wish to change and click on Done.
4. A dialogue box will open next. If your computer's e-mail client is Microsoft Outlook and it is running under the email account registered for the collar, then no further action is necessary. If this is not the case, the remote command must be manually emailed to iridium@atsidaq.com using the instructions provided in the dialog box using the registered email account.

You should receive an email indicating whether or not request was successfully received. If you receive an error email or no email and need further assistance, please contact ATS.

Once the remote command is received correctly, the GPS Collar will change its schedule the next time the collar successfully transmits an email. Only one remote command can be sent for each email. If you wish, you may send multiple remote commands to be processed later by the collar but you must wait until you receive a confirmation email for each request before you send another request. **NOTE: a request is only valid for five days. If within five days, the collar does not transmit an email, the command should be reissued.**

Section 10 Power-on Self Test

As explained in Section 4, Operating the GPS Collar, there is a special start-up beep pattern once the magnet is pulled off the collar. For five minutes the collar will emit a double pulse pattern at 48 ppm. This pattern will occur regardless of whether the collar is programmed to be actively emitting VHF pulses at that time.

Section 11 Data Conversion

ATSFixes for Satellite Collars provides two data conversion processes for users. One is a Julian day to month/day conversion. This conversion converts the format of the data from Julian day to the month (number) and day of the GPS data. The other conversion ATSFixes provides is an unsuccessful fixes removal from the data. In this conversion, all data for unsuccessful fixes will be removed from the data. In both conversions, the actual data file is not modified. Instead, a new file is generated with the filename of OUTPUTjjj-tttt where jjj is the Julian day when the file was created and tttt is the 24 hour time when the file was created.

To perform either of these conversions:

1. Save the file to be converted under the C:\Advanced Telemetry Systems, Inc\GPS folder.
2. From the ATSFixes home screen click on Convert Data Format.
3. Choose the conversion type between the 'Convert from Julian Day to Month and Day' and 'Remove all non-successful fixes from dataset' options.
4. Under the 'File Name:' prompt, enter the filename of the data file you wish to convert.
5. Click on Continue.

A new file will be generated with the filename described above under the C:\Advanced Telemetry Systems, Inc\GPS folder.

Section 12 Warranty and Service

The model G2110L LITE collar is warranted for one year from the time of shipment, and for one refurbishment cycle. The unit may be refurbished up to three cycles.

Should you encounter any difficulty during programming or operation of your collars, please contact ATS Sales and Service at 763.444.9267 during normal business hours. This and other ATS User Manuals are available for download from the ATS website, at www.atstrack.com.