APPENDIX A. REMOTE CONTROL

Two serial interfaces are used in SVAN 946A instrument: classical, relatively slow RS 232 and new, relatively fast USB 1.1. These interfaces enable one to control remotely the unit.

The RS 232 interface complies with CCIT V.24 standard, except connector - LEMO compatible type ENG.0B.305. Practically all Personal Computers can be linked to the instrument by means of this interface. The maximum available transmission speed is equal to 115200 bits / sec.

Note: *For reliable operation of the RS 232, proper synchronisation of the transmission by* ***DSR*** *and* ***DTR*** *lines (according to their definitions) is required.*

The USB 1.1 interface is the serial one working with 12 MHz clock. Its speed is relatively high and it ensures the common usage of USB in all Personal Computers produced nowadays.

The functions which are developed in order to control data flow in the serial interfaces (RS 232 or USB 1.1) ensure:
- bi-directional data transmission,
- remote control of the instrument.

The user, in order to programme the serial interface (RS 232 or USB 1.1), has to:
1. send "the function code",
2. send an appropriate data file

or

3. receive a data file.

INPUT/OUTPUT TRANSMISSION TYPES

The following basic input / output transmission types (called functions) are available:

#1 input / output of the control setting codes,
#2 output of the measurement data in the vibration level meter (**VLM**) mode,
#3 output of the measurement data in **1/1 OCTAVE**, **1/3 OCTAVE** or **FFT** mode,
#4 read out the data file from the internal Flash-disc and/or the special file located in the RAM memory,
#6 remote setting of the user filters,
#7 special control functions.

FUNCTION #1 – INPUT / OUTPUT OF THE CONTROL SETTING CODES

Function **#1** enables the user to send the control setting codes to the instrument and read out a file of the current control state. A list of the control setting codes is given in Tab. A.1. The format of **#1** is defined as follows:

#1,Xccc,Xccc,(...),Xccc;

or

#1,Xccc,X?,Xccc,(...),X?,Xccc;

where:

X - the group code, **ccc** - the code value,
X? - the request to send the current X code setting.

The instrument will output a control settings file for all requests **X?** in the following format:

#1,X ccc,X ccc,(...),X ccc;

In order to read out all current control settings the user should send to the device the following characters:

#1;

The instrument will output a control settings file in the format:

#1,X ccc,X ccc,(...),X ccc;

Example: The following sequence of characters:

#1, U946A, N3503, W310, Q0.2, M1, R2, P1, I1:1, I12:2, I15:3, i0, E1:1, E0:2, E4:3, G1:1, G2:2, G4:3, g0, d50, D12s, K1, L0, r1, w0, a0, m5, s0, o8, t23, n105, p10, q30, Y3, Xa1, Xv1, Xd1, XA0, XR0, S0;

means that:

- the **SVAN 946A** is investigated (U946A),
- the unit's number is **3503** (N3503),
- the instrument has the software version number **3.10** (W310),
- the calibration factor is equal to **0.2 dB** (Q0.2),
- the Vibration **Level Meter** function is selected (M1),
- the range is **316 ms^{-2}** (170 dB for standard reference level) (R2),
- the currently displayed profile is **1** (P1),
- the **HP1** filter is selected in profile 1 (I1:1),
- the **W–Bz** filter is selected in profile 2 (I12:2),
- the **KB** filter is selected in profile 3 (I15:3),
- the **HP** filter is selected for 1/1 OCTAVE, 1/3 OCTAVE or the FFT analysis (i0),
- the **125 ms** detector is selected in profile 1 (E1:1),
- the **100 ms** detector is selected in profile 2 (E0:2),
- the **1 s** detector is selected in profile 3 (E4:3),
- the **PEAK** values are stored in the files of the buffer from profile 1 (G1:1),
- the **P–P** values are stored in the files of the buffer from profile 2 (G2:2),
- the **RMS** values are stored in the files of the buffer from profile 3 (G4:3),
- results of 1/1 OCTAVE, 1/3 OCTAVE or the FFT analysis are not stored in the files of the buffer (g0),
- the buffer time step is set to **50 ms** (d50),
- the integration time is set to **12 s** (D12s),
- the number of repetitions is set to **1** (K1),
- the **LINEAR** detector is selected to the **RMS** calculations (L0),
- **20 kHz** band is selected for the FFT analysis (r1),
- **HANNING** window is selected for the FFT analysis (w0),
- **LINEAR** averaging is selected for the FFT analysis (a0),
- the trigger mode is set to **BUFFER** (m5),
- the trigger source for the Level Meter and the FFT Analyser is set to **RMS(1)** (s0),
- the trigger source for 1/1 OCTAVE is set to **125 Hz** (o8),
- the trigger source for 1/3 OCTAVE is set to **125 Hz** (t23),
- the trigger level is set to **105 dB** (n105),
- the number of the records taken into account before the fulfilment of the triggering condition is equal to **10** (p10),
- the number of the records taken into account after the fulfilment of the triggering condition is equal to **30** (q30),
- the measurement start delay is equal to **3** seconds (Y3),
- the reference level for acceleration measurement is set to **1 µms^{-2}** (Xa1),
- the reference level for velocity measurement is set to **1 nms^{-1}** (Xv1),
- the reference level for displacement measurement is set to **1 pm** (Xd1),
- the AutoSave option is switched off (XA0),
- the RAMfile will not be created (XR0),
- the instrument is in the **STOP** state (S0).

Note: *All bytes of that transmission are ASCII characters.*

Note: Any setting can be changed only when the instrument is in the STOP state (S0).

FUNCTION #2 – READ-OUT OF THE MEASUREMENT RESULTS IN THE VIBRATION LEVEL METER MODE

Function **#2** enables one to read out the current measurement data in the **VLM** Mode.

Notice: *This function can also be programmed while the measurements are taking place. In this case, the RMS values measured* ***after entering #2 function*** *will be sent out.*

#2 function has a format defined as follows:

#2,p,X?,X?,X?,(...),X?;

where:

X - the code of the result,
p - the number of the profile (1, 2 or 3).

Notice: *After entering the STOP condition, #2 function is no longer active and has to be reprogrammed in order to read-out successive measurements.*

The instrument will send the values of results in the format defined as follows:

#2,p,Xccc,Xccc,Xccc,(...),Xccc; (where **p** - the number of the profile)

or

#2,?; (when the results are not available).

The codes of the results are defined as follows:

T time of the measurement (ccc – value in seconds);
V the overload flag (ccc equals to 0 or 1);
P the **PEAK** value (ccc – the value in dB);
Q the **P–P** value (ccc – the value in dB);
M the **MTVV** value (ccc – the value in dB);
R the **RMS** value (ccc – the value in dB);
H the **VDV** value (ccc – the value in dB).

Example: Sending the string:

#2,1,T?,V?,P?,R?;

may result in the following answer of the instrument:

#2,1,T3,V0,P36.9,R24.5;

Notice: *All bytes of that transmission are ASCII characters.*

FUNCTION #3 – READ-OUT OF THE MEASUREMENT RESULTS IN 1/1 OCTAVE, 1/3 OCTAVE AND FFT MODE

Function **#3** enables one to read out the current measurement data in 1/1 OCTAVE, 1/3 OCTAVE and the FFT mode.

#3 function format is defined as follows: **#3;**

The device will respond, sending the last measured spectrum (when in STOP state) or currently measured spectrum (in RUN state) in the following format:

#3;<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <data byte> (...) <data byte>

Status Byte gives the information about the current state of the instrument.

D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0

where:

D7 = 1 denotes "overload indicator",
D6 = 1 denotes "averaged spectrum",
D5 = 0 the instantaneous current result (RUN State),
= 1 the final result (STOP State),
D0 to D4 reserved bits.

Note: *The measurement result is coded in binary form as dB•10 (e.g. 34.5 dB is sent as binary number 345).*

FUNCTION #4 – READ-OUT OF THE DATA FILE FROM THE INTERNAL FLASH-DISC AND/OR THE SPECIAL FILE LOCATED IN THE RAM MEMORY

Function **#4** enables the user to read-out the data file from the internal Flash-disc memory. The data file formats are given in Appendix B.

#4 function formats are defined as follows:

#4,0,\;	**the file containing the catalogue**
#4,1,FILE NAME;	**the file containing the measurement results**
#4,2,Bnnn;	**the file containing buffer**
#4,3;	the special file contained in the RAM memory (RAMfile),

where:

FILE NAME	not longer than eight-character name,
nnn	the number of the file from the buffer (one or more digits - depends on the requirements).
RAMfile	the special name for the file contained in the RAM memory, may be used also with the format: **#4,1,**....

Notice: *The "\" character is treated as the file name of the catalogue and must be sent to the instrument.*

The device will respond sending the specified file/catalogue in the following format:

#4,k;<4 bytes giving the file size (in binary form)><data byte>...<data byte>

where character k corresponds to the file type:

0 for the file containing the catalogue,
1 for the file containing the measurement results,
2 for the file containing the file from the buffer.

All data words are sent as **<LSB>**,**<MSB>**.

When an error is detected in the file specification or data, the instrument will send: **#4,?;**

The catalogue of the files is a set of the records containing 16 words (16 bits each). Each record describes one file saved in the instrument's Flash-disc. The record structure is as follows:

words 0 - 3 8 character file name,
word 4 file type (binary number),
word 5 reserved,
word 6 least significant word of the file size,
word 7 most significant word of the file size,
words 8 - 15 reserved.

The structure of the files containing the measurement results and/or files containing the files from the buffer is described in details in Appendix B.

FUNCTION #6 – REMOTE SETTING OF THE USER FILTERS

Function **#6** enables one to send to the instrument the coefficients of the user filters. In the available formats description of **#6** functions the following symbols are used:

type - 0 for the vibration filters,
name, **name$_1$**, **name$_2$** - filter names given by the user,
v - real type value, expressed in [dB],
first - integer type value (number of the coefficient in the user filter),
pos - integer type value (Total value number),
avd - for the vibration filters: 0 - Acc, 1- Vel, 2 - Dil,
cal - the calibration coefficient given as the real number expressed in [dB].

#6 function formats are defined as follows:

#6,type,L;

This function returns the list of the defined (existing in the instrument) filters in the following format:
#6,type,n,name$_1$, ... ,name$_n$;

#6,type,W,name,v,v,...,v;

This function sets the coefficients of the new user filter named as **name**. The **name** parameter should be unique (in the instrument there is not any other filter with the same name, otherwise it will be an error). The function answers in the format: **#6;**

#6,type,R,name;

This function returns the coefficients of the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function returns in the following format: **#6,type,n,v_1,v_2, ... ,v_n;**

#6,type,D,name;

This function deletes from the instrument the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,S,name,v,v,...,v;

This function sets the user filter named as **name**. If the **name** filter already exists, its coefficients are redefined. If the **name** filter does not exist, the filter is created. The function answers in the format: **#6;**

#6,type,C,name,first,v,v,...,v;

This function sets the coefficients in the user filter named as name starting from the first position. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,N, $name_1$, $name_2$;

This function change the name of the user filter from **$name_1$** to **$name_2$**. The function answers in the format: **#6;**

#6,type,@,L;

This function returns the names of the user filters, assigned to the consecutive **TOTAL** values, in the following format: **#6,type,3,$name_1$,$name_2$,$name_3$;**

#6,type,@,pos,?;

This function returns the description record of the user filter assigned to the **pos TOTAL** value in the following format: **#6,type,@,pos,name,avd,cal;** (the description record contains: the name of the filter, its type and the calibration coefficient).

#6,type,@,pos,*;

This function recovers the predefined filter for the **pos TOTAL** value and returns the following format: **#6,type,@,pos,name,avd,cal;**

#6,type,@,pos,name,avd,cal;

This function sets the description record of the user filter assigned to the **pos TOTAL** value in the following format: **#6,type,@,pos,name,avd,cal;**

The returned parameters: **name**, **avd** and **cal** are set in the description record after the execution of the function. In the case of an error they can differ from the current parameters of the function.

Notice: *In the case of an error all these functions return the following sequence of the characters:* ***#6?;***

FUNCTION #7 – SPECIAL CONTROL FUNCTIONS

Function **#7** enables the user to perform special control functions. **Some of them should be used with the extreme care.**

#7 function formats are defined as follows:

#7,CB;

This function clears the buffer memory - all buffer files will be deleted.

The function returns **#7,CB;**
This function is not accepted while the instrument is in the RUN state.

#7,BF;

This function returns buffer memory free space in the format: **#7,BF,ddddd;** (**ddddd** - number of bytes in decimal format).

#7,BN;

This function returns the number of buffer files created to the current time in the format: **#7,BN,ddddd;** (**ddddd** - number of buffer files in decimal format).

#7,RT;

This function returns current real time clock settings in the format: **#7,RT,hh,mm,ss,DD,MM,YYYY;** where **hh:mm:ss** denotes the time and **DD/MM/YYYY** gives the date.

#7,RT,hh,mm,ss,DD,MM,YYYY;

This function sets the current real time clock and returns the following sequence of characters: **#7,RT;**

#7,AS;

This function returns current real time and date settings for the AutoStart function in the format: **#7,AS,e,hh,mm,ss,DD;** where e=1 if AutoStart function is switched ON or 0 if it is switched OFF, **hh:mm:ss** gives the time and **DD** gives the day for the current date.

#7,AS,e,hh,mm,DD;

This function uses the given time and date settings for AutoStart function and returns the following sequence of characters: **#7,AS;**

For the unknown function and/or in the case of the other error, all these functions return the following sequence of characters: **#7,?;**

CONTROL SETTING CODES

The control setting codes used in the SVAN 946A instrument (starting from the internal software version 4.03) are given in the table below.

Table A.1. Control setting codes

Group name	Group code	Code description
Unit type	**U**	U946A (read only)
Serial number	**N**	Nxxxx (read only)
Software version number * 100	**W**	Wxxx xxx – version number * 100 (read only)
Calibration factor	**Q**	Qnnnn nnnn-real number with the value of the calibration factor in dB ∈ (-99.9 – 99.9)
Measurement function	**M**	M1 - **Vibration Level Meter** M2 - **1/1 OCTAVE analyser** M3 - **1/3 OCTAVE analyser** M6 - **FFT analyser**
Range	**R**	R1 - **17.8 ms^{-2}** (145 dB) R2 - **316 ms^{-2}** (170 dB)
Results displayed on the screen	**P**	P1 - **PROFILE 1** (read only) P2 - **PROFILE 2** (read only) P3 - **PROFILE 3** (read only)
Filter type in profile n	**I**	I1:n **HP1** filter for profile n I2:n **HP3** filter for profile n I3:n **HP10** filter for profile n I4:n **Vel1** filter for profile n I5:n **Vel3** filter for profile n I6:n **Vel10** filter for profile n I7:n **VelMF** filter for profile n I8:n **Dil1** filter for profile n I9:n **Dil3** filter for profile n I10:n **Dil10** filter for profile n I11:n **W–Bxy** filter for profile n I12:n **W–Bz** filter for profile n I13:n **H–A** filter for profile n I14:n **W–Bc** filter for profile n I15:n **KB** filter for profile n I16:n **Wk** filter for profile n I17:n **Wd** filter for profile n I18:n **Wc** filter for profile n I19:n **Wj** filter for profile n
Filter type in 1/1 OCTAVE, 1/3 OCTAVE or the FFT analysis	**i**	i0 - **HP** filter (read only)
Detector type in profile n	**E**	E0:n - **100 ms** detector in profile n E1:n - **125 ms** detector in profile n E2:n - **200 ms** detector in profile n E3:n - **500 ms** detector in profile n E4:n - **1 s** detector in profile n E5:n - **2 s** detector in profile n E6:n - **5 s** detector in profile n E7:n - **10 s** detector in profile n

Buffer type in profile n	**G**	G0:n - **None** buffer in profile n G1:n - buffer with **PEAK** values in profile n G2:n - buffer with **P–P** values in profile n G3:n - buffer with **MAX** values in profile n G4:n - buffer with **RMS** values in profile n
Storing the results of FFT, 1/ OCTAVE, 1/3 OCTAVE analysis in buffer's file	**g**	g0 - switched off (**none**) g4 - switched on (**RMS**)
Buffer time step	**d**	dnnnn - nnnn number in milliseconds ∈ (**2**, **5**, **10**, **20**, **50**, **100**, **200**, **500**, **1000**) dnns - nn number in seconds ∈ (1 ÷ 60) dnnm - nn number in minutes ∈ (1 ÷ 60)
Integration time	**D**	Dnns nn number in seconds Dnnm nn number in minutes Dnnh nn number in hours
Repetition cycle	**K**	K0 - infinity (measurement stopped when the STOP button is pressed or when remote setting S0 is received) Knnnn -nnnn number of repetitions ∈ (1 ÷ 1000)
Detector type in the **RMS** function	**L**	L0 - **LINEAR** L1 - **EXPONENTIAL**
Band of the FFT analysis	**r**	r1 - **20 kHz** band of the FFT analysis r2 - **10 kHz** band of the FFT analysis r3 - **5 kHz** band of the FFT analysis r4 - **2.5 kHz** band of the FFT analysis r5 - **1.25 kHz** band of the FFT analysis r6 - **625 Hz** band of the FFT analysis r7 - **312 Hz** band of the FFT analysis r8 - **156 Hz** band of the FFT analysis r9 - **78 Hz** band of the FFT analysis
Window in the FFT analysis	**w**	w0 - **HANNING** (read only)
Averaging in the FFT analysis	**a**	a0 - **LINEAR** (read only)
Trigger Mode (TriggerMode)	**m**	m0 - **OFF** m1 - **SLOPE +** m2 - **SLOPE –** m3 - **LEVEL +** m4 - **LEVEL –** m5 - **BUFFER**
Source of the triggering signal for measurement functions: M1 and M6 (TriggerSource)	**s**	s0 - **RMS(1)** – (only one result is available as a source of the triggering signal - the **RMS** value measured in the first profile)
Source of the triggering signal for measurement function M2 with the TriggerMode=BUFFER selection (TriggerOctSource)	**o**	onn - nn number of the filter in 1/1 OCTAVE spectra ∈ (8 ÷ NOct), respectively: 8 - 125 Hz, 9 - 250 Hz, ..., 15 - 16 kHz; NOct = 15 - number of filters in **1/1 OCTAVE** analysis
Source of the triggering signal for measurement function M3 with the TriggerMode=BUFFER selection (TriggerTerSource)	**t**	tnn - nn filter's number in 1/3 OCTAVE spectra ∈ (23 ÷ NTer), respectively: 23 - 125 Hz, 24 - 160 Hz, , 45 - 20 kHz; NTer = 45 - number of filters in **1/3 OCTAVE** analysis
Trigger level (TriggerLev)	**n**	nxxx - xxx level given in dB ∈ (60 ÷ 200)

Number of the records from the buffer taken into account before the fulfilment of the triggering condition (TriggerPre)	**p**	pnn - nn number of the records taken into account before the fulfilment of the triggering condition ∈ (0 ÷ 50)
Number of the records from the buffer taken into account after the fulfilment of the triggering condition (TriggerPost)	**q**	qnn - number of the records taken into account after the fulfilment of the triggering condition ∈ (0 ÷ 200)
Delay in the start of measurement	**Y**	Ynn nn delay given in seconds ∈ (1 ÷ 60)
Reference level for acceleration (RefLev_a)	**Xa**	Xannn nnn the reference level for acceleration given in μms^{-2} ∈ (1 ÷ 100)
Reference level for velocity (RefLev_v)	**Xv**	Xvnnn nnn the reference level for velocity given in nms^{-1} ∈ (1 ÷ 100)
Reference level for displacement (RefLev_d)	**Xd**	Xdnnn nnn the reference level for displacement given in pm ∈ (1 ÷ 100)
AutoSave option	**XA**	XA0 - switched OFF XA1 - switched ON (can **not** be set with the remote control function #1)
Using the RAM_file instead of the flash disk while storing results with the AutoSave option switched on	**XR**	XR0 - switched OFF XR1 - switched ON
State of the instrument (Stop or Start)	**S**	S0 - **STOP** S1 - **START**