

# **SYSCAL MANUAL Version 5**



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**PHOENIX GEOPHYSICS**  
**SYSTEM CALIBRATION PROGRAM - SYSCAL**  
**PROGRAM DESCRIPTION**  
**2006-Aug-10**

## **1. INTRODUCTION**

The SYSCAL program calculates the response function of a Phoenix MTU receiver as it was configured for a specific data acquisition, and outputs it to an ASCII file.

SYSCAL inputs an ASCII parameter (.PFC) file (which contains a list of frequencies for which a calibration is to be calculated), the parameter table (.TBL) file generated during data acquisition, the MTU calibration (.CLB) file generated in the MTU box calibration mode, and optionally the magnetic sensor calibration (.CLC) files generated in the MTU coil calibration mode. It outputs an ASCII system calibration (.CTS) file.

The system response output in the .CTS file is expressed as a complex number for each channel at each frequency. It can account for the response of the MTU only, or the complete system response including dipole lengths and sensor responses.

SYSCAL is a Windows 95 character mode application.

## **2. RUNNING SYSCAL**

The SYSCAL program can be run using the following command line. Order of the parameters is not significant. Fields in italics are to be filled in with actual values determined by the user. Parentheses [ ] indicate optional parameters.

```
SYSCAL [pfile.PFC] tfile.TBL [bpath\*.CLB] [spath\*.CLC] [cfile.CTS]
```

where

*pfile*.PFC is the path and name of the parameter file. Default is DEFAULT.PFC, which can be located in the same directory as SYSCAL, or the same directory as the .TBL file.

*tfile*.TBL the path and name of the MTU parameter table file.

*bpath*\\*.CLB is the path for the MTU box calibration file. Only the path is specified, with "\*" in place of the actual file name. The actual .CLB file name must be the serial number of the MTU box as it is stored in the .TBL file. The default is the same path as the .TBL file.

*spath*\\*.CLC is the path for the MTU sensor calibration files. Only the path is specified, with "\*" in place of the actual file name. The actual .CLC file names must be the serial numbers of the sensors as they are stored in the .TBL file. The default is the same path as the .TBL file.

*cfile*.CTS is the path and name of the output calibration file. Default is the same name as the .TBL file.

The Phoenix "Windows Off Line Startup Table Editor" can be used to examine the .TBL file to determine the sensor serial numbers, dipole lengths, and other parameters, if necessary.

If an appropriate DEFAULT.PFC file is set up, the SYSCAL program can also be run under Windows by dragging and dropping a .TBL file icon on to the program icon.

After successful completion, the SYSCAL program will display the message "Complete - Code 0". Other completion code values indicate an abnormal termination.

### 3. FILE FORMATS

#### 3.1 Parameter (.PFC) file

Each line of the parameter file begins with a keyword (case-independent) and contains one or two additional fields separated by commas or spaces. A comment can be placed after the last field. The parameter line formats are as follows:

**FLDTYPE**    *fieldtype*    *comments*

*fieldtype* is 0 to calculate the box response (V),  
is 1 to calculate the system response (V/m and T).

**FREQUENCY**    *filenumber*    *frequency*    *comments*

*filenumber* is the MTU sample rate “level” number (e.g. 3, 4, or 5 for a standard MTU) or the file number ( the *n* in .TS<sub>*n*</sub> ).

*frequency* is frequency at which the calibration is to be calculated, Hz.

The parameter file must contain one **FREQUENCY** line for each frequency for which a calibration is to be calculated. There must be no other types of parameter lines after the first **FREQUENCY** line. The number of frequencies is unlimited and they can appear in any order.

#### 3.2 System calibration ASCII (.CTS) file

The output file contains a header line followed by one system response line for each **FREQUENCY** line in the parameter file. The fields of each line are separated by spaces and commas.

The header line fields are:

- Acquisition start date and time from the .TBL file.
- MTU serial number.
- *fieldtype* parameter = 0 for box calibration, = 1 for system calibration.
- Other fields may be appended in later versions.

The system response line fields are:

- Frequency, Hz.
- File number or sample rate level.
- Response, Channel 1, real part.
- Response, Channel 1, imaginary part.
- The above two fields are repeated for each channel.

The units of the response real and imaginary parts are:

- If *fieldtype* = 0 (indicating a box response),  $V^{-1}$ .
- If *fieldtype* = 1 (indicating a system response), for electric channels,  $(V/m)^{-1}$ .
- If *fieldtype* = 1 (indicating a system response), for magnetic channels,  $T^{-1}$ .

The system response is expressed as a complex number. The magnitude of the complex number is the inverse of the peak amplitude of the input signal that would give a digital time series with “full scale” peak amplitude in the time series file. “Full scale” is considered to be  $\pm 2^{23}$  for 24 bit time series. The phase of the complex number is the phase of the digital time series relative to the phase of the input signal. In calculating phase, the date and time in the header of each time series record is assumed to apply to the first sample of each channel in each time series record. The complex numbers which express the response obey the convention that a negative phase indicates a phase lag or delay in the logged time series relative to the input signal.

## **4. RELEASE NOTES**

### **Version D0**

- Versions before this were experimental.
- Supports standard MTU and MTU-LR, including .CLB files for three channel sensors.
- In LRs, allows a calibration performed at any decimation level to be used for any time series file.
- The standard technique for detecting an LR box is to check for the substring "LR" in the HW parameter of the .TBL file.
- Detects early MTU-5LRs, in which the HW parameter was "MTU52", by checking for the existence of the parameter SRPM in the .TBL file.
- Detects early MTU-5LRs (by checking for existence of SRPM parameter and VER = 5LR01 or 3100C0), and calculates calibrations as if TALS = 3. These boxes had TALS = 1, which was incorrect.
- Detects .CLB files made with non-LR software on LR boxes (by checking the .CLB file for VER = 3100 ... or 5LR01) and calculates gains correctly.

### **Version D2**

- Fix bug in determining path of .CLB and .CLC files.
- Allow wait at end of run to be terminated by any keystroke.

### **Version D3**

- Fix bug that caused error termination for 12 samples/minute sample rate.

### **Version 4**

- Link with current libraries to support MTU-A.

### **Version 5**

- Link with current libraries to support 3112F firmware for MTU-5A.