INSTALLATION & OPERATING INSTRUCTIONS

Circuitmaster cfa1000m/b

CRIMP FORCE ANALYSERS

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Copyright Notice

About this manual

The following symbols are used throughout the manual to highlight particular instructions or procedures. The meaning of each is given below.

This symbol is found next to safety notes about work procedures that are potentially hazardous. Pay attention to these warnings and proceed with particular caution.

This symbol is placed next to notes about work procedures during which special care must be taken to prevent damage to the system or other associated equipment.

This symbol is placed next to useful tips or general information about a procedure or instruction.

This manual covers information for both the Circuitmaster cfa1000m and cfa1000b cfa models. Information that is exclusively relevant to one model or the other will be annotated with the relevant suffix e.g. cfa1000**m** or cfa1000**b**. Information which is common to both models will be annotated cfa1000**x**.

Product News And Updates

During the life of the product it is likely that software and/or documentation updates will become available from time to time, to fix bugs or add new features to the system.
These product updates will be published on the Circuitmaster website for download by customers. The Circuitmaster website address can be found at the front of this manual.

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1.0 cfa1000x Features & Benefits

The Circuitmaster cfa1000x is a second generation crimp force analyser which provides a cost effective solution to the problem of wire termination monitoring.

Product highlights include the following:-

- Powerful 16 bit microprocessor allows faster evaluation of more complex algorithms
- Operation with or without encoder.
- Operator Menus in English,German,Italian,Spanish and Portugese languages.
- On line statistics capability including mean,stdev,cp and cpk analysis
- Real force mode operation
- Unit can be calibrated with optional cal unit to read peak force in Newtons with high accuracy
- Graphical Control Panel (GCP) allows on line viewing of force curves aiding fault diagnostics.
- Universal mains power supply for worldwide operation.
- Relay interface for older generation automatic machines
- Coaxial interface for modern machine integration.
- Four freely programmable relay outputs (2 High power)
- Two opto-isolated freely programmable 24v inputs (One on cfa1000b)
- Four digit alphanumeric password facility.
- Software upgrades can be ‘downloaded’ to the analyser in the field using Win95/98 application.
- Useful batch counter facility for bench top applications.
- Operation with or without display unit connected (cfa1000m)
- New rugged preloaded force mode ram sensor design.
- Automatic sensor calibration and linearisation algorithms incorporated.

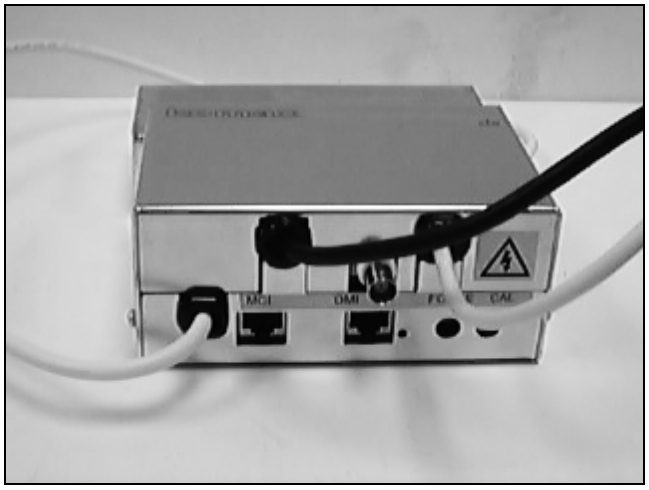
- Non-volatile terminal batch buffer holds the results of the last 1000 terminations.
- Rugged high quality enclosure.
- CE / FCC approved

1.1 cfa1000x System

The cfa1000x crimp force analyser system has been designed to be a flexible solution to the problem of wire termination monitoring. To this end the unit is available in two different variants depending on the application specifics.

Details of the two variants are given below:-

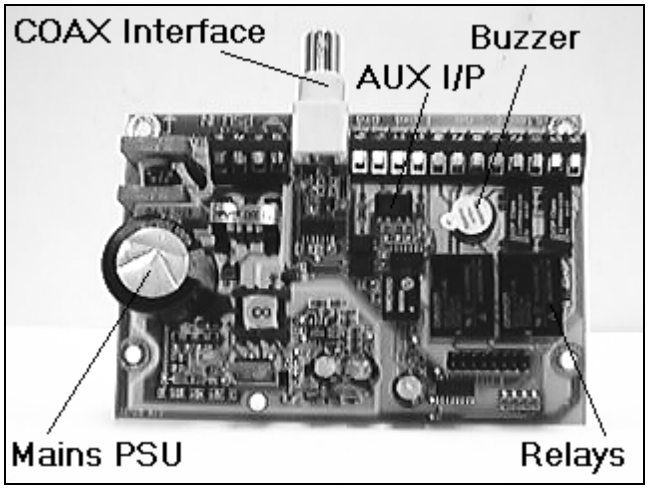
cfa1000m – Machine CFA



This system has been designed to allow all automatic machines to benefit from an improved CFA system. In this variant the CFA system consists of :-

- Press gearbox shaft encoder and housing
- Evaluation unit, I/O board and housing
- Ram sensor and lead
- Remote GCP (Graphical Control Panel).

The I/O board has the following machine interface features:-



- Universal input (90-250vac) mains power supply.
- 2 High-speed reed relays for pass/fail signalling
- 2 High-power (5A) relays whose operation is user programmable
- 2 isolated 24v inputs whose operation is user programmable
- Coaxial interface to allow communication with base machines.
- Piezo buzzer.

cfa1000b - BenchTop CFA

This system has been designed to allow all manual benchtop machines to benefit from an improved CFA system. In this variant the CFA system consists of :-

- Press gearbox shaft encoder and housing
- Evaluation unit, with integral GCP
- Ram sensor and lead.

The cfa1000b unit has the following interface features:-

- 2 High-speed signalling relays
- 2 High-power (5A) relays whose operation is user programmable.
- 1 isolated 24v input whose operation is user programmable.
- Coaxial interface to allow networking of bench press stations
- Serial Printer Interface.

2.0 System Installation

The following describes the installation of a cfa1000x on a MECAL or GAMMA type press. For details of installation on different types of presses contact your local Circuitmaster representative.

The procedure should take approximately 10 minutes and requires the following tools:-

- 6mm Allen Key.
- Adjustable wrench.
- Pozidrive/Philips screwdriver

Isolate the mains supply and remove any tooling from the press before carrying out this procedure.

The installer should first familiarise themselves with the following system components:-

- cfa1000x encoder and housing
- cfa1000x evaluation unit.
- GCP unit (If cfa1000m)
- Ram Sensor

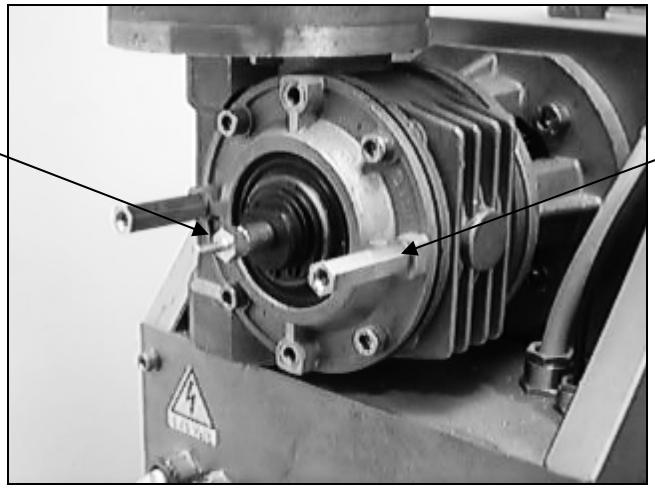
2.1 Unit Installation

- Working at the rear of the press, using a screwdriver, remove the two securing screws from the encoder housing and withdraw the cover.

- Withdraw the encoder drive pin, encoder mounting hex pillars and securing screws fixed inside the unit.

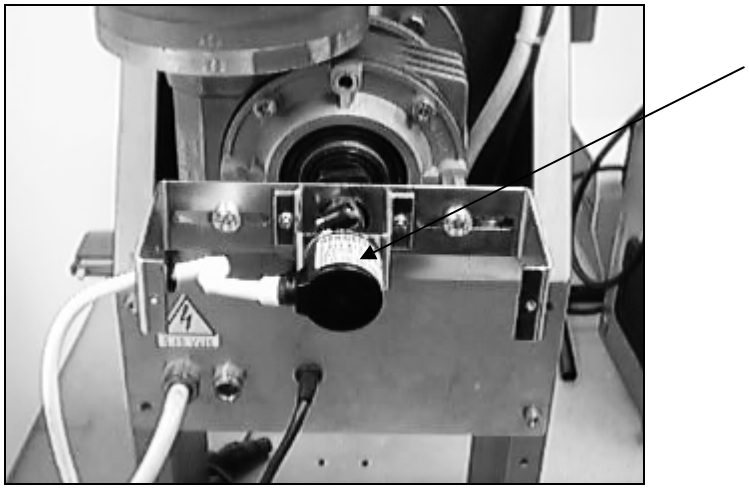
- Screw the two fixing pillars into the tapped holes on the press gearbox.

- Screw the drive pin and spacer into the tapped hole in the centre of the gearbox and secure with a wrench.



- Slide the drive coupling over the drive pin, releasing the Allen grub screw slightly if required.

- Offer up the housing bracket in the desired orientation and secure using the M6 fixing screws provided.

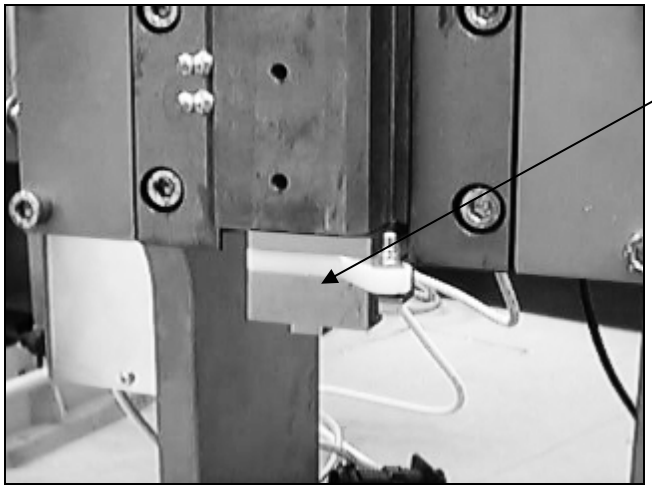


- Mount the CFA evaluation unit in a suitable place beside/on the press. The cfa1000m unit has a magnetic backing and will fix securely & easily to any ferrous metal surface.

- Working now at the front of the press remove the ram socket and replace it with the ram sensor supplied. Fit the sensor such that the sensor output jack is suitably positioned to allow easy routing of the sensor cable back to the evaluation unit. Tighten the two socket head bolts to the torque specified by the press manufacturer.

- On cfa1000m variants, position the GCP (Graphics Control Panel) in a suitable position on the machine. Note that the unit should be mounted outside any interlocked machine guards to allow control of the cfa with the guards in position. The GCP has a magnetic backing and will fix securely to any ferrous metal surface.

- On cfa1000m variants, plug in the GCP to the socket marked GCP or OMI on the evaluation unit.



- For cfa1000m variants refer to section **2.2 Unit Installation** and wire up the unit, for cfa1000b variants connect the mains lead supplied to the IEC socket on the rear panel.
- Power up the cfa1000x, but make sure the machine/press power is still OFF.
- Refer to section **2.3 Encoder Setup** and setup the shaft encoder.
- Refit the encoder housing cover and secure with the two screws provided. Tidy the sensor wiring with a suitable self adhesive cable tie allowing for the full stroke of the press ram.

2.2 Unit Wiring

Permanent connection to the mains supply to be carried out by competent personnel only.

Always use the cable strain relief devices on the housing walls

The wiring required will depend on the unit build option.

cfa1000m units are fitted with a universal mains power supply designed to be wired *permanently* to a base machine.

cfa1000b units come with a mains power cord ready for connection to a convenient mains power outlet.

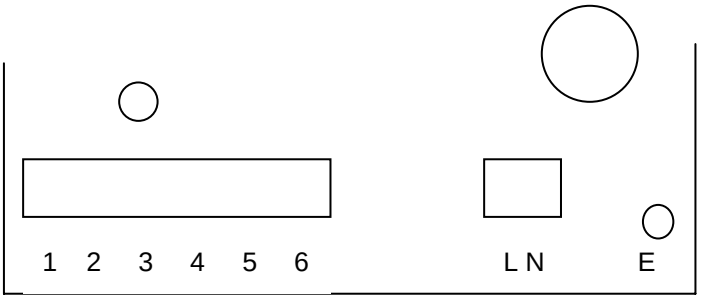
Connection to the mains supply of a cfa1000m unit should be carried out by competent personnel only and such persons should consider the following points:-

- The supply to the unit should be *permanent*, i.e. not one that is interrupted regularly by any machine interlocks. Unnecessary cycling of the supply puts strain on the power supply and may reduce its service life.
- The unit **MUST** be provided with a mains protection earth connection.
- The mains supply to the cfa should be protected at source with a **3A slow blow** fuse.
- Earth bond resistance testing should be carried out using a low current tester (<8A test current).
- Insulation breakdown testing (500VAC L&N to E) may produce a few milliamps of earth leakage current. This is normal and should not be viewed as a reason for failure.
- Flash testing (>500v) is discouraged as it may cause irreparable damage to the power supply.
- Connection to mains supply to be made with 3 core 1.5mm double insulated cable.

Connection to the local mains supply is made via the L, N and E connectors inside the main cover.

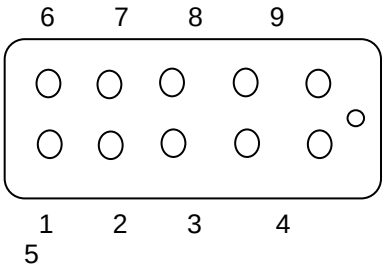
The Earth (E) connection should be made from the line cord directly to the designated earth point using a 1.5mm ring terminal.

NAME	**MARKING**	**COLOURS**
LIVE	L	BROWN **OR** BLACK
NEUTRAL	N	BLUE **OR** WHITE
EARTH	E	GREEN/YELLOW **OR** GREEN

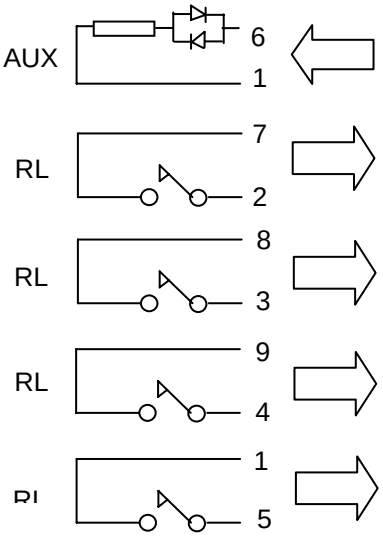


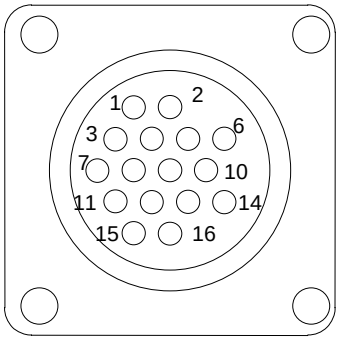
1	RL1
2	RL2
3	RL3
4	RL4
5	AUX1
6	AUX2
L	LIVE
N	NEUTRAL
E	EARTH

cfa1000m CONNECTIONS

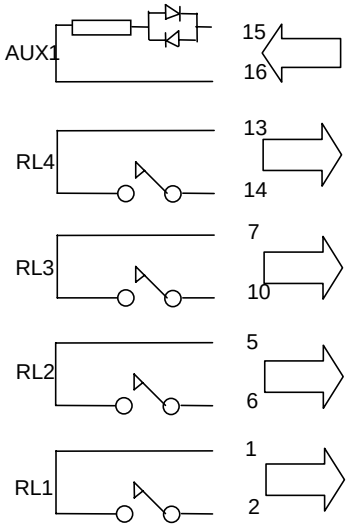


INTERLOCK CONNECTIONS
CFA1000b (rectangular connector)





INTERLOCK CONNECTIONS
CFA1000b (circular connector)



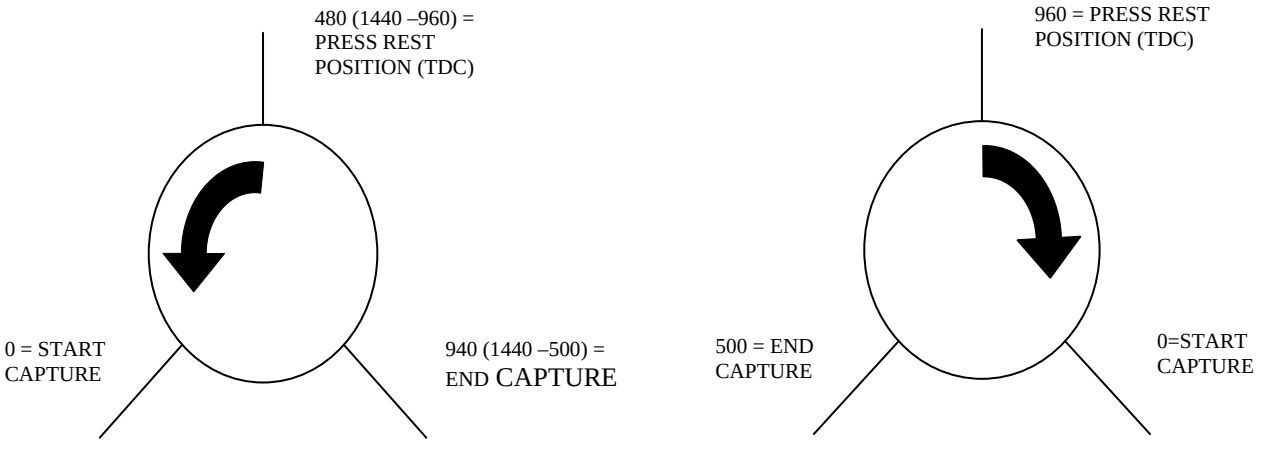
2.3 Encoder Setup

After fitment of the ram sensor always turn the press over by hand and check the stroke/shut height adjustment <u>before</u> operating the press with power ON. Failure to do so may cause damage to the press and/or tooling.

- Fit a suitable applicator or test jig to the press and adjust the shut height/stroke in the normal fashion.
- Power up the CFA.
- Go to the *SETUP-OPTIONS-ENCODER SETUP* screen which should show :-

Setup Encoder	
ANGLE:	????
quit	

- Turn the encoder in the normal direction of press travel until numbers appear on the display.
- Ensure that the press crank is in the TOP DEAD CENTRE (TDC or 12 o'clock) position.
- Turn the encoder coupling so that the reading on the display reads *960 (+/- 10) if the press rotates CW when viewed from the front. If the press rotates CCW when viewed from the front, adjust until the angle displayed is 480 (+/-10). (See diagram below)*
- Secure the coupling securing screw and operate the press twice.
- Check that the readings obtained are stable (+/- 10) at the end of each cycle. If not repeat the sequence and *ensure that the coupling securing screws are tightened securely.*
- Press and hold ESC on the GCP to return to the production screen.



3.0 Functional Overview

A CFA or **C**rimp **F**orce **A**nalyser is a sensitive piece of monitoring equipment which measures the force applied in forming a crimp terminal. The CFA consists of three main parts.

1) The optical **ENCODER** fitted to the crimping press, allows accurate measurement of the speed and position of the press drive shaft.

2) The **FORCE SENSOR** mounted in the press ram converts the force applied by the press into an electrical analogue.

3) The **CPU** (Central Processing Unit) monitors both the position and force applied and determines whether the crimp energy applied in the cycle is within acceptable limits.

The cfa1000x is first taught the force profile of a known good process cycle by running a prescribed number of TEACH CYCLES. At this stage the CFA does no analysis, but simply stores the force profiles as a reference profile. These crimps are then destruction tested off line for quality, usually using a combination of pull off and visual testing. Once the teach crimps quality has been verified, the CFA can then compare each subsequent crimp cycle with the reference crimp cycle in order to determine the quality of the crimp connection produced.

This system benefits the wiring harness manufacture in two ways:-

- 100 % testing of connections.
- No production rate impact.

3.1 The Force Sensor

The PiezoCeramic force sensor used on the cfa1000x converts the force applied by the press into an electrical signal which can be monitored by the CPU. The main type of force sensor is called a RAM SENSOR. The unit is mounted in-line with the press ram so that all the force applied in producing the terminal is transmitted via the sensor. A large range of sensors are available for different types of presses. The ram sensor can be calibrated in conjunction with the CFA system in order to give accurate force measurements. The output of the sensor is usually expressed in pC/N (PicoCoulomb/Newton).

3.2 The Encoder

The Press Position Sensor or ENCODER, is an optical incremental shaft encoder used to determine the direction, speed and position of the press drive shaft. The CPU uses the output of this sensor to trigger the capture of the force profile.

For the CPU to compare successive crimp cycles correctly, sampling must be consistent from cycle to cycle. Since the press speed can vary, due to heating of the motor or mains frequency fluctuations, an effective way of synchronising the sampling is to measure the press output shaft angle.

The unit is usually mounted on the output shaft of the press gearbox.

The unit fitted to the cfa1000x can resolve ¼ degree (15 minutes) of angular displacement.

Take particular care if this unit is removed from the press. Lateral forces on the encoder shaft can easily damage the encoder.

3.3 The CPU

The CPU (Central Processing Unit) or evaluation unit consists of a powerful 16bit Microprocessor and associated circuitry which captures and analyses the force profile.

This unit also controls the Graphical Control Panel) unit to provide menus and parameter editing and communicates with the host machine via relays or the coaxial interface.
The powerful Microprocessor used on the cfa1000x allows improved more complex algorithms to be used without impacting on machine throughput.

In addition the unit can be upgraded in the field allowing future algorithm developments / customer specific software to be incorporated easily and economically.

3.4 GCP – Graphical Control Panel

The Circuitmaster GCP (Graphical Control Panel) is a generic user interface for both the cfa1000m and cfa1000b. The GCP is designed to give Circuitmaster cfa equipment a consistent and easy to learn user interface in order that operator training costs are kept to a minimum.

The GCP has the following salient features:-

Graphics Screen

The LCD display screen is a 64x128 pixel text/graphics module used to display menus, scroll bars and parameter editing screens. The unit is back-lit and the contrast can be adjusted to aid viewing.

Control Knob

The control knob can be rotated both CW and CCW. Although its function changes with the specific menu displayed, common uses of the control knob include incrementing/decrementing parameter values and scrolling through menus.

Menu Select Keys

The function of the menu select keys is modal, that is, it changes depending on which screen is displayed. The actual function of the key at any time is displayed on the PROMPT LINE of the display (see below).

Pass Led

The green pass LED is lit when a good wire is produced.

Fail Led

The red fail LED is lit when a bad wire is produced. This may be accompanied by the integral buzzer sounding if this feature has been enabled.

Clr Key

The Clr or Clear key is used to reset the cfa after a bad wire has been produced.

Ref Key

The Ref or Reference key is used to initiate a TEACH SEQUENCE.

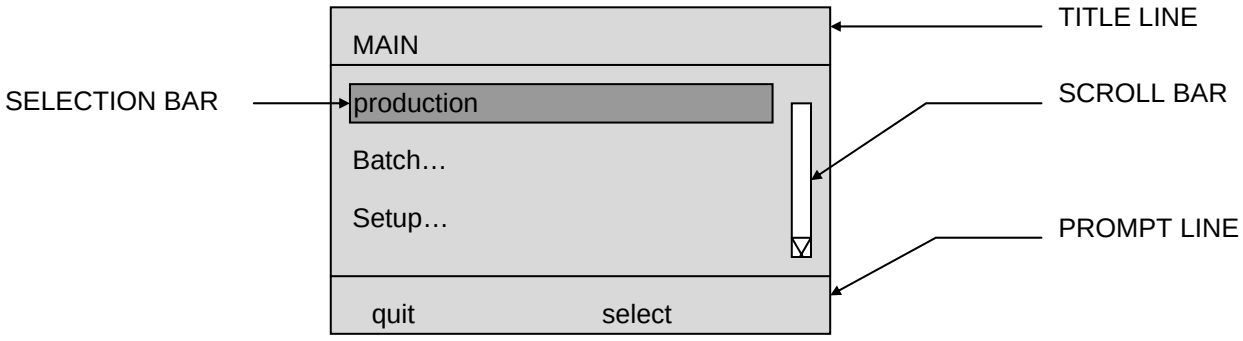
Ref Led

The Yellow Ref Led is lit during the TEACH SEQUENCE or learn phase. During production the Ref Led is off.

NOTES

- The cfa1000m can operate with or without a GCP.
- If operating as part of a machine integration scheme, the base machine can communicate (download parameters, upload results) with the cfa1000m via the coaxial interface. A separate operator interface GCP for each station is therefore not required.
- The GCP can be connected to the cfa1000m at any time (Hot plugged).

3.4.1 Selection Menus



Setting of cfa1000x parameters is achieved from the GCP by way of menus. A typical menu is shown above. Although there are a number of different types of menu used on the cfa1000x the basic features of each are common:-

- **TITLE LINE**

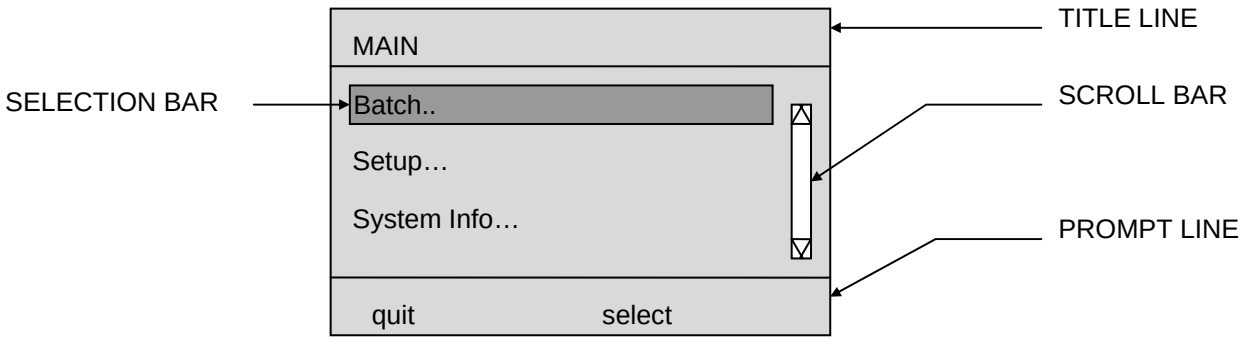
  The title line is separated from the rest of the menu by a horizontal line. The title line shows the title of the currently active menu.

- **SELECTION BAR**

  The selection or highlight bar indicates the currently selected item from the menu. The GCP control knob is used to move the highlight bar to the item required. Where a selection name is suffixed with three dots (…), this indicates that selecting this item will cause a submenu to appear.

- **SCROLL BAR**

  The menu scroll bar is displayed if there are more items in the menu than those currently displayed. In the menu above, the bottom arrow shows that more items exist further down the menu. To access these items the user moves the highlight bar down towards the bottom of the menu, using the control knob. When the last visible selection is highlighted, further movement of the highlight bar causes the menu to SCROLL UP. The menu now looks as follows:-



The Scroll bar now shows that there are items above and below the items currently displayed.

- **PROMPT LINE**

  The prompt line displays at any point in time the exact function of the MENU SELECT KEYS.

3.4.2 Adjusting the Display Contrast

To adjust the display contrast proceed as follows:-

- Turn off the cfa1000x by removing the mains power.
- Turn on the cfa1000x, whilst holding down the large menu select key.
- Continuing to hold down the key, adjust the contrast to the desired setting by rotating the control knob.
- To save the contrast setting release the large menu select key.

Normal display operation will now resume.

3.4.3 Setting the Real Time Clock RTC

To access the Time & Date set menu:-

- Turn off the cfa1000x by removing the mains power.
- Turn on the cfa1000x, whilst holding down the small menu select key.
- When the Time and Date set menu appears release the select key.

To adjust the time:-

- Turn the control knob until the TIME is highlighted, then select EDIT
- Adjust the HOURS by rotating the control knob, select OK to save the value or QUIT to replace the old value.
- Repeat the above for the MINUTES.

Note that the TIME <u>must</u> be entered in 24 hour clock format

To adjust the date:-

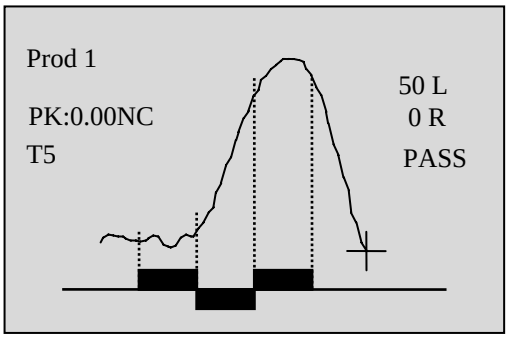
- Turn the control knob until the DATE is highlighted, then select EDIT
- Adjust the DAY by rotating the control knob, select OK to save the value or QUIT to replace the old value.
- Adjust the MONTH by rotating the control knob, select OK to save the value or QUIT to replace the old value.
- Repeat the above for the YEAR.

Note that the DATE <u>must</u> be entered in dd/mm/yy format

To complete setting of the RTC, select OK. Normal display operation will now resume.

Note that the the RTC function may not be supported on your system.

3.4.4 The Production Screen



The Production screen is shown above. The main screen area shows the force and reference curves along with the analysis zones marked with the vertical dashed lines.

The horizontal bar at the bottom of the screen shows the error marker bars. These marker bars show whether the force in a particular zone was above or below the limit in that particular zone.

The parameters shown on the left and right hand side of the screen are as follows:-

- PK : The peak force in KN
- T5 : Appears during teaching to show the teach cycle being performed.
- 50L : Shows the relevant overall evaluation limit.
- 0R : Shows the overall evaluation result RU0.

If the peak force display is suffixed with the letters NC, the peak force measurement is NOT CALIBRATED. The reading displayed is then an estimation of the peak force and may not be accurate.

3.5 Digital I/O

The cfa1000x has a number of freely programmable I/O (input/output) channels which can be used for a variety of different functions. The I/O channels provided are listed below:-

- **INPUTS**

Two Auxiliary inputs (AUX1 & AUX2) are non polarised 24v opto-isolated input lines.

- **OUTPUTS**

The cfa1000x has four relay outputs which provide galvanically isolated, volt free switching for signalling or load switching. The relay outputs are listed below:-

RELAYS 1&2

Relays 1&2 are 24v reed relay which enable high speed switching (0.5ms) for signalling or load switching up to 100V 0.5A-DC or 10VA RESISTIVE ONLY and have a contact resistance of 0.5Ohms.

RELAYS 3&4

Relay 3&4 are 24v power relays which enable switching of higher current loads up to 5A RESISTIVE ONLY .

If it is required to switch higher currents, mains voltages or Inductive loads, the relay in question should be used to drive a more suitable relay for the particular application.

Relays 1-4 can be programmed to perform a specific **action** in response to a number of **events**. For more details see later sections on the relay matrix.

The actions of relays 1&2 can be set in one of a number of signalling modes.

These modes allow interfacing to automatic machines and are accessed through the SETUP-RELAYS-QUICKSET menu.

The timings for relay events can also be specified in the SETUP-RELAYS-TIMING menu.

3.6 Coaxial Interface

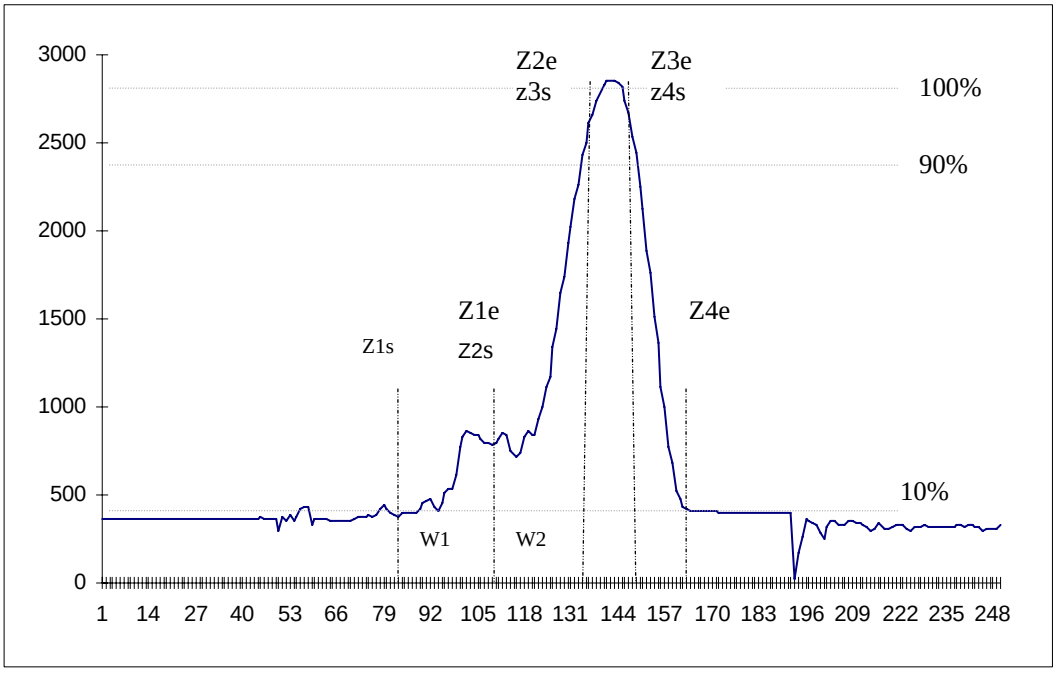
The Circuitmaster cfa1000x can communicate on a proprietary coaxial interface network using the coaxial communication protocol.

The coaxial interface offers the following benefits:-

- Allows remote setup of parameters and options by machine or remote PC.
- Allows downloading, viewing and storage of batch information, force and reference profiles.
- Allows manual machines to be easily included in auto data collating/networking schemes.

The coaxial interface NODE ID can be changed from the SETUP-COMMS menu.

4.0 Analysis algorithm



The cfa1000x cfa uses an advanced patented algorithm to analyse the force profile of the crimping process. The force profile is split into 4 zones as indicated by the vertical zone lines marked on the figure above.

Of the four zones (Z1-Z4) only zones Z1-Z3 are used for evaluation. Zone 4 is used internally for automatic scaling.

Each zone is defined by a start point an end point and a zone width , these points are marked on the figure.

The cfa1000x analyses and produces results for each zone as well as producing overall results for the force profile

This method of analysis provides a number of improvements over other cfa algorithms:-

- Errors in any one zone remain distinct, and are not diluted by errors in other zones. This makes the CFA more sensitive.
- Process limits and user controls can be provided for each individual zone allowing analysis in individual zones to be made more or less sensitive. This provides greater flexibility to the user.
- The zones of the curve closely represent the distinct parts of the terminal e.g. Z1 represents Insulation crimp formation, Z3 represents main crimp formation etc. This opens the way for improved categorisation of crimping faults which will allow production problems to be solved easier, thus reducing machine downtime.

- The addition of signed analysis and results gives more information on the failure mode. This provides information to drive quality improvement schemes.

In order that the cfa1000x can analyse the force profile it must first be taught the force profile of a good termination. This is achieved by performing a TEACH SEQUENCE.

During this sequence the analyser records and scales the force profile and records a STATIC REFERENCE profile and a DRIFTABLE REFERENCE profile to which all subsequent crimps will be compared.

The analyser also automatically sets the evaluation range during teaching by calculating the individual zone start and stop angles and hence the zone widths (W1_INC-W4_INC). Additionally the user may manually adjust the zone widths for zones 1 and 2 by editing WIDTH FACTOR parameters W1 and W2 .

The analyser compares the force profile at each point within each zone against the STATIC REFERENCE and DRIFTABLE REFERENCE profiles recorded during the teach sequence. The area between the two profiles is evaluated and two metrics, the SIGNED RESULT (RSx) and the UNSIGNED RESULT (RUx) are calculated.

These values represent the error between the force and reference profiles in the particular zone (x). In addition two further overall results are evaluated, the UNSIGNED RESULT OVERALL (RUO) and the SIGNED RESULT OVERALL (RSO).

The user can set process limits during teaching and production with a single limit the BAD LIMIT OVERALL (BLO) and three factors :-

- T FACTOR (TEACH FACTOR).
- S FACTOR (STOP FACTOR).
- D FACTOR (DRIFT FACTOR).

Additionally the user has three further ZONE SENSITIVITY parameters (S1, S2 & S3). These parameters set the relative sensitivity for each of the evaluation zones.

The individual zone limits are calculated by the analyser given BLO, the T,S and D FACTORS and the Zone width information (W1_INC-W3_INC) along with the user selected zone sensitivities (S1-S3).

A facility is included to allow the reference profile to follow the natural process variations and track the process within allowable limits. This facility is called DRIFT COMPENSATION.

4.1 Evaluation Range

The angles at which the zones start and end (Zxs, Zxe) must be determined by the cfa1000x. These points are clearly dependent on the wire and terminal type and will vary from application to application.

The cfa1000x calculates during the TEACH SEQUENCE where each evaluation zone should start and end, thus determining the width of each zone.

Although these calculations are performed automatically during the TEACH SEQUENCE, the user does have some manual control to override these settings by way of the W1 and W2, zone 1 & 2 WIDTH parameters, if desired.

4.1.1 Setting Width Factors (W1 & W2)

To set the WIDTH FACTOR parameters :-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *ANALYSIS* and press ENTER.
3. Select *ZONE PARAMETERS* and press ENTER.
4. Select *WIDTH W1* or *WIDTH W2* and press ENTER
5. Set the parameter using the control knob and press ENTER to save the value or ESC to quit.
6. Press and hold the ESC key to return to the *PRODUCTION* screen

It is not normally necessary to edit these parameters. They are provided for additional control and flexibility. It is recommended that the CFA1000x be left to set these parameters automatically.

4.2 Production Process Limits

During **production** the user has **one** limit and **two** factors which specify the process limits:-

- **BLO - BAD LIMIT OVERALL**

This limit is used by the cfa1000x along with user factors (see below) to calculate all the individual zone limits. Note the BLO limit is the basic error tolerance.

- **S FACTOR - STOP FACTOR**

This factor is used to determine the basic ratio between the STOP LIMIT and the BLO value.

The cfa1000x calculates the actual values for each zone SL1, SL2 and SL3 which also takes account of zone widths and sensitivity factors.

The difference between the current force profile and the DRIFTABLE REFERENCE is evaluated against the STOP LIMIT.

- **D FACTOR - DRIFT FACTOR**

This factor is used to determine the basic ratio between the DRIFT LIMIT and the BLO value.

The cfa1000x calculates the actual values for each zone : DL1, DL2, DL3 which also takes account of zone widths and sensitivity factors.

It therefore effectively limits the allowable process drift through the DRIFT COMPENSATION facility.

The difference between the current force profile and the STATIC REFERENCE is evaluated against the DRIFT LIMIT.

4.2.1 Setting BLO – Bad Limit Overall

To set limit BLO:-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *LIMITS* and press ENTER.
3. Select *BLO* and press ENTER.
4. Set the limit value and press ENTER to save the value, or ESC to quit.
5. Press and hold ESC to return to the *PRODUCTION* screen.

The BAD LIMIT OVERALL BLO sets the tolerance at which the terminal is deemed BAD. The PROD BAD relay event is generated.

4.2.2 Setting S Factor – Stop Factor

To Set the S Factor :-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *LIMITS* and press ENTER.
3. Select *S FACTOR* and press ENTER.
4. Set the factor value and press ENTER to save the value, or ESC to quit.
5. Press and hold ESC to return to the *PRODUCTION* screen.

The STOP LIMIT BLO x S Factor sets the tolerance at which the machine should be stopped. The PROD STOP relay event is generated.

4.2.3 Setting D Factor – Drift Factor

To Set the D Factor :-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *LIMITS* and press ENTER.
3. Select *D FACTOR* and press ENTER.
4. Set the factor value and press ENTER to save the value, or ESC to quit.
5. Press and hold ESC to return to the *PRODUCTION* screen.

The DRIFT STOP LIMIT BLO x D Factor sets the tolerance at which the machine should be stopped due to excessive process drift. The PROD STOP relay event is generated.

4.3 Adjusting Zone Sensitivities

The user has two sensitivity factors which allow the sensitivity of the analyser in zones 1 and 2 to be increased or reduced.

This feature is useful if one zone is particularly noisy or if one part of the crimp force profile is of more interest than the others in a particular application.

The sensitivity is adjusted by setting the values of parameters S1 and S2 the Z1 and Z2 sensitivity factors.

Increasing the sensitivity factor, increases the sensitivity of the analysis in that particular zone.

Reducing the sensitivity factors reduce the sensitivity in that zone.

4.3.1 Setting S1, S2 & S3 Sensitivity Factors

To Set the S1, S2 and S3 Factors:-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *ANALYSIS* and press ENTER.
3. Select *ZONE PARAMETERS* and press ENTER.
4. Select *SENSITIV. S1, SENSITIV. S2 or SENSITIV. S3* and press ENTER.
5. Set the factor value and press ENTER to save the value, or ESC to quit.
6. Press and hold ESC to return to the *PRODUCTION* screen.

It is not normally necessary to edit these parameters. They are provided for additional control and flexibility. It is recommended that the CFA1000x be left to set these parameters automatically.

4.4 The Teach Sequence

A cfa can be thought of as a repeatability monitor and as such it inherently has no way of knowing what constitutes a good termination.

The cfa must therefore be taught what a good crimp force profile looks like and this is the primary reason for the teach sequence.

The force curve must be scaled to fit the analysers input range to maintain resolution and accuracy over widely differing applications.

The teach sequence is a procedure that must be carried out when first setting up the analyser for a particular application, or when wire or terminals are changed.

It consists of a user selectable number of cycles (Odd 3-19) from which the analyser can scale and store its reference force curve.

- On the first teach cycle the analyser captures the force curve with its input amplifiers set for the largest possible crimp force the unit is able to cope with. This allows the unit to gauge the force applied relative to its maximum. The unit does no analysis, instead it calculates how much to scale the input signal by, to give best resolution and accuracy.

- Having set its AGC (Automatic Gain Control) circuit on the second teach cycle, the analyser stores the force profile, first checking that the force curve has been scaled correctly. Thus the STATIC REFERENCE crimp has been recorded. This STATIC REFERENCE is copied and a DRIFTABLE REFERENCE is also stored. The Zone and Evaluation ranges are also calculated at this time.

- Subsequent teach cycle are used to produce a weighted average on the stored references in order that the reference to be used for production analysis, closely represents the crimps which were seen in the teach sequence. Analysis is performed on these cycles against the STATIC REFERENCE curve with the T FACTOR and BLO being the relevant user editable parameters.

If during the teach sequence a result produced is in excess of the TEACH LIMIT T FACTOR x BLO, the teach sequence will restart automatically.

4.4.1 Setting T Factor – Teach Factor

To Set the T Factor :-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *LIMITS* and press ENTER.
3. Select *T FACTOR* and press ENTER.
4. Set the factor value and press ENTER to save the value, or ESC to quit.
5. Press and hold ESC to return to the *PRODUCTION* screen.

The TEACH STOP LIMIT BLO x T Factor sets the tolerance at which the machine should be stopped due to failure of the teach sequence. The TEACH STOP relay event is generated.

4.4.2 Setting the number of Teach Cycles

The user can select the number of teach cycle the cfa1000x will perform by editing the TEACH CYCLES parameter.

Odd values between 3 (Default) and 19 are valid.

To set TEACH CYCLES :-

1. From the main menu select *SETUP* and press the ENTER key.
2. From the *SETUP* menu select *ANALYSIS* and press the ENTER key.
3. Highlight *TEACH CYCLES* on the *ANALYSIS* menu and press the ENTER key.
4. Set the limit to the desired value using the control knob and press the ENTER key to save the new value. Pressing the ESC key will restore the old value.
5. Press and hold the ESC key to return to the *PRODUCTION* screen.

It is recommended that 3 or 5 teach cycles be set for a manual benchtop machine and 9 or 11 teach cycle be set for an automatic machine.

4.4.3 Starting a new Teach Sequence

To Initiate a new teach sequence:-

1. Press the REF key on the GCP.
2. A confirmation screen will be displayed on the display screen.
3. Accept this screen by pressing the right hand menu select key.

The yellow REF LED will now be lit indicating that the cfa is in TEACH mode. After the teach sequence has finished the REF LED will go out indicating PRODUCTION mode.

4.5 Drift Compensation

A process under control will exhibit fluctuations due to common causes within the manufacturing process. These common causes include tolerances of wire cross section, terminals and limits of reproducibility of the press and tooling.

This slow common cause drift is normal within any production process. Special cause is fast changing drift in a process, caused by a malfunction of the process or process equipment.

Ideally a process monitoring device should be insensitive to common cause drift within the process and sensitive to special cause drift.

The drift compensation facility on the cfa1000x is included to allow the reference profile to follow this slow common cause fluctuation.

The DRIFT RESULT is the result of evaluating the force profile with the STATIC REFERENCE recorded during the teach sequence. It therefore is a measure of the total process drift, since the last teach sequence.

By setting the DRIFT LIMIT **BLO x D Factor**, we control the maximum allowable process drift.

The RUO and RSO are the results of evaluating the force profile with the DRIFTABLE REFERENCE.

After the last teach cycle, the DRIFTABLE REFERENCE is formed by copying the STATIC REFERENCE, which is a weighted average of all the terminals in the teach sequence, and thus at this point in time the DRIFTABLE REFERENCE is the same as the STATIC REFERENCE.

DRIFT COMPENSATION allows the DRIFTABLE REFERENCE to follow the process and operates as follows:-

- If a zone evaluation result is found to be less than the ZONE BAD LIMIT (BLx) the DRIFTABLE REFERENCE is allowed to creep by one step closer to the force curve at each point within the zone.

- If the zone result is greater than the ZONE BAD LIMIT (BLx) the DRIFTABLE REFERENCE is held fixed.

- Since the force profile is compared also to the STATIC REFERENCE, the ZONE DRIFT LIMIT acts as a total process drift limit.

DRIFT COMPENSATION therefore allows the analyser to follow slow changing variations due to common causes yet still maintain sensitivity to detect process special causes.

4.5.1 Controlling Drift Compensation

To turn on/off DRIFT COMPENSATION :-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *ANALYSIS* and press ENTER.
3. Select *DRIFT COMP.* and press ENTER.
4. Set to ON/OFF using the control knob, press ENTER to save the new value, or ESC to restore the old value.
5. Press and hold ESC to return to the production screen.

It is recommended that the Drift Compensation feature always be enabled (default setting)

5.0 Force Calibration

The cfa1000x cfa can display the peak force applied during the termination process. In order to ensure that this value is accurate, it is first necessary to calibrate the unit. The calibration process is carried out using a NAMAS approved force calibration standard and test jig that is available through Circuitmaster agents.

The ability of the cfa1000x to accurately measure the peak crimping force offers the following user benefits:-

- Improved production levels – Offline crimp height measurement is not required
- True 100 % testing to terminal manufacturers specification.
- Improved Quality assurance.

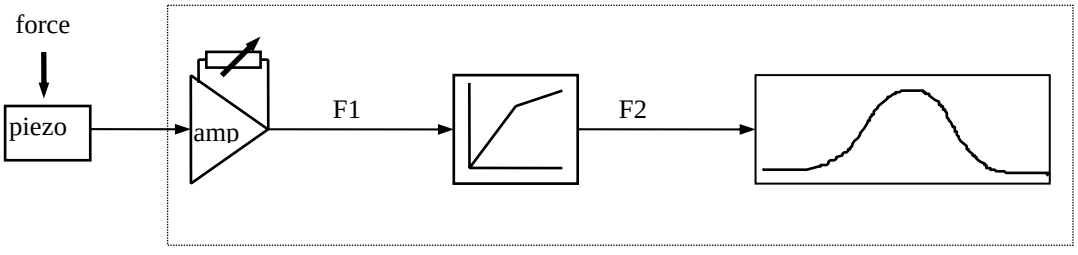
During the calibration process, the calibration unit is connected to the cfa1000x CAL input. The calibration unit has its own sensor which is incorporated into a test jig.

The jig is put in place of the tooling on the press and the calibration unit measures the force applied. It also drives the cfa1000x CAL input with a voltage proportional to the force in Newtons.

In calibration mode, the cfa1000x compares the voltage from its own sensor with that from the calibration unit and constructs a table to map the response of its own sensor onto the calibration unit.

In this way the cfa1000x compensates and scales the output from its own sensor to enable it to accurate read the peak crimping force.

The cfa1000x maintains an internal linearity lookup table which can compensate for small non-linearities and gain variations in the force transducer.



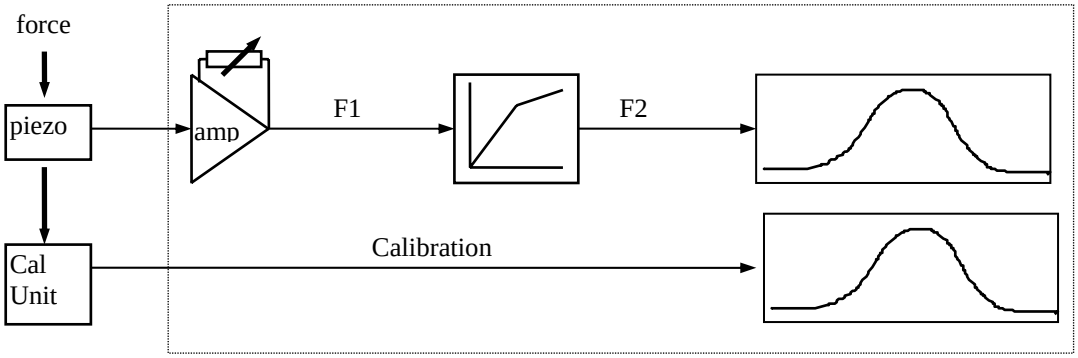
The force F1 which is the instantaneous force calculated by the cfa1000x (taking into account the amplifier gain, input capacitor and the sensitivity of the piezo transducer) is processed through a compensation algorithm which

uses linear interpolation between spot force values held in a lookup table to provide calibrated force F2.

The default state of the lookup table is a linear 1:1 transfer function i.e. no compensation is introduced.

If a more accurate calibration is desired, the lookup table must be loaded with calibration data in-situ. This is achieved by using a Kistler force sensor and calibration jig.

The calibration unit provides a calibrated output signal of 4V per 20kN. This signal is connected to the calibration input of the cfa1000x and the cfa1000x simultaneously records the force curves from the cfa1000x sensor and the calibrated sensor as a press cycle is performed.



5.1 Peak force Calibration of the CFA1000x

The cfa1000x as supplied, uncalibrated, displays a calculated estimate of the peak force applied during a crimping cycle.

The cfa1000x's sensitivity to crimping errors is not influenced by the accuracy of this calculation since the detection algorithm is based on ratiometric error analysis.

A user may desire to improve the accuracy of the peak force calculation, he may wish to use the measurement for a tooling set-up qualification procedure for example.

The calibration procedure is outlined as follows:-

1. A certified calibration unit, currently a Kistler model 5995 charge amplifier is connected to the **cal** input of the cfa.

2. The calibration unit's force sensor is installed in place of the terminal applicator, fixed to the baseplate of the press. An adjustable spring is installed into the ram slide so that it makes contact with the Kistler sensor at the bottom of the press stroke.

3. The cfa1000x is switched into calibration mode by navigating to the calibration menu on the GCP.
   The current date should be entered on the first calibration screen. Pressing Enter then advances to the next screen.

4. The press is fired and the GCP displays the force analogue seen at the calibration input, the press should be adjusted until this value is just below 20kN. Also displayed is a percentile measure of the amplitude of the signal from the cfa1000x's sensor, the cfa1000x adjusts it's input amplifiers each time the press is fired, to try to achieve a good signal amplitude. The input should be allowed to stabilise at between 80% and 90%, stability should be achieved within two to four press cycles after the calibration force has been set (by adjusting the spring). Pressing Enter then advances to the next screen.

5. The calibration units charge amplifier should be 'reset' to clear any 'drift' errors that may have accumulated. The press should be fired and the GCP displays a selection of points from the linearity lookup table which it has generated. The charge amplifier should be reset and the press fired again. The linearity table is recalculated based on the average of the two cycles, this increases the accuracy of the calibration.

6. The charge amplifier can be reset and the press can be fired again several times, each time the calibration is improved because the averaging tends to cancel any 'noise' in the measurements.
   A cycle counter is displayed on the GCP, it is recommended to average at least 10 cycles for optimum calibration accuracy. With each successive press cycle, the displayed figures from the lookup table should become more stable. The figures should vary by less than 1%.

7. Once the user is satisfied that the calibration figures are stable, the Enter button is pressed and the calibration sequence is complete.

If the Esc button is pressed during any part of calibration, the original calibration data will remain in effect.

6.0 The Batch Buffer and Online Statistics

The cfa1000x incorporates a non-volatile ring buffer called the BATCH BUFFER which stores the last 1000 good crimp results (RSO).

Remote access to the batch buffer is achieved via the coaxial interface. This allows for data collating and off-line analysis.

The cfa1000x is also capable of calculating process statistics online, based upon the contents of the batch buffer. The process parameters and capability metrics that are available online are discussed below.

Process Mean

The cfa1000x calculates the Mean of the RS0 values.

Process Standard Deviation

The cfa1000x calculates this process parameter according to the following formula:-

$$\frac{1}{n^{2}}\sqrt{n\sum x^{2}-\left(\sum x\right)^{2}}$$

Process Capability Parameter - Cpk

The cfa1000x calculates this process parameter according to the following formula:-

$$\frac{BadLimit-\sum x \big/ PassCount}{3\sigma}$$

Where BadLimit = BLO

Process Capability Parameter Cp

The cfa1000x calculates this process parameter according to the following formula:-

.

$$\frac{2 * BadLimit}{6\sigma}$$

Where *BadLimit* = BLO

In addition to the above calculations, the cfa1000x also calculates

- Min and Max result values
- Total number of crimps in the BATCHBUFFER
- Total number of GOOD crimps
- Total number of BAD crimps
- % of GOOD and BAD crimps

6.1 Viewing Batch Statistics

To View the Batch Statistics :-

1. From the *MAIN* menu select *SYSTEM INFO* and press ENTER.
2. Select *STATISTICS* and press ENTER.
3. The batch statistics are now available for viewing.
4. Press and hold ESC to return to the *PRODUCTION SCREEN*

7.0 The Batch Counter Facility

The batch counter facility is particularly intended for bench top applications.

In such applications, an operator is required to produce batches of a certain number of wires.

This facility eases this task by counting the number of good and bad wires produced and automatically deducting the GOOD WIRE COUNT from a user entered TARGET batch size.

The unit also displays a TO DO count which is the number of wires in the batch still to be made.

An end of batch EVENT is triggered when the TO DO count reaches zero.

7.1 Setting the Batch Counter

To setup a new batch:-

1. From the *MAIN* menu select *BATCH* and press ENTER.
2. Select <*RESET*> and press ENTER to clear the batch counters.
3. Select *TARGET* and press ENTER.
4. Using the control knob select a digit and then press ENTER.
5. Use the control knob to set the digit to the desired number, then press ENTER to save.
6. Repeat steps 4 & 5 to achieve the desired TARGET value.
7. Press and hold ESC to return to the *PRODUCTION* screen.

When the batch is finished an end of batch relay EVENT is triggered.

This event can cause a user specifiable ACTION on any one of the 4 relays, for example to switch on an indicator or annunciator.

More information on setting up relay actions is available in a later section on relays.

8.0 Auxiliary Inputs and the Relays

The cfa1000x has a number of freely programmable I/O (input/output) channels which can be used for a variety of user defined functions.

The relays are EVENT driven, that is one of 5 specific user programmable ACTIONS can be performed by the relay in response to a given cfa EVENT.

Custom user programming is achieved using the RELAY MATRIX screen.

For quick setup for specific relay configurations (e.g. K40, ALPHA etc) a QUICK SET screen is provided.

Relay timing may also be specified through the STROBE TIMING menu.

This feature allows fine tuning of custom relay good/bad signalling for different automatic machines.

The specifics of each of the I/O channels provided are listed below:-

INPUTS

Two (One on cfa1000b) Auxiliary inputs (AUX1 & AUX2) are non polarised 24v opto-isolated input lines.

There are four events available from these input lines:-

- AUX1H This event occurs when the AUX1 input changes from a low to a high level
- AUX1L This event occurs when the AUX1 input changes from a high to a low level.
- AUX2H This event occurs when the AUX2 input changes from a low to a high level.
- AUX2L This event occurs when the AUX2 input changes from a high to a low level.

In the above, the exact meaning of HIGH and LOW are dependant on the polarity of the voltage applied to the inputs.

OUTPUTS

The cfa1000x has four relay outputs which provide galvanically isolated, volt free switching for signalling or load switching. The relay outputs are listed below:-

- RELAY1

Relay 1 is a 24v reed relay which enables high speed switching (0.5ms) for signalling or load switching up to 100V 0.5A DC or 10VA RESISTIVE ONLY and has a contact resistance of 0.5 Ohms.

- RELAY2

Relay 2 is a 24v reed relay which enables high speed switching (0.5ms) for signalling or load switching up to 100V 0.5A DC or 10VA RESISTIVE ONLY and have a contact resistance of 0.5 Ohms.

- RELAY3

Relay 3 is a 24v power relay which enables switching higher current loads up to 5A RESISTIVE ONLY.

- RELAY4

Relay 4 is a 24v power relay which enables switching higher current loads up to 5A RESISTIVE ONLY.

8.1 Relay Mode Quick Set

To quick set the relay mode:-

1. From the *MAIN* menu select *SETUP* and press ENTER.
2. Select *RELAYS* and press ENTER.
3. Select *QUICK SET* and press ENTER.
4. Select the desired relay mode and press ENTER.
5. Press and hold ESC to return to the *PRODUCTION* menu.

8.2 Quick Set Modes

In the timing diagrams which follow, a **low** level indicates a **closed** relay contact.

NOTES

- T(analysis), the time for which the relays are operated, begins when the analyser receives a sync pulse from the encoder and ends when the result of the analysis is available.
- T(debounce), represents a relay debounce delay of 10 milliseconds.
- The two relays which signal pass/fail results can be configured to behave in several modes of operation as the diagrams which follow show

BenchTop Mode

If the analyser is fitted to a manually operated bench press, Relay 1 will be closed and relay 2 will be opened on producing a 'pass' result. Conversely Relay 2 will be closed and Relay 1 will be opened on producing a 'fail' result.

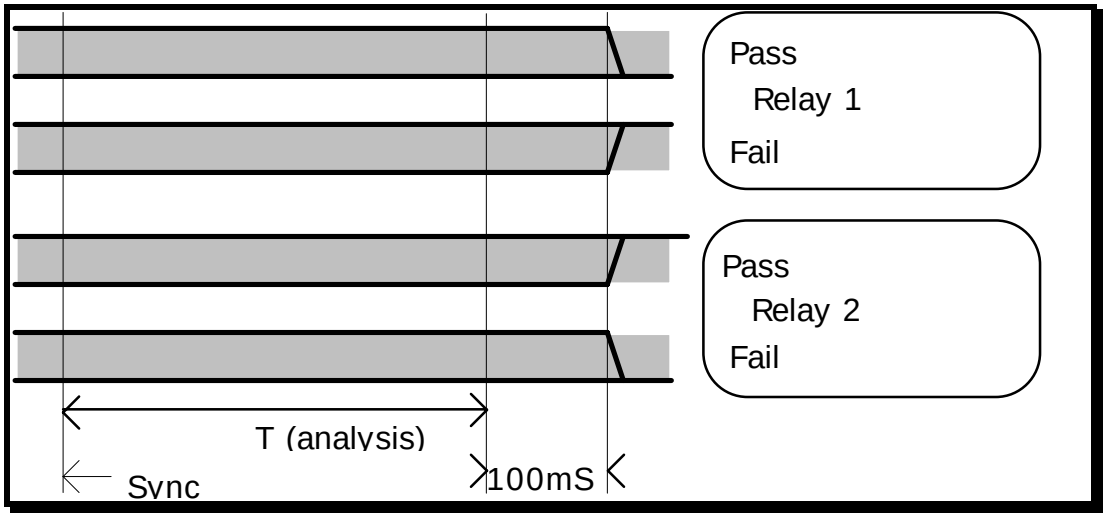
The 100mS delay after T (analysis) allows the press cycle to finish avoiding stopping the press in mid cycle if the relays are wired to the emergency stop circuit of the press.

NOTE

If the Relay mode is set to BenchTop mode, the operation of the unit changes as follows:-

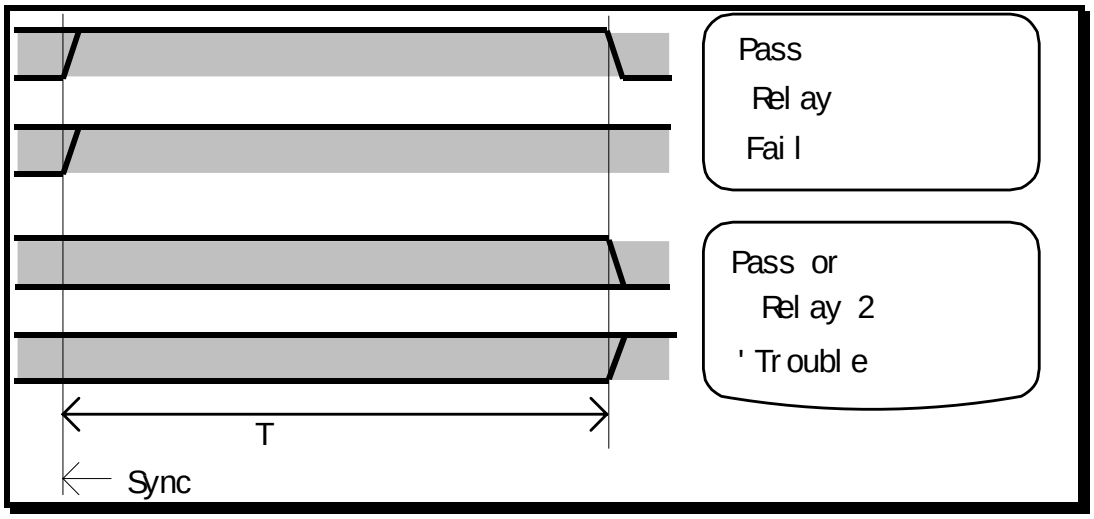
1. The batch count is displayed in the top right hand corner of the PRODUCTION SCREEN display in large numbers for the convenience of the operator. It may be reset from this menu by pressing and holding the ESC key until a confirm message is displayed. Pressing the ENTER key at this point clears the batch counters, pressing ESC will leave the batch counters unchanged.

2. When an error occurs the buzzer will sound, and the PROD or TEACH BAD relay ACTION will be performed. Pressing the ENTER key at this point will bring up a confirm message to clear the error condition. Pressing ENTER again will silence the buzzer and will cause the OP RESTART relay ACTION to be performed.



Komax 40 Mode

Komax 40-43 systems should be connected to relay 1 only , a 'trouble crimping unit' signal is also available at relay 2 (see Alpha Mode specification for details).



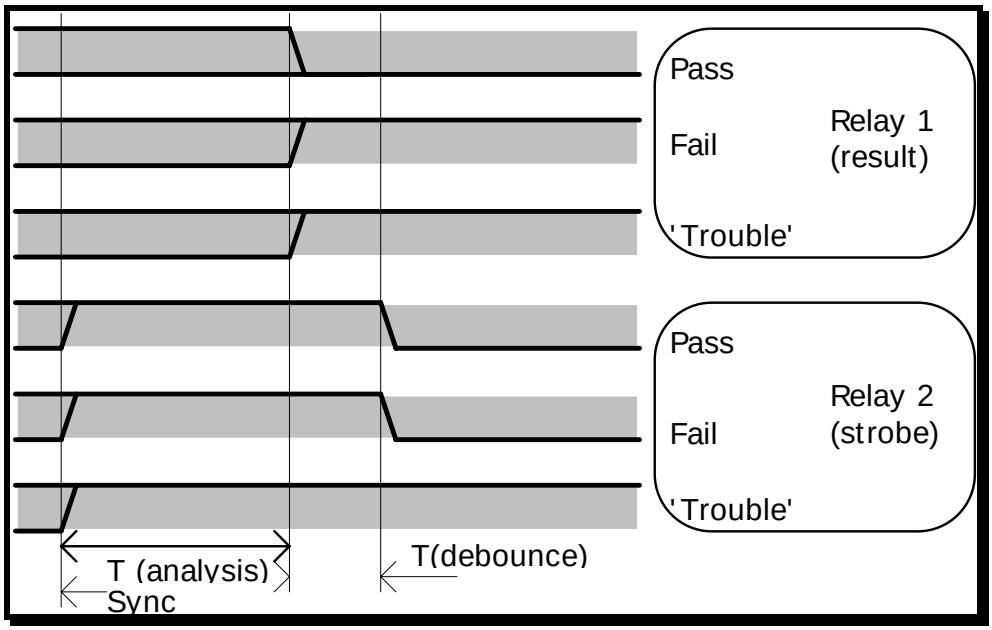
Alpha Mode(Default)

These machines allow a 3 level result system where:

- A **trouble crimping unit** signal should only be issued to stop the machine in the event of a gross error where tool damage could be a likely consequence.

- A **Fail** signal should be issued where force mismatch is high enough to indicate a faulty crimp but not high enough to warrant stopping the machine. In this case the machine would reject that particular wire and would automatically produce another to replace it without stopping production.

- A **Pass** signal should be issued if the force mismatch is within the specified limits.


Pass
Fail
'Trouble'
Relay 1
(result)
Pass
Fail
'Trouble'
Relay 2
(strobe)
T (analysis)
Sync
T(debounce)

8.3 Relay Programming Matrix

Although the standard relay interface modes can be programmed using the Quick Set method, in some applications customising of relay behaviour is required. The relay matrix allows cfa1000x EVENTS to trigger ACTIONS by any of the four relays.

8.3.1 CFA1000x Events

In all the cfa1000x generates 15 events, listed and explained below:-

1.	START	The start of a cycle.
2.	PROD PASS	A pass in production
3.	PROD BAD	A fail in production
4.	PROD STOP	A gross failure in production
5.	TEACH PASS	A pass in the teach sequence
6.	TEACH BAD	A fail in the teach sequence
7.	TEACH STOP	A gross failure in the teach sequence
8.	T AMP PASS	A pass on the second teach cycle (Cal amplifiers)
9.	T AMP FAIL	A fail on the second teach cycle (Cal amplifiers)
10.	END BATCH	The batch counter TO DO count is zero.
11.	OP RESTART	Operator has acknowledged an error and is ready to restart.
12.	AUX1 HI	The level is HIGH on AUX1 i/p line
13.	AUX1 LO	The level is LOW on AUX1 i/p line
14.	AUX2 HI	The level is HIGH on AUX2 i/p line
15.	AUX2 LO	The level is LOW on AUX2 i/p line

8.3.2 CFA1000x Relay Actions

There are five possible relay actions:-

• 1	TURN ON	Contacts Close
• 0	TURN OFF	Contacts Open
• T	TOGGLE	Change State
• S	STROBE	Contacts close after delay, then open after Delay
• X	DO NOTHING	Contacts stay in same state

8.3.3 Linking Events with Actions

The relay matrix menu lists all the available events against the available relays. By editing the actions user specific relay actions may be easily accomplished.

	RELAY	1 2 3 4
START		**1 0 X X**
PROD PASS		**1 S T 0**

Two typical lines from a matrix screen are shown above. On the left are the EVENTS (START and PROD PASS).

The four columns to the right labelled 1-4 specify the relay numbers.

Notice that for each of the EVENTS (ROWS) there is a corresponding ACTION (1,0,S,T,X) specific to each relay (COLUMNS).

The example above specifies that:-

On START of cycle **RELAY1 Closes, RELAY2 Opens, RELAYS 3&4 Do Nothing.**

On PROD PASS **RELAY1 Closes, RELAY2 Strobes, RELAY3 Toggles and Relay 4 Opens.**

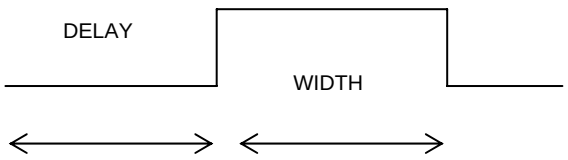
By specifying ACTIONS for each of the EVENTS the user can easily customise the function of any or all of the relays.

8.3.4 Setting a Relay Action

To set a relay ACTION with the relay matrix :-

1. From the MAIN menu select SETUP and press ENTER.
2. Select RELAYS and press ENTER.
3. Select MATRIX and press ENTER.
4. Scroll to the required EVENT and press ENTER.
5. With the control knob select the required relay and press ENTER.
6. Again using the control knob selects the required ACTION and press ENTER.
7. Press and hold ESC to return to the production screen, or if other settings are to be made press esc once to select another relay or twice to select another event.

8.3.5 Relay Strobe Timings



When a strobe action is specified for a relay, the relay timing is governed by the settings in the STROBE TIMING menu. The two editable parameters are shown pictorially in the diagram above.

- The DELAY is the delay before the relay contacts close specified in mS (milliseconds)
- The WIDTH is the delay after the relay contacts close before they open again specified in mS (milliseconds).

9.0 The Password Facility

Parameter editing on the cfa1000x is quick and easy using the GCP menu system.

It is a common requirement however, to restrict editing access to key parameters within a unit.

In recognition of this fact the cfa1000x has a password facility which allows the production engineering staff to prevent unauthorised personnel from gaining access to menus which allow editing of such parameters.

9.1 Setting the system password

The system password is any four character alpha-numeric string. To set the system password:-

1. From the MAIN menu select SETUP and press ENTER.
2. Select PASSWORD and press ENTER.
3. Select CHANGE PASSWORD and press ENTER.
4. Select a character and press ENTER.
5. Use the control knob to select the required alphanumeric and press ENTER.
6. Repeat steps 4 & 5 for all the characters in the required password.
7. Press ESC to leave character editing mode and set the password.
8. Press and hold ESC to return to the production screen.

9.2 Locking Menus

To restrict menu access:-

1. From the MAIN menu select SETUP and press ENTER.
2. Select PASSWORD and press ENTER.
3. Select LOCK MENUS and press ENTER.
4. A confirm screen is displayed, press ENTER to lock or ESC to quit.
5. Press and hold ESC to return to the production screen.

9.3 Unlocking Menus

To allow unrestricted menu access:-

1. From the MAIN menu select SETUP and press ENTER.
2. Select PASSWORD and press ENTER.
3. Select UNLOCK MENUS and press ENTER.
4. Select a character and press ENTER.
5. Use the control knob to select the required alphanumeric and press ENTER.

6. Repeat steps 4 & 5 for all the characters in the system password.
7. Press ESC to leave character editing mode and unlock the menu system.
8. Press and hold ESC to return to the production screen.

9.4 Password Utility

If the system password has been lost or forgotten, there is no way for the user to regain access to the locked menus.

A Windows 95/98 utility is therefore available to generate a MASTER PASSWORD which will unlock the system again.

To use the Unlock Code Generator utility to unlock a cfa1000x:-

1. Run the utility from your win95 desktop (START->PROGRAMS->CFA1000UTILITIES)
2. On the cfa1000x from the MAIN menu select SYSTEM INFO and press ENTER.
3. Select SW-VERSION and press ENTER.
4. Note down the SERVICE NUMBER and press and hold ESC to return to the PRODUCTION screen.
5. Enter the service number in the unlock utility dialogue and press the CALCULATE button.
6. Note down the unlock code and then shut down the application.
7. On the cfa1000x, follow the procedure for UNLOCKING MENUS and enter the unlock code as the system password.
8. The cfa1000x should now be unlocked.
9. Select a new password and set the system password by following the procedure for SETTING THE SYSTEM PASSWORD. Make a note of the system password and store it safely for future reference.

10.0 Press cycle counter facility

The cfa1000x incorporates a feature for logging the number of press cycles.

Two facilities are provided:-

- CYCLES

A resettable counter for the number of cycles. This counter can be used as a press service counter.

- TOTAL CYCLES

A non-resettable counter for the total number of press cycles.

10.1 Viewing the press cycle counters

To view the press cycle counters:-

1. From the MAIN menu select SYSTEM INFO and press ENTER.
2. Select COUNTERS and press ENTER.
3. Press and hold ESC to return to the production screen and end viewing.

10.2 Resetting the resettable press counter

To reset the resettable cycle counter:-

1. From the MAIN menu select SYSTEM INFO and press ENTER.
2. Select COUNTERS and press ENTER.
3. To reset, Press ENTER with the highlight bar over CYCLES <reset>.
4. Press and hold ESC to return to the production screen.

11.0 Additional features and settings

11.1 Restoring Factory Default Settings

To restore the cfa1000x factory default settings:-

1. From the MAIN menu select SYSTEM INFO and press ENTER.
2. Select SETUP and press ENTER.
3. Select OPTIONS and press ENTER.
4. Select SET DEFAULTS and press ENTER.
5. Press ENTER on the confirm screen or ESC to quit.
6. Press and hold ESC to return to the PRODUCTION SCREEN.

11.2 Setting the coaxial interface node address

To set the cfa1000x coaxial interface node address:-

1. From the MAIN menu select SETUP and press ENTER.
2. Select COMMS and press ENTER.
3. Highlight NODE ID and press ENTER to go into edit mode.
4. Select the required address and press ENTER to save.
5. Press and hold ESC to return to the production screen.

Address 0 is the NETWORK MASTER (PC or MACHINE) address and address 255 is a reserved broadcast address and therefore cannot be set for a CFA.

11.3 CFA1000x Data Capture Triggering

The cfa1000x has two data capture modes:-

- **Encoder trigger mode** (default)

The encoder triggers data capture.

- **Time triggering Mode**

A cpu timer controls data capture. Data gathering is initiated with an optional trigger sensor in place of the encoder.

11.3.1 Setting the data capture mode

To set the cfa1000x data capture mode:-

1. From the MAIN menu select SETUP and press ENTER.
2. Select OPTIONS and press ENTER.
3. Highlight TRIGGER and press ENTER to go into edit mode.
4. Select the required mode and press ENTER to save.
5. If the mode set was TIME highlight RPM and press ENTER.
6. Set the press speed in using the control knob and press ENTER to save.
7. Press and hold ESC to return to the production screen.

The RPM figure associated with this menu is used only in the TIME trigger mode. If operating in the time trigger mode enter the press output shaft speed. This is simply the motor speed RPM / gearbox reduction ratio.

11.4 Controlling buzzer operation

The option board buzzer is used to provide an audible warning of a bad termination.

The buzzer can be disabled through the OPTIONS menu however. To Enable/Disable the option board buzzer:-

1. From the MAIN menu select OPTIONS and press ENTER.
2. From the OPTIONS menu select BUZZER and press ENTER.
3. The buzzer state is now highlighted; use the control knob to select the desired state.
4. Press the ENTER key to save the setting or the ESC key to restore the old setting.
5. Press and hold the ESC key to return to the MAIN menu.

NOTES

The default settings for the buzzer are dependant on the relay mode settings as follows:-

BENCHTOP	BUZZER ON
ALPHA	BUZZER OFF
K40	BUZZER OFF

12.0 cfaNET PC Software

CfaNET is a windows program which allows simple control and monitoring of up to 254 cfa1000x units.

The system PC communicates using a free COM port via a converter box supplied with the networking kit.

Each cfa1000x is connected to the common coaxial bus using a T-piece connector and the network socket located on the back of the unit.

A unique network NODE ID is allocated and used to allow each cfa on the network to communicate with the network PC.

12.1 cfaNET Software Installation

The minimum PC requirements for the cfaNET software to operate are as follows :-

- Pentium II class or better with 32MB Ram.
- Minimum 10MB of free disk space.
- CD Rom Drive.
- 1 spare COM port
- Windows 95/98/NT4/2000 Operating System.

It is strongly recommended that before you begin installing the software you shut down all other applications on your machine and reboot it.

Insert the cfaNET CD ROM into your drive (usually “d”) and close the door.

The software has an autorun file so the installation software should run up automatically.

If for any reason this fails to happen proceed as follows:-

- Click on start then run
- Type d:\setup.exe (where “d” is the letter of your CD ROM drive)

Follow the on screen instructions.

12.2 cfaNET Hardware Installation

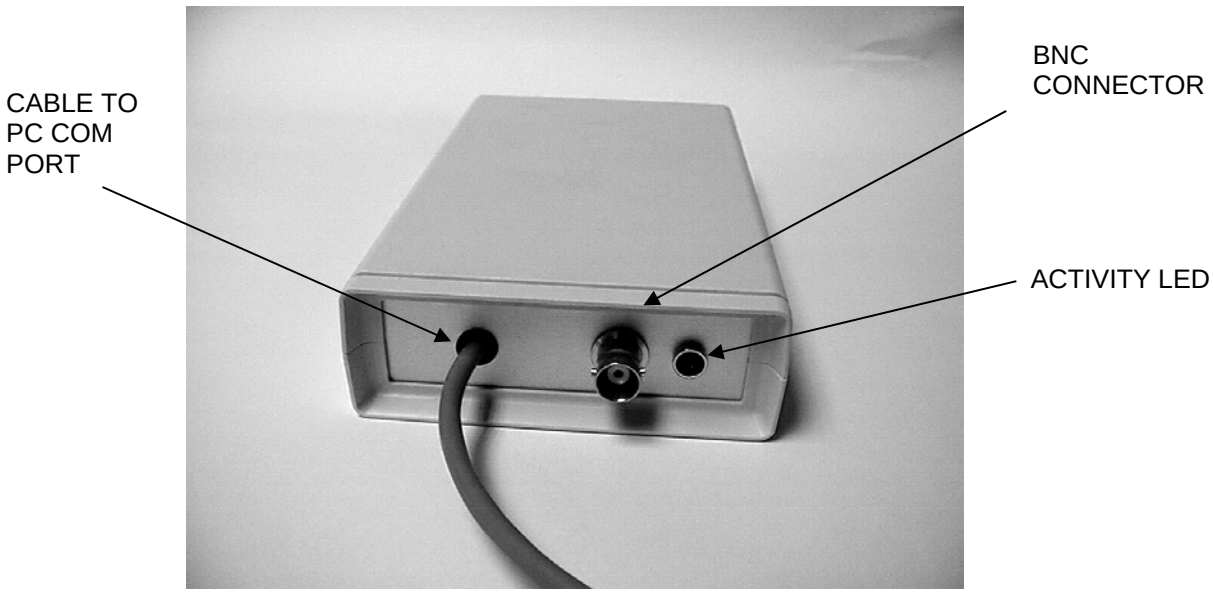
CfaNET hardware installation consists of three simple steps :-

- Connection of the network adapter to the Network PC
- Connection of the network cable to each cfa on the network
- Configuration of the network NODE ID for each cfa on the network.

The following sections will guide you through these steps.

12.2.1 Network Adapter Connection

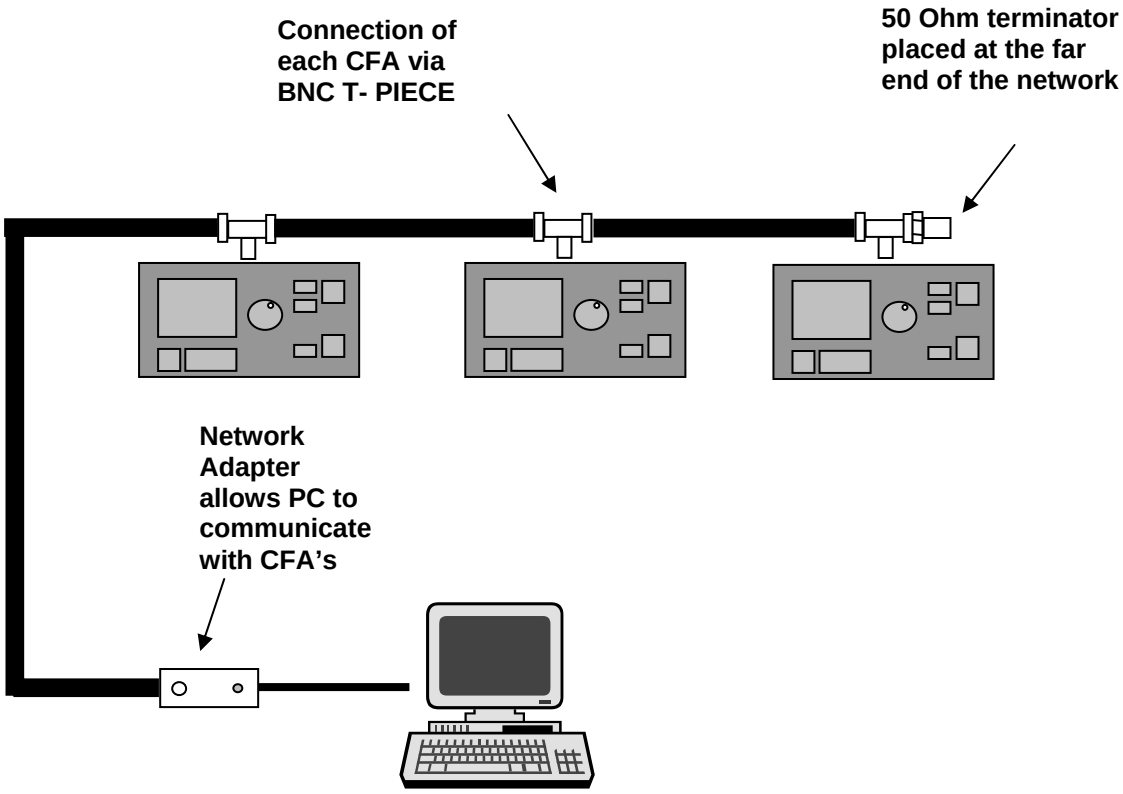
The network adapter is shown below



- Connect the 9 way dsub connector to an appropriate COM port on the Network PC.

- Connect the network cable to the BNC connector on the network adapter box

12.2.2 Connection of cfa1000x to the cfaNET



Do not route any part of the network cable inside any conduit carrying mains electrical supply wiring as this would contravene local electrical safety regulations.

- Each analyser should be connected to the network by a BNC 'T'-piece fitted to the network socket on the analyser. The cable layout should form an electrical 'daisy-chain' of analysers.

- One end of the daisy-chain should be connected to the P.C. interface card and the other end should have a 50 ohm BNC terminator fitted to the unused branch of the 'T'-piece of the last analyser on the chain. The coaxial cable specified for the network is standard RG58/CU, all connectors are standard 50 ohm BNC parts.

- Try to keep all cable runs as short as is practicable.

Do not allow any exposed metal parts of the BNC 'T'- pieces or connectors to connect to mains earths or machine grounds, the net cable is earthed for safety at the P.C., other spurious earth connections could cause ground loop currents to flow in the cable causing electrical interference to the network.

12.2.3 Configuring the network NODE ID

Refer to section ***11.2 Setting the coaxial interface node address*** and set the desired node address on each of the cfa's on the network.

- You must set a unique address on each unit.
- Address **0** is used by the network PC and therefore cannot be set on a cfa.
- Address **255** is a broadcast address and therefore cannot be set on a cfa.

12.2.4 Troubleshooting the cfa network

- Check the unit is powered up and plugged into the network.
- Check there are no breaks in the network cable.
- Check the network adapter is plugged on to the correct COM port.
- Check the network adapter batteries are not exhausted (Observe Red LED when Sending).
- Check the network node ID is set correctly and uniquely.
- Check the communications protocol is set to OMI in the SETUP-COMMS menu.

12.3 Use of cfaNET software

The following sections describe the use of the cfaNET pc software.

It is assumed that the reader has a basic working knowledge of pc's and the Windows 95/98/NT4/2000 operating systems.

12.3.1 Serial Port Settings

It is assumed at this stage that you have followed the guidelines in section 12 and installed the hardware correctly.

To set the cfaNET software to use the correct COM port on your PC proceed as follows:-

- From the **view** menu select item ***serial port settings…***
- The serial port settings dialogue box opens.
- Type in the name of the COM port on your PC which is connected to the cfaNET. These are usually called COM1, COM2 etc.
- Test the communication by running up the PC software.
- In the **press stations** window highlight a press station by clicking on the icon with the left mouse button. The icon will change colour to indicate it is selected.
- Now click the right mouse button to bring up the pop up menu.
- Select item **download force curve**. If the COM port is setup correctly, the activity led on the network adapter box should light briefly. If the light fails to flash, then it is likely that the wrong COM port is set up.

Ignore any error messages referring to the fact the download failed, as at this stage no press station properties have been set

12.3.2 Adding/Deleting a press station

To add a press station to the **press stations** window:-

- In the press stations window position the mouse cursor away from any press icons then right click.
- Select item **Add new press**
- The new press station appears in the top left corner of the window.
- Set the press station properties to allow communication with the unit.

To delete a station select the station:-

- In the press stations window position the mouse cursor over a press icon and right click to show the popup menu.
- Select item **Delete press**
- Confirm the action to delete the press.

To move a press station icon, click and drag it to the desired position

12.3.3 Setting Press Station Properties

In order to communicate with a press it is first necessary to set the press station properties. To set the press station properties:-

- Add a new press station Icon as described in section 12.3.2.
- Double click the press station icon and wait.
- A dialogue box will indicate that the press station is not responding.
- Press OK to cancel the error message.
- The press properties dialogue box will open.
- Fill in the NODE ID, SERIAL NO, STATION ID, WIRE TYPE and TERMINAL TYPE.
- Press OK
- Again double click the press icon. This time no error message will be displayed and the cfa settings will be filled in.

12.3.4 Downloading a force curve

To download a force curve:-

- From the **press stations** window select a press station by clicking on the icon.

- Right click the mouse and select **download force curve** from the popup menu.

- The force curve from the selected press station will be opened in a new window.
- To print preview the force curve select **print preview** from the **file** menu.
- To print the force curve select **print** from the **file** menu.
- To save the force curve curve select **save as** from the **file** menu.

Multiple press stations can be selected by clicking the left mouse button and dragging a box over the icons required.

12.3.5 Downloading the batch buffer

To download the batch buffer:-

- From the **press stations** window select a press station by clicking on the icon.
- Right click the mouse and select **download batch buffer** from the popup menu.
- The batch buffer from the selected press station will be opened in a new window.
- To print preview the force curve select **print preview** from the **file** menu.
- To print the force curve select **print** from the **file** menu.
- To save the force curve curve select **save as** from the **file** menu.

12.3.6 Resetting the batch buffer

To reset the batch buffer:-

- From the **press stations** window select a press station by clicking on the icon.
- Right click the mouse and select **reset batch buffer** from the popup menu.

- Confirm the action by pressing OK.

Data in the batch buffer is lost forever when the batch buffer is reset. Consider downloading and saving the data before a reset is performed.

12.3.7 Add to statistics window

To add statistics information from a cfa to the statistics window:-

- From the **press stations** window select a press station by clicking on the icon.
- Right click the mouse and select **Add to statistics window** from the popup menu.
- The statistics information for the press selected will appear in the statistics window. The data is updated continuously to produce a live display.
- To delete a press from the statistics window, select the required line and press the **delete** key.

12.3.8 Adding a user defined background

It is possible to add a user defined backdrop bitmap to the press stations window in order to represent a users production facility.

To add a user defined backdrop:-

- In the press stations window, move the mouse cursor away from all press station icons and right click.
- Select menu item add background.
- In the file selection dialogue box browse to your background bitmap and press ok.
- The background will appear in the window.

A background bitmap can be created in most graphical editing software. Examples include MS PAINT, MS WORD, COREL DRAW. Be sure to save your backdrop as *.BMP

13.0 Printing a batch report using the optional printer

The cfa1000b benchtop system can be connected to an optional thermal printer. This allows a hardcopy batch report to be obtained, listing the following information.

- Current Time and Date
- Batch Start Time and Date
- Current CFA settings
- Batch statistics

The system currently supports the Seiko DPU-414 thermal printer.

A batch report can be printed at any time as follows:-

- From the *Main* menu, select item *System Info*.
- From the *Info* menu select item *Print Report*.

Make sure that the printer is powered up,on-line and connected to the cfa1000B printer socket with the lead supplied.

If a printer is connected to the cfa1000B, a batch report will automatically be printed when the batch counters are reset.

13.1 Printing – Troubleshooting

If problems are experienced trying to print batch reports, check the folowing points before calling for assistance.

- Check the printer lead supplied is connected between the SERIAL socket on the printer, and the PRINTER socket on the cfa1000b.

- Check that the printer is powered up using the power supply provided (Green LED on front panel lit), and is ON LINE (Green ON LINE light illuminated).

- Check that there is sufficient paper in the printer and that the PAPER END led is OFF.

Finally check that the printer settings are correct as follows:-

- Switch OFF the printer.

- Switch ON the printer whilst holding down the small front panel key.
- Release the key once printing of the settings commences.

Check that the following key settings are correct:-

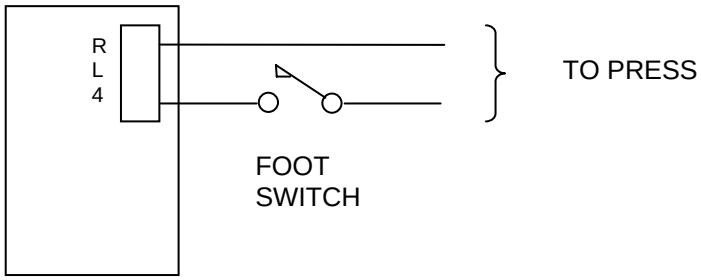
DIP SW -1	*1(OFF)*	*Input = Serial*
DIP SW -2	*5(ON)*	
	6(ON)	
	7(OFF)	
	8(OFF)	*International Character Set = England*
DIP SW -3	*1(ON)*	*Data Length = 8 bits*
	2(ON)	*Parity Setting = No*
	4(ON)	*Busy Control = H/W Busy*
	5(OFF)	
	6(ON)	
	7(ON)	
	8(ON)	*Baud Rate = 9600 bps*

If settings are found to be incorrect, refer to the printer manual for details on how to change them.

Appendix A Machine Integration Information

BENCHPRESS

WIRING



CFA1000B

RELAY SETTINGS

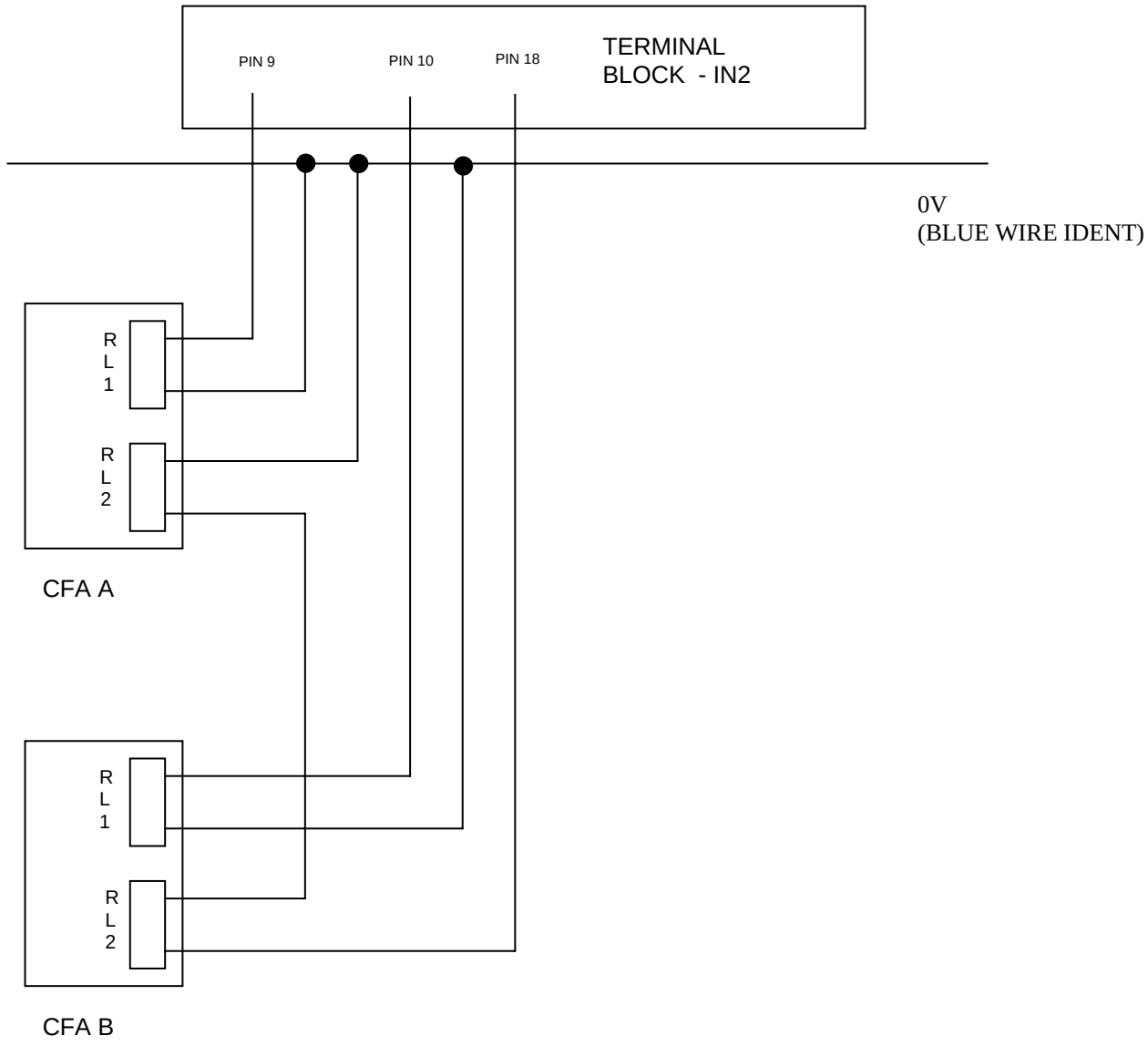
Select BENCHTOP mode from the QUICKSET menu.

RL4 opens on fail, preventing the press from firing again until the error condition is reset on the GCP by the operator.

NOTES

An alternative wiring arrangement to wiring RL4 in series with the footswitch (as shown above), is to wire RL4 in to the emergency stop (e.g. operator guard interlock) although this is not recommended.

WIRING


PIN 9
PIN 10
PIN 18
TERMINAL
BLOCK - IN2
0V
(BLUE WIRE IDENT)
RL1
RL2
CFA A
RL1
RL2
CFA B

RELAY MATRIX SETTINGS

EVENT	RELAY 1	2	3	4
START	0	1	X	1
PROD PASS	S	1	X	1
PROD BAD	0	0	X	0
PROD STOP	0	0	X	0
T PASS	S	1	X	1
T BAD	0	0	X	0
T STOP	0	0	X	0
T AMP PASS	S	1	X	1
T AMP FAIL	0	0	X	0
END BATCH	X	X	X	X
OP RESTART	0	1	X	1
AUX 1 HI	X	X	X	X
AUX 1 LO	X	X	X	X
AUX 2 HI	X	X	X	X
AUX 2 LO	X	X	X	X

RELAY STROBE SETTING

DELAY 10ms

WIDTH 150ms

MACHINE SETTINGS

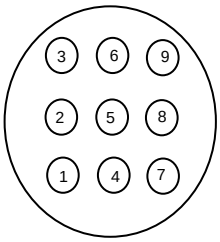
The machine control software must be put into a mode which expects to see a pulse on pass signal on pins 9 and 10, and closed contacts on pin 18 if the cfa is operating.

Refer to the machine instruction manual for further information.

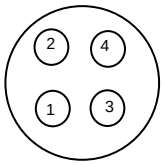
KOMAX K40-K43

WIRING

Cfa1000M 9way
Adapter Plug



Komax 40-43 Force
Check Socket



CFA 1000M ADAPTER PLUG	KOMAX K40-43 FORCE SOCKET
5	2
8	1

- Wire the 9 way adapter plug to the cfa1000m according to the instructions *cfa1000m - Wiring 9 way Adapter Lead* which follow.

- Connect the K40-43 interface lead between the cfa1000m and K40-43 Force Check socket.

RELAY SETTINGS

Select K40 relay mode from the relay quickset menu.

NOTES

- An adapter lead *cfa1000m 9way Adapter lead* Part No. 900009 is required.

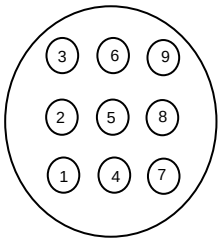
- A connection lead *Komax K40-K43 interface lead* Part No. 022892 is required.

- Software adjustments may be required on the base machine. Consult the operating manual for further details.

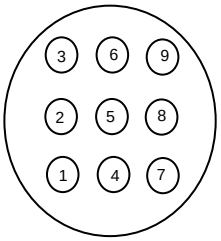
KOMAX ALPHA 411/421/422/432

WIRING

Cfa1000M 9way
Adapter Plug



Alpha Cfa Socket



cfa1000m 9 way Adapter	Alpha cfa socket
5	7
6	7
8	8
9	9

- Wire the 9 way adapter plug to the cfa1000m according to the instructions *cfa1000m - Wiring 9 way Adapter Lead* which follow.
- Connect the Alpha interface lead between the cfa1000m and Alpha cfa socket.

RELAY SETTINGS

Select Alpha mode from the Relay Quick Set menu.

NOTES

- An adapter lead *cfa1000m 9way Adapter lead* Part No. 900009 is required.
- A connection lead *Komax Alpha Interface Lead* Part No. 022891 is required.
- Software adjustments may be required on the base machine. Consult the operating manual for further details.

cfa1000M - Wiring 9 way Adapter Lead

Isolate the mains supply before carrying out this procedure.

The 9 way adapter lead is wired to the screw terminals inside the cover of the cfa1000m according to the table below.

COLOUR	FUNCTION	cfa1000m TERMINAL
BROWN	LIVE	L
BLUE	NEUTRAL	N
GREEN/YELLOW	EARTH	E
VIOLET	RELAY1 N.O. CONTACT	RL1
VIOLET	RELAY1 N.O. CONTACT	RL1
WHITE	RELAY2 N.O. CONTACT	RL2
WHITE	RELAY2 N.O. CONTACT	RL2

Appendix B Troubleshooting Guide

cfa1000x intermittently fails good terminals.

This problem is often caused by the encoder slipping. Go through the encoder setup procedure and check the readings at the end of each press cycle. If the readings vary, then the encoder fixing screws or securing screw is loose.

cfa 1000x fails terminals producing results below the BLO limit.

This is because internally, the cfa uses your overall limit BLO to produce limits for each zone. Although the result overall may pass, if any of the zone result exceed the calculated zone limit then the termination is bad. This is a big advantage over other systems as it makes the system very sensitive to errors occuring in only one part of the termination process. You can see with the error markers on the PRODUCTION SCREEN which zone has failed. The actual results for each zone can also be viewed in the ZONE RESULTS menu.

No force profile shown on GCP when press is fired.

- Check the encoder operation by rotating the press by hand and watching the angle increase on the ENCODER SETUP menu.
- Check that the sensor is fitted securely and that the sensor cable is fitted between the sensor and the FORCE input on the evaluation unit.

Yellow REF led is lit all the time.

This is because the teach sequence is not being completed properly, due to the analyser failing one of the terminals,and is therefore restarting automatically. The reason for the processing failure should be investigated.

Appendix C SPARE PARTS

Part No	Description
200970	FP2 Ram Sensor
200980	Makfil Ram Sensor
200972	Force Sensor Lead
200981	cfa1000b Encoder Unit
200971	cfa1000m Encoder Unit
200982	cfa1000b Evaluation Unit
200983	cfa1000m Evaluation Unit
200984	cfa1000m Graphical User Interface (GCP)
200973	cfa1000m 9 Way Adapter
022892	KOMAX K40-K43 Interface Lead
200905	cfa1000x Operating & Instruction Manual

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electronic innovations

Declaration of Conformity

Circuitmaster Designs Ltd, Kingsway West Business Park, Moss Bridge Road, Rochdale, Lancs, UK

Declares that the product **cfa1000**

Has been tested and conforms to the following specifications and may carry the CE marking accordingly:-

EC DIRECTIVE **2004/108/EC (EMC Directive)**
- BS EN 61000-6-1 :2007
  - GENERIC EMC IMMUNITY STANDARD
  - RESIDENTIAL, COMMERCIAL AND LIGHT INDUSTRY
- BS EN 61000-6-3 :2007
  - GENERIC EMC EMISSION STANDARD
  - RESIDENTIAL, COMMERCIAL AND LIGHT INDUSTRY

EC DIRECTIVE **2006/95/EC (Low Voltage Directive)**
- BS EN 610101-1 :2001.
  - Electrical equipment for measurement, control and laboratory use - Safety

The technical file is available for competent authority review with reasonable notice.

Signature A Bainbridge Date **28/04/2010**

Andrew Bainbridge

Circuitmaster Designs Ltd
Technical Director

Appendix to CFA1000M/B INSTALLATION & OPERATING INSTRUCTIONS for software release CFA1000R4 16/09/03

Appendix D Artos MTX/STX machine Interface

A relay quick set for Artos machine interface has been added at software R4.
Artos machines require:

1) One input, pulsed to signify a pass/ no pulse to signify a marginal fail.
2) A second input asserted to signify a gross pass / not asserted to signify a gross fail.

When the relays are quick set to Artos mode, the strobe delay is set to 5mS and the strobe width is set to 50mS.

WIRING to Artos machine I/O

Relay 1 provides the 'marginal OK' signal.
For the 'lead CFM' this is at I/O board C terminal 9
For the 'tail CFM' this is at I/O board C terminal 10

Relay 2 provides the 'gross OK' signal.
For the 'lead CFM' this is on I/O board C terminal 5
For the 'tail CFM' this is on I/O board C terminal 6

Both I/O signals should be +24V, the CFA1000 relays are volt-free therefore they should be supplied by +24V, this can be provided from terminal 301 inside the machine cabinet.