S7-200 Explorer Automated Data Log Upload Procedure

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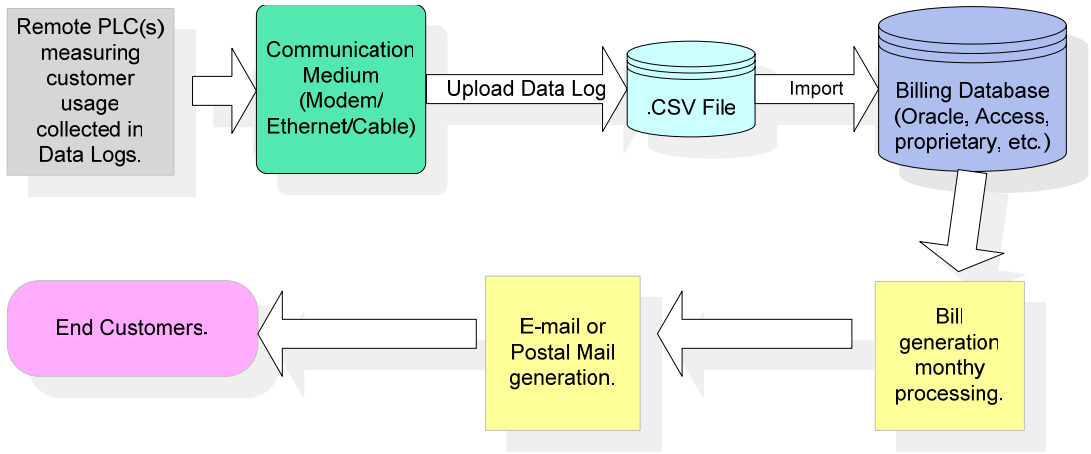
2 Introduction

Data Logs can be read from a S7-200 PLC memory cartridge into a .CSV (Comma Separated Value) file. Reading a data log from the S7-200 PLC can be accomplished in two ways. First, you can manually click on the desired Data Log item in the 'S7-200 Explorer' Micro/WIN V4.0 tool and double click on the Memory Cartridge Data Log file. Second, you can create a shortcut via the menu selection "Create Shortcut" and schedule the upload to occur automatically (without human intervention) using a Microsoft Windows 'Scheduled Task'. This document explains how to set up and execute a scheduled, automated upload of a data log. More specifically it explains how to achieve the automatic uploads over a PC to s7-200 PLC modem connection. The ability to upload automatically with modems was added in STEP 7-Micro/WIN V4.0 SP1 (Version 4.0.1).

The ability to upload without human interaction is a very deterministic and reliable way to accomplish mission critical data gathering in many types of applications, especially those that need data collection in non-peak hours. The following diagram illustrates the use of common technologies that can completely automate the process of measuring usage/quantity of a product and billing customers using Data Logs with no need for user interaction:

Picture 1

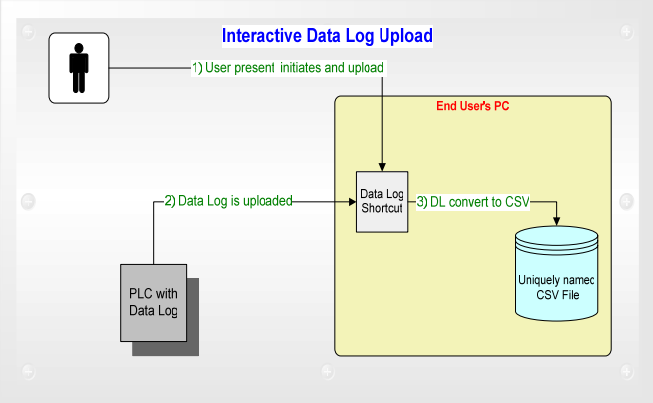


3 Uploading data logs

Uploading (or reading) Data Logs from a S7-200 memory cartridge can be accomplished in two ways:

1. Interactive Uploads
2. Automated Uploads

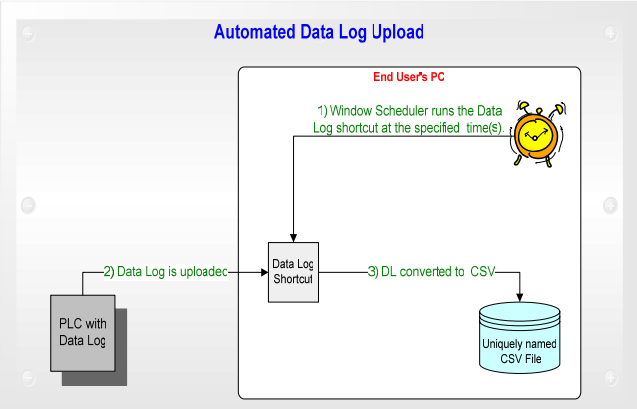
Picture 2



4 Interactive Uploads

An Interactive upload is simply an upload with a user present to initiate the upload. You must open the Micro/WIN V4.0 (or greater) tool called S7-200 Explorer to browse for a PLC's Data Log. You either double click on the Data Log file or select "Upload" from the context menu on the Data Log. The generated CSV file is opened in whatever application is associated with .CSV files (the default application for CSV files is Excel) on your PC. You may configure any PC application to open a CSV file by changing the 'Folder Options' for CSV files in the PC's Control Panel. Since the Interactive upload relies on a manual interaction with a user, it may be more error prone and less consistent for some applications.

Picture 3



5 Automated Uploads

Automated Uploading of a Data Log will cause the CSV file to be stored in a specific sub-directory on your PC hard drive at a scheduled time. The Scheduled Task feature, which is part of the Microsoft Windows operating system, provides a simple way to setup and configure automated uploads. Using automated uploads, you are able to schedule the upload of Data Logs from multiple, remote PLC's into data files at a specific time. For instance, you can schedule uploads when long distance rates are at their lowest or when field equipment connected to the PLC's is not in operation. There is no appreciable limit to the number of tasks that can be scheduled to run. However, there are limits to the amount of time required by each upload. For instance, you must not schedule automatic uploads that will overlap. The user can address that by using more than one machine to accomplish this if such a problem were encountered. This opening of the CSV file does not occur in automated uploads since users are not normally present. The user can open the uploaded CSV file by browsing to the "C:\Program Files\Siemens\Microsystems\Data Logs" folder and finding the specific Data Log file.

Uploading (regardless of method) always stores the uploaded Data Log data in a filename that is created based on the connection that is being used. For instance, the resulting Data Log filename consists of the address and connection (if using a modem) of the PLC, user specified Data Log name, and date and time of upload. The error result is used as part of the filename if the upload attempt was unsuccessful.

The Data Log may also be uploaded to the computer by using a user-generated application program written in a language such as Visual Basic. The instructions for implementing uploads with a programming language are included near the end of this document in the section 'Programmatic Uploads'.

5.1 The Concept of Automatic Uploads

Automated uploads work using a shortcut file. A shortcut file is a file that has a ".LNK" extension that contains a path to a Windows Shell Object. There are typically many shortcut files on a user's PC desktop. A shortcut is clicked to run the associated application.

Clicking a shortcut causes the object identified (in this case S7-200 Explorer) to open and initialize to the state it was in when the shortcut was created. Clicking a Data Log shortcut triggers the upload action and causes the file to be read (uploaded from the PLC memory cartridge) into

the indicated Data Log into the Microsystem Data Log directory. A shortcut .LNK file can be executed by any of the following methods:

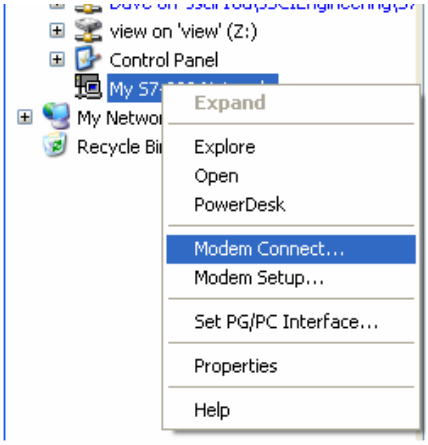
- Double clicking it
- Right clicking on it and requesting “Open”
- Calling it from a shell function in a programming language (as described later in this document)
- Dragging the short cut into the Windows Scheduled Task folder and setting its parameters of when and how often it is to be run

Users must ensure sufficient time is given to each task to complete.

5.2 Manual (Interactive) Uploads With Modems (S7-200 Explorer V1.0)

In the initial release of S7-200 Explorer (V1.0), a S7-200 PLC connected via a modem for uploading a Data Log could not be automated. In the initial V1.0 release, a modem connection had to be performed manually for both the modem ‘Connect’ (to release the online connection) and modem ‘Disconnect’ (to release the online connection and close the modem).

Picture 4



The diagram above shows the how modems are connected manually in S7-200 Explorer V1.0 with user interaction to select the ‘Modem Connect’ menu item.

This keeps the PLC modem connection open until the user is finished with browsing operations. Then entire process of browsing a remote PLC and uploading Data Log file(s) is done interactively by a user.

When the upload is finished the user must also perform a manual 'Modem Disconnect' (the disconnect option only appears in the menu while a modem is connected).

Requiring a user to manually perform the modem connection can often be too restrictive since a user must be involved each time there is a need to upload the Data Log file(s). In addition, applications frequently have multiple remote sites where each site uses a different modem. For these applications it is usually unacceptable to leave the modem(s) connected at all times because of concerns with security and connection costs.

5.3 Automated Uploads With Modems (S7-200 Explorer V1.0.1.x)

The latest V1.0.1.x of the S7-200 Explorer tool consists of an automated upload that will first "auto-connect" to a modem by dialing the modem, then uploading the Data Log file, and then (after the action has completed) it performs an "auto-disconnect" from the modem.

A shortcut that is scheduled as an automated task must connect and disconnect each time it uploads a single Data Log file, even if the Data Log file is on the same PLC where a previous upload occurred. Individual and separate connections must be performed because the S7-200 Explorer tool does not know whether an application will communicate to the same PLC or to a different PLC for the next scheduled upload.

5.4 Summary of Steps for Configuring Automatic Data Log Uploads

To setup the automatic uploads of Data Log files, you must complete two configuration steps:

1. **Configure and Connect to the Modem once to create the connection string that is used in the Shortcut**
   The detailed steps about how to complete this configuration are explained in the subsequent section of this document named: *'Configuring Modem for Uploads'*

2. **Configure a Scheduled Task in the Microsoft Windows Control Panel.**
   The detailed steps about how to complete this configuration are

explained in the subsequent section of this document named: ‘Scheduling Automated Uploads’

You need to be aware that your PC must be in a state where a connection can be initiated or the upload will fail. Examples of this would be that the user has communications configured for a device other than modems, or that the user leaves the machine connected to another modem connection. The automated shortcut will not break connections in progress. It will simple fail and log the error in the user’s CSV file.

6 Configuring Modems for Uploads

You must configure the modem that will be used for an automated Data log upload(s). To configure an automated upload(s) with a modem, you must follow the steps below in the order that they are listed:

1. Using the Modem connection menu, configure parameters for your modem (More details see 6.1)
2. Using the Modem Connection menu, connect to the PLC with the modem (More details see 6.2)
3. Using S7-200 Explorer, browse to the Data Log file on the PLC memory cartridge and create a shortcut (More details see 6.3)
4. Using the Modem Disconnection menu, close the connection to the modem and PLC (More details see 6.4)

Steps 1 – 4 must be repeated for each PLC modem connection that you want to perform automat uploads from.

When you have finished configuring each PLC modem connection, you should have a shortcut .LNK file for each one.

6.1 Configure parameters for the Modem

To use a modem in Micro/WIN or in the S7-200 Explorer, you must configure a modem connection using the TAPI (Telephony Application Program Interface) to set up numbers and types of modems. The two applications (STEP 7-Micro/WIN and S7-200 Explorer) use the same modem driver information. Therefore, if the modem has been previously configured in Micro/WIN, it will be readily available in the S7-200 Explorer modem connection dialogs and additional modem parameterization will not be necessary. This configuration is found in the S7-200 Explorer under the 'Modem Connection' dialog as explained below. You may set up an address book of different numbers for the modem to dial.

6.2 Connecting to the site

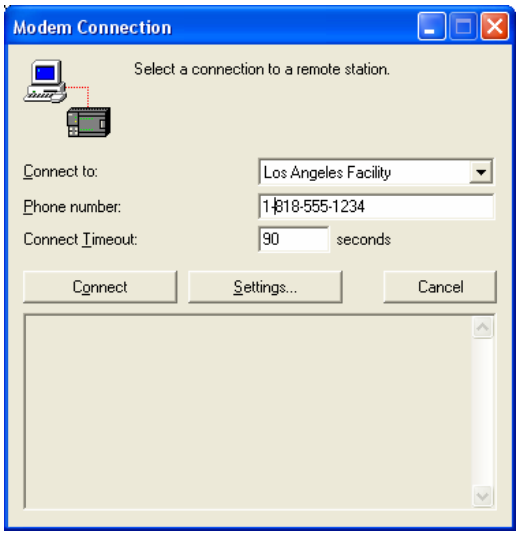
To the left is an example of the connection dialog provided through the Microsystems Communication object.

The configuration process starts by selecting the **Connect to** field and selecting a connection from the list.

The user can select the desired site, in this example the user has selected a remote site in Los Angeles that would have one or more PLCs connected via a modem and possibly networked via modem/smart cable combination.

When the user clicks Connect, then the facility will be automatically dialed and connected to. After the connection is made use S7-200 Explorer to browse and select from the connected PLC's.

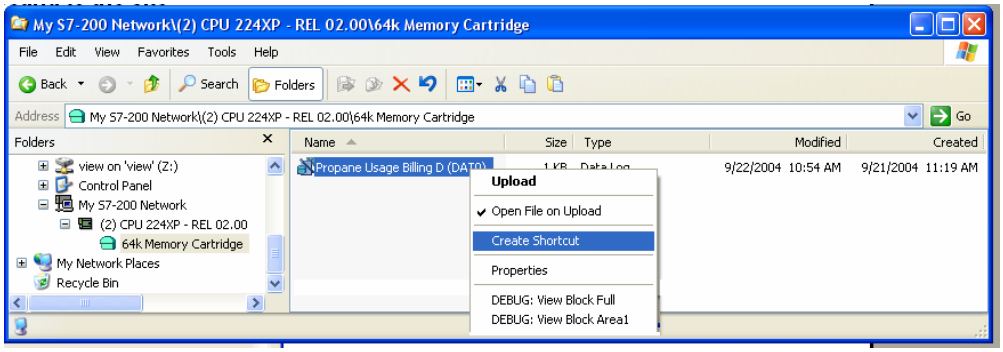
Picture 5



6.3 Browsing to the Data Log and Creating a Shortcut

After clicking on the PLC, browse to the desired Data Log and right click and select "Create Shortcut" on it to create a shortcut.

Picture 6



Since the connection is made with a modem, this specific connection information is saved in the shortcut so that the next time the shortcut is run, S7-200 Explorer will ensure that this connection is either already made to

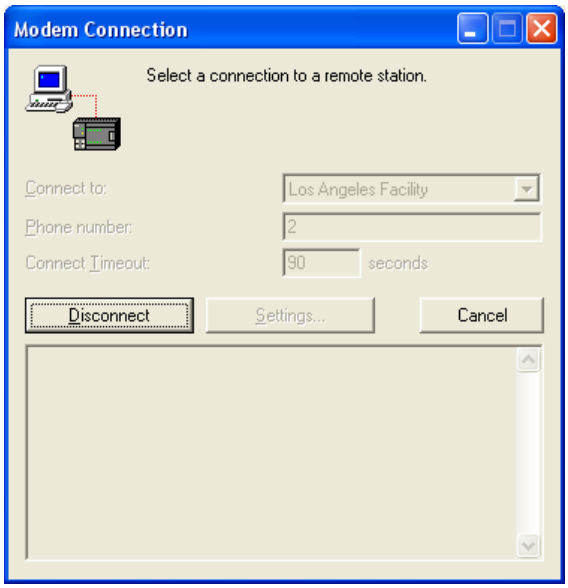
that connection site, or it will make the connection assuming the modem is available. If it makes the initial connection, it will automatically disconnect when finish so that another upload to another site can be executed.

6.4 Disconnecting the Modem

The modem is disconnected by the same process as connecting. The user right clicks on the "My S7-200 Network" and selects "**Modem Disconnect…**". This will open the disconnect dialog provided by the Microsystems communications object.

When the user clicks on "**Disconnect**" the communication object will automatically drop the call and disconnect the modem.

Picture 7



This completes the configuring modems for upload. The shortcut is placed on the desktop and now contains all information necessary to automatically connect, transfer the Data Log, and disconnect without the interaction of the user.

7 Scheduling Automated Uploads

Using the Microsoft Windows Scheduled Tasks feature is convenient because it does not require additional software to be installed on your PC. It requires a simple set up procedure using the standard Windows operating system with the shortcut files that you created in the previous section.

By simply dragging your Data Log shortcut into the Scheduled Tasks folder and configuring the properties, the user can run the shortcut to upload the Data Log at any frequency, or time of day, day of week, etc. It could be configured to run as frequently as once every few seconds to as infrequently as once every year. Users may even log out of the PC (restarting the computer) and have configured the shortcut's scheduled task, to automatically log into the computer run and upload the data log and then log out of the computer. All of this is built in to Windows Scheduler and is available on both Windows 2000 and Windows XP.

To schedule an automated upload(s) with a modem, you must follow the steps below:

1. Open the 'Scheduled Tasks' window from the Control Panel (More details see 7.1)
2. Drop and Drag a shortcut(s) into the Scheduled Tasks as a Task and configure the task properties (More details see 7.2)
   - Assign basic information for the 'Task' (More details see 7.2.1)
   - Assign parameters for the Task 'Schedule' (More details see 7.2.2)
   - Assign parameters for the Task 'Settings' (More details see 7.2.3)
   - Assign parameters for the Task 'Security' (More details see 7.2.4)

Each of these steps in explained further in the following sections.

7.1 Open Scheduled Tasks Folder in the PC's Control Panel

Open the Windows Control Panel by clicking on the Start menu and selecting **Settings**-> **Control Panel**. From the Control Panel window, double click on **Scheduled Tasks**. Shortcut files and executables can be dragged and dropped into the Scheduled Tasks window to create an application task that will run at configurable intervals

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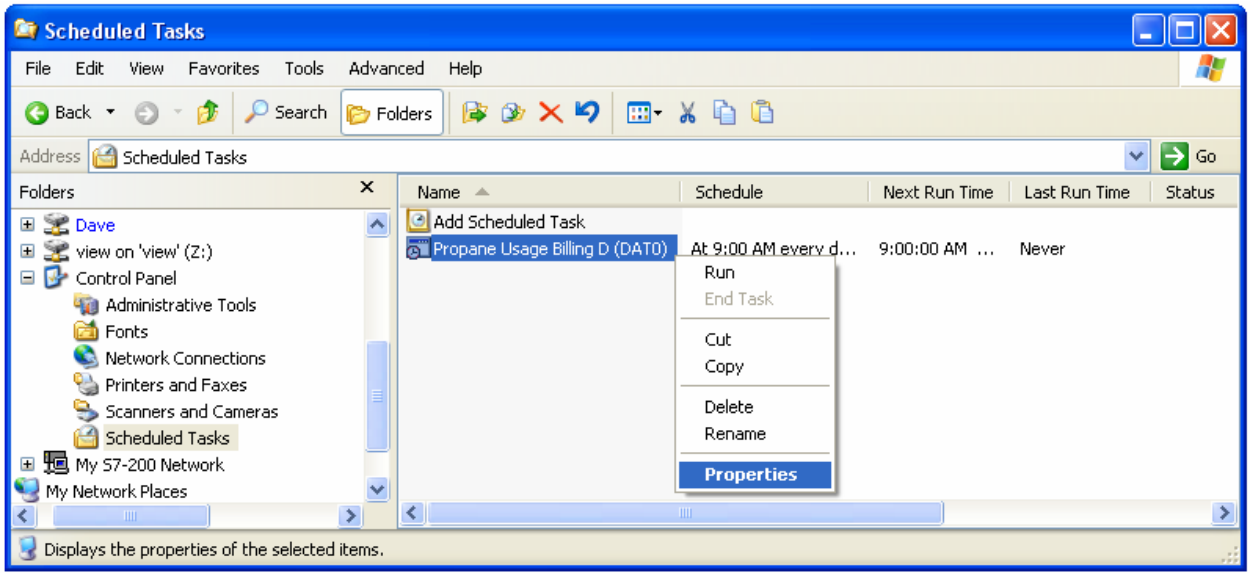
7.2 Drag and Drop a Shortcut into Scheduled Tasks Folder

The example below shows the results of dragging the shortcut that you created earlier for the PLC Modem Connection. In this example the particular Data Log file shortcut was named 'Propane Usage Billing'.

Picture 8



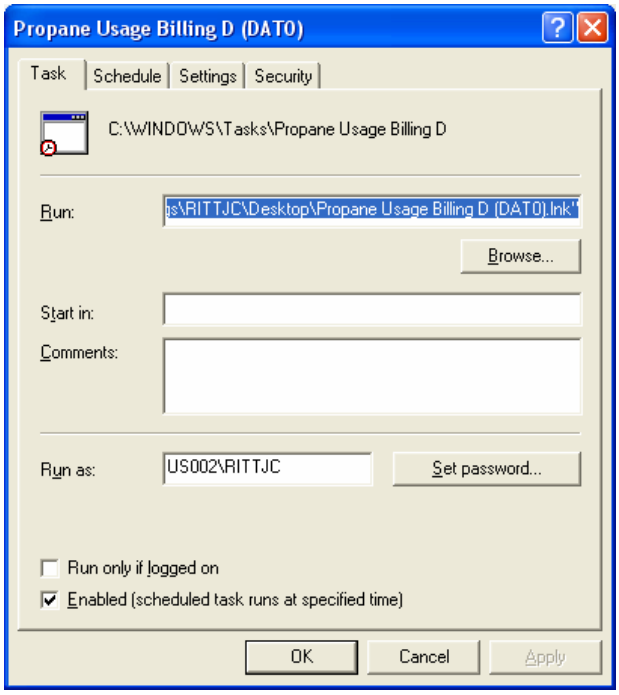
Right click on the shortcut and select 'Properties' to open up a configuration dialog where you can set the time, frequency, security and automatic login for when the selected task is to be executed. Alternatively, you can double click the shortcut file to open up the 'Properties' dialog.

7.2.1 Assign basic information for the 'Task'

The first tab in the Properties dialog shows the Task to be run, the folder for it to run in, and the Login User ID and Password to run the task as. This means the user can set the task to automatically log into a machine and run under a specific Windows user account using the permissions of that account. Under Windows XP the Scheduled Tasks Property dialog appears as follows:

Data Log Upload Procedure

Picture 9



The **Run** field contains the link or executable to run at the scheduled interval.

The **Start In** field contains the folder in which to start running the task.

The **RunAs** contains the user account to log in as. Clicking on the “Set Password” allows the user to enter the password to use when the run is automated. This can be the same user account and Password the user uses to log into the computer normally or can set up special accounts to be used to run the task.

If the **Enabled** checkbox is checked, the task will run at the scheduled times. If unchecked the task is not scheduled to run at all.

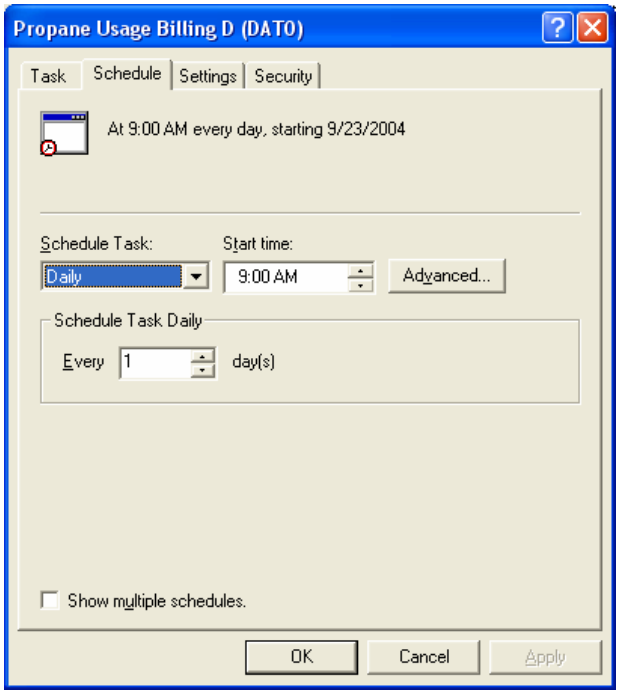
If **Run only if logged** is checked, it indicates that the task should not automatically run if the specified user account is not already logged on to. If unchecked, automatic login will occur if password and account ID are correct.

7.2.2 Assign parameters for the Task ‘Schedule’

The Schedule tab allows you to select which time and or frequencies to run the current task on. When selected, you will see the following under Windows XP:

Data Log Upload Procedure

Picture 10



The **Daily** combo is the frequency in which to run the task.

The **Start Time** is the time of day to run the task on the schedule.

The **Advanced** button allows the user to specify Start and End dates for the scheduling as well as how many times or a time interval to repeat the task on a given day.

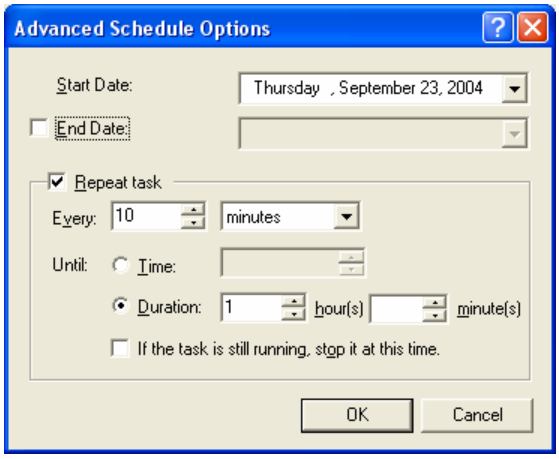
The **Schedule Task Daily** allows the user to specify intervals of days to regularly run the task. The Advanced button however, offers more flexibility, but is a bit more complicated to configure.

The **Show multiple schedules** allow the user to specify multiple schedules for the current task to run on which is useful if schedule times are asymmetrical.

Clicking the Advanced button will open the following dialog:

Data Log Upload Procedure

Picture 11



This dialog allows the user to configure the **Start Date** to start running the task and optionally the **End Date** to stop running the task.

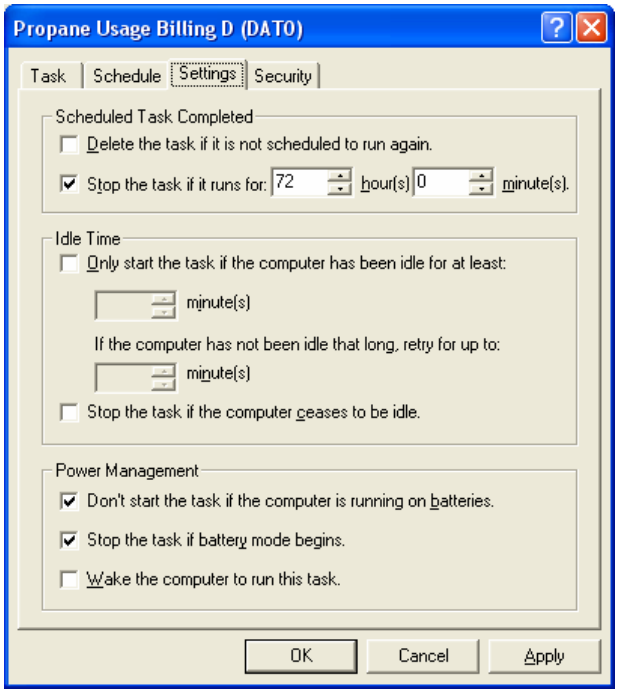
If **Repeat task** is checked, the task can be run at time intervals within a specific day including a stoppable duration that can kill the task. Stopping tasks should not be used for S7-200 PLC modem connections and Data Log uploads.

7.2.3 Assign parameters for the Task 'Settings'

The Settings tab allows you to select to apply specific behaviors and constraints on the task. When selected, you will see the following under Windows XP:

Data Log Upload Procedure

Picture 12



Selecting **Delete the task if it is not scheduled to run again** will remove the task from the Scheduled Task folder when the task's configured lifetime is completed.

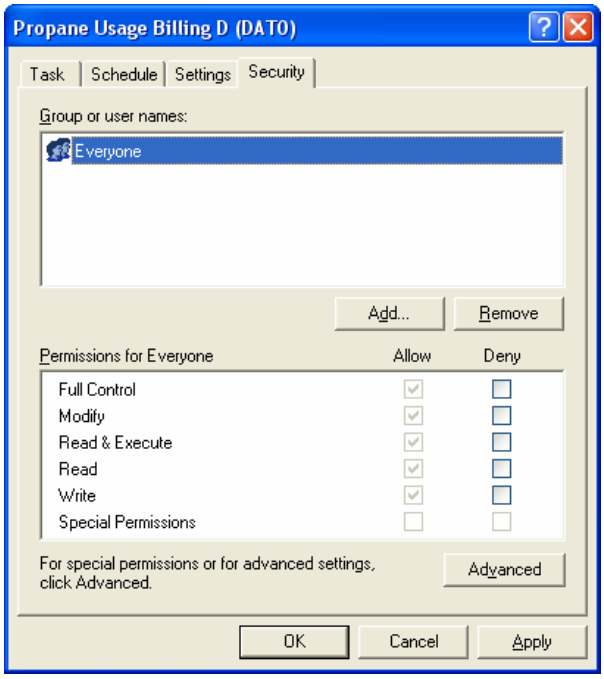
"Stop the task if it runs for…" puts limits on the time allowed for the task to run when checked. This stops the task if it exceeds this time spec.

Idle Time allows the scheduler to wait until the machine is not busy for a specified time. This is handy if the user wants it to run automatically each day after leaving for the day.

Power Management allows the task to be conditional on AC power requirements and will start a computer up that is already in the power down sleep mode if selected.

7.2.4 Assign parameters for the Task 'Security'

Picture 13



The Security tab allows you to select which user or user groups are allowed to execute the scheduled task. When selected, you will see the following under Windows XP:

This is just like the normal Windows Security account and rights maintenance dialogs and is not elaborated on here. Users and Groups may be allowed access to a specific task.

8 Programmatic Uploads

Since S7-200 Explorer is a “namespace extension” to the Windows Shell, it offers new capability that enables the user to completely “Automate” the process of uploading a Data Log and schedules its execution on a regular basis at optimal times. In additional, the user can call it programmatically from VB, batch files or any language that has access to the Windows Shell API.

A programmatic upload is an automated upload that is started by a call from a shell compliant programming language like Visual Basic, VB Script, C++, C#, etc. For example, to call it from Visual Basic you would use the following format:

Shell "cmd /c c:\upload_data_log.lnk "

Where:

“**Shell**” is the VB function to call the Windows Shell

“cmd /c” tells the command to run as a child process (so it doesn’t open a console window)

“**c:\upload_data_log.lnk**” is the name of the shortcut file (renamed by the user)

When the command is executed, it would invoke S7-200 Explorer and upload the Data Log that created the shortcut.

A programmatic upload can be used to control the whole process of gathering data and billing customers in our example in the introduction. The program managing the process itself can be placed in the Windows Scheduled Tasks as well with the same benefits mentioned with shortcuts above.