Communications & Power Industries

DFTS

OPERATING INSTRUCTIONS for DIGITAL FAST TUNER SYSTEM

These instructions apply to the Digital Fast Tuner Systems (DFTS) supplied by CPI Canada integrated with a C-band or Ku-band satellite communications klystron. For general enquiries call CPI Canada Customer Support at (905) 877 0161 or e-mail: marketing @cmp.cpii.com.

OPERATING INSTRUCTIONS: DIGITAL FAST TUNER SYSTEM.

General.

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Installation.

CAUTION:

DO NOT MAKE OR BREAK ANY CONNECTIONS TO THE DFTS CONTROLLER WITH POWER APPLIED. THIS APPLIES TO BOTH THE 15-PIN POWER LEAD AND THE LARGE 50-PIN CONNECTION (96 pin on 6-cavity models) BETWEEN THE CONTROLLER AND THE PERSONALITY MODULE ON THE KLYSTRON.

Klystron Installation.

1. Ensure that the 50-pin connector (96-pin on 6-cavity models) is properly mated and that the rubber "feet" of the controller are in contact with the tuner module on the klystron.
2. Secure using the four fasteners, two each side, to hold the controller to the bracket.
3. It is recommended that the controller unit be attached to the klystron before installing it into the KPA, as access to the fasteners is limited in some KPA's.
4. Once the klystron is properly installed in the KPA, attach the lead to the controller 15-pin input.

Turn-On.

Be sure that the 24V DC supply is within the correct voltage range (22-25V). The DFTS will go through its turn-on sequence, consult the KPA manual for any system messages.

Klystron Or Controller Replacement.

When a controller and a klystron are mated for the first time, the acknowledgement will be transmitted in one of two forms, depending on whether CPI format is used, or whether the controller firmware is the "A" version, which simulates the Thales HSTS to be compatible with some MCL and RSI-Vertex KPAs. For CPI and Xicom KPAs, CPI format is always used. THE ONLY DIFFERENCE between the Thales-emulation and CPI formats is at power-up, otherwise the firmware is exactly the same.

CPI Format (v7.04)	Thales Format (7.04A)
CPI-V7.04 N E00	V1.6 E00

The "N" flag under CPI format means that there is no match between the klystron (personality module) database and the controller database. A suitable terminal program must be used to send some commands to copy the appropriate database memories. Suitable programs are HyperTerminal (Windows 98 utility), FELIX (CPI Canada's communications utility), or other communications utility. If using a terminal emulator, the following settings are to be used:

9600bps, 8 bits, no parity, 1 stop bit.

The following notes ONLY APPLY the first time a klystron and controller are coupled. If the acknowledgement returned is **CPI-VX.XX Y** then the modules are a matched pair and are ready for service.

A suitable cable must be used to connect a personal computer to the DFTS controller while using the KPA's 24VDC supply to power the unit. CPI Canada makes cables for this purpose (764058), and they are supplied with spare klystrons and spare controllers. Check your packing in which you received your products.

Using FELIX.

At runtime, version 3.x of Felix will check the flag returned from the controller turn on acknowledgment and if a mismatch is detected, will prompt you to fix the mismatch. If you respond [Y]es to the prompt, Felix will open the Advanced Configuration dialog permitting you to copy the klystron personality module data to the controller module.

Otherwise, to open the Advanced Configuration dialog, start Felix and select *[Tuning]-[Show Channel Database]* and respond [No] to the prompt to "Read all the DFTS data now". Then click the [Access Menu] button, select *[Dialogs menu...]-[Advanced Configuration]* to open the Advanced Configuration dialog to copy both the Parameters Database and the Channel Tuning Database in the appropriate direction.

Start with the upper field - Controller Parameters - and check [Copy Personality module to controller module] and click the adjacent [Do it] button to copy the controller parameters from the personality module to the new DFTS controller.

Now check [Copy Personality module to controller module] in the lower Klystron Database field and click that [Do it] button to perform that copy. Check that it has been achieved by checking the respective [Compare Modules] checks followed again by the respective [Do it] buttons. Felix will check the appropriate compare, not compare check box.

For more detailed Felix documentation see Appendix 3.

Using Terminal Emulation Software.

The commands and responses should be as shown below. This assumes a 5-cavity device, firmware version 7.01, a 6-cavity product version is currently 1.70.

Action.	Response: CPI Format	Response: "A" versions	Meaning
Power On	CPI-V7.01 N E00	V1.60 E00	Confirms Version. (CPI only: No memory match) No other errors.
A1984	E00		Password Access Set.
Y0	0		No tuning database match between personality module and controller.
Y5	0		No motion control parameter database match between personality module and controller.
Y1 (or Y2) (see Meaning)	E00		Copies klystron (personality module) tuning database to the controller. Do this if the klystron memory is to be transferred, which is usually the case. If you had to replace the personality board on the klystron, then use Y2 instead.
Y3 (or Y4) (see Meaning)	E00		Copies klystron (personality module) motion control database to the controller. Do this if the klystron memory is to be transferred, which is usually the case. If you had to replace the personality board on the klystron, then use Y4 instead.
Y0	1		Memory match: tuning database on personality module and in controller.
Y5	1		Motion control parameters match between personality module and controller.
Power Cycle OFF and ON	CPI-V7.01 Y E00	V1.6 E00	Confirms Version. CPI: Confirms Memory Match. No errors.

Safety Information.

There are quickly-moving high-torque motors in the tuning mechanism of the klystron, and users must be careful to keep fingers etc away from these parts when they could move. The voltages present in the controller and in the tuner are all 24V nominal or less.

System Overview.

The Digital Fast Tuner System is a motorized, microprocessor controlled, tuning system. The DFTS-equipped klystron must be used in conjunction with a controller, CPI Canada part number 760122. Different mechanical versions of this controller are used in different klystron/KPA configurations, such as S-, C-, Ku-, and DBS-band. Call CPI Canada for details.

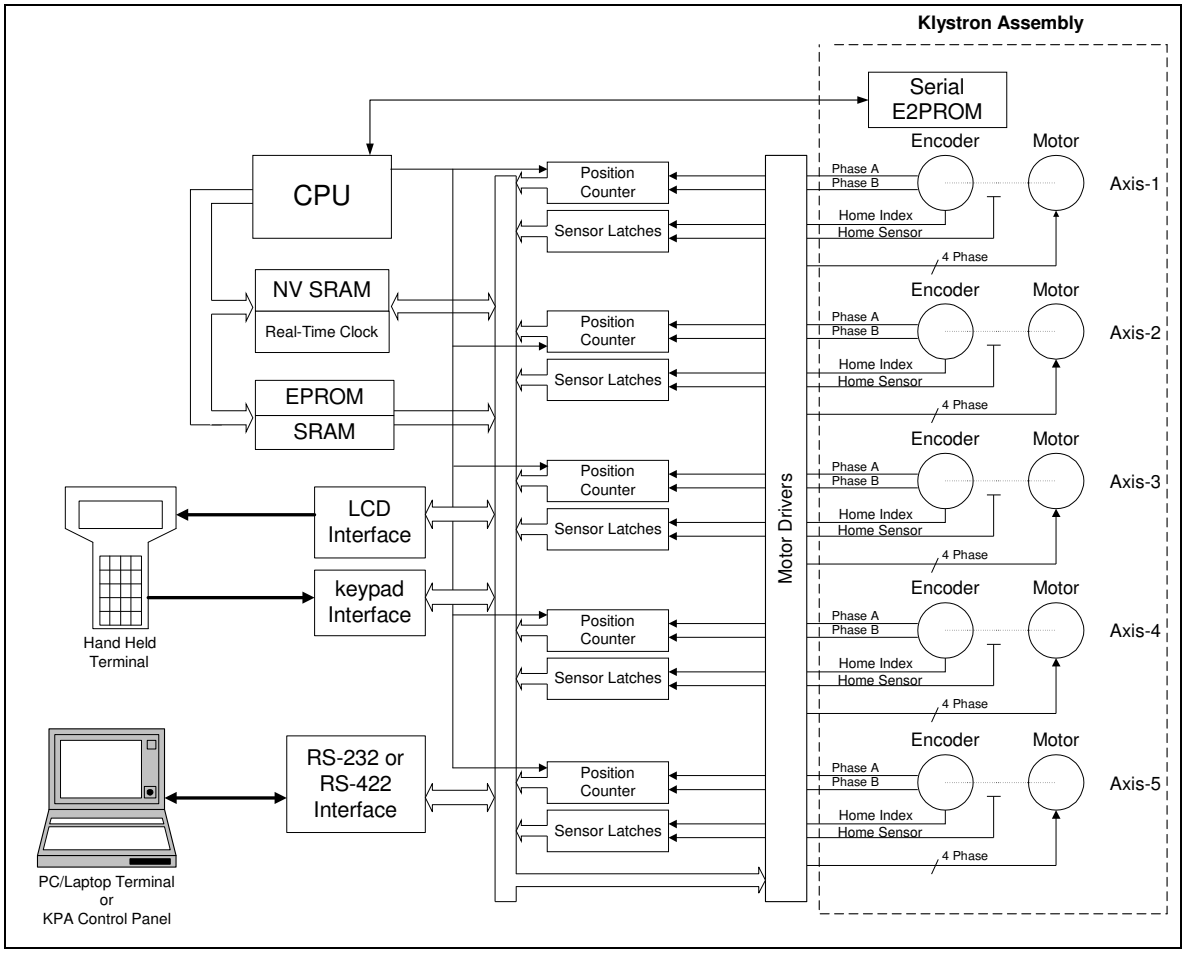
Each cavity of the klystron is independently tuned by a stepper motor, which is controlled in a closed-loop fashion by the controller. The control signals are issued in response to commands sent to the controller through its RS232/RS422 port.

The tuner attached to the klystron has five or six motor axes, depending on model, each axis comprising a stepper motor, an encoder, an optical switch to aid in finding a reference position, and a precision actuator set. For each tuned channel, the relevant stored information comprises one position value for each cavity (axis), plus the frequency of the channel. The frequency value is used by the system when interpolating to a frequency for which no channel has been tuned.

Each klystron is supplied with a personality module attached to the device. This personality module contains:

- System parameters (e.g. acceleration rate) that define the motion control.
- Interpolation coefficients, frequency limits, and other set-up information for that klystron.
- Channel data for up to 50 channels.
- Channel change counter, serial number information.

The controller mounts to the tuner using a 50-pin connector for five cavity models, or a 96-pin connector for 6-cavity versions. This connection allows transfer of motor and encoder signals and transfer of configuration data between the personality module and the controller.



Controller Inputs.

There are two input connectors to the controller. One is no longer used: it was for the CPI hand-held terminal, using a DB25 socket. We expect to remove this input port in a coming hardware revision. The other input, a DB15 socket, is for DC input power, as well as RS232 and RS422 connections. The pin assignments for the DB15 connector are given below.

Pin	Description
1, 9	GND
2	RS232 Rx
3	RS232 Tx
4	N/C
5	N/C
6	RS232 0V
7 & 14	OV DC Supply
8 & 15	+24V DC Supply
10	RS422 Rx A
11	RS422 Rx B
12	RS422 Tx A
13	RS422 Tx B

Input Requirements.

RS232, RS422: 9600bps, 8 bits, no parity, 1 stop bit.
ASCII-coded alphanumeric string.

DC 24VDC +1V, -2V

DAMAGE MAY OCCUR TO THE EMI SUPPRESSING FERRITES AT OR ABOVE 26V.

System Parameters and Channel Data.

The system parameters are organized in the klystron personality module memory as an array of 16-bit integers. Also contained within the personality module is channel data for each tunable channel, and this comprises position data for each axis, as well as the frequency assignment for the channel. All of this data resides on a personality board, which is configured and supplied with each klystron. This means that DFTS controllers are interchangeable between klystrons. See Appendix 2 for the list of System Parameters and some explanation of their function.

Issuing Commands.

General.

Commands are issued through the RS232/422 port. Communications with the port will typically be conducted by a controller found in a KPA system, but for system configuration it may be more convenient to use either a terminal emulation program on a personal computer, or to use CPI's DFTS communication application FELIX which runs under Microsoft Windows 3.1, 95/98 or NT 4.x.

Windows Interface Program.

CPI offers a Windows Interface Program - FELIX - to make configuration and tuning of the product highly convenient. This program is available upon request to any user of CPI's DFTS products, subject to normal agreements on usage and further distribution. See Appendix 3 for instruction on its use.

Error Codes

The following is a list of error codes the controller may return. If no error is reported after a command is issued, the controller will return the "E00" code:

SYSTEM READY	E00
EMPTY CHANNEL	E03
PLUNGER POSITION LIMIT	E04
SYNTAX ERROR	E05
PLUNGER NOT AVAILABLE	E07
PROTECTED INSTRUCTION	E08
LIMIT SWITCH REACHED	E09
MISSING EEPROM	E10
EEPROM FAIL	E11
CORRUPTED EEPROM	E12
DISPLACEMENT TIMEOUT	E13
CALC ERROR	E14
CHANNEL CHANGE TIMEOUT v7.01, 7.02 only	E15
HOME MOVE TIMEOUT v7.01, 7.02 only	E16

Power Up sequence

Upon power up, the controller goes to the home position and then will assume the last active channel settings, if enabled through parameters 60 and 61. This takes approximately five seconds with simultaneous zeroing of all axes, or 20 seconds plus a configurable delay time if using sequential zeroing. The controller will then transmit the version number of the installed firmware, with an identifier "CPI". This allows system designers to differentiate CPI versus other manufacturers' products. The last character in the version string is a "Y" or "N" to flag memory mismatch between controller and klystron personality module. (Note that V7.0xA does not do this – it returns a Thales-consistent string.)

Precision of Home Position.

The home position is a zero-reference position. It is found by moving the axes upwards until an optical switch is triggered, which means that HOME has been found within about 0.020". The system then searches for the next encoder index mark, which locates HOME to the exact encoder position. As an indicator of system precision, there are typically 1600 encoder steps per revolution, and a revolution translates to 0.031" (0.80mm) for Ku-band, so one encoder step is 0.000 019" (0.5µm).

Command Set Summary

1. Command codes are not case sensitive.
2. All error codes are terminated with a carriage return character (0x13).
3. All return strings are terminated with a carriage return character (0x13).
4. All user entries should be terminated with a carriage return character (0x13).

Tuning Notes

The klystron tuning is the same as for the manually tuned equivalent klystron with one very important exception. The final direction for tuning each cavity prior to memorising has to be made in the UPWARDS direction in frequency. This is opposite to what most users are used to with C-band and Ku-band klystrons.

Note that mechanical backlash is significant so that a downward movement in cavity frequency must go beyond the target and return, with backlash of about 400 to 600 points in each direction. It is highly recommended that tuning be done from the front panel of the KPA if the model is equipped with this option, especially where the KPA manufacturer has devised a system to compensate for backlash for customer convenience. However, many KPAs are not so equipped, and the easiest way to retune is to use CPI Canada's "FELIX" utility.

Tuning Using Felix.

Please see Appendix 3 for detailed instructions.

1. You need an interface cable to draw 24V power from the KPA while providing an RS232 connection between klystron and the 760122 controller. CPI Canada can provide such a cable (764058), check your packaging to see if you have one already. Otherwise, see the section "Controller Inputs" for the pin assignments for the controller.
2. Start Felix, and set the COM port correctly for your computer.
3. Use pull-down menu [Tuning]- [Show Channel Database]
4. Select a channel by left clicking on it, then right click, and choose [Tune to this channel].
5. If there is no channel tuned to the frequency of interest, you can interpolate to that frequency by clicking in the frequency field of the [Channel / Database Edit] area, enter the frequency of interest, and press <return>.
6. Click on the button that is marked [Read Cavity Positions].
7. You can now trim the channel by selecting a step size, then clicking in the space for a given cavity, and use the up and down arrows on your keyboard to move the tuning up and down.
8. For taking the backlash out, use a step size of 100 or 200.
9. For fine trimming, a step size of 10 is generally fine enough.
10. THIS IS IMPORTANT. Make sure you finish tuning each cavity with an UPWARD movement.
11. THIS IS VERY IMPORTANT. Before memorising a channel, press the button [Read Cavity Positions], then memorise it

Tuning Using HyperTerminal or similar.

NOTE: This procedure is possible, but will take some time and is a little cumbersome. A better alternative is to contact CPI Canada to obtain the latest version of FELIX if possible, or to obtain advice from a technician familiar with the product on how to proceed.

The commands you will need are:

- A1984 (password access),
- C***cc*** to tune to channel ***cc***,
- S***n*** (to select a cavity),
- Q001***xxxxx*** (to select a step size for tuning via U and D commands),
- U (to tune cavity ***n*** up in frequency by ***xxxxx*** points),
- D (to tune cavity ***n*** down in frequency by ***xxxxx*** points),
- R to read the current positions,
- R***cc*** to read the current contents of channel ***cc.***
- M***cc*** to memorise the current state as channel ***cc***.
- F***fffff.f*** to interpolate to ***fffff.f*** MHz.

See Appendix 1 for a complete list of available commands and a brief description of how they work.

APPENDIX 1: Command Set Summary Table.

COMMAND	NAME	SYNTAX	RETn CODES	COMMENTS
A	Password	1) Annnn 2) A	E00, E05	1) Enable password protected commands 2) Disable protected commands
B	Read Active Channel	B	E05	Returns string for xx, the last requested channel number, with position data: BxxP1nnnnnP2nnnnnP3nnnnnP4nnnnnP5nnnnn
C	Change Channel	Cnn	E00, E05, E03, E13.	Move to channel nn.
D *	Move down	D	E00, E07, E08, E09	Moved selected tuner (Command S) up (increase cavity frequency). Distance governed by STEP SIZE parameter.
E +	Clear Database	E	E00, E05, E08.	This command will clear the controller channel database. Clearing the controller channel database does not affect the data stored in the Klystron personality module.
F *	Frequency Interpolation	Fnnnnn.n	E00, E05, E20, E09.	Interpolates from database to tune to input frequency nnnnn.n MHz.
G	Read Ch Chg Counter	G	E05	Returns Gnnnnnnnnnn, the number of channel changes made by the tuner mechanism.
H	Channel Change Time	H	E05	Returns Hnnnn, where nnnn is last channel change time in msec.
J +	Index Count	J	E05, E08	Return string is the count for each cavity of distance from triggering home position optical switch to true home P1nnnnnP2nnnnnP3nnnnnP4nnnnnP5nnnnn
M *	Memorise Channel	1)MxxFffffff.fP1nnnnn P2nnnnnP3nnnnnP4 nnnnnP5nnnnn 2) Mxx	E00, E05, E04.	1) Memorise string as Channel xx. 2) Memorise current positions in channel xx.
N	Read Parameter Value	Nxxx	E05	Returns Nxxxnnnnn where nnnnn is the stored value of system parameter xxx.
P *	Read Position	P	E05	Returns Px nnnnn, where x is the selected cavity tuner and nnnnn is its position.
Q +*	Write Parameter Value	Qxxxnnnnn	E05, E00	Stores nnnnn as the new value of system parameter xxx.
R	Read Channel	1) Rnn 2) R	E05	1) Read contents of channel nn from database. 2) Read current tuner positions.
S *	Select	Sn	E00, E07, E08	Select tuner of cavity n.
U *	Move up	U	E00, E07, E08, E09	Moved selected tuner (Command S) up (reduce cavity frequency). Distance governed by STEP SIZE parameter.
W K	Read Version	W	E05	Returns "CPI-v.vv x" where v.vv is firmware version number and x is "Y" or "N", indicating Y for a match between personality module and controller module or N for a mismatch. x applies to firmware rev 6.6 or higher only
X	Unused Command	X	X000000000000	Command has no relevance to CPI's tuner, but is acknowledged by the tuner for compatibility. Return string is X000000000000
Y *	Copy Database	Yn	E00, E05	Y0 = performs a database comparison between the Klystron Personality module and the controller. Echoes '0' for no match or '1' for a database match. Y1 = Database Copy: Copy Klystron personality module database to controller. Y2 = Database Copy: Copy controller database to the Klystron personality module. Y3 = Copy Parameters from the Klystron personality module to controller. Y4 = Copy parameters from controller to the Klystron personality module. Y5 = Compare parameters between the controller and the Klystron personality module. Echoes '0' for no match or '1' for a parameter match.
Z	Go to Home	Z	E00, E05	This command sends all cavity tuners plungers to the home reference position, and resets all position counters.

* = Password Protected. The password is "1984".

+ = Factory Password Protected. "Q" command protection varies by parameter, see Appendix 2.

APPENDIX 2: Parameter Range & Details

Param No.	Name	Value Range	Details
001	Step Size	5 to 65535	This defines the number of micro-steps executed by the D or U command. Values smaller than 5 will not yield good results due to backlash and motor inertia. For large steps (coarse tuning) use a typical value of 100 to 200. For fine tuning use a typical value between 5 and 20.
002	Travel Speed	400 to 32767	Travel speed: The smaller the value, the faster the travel speed. Lower values below 400 may work depending the supply voltage and the mechanical torque required for the particular Klystron tuner assembly. In general a value of 500 would yield stable performance. If the travel value is too small, one or more of the motors may jam.
003	Home Speed	2 to 7	Home speed value: The smaller the number, the faster the home travel speed. Prior to v7.01, we recommend setting to 7. At v7.01, we recommend a value of 2.
004	Acceleration step size	0 to19	Acceleration step: defines how smooth is the acceleration curve when travelling from channel to channel. A small value would yield faster travel between channel to channel, but coarse acceleration curve. A large value would yield slower travel between channel to channel with a smooth acceleration curve. Smooth acceleration is required for systems with a large torque requirement. If the acceleration value is too small for a large torque Klystron tuner, one or more of the motors may jam.
005	Compen-sation	1 to 32767	Compensation (number of encoder steps used for belt compensation) – Compensation is required to correct for mechanical backlash. It is activated only in one direction. In a typical system there are 1600 encoded position per revolution, therefore a value of 1200 would yield a ¾ revolution compensation span. The smaller the compensation value, the faster is the channel-to-channel change time (when used in the compensation direction). The compensation must be greater than the total system backlash
006 *	Mechanical Position Limit	1 to 32676	Mechanical Position Limit: Software uses this value to prevent motion beyond a certain limit point. If the user attempts to move to a channel that contains positions above this limit, no motion will take place and an error code (“E09 Software Limit Reached”) is returned. This parameter is set based on the mechanical limit of the tuner assembly. For example if the travel span for the tuner is 10 revolutions and the encoders provide 1600 points per revolution, the limit should be set to 16,000 points.
007 *	No. of cavities	1 to 65535	Number of cavities – a parameter that is used to identify the type of controller in use (4, 5 or 6 cavity controller).
008 *	Fmin	1 to 65535	Fmin – The minimum frequency tuned by the controller defined in MHz integer units.
009 *	Fmax	1 to 65535	Fmax – The maximum frequency tuned by the controller defined in MHz integer units.
010 *	Ch Ch Count	00	Lower 16-bit value of the channel change count – this is the LS part of a 32-bit system parameter that is used to count the number of times the controller changed channels.
011 *	Ch Ch Count	00	Upper 16-bit value of the channel change count – this is the MS part of a 32-bit system parameter that is used to count the number of times the controller changed channels.
012	Position error window	1 to 65535	Defines the maximum deviation from the desired target position that will not result in motion. For example: If parameter 012 is set to 5 and the memory setting for CH01, P1 is 5000 and its actual position is between 4995 and 5005, the command C01 will result in no motion. In this way, unimportant position errors will not cause an attempt to reset position if the same channel is requested again. Typical values for this parameter are 3 to 10.
013	Linear Tune Range	0 to 65535	The interpolation F command will linearly interpolate between two tuned channels that straddle the target frequency, provided those two channels are spaced less than nnnn.n MHz apart. eg a value of 05000 corresponds to 500.0 MHz.
014 *	Home UP move	0 to 65535	This defines the distance that the tuner will move UP before moving DOWN to HOME. For this parameter, 12800 corresponds to one revolution. Recommended: 37000.
015 *	Smart Home	0 = off 1 = on	When enabled, the tuner only moves UP (by 014 value) before seeking HOME if the optical switches are triggered, i.e. the tuner is close to the HOME position already. If the optical switch is clear, no UP movement takes place.
016	Sequential Zero	0=disabled 1=enabled	When enabled, the first HOME command after start-up is performed by zeroing (going to home) with one cavity at a time. This reduces current draw during the first few seconds after powering on the KPA, which facilitates KPA power management.

017	Start-Up Delay	0 to 900	The value of this parameter is a delay time in seconds between the end of sequential zeroing and assuming the last active channel (if enabled via parameters 060 and 061).
018 *	Ch Change timeout	2 to 30	Channel Change Timeout. Value is number of seconds to report: default is 3 seconds for 5 or 6 cavity, 10 seconds for 4 cavity.
019 *	Home Timeout	2 to 30	Channel change timeout. Value is number of seconds to report: default is 10 seconds.
020 to 024 *	A (See note 1,3)	0 to 65535	A coefficients for Cavity 1 to Cavity 5 respectively, used in frequency interpolation.
025 to 029 *	B (See note 1,3)	0 to 65535	B coefficients for Cavity 1 to Cavity 5 respectively, used in frequency interpolation
030 to 034 *	C (Notes 1,2,3)	0 to 65535	C coefficients for Cavity 1 to Cavity 5 respectively, used in frequency interpolation
020 to 025 *	A (note 1,3)	0 to 65535	A coefficients for Cavity 1 to Cavity 6 respectively, used in frequency interpolation on 6 cavity klystrons.
026 to 031 *	B (note 1,3)	0 to 65535	B coefficients for Cavity 1 to Cavity 6 respectively, used in frequency interpolation on 6 cavity klystrons
032 to 037 *	C (note 1,2,3)	0 to 65535	C coefficients for Cavity 1 to Cavity 6 respectively, used in frequency interpolation on 6 cavity klystrons.
050 *	Klystron S. No.	0 to 65535	Klystron (board) Serial number : the parameter value is set by the manufacturer during the product configuration phase (prior to shipment).
051 *	Controller S. No.	0 to 65535	Controller serial number: the parameter value is set by the manufacturer during the product configuration phase (prior to shipment).
052 *	Controller Model	0 to 65535	Controller Model: the parameter value is set by the manufacturer during the product configuration phase (prior to shipment).
053 *	Klystron Model	0 to 65535	Klystron Model Number: the parameter value is set by the manufacturer during the product configuration phase (prior to shipment).
054	Comms mode	0 to 65535	Communication mode selection: system configuration parameter (read only from the serial interface, write accessible from the keypad) was added to select either the RS232 or the RS422 interface, now irrelevant since v5.9. Value = 0 enables the RS232 transceiver (default) Value = 1 enables the RS422 transceiver
055 *	Encoder Logic	0 to 65535	External/Internal Optical encoder Logic selection: Factory option for future upgrade. Value = 255: Selects external HP logic encoder Logic (default) Value = 0 : Selects the internal FPGA logic optical encoder Logic
060 *	Active Seek	0 to 65535	If this signature is set to 0xAA along with Parameter 061=0x55, the controller will travel to the last active channel on power up. For any other value, following power up the controller will travel to the home position remain there. Value=170 : Travel to last active channel on power up if Parameter 061=85
061 *	Active Seek	0 to 65535	If this signature is set to 0x55 along with Parameter 060=0xAA, the controller will travel to the last active channel on power up. For any other value, following power up, the controller will travel to the home position and remain there. Value=85 : Travel to last active channel on power up if Parameter 060=170

* = Factory Password required to write to this parameter. Others require User Password (1984)

NOTES

1. To maintain maximum processing speed and minimise memory usage, negative interpolation coefficients are entered in raw 16-bit signed integer format (16-bit complement notation). E.g.:
   -1 = 65535, -2 = 65534, -3 = 65533 etc.
   In general any negative coefficient –n between –1 and –32,767 is computed and entered numerically as (65536-n).
2. The C coefficient is internally scaled down by a factor of 1000. This is done in order to accommodate decimal coefficient numbers (as required by the interpolation algorithm). For example a value of 0.034 is entered as an integer value of 34, and a value of -0.023 would be entered as an integer value of –23 translating to an entry of 65513 (see note 1 above for entering negative numbers).

3. The specific memory allocation for interpolation coefficients depends on the model of the DFTS tuner assembly. Five cavity tuners allocate coefficients parameters from 020 - 034 inclusive. Six cavity tuners allocate coefficient parameters from 020 - 037 inclusive. For this reason, care must be taken when manually setting interpolation coefficient parameters to ensure the proper parameter is being accessed for the tuner assembly being used. CPI recommends using the FELIX utility v3.x or greater (available free of charge to OEMs and CPI DFTS customers) for setting these and all other controller parameters on 5 and 6 cavity DFTS units.

APPENDIX 3: Felix Tuning Utility Instructions.

FELIX 98 INSTALLATION

NOTE:
If the file you have is FXPxxSETUP.EXE where xx could be anything, go to the Felix XP installation section.

FELIX34.ZIP Contents

760963D.EXE	Microsoft Windows executable - Felix 3.x
740945E.DOC	MS Word 6.0 DFTS Interface/Felix utility manual
A*.DLL	Async Routines DLL files
BWCC.DLL	Library Routines DLL

Installation Instructions for Felix v 3.4

Two installation batch files have been added to assist you with installing Felix.

INSTAL98.BAT - for installing to all Win95/98/ME systems
and
INSTALNT.BAT - for installing to all NT/Win2000 systems **

Log onto the drive directory where the batch files are stored and run the appropriate batch file from a DOS/Command prompt.

** Notes on operation under Windows NT/2000/XP

Known fault: The Interactive Tuning Dialog is disabled.

You will need Administrator rights on Win2000/NT/XP systems to write files to any system directory (ie x:\WINNT), which the batch file will attempt to do.

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1)Extract and copy all the *.dll files in the FELIX34.ZIP file to the x:\windows\system directory. Now you can either just run the appropriate batch file as described above, or you can manually install the program by continuing with step 2.

1)Extract and copy all the *.dll files in the FELIX34.ZIP file to the x:\windows\system directory.

2)make a directory called FELIX on a hard drive (md x:\felix).

3)copy 760963D.EXE and 740945E.DOC from the zip into the FELIX directory you created.

4)760963D.EXE is the FELIX executable. You can just run it from the FELIX directory or make a short cut to it in the standard Win95/98/NT way.

Whats new in Felix 34

1) some minor mods to support EEPROM ver 7.x.
2) Felix also now displays all carriage returns (0x13) recieved in the Interactive Tuning Dialog as [cr]

Whats new in Felix 3.3

1) Fixed a bug in the handling of the Interpolation Limit parameter when transferring to and from the Configuration Dialog that caused an order of magnitude change on each transition.
2) Added support for the Low Power Home Delay parameter in Version 6.92 EEPROMs
3) Some modifications to the async routines to try and achieve compatibilty with Windows NT/2000/XP. We still recommend Windows 95/98. A known bug under Windows NT/2000/XP is improper operation in the Interactive Tuning Dialog.
4) Felix now uses Internet Explorer to launch/view this document from the Help button.

Whats new in Felix 3.1

1) This manual has been added to the CPI software drawing number 760945C.

2) Felix will now try to start Microsoft Word when displaying this document. If he can't find Word, Felix will use WordPad to display the document.

3) support for the new parameter, Low Power Home, (parameter #016) in five cavity EEPROM version 6.9 has been added. This parameter can be accessed from the Configuration Dialog using the Low Power Home checkbox, or from the Show Channel Database dialog in the Parameters Listbox.

Whats new in Felix 3.0

1) Felix version 3.x now offers support for both 5 and 6 cavity CPI DFTS controllers/klystrons. Thompson analog tuners are not longer supported, although they may work in part, proper operation is not guaranteed.

Following are some pertinent notes on this new multi-controller support

i) With support now extended to 5 and 6 cavity controllers, at runtime Felix will attempt to contact a DFTS on the last COM port used in order to determine what kind of controller is connected. If a controller is found, the version number and number of cavities will be read from the DFTS controller and Felix will pop up a small window displaying this information. If no DFTS controller is found, a couple of error windows will be displayed to this effect. Respond No or Cancel to these if you do not have a DFTS connected to your computer or you wish to change the COM port. If there is a DFTS connected and you get error messages at runtime, always Retry the errors in order to read the data correctly.

ii) If you start Felix without a controller connected and then subsequently connect a controller while Felix is running YOU MUST select the *[System]-[Check DFTS]* menu before doing anything else in order to let Felix interrogate the newly connected controller in order to determine number of cavities and firmware revision. This is VERY IMPORTANT, as without correct cavity and firmware revision data, Felix will not be able to correctly communicate with the attached controller.

iii) In the rare event that you change the controller connected from a 5 to a 6 cavity (or vice versa) while Felix is running, you must again select *[System]-[Check DFTS]* to allow Felix to re-read this information from the newly attached controller.

2) In the Configuration Dialog, you can now set the two parameters, Active Seek Hi and Active Seek Lo, by simply checking (or unchecking) the [Seek Last Channel] checkbox. When this checkbox is checked or unchecked, Felix will take care of setting these two controller parameters for you automatically.

3) support for the new parameter HomeStretch has been added. See Appendix 2 for details on this new DFTS controller parameter

4) Generation of the System Log File (.SLF files, see the section Files Generated by Felix toward the end of this document for an explanantion of the .SLF files) can now be turned off if desired, as per user request.

You can access this function from the main *[System]-[Save System Log?]-[Yes/No]* menu as well by clicking the [Access Menu] Button on the DFTS Channel Database display (or the Right Mouse Button on the DFTS Channel Database display) and selecting *[System Menu]-[Save System Log?]-[Yes/No]* from the pop up menu.

Felix will also remember the setting in the FELIX.INI file so you do not have to reset the menu selection during subsequent use. The default is to enable saving the system log file the first time you run Felix 3.x, as it was in Felix 2.x. If you don't want to save the .SLF file, turn if off with this menu selection.

5) a number of prompts and dialog titles have been changed in the hopes of making them more self explanatory to the user.

6) a Help button has been added to the Channel Database dialog which will open this document.

7) In the Interpolation Coefficient Dialog, you can now send a single coefficient to the controller by enter the desired value for that parameter and then pressing Enter to send that single parameter to the DFTS controller.

Show Channel Database: General Information.

[Tuning]-[Show Channel Database]. When the dialog opens Felix wants to read the DFTS controller channel database. This takes, at most, 10 seconds if you choose to read all 50 channels from the DFTS

If you respond Y he will read the DFTS. If you respond No he won't if you wish to load a formally saved database from a disk file (.CPI extension). More on this later. If you don't wish to read all 50 channels, then respond No, change the number of channels and then click the [Read DFTS database] button to read the tuner again. Felix only reads (and writes) the number of channels in the Channels edit cell

In most cases you should respond Y and let Felix read the current database and parameter set from the klystron unless this is a new controller that you wish to download an existing database and parameters to.

Once you have a database in the display and you have selected an entry:

- Left doubleclick - brings that ch to the edit cells
- E - brings that ch to the edit cells
- Ctrl - tunes to the selected channel
- Enter - tunes to the selected channel
- Insert - pops up the Password Input prompt.
- M - memorizes the channel
- C - Clear this channel (all data 00000s)
- R - Load/Read a database file from disk
- S - Save/Write this database to a disk file.
- A - Apply or Send this database to the DFTS

When the input focus is on either list box or in any edit cell the following keystrokes are "hot".

- F1-F6 - selects Cavity 1 - 6 respectively (F6 is ignored when using a 5 cavity controller)
- F8 , S - selects the step size edit cell.

or use the right mouse button to bring up a menu on any channel entry.

The CTRL or Enter key will immediately tune the klystron to the selected channel in the Channel Database list.

Tuning the klystron with the keyboard

You can give the focus to any of the cavity edit cells in the following way:

- F1 - F6 - selects cavity 1 - 6 respectively (six cavity controllers);
- F1 - F5 - selects cavity 1 - 5 respectively (five cavity controllers);
- F8 , S - selects the step size edit cell
- by clicking on an edit cell or using the TAB or SHIFT-TAB key to move the focus to an edit cell;

Now use the up/down arrow keys to tune that cavity. Here is a suggested method for tuning as quickly as possible using only the keyboard:

- "pop" to the cavity you want with an F1-F5 or F6 function key
- now use the UP or DOWN arrow keys to move the cavity by the increment shown in the Step Size cell
- press F8 or S at anytime to move to the step size cell

You can use this method to quickly move from cavity to cavity and tune the device. Remember, TAB and SHIFT-TAB will move you forward or backword through the edit cells respectively.

If the target cavity position (Current position + / - Step size) will exceed the Position Limit parameter or will be less than 0, the cavity won't move.

Changing Cavity Step Size

Press F8 or S anytime the focus is on any edit cell or either of the list boxes.

Change the step size by using the scroll bar or the keyboard. The step size moves in 10,20,50,100,200,500,1000,2000,5000 increment settings.

...with the keyboard

use the UP and DOWN keys to change the step size. Everytime you change it, the new step size is automatically sent to the DFTS, no need to press ENTER on the cell to set the step size

...with the mouse

Everytime you click the scroll bar the new step size is automatically sent to the DFTS. There is no longer any need to press ENTER on the cell to send the step size

If you wish to use a step size other than those automatically selected, enter the value in the step size edit cell and press Enter to set that step size.

Setting a Frequency using interpolation

NOTE: This procedure assumes that correct Interpolation Coefficients, and the Linear Interpolation Limit parameter have been initialised in the DFTS controller

7Enter a Frequency in the Freq Edit cell and press ENTER. The DFTS will attempt to interpolate to the frequency and set the cavities. If the frequency is outside the permitted Min/Max frequency parameter values an error will be reported.

After successful interpolation, Felix will update the edit cells with the new cavity positions and the interpolated frequency and show as channel 00.

Usage Tip. You can now set the channel number in the Ch edit cell to an unused channel and press the ENTER key, or select the [Memorize Channel] button to save this frequency and cavity data to that new channel number

- ***NOTE*:** this only applies to EEPROM v5.9 or later . Earlier EEPROM versions will not read back the interpolated data correctly. To find out what EEPROM version you have, double click on the "DFTS Firmware Level" entry in the Controller Parameters list box.

Changing the number of channels

Use the scroll bar next to the Channels edit to set the number of channels. The range is 1-50. When reading or writing the klystron database, this is how many channels Felix will read/write. If you attempt to save a new channel to a channel number beyond the indicated value, Felix will increment the channel number to reflect the new channel. If you attempt to save a channel number <1 or >50 Felix will report an error.

The Buttons:

Memorize: will take the data in the edit cells, check it syntactically and if correct, set the klystron to that channel and then prompt if you wish to save it using the M command to the DFTS. Channel number must be from 1-50.

If you DO NOT save the data to the DFTS, the database display will be updated with the new channel you just set, but it will be preceded by a small "m" indicating it is not memorized in, or applied to, the DFTS.

Apply to DFTS: will write all the channels in the database display to the DFTS sequencially. This takes about 10-15 seconds for 50 channels

Save Database to disk: will save the database and all current parameters in a .CPI file.

NOTE: The interpolation coefficients ARE NOT saved in the .CPI file. They are saved in .COF files from the Interpolation Coefficients dialog [Save] button.

Read Database from disk: will read the database and all current parameters in a .CPI file. The database is placed in the channel list and all channels will be marked with a preceding "m" indicating they have not been saved/memorised in the DFTS

Read DFTS Database: will re-read the DFTS controllor database and update the database display with the new info. The number of channels read is determined by the setting of the Channels edit cell.

Read Cavity Positions: will read the DFTS cavity positions and place the results in the edit cells as Channel 00. Frequency information is undefined in this case.

Access Menu: pops up the same menu you see when you right mouse button on the Channel Database Listbox.

Home Position: Moves all the cavities to the home position (00000). Felix will update the edit cells with the new cavity information and set Ch 00. Frequency information is undefined in this case.

Help: Will open this document

Notes on restoring a controller configuration/channel database from a previously saved .CPI disk file:

In the event that you wish to restore a DFTS configuration from a previously saved .CPI file, here is the proper procedure:

1) Start Felix and go to the Channel Database - *[Tuning]-[Show Channel Database]* from the main menu

2) When Felix asks you if you wish to "Read all the DFTS data now", respond *No*.

3) Click the [Read database from disk] button, and select your previously saved .CPI file from the File Open dialog. Felix will load that file and initialise all his internal data structures with the saved information from the file. At this point no data has been sent to the DFTS controller. It has only been loaded into Felix's memory.

4) Now select the [Apply Parameters] button (Felix makes this the default button after loading a file). This will send all the DFTS controller parameters to the DFTS.

5) Now select the [Apply to DFTS] button. Felix will now download the klystron channel database to the controller.

6) That's it. The controller is now properly configured with the data loaded from the .CPI file.

NOTE: it is VERY IMPORTANT to do step 4 BEFORE step 5, as obvious as that might seem. The controller must be setup with the proper parameters before you attempt to send the channel database to the controller or errors will likely occur.

Notes on restoring Interpolation Coefficients from a previously saved .COF file:

The above procedure only restores the DFTS controller parameters and the klystron channel database. It does not restore the interpolation coefficients. To restore the interpolation coefficients follow this procedure.

1) access the interpolation coefficients dialog by clicking the [Access Menu] button, then select *[Dialogs Menu....]-[Coefficients]*

2) Click the [Load] button and select the previously saved .COF file from the

3) Felix will pop up a window and prompt "Coeffients loaded. Send them to the DFTS?". Click Yes if you wish to send them to the DFTS controller, or No if you wish to edit them first before sending.

If you clicked Yes, Felix will display "....writing interpolation coefficients..." followed by "Coefficient write complete". At this point the coefficients have been successfully downloaded to the DFTS controller.

If you edit the coefficients before sending them, once you have completed editing, click the [Write] button to send all the coefficients to the DFTS controller.

The Interpolation Coefficients dialog also supports sending single coefficients to the controller. Just navigate to the coefficient you wish to send and press Enter on that edit cell. That single coefficient will be sent to the DFTS controller.

Right mouse button menu:

If you right mouse button - (RMB) anywhere on the Channel database list, you get a context menu with the following selections.

- *[Tune to this channel]*: Tunes to the selected channel. It works on whatever database entry is selected (LMB), which may or may not be the entry you were on when you did the RMB

- *[Memorize this channel]*: will memorize the selected channel and clear any "m" marker on the channel if the memorize function is successful

- *[Edit this channel]*: puts the selected channel data into the cavity edit cells.

- *[Clear this channel]*: will clear all the data in the channel, setting Freq and all cavities to 00000 in the controller.

- *[Read this channel]*: will read the selected channel and place the data in the cavity edit cells.

- *[Save and Read database]*: work the same as the Save and Read buttons.

- *[Apply database to DFTS]*: will apply (save/memorise) the entire channel database into the DFTS controller, same as the "Apply to DFTS" button

- *[Dialogs Menu...]* : will pop up a sub menu which lets you open any of the other dialogs, Configuration, Advanced Configuration, Coefficients, and Interactive Tuning.

- *[System Menu...]* will allow you access various system related functions, including [View System Log] (see below), which will display a log of all Felix I/O activity to the DFTS. It also permits you to access Windows accessories like NotePad, Calculator etc.

- *[System Menu...]-[View System Log]*: The System log is a file Felix creates at run time and uses it to store a log of all RS232 commands sent to the DFTS as well as the DFTS response to those commands. The file name will be the system date in the following format, YYYYMMDD, where YYYY is the system year, MM is the system month and DD is the system day on which the file was created. The extenstion of the file will be .SLF (System Log File).

- *[System Menu...]-[Save System Log?]-[Yes/No]* will enable or disable the generation of the .SLF file(s).

Every new calender day Felix will create a new .SLF file based on that days date. Old files are not removed or deleted. The user can decide if and when old .SLF files should be purged from the system. These files may prove helpful in diagnosing problems with the DFTS as they will provide a time/date stamped history of all commands sent and their responses.

- *[System Menu...]-[Check DFTS]*: Forces Felix to go out and attempt to read the number of cavities and the EEPROM revision number from the DFTS controller. Same function that is executed at runtime in Version 3.x, as well as from the main *[System]-[Check DFTS]* menu.

Parameter Control

Double click on any parameter in the *Controller Parameters* list to open an edit cell that will permit you to see the current value for that parameter (as just read from the DFTS), and the current Min and Max for this parameter, if applicable. You can enter a new value and press ENTER or click [OK] to send that parameter to the DFTS. Klick [Cancel] to back out and leave the parameter unchanged.

Parameters are password protected. Use the *[Password]* menu selection to gain access.

You can also just right click the mouse to display the current value of the selected item in the Parameter list at the bottom of the dialog.

The [Read Parameters] button will read all the controller parameters into memory and should be done before you save a database file to ensure that the current DFTS controller parameter set is saved in the .CPI file.

Configuration Dialog

Accessed by clicking the [Access Menu] button from the Channel Database dialog, and selecting *[Dialog Menu...]-[Configuration]*.

This display shows all the controller parameters (tho not the interpolation coefficients) at a glance. You can navigate to any edit cell and enter a new value for the parameter and then press ENTER to send that single parameter to the controller.

Advanced Configuration Dialog.

This permits you to compare the DFTS Controller Module (CM) software parameters and klystron database parameters to those in the Klystron Personality Module (KPM). It also permits you to copy the data from either the CM to the KPM, or KPM to the CM.

Simply click on the check box representing the action you wish to take and then click the respective [Do it] button to perform the operation.

When you select Compare, Felix will update the respective comparison indicator checks to display the results of the comparison you selected.

The [Clear] button will completely erase the DFTS Controller channel database. The Klystron Personality Module channel database remains unaffected.

Felix will warn you to this effect and allow you to back out. If you proceed, be advised that all 50 channels in the current Controller Channel Database will be cleared to 00000s. The Klystron Personality Module database will be retained.

Interactive Tuning Dialog

The Interactive Tuning Dialog is accessed from *[Tuning]-[Interactive Tuning]* main menu selection or from the *[Dialogs Menu...]-[Interactive Tuning]* from the Channel Database menu.

The Interactive Tuning window is essentially a smart terminal interface to the DFTS. You can enter any valid command in the edit cell and press Enter to send that command to the tuner. If the file 740945B.DOC is in the runtime directory, the help button will open it. This is a manual for the current DFTS EEPROM version.

The [Save log to disk] button will save the current command log history into a text file on disk. Felix prefers to use the directory [runtime]\logs, where [runtime] is whatever directory you ran Felix from, however you can navigate to whatever directory you want and store the file. If the [runtime]\logs directory does not exist at runtime Felix will attempt to create it for you at runtime.

These files may prove helpful in trouble shooting.

Commands sent to the DFTS will be displayed in the Tuning Log listbox, preceded by the time of day stamp and TX:

Information received from the DFTS will be displayed in the Tuning Log listbox preceded by the time of day stamp and RX as shown below:

[10:58:35] : Tx -> W <---- command sent to the DFTS
[10:58:36] : Rx -> CPI-7.01 Y <---- response recieved from the DFTS

- ***NOTE:*** Be careful with this dialog. You can access and modify ALL DFTS parameters through the use of the Interactive Tuning Interface. NO CHECKS are made for valid parameter values.

Right Mouse Button

If you click the right mouse button anywhere in the tuning log listbox, Felix produces a small menu that lets you save the log to disk (same as clicking the [Save Log to File] button) or copy the highlighted command in the log to the entry cell. This permits you to take a previous command and re-send it easily or permits you to edit a previous command slightly to re-send it without having to re-type a long cryptic command.

The menu also provides access to some basic Windows utilities like Notepad, Calculator etc for your convenience.

Double Clicking on an entry in the Tuner Log will immediately copy it to the edit cell, but not send it, thereby allowing you to edit the command first if necessary. This can save time. For example: the result from a R command will display all the freq and cavity information for the current channel. Doubleclick on the RX entry produced by the R

command in the list and it will appear in the Tuner Command cell. Then you can change the R to an M, change the Cxx to whatever channel you want to save this freq as, and then press Enter to memorize the command without having to type in all those numbers.

The [Help] button will display the DFTS EEPROM command documentation provided the file 740945E.DOC is in the runtime directory.

Frequency Interpolation Coefficients Dialog

This dialog, *[Tuning]-[Interpolation Coefficients]*, displays the Interpolation Coefficients used in Frequency Interpolation. It allows you to read and write the coefficients to the DFTS as well as to a disk file for permanent storage and retrieval.

- Click the [Read] button to read all the data from the DFTS.
- Click the [Write] button to send all the displayed data to the DFTS.
- Click the [Save] button to save all the displayed data to a disk file (extension .COF).
- Click the [Load] button to load all the data from a disk file (extension .COF).

WARNING: Sending incorrect coefficients to the DFTS can have undesirable effects.

In version 3.x you can send each coefficient to the controller one at a time by navigating to the desired coefficient edit cell and pressing Enter on that edit cell.

Tuner Cycle Testing Dialog

This dialog permits you to cycle the tuner through as many as 6 different channels, through as many iterations as you prefer.

The edit cells labelled S1 to S6, the indices, allow you to select which channels you wish the tuner to cycle through. Set the channel number to 0 to de-select that index. You can select any valid channel for any index. Use the scroll bars to select a channel for that index.

Choose the number of iterations you wish to cycle through with the [Number of iterations] edit cell/scroll bar.

Click the [Home between sequences] check box to force the tuner to the home position between each iteration.

The [Iteration Delay] edit cell permits you to force a delay (in milliseconds) between each iteration.

Click [Begin Test] to start the cycling. Once the cycle is underway, Felix will display the start time/date, the current time/date as well as the elapsed time for the test.

Moving the mouse pointer anywhere over the dialog will cause Felix to prompt you to abort the test. This is the ONLY WAY to interrupt the cycling.

- ***NOTE:*** Background processing will be degraded significantly while Felix is cycling the tuner. This is a side effect of ensuring that Felix is not interupted during cycling.

- We also recommend that you disable any screen savers you have running while cycling the tuner as screen saver invocation has caused problems during cycle testing at CPI.

Files Generated by Felix

Felix can generate the following files (in the following examples, FILENAME can be any 8 characters you choose, although Felix will default to the DFTS SN parameter for the filename).

FILENAME.CPI - This is a database file of all DFTS software parameters as well as the klystron tuning database. It is generated by clicking the [Save] button on the Configuration Dialog

FILENAME.LOG - This is a log of all commands sent and the DFTS response received from the Interactive Interface Dialog. It is created by clicking [Save log to file] in the Interactive Interface Dialog.

FILENAME.COF - this is a database file containing the coefficients used in calculating interpolated frequencies. It is created by clicking [Save] in the Interpolation Coefficients dialog.

YYYYMMDD.SLF - where YYYY is the system year, MM the system month and DD the system day.

FELIX.INI - this file is created in the x:\windows\system directory and stores information used by Felix.

To report bugs or other information about Felix, send email to eda@cmp.cpii.com or contact CPI in the normal manner.

APPENDIX 4: Felix_XP Operating Instructions

Installation Instructions for Felix_XP

Run the file FXPSETUP.EXE you downloaded or received. You may need Administrator rights to install Felix_XP. Felix_XP requires WindowsNT/XP/2000/2003 Server with one available COM port or USB to COM port adapter cable.

Whats new in Felix_XP

1) New re-write of Felix_XP into a 32 bit compiler. There are a number of different context menus throughout the program dialogs. Right click to see them.
2) Felix_XP now supports integrated generation of interpolation coefficients. Highlight three channels in the channel database list, in ascending order of freq, and click the Calc Coefficients button. In this version, Felix_XP is picky about the order of the channels. They must be from top to bottom in the list, in ascending order of freq, ie lowest freq at the top, middle freq in the middle and highest freq at the bottom, relatively speaking, in the list box. Any three freqs can be used provided they meet these "placement" restrictions. Coefficient setup is generally a factory only adventure and performed after the first three channels (lowest freq, middle and highest) are tuned, so user friendliness was not a high priority when implementing this.
3) All controller parameter writes are password protected. Use the menus to set the password. The menu entry shows you the current password level. Pressing Cancel on the password entry dialog will CLEAR the password.You must have factory password access to use this function.
4) scripting from the Interactive Dialog requires factory level password access. Scripting is also a factory only function and caution should be taken if you wish to run scripts. You should save the current controller EEPROM to a disk file BEFORE you attempt to run scripts in order to facillitate restoring the DFTS controller in the event of scripting mistakes or other problems that might corrupt the EEPROM as a result. You must have factory password access to use this function.
5) Felix_XP no longer uses two data files to save the EEPROM configuration. Felix ver 3 used one file for interpolation coefficients and one for EEPROM controller parameters and the channel database. Felix_XP stores all the data in a single ASCII text file with the default extension (.DFTS). Hence the old data files are not compatible with Felix_XP.
6) Felix_XP supports the use of variable timeouts for RS-232 communications. These can be accessed from the main menu, [DFTS System] - [Set DFTS Timeouts] Three different timeouts are defined. Channel Change, Home Position and Basic Timeout.

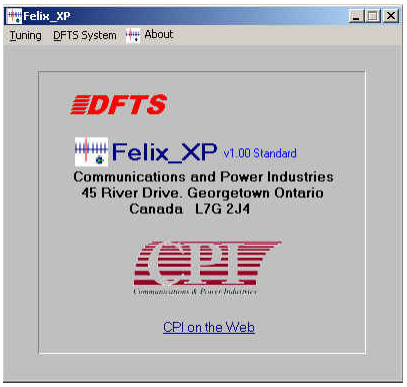
Running Felix_XP

Click the Felix_XP icon  on your desktop,

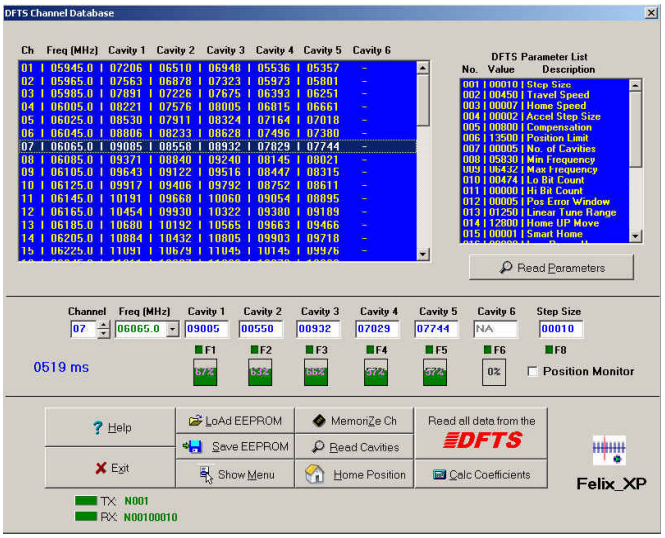
or run Felix from the Start Menu:

Start-All Programs-Felix_XP-Felix.

It should appear like this on your display.



Show Channel Database: General Information



[Tuning]-[Show Channel Database]. When the dialog opens Felix_XP wants to read the DFTS controller channel database. If you respond Y he will read the DFTS. If you respond No he won't in the event you wish to load a formally saved database from a disk file (.DFTS extension). More on this later. In most cases you should respond Y and let Felix_XP read the current database and parameter set from the klystron unless this is a new controller that you wish to download an existing database and parameters to.

Once you have a database in the display and you have selected an entry it should appear something like this:

- •Left doubleclick - brings that ch to the edit cells
- •Right click - show menu for all functions
- •Enter - tunes to the selected channel
- •Insert - pops up the Password Input prompt.
- •M - memorizes the channel
- •C - Clear this channel (all data 00000s)
- •R - Load/Read a database file from disk

- S - Save/Write this database to a disk file.

When the input focus is on either list box or in any edit cell the following keystrokes are "hot".

- F1-F6 - selects Cavity 1 - 6 respectively
  (F6 is ignored when using a 5 cavity controller)
- F8 - selects the step size edit cell.

or use the right mouse button to bring up a menu on any channel entry.

The Enter key will immediately tune the klystron to the selected channel in the Channel Database list.

Tuning the klystron with the keyboard

You can give the focus to any of the cavity edit cells in the following way:

- F1 - F6 - selects cavity 1 - 6 respectively (six cavity controllers);
- F1 - F5 - selects cavity 1 - 5 respectively (five cavity controllers);
- F8 - selects the step size edit cell
- by clicking on an edit cell or using the TAB or SHIFT-TAB key to move the focus to an edit cell;

Now use the up/down arrow keys to tune that cavity. Here is a suggested method for tuning as quickly as possible using only the keyboard:

- "pop" to the cavity you want with an F1-F5 or F6 function key
- now use the UP or DOWN arrow keys to move the cavity by the increment shown in the Step Size cell
- press F8 at anytime to move to the step size cell

You can use this method to quickly move from cavity to cavity and tune the device. Remember, TAB and SHIFT-TAB will move you forward or backword through the edit cells respectively.

If the target cavity position (Current position + / - Step size) will exceed the Position Limit parameter or will be less than 0, the cavity won't move.

Changing Cavity Step Size

Press F8 anytime the focus is on any edit cell or either of the list boxes.

Change the step size by using the scroll bar or the keyboard. The step size moves in 1,2,5,10,20,50,100,200,500,1000,2000,5000 increment settings. Use the UP and DOWN keys to change the step size. Everytime you change it, the new step size is automatically sent to the DFTS, no need to press ENTER on the cell to set the step size

If you wish to use a step size other than those automatically selected, enter the value in the step size edit cell and press Enter to set that step size.

Setting a Frequency using interpolation

NOTE: This procedure assumes that correct Interpolation Coefficients, and the Linear Interpolation Limit parameter have been initialised in the DFTS controller

Enter a Frequency in the Freq Edit cell and press ENTER. The DFTS will attempt to interpolate to the frequency and set the cavities. If the frequency is outside the permitted Min/Max frequency parameter values an error will be reported.

After successful interpolation, Felix_XP will update the edit cells with the new cavity positions and the interpolated frequency and show as channel 00.

Usage Tip. You can now set the channel number in the Ch edit cell to an unused channel and select the [Memorize Channel] button to save this frequency and cavity data to that new channel number

- NOTE: this only applies to EEPROM v5.9 or later . Earlier EEPROM versions will not read back the interpolated data correctly. To find out what EEPROM version you have, double click on the "DFTS Firmware Level" entry in the Controller Parameters list box.

The Buttons:

Memorize: will take the data in the edit cells, check it syntactically and if correct, set the klystron to that channel and then prompt if you wish to save it using the M command to the DFTS. Channel number must be from 1-50.

Save EEPROM: will save the database and all current parameters in a .DFTS file.

Load EEPROM: will read the database and all current parameters in a .DFTS file. The database is placed in the channel list and all channels will be marked with a preceding "m" indicating they have not been saved/memorised in the DFTS

Read all data from the DFTS: will re-read the DFTS controllor database and update the database display with the new info. The number of channels read is determined by the setting of the Channels edit cell.

Read Cavities: will read the DFTS cavity positions and place the results in the edit cells as Channel 00. Frequency information is undefined in this case.

Show Menu: pops up the same menu you see when you right mouse button on the Channel Database Listbox.

Home Position: Moves all the cavities to the home position (00000). Felix_XP will update the edit cells with the new cavity information and set Ch 00. Frequency information is undefined in this case.

Help: Will open this document

Calc Coefficients:

You must first tune three channels, the bottom of the frequency band, the top and somewhere in the middle, the closer to the middle the better. Highlight these three channels in the channel listbox and click the button. Felix_XP will calculate the coefficients and display them. At this point the calculated coefficients HAVE NOT been written to the controller. Click the Write Coefficients button to update the controller with the new coefficients. Once the coefficients are written to the controller you should now be able to interpolate to any freq within the band defined by the max and min freq parameters.

The Interpolation Coefficients dialog also supports sending single coefficients to the controller. Just navigate to the coefficient you wish to send and press Enter on that edit cell. That single coefficient will be sent to the DFTS controller.

Frequency Interpolation

Once the interpolation coefficients are calculated and written to the controller, (see Calc Coefficients above) you can enter a frequency, in MHz, in the FREQ edit cell and press enter to move the cavities to that frequency. If the freq entered already exists in the database, the controller moves to that channel. If the frequency is within the range for linear interpolation, as set by paramter xxxxx, linear tune range the controller uses Linear interpolation. If the frequency is outside the linear interpolation range, the controller uses Parabolic Interpolation.

Right mouse button menu:

If you right mouse button - (RMB) anywhere on the Channel database list, you get a context menu with the following selections.

- [Change to this channel]: Tunes to the selected channel. It works on whatever database entry is selected (LMB), which may or may not be the entry you were on when you did the RMB
- [Read this channel]: will read the selected channel and place the data in the cavity edit cells
- [Clear this channel]: will clear all the data in the channel, setting Freq and all cavities to 00000 in the controller.
-
- [Tune cavities]: selects cavity 1 allowing you to manually tune the cavities with the up/down arrown keys.
-
- [Save and Read database]: work the same as the Save and Read buttons
- [Read this channel]: will read the selected channel and place the data in the cavity edit cells.
- [Clear the database]: will clear the entire channel database.
-
- [DFTS Password]: enter the DFTS access password.
- [EEPROM Configuration]: display the EEPROM configuration dialog
- [Interpolation Coefficients]: display the coefficients dialog.
- [Controller/Personality Module]: display the Advanced Configuration dialog.
- [Interactvie Tuning]: display the terminal interface dialog.
- [Tuner Cycling]: display the cycling dialog.

Parameter Control

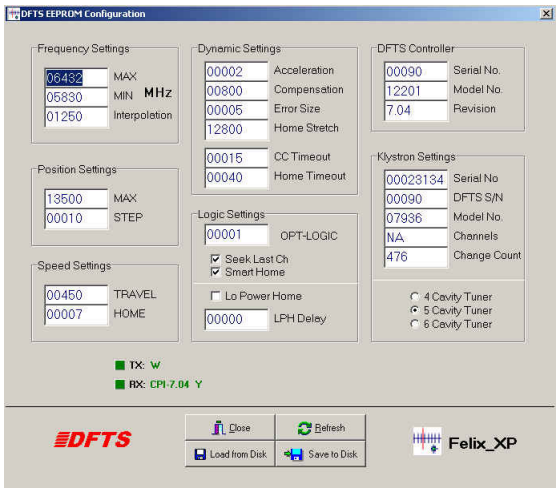
Double click on any parameter in the Controller Parameters list to open an edit cell that will permit you to see the current value for that parameter (as just read from the DFTS), and the current Min and Max for this parameter, if applicable. You can enter a new value and press ENTER or click [OK] to send that parameter to the DFTS. Klick [Cancel] to back out and leave the parameter unchanged.

Parameters are password protected. Use the [DFTS Password] menu selection to gain access.

You can also just right click the mouse to display the current value of the selected item in the Parameter list at the bottom of the dialog.

The [Read Parameters] button will read all the controller parameters into memory and should be done before you save a database file to ensure that the current DFTS controller parameter set is saved in the .CPI file.

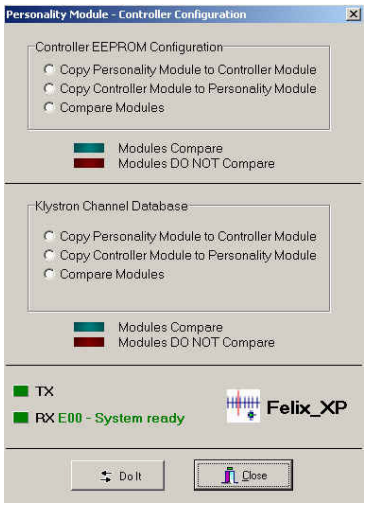
EEPROM Configuration



Accessed by clicking the [Access Menu] button from the Channel Database dialog, and selecting [EEPROM Configuration] or from the main menu by selection [Tuning]-[EEPROM Configuration].

This display shows all the controller parameters (tho not the interpolation coefficients) at a glance. You can navigate to any edit cell and enter a new value for the parameter and then press ENTER to send that single parameter to the controller.

Personality Module Dialog

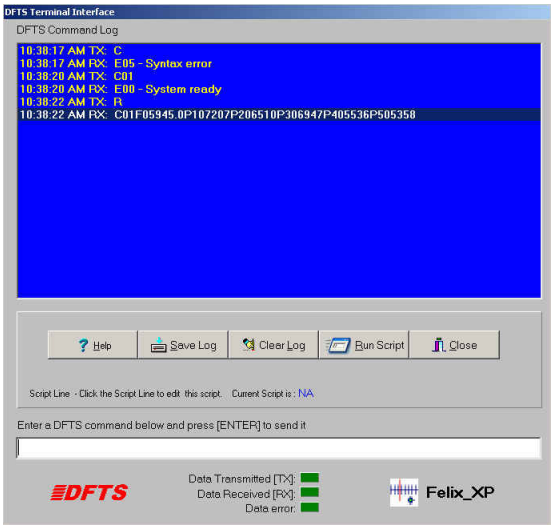


This permits you to compare the DFTS Controller Module (CM) software parameters and klystron database parameters to those in the Klystron Personality Module (KPM). It also permits you to copy the data from either the CM to the KPM, or KPM to the CM

Simply click on the check box representing the action you wish to take and then click the respective [Do it] button to perform the operation.

When you select Compare, Felix_XP will update the respective comparison indicator checks to display the results of the comparison you selected.

Interactive Tuning Dialog



The Interactive Tuning Dialog is accessed from [Tuning]-[Interactive Tuning] main menu selection or from the [Interactive Tuning] from the Channel Database menu.

The Interactive Tuning window is essentially a smart terminal interface to the DFTS. You can enter any valid command in the edit cell and press Enter to send that command to the tuner. If the file HELP_XP.PDF is in the runtime directory, the help button will open it. This is a manual for the current DFTS EEPROM version.

The [Save log to disk] button will save the current command log history into a text file on disk. These files may prove helpful in trouble shooting.

Commands sent to the DFTS will be displayed in the Tuning Log listbox, preceded by the time of day stamp and TX:

Information received from the DFTS will be displayed in the Tuning Log listbox preceded by the time of day stamp and RX as shown below:

[10:58:35] : Tx -> W <---- command sent to the DFTS
[10:58:36] : Rx -> CPI-6.90 Y <---- response recieved from the DFTS

- **NOTE: Be careful with this dialog. You can access and modify ALL DFTS parameters through the use of the Interactive Tuning Interface. NO CHECKS are made for valid parameter values.**

Right Mouse Button

If you click the right mouse button anywhere in the tuning log listbox, Felix_XP produces a small menu that lets you save the log to disk (same as clicking the [Save Log to File] button) or copy the highlighted command in

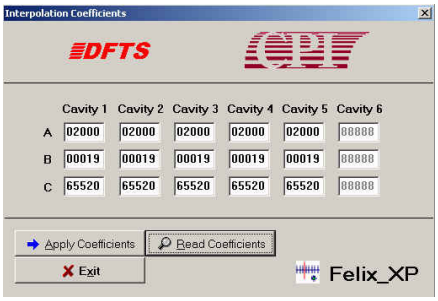
the log to the entry cell. This permits you to take a previous command and re-send it easily or permits you to edit a previous command slightly to re-send it without having to re-type a long cryptic command.

The menu also provides access to some basic Windows utilities like Notepad, Calculator etc for your convenience.

Double Clicking on an entry in the Tuner Log will immediately copy it to the edit cell, but not send it, thereby allowing you to edit the command first if necessary. This can save time. For example: the result from a R command will display all the freq and cavity information for the current channel. Doubleclick on the RX entry produced by the R command in the list and it will appear in the Tuner Command cell. Then you can change the R to an M, change the Cxx to whatever channel you want to save this freq as, and then press Enter to memorize the command without having to type in all those numbers.

The [Help] button will display the DFTS EEPROM command documentation provided the file HELP_XP.PDF is in the runtime directory.

Frequency Interpolation Coefficients Dialog



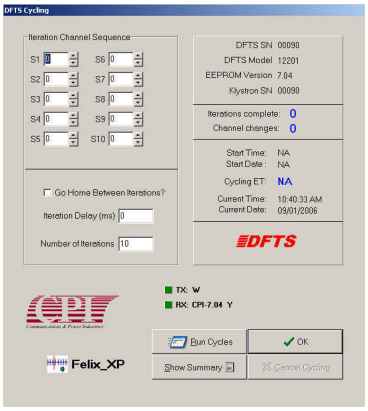
This dialog displays the Interpolation Coefficients used in Parabolic Frequency Interpolation. It allows you to read and write the coefficients to the DFTS.

- Click the [Read] button to read all the data from the DFTS.
- Click the [Write] button to send all the displayed data to the DFTS.

WARNING: Sending incorrect coefficients to the DFTS can have undesirable effects.

In Felix_XP you can send each coefficient to the controller one at a time by navigating to the desired coefficient edit cell and pressing Enter on that edit cell.

Tuner Cycle Testing Dialog



This dialog permits you to cycle the tuner through as many as 10 different channels, through as many iterations as you prefer.

The edit cells labelled S1 to S10, the indices, allow you to select which channels you wish the tuner to cycle through. Set the channel number to 0 to de-select that index. You can select any valid channel for any index. Use the scroll bars to select a channel for that index.

Choose the number of iterations you wish to cycle through with the [Number of iterations] edit cell.
Click the [Home between sequences] check box to force the tuner to the home position between each iteration.
The [Iteration Delay] edit cell permits you to force a delay (in milliseconds) between each iteration.

Click [Begin Test] to start the cycling. Once the cycle is underway, Felix_XP will display the start time/date, the current time/date as well as the elapsed time for the test.
Click [Cancel] to stop cycling.

Click [Show Summary] to display a printable summary of the cycling test.

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