Created a test program in Turbo C 3.0 for dos, reusing old code form my Modbus test program. The program was a small simple program compared to the Modbus test program, it was designed to be small and simple to use. On the main menu the user has three choices "Build", "Baud", "Quit". The build section lets the user input a test data frame form the keyboard the BCC is then calculated and added to the frame which is then transmitted through COM1 at the current baud rate. The baud section lets the user select the baud rate, 9600 to 56K.

SCI Annuciator Frame format: -

SOI	ADDR	DATA1	DATA2	DATA3	DATA4	DATA5	ENC	BCC

SOI = 7Eh, start of information
ADDR = 30 – 3F, address 0 TO 15
DATA = Binary data for channel 1 to channel 20
ENC = Encoding information
BCC = Block check sum, if SUM = ADDR+DATA1+DATA2+DATA3+DATA4+DATA5+ENC then BCC is the one's complement of the LSB of SUM

The encoding information is used to recover the received data. Because the SCI annuciator is designed to work with GenAccess, some control characters like 0x01 (SOH), 0x06 (ACK), 0x10 (EOS), 0x18 (CAN), should be avoided to transmission. IF any data equals one of these control characters, the data will be inverted and hence the corresponding bit in ENC is set to 1. The bit 7 in NEC is always set to 1 to ensure that it is not one of the control characters. The bit 0 is to make sure BCC is not one of the control characters. If the calculated BCC equals one of the characters, the bit 0 in ENC will be set to 1, and BCC is calculated again.

The content of ENC is as below.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	DT5	DT4	DT3	DT2	DT1	0	BCS

DTn = 1, DATAn in the frame is inverted.
DTn = 0, DATAn in the frame is normal.
BCS = 1. The old BCC was one of the control characters (with BCS=1, it is not)

It is clear the SCI annuciator data frame is not as complex as the Modbus data frame, but it does its job well. Unlike Modbus the communication between the access 4000 control panel and the SCI annuciator is not bi-directional, (Modbus designed to work with up to 255 slave devices) and a simple data frame is all that's needed.

Week 16: Monday 06/11/2000 to Friday 10/11/2000

Monday OFF – took my Second floating Holiday, still have 6 more floats to take before the Christmas Holidays, It has been confirmed by my manager (Dr Ning Li) that I can move a couple of days across to the new year, or take the money. The plan is a present that I take 3 more before the Christmas holidays and pass 3 days to next year.

Continued working on "Access 4000 control panel database" program, added "Export Configuration File", "Export Text File" and many small modifications.

The configuration file looks like this: -

```
CCC,1000102823,1,1,1,1,1,1,1,9600,4,14,17.5,50,4,3,96,4,380,1,8,300,7
,7,3,0,0,0,0,1.000,0,1.000,0,1.000,0,1.000,0,1.000,0,1.000,0,1.000,1,
1.000,0,1.000,1,242,5,2,1,198,5,2,1,55,5,2,1,45,5,2,1650,0,1199,0,2,1
,14.7,5,1,11.3,10,1,12,10,0,3.0,0,95,0,30,0,10,0,0,0,0,1,0,0,1,1,0,0,
1,1,0,0,1,1,0,0,1,0,0,0,0,1,1,0,1,0,1,1111,2222,2004,9999,@
```

It contains all the configuration setpoints stored in the database, and is downloaded directly into the Access 4000 control panel. The file starts with 'ccc' and ends with '@', this is always the case. The individual setpoints are then separated by commas, e.g. 1000102823 above is the SAP works order number and 9600 is the baud rate etc…

The text file, once exported is also downloaded directly into the Access 4000 control panel. Each file starts with 'TTT' and ends with @, and messages are separated with commas. The database a present contains 12 text files for 12 different languages (table [tblTextFile]); FRE, DAN, ITA, DUT, NOR, SPA, POR, SWE, ENG, FIN, GER, ICE. The language that is selected on the current record is exported. For example if the current record has ENG as its language, when the user hits "export text" the ENG text file will be export, while if the current record has GER as its language, the GER text file will be export.

Text file [ENG] -

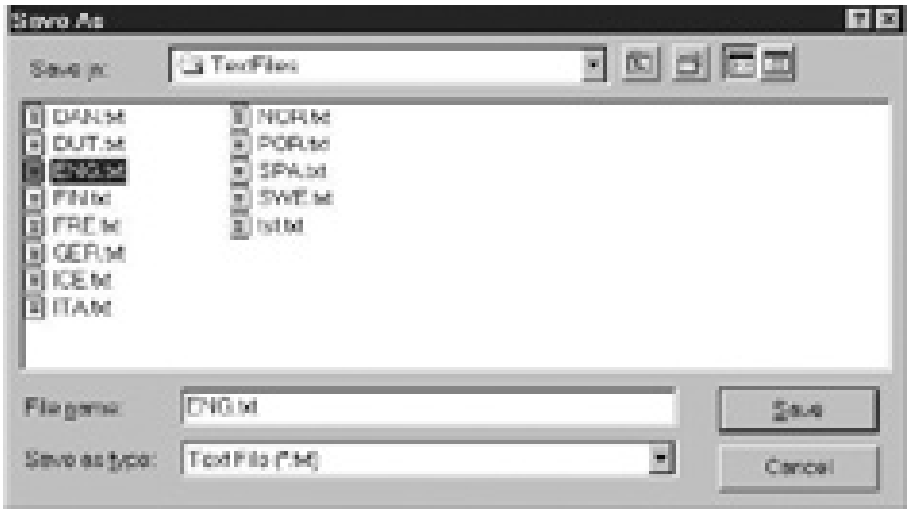
```
TTT,     SCROLL TO A      ,      MENU ITEM       ,  THEN PRESS ENTER  ,
OVERVIEW*,   ENGINE*,ALARM LOG*,*GENERATOR,*CONFIGURE,*CONTROL  ,V
...
Engine Temp   ,Low Oil Pressure   ,Fault Channel 1    ,Fault Channel
2    ,Fault Channel 3    ,Fault Channel 4    ,@
```

Text file[GER]: -

```
TTT,     MENUEEINTRAG     ,     HERVORHEBEN      , UND ENTER DRUECKEN ,
UEBERS.*, MASCHINE*,ALARMBER.*,*GENERATOR,*KONFIG.  ,*STRT.KONT,V  ,A
...
,Nied.Oeldruck       ,Fault Channel 1     ,Fault Channel 2     ,Fault
Channel 3    ,Fault Channel 4    ,@
```

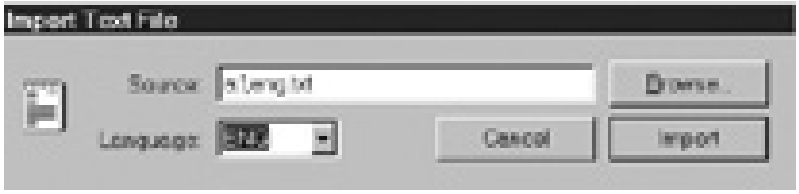
The above text files are summarised as the full text file contains 182 messages / commas.

For both the "Export Configuration" and "Export Text" a standard file dialog was used: -



Week 17: Monday 13/11/2000 to Friday 17/11/2000

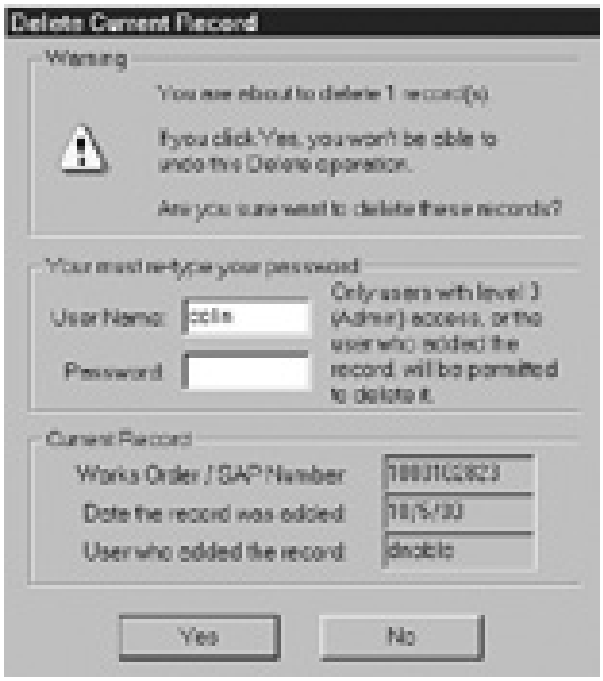
Continued working on "Access 4000 control panel database" program, Added "import text file": -

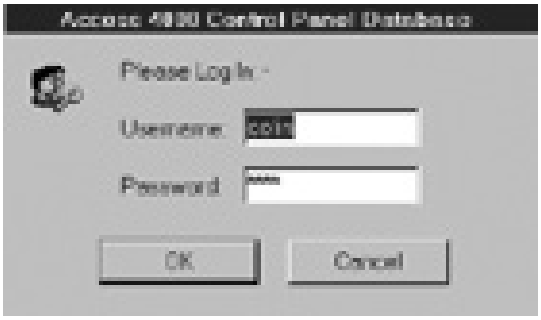


This imports a text file into an existing or new language record.

Options dialog added this option dialog lets the user specific the default database, which will be loaded automatically on start-up. The data is stored in an INI file, c:\Panel_config.ini, which is loaded on start-up. If the default database does not exist or is not valid or the INI file does not exist, the user is ask to select the database via a standard file dialog, and the INI is updated / created.

Many other small improvements & bug fixes where made, some where visual improvements: -





Week 18: Monday 20/11/2000 to Friday 24/11/2000

Continued working on the Access 4000 database program, additional features where added, improvements to existing features where also made.

One additional feature was to restrict any record to one user at any one time; e.g. no two users can access the same record at any one time. This was accomplished by locking records that where in use by other users, an AfxMessageBox will appear with the message {"Sorry, record: - \nWorks order / SAP number: " + ID + "\n\nIs being use by user: " + m_Pass->m_LastUser +"\n\nRecord is locked, try again later..}, if a users attempts to access an locked record.

The records where locked by adding the record ID and User name, to a table specifically designed for the task. Before the program moves to any records, its looks up this table and checks that the record it was requested to move to is not locked. Upon logout the program makes sure there are not any lock records by that user, if any are found they will be remove, hence unlocking the records. The same occurs upon login, the reason for this is to make sure there are not any lock records by that user, which could occur if the user did not logout (Power cut/ Computer crash).

Another additional feature was to create a new record from an existing one (e.g. makes a copy). The user clicks the tick-box at the bottom of the dialog, once ticked the combo-box below is activated and the user selects the source record. (The default selected source record will be the current record). Once an appropriate "Works Order Number" is entered for the new record the OK button is activated.

On OK: -

- If tick-box not ticked, new record created with default values.
- If tick-box ticked, new record created with all the values from the source record (copy), except fields: "Works Order Number", "Date", "User", "Last User" & "Issue", which will not be the same as the source record.

The feature enable/disabled users was added, this feature lets admin users disable/enable "level 1" & "level 2" users. If a user is disabled that user will not be granted access to the system. An AfxMessageBox will appear saying "User profile disabled by Admin. Access denied". Locked users are added to table with CRC which validates that, the users are disabled.

Other additional features included: -

- Save all dialog when main frame is closed.
- Close all multidocument windows when the main control window is closed.
- Print user history table & Print user lost table.
- Sense each user locks their current record, therefore the max number of users is equal to total number of records. If there are already the maximum number of users logged in no more are users will be granted access. This is unlikely to happen, as there are 60 users in total and there are at present 230 records and its unlikely that the records count will decrease but in-fact will probably increase.

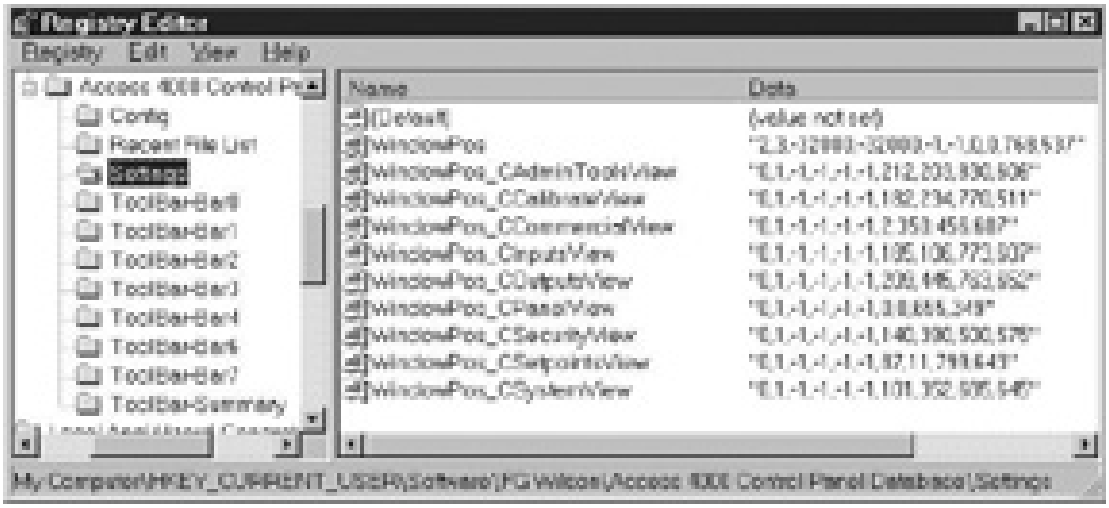
Many small visual displays, bug fixes and performance improvements very made.

Week 19: Monday 27/11/2000 to Friday 1/12/2000

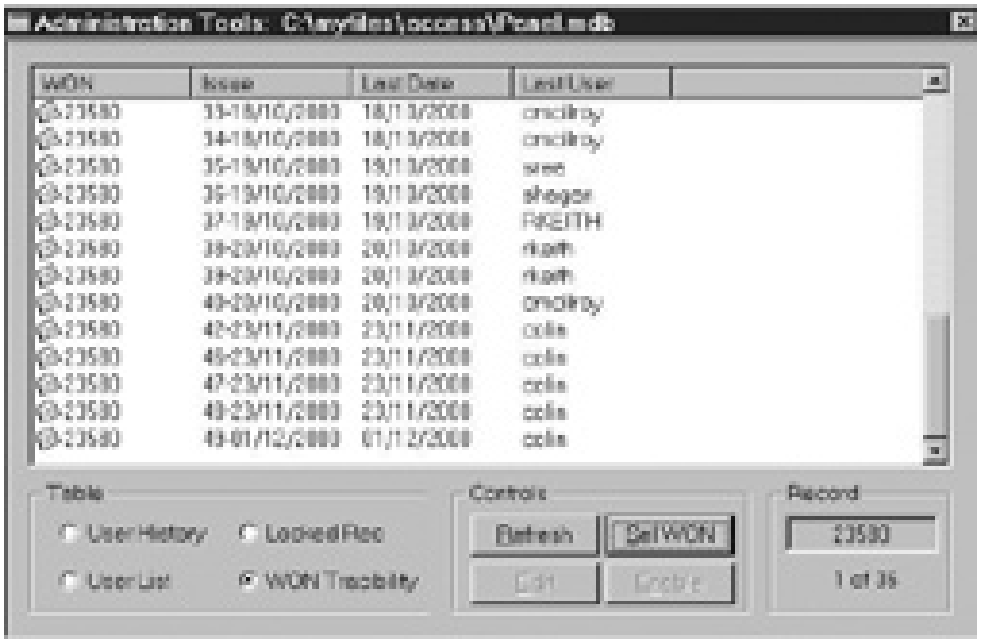
Continued working on the Access 4000 database program, additional features where added, improvements to existing features where also made.

Additional features include: -

- Save size & positions of windows, including the main frame, main control window, configuration windows and the administration tools window. The size & positions of these windows where save into the windows registry, just before the program is close and restored on start-up. Default positions have been programmed for initial first time use.



- Save size & positions of all toolbars and status bar, again stored in the windows registry just before the program is close and restored on start-up, default positions have been programmed for initial first time use.
- Added Titles to the tile bars of all configuration windows.
- Added Tractability table to administration tools, this allows Admin to select a works order number, the program then looks through the user history and filters out everything expect the records that are relevant to the select works order number. Select print on the menu bar will printout the “Works Order Number Tractability Report”.



The default database was originally stored in an INI file; the program has now been modified so that it is stored in the windows registry. If no path is found (will occur when running for the

first time) a File dialog appears and asks the user to select the default database file. (Microsoft Access *.mdb).

Many other improvement and bug fixes where made.

Modbus

The Modbus protocol I developed, has now been released for sometime now, and there is an official software upgrade available for all existing customers of the access 4000 control panel.

On Thursday I demonstrated the basic operation of the Modbus protocol, for customers that where interested in making use of the Modbus protocol. The demonstration was carried out using my Modbus test program, in the Genset test bays. The customers appeared to be happy with the protocol (which passed all their tests) and plan to make use of the protocol, by developing their own windows based software for controlling and monitoring the Genset. The Modbus protocol is medium that lets communicate between the Access 4000 control panel and their software application take place.

Week 20: Monday 04/12/2000 to Friday 08/12/2000

I took three float holidays between Monday and Wednesday of this week.

Thursday was spent evaluating the control software for Access 4000 Modbus; it was developed in China. They also stated that sometimes the response too a Modbus command sent to the controller was too slow, normally the master should expect a response for a query within 128ms. But as discovered when evaluating there control software, the average response time is slow when the engine is running, and sometimes slower than 128ms.

The reason for a slower response when engine is running is because there is a lot of complex calculations taking place and the processor is being pushed to the limit, as a result the Modbus communication slows slightly, as it is a lower priory.

There is not much that can be done to improve the response time on the Access 4000 control panel as it would require a faster processor, which is not an option at present. One solution is to increase the timeout on Master control software to 150ms; this will reduce the number of repeats.

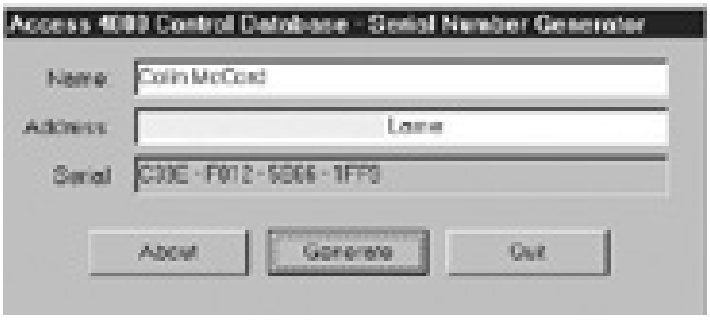
The main problem was not the response time. When engine is running (only when engine is running) exception error 0A (Gabbled Message) appears approx. 5% of the time, this occurs because the processor is involved in complex calculations and sometimes it misses a character (e.g. character fails to be added to the buffer). If there is a cap of more then 1.5ms between character a timeout will occur and exception error 0A (Gabbled Message) will be send to the master, then master will repeats the query. A some gap between commands will reduce the change of this occurring, as It will give the processor in the control panel more time to complete its calculations, store incoming characters in the buffer and respond to Modbus commands.

Evaluation was complete, report written.

Also modifications were made to my Access 4000 control panel database program, they included many small improvements in the program structure, making it more readable and

easier to modify. Plus serial number generation program was written, serial number check and dialogue for user input were added to main database program.

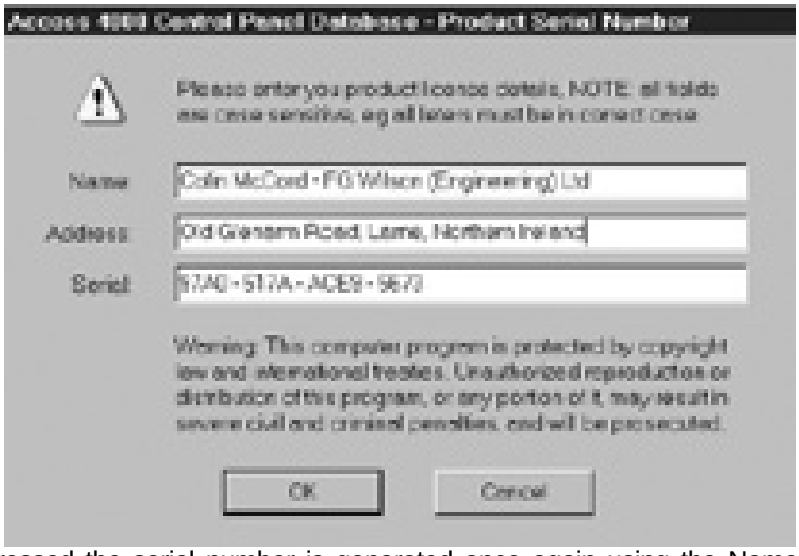
The serial number generator, is a dialogue based MFC program, a password is required for access to the program. After the correct password as been entered the dialogue shown below is displayed: -



The user enters Name & Address, hits the [Generate] button and the 16-digit serial number is generated, the serial number is depend on both the name & address and all fields are case sensitive. This program is not for general use, but only for administrator use only; he/she will generate a user or company license, which will then be passed on (not the program).

When the main database program start-ups it will check the windows register, for license details if found, it will generate its own serial number form the name & address fields and hence compare the generated serial number with the one stored in the windows registry.

If the generated serial number does not match the generated one, or there are no license details (will occur when program first installed onto a machine) a dialogue box will appear asking the user to enter user license details.



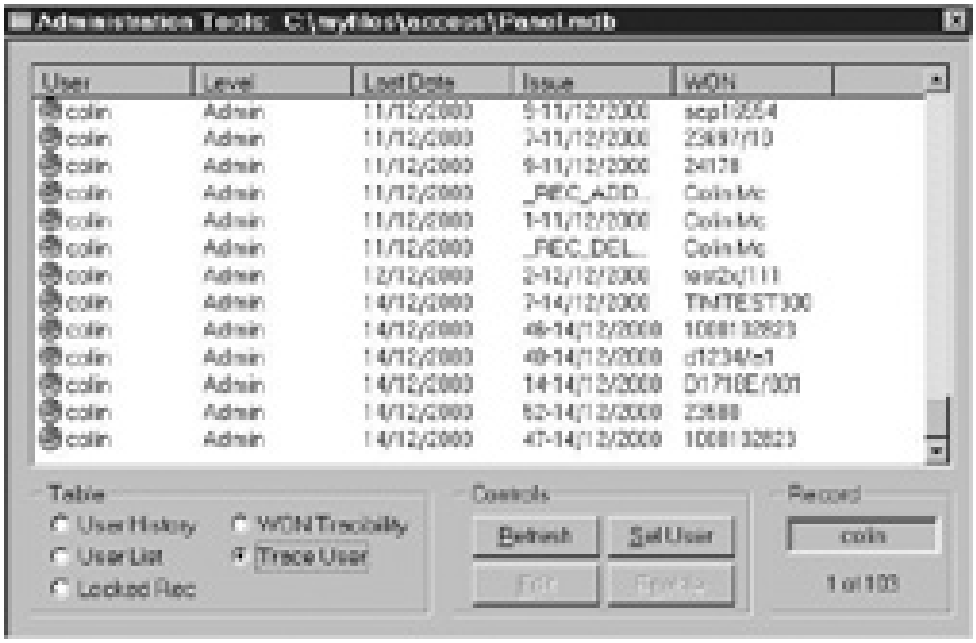
When OK is pressed the serial number is generated once again using the Name (Edit Box) and the Address (Edit Box), once generated it is compared with the Serial (Edit Box). If they match the license details are added to windows register and program starts as normal, else

AfxMessageBox appears saying that invalid license details have been entered and asking the user to check for mistakes. If [Cancel] is pressed the program unloads and access to program denied, until valid user license has been entered.

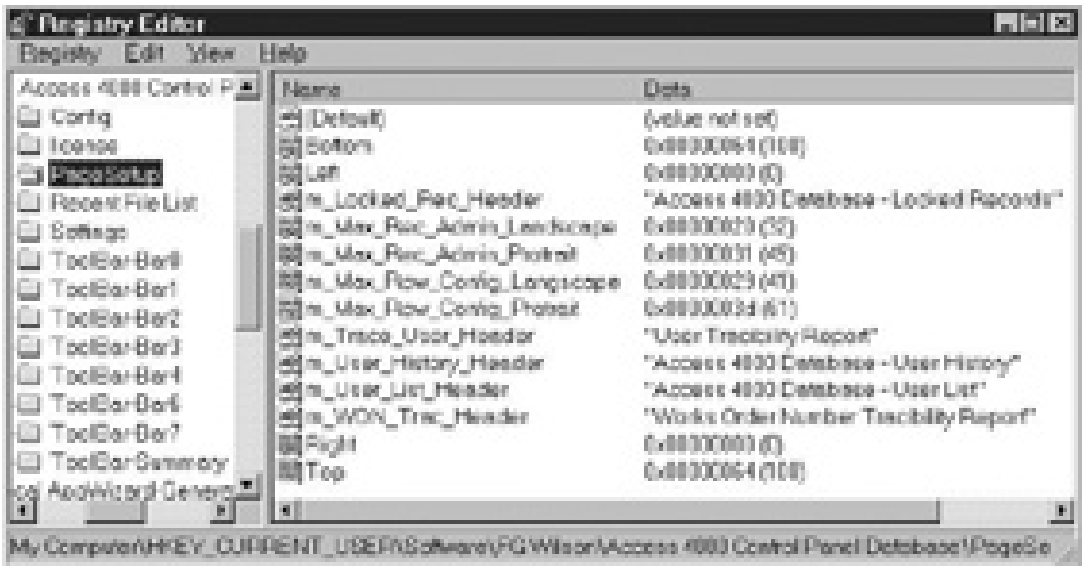
Week 21: Monday 11/12/2000 to Friday 15/12/2000

Continued development of my database application, including many small bug fixes, visual improvements, improved more readable code.

Added "Trace User" table to Administration tools, this allows a user to be selected then a complete history of that user is displayed. The database [UserHistory] is used to generate the table; the program goes through every record within [UserHistory] and filters out all the records that are related to the selected user. Print code was updated for printing of this additional table.



Page setup dialogue added. This dialogue lets the user modify page layout settings, including configuration, margins (offset), administration Tools, orientation and printer settings. All data is stored within the window's registry with default values hard-coded into the application for first time use.



Shown below is a screen shot of “Page Setup” dialogue: -

Stage one (The Database stage) of the application is almost compete, for the next couple of weeks the program will be tested within are group (E11 – Electronic Control Design), with the database file stored within a network drive [O].

The program will be tested for reliability, ease of use, etc… The program will then be modified depending on test results and suggestions, this producer may have to be repeated several times, but eventually the program will be released to replace the existing database (hopefully within 1 to 2 months).

The program has a number of advantages over the existing Microsoft Access based database: -

1) My program is fully compatible with the original *.mdb.
2) Although the database file was created with Microsoft Access, the program does not require Microsoft Access to be installed on the machine to run. The exe file at present is only 380Kb in size; it is so small it can easily be executed from a floppy disk.
3) The program is designed specifically for this task; hence the program is much easier to use than the monster Microsoft Access.

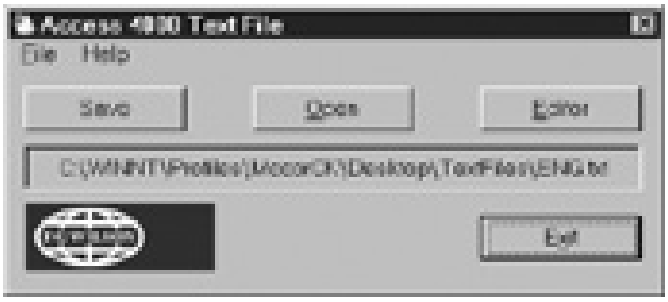
The database stage is only the first stage of many, because it is such a large project it has been split up into stages, and the program will be released at each stage, it could be sometime before all stages are complete. The finished project will include: Internet TCP/IP communication, which will let customers have access to the database from anywhere in the world updating there data as required.

At present my job is to create the database stage (Stage 1) with easy readable code, as it will be use as the bases, for any additional stages at a later date. The modifications may not be completed my me, so its important that my coded is easy to read and contains lots of comments.

Week 22: Monday 18/12/2000 to Friday 22/12/2000

Developed a small dialogue based MFC program, for creating and editing access 4000 text files. There is a dos program already in use, but a windows based application would be a large improvement, so the go ahead was given to create a new windows based application.

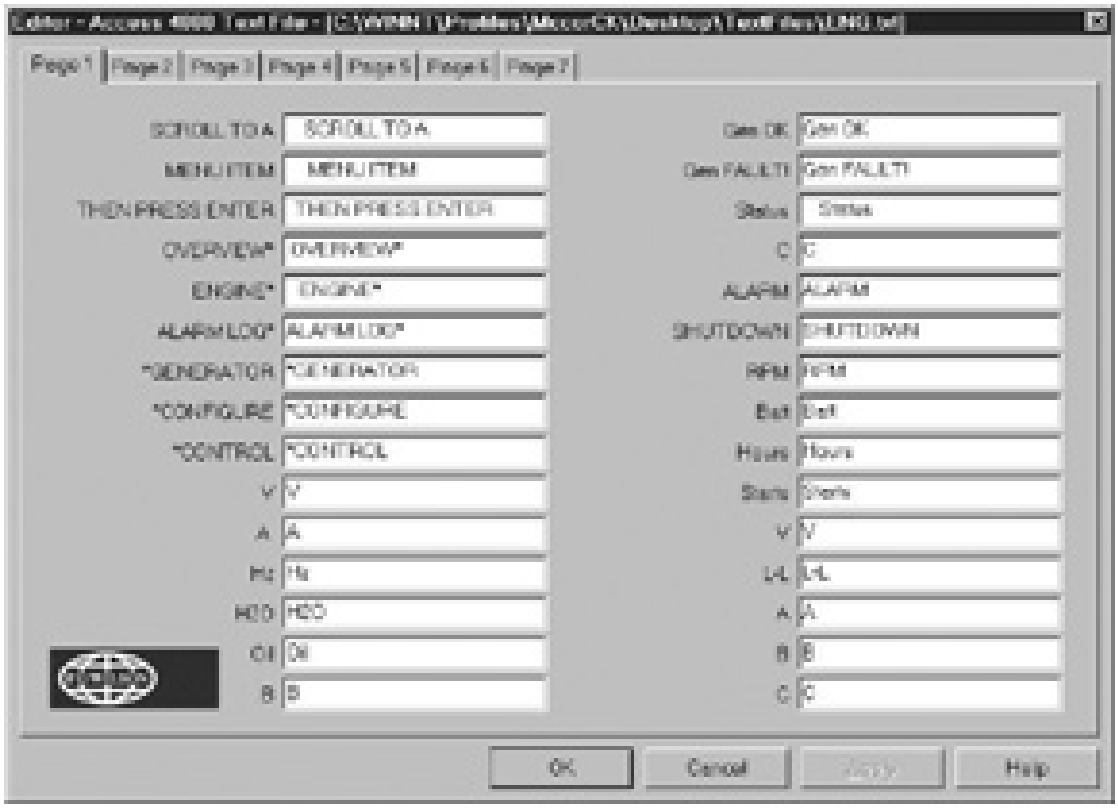
The program was made as simple as possible, and designed for ease of use, the main control dialog is shown below: -



The user can create a new text file by selecting 'new' from the File menu.

The user can select a text file in there ways: -
1) Click the 'Open' Button.
2) Click the 'Open' menu item under 'File'.
3) Drag a text file into the dialog window.

Once a text file has been selected, the user clicks the button Editor, for display & edit of the selected text file.



The editor contains 7 pages, was contain all 181 strings used on the Access 4000 control panel. The user can edit any string, which is saved directly to the text file when the [Apply] or [OK] buttons or pressed.