ZETA 2.01

GDP/MUX control program

User's Manual

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INTRODUCTION

This manual covers use of the ZETA control software designed to control the GDP and 1 or more multiplexor (MUX) boxes. There is also an automatic ZETA schedule generator and a data reformatter. Currently the ZETA control software supports RPIP, TDIP, and CR data collection for the Dipole-Dipole, and User-Defined array types only. Multiplexor boxes may be used in serial or parallel. All data collected by the ZETA software is held in the GDP in a standard cache file which is processed by Zonge's normal data processing software. Data collected under the user defined array types must be processed taking into account each user's custom survey geometry. The data re-formatting program can usually be modified to support new custom survey geometries.

The ZETA 2.01 package includes the control program, a schedule generator, and a .RAW file re-formatter. The control program now provides auto search for the GDP and MX30, contact resistance checks, arbitrary schedule access on a line by line basis, new support for multi-box schedules, and logging of your MUX configuration *in the .RAW file* for user defined survey geometries. The schedule generator builds schedules for dipole-dipole surveys and for arbitrary survey geometries. This tool also generates contact resistance check schedules. A data reformatter operates on the .RAW file, and possibly your schedule file, to produce column oriented data output suitable for input into EXCEL, RES2DINV, or your own custom data processing application.

The ZETA 2.01 control program preserves the key features of the ZETA 1.xx versions. The GDP is "hot-linked" to the control software, allowing you to leave the main ZETA screen on the GDP and view/plot data in the cache, or to disconnect and reconnect the GDP. The GDP and MUX's can be connected and turned on at any time in any order. The new control program will auto-search the serial ports for the MUX and GDP. As in the version 1.xx programs, only those GDP channels required by the current schedule line are turned on, saving battery power and keeping the stored data more organized. Version 2.01 of ZETA supports a user defined array type all the way down to the GDP's cache. Arbitrary schedule geometries are supported by recording active MUX TX and RX electrodes associated with each GDP channel *in the cache.* All ZETA control program settings (except the schedule

file and schedule line) are recorded when you leave the program and restored when the software is re-started.

The ZETA control software integrates multiplexor control into the main program so use of a separate program is no longer necessary. MUX boxes can be “whoed” (a process which verifies MUX presence and current channel configuration) and “reprogrammed” (each MUX box must have a unique number on the serial chain).

The schedule file format has been enhanced to further support multi-box schedules. Dipoles can now branch across MUX boxes. MUX box #’s can appear in any order which is convenient (i.e. box 5 can appear before box 3 if that is the way you have them wired). MUX routing within the schedule is simplified and can be changed for the entire schedule with a single search and replace command. Antiquated schedules using only a single MUX can be used directly with the new ZETA software.

If you are interested in collecting data as quickly as possible, read the ZETA installation manual section followed by the Quick start manual section.

INSTALLING ZETA

The ZETA software may be installed using a CD or for Zonge employees by accessing the "Developer" computer under the Engineering group. The current version of the ZETA software will be in the C:\Software\ZETA directory; you will want to copy the contents of this directory into a temporary directory on the machine you intend to install the software on.

In either case activate the Setup.EXE program from your source of choice and follow the indicated dialog prompts. If you have a prior version of the ZETA software on your machine, the first operation of the Setup.EXE program will be to un-install your prior version. **You will have to run Setup.EXE a second time to install the updated version.**

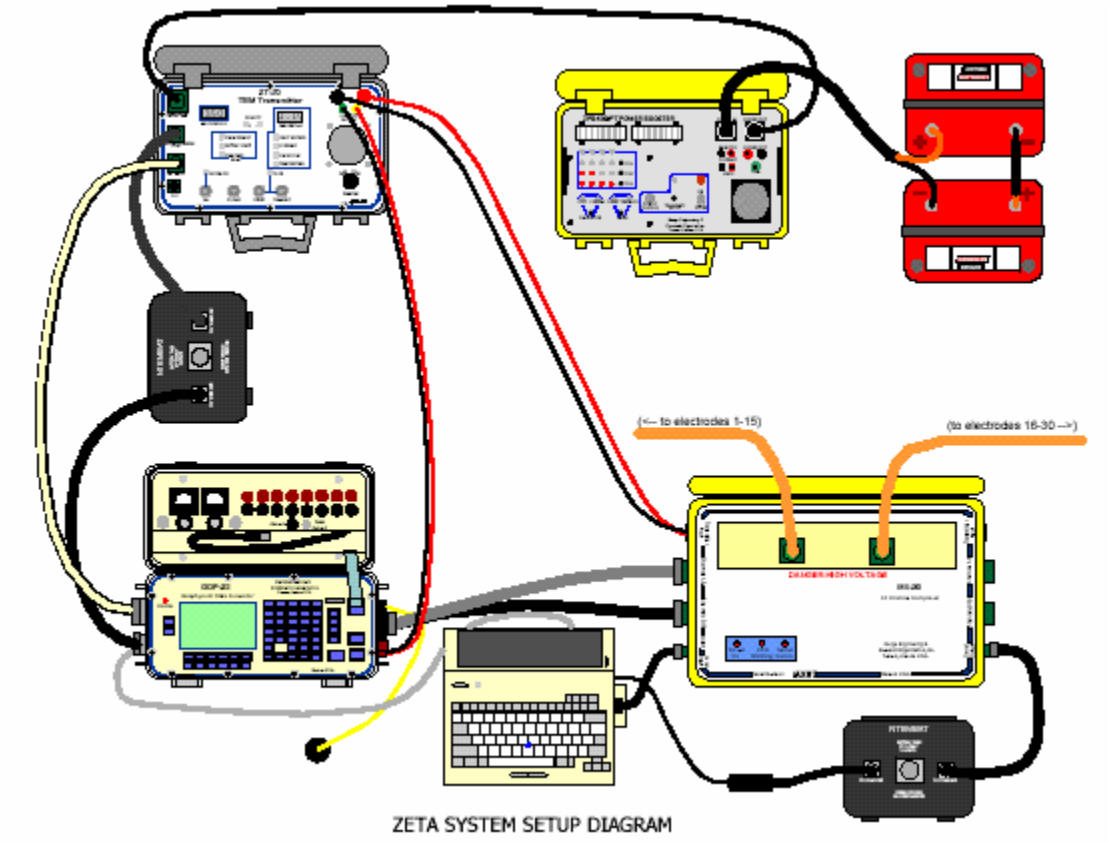
The ZETA software will be placed in Program Files\ZETA by default, you can of course select a different directory.

A ZETA selection will be placed on the Start|Programs button accessible at the lower left corner of your desktop.

After you have successfully installed the ZETA software, read the Quick Start section of this manual.

QUICK START

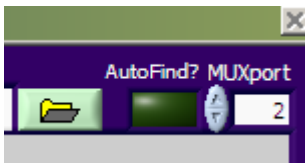
This manual section will hopefully assist you in gathering data as quickly as possible. Below is shown an overall connection diagram for operation of the ZETA system.



ZETA SYSTEM SETUP DIAGRAM

SERIAL PORT AUTO-SEARCH

The ZETA control software will auto-search for the two serial ports needed for operation. You should connect one serial port to the GDP and the other to the MUX box chain. ZETA 2.01 will search for the GDP automatically. Because it is easy to "jam" the MUX serial port, you have to activate this search manually by clicking the



"AutoFind?" light to the left of the MUX port entry box. To avoid jamming the MUX communication hardware, you should connect and power on the MUX before enabling the "AutoFind?" light.

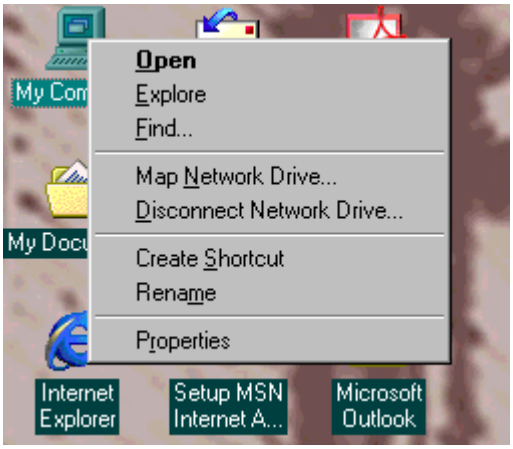
If you suspect that MUX communication is "jammed", turn off the MUX auto search by clicking the "AutoFind?" light making it dark. Power the MUX off/on. Re-enable auto-search after the MUX is repowered on.

KNOW YOUR SERIAL PORTS

The ZETA software requires two serial ports. The first is used to control the GDP and the second is used to control a chain of 1 or more multiplexors. If you will be using your serial ports for the first time, check and make sure they are active and functioning correctly.

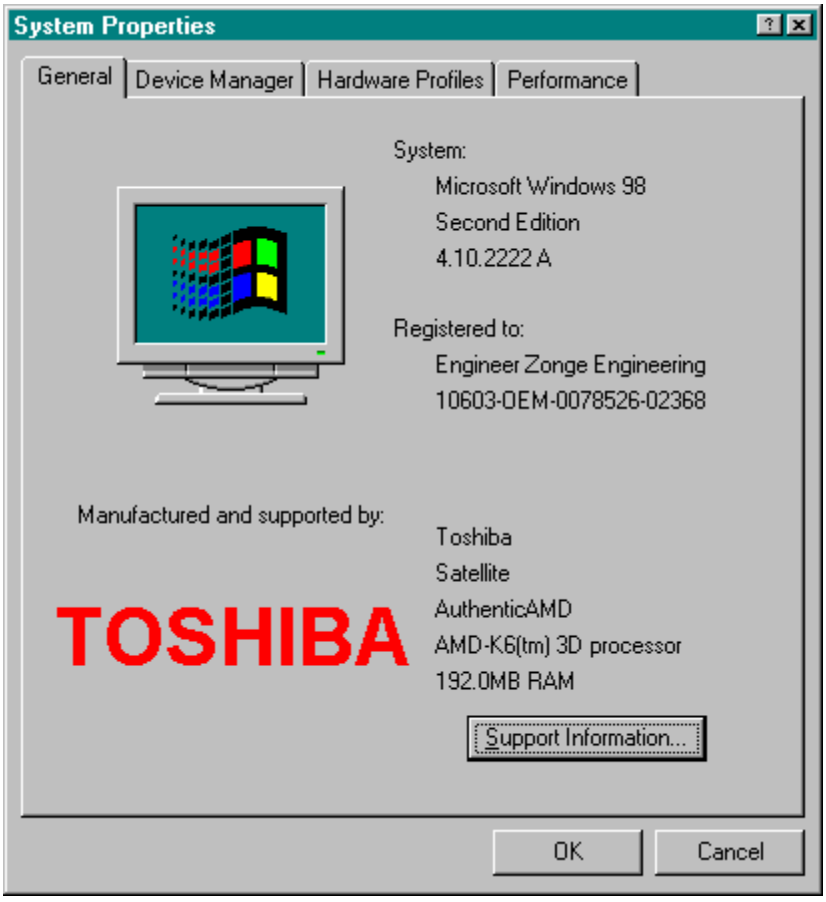
For proven serial ports, simply make a note of the serial port numbers you plan on using with the ZETA software (1 and 4 for example, or 5 and 6). Skip to the next section entitled "START THE ZETA SOFTWARE".

To verify that your serial ports are active and functioning properly, **right click** the "My Computer" icon on your desktop.

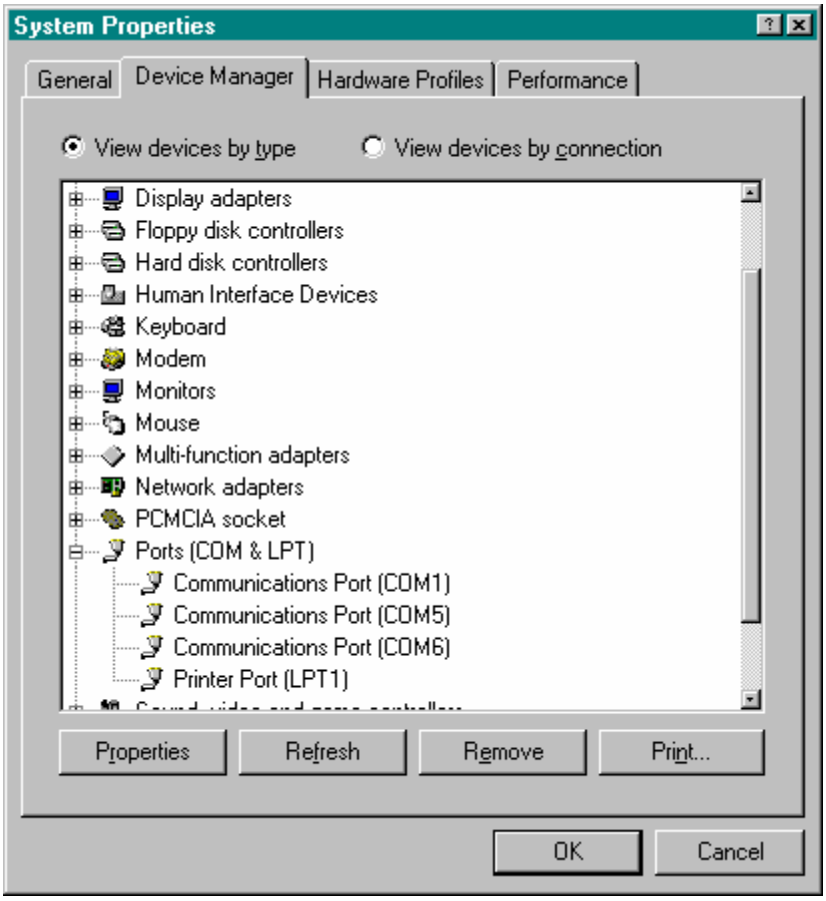


Select "Properties" at the bottom.

You should see the device setup screen.



Click the “Device Manager” tab at the top of this screen.



… and select the Ports item. You should see a list of active serial ports. Note the port numbers that you plan on using with the ZETA software.

You will see a small yellow exclamation next to any ports which are not functioning correctly. If you installed a QuaTech card under XP and used W98 drivers for the card, for example, you will see an exclamation point.

Your local computer guy can help you get any non-functioning ports working.

Close the Device Manager screen. You are ready to run the ZETA software.

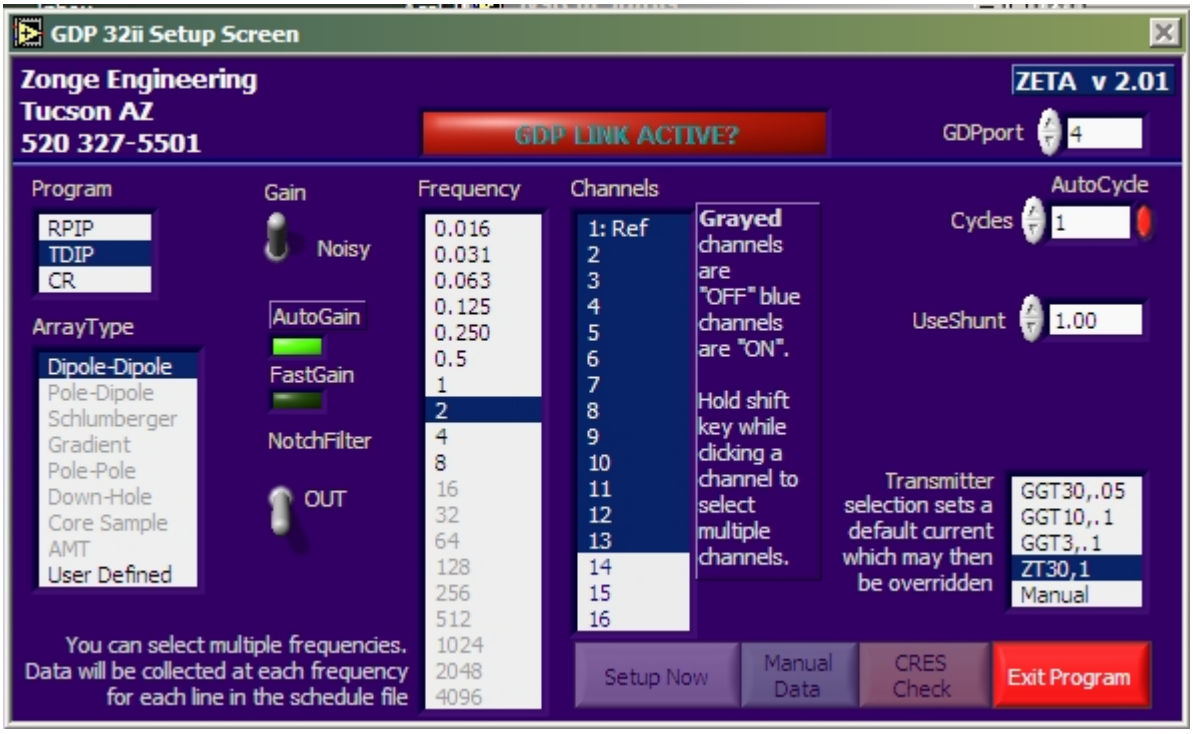
START THE ZETA SOFTWARE

Using the Start button in the lower left corner of your computer's desktop screen, select Programs|Zeta|Zetan_nn to start the current version of the software. Once started, the ZETA software will begin auto-searching for the GDP by a trial and error search of serial ports 1 through 9. At this point you can let the auto-search continue or manually stop the auto-search and set your own serial port choices.

SET THE GDP SERIAL PORT

To manually set the GDP serial port, make sure the GDP is connected, turned on, and the Zeta program on the GDP has been activated.

Use the GDP Setup screen to set the serial port for GDP communication. If you have just started the program, it will be in auto-search mode and you will see the "GDPport" field changing.



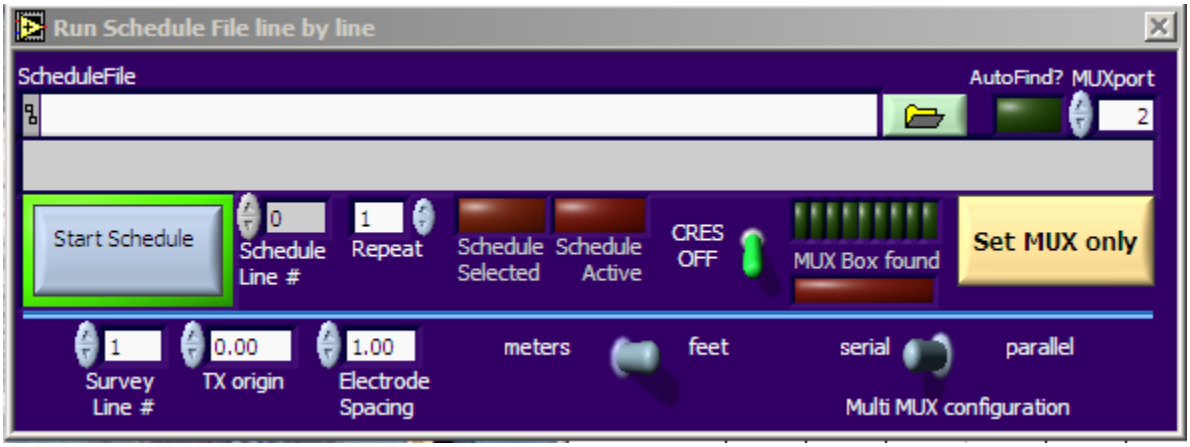
When the GDP is found the large red light titled "GDP LINK ACTIVE?" will change from red to green. Also, the GDP will beep every 3 seconds and the word "Link"

should appear in the lower left corner of the GDP's LCD.

If the light does not change, than you are not communicating with the GDP. Check your serial connection and that you have powered on the GDP and started the Zeta program *on the GDP*.

SET THE MULTIPLEXOR SERIAL PORT

You can manually set the multiplexor serial port, by placing the serial port number into the “MUXport” box of the Run Schedule screen as shown below. The MUXport box is in the upper right corner of the Run Schedule screen.



Once your MUX boxes have been found, you will see the “MUX Box found” light

change from red to green. In addition each of the first nine MUX boxes have their own individual lights to indicate how many MUX’s are active on the multiplexor chain.

CONFIGURE THE GDP

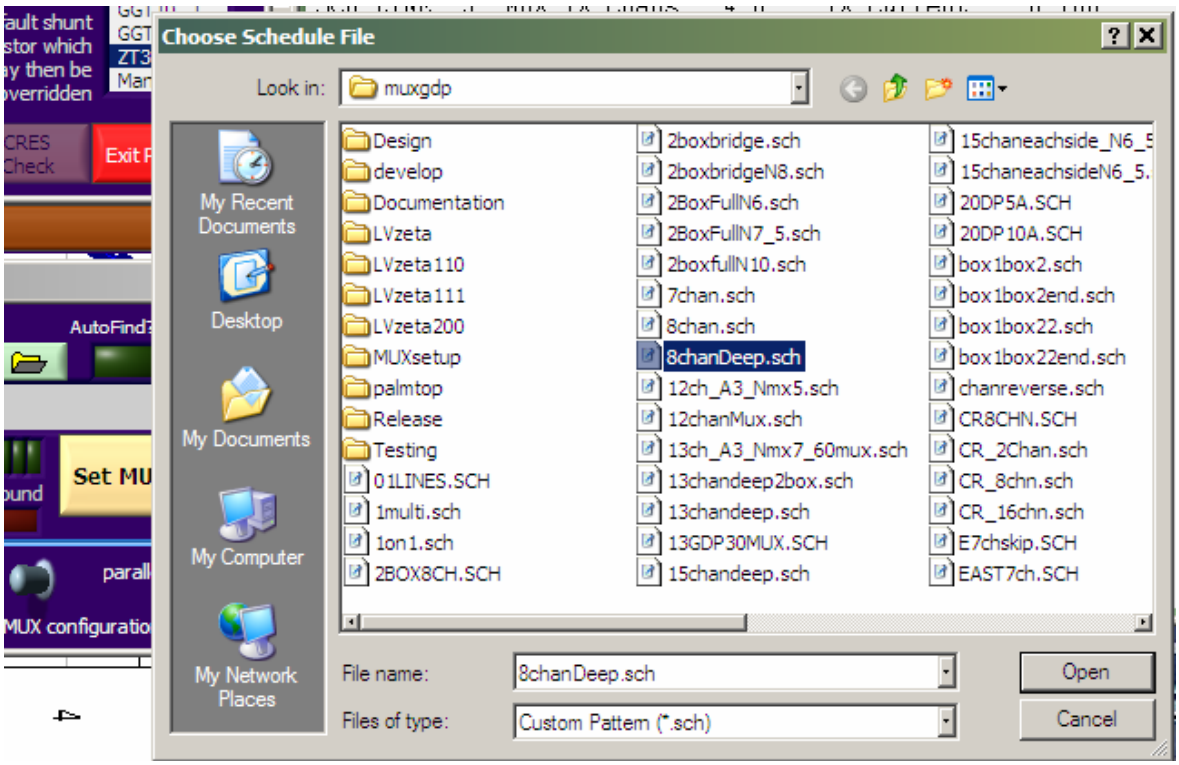
Use the GDP Setup screen to configure the GDP for data taking. You can select multiple frequencies for each line in the schedule. Hold the Shift key while selecting multiple items in the Frequency selection list located near the center of the GDP setup screen.

The Channels selection list is used only for manual data taking as opposed to schedule based data taking. Whatever channels you have selected in the "Channels selection list" will be overridden by your schedule file.

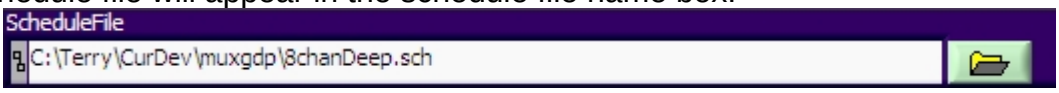
When you have setup the GDP the way you want click the "Setup Now" button. This button will "gray out" until the physical GDP box has been setup.

CHOOSE A SCHEDULE

Next, you will want to choose a schedule file to drive your data collection. Click the browse button located to the right of the schedule file name box.



Select your schedule file and click the "Open" button. The full path of your selected schedule file will appear in the schedule file name box.

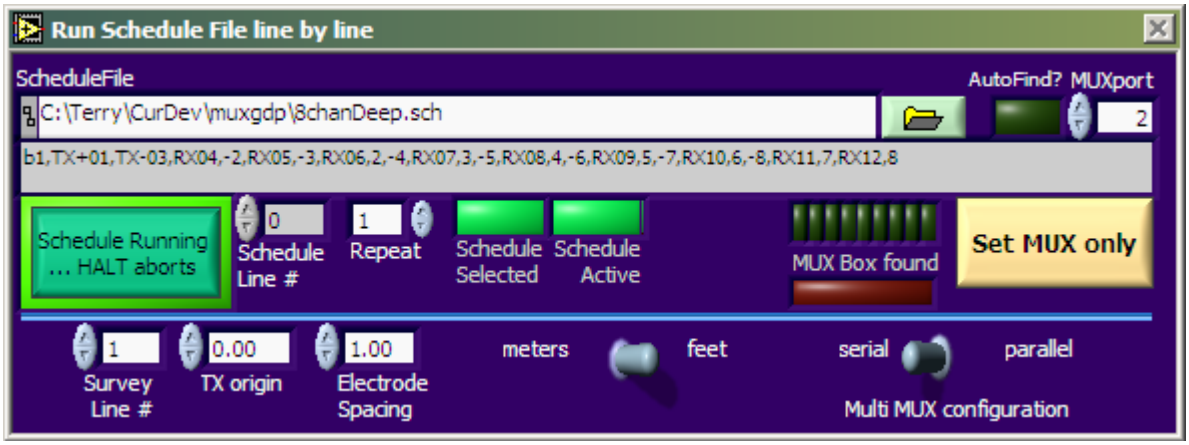


Review your settings for how schedule lines will be processed. The starting location

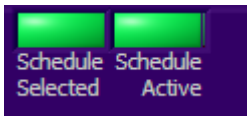
of the first transmitter electrode in your line can be entered, as well as the spacing between your electrodes. All distance parameters can be set in units of meters or feet. Set your repeat count for each line in the schedule. Finally if you are using a multi-MUX box setup, tell the software if the MUX's are being used in serial or parallel.

COLLECT DATA

You are ready to collect your data. Use the Run Schedule button located on the left side of the Run Schedule screen. This button will latch until your schedule is complete or an error which requires a schedule halt occurs.



Once you start your schedule, note the schedule status display located in the lower left corner of the Run Schedule screen.

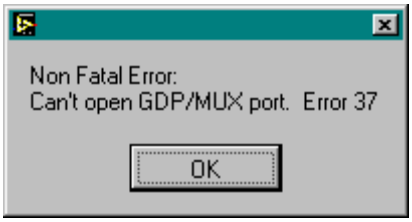


When you first start your schedule, the entire file is read into memory and a simple validation is performed. Once your schedule is validated, the "Schedule Selected" light will turn bright green. ZETA v2.01 will also case fold your schedule appropriately and remove any extra white space within each schedule line. This allows you more flexibility when producing hand made or modified schedules.

If MUX boxes have not already been located via the auto-search function, a search for MUX boxes will be performed prior to actually running the schedule. Only the first 9 of a possible 255 MUX boxes are searched. The 9 MUX Box found lights will light up according to which MUX's are present on the serial chain.

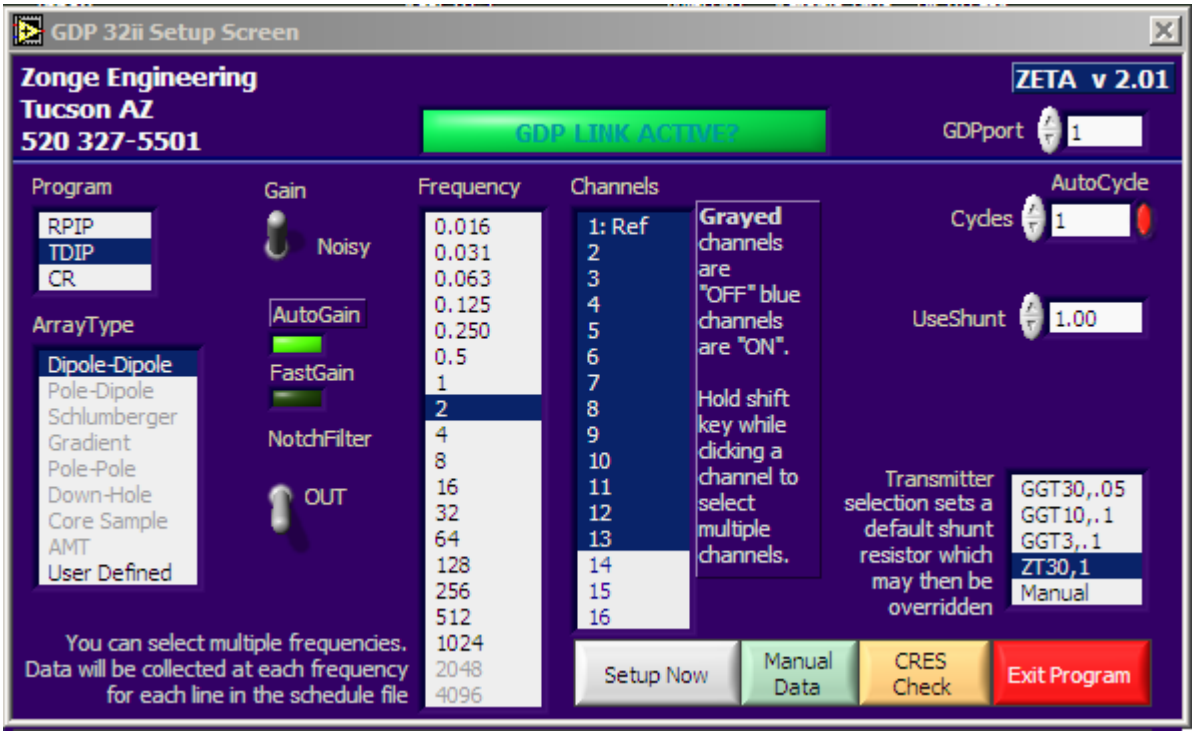
Finally the "Schedule Active" light will turn on indicating that your schedule is being processed. The number of the schedule line currently being processed as well as the line itself will be displayed.

If you hit the Run Schedule button and see the following message, return to the "KNOW YOUR SERIAL PORTS" section of this manual, or use the "AutoFind?" function to locate the MUX serial port.



EXIT THE PROGRAM

Once your data has been collected use the red “Exit Program” button located on the GDP Setup screen to exit the program.

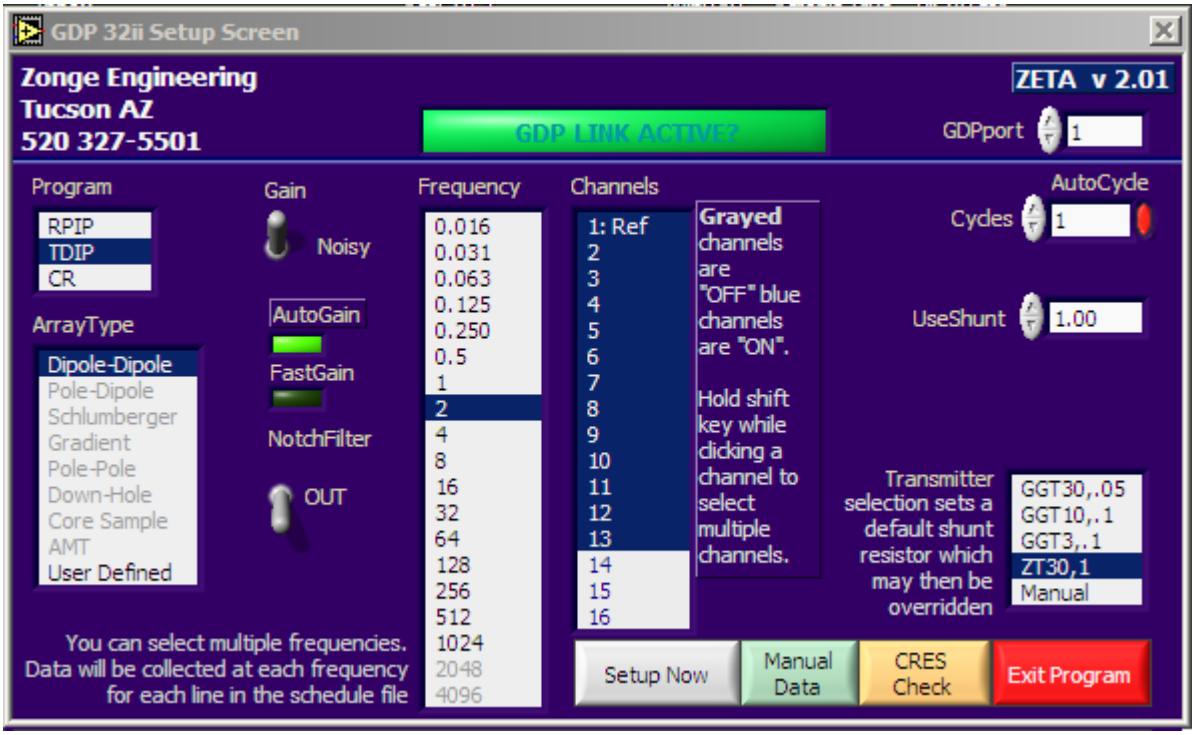


DETAILED USE OF THE ZETA SOFTWARE

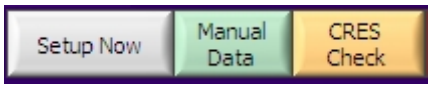
This manual section covers detailed use of all the controls on the various screens of the ZETA software. Complete usage as well as error interpretation is covered.

USING THE GDP SETUP SCREEN

This screen is your means of configuring the GDP acquisition box, as well as collecting manual data blocks, and performing single contact resistance checks. Once you have connected to the GDP via a serial port and have started the Zeta software **on the GDP**, you can run the GDP entirely from this setup screen. It is possible to take individual blocks of data (one at a time) using the "Setup Now" button in conjunction with the "Manual Data" button. However it is typical to set up the GDP once, and then take many blocks of data as governed by a schedule file.



Note: Nothing actually happens on the GDP until you use one of the 3 buttons below. Setting program type, array type, gain, autogain, fast gain, notch filter, which channels to use etc. do not take place until you use the "Setup Now" button. The



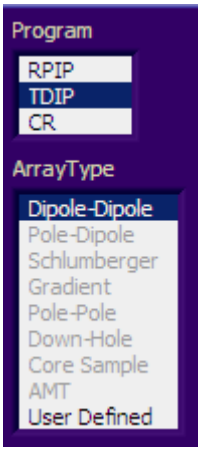
"Manual Data" button uses only the current list of frequencies during acquisition. Any other hardware settings must be set using the "Setup Now" button.

Special Note: If you use the manual contact resistance check button, and the GDP is connected to the MUX, *the MUX must be setup before the CRES Check will mean anything.*

Functional groups of fields are discussed in the following manual sections.

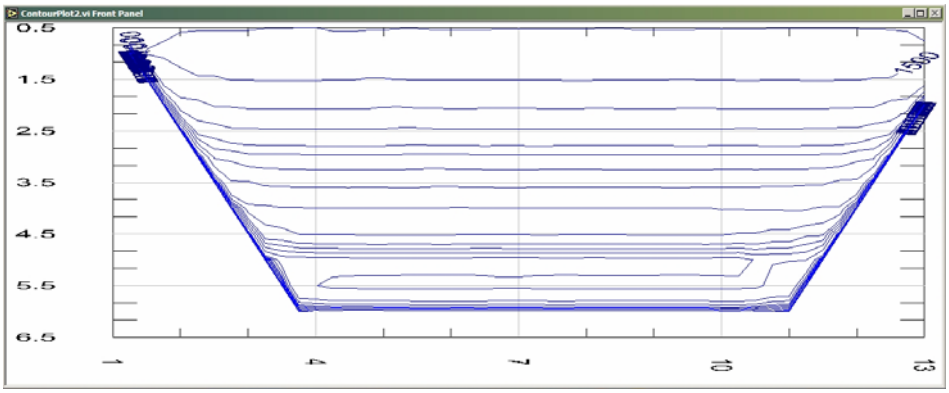
PROGRAM AND ARRAY TYPE

You can select the type of acquisition for the GDP to perform by making a choice of program type along with an array type. Refer to the GDP-32 Multifunction Receiver Instruction Manual for an explanation of each program type.



Only a single program type can be selected. In order to perform acquisitions with multiple program types, you will have to select the new program type and re-run your schedule.

For the Dipole-Dipole array type, the software will automatically calculate “A” and “N” spacing for stored cache values on the GDP. A suite of error checking is in place to check your schedule for consistency relevant to the assumed geometry of the sensors in a Dipole-Dipole survey. The ZETA 2.01 software will also calculate resistivities and display them on a contour plot.



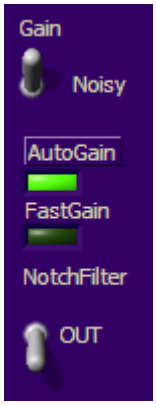
For the User-Defined array type, geometry checking of the schedule file is turned off. In addition, all error severities are blanketed to “Information” which means they will be reported in the System status window, but no dialogs will interrupt processing of your schedule.

The contour plot will be automatically minimized for this array type. No updates will be sent to the plot for User-Defined array types.

When this array type is selected, the MUX TX and RX electrodes associated with each GDP channel will be recorded in the .RAW file on the GDP.

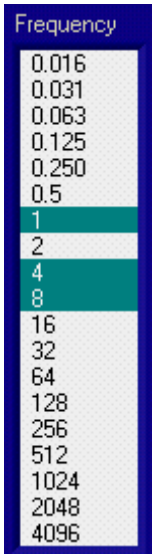
CONFIGURING GDP ACQUISITION HARDWARE

This functional group of controls allows you to set the GDP’s gaining method and control use of the Notch Filter. The GDP multifunction receiver manual explains the significance of each of these settings.



SELECTING ONE OR MORE FREQUENCIES

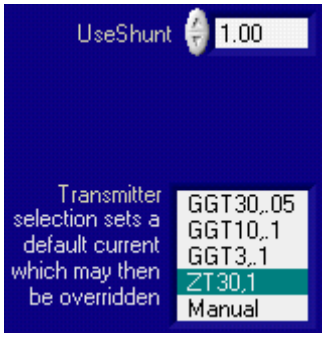
Select the frequency (in hz) to collect data at. Multiple frequencies can be collected by holding the Shift key down on your keyboard while clicking the extra frequencies you would like to use. In the example below, frequencies at 1hz, 4hz, and 8hz have been selected.



Each line in your schedule will be run for each selected frequency. If you wish to run the entire schedule file for a given frequency, select only a single frequency, run your schedule, select a new frequency, run your schedule etc.

TRANSMITTER SELECTION

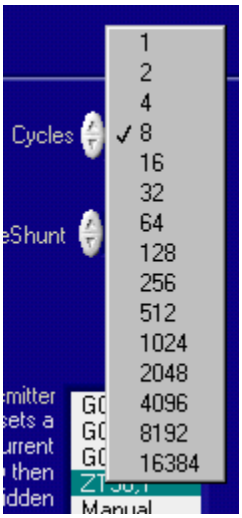
Next select the type of transmitter you will be using. A default Shunt resistor value will be entered into the "UseShunt" box when you have selected a transmitter. You can override this default by simply editing the "UseShunt" box.



CYCLE OPTIONS

To set your cycles or number of data points to be averaged into each GDP cache record, use the “Cycles” control box. Only powers of 2 are allowed in this box. For example 1,2,4,8,16,32 etc.

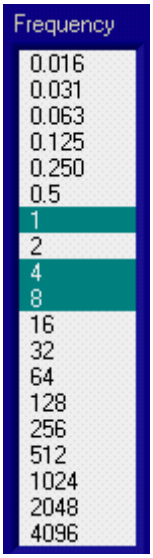
A quick way to select your cycles is to click the value in the “Cycles” box. A list of all allowed values will be displayed, and you may directly select the desired value.



The “AutoCycle” button can be used to automatically advance the cycle count if you have selected multiple frequencies.

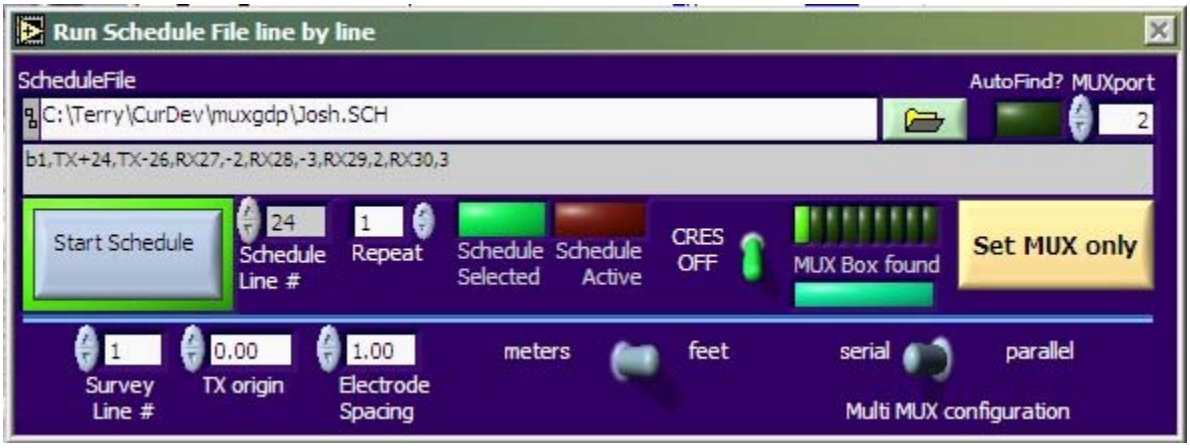
For example if you have selected a Cycles value of 8, this will apply to your first selected frequency. Subsequent frequencies will then be cycled by the appropriate power of 2.

For the frequencies selected below, 1hz will be cycled 8 times, 4hz 32 times, and 8hz 64 times.



USING THE RUN SCHEDULE SCREEN

The run schedule screen is used to select a schedule file and to control how that schedule file will be run. This screen is also used to control the MUX boxes on the MUX chain. All operating parameters of this screen **with the exception** of the schedule file name and the repeat count field will be restored from the last operation of the ZETA program. The simplest use of this screen requires that you select a schedule file, and hit the Start Schedule button.

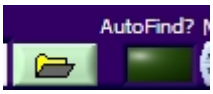


However the complete use of this screen is discussed here.

SELECT MUX CHAIN SERIAL PORT

This box is used to select the serial port used to communicate with the MUX chain. See the “Know Your Serial Ports” section of this manual, if you don’t know which serial ports are available on your computer, and you wish to set the port manually.

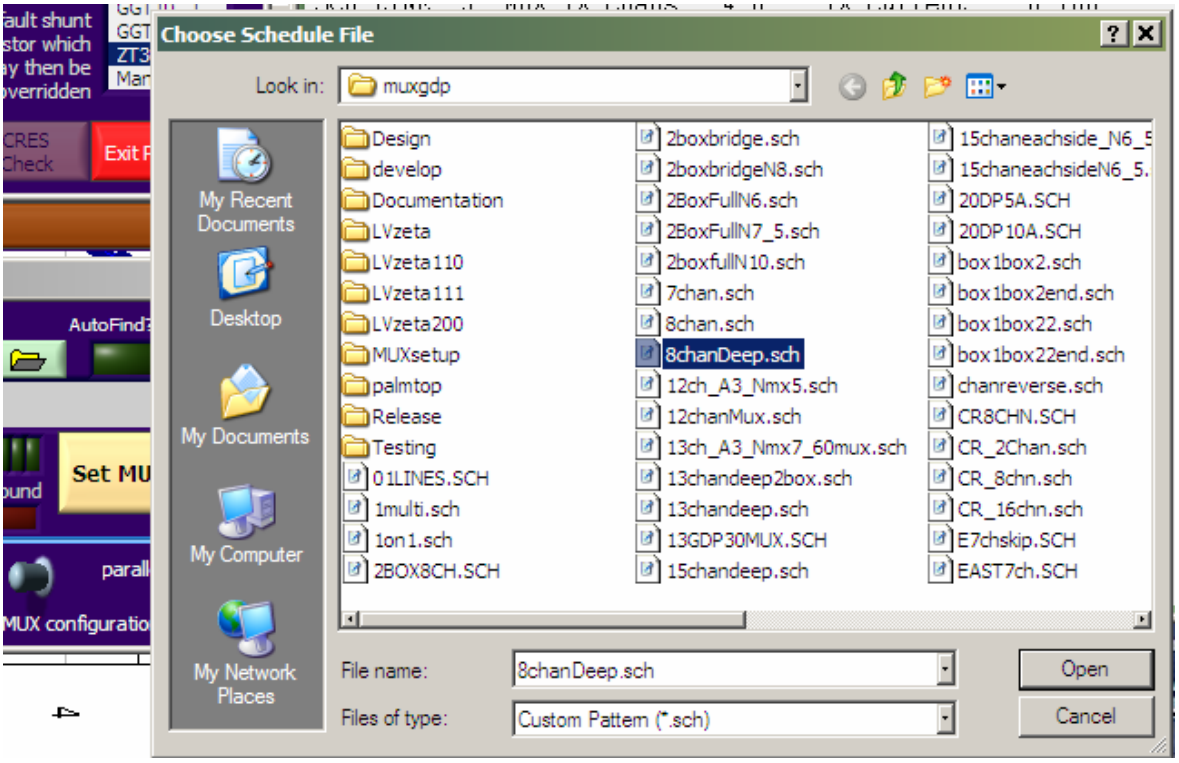
You can either type a value into the field or use the dial control to the left of the field. You can have the software search for the MUX serial port by clicking the “AutoFind?” light. This works best if the GDP port has already been found.



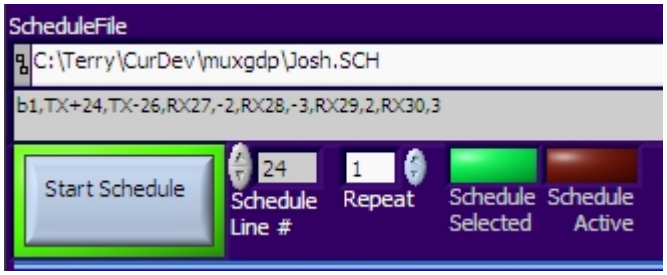
SELECT SCHEDULE FILE

This control is used to type in or browse for the schedule file you wish to use. The browse button is located to the right of the ScheduleFile name box.

Once you click the browse button, you will be presented with a standard file browse dialog box. This box will use the *.sch file mask by default. If you schedule file has a different extension, you will need to change it.

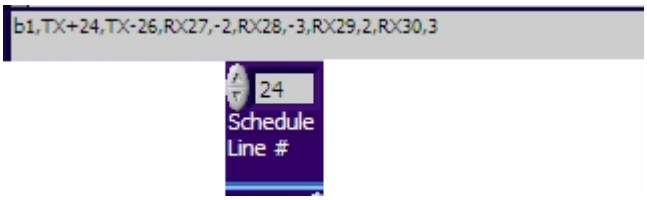


Upon selection of your schedule file, the file will be loaded, case folded, and syntax checked for gross errors (errors which depend on your array type will not be trapped until you actually try to use the schedule file). You should see the “Schedule



Selected" light come on, and the first line of your schedule should be displayed. **NOTE:** when you select a new schedule file, all MUX boxes on the serial chain will be rest. So you will hear all MUX relays being toggled to the reset position as your schedule file is loaded.

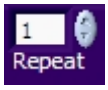
You can scroll through your schedule line by line via the "Schedule Line #" control. Use the button to the left of the control to move 1 line up or down in schedule. Alternatively, you can enter the line # directly by clicking in the number box itself.



As you change the line #, you will see the corresponding schedule line change in the box above.

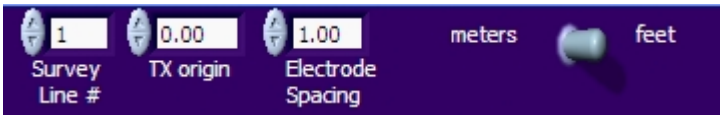
SET SCHEDULE LINE REPEAT COUNT

This control sets the number of times each schedule line will be repeated. A value of 1 means the schedule line will be used once *for each selected frequency.* If you have multiple frequencies selected, each frequency will be repeated prior to using the next frequency.



SET SPACING INFORMATION & INITIAL LOCATION

The controls shown below let you characterize the physical layout of your lines. The two distances can be entered in meters or feet. The units control on the right is a slide switch used to set your choice of units. The electrode spacing is the distance



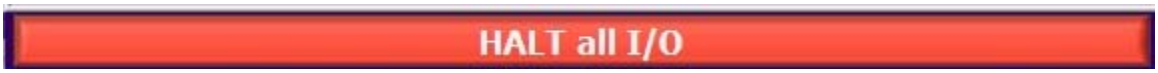
between electrodes in your line. The TX origin is used to record a fixed distance between your line's end electrode and some known point of origin in your survey.

The serial/parallel switch tells the software how you are using multiple MUX boxes. Seeing as the ZETA software calculates GDP N and A spacings automatically, it needs to know if you are using pairs of lines in series or parallel. Parallel configurations are often used for CR data collection.

USING THE HALT BUTTON

The "Halt" button is used to stop or suspend all I/O on both serial ports. No I/O will take place as long as the Halt button is latched. The software may decide to latch this button automatically if an error occurs which makes continued processing of a schedule impossible or likely to produce bad or inconsistent data.

As long as the Halt button is latched (the button will turn bright red), you won't be able to talk to the GDP or the MUX chain. Un-latch the button by clicking it with the mouse.



If you think the program is behaving funny or has stopped working, check to make sure that the Halt button has not been set.

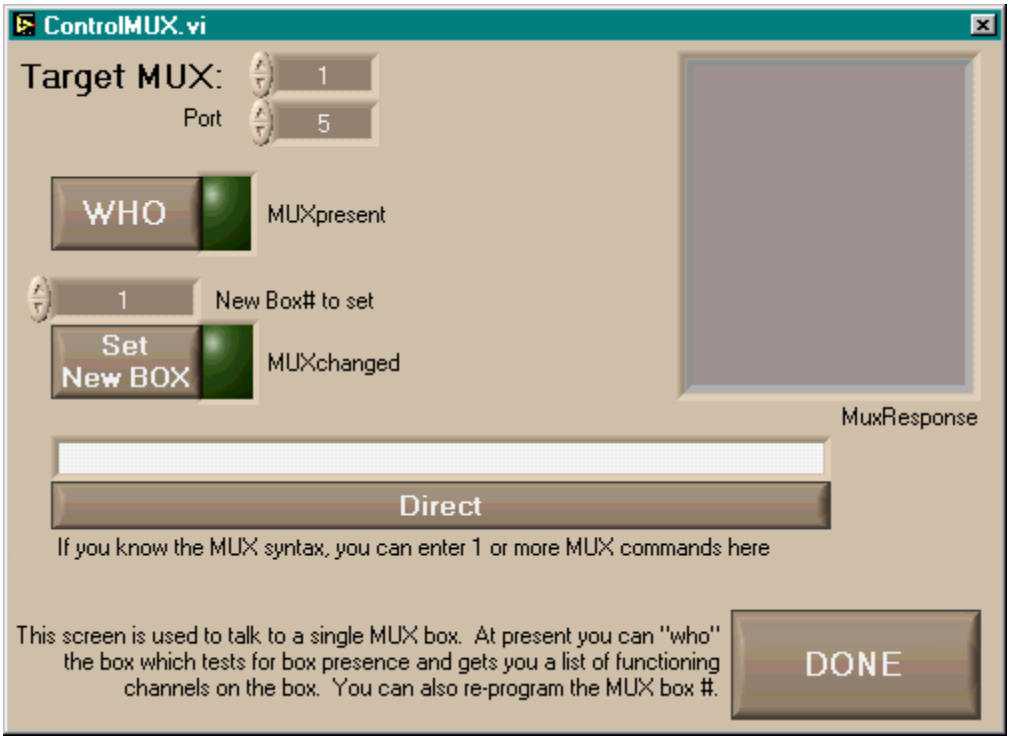
You can use the Halt button at any time to abort a schedule file or a GDP setup. If you are tired of listening to the beep of the GDP hot link, use the Halt button between schedule invocations.

Under some error conditions, the ZETA software will set the Halt button for you. Some of these conditions are:

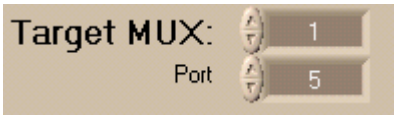
1) Your schedule file calls for GDP channels which are not physically installed in the GDP.
2) Your schedule file calls for a MUX box which is not present in the serial chain.
3) The GDP is collecting a different type of data than indicated by the GDP setup screen. For example the GDP might be collecting TDIP data but the GDP setup screen calls for RPIP data. This can happen if you forget to setup the GDP before running a schedule.
4) The software cannot find any MUX's on the MUX chain.

ACCESSING A MUX BOX DIRECTLY

Hitting any function key **while the Run Schedule** screen is active will bring up a direct MUX control dialog. This dialog can be used to control any MUX box on the serial chain. The main uses of this screen are to search for an existing MUX box on the serial chain, or to "program" MUX boxes to be consistent with a given schedule.



First choose the target MUX box number and the serial port used to communicate with the MUX box.



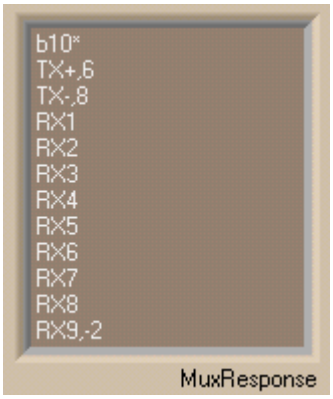
In the example above we will try to talk to MUX box 1 using serial port 5. There are two "pre-packaged" commands available in the dialog. One for performing the "Who" command and one used to "Reprogram" the MUX box. In addition any valid MUX command string can be sent to the MUX using the "Direct" command button.

WHO A MUX

To send a “WHO” command to the Target MUX using the indicated serial port, press the “WHO” button shown below.

If the MUX box is present, the “MUXpresent” light will turn bright green as shown below...

… and the MuxResponse box will fill with the return string. If you like you can scroll through the MUX response by clicking inside the response box and using your keyboard arrow keys to move through the MUX response.



If the MUXpresent light remains dark (or turns dark), and the MUXResponse box remains empty, than that MUX is not present on the serial chain.

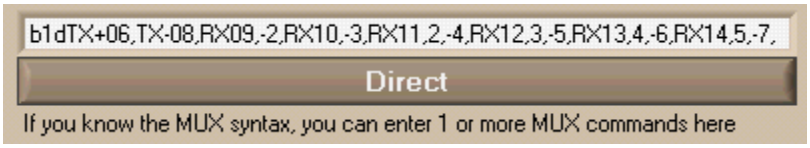
"REPROGRAM" A MUX

The other field operation supported by the direct MUX control screen is changing an existing MUX box #. This is called "Reprogramming". This operation becomes important when running multi-box schedules or using a MUX box which is new to the current work.

To reprogram a MUX box (which you have already found using the Who command), enter the **new** box # you would like associated with the current MUX. Then press the "Set New BOX" button. If the reprogramming is successful, the "MUXchanged" light will change to bright green.

SENDING DIRECT MUX COMMANDS

If you know the syntax of Multiplexor commands you may enter them into the string box which sits above the "Direct" button. For example, pre-pending "bnd" to any schedule line will configure MUX number n as indicated by that line.

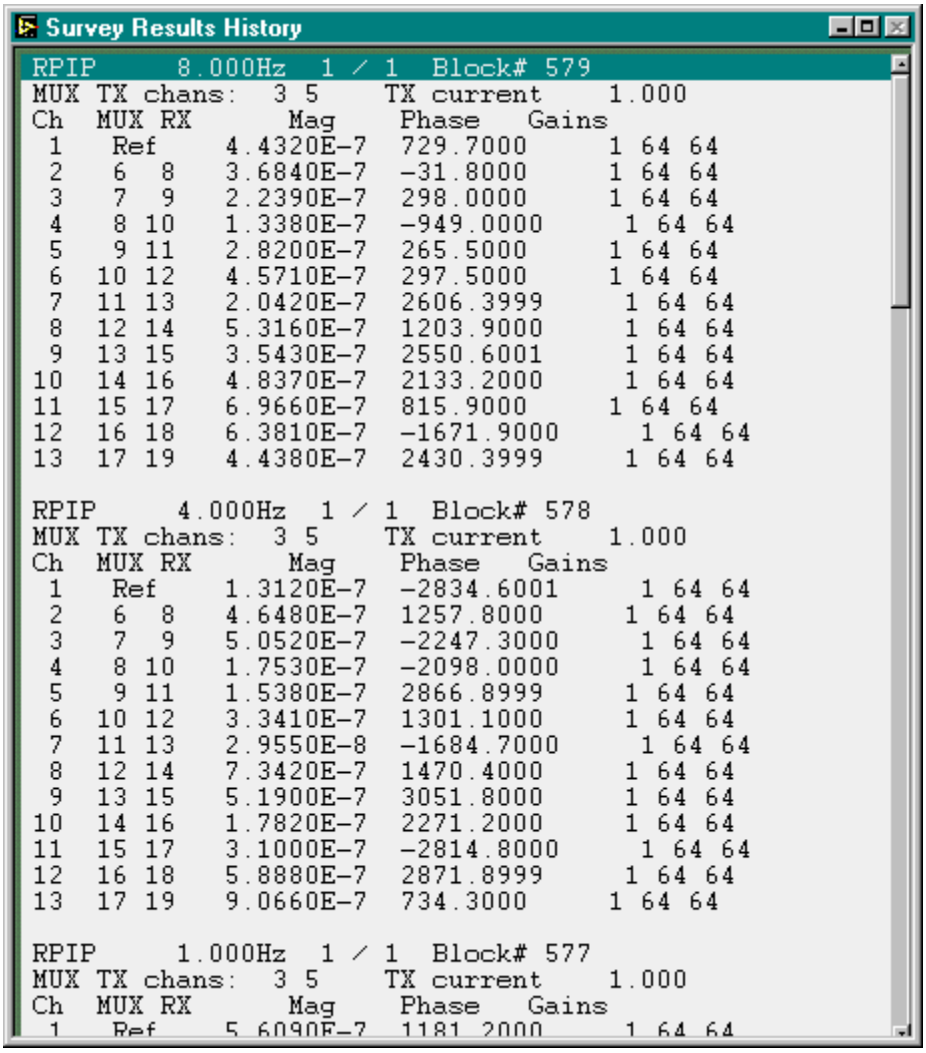


The MUXresponse box will contain whatever MUX response is appropriate to that command.

Practical uses of this function, could include manually setting up a MUX priror to Manual data taking on the GDP.

THE RESULTS DISPLAY SCREEN

The results display screen contains the cumulative history of all data taken by the GDP since you started the program. You can resize this screen to any size which is convenient. The most current data is always at the top of the screen. You can scroll through past data by using the scroll bar on the right. This only works well if data **is not** being collected.

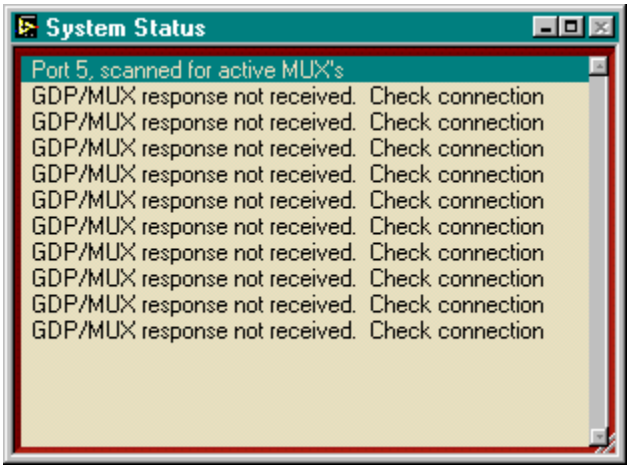


The results display screen can be minimized like any window in Windows. It can be restored by clicking on the minimized button on the start bar at the base of your desktop.

SYSTEM STATUS/ERRORS

System errors are stored in a system status window which is just visible at the top of the GDP status screen. Click on this window to see a display of system status.

The contents of the System Status window is mostly for technical support and debugging purposes, and in most cases you won't have to worry about it. Many system events are recorded in this window which are not necessarily errors. The most recent event will appear at the top of the window.



For the example shown above, Port 5 was scanned for active MUX's on a trial and error basis. Not all MUX's were present so some time outs were generated as the software tried to access non-present MUX boxes.

Exception: If running the Zeta software with array type set to "User-Defined", **ALL** errors will appear in this window only. You will have to check this window manually.

The ZETA software processes errors based on severity and context. For example a time out error while searching for possible MUX's is normal and to be expected.

During schedule processing however, such an error is critical to data collection. In the first case, the error is assigned a severity of "Information" which means it is simply logged to the status screen. In the second case the error has a severity of "Stop" which means that the software will automatically latch the Halt button, and display an acknowledgment dialog.

SYSTEM ERROR LEVELS

The ZETA software has four severity levels. The processing for each is described below.

ABORT

This severity level will cause automatic termination of the software. An acknowledgement dialog will be presented, and the program will terminate following acknowledgement. Errors with this severity are rare and if you get one you should note the message in the acknowledgement box, and contact Zonge for technical support.

STOP

The stop severity level means that data collection can no longer continue because data quality will be un-acceptable. Examples include loss of serial communication with either the GDP or MUX during schedule operation, inconsistent setup between the physical GDP and the GDP setup screen, or conflict between schedule contents and the physical reality of the hardware.

CONTINUE

The continue severity level means that the error will not affect data quality, but the operator should be made aware of the condition. Errors of this severity will cause an acknowledgement dialog to appear. Upon acknowledgement processing will continue. A current below a given threshold will cause this error, and is often indicative of an unconnected/unpowered transmitter or a malfunctioning sensor.

INFORMATION

The information severity level means that the error is so trivial that the operator should not be bothered. Processing will continue un-interrupted and a message will be logged to the System Status window.

Exception: If running the User-Defined array type, all error severities will be blanket defined to “Information”.

LIST of ERROR NUMBERS and MESSAGES

The ZETA software does not really work solely by error number. Instead it presents a descriptive message, and then a number which usually has something to do with the error itself. Below is a list of all the possible error messages and number ranges which the ZETA software will generate.

-1073807343 | Can't open serial port

37 | Old serial port access error code

Each time a serial communication is attempted in the software, the serial port is re-opened and re-initialized. This is what allows you to disconnect and subsequently reconnect a serial port while the software is running.

?? | "Write error port nn"

?? | "Read error on port nn"

If you see this error, there was a problem writing/reading to/from the indicated serial port. Practically you should never see the message. As the port is re-opened and initialized for each communication, if there is a problem with the serial port it will most likely appear in association with the port open.

1 | No matching GDP channel on a dipole

It is assumed, when running Dipole-Dipole array types, that each GDP channel must have a + and – side. This error message is displayed when only a “+” or a “-“ side has been specified in the schedule. If you are running a custom schedule, select the “User Defined” array type to avoid this message.

2 | Variable a-spacing

For Dipole-Dipole array types, it is assumed that each dipole has the same physical length. If the ZETA software finds a difference in dipole spacing within your schedule, this message will be generated. You can bypass this checking by selecting the “User Defined” array type.

3 | Port scanned for active MUX's

This is an informational message which should appear only in the system status window. It's just a recording of the MUX scan activity.

7 | Nspacings don't match # of plot values

If you see this message while running a schedule, there is an internal program error and you should contact Zonge to have it fixed. You will see this message when taking manual data **if the number of GDP channels you have turned on does not match the most recently run schedule line.** If taking manual data, simply click the "OK" button acknowledging the error, and continue on with your work. This minor program bug will be fixed in the next ZETA revision.

20 | "GDP/MUX response not received. Check connection" time out

This message is displayed when the control software did not receive an expected response from either the GDP or a MUX within a given time frame. This can occur unexpectedly when the GDP or MUX battery dies, the serial connection has been stepped on or is loose, you accidentally changed your serial port #, or a non-ZETA related software grabbed the serial port.

21 | GDP protocol error, check communication line

22 | MUX protocol error

You will see this error when the received serial port communication did not match the ZETA communication protocol. You have noise on the serial line, or you have found a program error in the GDP.

23 | GDP command/response mismatch

Each command given to the GDP must be echoed back to the control software with an associated error code. This is how the GDP, MUX, and control software all remain synchronized. If you see this message, you could possibly have a bad serial connection, but more likely there is a program error on the GDP. You should restart the GDP and resume your schedule at the last successfully completed line.

32 | Channels not available on the GDP

You will see this message if your schedule tries to use a GDP channel which is not installed on the GDP. Install the needed channels on the GDP or modify your schedule.

51-59 | MUX box already on bus

You will see this message if you try to use the direct MUX control screen to "reprogram" a MUX, and you have selected a box # in use by another MUX on the serial chain. Try a different MUX box #.

100 | Low current

You will see this message if the GDP's reference channel (channel 1) reports a current below 0.0001 amps. Usually this means that your transmitter has not been powered on, or it has not been enabled to transmit. **NOTE: You MUST use the reset/transmit buttons while the duty signal is active… otherwise the transmitter will light it's green light indicating that it is enabled, but will not actually be enabled.** You can take a manual data block using the GDP setup screen and hit the reset/transmit button sequence on the transmitter. It is also possible that your reference channel is not hooked up to the transmitter.

101 | "No MUX's found!! Check connections"

This message is displayed when no MUX's can be found on the serial chain.

200 | "CRES switch is active, but no .CRS schedule file can be found"

You have requested a schedule based contact resistance check, but no contact resistance schedule file can be found. If you hit the "Run Schedule" button while the CRES check switch is in the yellow position, the software will look for a schedule file with a .CRS extension. The .CRS file has the same name as your schedule file, .SCH and is generated automatically by the schedule generator software. You can of course manually create a contact resistance schedule file.

?? | GDP error code... "GDP command error: ??"

This message occurs when the GDP has been unable to implement a requested command.

Error codes that you will see from the GDP are:

1 Bad array type given to GDP (ZETA internal error)

2 No channels are turned on in the GDP

7 Channel is saturated (interpreted)

15 A non-existent channel was asked for (interpreted).

17 Incorrect notch filter setting (ZETA internal error)

18 Bad frequency (ZETA internal error)

24 Program type unknown(ZETA internal)

25 Wrong type of card in GDP… one or more of the GDP channels have nano-tem or 24 bit cards installed in them.

?? | "MUX command error... check schedule file"

| 3 TX+,TX- connected to same electrode... short

| 4 electrode number not between 1-30, illegal electrode #

| 5 TX,RX connected to same electrode

| 6 Check sum error on command string

| 7 Invalid/unkown command

| 8 MUX is not ready

| 9 Illegal A/D channel #, must be 1-16

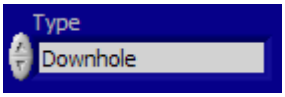
1-??? | Syntax error in the schedule file... error number is the schedule line #

WRITING A SCHEDULE FILE

ZETA SCHEDULE GENERATOR

You may now use the ZETA Schedule Generator to create schedule files (*.sch) for your ZETA system. The Schedule Generator supports dipole-dipole and downhole survey types. You may still use manually created files if you wish, or create a schedule file and make changes before saving within the Schedule Generator. The Schedule Generator also creates a contact resistance file (*.crs) automatically when creating a schedule file.

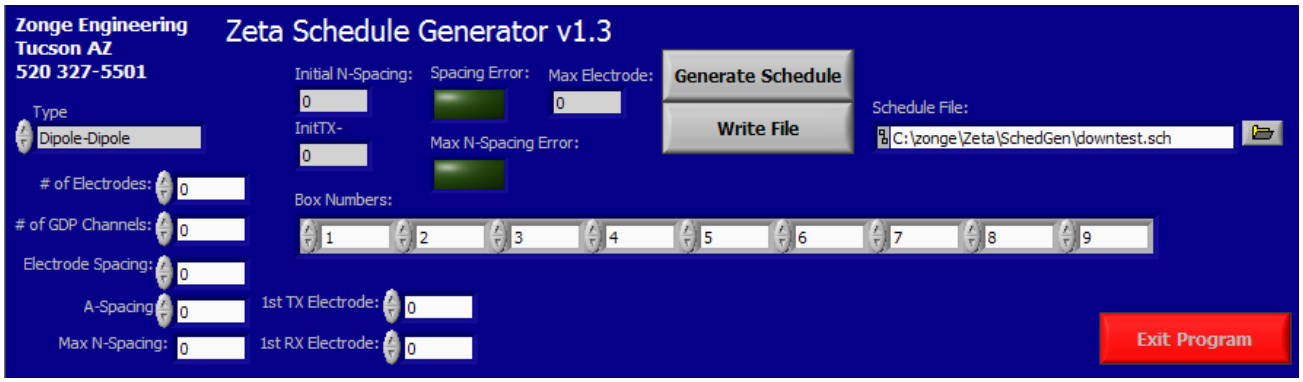
SURVEY TYPE



The survey type allows you to select the format of the schedule file you want to generate. There are currently two types of surveys supported: dipole-dipole and downhole.

DIPOLE-DIPOLE

This is how the controls for the Schedule Generator look when dipole-dipole is selected:

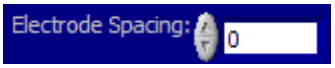


You will need to enter the following information before generating a schedule:

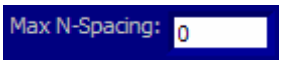
- 

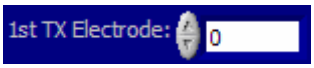
# of Electrodes: The total number of electrodes being used in the survey.
- 

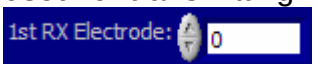
# of GDP Channels: The total number of GDP channels being used in the survey.

- 

Electrode Spacing: The physical distance between electrodes in units of length.
- 

A-Spacing: The length of a dipole in integer units of electrodes.
- 

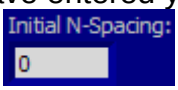
Max N-Spacing: The maximum depth of investigation.
- 

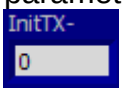
1st TX Electrode: The number of the first electrode used for transmitting.
- 

1st RX Electrode: The number of the first electrode used for receiving.
- 

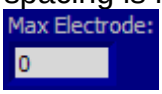
Box Numbers: The numbers assigned to the MUX boxes in order.

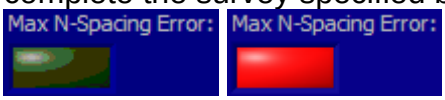
There are several indicators for dipole-dipole surveys that you can use to verify that you have entered your parameters correctly:

- 

Initial N-Spacing: This is the n-spacing calculated from the parameters entered. Make sure this is the value you expected.
- 

Init TX-: This is the number of the first electrode used as the negative terminal for the transmitter.
- 

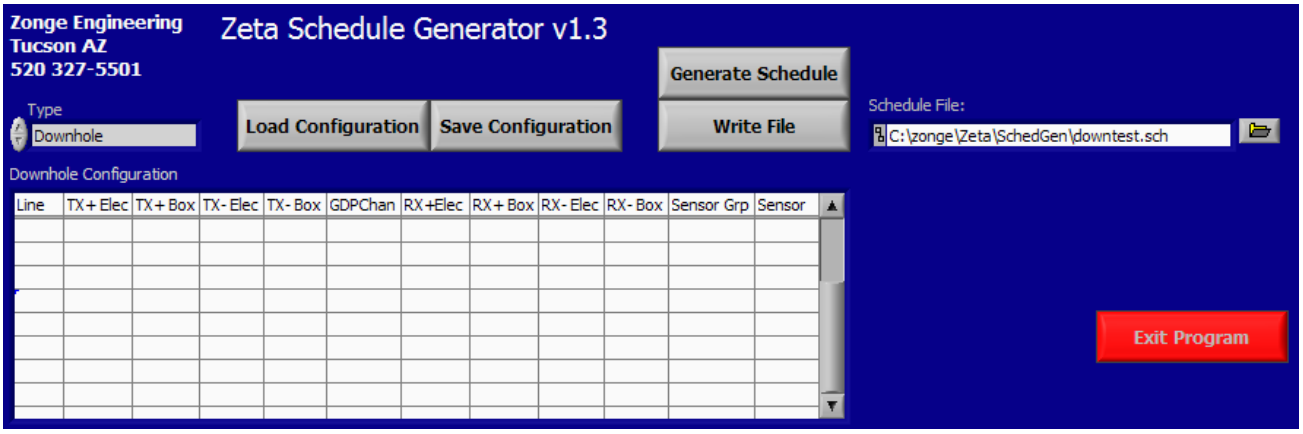
Spacing Error: Lights red when the calculated n-spacing is less than or equal to zero.
- 

Max Electrode: The number of the maximum electrode needed to complete the survey specified by the given parameters.
- 

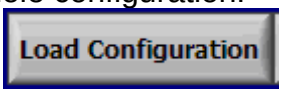
Max N-Spacing Error: Lights red when Max Electrode is greater than # of Electrodes.

DOWNHOLE

This is how the controls for the Schedule Generator look when downhole is selected:



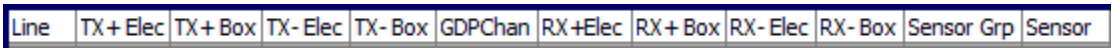
There are two buttons that can be used to save and retrieve configuration tables for downhole configuration:

- 

Load Configuration: This button will load a ZETA Schedule Table file (*.zst) into the Downhole Configuration table.
- 

Save Configuratoin: This butten will save the contents of the Downhole Configuration table to a ZETA Schedule Table file (*.zst).

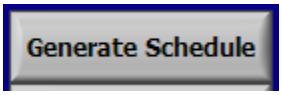
The Downhole Configuration table is used to enter the information that will be used to generate the schedule file. You can think of each row in the table as defining a dipole by using the following fields:



- Line: The line of text in the schedule file that the dipole will appear on.
- TX+ Elec: The number of the electrode that will be used as the positive transmitter channel.
- TX+ Box: The number of the MUX box that TX+ Elec is connected to.
- TX- Elec: The number of the electrode that will be used as the negative transmitter channel.
- TX- Box: The number of the MUX box that TX- Elec is connected to.
- GDPChan: The channel on the GDP that will be connected to this dipole.
- RX+ Elec: The number of the electrode that will be used as the positive receiver channel.
- RX+ Box: The number of the MUX box that RX+ Elec is connected to.

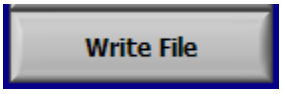
- RX- Elec: The number of the electrode that will be used as the negative receiver channel.
- RX- Box: The number of the MUX box that RX- Elec is connected to.
- Sensor Grp: This field is not used in generating a schedule; it is provided to help you document your work.
- Sensor: This field is not used in generating a schedule; it is provided to help you document your work.

GENERATE SCHEDULE



When you have entered all the information needed for your schedule type, click the Generate Schedule button. This will assemble the text of your schedule and display it in the Schedule Text box. You can now edit the text of the schedule before saving it to a file.

WRITE FILE



Once you have generated the schedule text and made any changes you like, you are ready to save the text to a file. First, enter a path and filename in the Schedule File: box, or click on the file button next to the box and select an existing file (note that this will overwrite the existing file). Once you have selected the desired schedule file, click on the Write File button. This will save the text in the Schedule Text box to the specified file, as well as automatically generate a Contact Restance file (*.crs) with the same name as the schedule file.

EXIT PROGRAM

You may click the Exit Program button at any time to quit the ZETA Schedule Generator.

The new ZETA software supports a new schedule file format which facilitates generation of multi-box schedules. Single box schedule files in the old format are supported and may be used directly with the new ZETA software.

Also, there are several assumptions made about schedule file format which you must adhere to in order for the program to correctly process your schedule. These assumptions are array-type specific. The ones listed below apply to the Dipole-Dipole array type. For User-Defined array types only item 4 applies.

ASSUMPTIONS ABOUT SCHEDULE FILE FORMAT

1) It is assumed that when a GDP channel first appears in a schedule line, that it will appear as a negative number. Your N spacings will be wrong if you reverse this order. For example TX+01,TX-04,RX05,-2,RX08,2… is valid but TX+01,TX-04,RX05,2,RX08,-2… will give an erroneous N spacing.
2) You may skip MUX electrodes in your schedule (variable N spacing) however should you make the common error of also varying A spacing, you will receive an error.
3) It is assumed that all GDP channels must appear in the schedule as positive and negative pairs. Un-matched channels will generate an error.
4) All MUX channels are assumed to reference MUX box 1 unless explicitly indicated via a “bn” command i.e. “b4” to indicate MUX box 4.

A NEW WAY OF HANDLING MUX BOX NUMBERS

The example excerpt from a schedule file shows how a multibox schedule is used to drive CR data acquisition. All mux channel references are assumed to be on MUX box 1 unless otherwise indicated.

TX+01,TX-03,b2,RX04,-2,RX05,-3,RX06,2,-4,RX07,3,-5,RX08,4,-6,RX09,5,-7,RX10,6,-8,RX11,7…

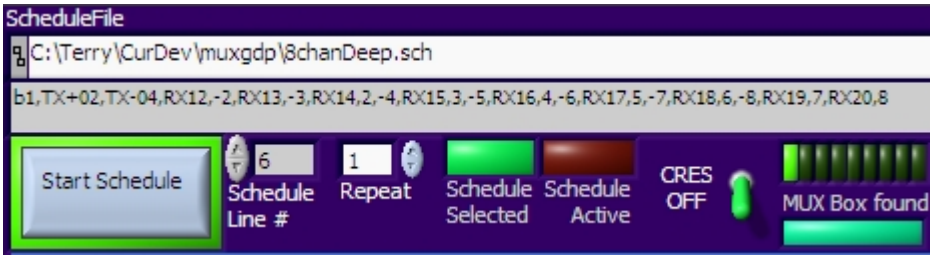
In this example, the TX channels are on MUX box 1 and the RX channels are on MUX box 2 as indicated by the ,b2, following the definition of the TX channels. So you can change the entire schedule to a single box schedule using a single search and replace operation. Simply replace ,b2, with ,b1, and you will have a single box schedule. Restoring the schedule to a multi-box schedule simply means returning ,b1, to ,b2,. It is no longer necessary to edit each channel separately for each line in the schedule.

MORE ADVANCED USE OF THE ZETA SOFTWARE

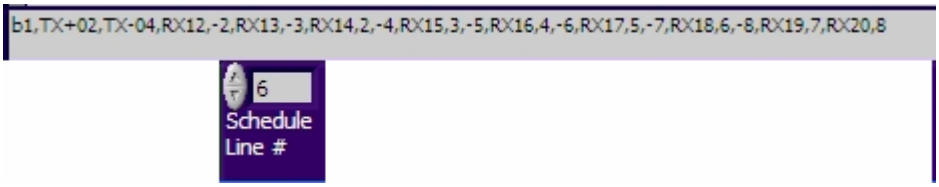
SCROLLING THROUGH YOUR SCHEDULE FILE

ZETA 2.xx software allows you to scroll line by line through your currently selected schedule file. You can use the feature to manually set up a MUX, support manual CRES checks, trouble shoot a MUX, debug a schedule you are having problems with, or to resume data collection part way through a schedule.

To scroll through your schedule, *after it has been selected,* use the "Schedule Line



#" control located to the right of the "Start Schedule" button. You will see the current schedule line displayed in the box above.



TEMPORARILY CHANGING A SCHEDULE LINE

The ZETA 2.xx software allows you to **edit the current schedule line on display**. If you are having problems with a given schedule line, select that line (via the procedure above), then click your mouse in the schedule line display box. You can now use your keyboard to change the schedule line. NOTE: that any changes are only good until you change to a new schedule line.

After you have changed your schedule line, use the "Set MUX only" button to send

your modified schedule line to the MUX.

MANUALLY SETTING UP A MUX

The ZETA v2.xx software allows you to send a single schedule line to the MUX(s). This will close the transmit and receiver relays on the MUX and map the receiver channels to GDP channels. Select and optionally modify the schedule line you want to configure the MUX with. This process is described above. Use the "Set MUX Only" button to configure the MUX. You should hear the MUX relays click.

Once the MUX is set up, you can check it's hardware settings using the direct MUX control screen, manually with an ohm meter,or you can perform single CRES checks using the GDP setup screen.

MAKING YOUR SCHEDULE FILES MORE ACCESSIBLE

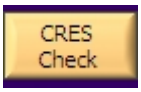
For traditional reasons, the ZETA software is installed in the C:\Program Files\Zeta_200 directory. The ZETA installation includes the ZETA control, schedule generator, and cache conversion programs as well as this user manual and several example schedules. Loading your schedule file can be slightly annoying as your are forced to traverse several directory levels to access your schedule files.

Simply move your schedules into a directory such as C:_ZETA to have more immediate access to your schedule files. Remember to copy the .CRS contact resistance schedules as well.

WAYS TO PERFORM CRES CHECKS

ZETA 2.xx allows you to perform contact resistance checks in several ways. You can manually perform CRES checks, one configuration at a time or you can perform a CRES check for an entire schedule you are planning on running.

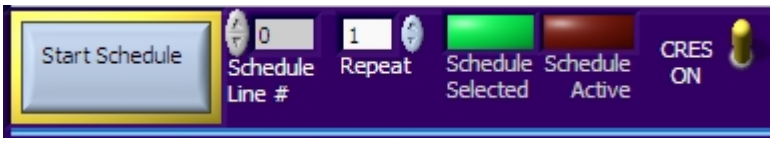
To manually perform a CRES check, you must first set up the MUX as described in "Manually Setting up a MUX". Next, use the "CRES Check" button located on the



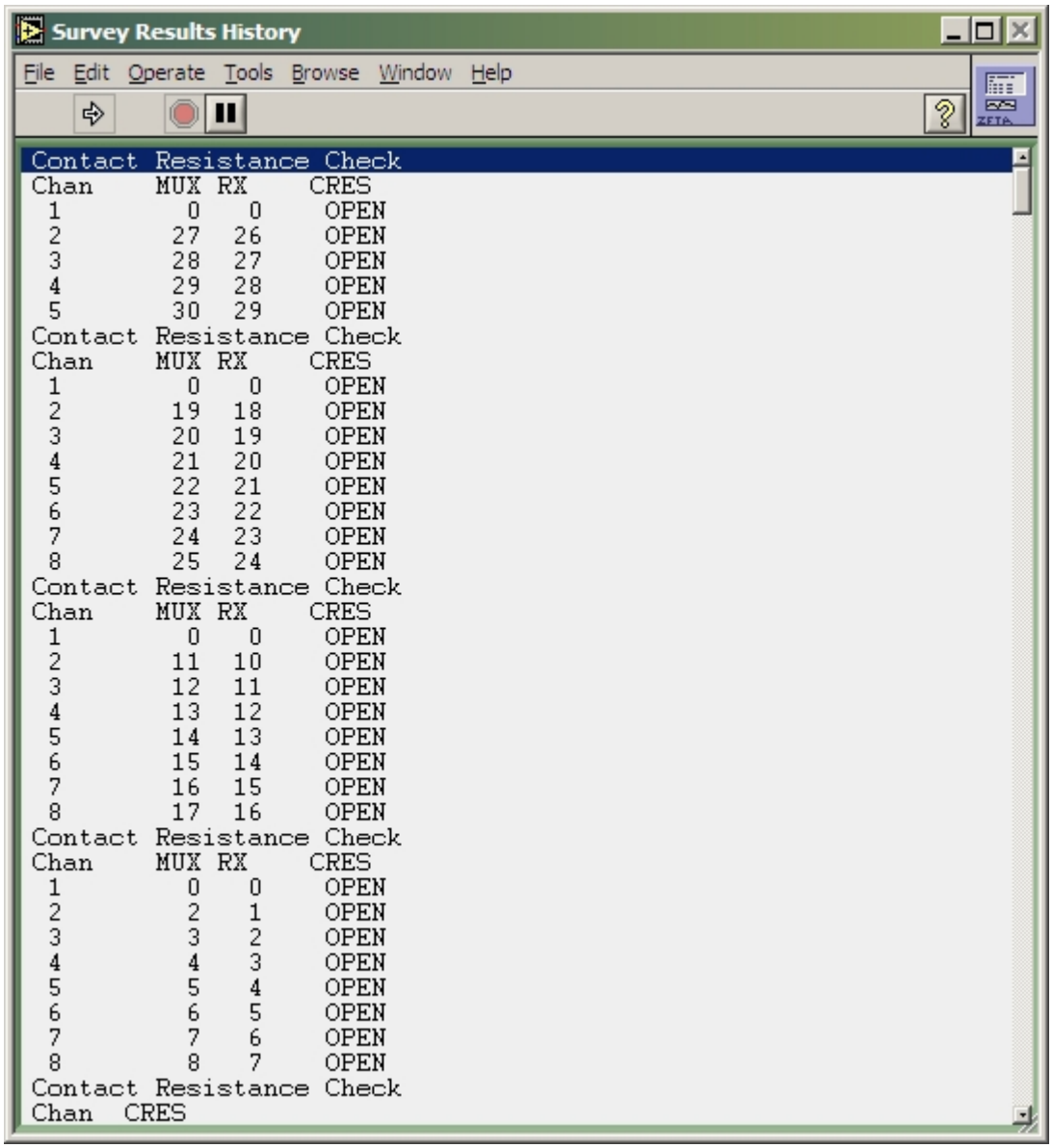
lower right corner of the GDP Setup screen.

To perform a CRES check for your entire schedule, you will need a CRES schedule (a schedule which has a .CRS file extension). If you used the schedule generator to make your schedule, then the generator built a .CRS file at the same time it built your main schedule file (.SCH). You can build your own CRES schedule by simply removing the transmitter electrodes from an existing schedule.

Select your schedule. Set the CRES switch prior to running your schedule. You

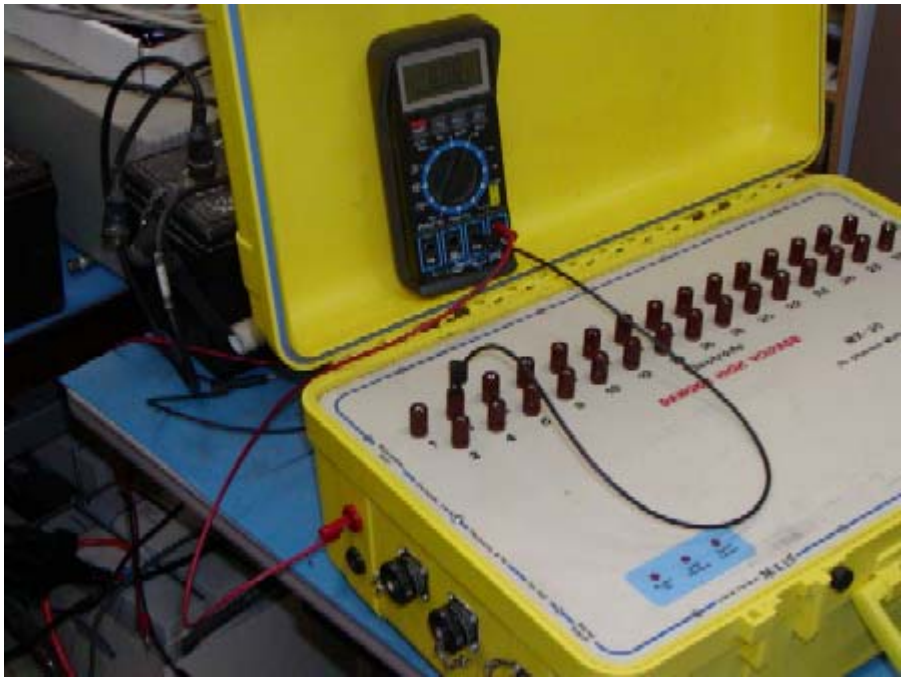


should see the CRES switch turn yellow. The background of the "Start Schedule" button should also change to yellow. Press the "Start Schedule" button and await your CRES results in the Survey History Screen.


Survey Results History
File Edit Operate Tools Browse Window Help
Contact Resistance Check
Chan MUX RX CRES
1 0 0 OPEN
2 27 26 OPEN
3 28 27 OPEN
4 29 28 OPEN
5 30 29 OPEN
Contact Resistance Check
Chan MUX RX CRES
1 0 0 OPEN
2 19 18 OPEN
3 20 19 OPEN
4 21 20 OPEN
5 22 21 OPEN
6 23 22 OPEN
7 24 23 OPEN
8 25 24 OPEN
Contact Resistance Check
Chan MUX RX CRES
1 0 0 OPEN
2 11 10 OPEN
3 12 11 OPEN
4 13 12 OPEN
5 14 13 OPEN
6 15 14 OPEN
7 16 15 OPEN
8 17 16 OPEN
Contact Resistance Check
Chan MUX RX CRES
1 0 0 OPEN
2 2 1 OPEN
3 3 2 OPEN
4 4 3 OPEN
5 5 4 OPEN
6 6 5 OPEN
7 7 6 OPEN
8 8 7 OPEN
Contact Resistance Check
Chan CRES

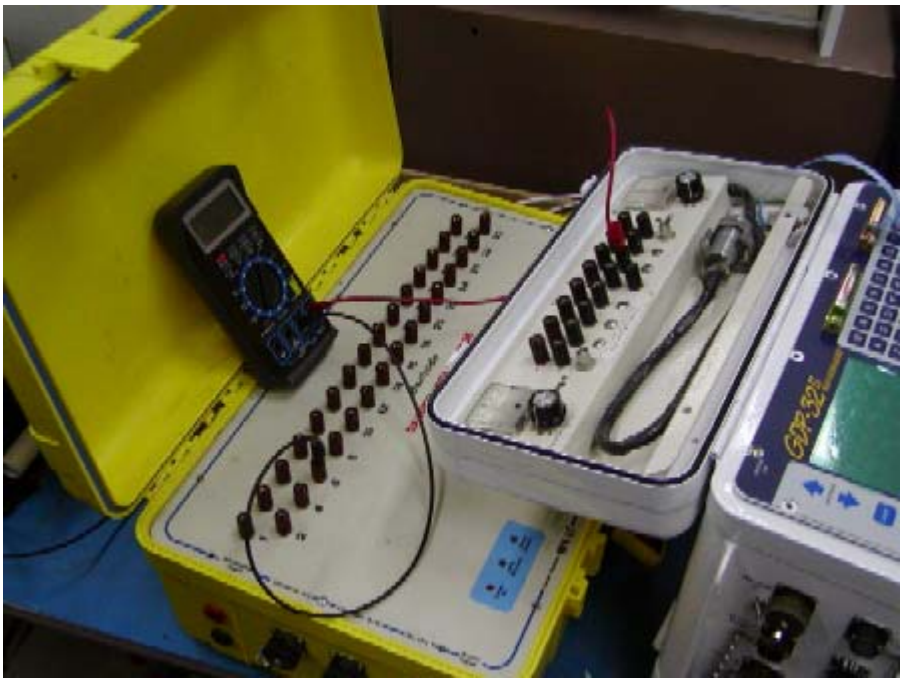
TROUBLE SHOOTING A MUX

Before trouble shooting the MUX, disconnect the transmitter connections to the MUX, and turn off the transmitter. You will need a multi-meter set to the low ohm range for checking continuity. Shown in the picture above is a check for TX+03. There should be continuity between the positive transmitter input (located on the side of the MUX) and relay 3 of the MUX. Of course this will only be the case if you have manually setup the MUX with the "Set MUX only" button, and the schedule line used had a TX+03 in it.



All other MUX relays should show as open if a TX+03 command segment was sent to the MUX.

You can also test receiver connections on the MUX, without disconnecting the GDP from your circuit. Shown in the picture below is a test of the RX6,-6 command segment. Channel 6 on the MUX should show continuity with the negative side of channel 6 on the GDP. A typical schedule line will contain many MUX RX channel/GDP channel connections. You will want to test each one.



USING INITIALIZATION FILES

The ZETA software keeps track of current program settings in two binary .INI files. You cannot edit these files with a text editor, however it is important to know that they exist. If they are lost or destroyed, the program will write new ones upon program exit. A sophisticated use of these files would be to save various common configurations in a separate directory, restoring the .INI files of your choice when needed.

The two initialization files are GDPzeta.INI and MUXzeta.INI. The GDPzeta.INI holds all settings for the GDP Setup screen while the MUXzeta.INI holds all settings for the Run Schedule screen.

USE OF GDP SETUP AND RUN SCHEDULE SCREENS BY THE SOFTWARE

The GDP Setup screen and Run Schedule screen run as two separate tasks in the ZETA software. So you can select a schedule file while the GDP is actively being set up. Also you can change GDP or Run Schedule parameters on the fly. Parameter changes will take place following collection of the current data block.

This should mostly prove useful in an experimental or research mode. For field production work, it will be un-needed.

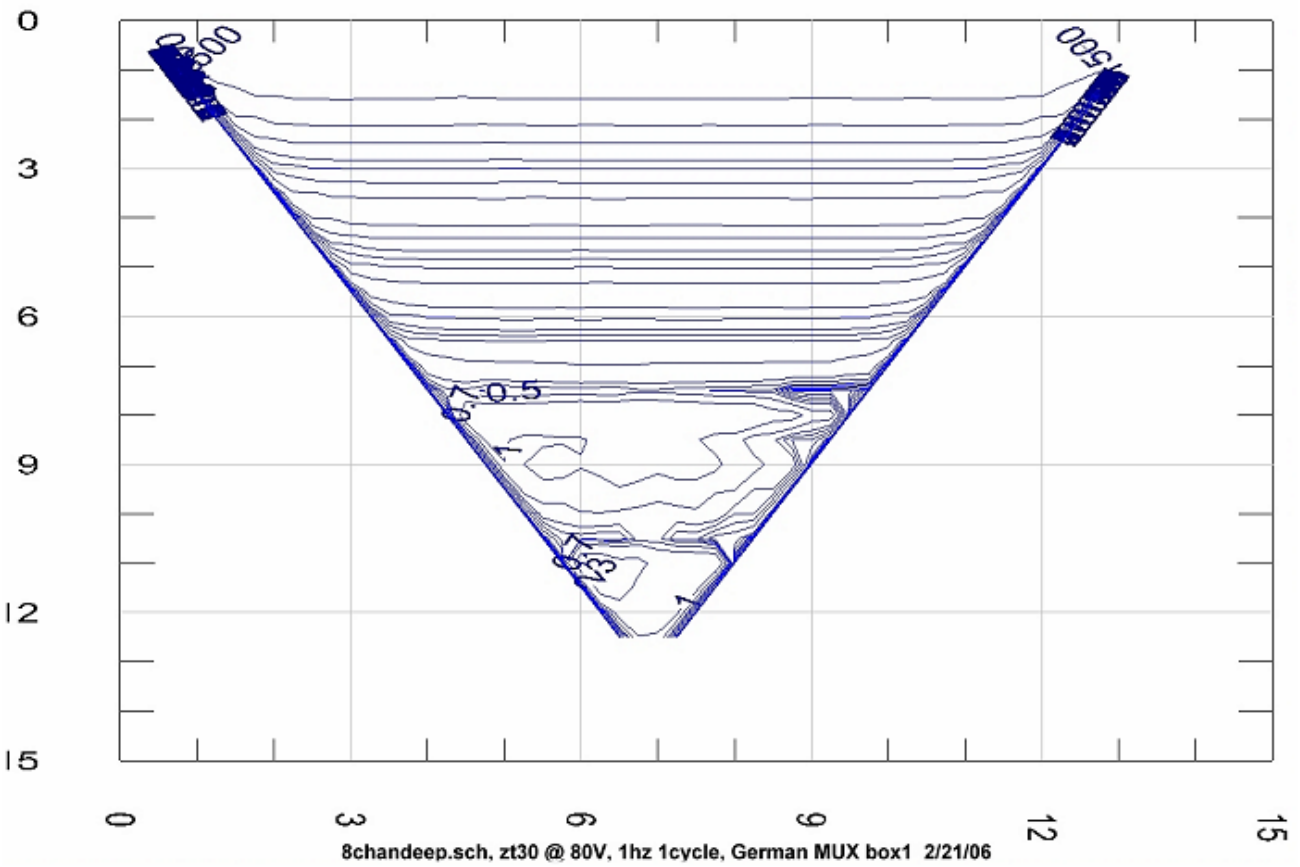
HOW A SEARCH FOR ACTIVE MUX BOXES IS PERFORMED

The ZETA software searches for the first nine of a possible 255 MUX boxes automatically. It does this by trying to “WHO” the respective MUX. If a time out of 3 seconds occurs before the MUX responds, it is marked as not present. You can use a schedule which calls out MUX boxes greater than 9, but your schedule must contain at least one MUX box which falls between 1 and 9 inclusive.

CONTOUR PLOT INTERPRETATION

Connecting your resistor test board to a MUX and running a TDIP survey (dipole-dipole array type) with one of the supplied schedules (josh.sch or 8chandeep.sch) yeilds information about the entire ZETA system with the exception of your ground sensors and their associated cabling. In this section, several contour plots which were encountered during various trouble shooting sessions, are listed and interpreted.

IDEAL CONTOUR PLOT

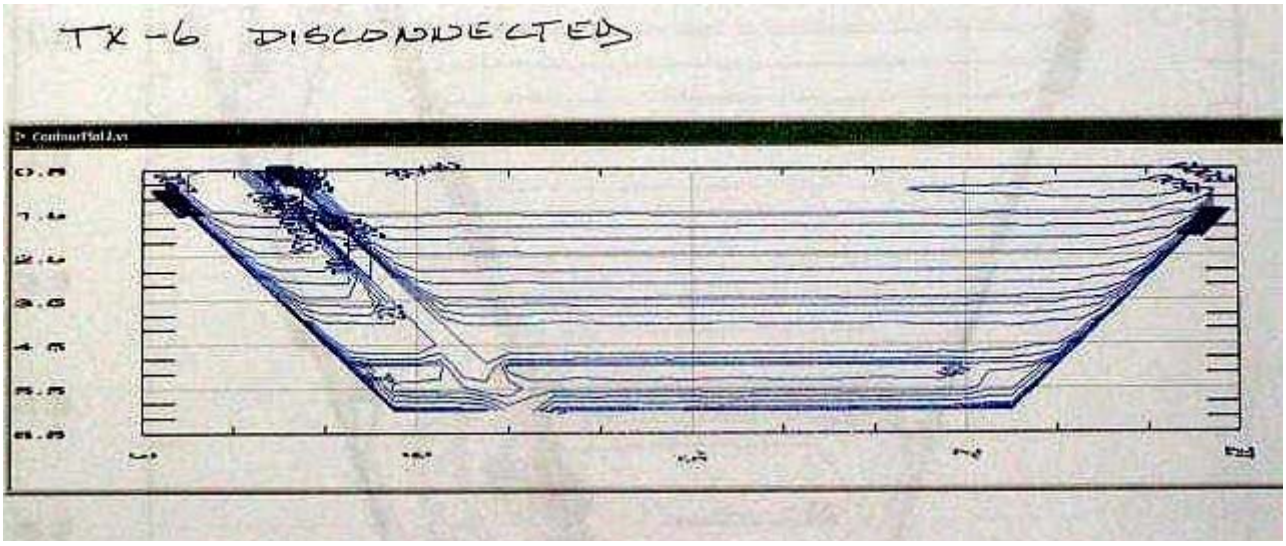


The plot above is ideal and indicates no problems with the ZETA system. Signals fading to noise at a “depth” of N=8 on the resistor board is expected. The remainder of this manual section deals will contour plots indicating a problem.

MUX RECEIVER OPEN

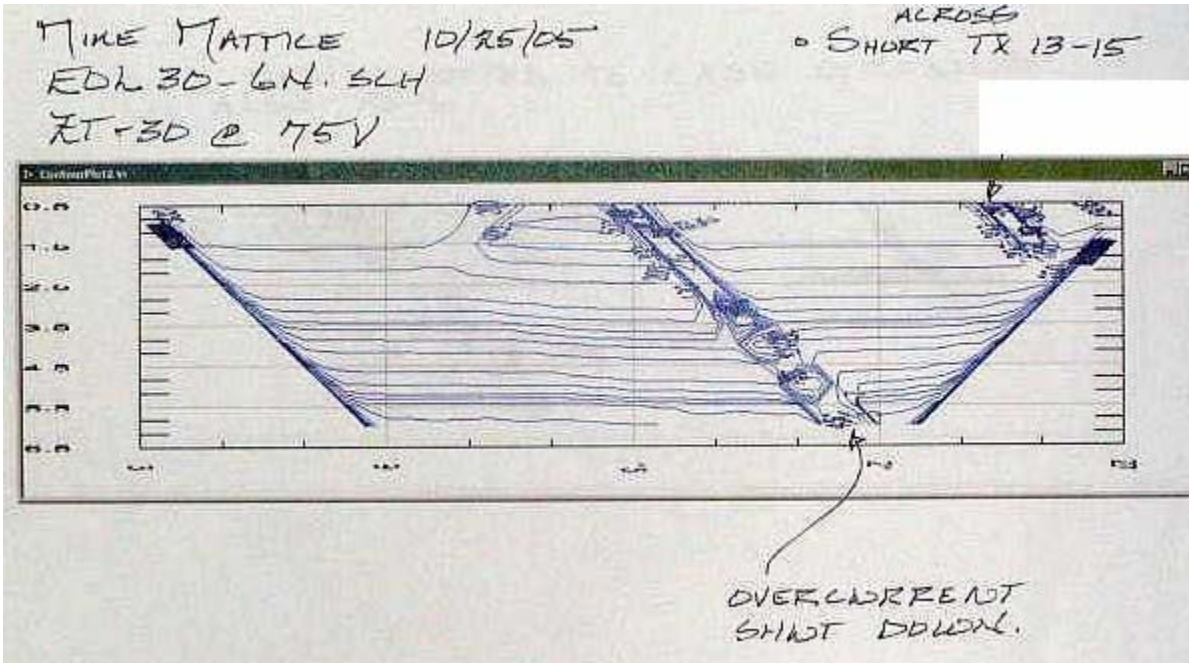
In the contour plot above, RX-6 is open… its relay was prevented from closing. Because a dipole schedule used RX-6 both on the + side and the – side, two anomalies appear in the contour plot.

MUX TRANSMITTER OPEN



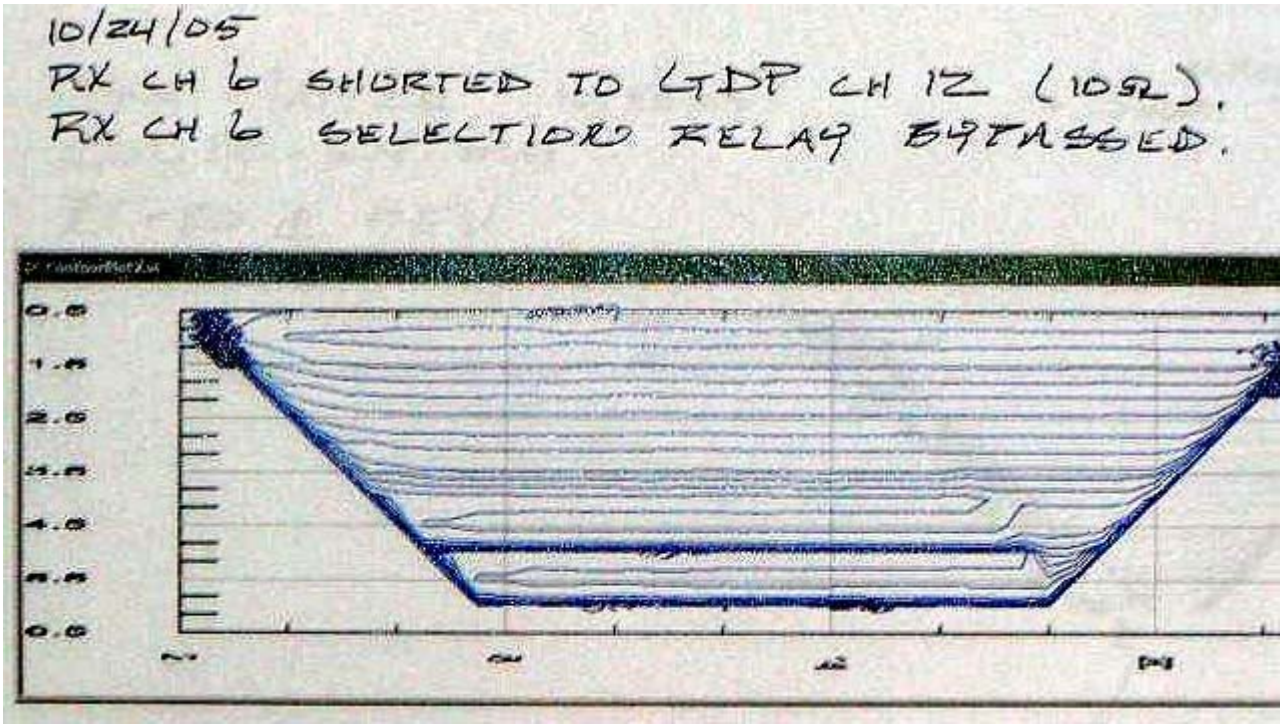
This contour plot shows an open TX+6 relay.

MUX TX +/- SHORT



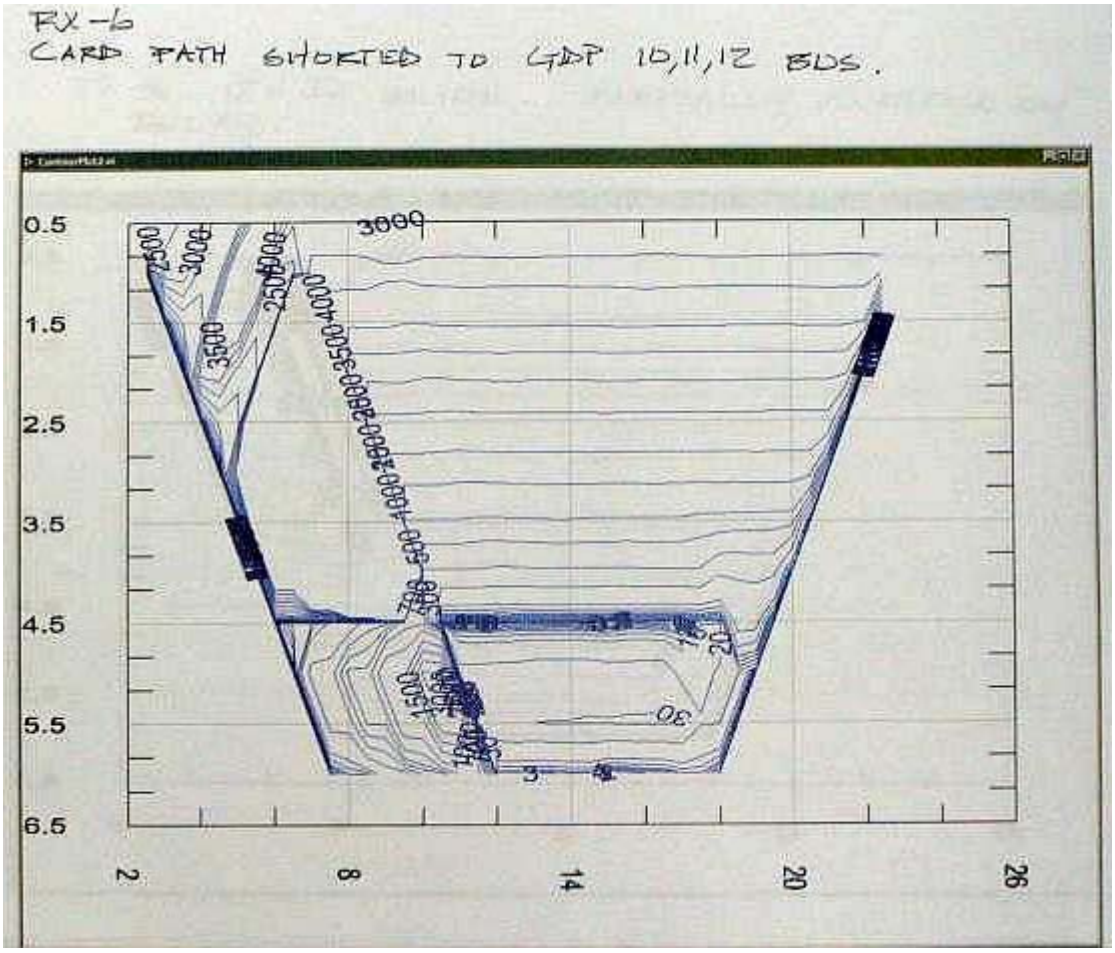
This contour plot shows a short between TX-13 and TX+15. The overcurrent shutdown on the transmitter was reset by the next data block. Without this reset, the remainder of the contour plot would have been noise.

MUX RX-GDP BUS SHORT



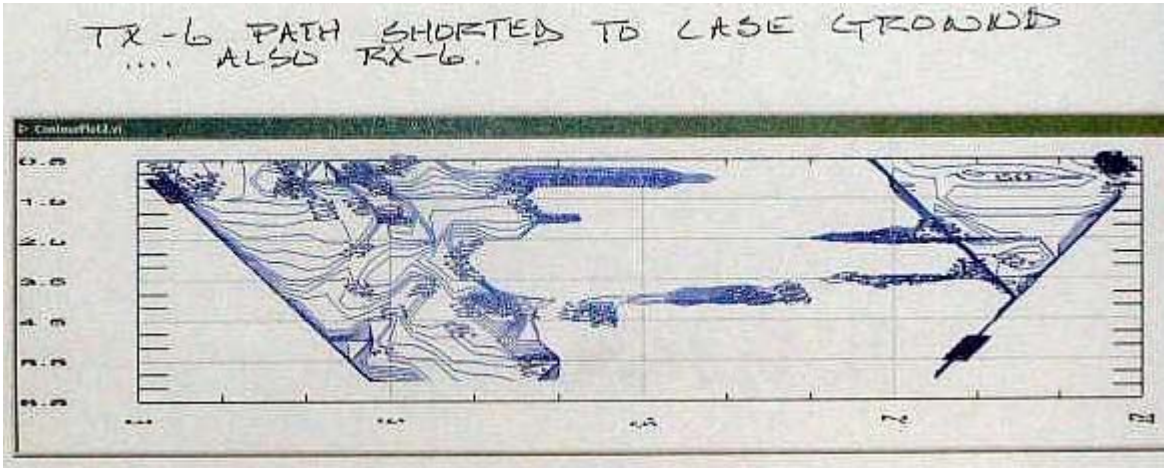
In this contour plot, the selection relay on MUX RX card 6 has been bypassed (partially stuck closed) with 10ohms on the short. The horizontal line indicates a problem with the GDP routing in the MUX. It could also mean an SC-8 cabling problem or a problem with the GDP's analog card. Swapping SC-8 cables, and subsequently the GDP's card will tell which of the hardware items has the problem.

MUX RX TO GDP CHANNEL SHORT



This contour plot shows the effect of shorting MUX RX-6 card to GDP channels 10,11, and 12 on the GDP channel bus within the MUX.

MUX TX SHORT TO CASE GROUND



This contour plot shows the effect of a transmitter short to case ground.

MUX CONTOUR PLOT SUMMARY

So in summary, simple transmitter relay problems show up as diagonals sloping down from left to right. Simple receiver relay problems show up as diagonals sloping up from left to right. Simple receiver GDP channel bus problems show up as horizontals.

More complex problems show up with contour plots exhibiting wider area effects.