GidasToSynop

User Manual

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Index

1. Introduction

GidasToSynop program allows to configure and set up SYNOP bulletins using the data measured by E-Log data loggers and stored into database SQL Server 2005 (©Microsoft) *Gidas*. The bulletins generated by the program (both from single station and combined) are saved into text file.

2. System requirements

The program needs following hardware and software:

Personal computer

- Processor operating by 600 MHz or more, 1 GHz recommended;
- Graphics card: SVGA res. 1024x768 or more;
- Operating system: Microsoft Windows 2000/XP/Vista/2003 Server;
- Microsoft .NET Framework V.2.0 (supplied with the program);
- Instance of SQL Server 2005(*).

(*) *Gidas* database can be installed both in local and in network (on server). It's installed by *GidasViewer* program and fed by *CommNetEG* and *3DOM* programs. If necessary *GidasViewer* program installs free release of engine of *SQL Server 2005 Express* database.

For information and details about the installation and use of these programs make reference to their manuals.

3. SYNOP bulletin implementation

Implementation of SYNOP bulletins according to following details:

Manual on Codes - International Codes
VOLUME I.1 (Annex II to WMO Technical Regulations) 1995 edition WMO–No. 306
Secretariat of the World Meteorological Organization – Geneva – Switzerland 1995
Part A — Alphanumeric Codes

According to above details the implementation includes some hypothesis and assumptions to adjust oneself to data measured by LSI LASTEM data loggers.

The implementation of SYNOP details is made according to following subdivision: groups of data that are manually defined by operator and groups of data which values are automatically loaded by *Gidas* database where the data of LSI LASTEM data loggers have been downloaded.

The program allows to prepare both manual bulletins (through operator) and automatic bulletins (without operator).

3.1. Detail of implemented data groups

Following table describes the implementation's detail about each section of the bulletin; the column "*Source*" shows the source (origin) of the datum:

- *M*: manual, inputted by operator;
- *A*: automatically inputted by program;
- *C*: automatically calculated by program;
- *D:* loaded from database.

Section 1

IIiii $i_R i_X$hVV Nddff $1s_nTTT$ $2s_nT_dT_dT_d$ $3P_0P_0P_0P_0$ 4PPPP(4$a_3$hhh) 5appp 6RRRt_R 7wwW_1W_2 8$N_hC_LC_MC_H$

Group	Description	Source	Notes
IIiii	International Index Number	M	
$i_R i_X$hVV	i_R=Precipitation Inclusion-Exclusion i_X=Type operation h=Cloud Height VV=VisibilityGroup	A A M M	Parameter i_R is automatically assigned according to table (Code Table 1819). Parameter i_X has value 6 if bulletin is generated in automatic mode.
Nddff	N=Total Cloud Cover ddff=Wind Group	M D	Unit of measurement of Wind intensity in m/s
$1s_nTTT$	Air Temperature Group	D	
$2s_nT_dT_dT_d$	Dew Point Temperature Group or Relative Humidity	C D	If bulletin includes Dew Point Temperature the calculation is according to EN ISO7626.
$3P_0P_0P_0P_0$	Station Pressure Group	D	
4PPPP	Sea Level Pressure Group	C	If value of Sea Level Pressure is calculated using the formula written in WMO Instruments and Observing Methods Report No.19 par. 6.5 Sea level Pressure. If group has form 4$a_3$hhh the geo-potential height of selected isobaric surface is calculated using the

Group	Description	Source	Notes
			inverse formula.
5appp	3-Hour Pressure Tendency	D	Parameter a has value 2 in case of positive variation and value 7 in case of negative variation
$6RRRt_R$	Amount of Precipitation Group	D	Time t_R is evaluated during configuration of the station: the program allows to define two values that can be used for different issue times
$7wwW_1W_2$	Present and Past Weather Group	M	
$8N_hC_LC_MC_H$	Cloud Type Group	M	

Section 2

Section 2 isn't supported.

Section 3

$0C_SD_LD_MD_H$ $1s_nT_XT_XT_X$ $2s_nT_nT_nT_n$ 3Ejjj 4E'sss $5j_1j_2j_3j_4$ $6RRRt_R$ $7R_{24}R_{24}R_{24}R_{24}$ $8N_sCh_sh_s$ $9S_pS_ps_ps_p$

Group	Description	Source	Notes
$0C_SD_LD_MD_H$	State of the Sky in the Tropics Group	M	
$1s_nT_XT_XT_X$	Maximum Temperature Group	D	This group is evaluated during past 24 hours
$2s_nT_nT_nT_n$	Minimum Temperature Group	D	This group is evaluated during past 24 hours
3Ejjj	State of the Ground without Snow	M	
4E'sss	State of the Ground with Snow	M	
$5j_1j_2j_3j_4$	Regional supplementary Group	-	View the following table
$6RRRt_R$	Amount of Precipitation Group	D	Time t_R is evaluated during configuration of the station: the program allows to define two values that can be used for different issue times
$7R_{24}R_{24}R_{24}R_{24}$	24-Hour Precipitation Group	D	
$8N_sCh_sh_s$	Individual Cloud Layer Group	M	
$9S_pS_ps_ps_p$	Special Phenomena Group	M	

Regional Supplementary Group

$5EEEi_E$ $54g_0s_nd_T$ $55SSS(j_5F_{24}F_{24}F_{24}F_{24})$ $56D_LD_MD_H$ $58P_{24}P_{24}P_{24}$ or $59P_{24}P_{24}P_{24}$

Group	Description	Source	Notes
$5EEEi_E$	Amount of Evaporation	D	Parameter i_E has value 4
$54g_0s_nd_T$	Temperature Change Group	M	
55SSS	Duration of Sunshine	D	This group is always evaluated during past 24 hours
$j_5F_{24}F_{24}F_{24}F_{24}$	Radiation During Preceding 24 hours	D	If there is group 55SSS it's possible input groups 2FFFF and 3FFFF too (global and diffused solar radiation during preceding 24 hours)
$56D_LD_MD_H$	Cloud Direction Movement Group	M	
$58P_{24}P_{24}P_{24}$ $59P_{24}P_{24}P_{24}$	24-Hour Pressure Change Group	D	

3.2. Management of data loaded by database automatically

The data loaded by database automatically make reference to following quantities:

- Wind intensity and direction, and standard deviation (optional)
- Temperature
- Pressure
- Relative humidity
- Rainfall
- Evaporation
- Insolation
- Radiation

All groups marked with *D* in previous tables make reference to these quantities. They are groups used for carrying out of manual bulletins (without operator intervention). For this reason during configuration of one station the user must specify: the references needed to identify the datum inside *Gidas* database, and also the times in which the groups, connected to these quantities, must be included in the bulletin (ref. §6.3.1).

As the time of bulletin generation isn't usually the same time of real output, during configuration it's possible specify one time parameter (minutes) that specify the slot in which consider the data of automatic station (*Tr*). For example, if we evaluate the slot of 20 minutes, when it generates the bulletin referred to 12 o'clock the program considers the data of station included into the slot 11.40 – 12.00.

WARNING:
The program considers that data included into database are quantified in hour UTC.

3.2.1. Groups that use last available datum

Following groups use the latest datum included into slot *[bulletin time] ; [bulletin time] - [datum search time (Tr)*]:

- `Section 1 - Nddff`
- `Section 1 - 1snTTT`
- `Section 1 - 2snTdTdTd`
- `Section 1 - 3P0P0P0P0`

3.2.2. Groups that use total amount data

Following groups use the addition of data, included into slot required by bulletin, like specified in the above mentioned tables:

- `Section 1 - 6RRRtR`
- `Section 3 - 7R24R24R24R24`
- `Section 3 - 5EEEiE`
- `Section 3 - 55SSS`

3.2.3. Groups that use average data

Following groups use the average of data included into slot required by bulletin like specified in the above mentioned tables:

- `Section 3 - j5F24F24F24F24`

3.2.3.1. Evaluation of radiation data

The radiation data are reported inside bulletins using J/cm^2 unit and are referred to last 24 hours. As the instruments measures the data using W/m^2 unit, the average datum is correct through conversion coefficient 0.0001 and then multiplied by 86400 seconds.

3.2.4. Groups that use data variations

Following groups evaluate the difference among data included inside one slot: the data are considered like valid if included inside search time of datum *Tr*.

- `Section 3 (3 hours) - 5appp`
- `Section 3 (24 hours) - 58P24P24P24`
- `Section 3 (24 hours) - 59P24P24P24`

3.3. Calculated Groups

Groups 2snTdTdTd (*Dew Point Temperature*), 4PPPP (*Sea Level Pressure*) and 4a3hhh (*Geopotential Height*) are calculated by program directly.

3.3.1. Formula for calculation of pressure at sea level and of geo-potential height

The calculation of pressure at sea level is made according to section 6.5.1 of following WMO publication:
(http://www.wmo.int/pages/prog/www/IMOP/publications/IOM-19-Synoptic-AWS.pdf)

INSTRUMENTS AND OBSERVING METHODS
REPORT No. 19
SOME GENERAL CONSIDERATIONS AND SPECIFIC EXAMPLES
IN THE DESIGN OF ALGORITHMS
FOR SYNOPTIC AUTOMATIC WEATHER STATIONS

The formula needs the data about temperature, pressure and relative humidity and the station's height too. If required the calculation of geo-potential height is obtained using the inverse formula.

3.3.2. Formula for calculation of dew temperature

The calculation of dew temperature is made using formula included into rule *EN ISO 7726 Ergonomics of the thermal environment Instruments for measuring physical quantities*.

4. Notes about E-Log configuration

In order to use SYNOP, take into consideration following instructions during configuration of E-Log data loggers:

- elaboration rate: 10 minutes;
- synchronize the clocks of instruments on UTC hour;
- keep the default units of measurement;
- as radiometer doesn't measure the diffused radiation, set up one channel so that the instrument can supply this datum directly.

The default units of measurement are the following:

- wind direction and standard deviation: degrees;
- wind intensity: m/s;
- temperature: °C;
- evaporation: mm;
- radiation: W/m^2;
- pressure: hPa;
- rainfall: mm;
- insolation: minutes.

The calculation of *Sea Level Pressure* (or of *Geopotential Height*) needs the channels of temperature, pressure and relative humidity; the calculation of *Dew Point Temperature* needs the data of relative humidity and temperature.

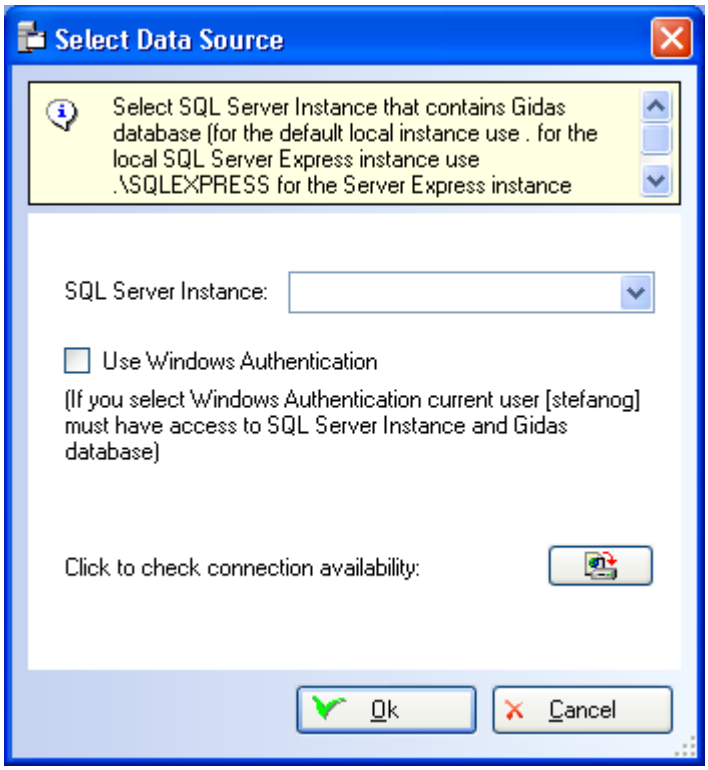
The program allows the input of one multiplicative factor in order to modify the units of measurement used by measured data as regards the units of measurement used in different bulletin's groups. In the following list you can find the pre-set factors that are different from one and that correspond to the above mentioned units of measurement; in brackets there is the unit of measurement used in the bulletin:

- air direction (tens of degree): 0,1;
- temperature (tenths of °C): 10;
- pressure (tenths of hPa): 10;
- evaporation (tenths of mm): 10;
- radiation (J/cm^2): 0,0001.

WARNING:
Do not modify the units of measurement of insolation and wind intensity.

5. Connection to Gidas database

When you start program first time, you need to specify *Gidas* database from which load data to generate SYNOP bulletin. In order to connect to *Gidas* database (or modify current instance) select menu *File* → *Change Data Source.* This menu opens the window for selection of data source:



Specify the instance of SQL Server 2005 it has to connect to and check connection through key  (for further information about identification of SQL Server instances make reference to §Errore: sorgente del riferimento non trovata).

WARNING
If you use Windows authentication, actual user needs the privileges required for connection to instance of SQL Server 2005 and use Gidas database.

The list of *SQL Server instances* shows the instances of SQL Server 2005 which have been identified in local computer; depending on the setup of net administration the instances of SQL Server 2005 inside the network can be displayed. It's possible select one value from the list or set up a new one.

The name of an SQLServer 2005 instance has following format:

[servername]\[instance name]

[servername] is the network name of the computer where SQL Server has been installed (in case of local instances it's possible use whether name of the computer or word *(local)* or only the point).

SQLEXPRESS is the name of default instance of SQL Server 2005 Express database; but the name of default instance of other SQL database versions isn't usually established. LSIDB is the name of SQL Server 2005 Express instance installed by the guided procedure. For example:

- If you want install *Gidas* database in your computer after you have already installed SQL Server 2005 Express through guided procedure, input:

  .\LSIDB or *[computername]\LSIDB*

- If you want install *Gidas* database in your computer after SQL Server 2005 Express has already been installed through default options, input:

  .\SQLEXPRESS or *[computername]\SQLEXPRESS*

- If you want install *Gidas* database in your computer after SQL Server 2005 had already been installed (not Express version), input for default instance:

  . or *[computername]*

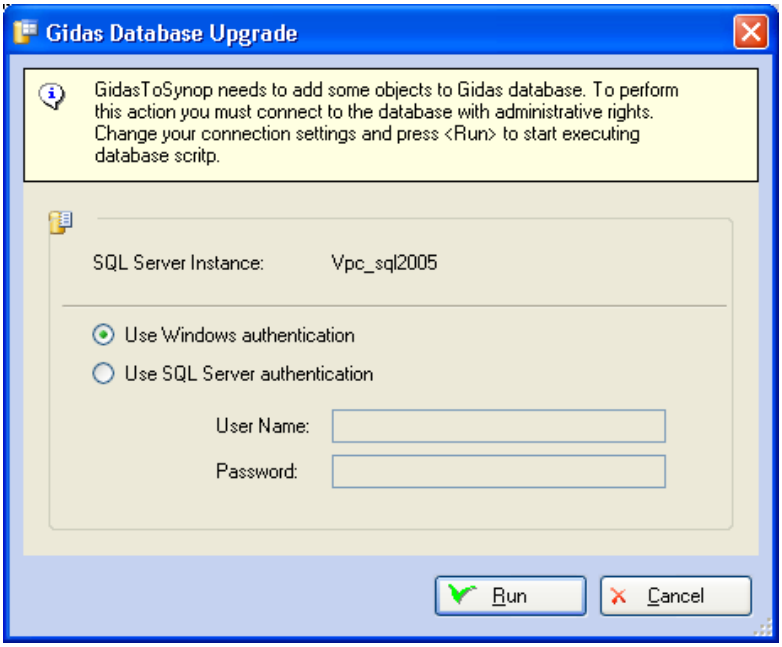
- If you want install *Gidas* database in network server, input:

  [computername]\[istancename]

WARNING
If you use Windows authentication, actual user needs the privileges required for connection to instance of SQL Server 2005 and use Gidas database.

5.1. Database Updating

GidasToSynop program uses *Gidas* database 2.01.00 release or higher and needs the input of some tables and Stored Procedures. The program makes this operation automatically when it connects to one data source which doesn't have them. In order to update *Gidas* database you have to enter into instance of SQL Server 2005 using administrator's privileges; if connection doesn't have these privileges, it'll ask to arrange login using administrator's privileges (ask the help of database administrator to use the network database):



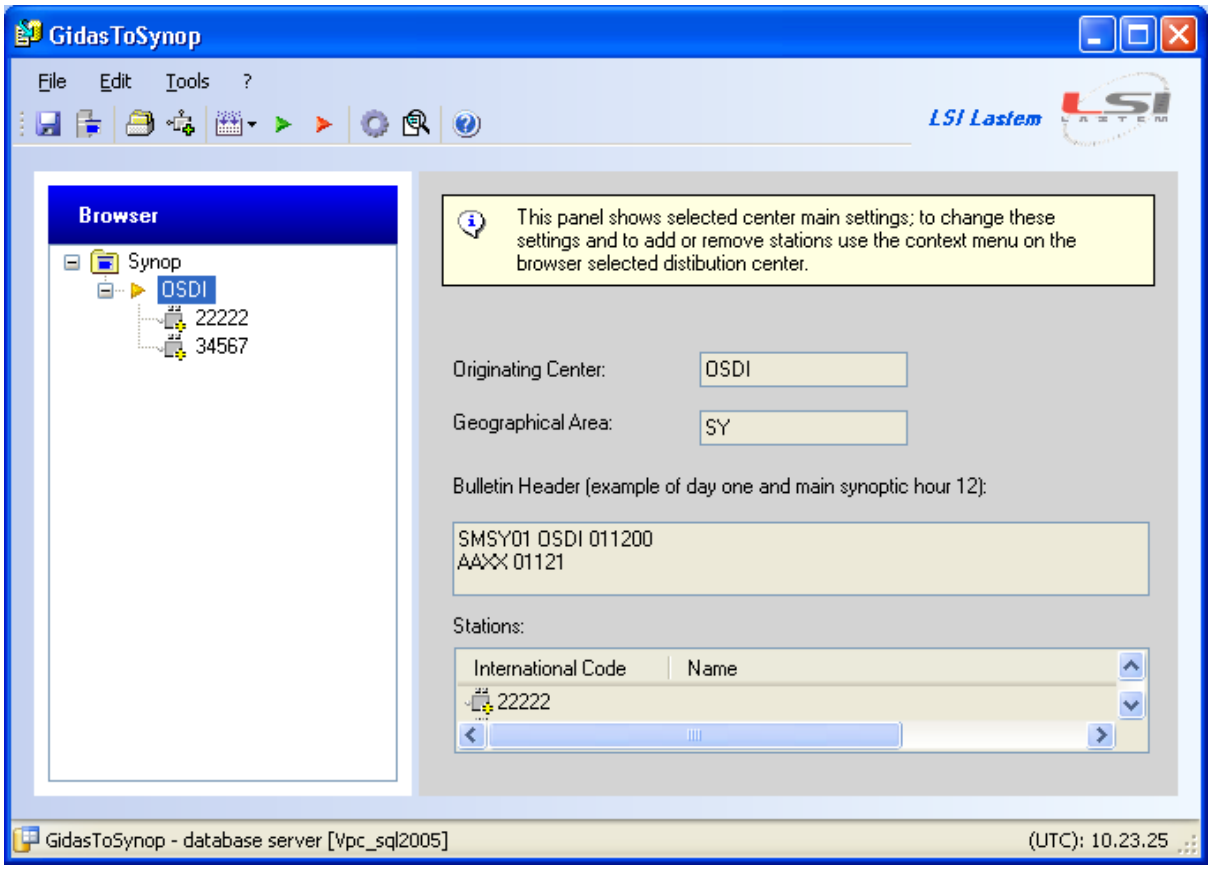
Alternatively it's possible arrange the manual update of database using script `SynopCreate.sql` situated in:

`C:\Documents and Settings\All Users\Dati applicazioni\LSI-Lastem\GidasToSynop\Library`

6. Using the program

GidasToSynop program allows the configuration of weather stations grouping them in distribution centres, in order to send SYNOP bulletins.

The bulletins can be generated in automatic mode (using only data on Gidas database) or in manual mode (adding other data supplied by operator).



The left side of program's main window shows the distribution centres configured with the included stations that are identified by them international code consisting of 5 numbers. The right side shows the main characteristics of selected item.

The different functions of the program can be selected from main menu, from keys bar and from contextual menu on Browser nodes.

The status bar shows the current data source, the possible need to setup the data (if modified), and current UTC time.

6.1. Menu

The program has following menus:

File

- *Change Data Source*: it displays the window to modify the instance of *Gidas* database used by program. The program can use local database and remote database too;
- *Save*: it saves the configuration's changes inside;
- *Exit*: it closes the program.

Edit

- *Add Center*: it adds one distribution centre (ref. §6.2);
- *Add Station*: it adds one new station to one distribution centre (ref. §6.3);
- *Remove Station*: it removes the selected station;
- *Edit Station*: it modifies the selected station (ref. §6.3).

Tools

- *Create Bulletin -> Create Station Bulletin:* it sets up the bulletin for selected station;
- *Create Bulletin -> Create Center Bulletin:* it sets up the bulletin for selected distribution centre;
- *Run Automatic Bulletin:* it starts the mode for automatic setup of bulletins;
- *Stop Automatic Bulletin:* it stops the mode for automatic setup of bulletins;
- *Test Calculation and Synop Coding:* it opens the window for test of: calculations of calculated quantities and coding of Synop supported data belonging to different bulletin's groups;
- *Options:* it imports the configuration's general options.

?

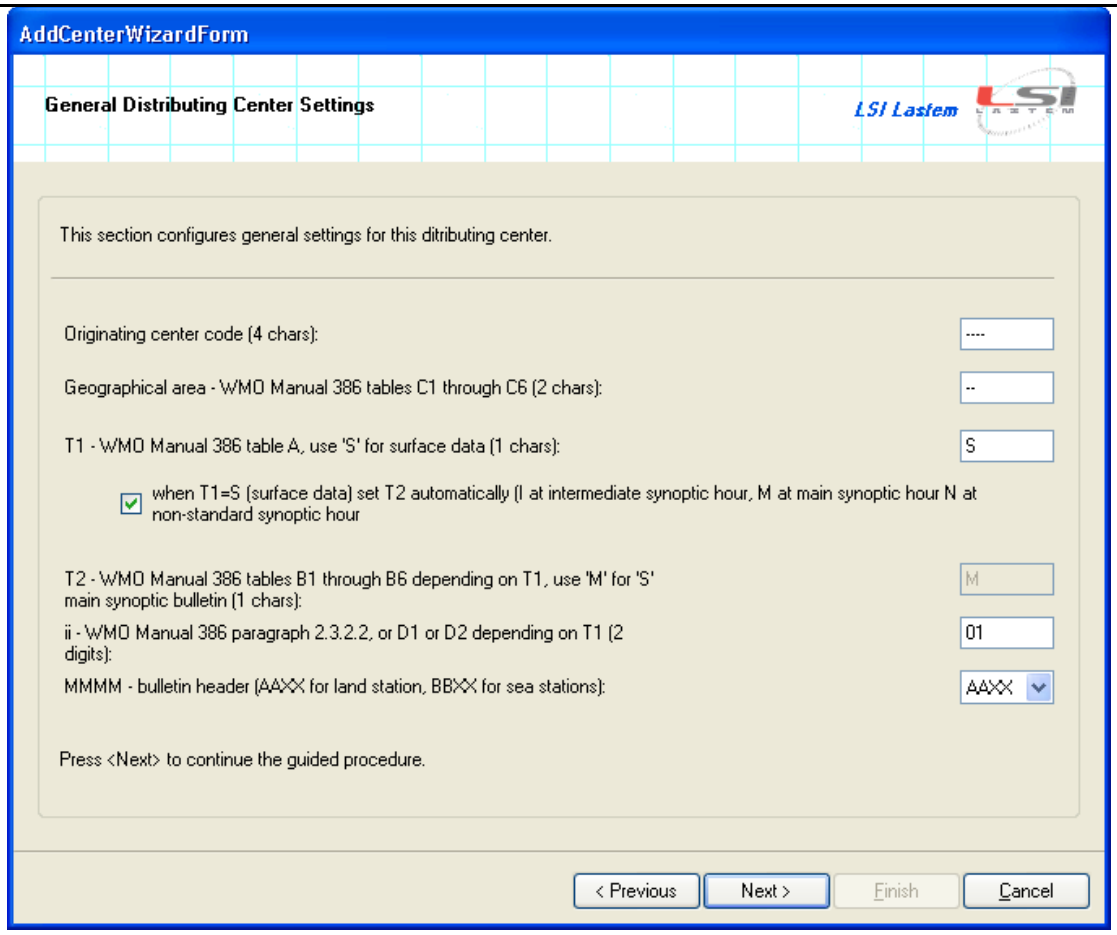
- *Contents:* it shows program's user manual;
- *Check for Updates:* it starts the request of program's updates;
- *About:* it shows the window about program's information.

You can find some of these menus like keys bar, under menu of main window.

6.2. Add and change one distribution centre

Distribution centre is the container of single configured stations. To add one new distribution centre select menu *Edit* → *Add Center* or select node *Synop* of *Browser* and contextual menu *Add New Center*. To modify an existing distribution centre select the distribution centre that you want modify and contextual menu *Edit*.

These functions start the guided procedure for input of one new distribution centre:



In the above figure you can see the data required for configuration of distribution centre; they make reference to data included into bulletin's header:

```
T1T2A1A2ii CCCC YYGGgg (BBB)
MiMIMjMj
```

Please consider that:

- If T1='S', the value of T2 can be set up by program automatically ticking the respective box;
- BBB indicator isn't supported.

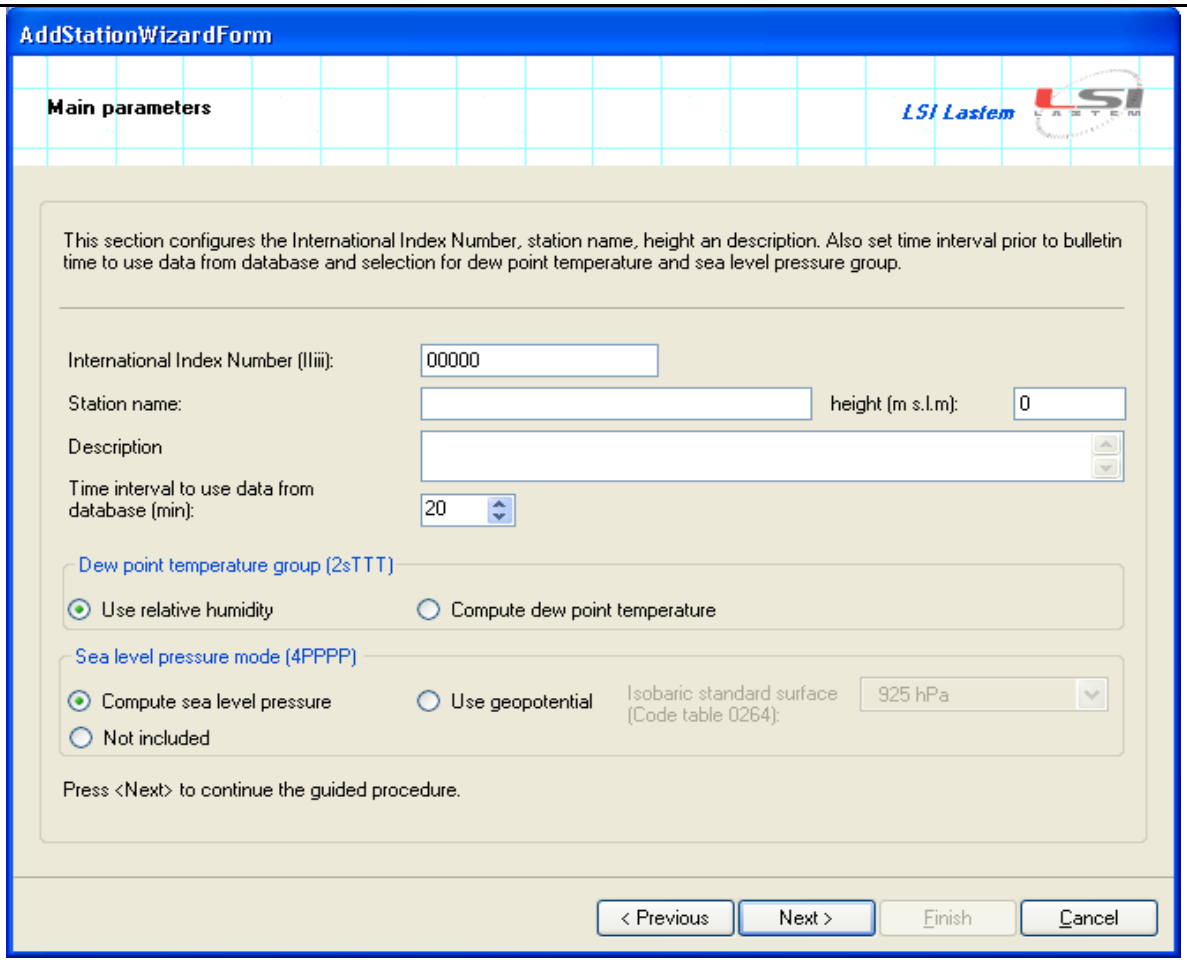
After the input of general parameters, the guided procedure will ask you the input of several stations that belong to this group (ref. §6.3).

If guided procedure has been started in change mode, it ISN'T possible change the CCCC centre's code.

6.3. Add and Change one station

To add new station to one distribution centre select distribution centre in Browser and menu *Edit* → *Add Station* or contextual menu *Add New* Station. To modify an existing station select the station you want modify and contextual menu *Edit*.

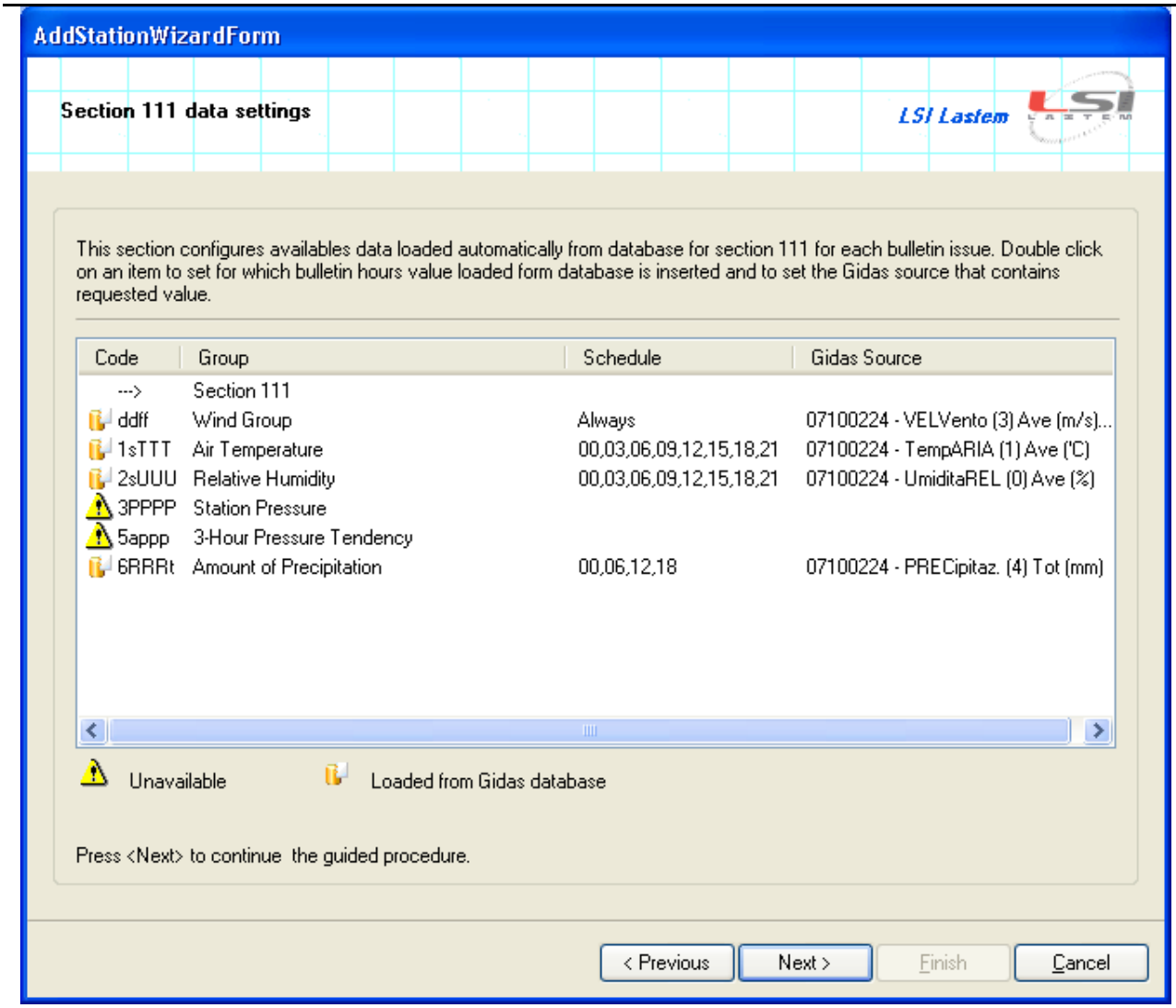
Following functions start the guided procedure for input of new station:



First screen needs the input of general information referred to one station. Particularly:

- *Time interval to get data*: they are the minutes to deduct from bulletin's issue time in order to consider the valid data reached to the station.
- *Dew point temperature group*: it shows if group 2 of section 1 include the dew temperature or relative humidity. ***Bear in mind that for calculation of dew temperature it's needed the relative humidity channel***.
- *Sea level pressure mode*: it shows the representation modes of group 4 of section 1; it's possible to calculate the pressure at sea level, calculate the geo-potential height of one selected reference surface, or leave out the group.

The next screen allows the configuration of timing and the access to database for measures of section 1. Bear in mind that (when you have set a bulletin's issue time) the quantities acquired from database can be automatically calculated ONLY if they have been configured to be inputted into bulletin at specified time.

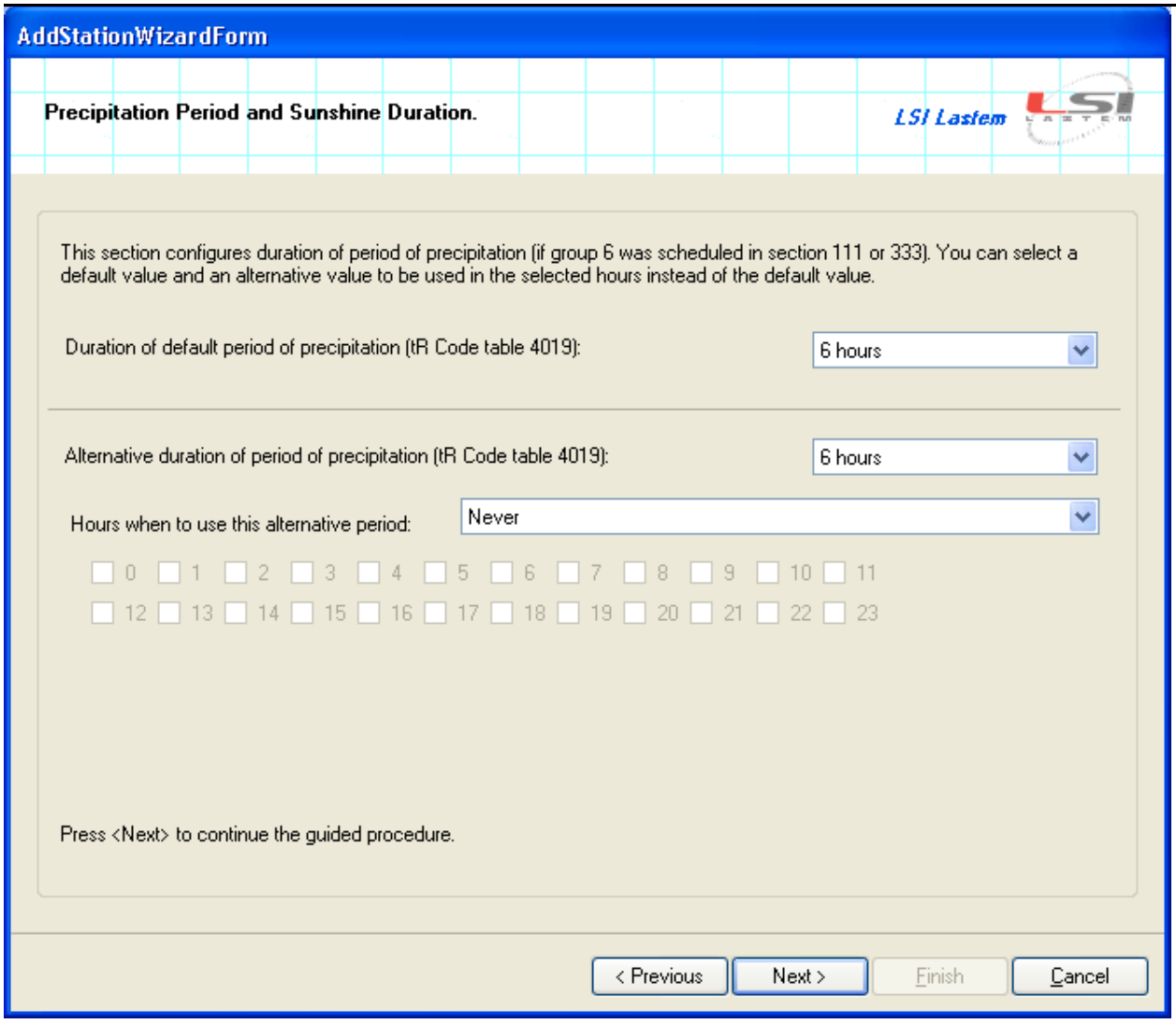


Particularly:

- Icon near each item shows if the item has been configured or not; if it hasn't been configured (*Unavailable*) ***it won't never be inputted into any bulletin***;
- The configuration of one item needs the specification of group attendance time inside bulletins (*Schedule*) and the configuration of parameters for access to Gidas database (*Gidas Source*);
- To modify the configuration of one item: double-click on the item included in the list (ref. §6.3.1).

The following screens are the same like the above and are referred to groups of section 3 and groups of section radiation, if group `55SSS` (*Sunshine*) has been configured.

In the last screen you have to specify the parameter t_R that states the rainfall's valuation period, if group 6 in section 1 and/or 3 (rainfall) has been required.

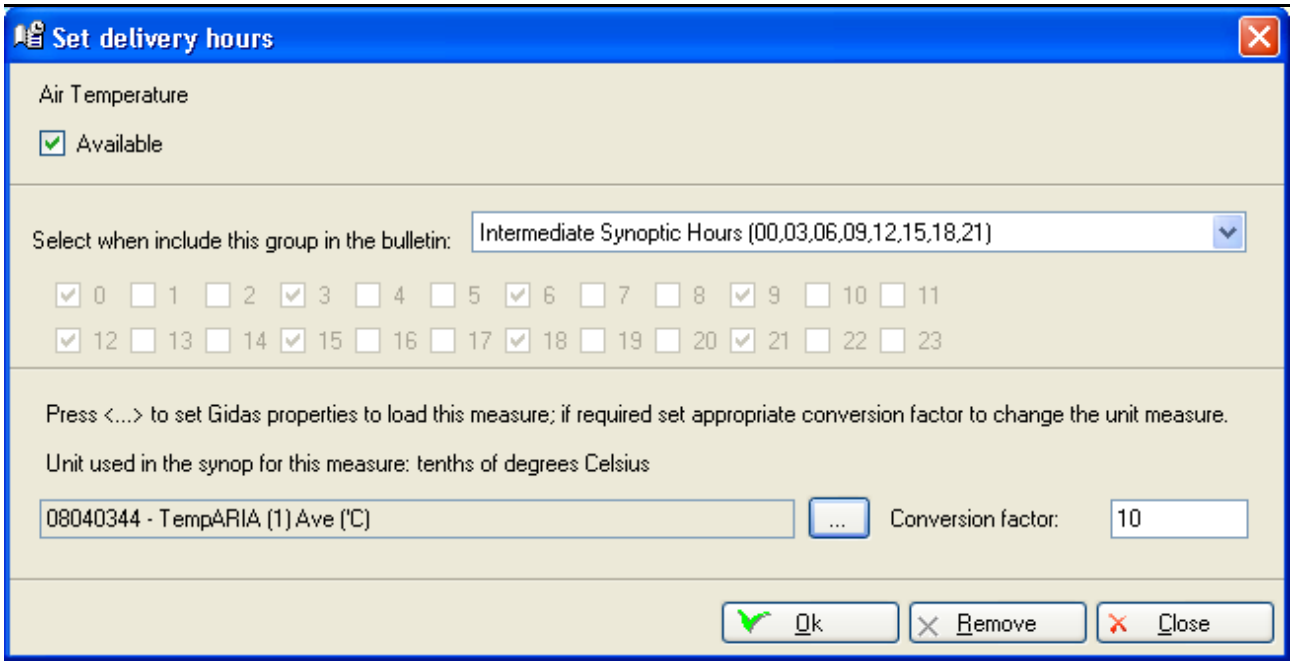


The program allows to specify one main slot (time interval) and one second slot to use at specified times; in this way it's possible differentiate the extraction recurrence of data according to bulletin's issue.

WARNING:
Consider that all groups correlated to stated quantity (for example the different groups that include the Pressure) always use same data access channel. For example it isn't possible to specify one Gidas channel for group 3 and one different channel for group 5 as both channels are referred to pressure data.
If guided procedure has been started like modification mode it ISN'T possible to change the station's code.

6.3.1. Configuration of channels included into database

Double click on one item included in previous screen's list to start the channels configuration window.

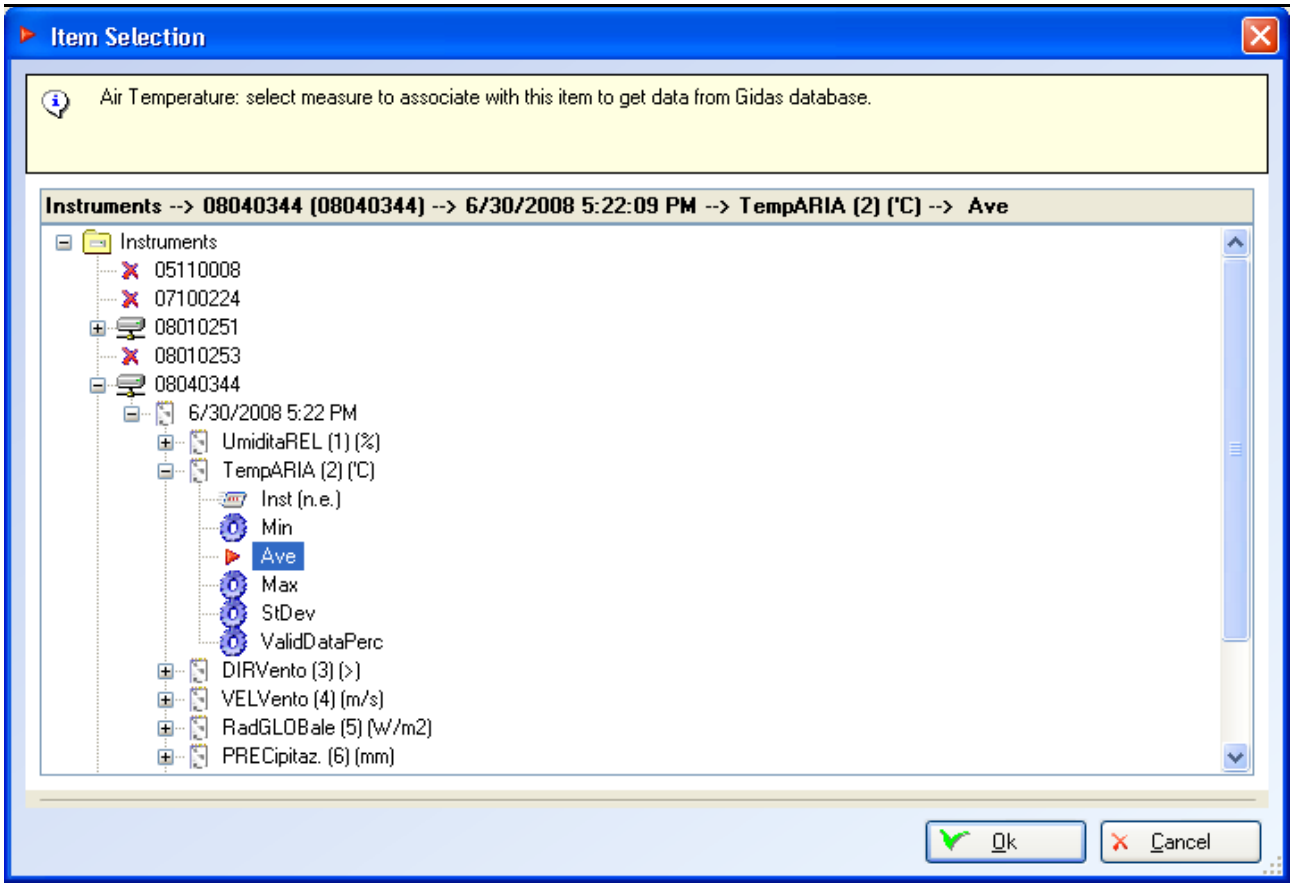


In this window you can:

- Select bulletins' times for input of selected group; it's also possible select single hours;
- Configure the passwords for access to *Gidas* database pressing key ...; they identify the considered quantity (in the example it's the temperature channel);
- Set possible conversion factor between the unit of measurement of datum in database and the unit of measurement of datum inputted into the bulletin; in the example the temperature is measured °C and the multiplication factor is 10, because the groups of bulletin use tenths of degree;
- Press key *Remove* to cancel the channel programming.

WARNING:
Also for manual bulletins the groups that load data from database are inputted ONLY is they have been timed for bulletin's time.

The window for set *Gidas* field to represent selected measure will start pressing key ...:



This window shows all instruments included into database: to configure one measure (in this case the temperature) select the corresponding instrument, its configuration, the channel and the corresponding elaboration. We recommend to use elaboration *Ave*rage item. Press <*Ok*> to confirm the selection.

WARNING:
If channel hasn't been configured for access to database it won't be inputted into any bulletin.

6.3.1.1. Configuration of wind channels

The window for configuration of wind channels (intensity, direction and standard deviation) doesn't allow the setup of scheduling because the group is always present.

It's also possible specify the channel of standard deviation and one threshold value; above this value the direction datum has value 99, that is variable and not-determinable direction.

6.3.1.2. Use licences

The program allows to display the data of instruments included into *Gidas* database for which one licence file valid for program *GidasToSynop* is available; the user can ask the LSI LASTEM for licence file.

In case the licence file isn't available, the instrument is displayed in Navigator with icon and the access to its data isn't allowed.

6.4. Generation of manual bulletin

The program allows the generation of manual bulletins (through operator intervention) for single station and for distribution centre too.

6.4.1. Save of bulletins on text file

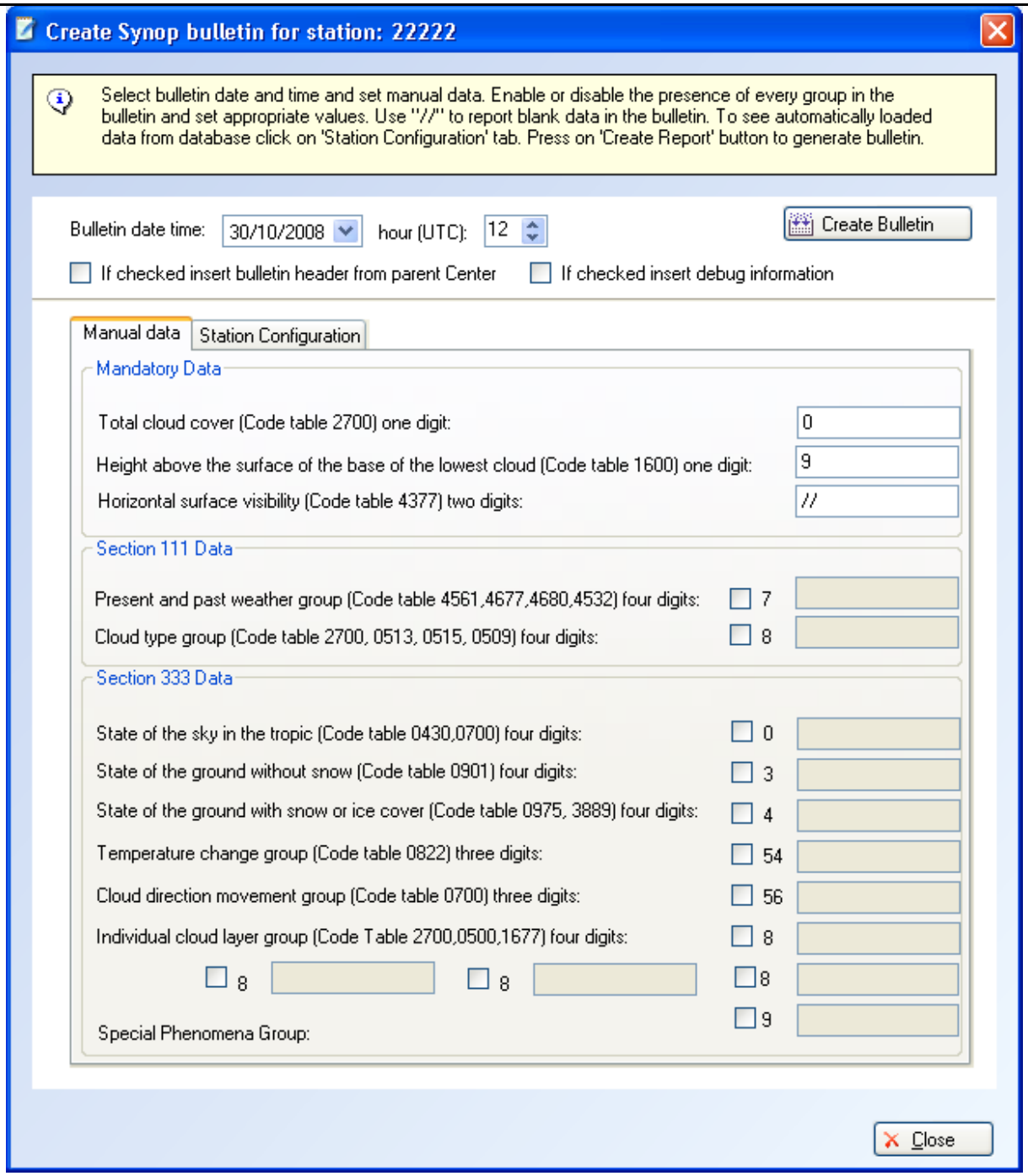
The manual and automatic bulletins are saved on text file with following name:
`[path]\yyyy_mm_dd.hh_[Code].txt`

where:

- `[path]`: it shows the save path of bulletins and it's set up in general options window (ref. §6.6);
- `yyyy_mm_dd.hh`: it shows the date the bulletin is referred to;
- `[Code]`: it's the code of station for single station bulletin, the code of centre for distribution centre bulletin.

6.4.2. Manual bulletin for single station

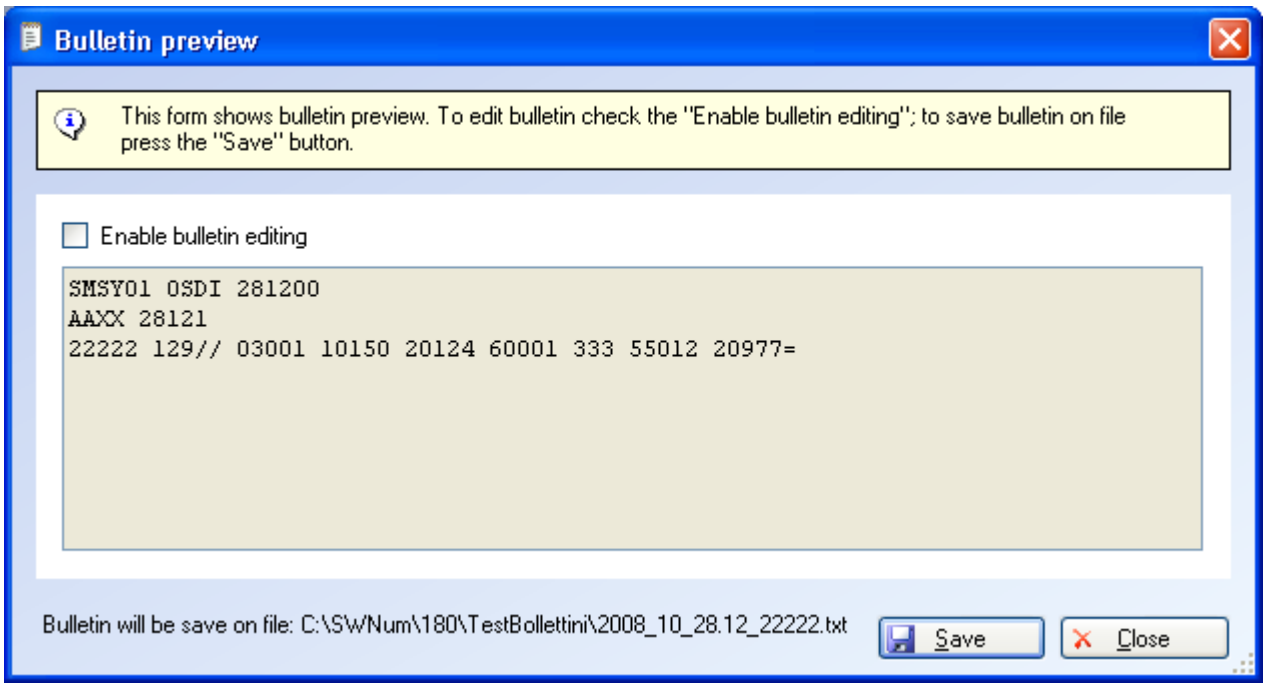
In order to open the window for generation of single station bulletin, select the station from navigator and use contextual menu *Create Bulletin*:



Particularly:

- select date and bulletin creation UTC hour (it's considered the data stored into database are always referred to UTC hour); at opening of window these values are initialized on current date and higher intermediate synoptic hour;
- enable the groups that have to be manually inserted into bulletin and input their values: the input fields accept numerical characters and character '/' that's the missing datum; if one group is enabled but any value isn't inputted, the group WON'T be inputted into bulletin;
- select tick box "*If checked insert bulletin header…*" to input the header of distribution centre (the station belongs to) into bulletin;
- select tick box "*If checked insert debug information*" to queue in bulletin the original data got from database for groups connected to automatic data; this function can be useful during check of program operation;
- Select card "*Station Configuration*" to check the configuration setups for automatic data.

Press key *Create Bulletin* to show bulletin preview window.



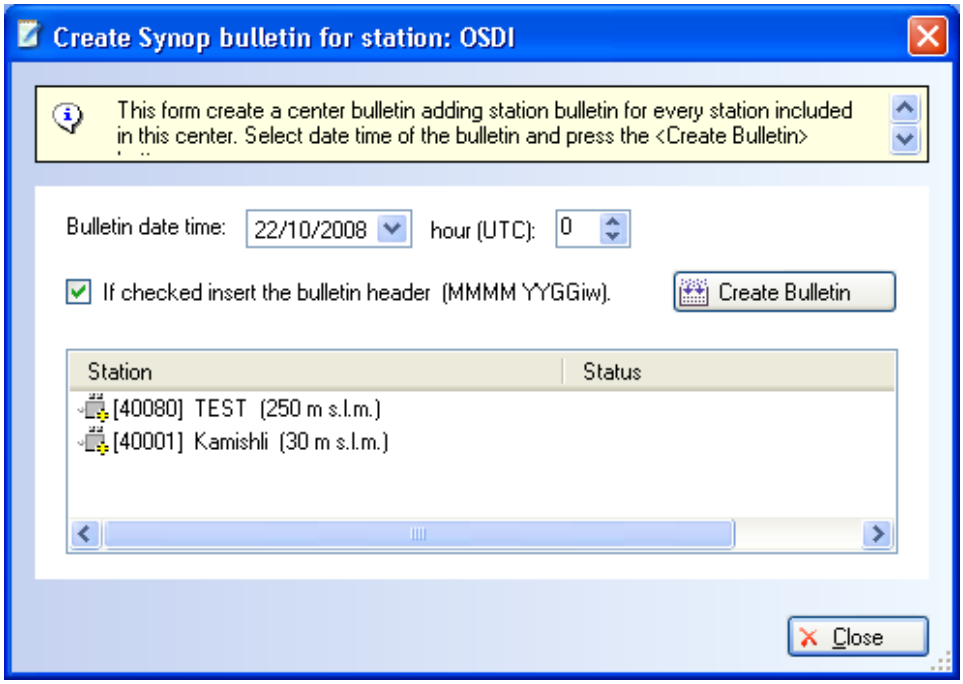
Select tick box "*Enable bulletin editing*" to enable the bulletin's editing

WARNING:
If bulletin has been modified, the program doesn't carry out ANY compatibility check.

Press key *Save* to save bulletin on file. It'll save all displayed contents, including possible information about bulletin source data.

6.4.3. Manual bulletin for distribution centre

In order to open the window for generation of bulletin for one distribution centre, select the distribution centre from browser and use contextual menu *Create Bulletin*:



Particularly:

- Select date and bulletin creation UTC hour (it's considered that data stored into database are always referred to UTC hour); at the opening of the window these values are initialized on current date and higher intermediate synoptic hour;
- Select tick box "*If checked insert the bulletin header*" to input, under emission centre's string (always inputted), the string `MMMM YYGGiw`;
- The list shows the stations included in the group.

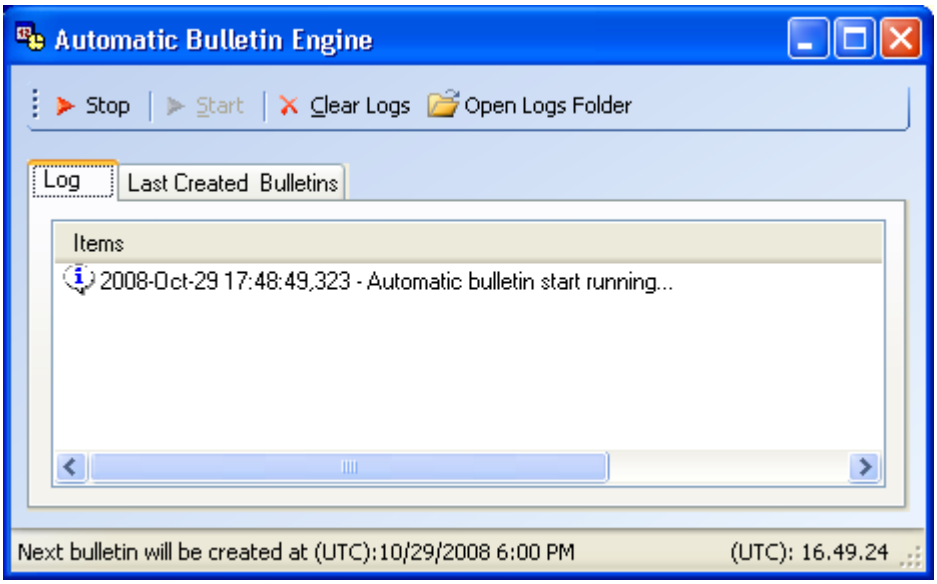
Press key *Create Bulletin* to start bulletin creation. During bulletin creation it's successively displayed the manual creation's window of each single station included in the group. The bulletin's creation follows the instruction in (ref. §6.4.2), but the preview window isn't displayed:

- If you press key *Create Bulletin* in window for creation of single source's bulletin, the program creates the bulletin of that station and queues it in bulletin of distribution centre;
- If you press key *Close* in window for creation of single source's bulletin, the program DOESN'T create the bulletin of that station.

When the cycle on all sources included in the distribution centre has been finished, the program shows the above mentioned bulletin's preview window (ref. §6.4.2).

6.5. Automatic bulletins generation

Selecting menu *Tools* → *Run Automatic Bulletin* the mode for automatic generation of bulletins starts.



This window displays the execution information in *Log* paragraph, and last created bulletin in *Last Created Bulletins* card.

The execution information is stored on text file in the folder:

`C:\Documents and Settings\[User]\Dati applicazioni\LSI-Lastem\GidasToSynop\Log`

Every day the program creates one file including execution information (if mode for automatic creation of bulletins has been started).

Key *Open Logs Folder* places program Windows Explorer on folder in which the files with execution information are stored.

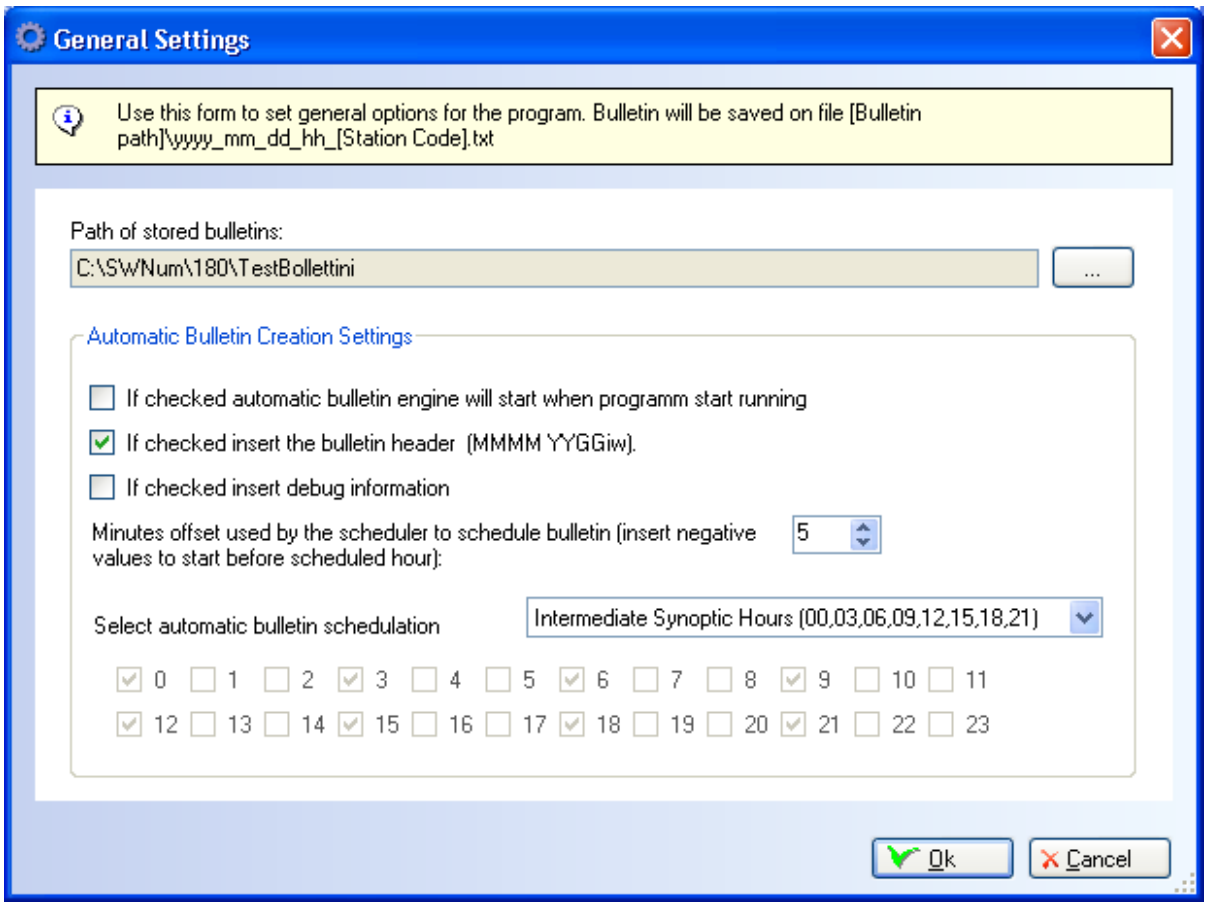
Key *Clear Logs* removes the execution information from window (but not from files).

Press key *Stop* to stop the automatic execution ; press key *Start* to re-start it.

WARNING:
The configuration and the general options cannot be modified during operation of mode for automatic generation of bulletins. If necessary, stop the mode pressing Stop, make the modifications, save them into database and re-start the mode pressing Start.

6.6. Configuration options

Selecting menu Tools → Options the window for configuration of program's general options starts:



You have to input the path (local or network) for saving of generate bulletins and configure the options for mode for automatic creation of bulletins. Particularly:

- Set up the minutes of slot (time interval) referred to bulletin's creation time; if you set up 5 minutes, the bulletin of 12 o'clock will be created at 5 past 12. This slot can be useful to allow the instruments the sending of updated data;
- Set up the hours for generation of bulletins: every station will input the scheduled groups referred to stated time.

6.7. Program configuration file

The name of program configuration file is *GidasToSynop.exe.config* and it's located in the folder of program installation. The format of file is *xml* and it includes come default setups:

```
<LSI_Lastem.Lib2.Gidas.Synop.UI.Properties.Settings>
    <setting name="UserDefinedCulture" serializeAs="String">
        <value />
    </setting>
</LSI_Lastem.Lib2.Gidas.Synop.UI.Properties.Settings>
```

where:

- *UserDefinedCulture*: language used by program. If computer's language is Italian the program starts using Italian like default language (not stated value), otherwise it starts using English. To force the use of English in Italian computer input value `<value>en-us</value>`; to use Italian in other language computer input value `<value>it-it</value>`.

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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