6004MF

Multi functional Transmitter

• Introduction

Welcome to the weighing electronics world of the Multi-Function Model 6004 MF. Using the latest ARM microprocessor technology we are now able to offer a powerful, compact, field-mount unit that you can select for a variety of weighing functions at a cost-effective price. The main advantage to the user, servicing organisation or marketing company is having one electronics unit that can be used for almost any application in the weighing industry.

• Applications

- Loadcell Transmitter
- Beltweigher
- Loss-in-weight Transmitter
- Through-put Weigher
- Bag-filler
- Batchweigher
- Dynamometer
- Evolutions

• Features

- Rugged, powder coated, cast Aluminum housing with splashproof keypad
- Clear 20mm 6-digit LED main display & auxiliary information LCD display
- Inputs from loadcell, incremental encoder & six digital
- Powerful ARM microprocessor with integral clock & USB I/O port
- Programming, keypad using LCD or PC via USB with supplied software
- User-programmable function keys, digital inputs and relay outputs
- Precalibration of sensitivity and range, zero trim and deadweight span trim
- Lineariser 15-point, min/max hold, auto-zero maintenance, preset tare
- PI control with auto-manual setpoints, bumpless transfer, anti-reset windup
- Bootloader for remote internet firmware updates and program specials
- Outputs for isolated analog 1-5/0-10Volts or 0/4 - 20mA
- Power supply 90-260V switchmode or 10-30V isolated DC

• Options

- Output relays or photomos 2, 4 or 6, plug&play, programmable functions
- Serial outputs, RS232, RS485, Ethernet, plug&play
- Formats in ASCII, Modbus or do-it-yourself Buildabus
- SD memory card for storing commissioning setup or data logging
- GPS, factory fit, for accurate position recording with on-board weighing

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Description of the units available

Loadcell transmitter

A loadcell transmitter is used to convert loadcell outputs into a standard instrumentation analog signal such as 4-20mA or 0-10volts, it will also supply power to excite one or more loadcells. The 6004MF has many additional features such as displays for mass and programming, digital communications for direct connection to control computers and alarms. Our weighing electronics has always incorporated a precalibrate, zero trim and span trim feature. This is a simple way to set up a strain-gauge loadcell system. All the variables, such as sensitivity and range, are inserted in the precalibrate section so that the system is reasonably accurate before adding test weights. The weighing system is then zero trimmed (backbalanced) to offset the dead weight of weighbin, weighframe or weighbridge deck. With known test weights the system can be span trimmed to get higher accuracy. In some instances, such as very large weightanks where it is not possible to use test weights, precalibration using factory test certificates for loadcell sensitivity results in an acceptable overall system accuracy.

The ARM processor used incorporates a USB port and a real time clock with day/date. We have made full use of these facilities and added an optional, factory fitted, global positioning system (GPS) to cater for such applications as on-board truck weighing, positioning and data logging. In refuse removal some countries are introducing legistration for customers to pay by weight for this service. Farmers are starting to monitor crop production and fertiliser distribution by location to improve farming efficiency. Logging contractors need to load for maximum profit without incurring overweight fines.

Beltweigher

The beltweigher measures the weight of material on a conveyor belt and it's speed, from this a mass flow is calculated in kg/min or tonnes/hr. The 6004MF allows you to set or measure a belt speed, and, if measure, to set the pulley diameter, encoder pulses/rev and also to enter the weighsection length. With this information and the precalibrate feature described above the material flow rate will be calculated and displayed. Zero trim time is selectable to allow for one full conveyor belt cycle and, if some form of check weighing is available, a rate correction factor can be inserted. All rates have a main totaliser as well as a resettable totaliser. The totaliser can be set for remote display through one of the setpoint outputs using an optional photomos solid state relay which is ideal for this purpose. The PI control selection used with a variable speed drive can convert the beltweigher into a flow controller.

Loss-in-Weight Transmitter

Loss-in-weight is becoming a popular form of mass flow measurement or control as it requires few moving or wearing parts. Measure a weighbin over time and you can can get a material flow rate either emptying or filling. Although we sample the averaged weight every second you can select the measurement comparison period from 10 to 480 seconds. A short period is ideal for small bins and extended time for larger weighbins. The system can be selected to run for one weighbin cycle then stop or can be set to hold the rate display and output whilst it refills the weighbin. Totalisers and selectable PI control are also standard features.

Description of the units available

Throughput Weigher

A throughput weigher makes use of a small weighbin to weigh and dump batches in quick succession typically used in bulk handling of cereals. The flexibility of the 6004MF allows you to set high and low levels of the weighbin and various time delays in order to tune the throughput weigher for maximum efficiency. The main display is normally the total but a flow rate can also be displayed provided the timebase is long, say, kg/hr or tonnes/hr so that the batches can be smoothed out.

Dynamometer

The dynamometer application measures power of engines, electric motors or hydraulic motors in conjunction with some form of braking. It makes use of the loadcell input to measure torque normally in conjunction with a lever arm and the encoder input to measure revolutions per minute (RPM). The loadcell can be precalibrated and the lever arm length entered. For various shaft encoders the impulses per revolution can also be set. The 6004MF will then display kW (or horsepower) , RPM and torque. Displays are selectable, eg, kW on main and RPM and torque on the auxilliary LCD.

Bagfiller

This application provides the control for bagfilling machines as used for measuring precise weights of cement or flour, etc. It has setpoints for fast and slow fill, inputs for interlock and footswitch and outputs for filling, vibrating and bag clamps. The settle, vibrate and waiting times are adjustable to optimise the filling. In-flight correction is standard which will correct any weighing error over a preset number of bags. Total can be bags filled or totalised weight or both

Batchweigher

Batchweighers are typically used for control of industrial concrete mixers but can also control just about anything that requires a repetitive recipe mix. The freely programmable inputs, function keys, displays and outputs results in a batchweighing system with tremendous flexibility. The setup allows for a maximum of five ingredients. Each can be named (Sand, Cement, etc), be a mass or count (say, from a water meter), have an interlock, time delay and/or in-flight correction. In the setpoint values section up to four recipes (A,B,C or D) can be set. With these selections just about any batching system can be customised, even on site if need be.

• Safety

This equipment is supplied by a mains voltage which can cause an electric shock injury. Before removing the cover from the housing, switch the instrument off, isolate it from the mains power supply and make sure that it cannot be connected inadvertently by other persons.

If the cover is removed from the housing, do not apply power to the instrument unless specifically instructed to do so in these instructions. When working on live equipment, exercise great care, use insulated tools and test equipment, and do not work alone.

When handling circuit boards, ensure that full anti-static precautions are observed.

Replace mains fuse with one of an equivalent type or rating.

• Cleaning

Do not clean the instrument while the instrument is on. Harsh abrasives, solvents, scouring cleaners and alkaline cleaning solutions, such as washing soda, should not be used especially on the display window. The outside of the instrument may be wiped down with a slightly damp clean cloth (lightly moistened with water only).

Under no circumstances should you attempt to wipe the inside of the instrument.

• Guarantee

This product is guaranteed against faulty workmanship or defective material, for a period of 3 (three) years from date of delivery.

The manufacturer undertakes to replace without charge all defective equipment which is returned to it (transportation costs prepaid) during the period of guarantee, provided there is no evidence that the equipment has been abused or mishandled in any way.

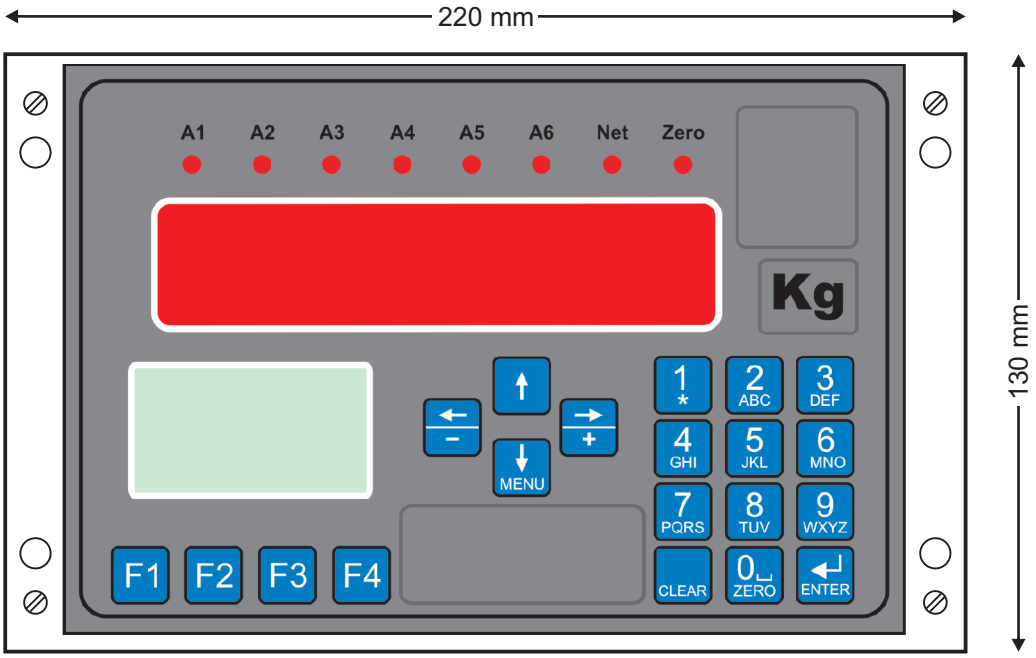
The manufacturer reserves the right to alter any specification without notice.

• Installation

Installation

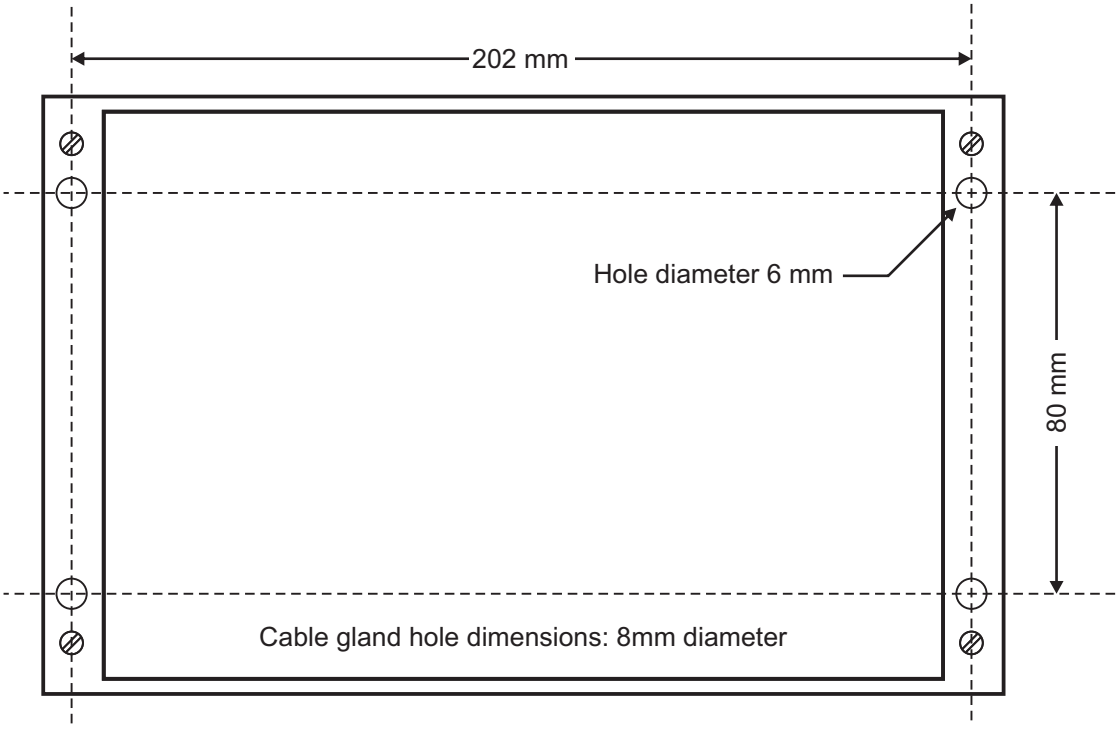
Overall dimensions

- Not to scale.
- Height of 130mm excludes cable glands
- Depth is 70 mm



Mounting holes

- The housing side covers need to be removed to gain access to the mounting holes.



• Wiring and Links

LOADCELL WIRING

The straingauge loadcell is basically a four-wire device. For short distances or lower accuracy requirements the remote sense leads are not essential. However the sense and excitation must be linked (S+ to Ex+ and S- to Ex-) at some point or there will be no control of the excitation voltage and it will go to maximum. You can use the links J1 & J2. For better accuracy on a four-wire connection cut J1 & J2 then put in links on the field side of the plug-in terminals.

For long distances, higher accuracies or using Intrinsically safe (Is) barriers use a six-wire connection with the sense leads to the loadcell/s. These sense leads measure the excitation voltage at the loadcell (or field junction box) and compensate for any lead or barrier volt drops. Cut J1 & J2. No links on terminals.

For multiple loadcell systems join all loadcells in parallel. Make sure that the loadcells are impedance matched and have the same sensitivity (mV/V). Use a field junction box to save wiring and facilitate terminal connections.

EXCITATION VOLTAGE

10 Volts for up to 4 x 350Ω loadcells (factory default)
10 Volts for up to 8 x 1000Ω loadcells
5 Volts for up to 8 x 350Ω loadcells
5 Volts for Is (barriered) applications up to 2 x 350Ω loadcell
3.5Volts for Is (barriered) applications up to 4 x 350Ω loadcells

LINKS
Power off, change links, power on.

Programmable excitation voltage links J7 & J10 then set in Precalibrate menu.
Fixed excitation voltages link J9 = 3.5 Volts, J8 = 5 Volts, J7+J8 = 10 Volts.
Link J27 connects ground plane to earth. Normally off.
Link J5 is for encoder NPN or PNP selection.
Link J2 on top circuit board is a hardlock for programming.

HARDWARE OPTIONS

Power off, fit option, check alignment with standoff pillor, power on, activate option in Transmitter Settings, Hardware Fitted.

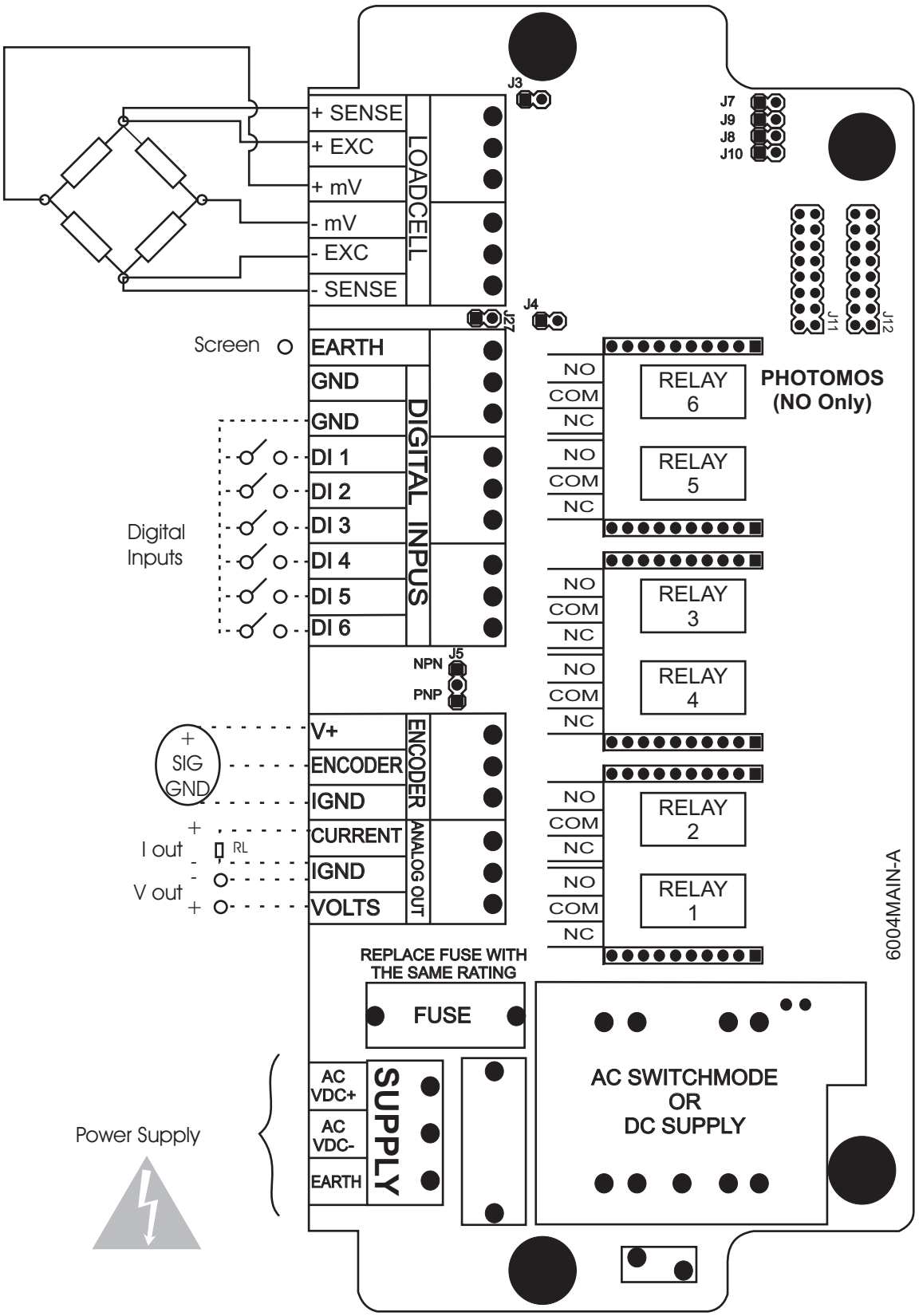
Plug-in relays or photomos. Use R6 (photomos) for totaliser output.
Plug-in coms options on top circuit board. RS232, RS485, USB, Ethernet, RF.
Factory fit options Global Positioning System (GPS) and SD data card.

POWER SUPPLY

Power supply is factory supplied 90-260V AC/DC or 10-30VDC. These modules are not easily field replaceable as they have to be soldered in.
Note: For critical applications or electrically noisy environments (heavy switch gear or large variables speed drives) ensure the power supply to the instruments is clean and stable, you may need to fit an external uninterruptible power supply (UPS).

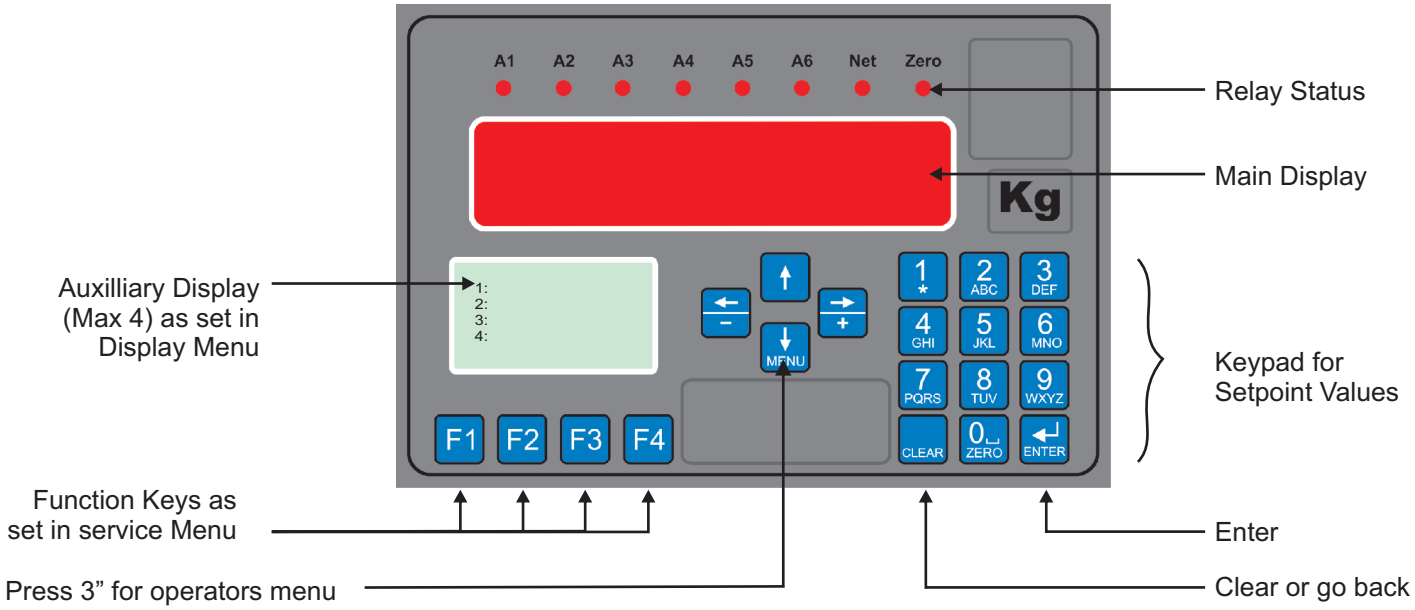
• Wiring Connections

Wiring connections, jumpers and fuse replacement

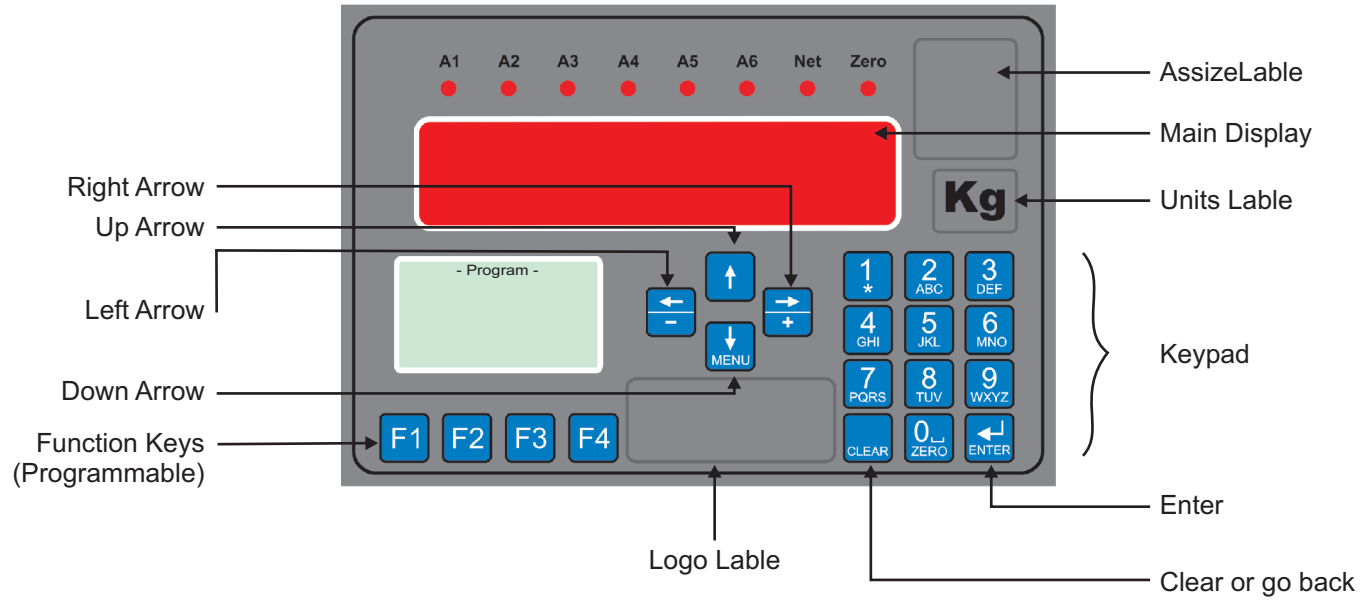


• Display and Controls

Keypad during run mode



Keypad during programming mode



LED Definitions

A1 A2 A3 A4 A5 A6 — Output relay status

Net — Main display in net mode

Zero — Net display value is zero

Relay energised: Normal = LED on, Inverted = LED off

Scroll through menus

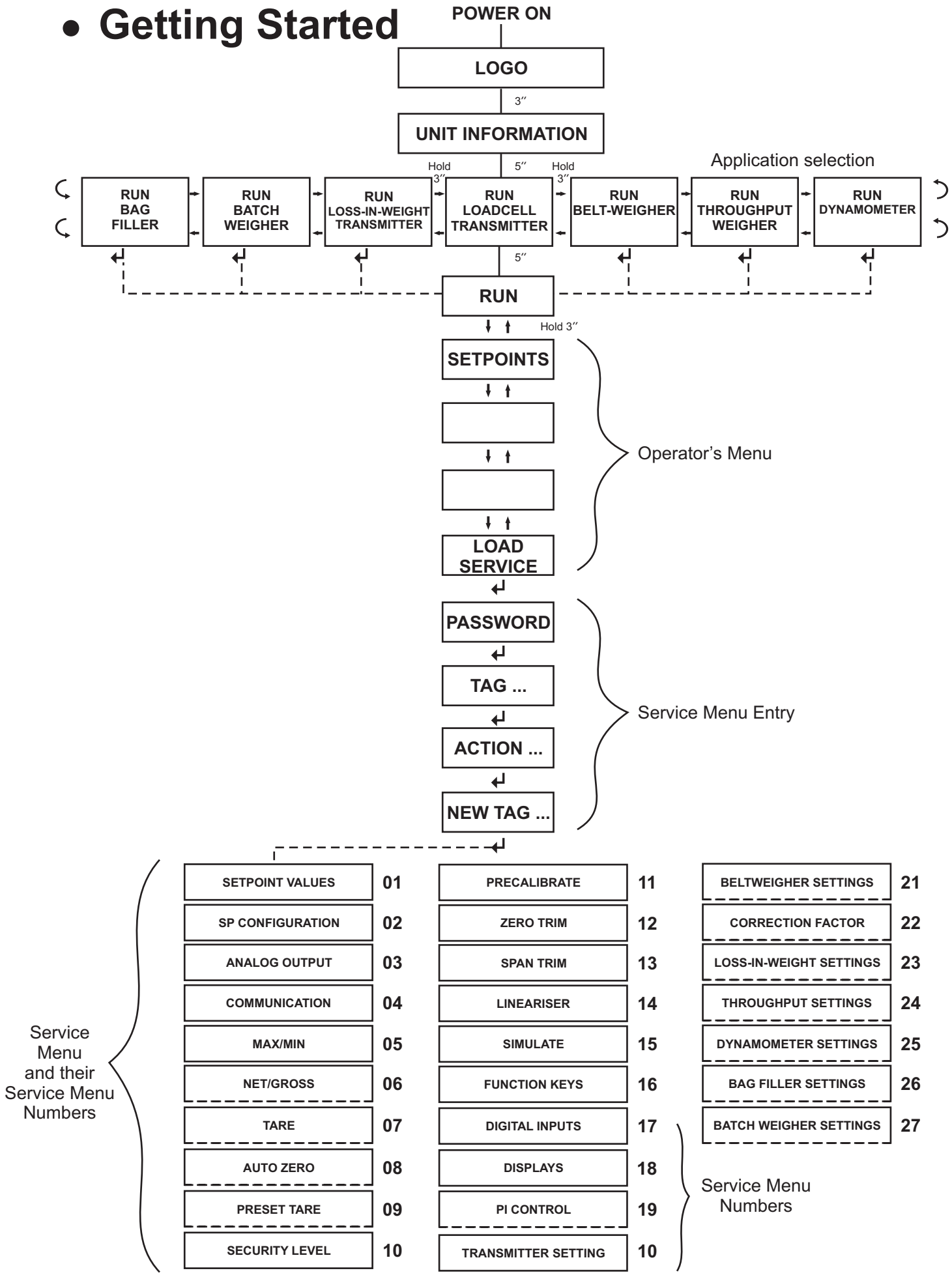
Scroll through options

Key — Key in values (Alpha numeric)

Display — Display options

Enter values *or* open function blocks

• Getting Started



• Applications Menu

Application Block Number 01
01. **RUN LOADCELL TRANSMITTER**

Select RUN LOADCELL TRANSMITTER if not already in this application. Press side arrow after power up when RUN (application) is displayed, key in password, enter and use side arrows to select, then enter again.

For quicker commissioning first select Security Level 1 and connect the Hardlock link. Going in to the Service menu select Calibrate, not view, in order to change settings. Change Security levels and passwords last. Note that you make changes to the whole Service menu block then press Enter.

It is advisable to first set up the Displays, Digital inputs and Function keys, then go to Precalibrate and set up loadcell values and scales. After this you can go through the Service menu blocks to select and set other functions that you require. Descriptions of these are listed in the Service menu pages.

Final calibration trim can be carried out on the system using Zero Trim and, if test weights are available, Span trim.

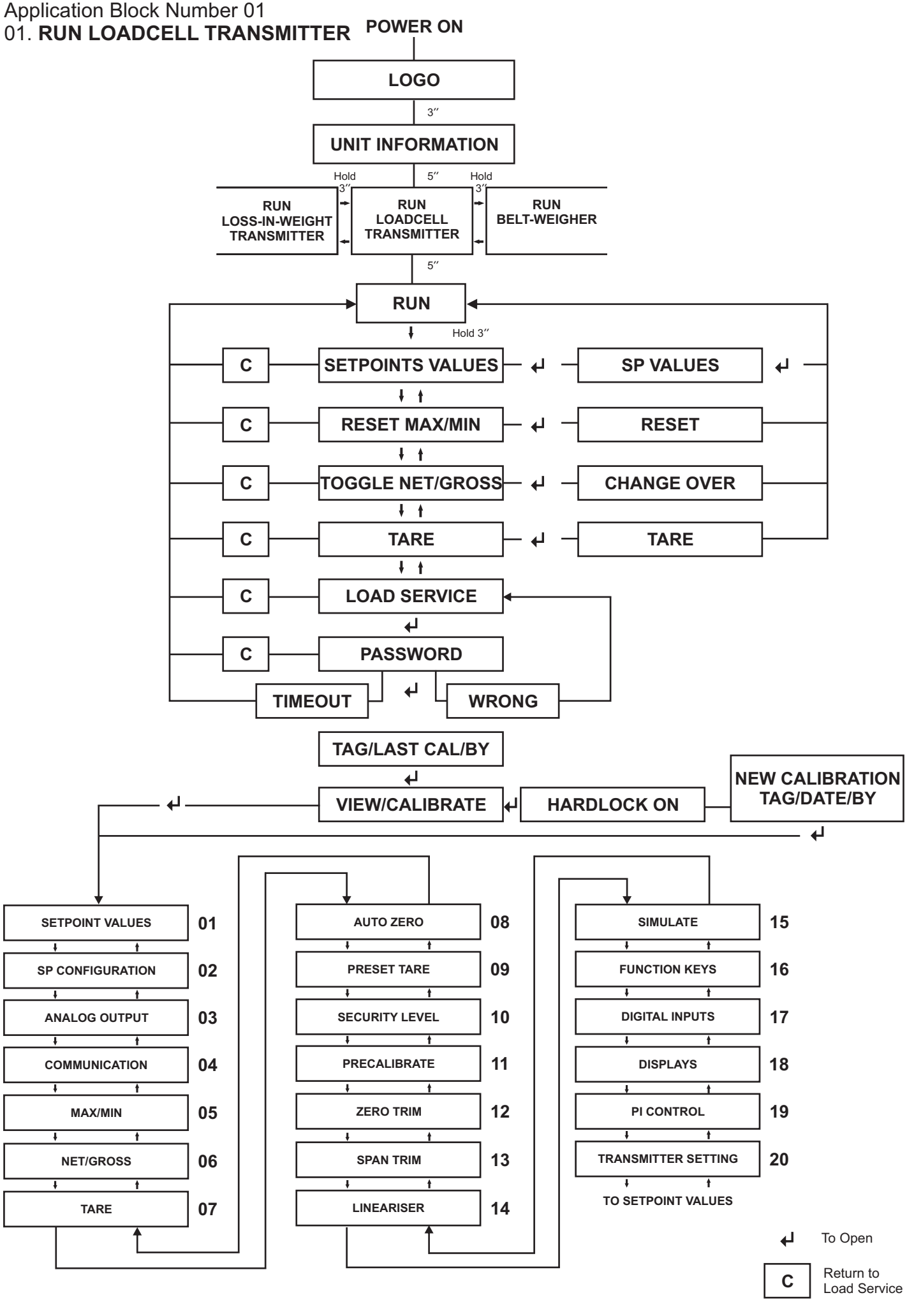
The Loadcell Transmitter Service menu contains the following functions:- (Detailed descriptions are listed in the Service menu section of this manual)

01 Setpoint values	***Set values for setpoints 1-6***
02 Setpoint configuration	***Select functions for setpoints 1-6***
03 Analog output	***Select output 1-5V, 0-10V, 0-20mA or 4-20mA***
04 Communications	***Select and set up serial output***
05 Min/Max	***Select minimum and/or maximum hold***
06 Net/Gross	***Select Gross only, Net only or Net/Gross***
07 Tare	***Select Tare to zero Net reading***
08 Auto zero	***Select and set up Auto Zero Maintenance (AZM)***
09 Preset tare	***Select Preset tare function***
10 Security level	***Select access to Operator and/or Service menu***
11 Precalibrate	***Set loadcell values, excitation and range details***
12 Zero trim	***Trim off empty weighbin/ weighbridge deck...***
13 Span trim	***Trim range using test weights***
14 Lineariser	***Select up to 15 points of linearising***
15 Simulate	***For testing, force analog and relay outputs***
16 Function keys	***Set functions for keys F1-4***
17 Digital inputs	***Set functions for inputs D1-6***
18 Displays	***Set main display and up to 4 auxilliary on LCD***
19 PI Control	***Change transmitter into controller***
20 Transmitter settings	***Set password, calibration, hardware & time/date***

• Applications Menu

Application Block Number 01

01. **RUN LOADCELL TRANSMITTER**



• Service Menu

Function Block Number 01
01. **- SETPOINT VALUES -**

Setpoint Values can be viewed here in the Service Menu as well as in the Operators' Menu and inserted or altered here (subject to password, calibrate and hardlock being activated) and in the Operators' Menu (subject to the Security Level set)

To view or alter setpoint values press Enter +when the SETPOINT VALUES function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block (SP1-6) are completed.

When pairs of relays or photomos have been plugged in the option must be activated in Options Fitted in the TRANSMITTER SETTINGS block or else the message 'Hardware not fitted' will appear.

SP1 to SP6 are shown. If the SP has been set for High or Low you can key in a setpoint value with the decimal point that corresponds to the tracked variable (gross, net or main display in Setpoint Configuration, next function block). The value keyed in must be within the scale range. If another configuration, such as None, Net, Zero, Total, etc has been selected in the Setpoint Configuration this will be shown and no value can be inserted.

If the Pretare function has been activated the Pretare Value: will be displayed on the first line and the Gross offset value can be keyed in.

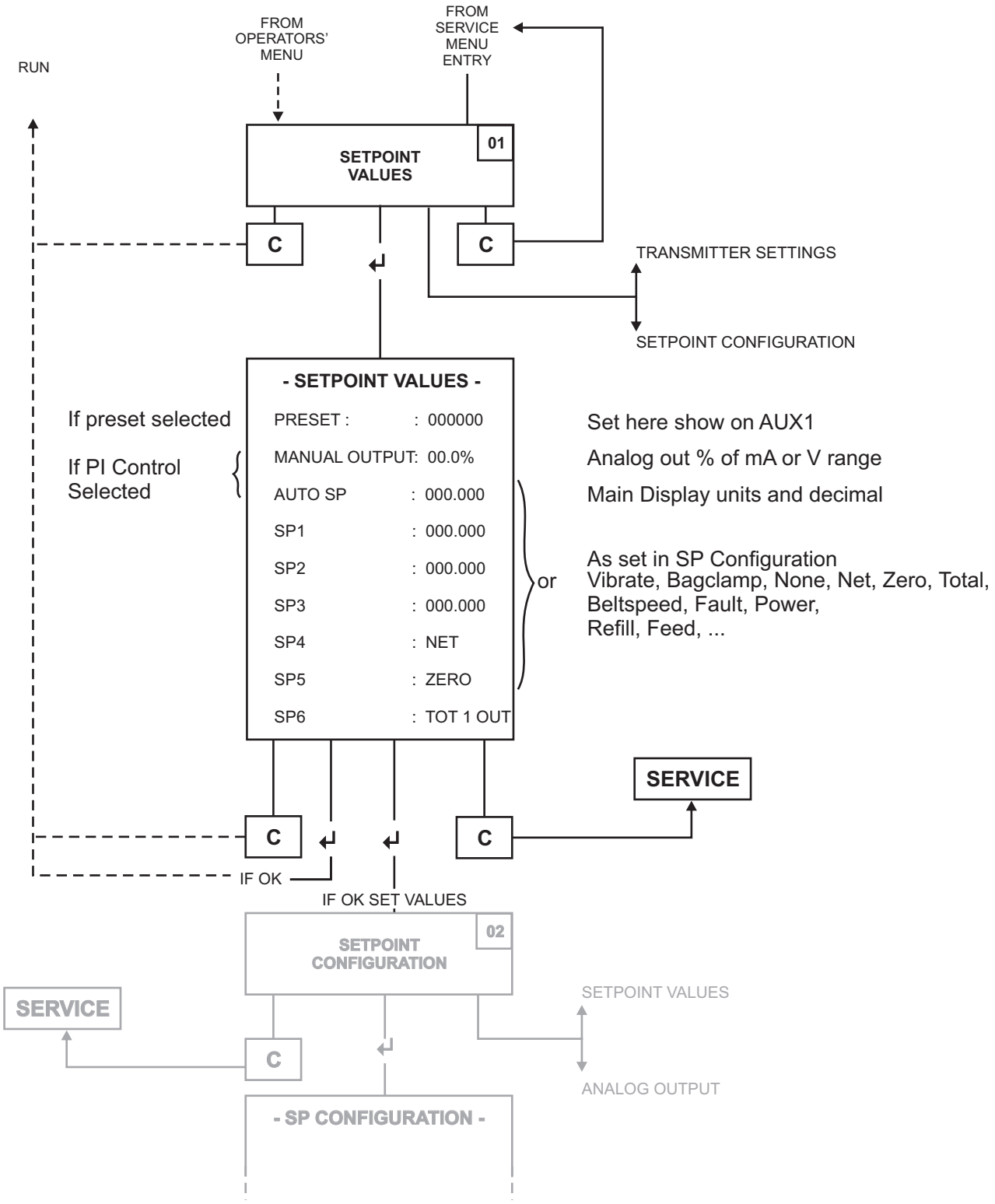
If the PI Controller has been activated in the Service Menu then the Setpoint Values block will include Manual Output: (00-99)% which corresponds to a percentage of the selected analog output and Auto SP: xxx,xxx which corresponds to a main display setpoint value including the existing decimal point.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case SETPOINT CONFIGURATION.

• Service Menu

Function Block Number 01

01. **- SETPOINT VALUES -**



Note: Preset on Loadcell transmitter only
Preset and PI Control cannot be on together

Service Menu

Function Block Number 02

02**. - SETPOINT CONFIGURATION -**

To view or alter the setpoint configurations press Enter + when the SETPOINT CONFIGURATION function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block (SP1-6) are completed.

Select any Setpoint from 1-6 using the side arrows. Configure the chosen setpoint number then select the next one.

Select the setpoint function using the side arrows list. Some examples:-
None= Not active,
High= Relay on above Setpoint value. Low= Relay on below Setpoint value
Total= Photomos pulse output to remote total counter. Use SP6 Photomos.
Net= Relay on if main display in net. Zero= Relay on if main display zero.
Power= Relay on when mains power on.
Fault= Relay on if fault (overrange, timeout, beltspeed low, RPM high,...)
Refill and Feed= Loss-in-weight outputs.

Note: The 6004MF treats relays and photomos (SSR) in the same way. Relays have 5A 250V AC change-over contacts and photomos is 0,5A 400V AC/DC.
Use relay outputs for higher current switching or for changeover contacts.
Use photomos for totaliser outputs and solenoids to prevent contact burnout.

Setpoint Tracks: allows you to select which variable the setpoint is compared to. Side arrows to select Gross, Net, Main [display], Count or Total.

Setpoint Hysteresis: Use keypad to set 000-999 counts to reset setpoint relay below High value or above Low value

Setpoint Delay: Use keypad to set 000-999 seconds delay before setpoint relay energises

Setpoint LED: Use side arrows to select Normal (LED on when relay energised) or Inverted (LED off when relay energised)

Setpoint Latch: Use side arrows, No or Yes. If Yes you must select a reset such as D1-6 (Digital Inputs) or F1-4 (Function Keys) or power off.

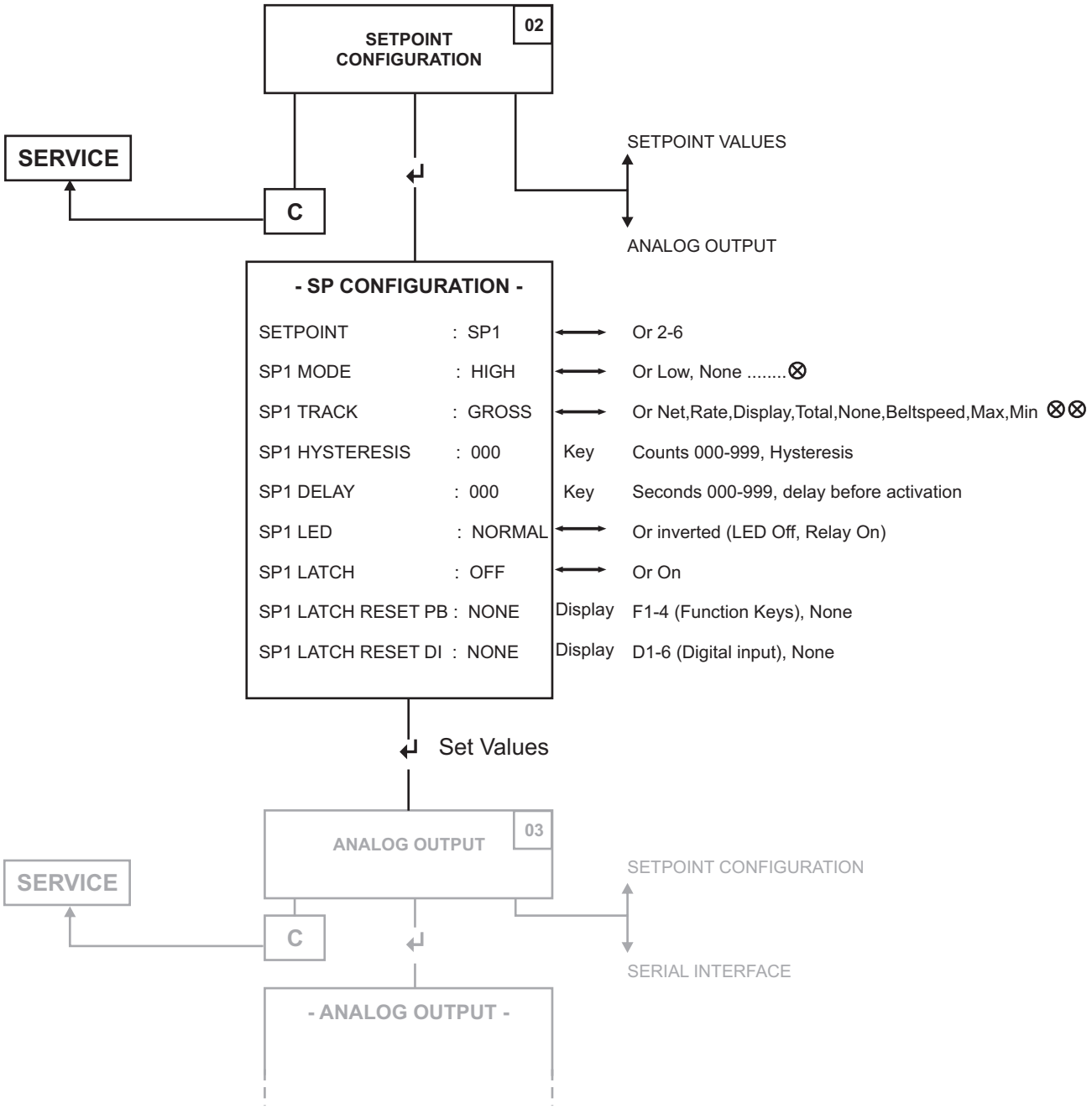
Setpoint Reset: This displays the reset activator above

When all changes (SP1-6) are completed press Enter +. This will set the whole block and move on to the next block, in this case ANALOG OUTPUT.
Service Menu

• Service Menu

Function Block Number 02

02**. - SETPOINT CONFIGURATION -**



⊗ Off, High, Low, Power, Faulty, Net, Zero, Total 1 out, Liw feed, Liw Refill. Liw time Out, ...

⊗⊗ None, Gross, Net, Max, Min, Display, Belt Rate, Belt Speed, Totaliser 1, Totaliser 2, LIW Rate....

• Service Menu

Function Block Number 03
03. **- ANALOG OUTPUT -**

To view or alter the analog output settings press Enter + when the ANALOG OUTPUT function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

The Analog Output is isolated from the input and power supply for safety. You can select a standard analog output from 0-20mA, 4-20mA, 1-5V or 0-10V. This output can then be ranged to suit your tracked value or less. Tracks: allows you to select the measurement that the analog output will follow and Fault Value: is the analog output under fault conditions. When Fault Value is set to off then the analog value continues to track the selected measurement.

Analog Output: Use side arrows to select from 0-20mA, 4-20mA,1-5V or 0-10V

Tracks: Use side arrows to select analog output tracking of Gross, Net, Rate, (main) Display, kW, RPM, Torque, minimum, maximum, none, Total....

4mA value: (or 0mA, 0V or 1V value) Use keypad to insert lower scale value.

20mA value: (or 5V or 10V value) Use keypad to insert a full scale value.

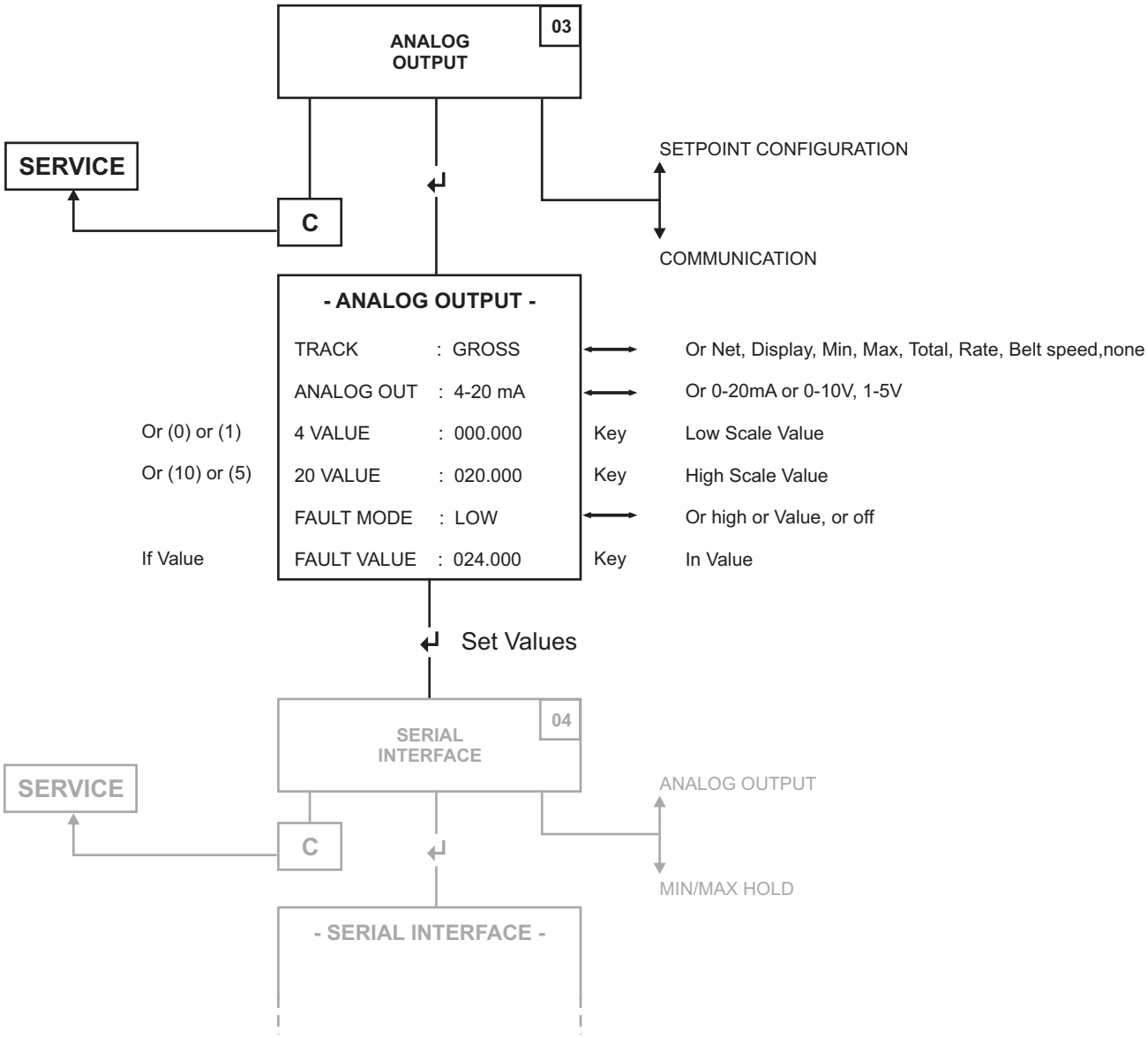
Fault output: What occurs to the output when a fault condition (overrange, underrange, timeout, etc) occurs. Use side arrows to select high, low, off or value. If higher then output goes to 21mA (or 5.5V or 10.5V). If low then output goes to 0mA (or 0V or 0V). If off then not active, if value then use keypad to select output value.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case COMMUNICATIONS.

• Service Menu

Function Block Number 03

03. **- ANALOG OUTPUT -**



Track: None, Gross, Net, Max, Min, Display, Belt rate, Belt speed, Totaliser 1, Totaliser 2, ...

Service Menu

Function Block Number 04
04. **- COMMUNICATION -**

To view or alter the serial interface settings press Enter + when the SERIAL INTERFACE function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Unit Address: is needed when using RS485. Use the keypad to select.

Protocol: is currently ASCIIBUS. Future selections will be MODBUS and a propriety flexable protocol format compiler, BUILDABUS.

Line Settings: can be off (NO) or on (YES) in which case you can select Baud Rate, Data Bits, Stop Bits and Parity.

Press Enter to set and return to the Communications menu.

ASCIIBUS setup: can be off (NO) or on (YES) in which case you can select:- Track: None, Gross, Net, Max, Min, Display, Belt rate, Beltspeed, Totaliser 1, Totaliser 2, ...
Time&Date: Off or On
Mode: Continuous or On demand
If On demand the Print pushbutton and digital input will be shown if selected.

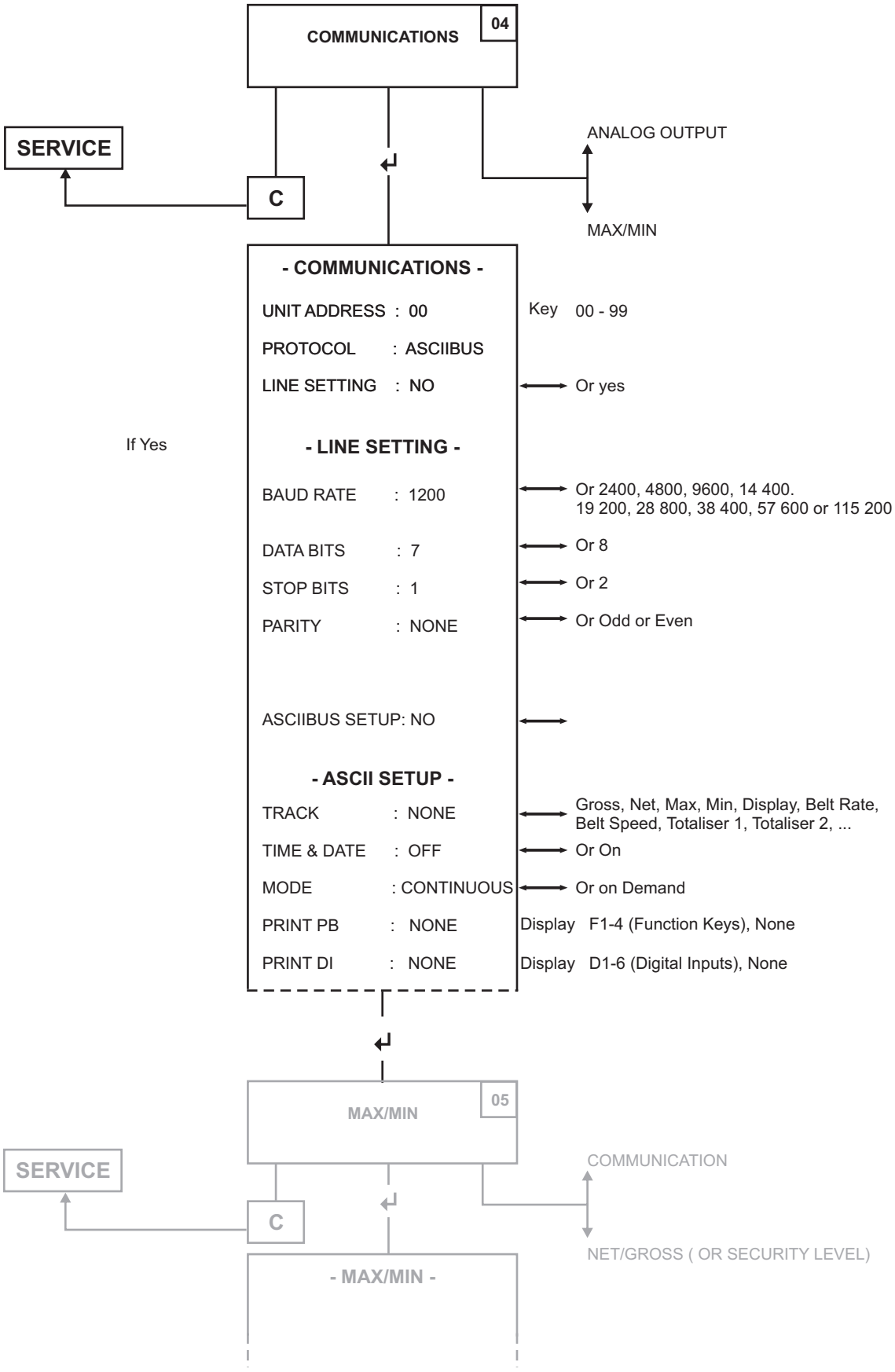
Press enter to set and return to the Communications menu

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case MIN/MAX .

• Service Menu

Function Block Number 04

04. **- COMMUNICATION -**



Service Menu

Function Block Number 05
05. **- MAX/MIN -**

To view or alter the min/max settings press Enter + when the MIN/MAX function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Tracks: use side arrows to select Gross, Net, Rate, Display...

Min Reset PB: display only, select in Service menu Function Keys (F1-4)

Min Reset Dig Input: display only, select in Service menu Digital Inputs (D1-6)

Max Reset PB: display only, select in Service menu Function Keys (F1-4)

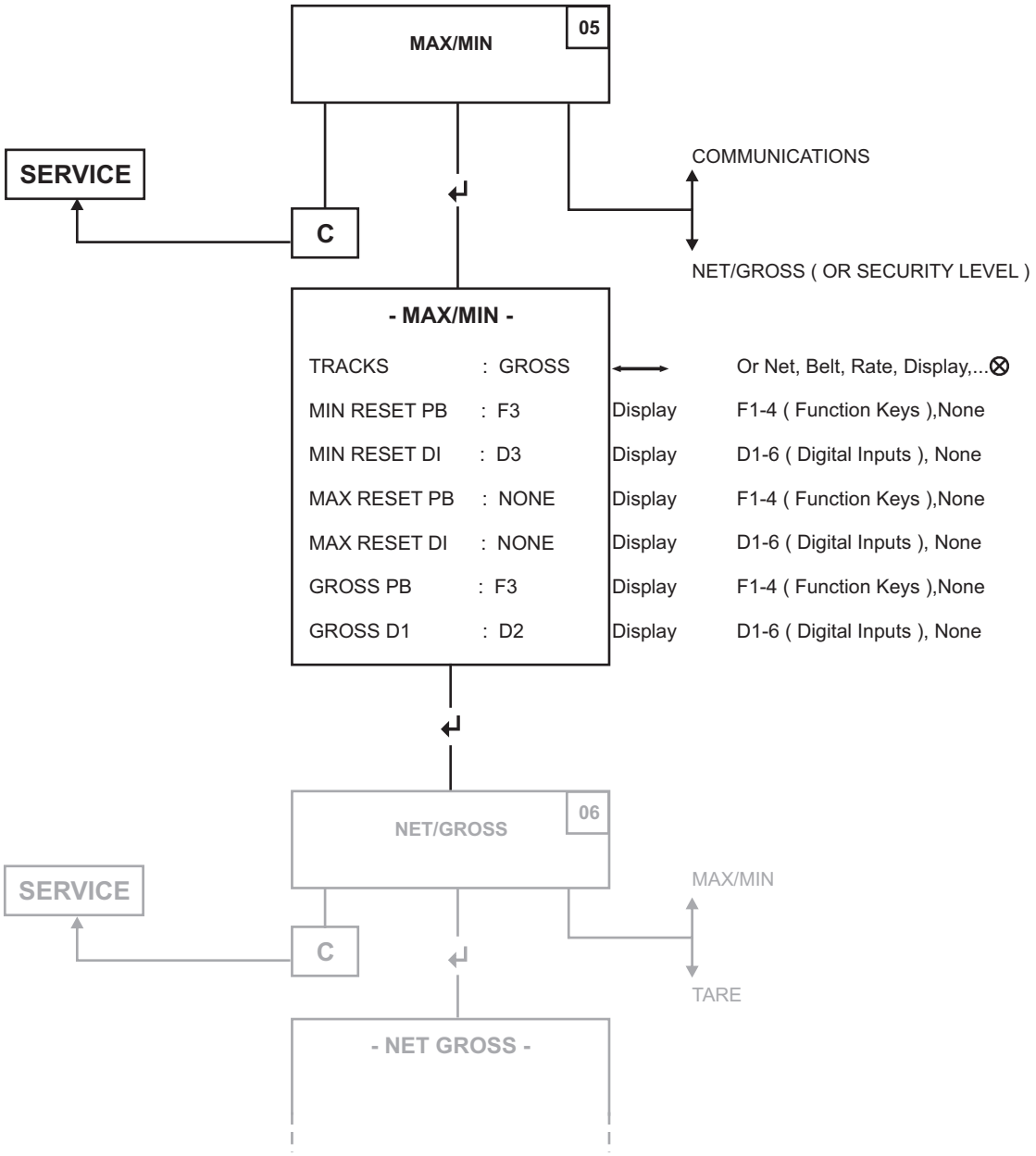
Max Reset Dig Input: display only, select in Service menu Digital Inputs (D1-6)

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case NET/GROSS for Loadcell Transmitter and Batchweigher or SECURITY LEVEL for Beltweigher, Loss-in-weight transmitter, Throughput Weigher, Bag-filler and Dynamometer.

• Service Menu

Function Block Number 05

05. **- MAX/MIN -**



⊗ Gross, Net, Belt rate, LIW rate

Service Menu

Function Block Number 06
06. **- NET/GROSS -**

To view or alter the net/gross settings press Enter + when the NET/GROSS function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Gross is defined here as the total material mass without the dead weight of the bin itself. (On weighbridges the gross is the measured mass without the mass of the deck)
Net is defined here as the change in material mass (positive or negative) displayed after the bin has been tared.

Mode: Use side arrows to select Gross (main display locked in Gross only), Net (main display locked in Net only) or Net/Gross (display can toggle between Gross and Net, normally used for batching in or out a specific mass). We suggest that when Net/Gross is selected that the Main display is set to Gross and the first auxiliary display is set to Net in Service menu Displays. When Function key (F1-4) or Digital input D1-6 is set to Net/Gross then these two displays will swop over.

The Net/Gross changeover can be activated through the Operator's menu.

Net/Gross Pushbutton: Display of None or F1-4 if selected in Function Keys.

Net/Gross Digital input: Display of None or D1-6 if selected in Digital Inputs.

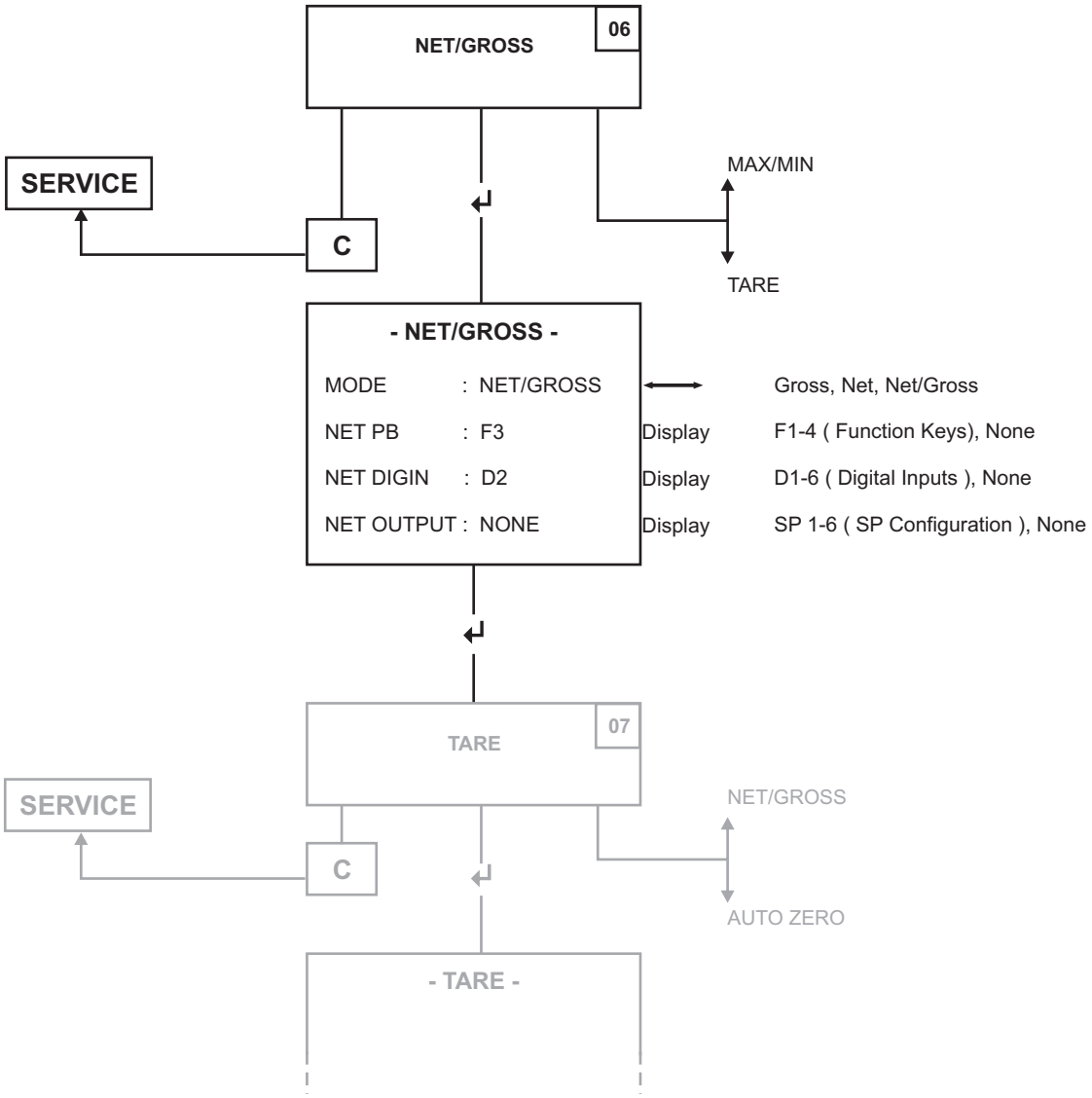
Net Output: Display of None or SP1-6 if selected in Setpoint Configuration. The Net output relay is used to signal that the LCT is in Net mode to some external device such as a PLC.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case TARE.

● Service Menu

Function Block Number 06 (LTC)

06. **- NET/GROSS -**



Service Menu

Function Block Number 07

07. **- TARE -**

To view or alter the tare settings press Enter + when the TARE function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

For this block to be active (On), Net or Net/Gross must be selected in the NET/GROSS block above

Tare is defined as an instruction to zero the net value

Tare: Use side arrows to select for Off or On.

If ON then:

The Tare can be activated through the Operator's menu.

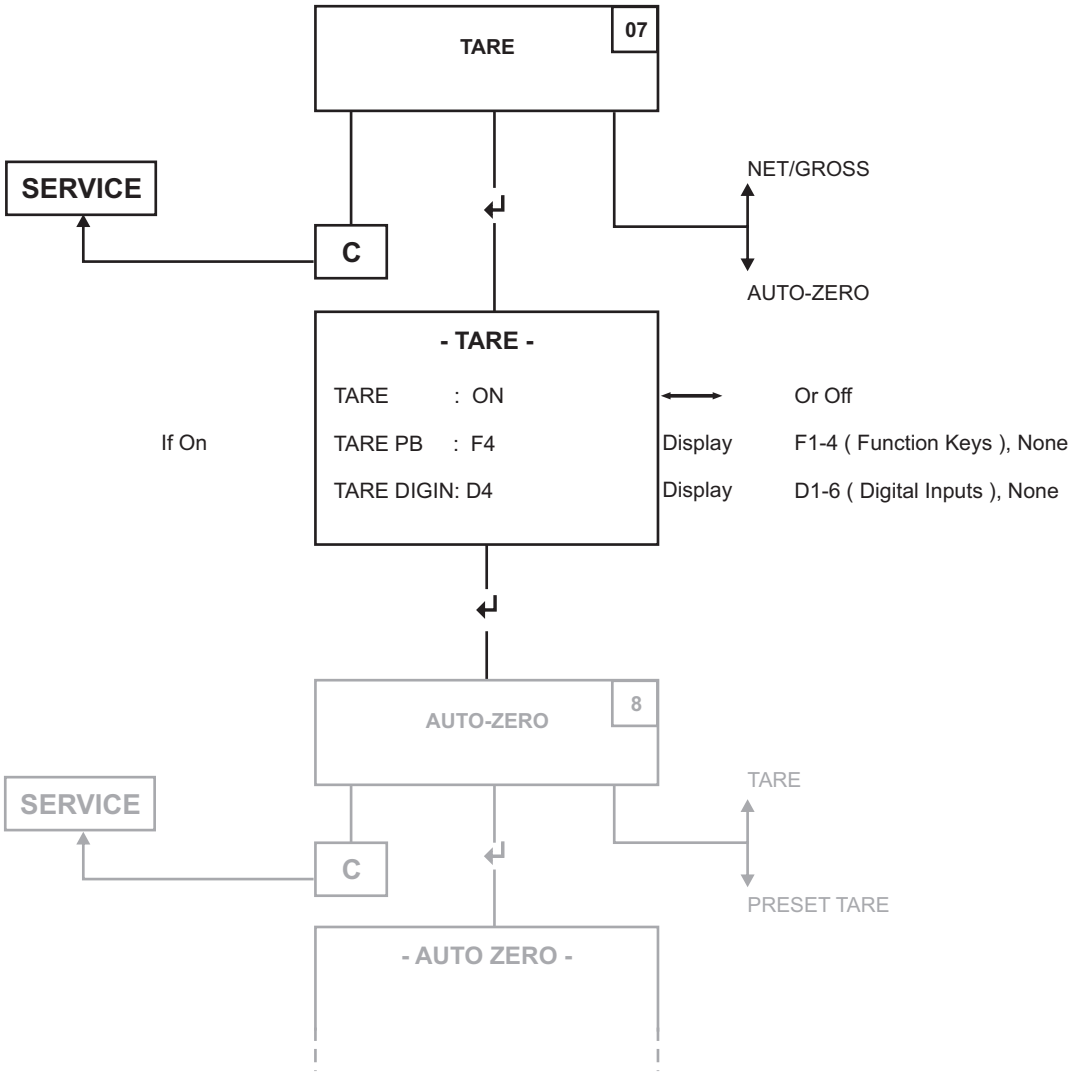
Tare Pushbutton: Display of None or F1-4 if selected in function Keys

Tare Digital input: Display of None or D1-6 if selected in Digital Inputs

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case AUTO ZERO.

• Service Menu

Function Block Number 07 (LTC)
07. **- TARE -**



• Service Menu

Function Block Number 08
08.**- AUTO ZERO -**

To view or alter the auto zero settings press Enter + when the AUTO ZERO function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Auto zero or Auto Zero Maintenance (AZM) can be used to automatically compensate for zero drift which is usually caused by temperature changes or load cell creep (bonding movement) or slight physical imperfections in the system. AZM can only be used for very small amounts of zero drift or it will result in system errors (such as pulling a real reading back to zero in a slowly filling weighbin). In Assized Systems the deviation and time is defined.

AZM: Use side arrows to switch Auto Zero Maintenance Off or On

If On then:-

Band: Use keypad to select the number of counts (000-127)

Time: Use keypad to select the time (000-999 seconds)

Example:- Band is 10 counts and Time is 30 seconds. If the average deviation (positive or negative) is more than 10 counts over 30 seconds it is ignored. If it is less than 10 counts in 30 seconds the reading is brought to zero.

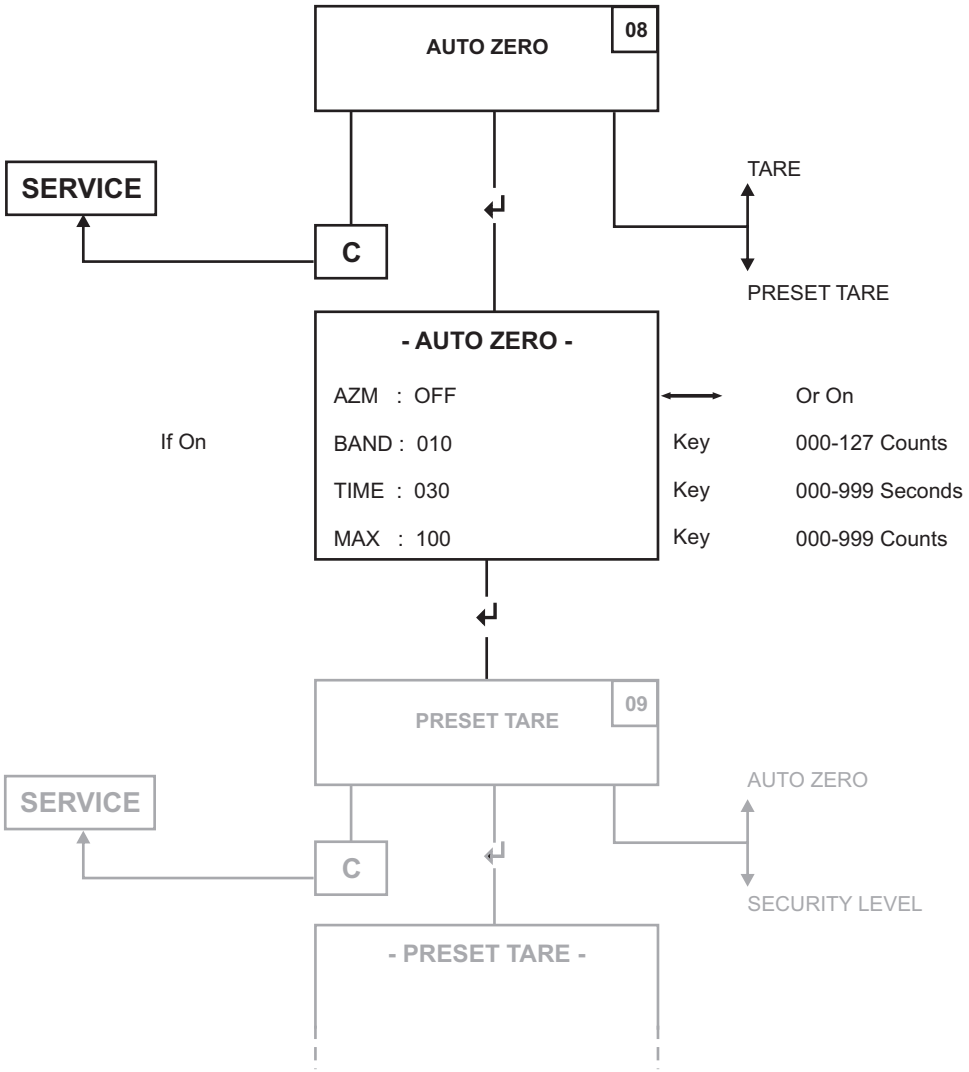
Max: Use keypad to select the maximum counts to be accumulated. Fault output is activated and warning displayed on auxiliary LCD if maximum exceeded.

The accumulated value in the AZM register is cleared to zero if mains power is turned off, if the AZM : is switched to Off or if Zero Trim (Backbalance) is activated.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case PRESET TARE.

● Service Menu

Function Block Number 08 (LTC or (06) Beltweigher or (06) Loss-in-Weight)
08.**- AUTO ZERO -**



• Service Menu

Function Block Number 09
09. **- PRESET TARE -**

To view or alter the preset tare settings press Enter + when the PRESET TARE function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Pretare can be used to manually offset a known tare weight. Imagine a quarrying operation with many road trucks. As each truck comes on to the weighbridge the Operator keys in the tare weight of the truck which is displayed on it's door. The gross (contents) weight is then shown on the weigh indicator. This saves preweighing every truck every time it comes to the quarry. The same procedure can be used for railcars or containers to determine the gross (contents) weight.

Pretare: Use side arrows to select Off or On

If On:-

PRETARE: xxx.xxx will be displayed on first line of the LCD auxiliary display in the same units and with same decimal place as Gross on the main scale. Press the down key for three seconds to go to Setpoint Values, key in Pretare value and Enter + to offset the Gross value on the main LED scale.

For this application we suggest that a function key (F1-4) is selected for Set Setpoints to provide a short cut to the settings.

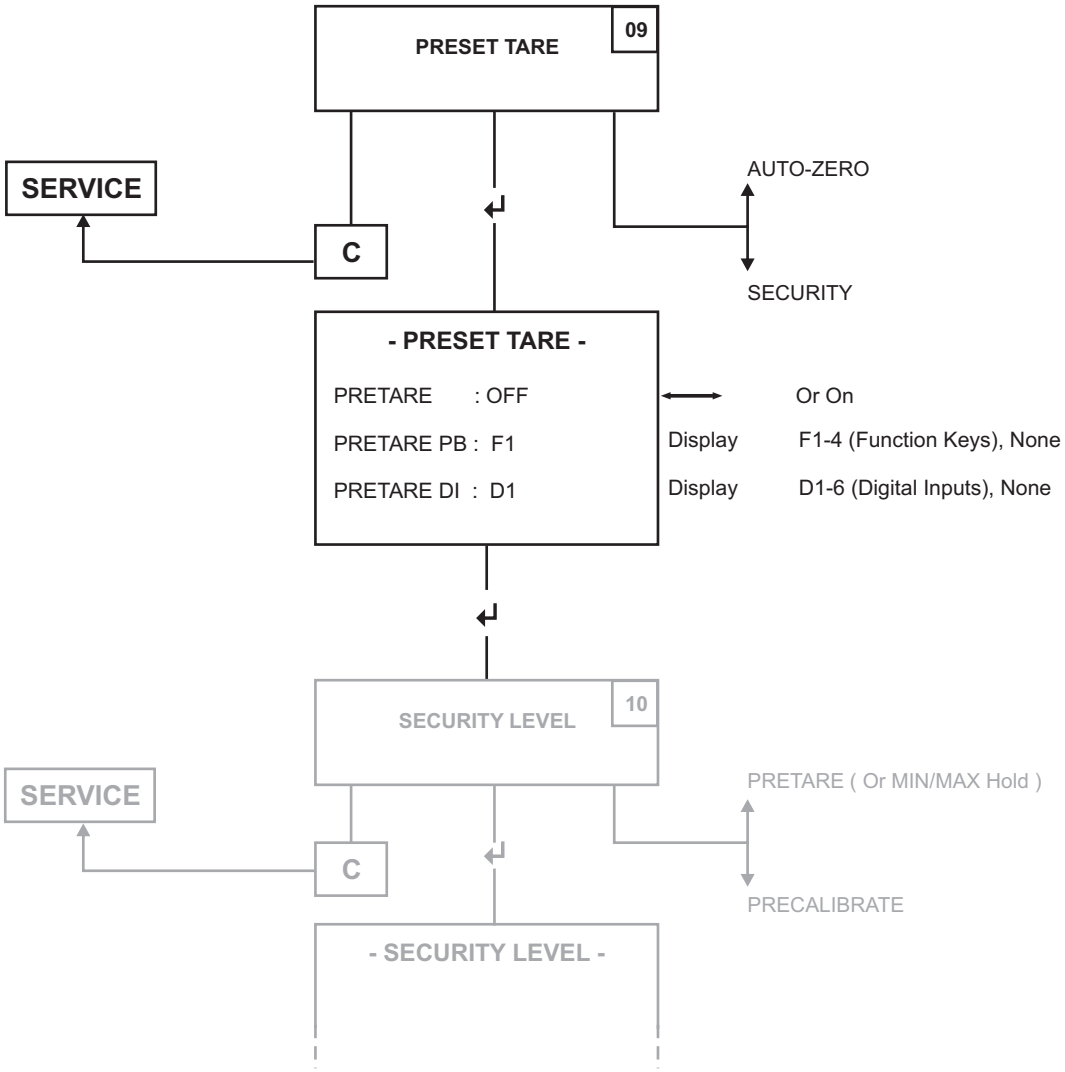
Before using Pretare the Precalibration, Zero Trim (backbalance) and Span Trim menus should all be completed to ensure calibration and taring off the scale or weighbridge deck.

When Pretare is switched ON then the PI Control is automatically turned off.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case SECURITY LEVEL.

• Service Menu

Function Block Number 09 (LTC)
09. **- PRESET TARE -**



Service Menu

Function Block Number 10
10. **- SECURITY LEVEL -**

To view or alter the security level press Enter + when the SECURITY LEVEL function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

The Security Levels set access to the various menus. The Operator's menu can always be viewed in Security Level 0 but not altered. In Security Level 1 the Operator's menu can be viewed/activated, with password can enter service menu, with link can alter. In Security Level 2 the Operator's and Service Menu can be viewed or calibrated without a password but will still require the hardlock to be in place on the back of the display PCB for activation.

Level 1: View and activate Operators' Menu. Service Menu can be viewed WITHOUT PASSWORD and activated (calibrated) with hardlock link .

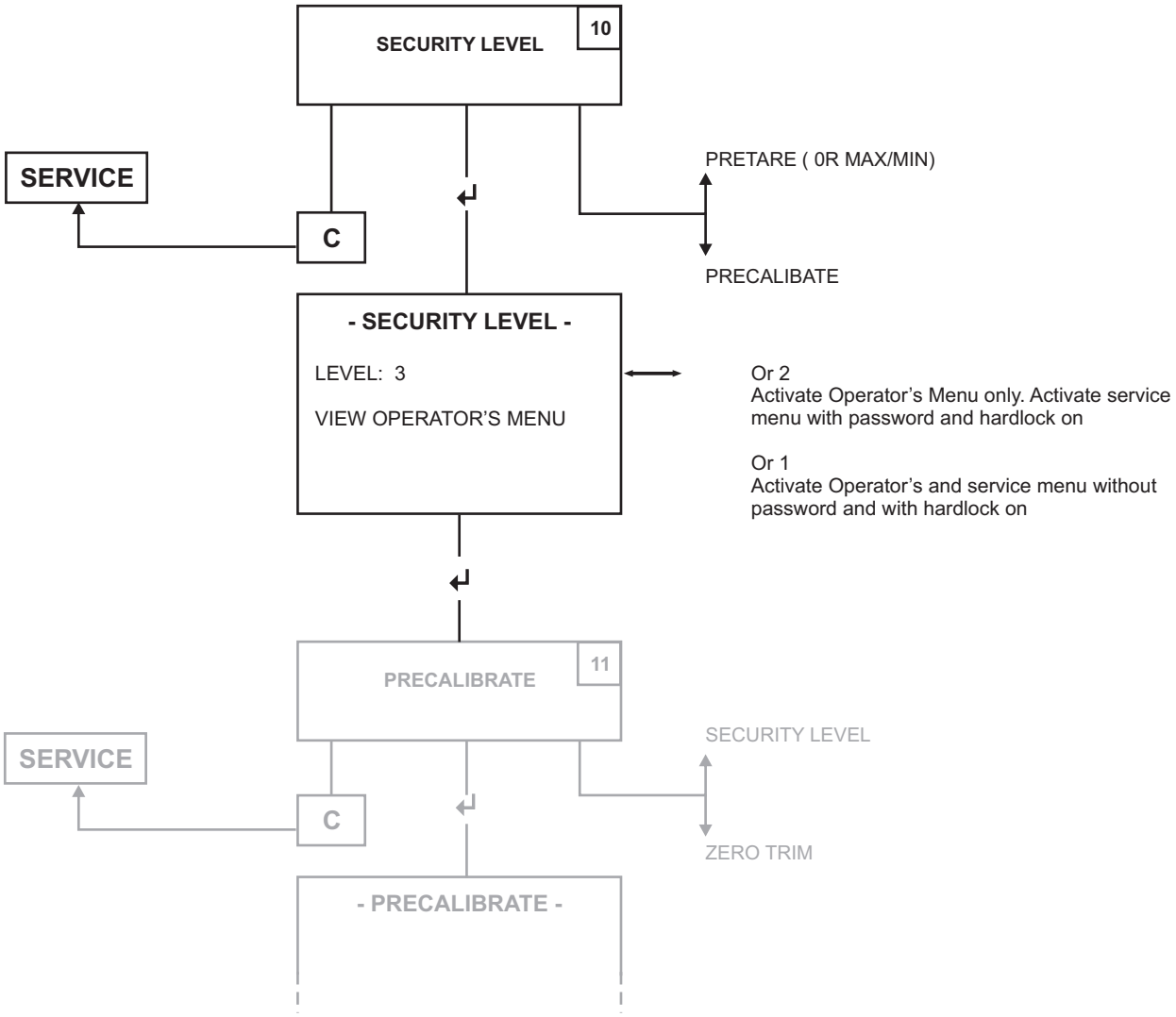
Level 2: View and activate Operators' Menu. Service menu can be viewed WITH PASSWORD and activated (calibrated) with hardlock link.

Level 3: View Operators' Menu only. Service menu can be viewed WITH PASSWORD and activated (calibrated) with hardlock link.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case PRECALIBRATE.

● Service Menu

Function Block Number 10 (LCT or (07) Beltweigher or (07) Loss-in-Weight)
10. **- SECURITY LEVEL -**



• Service Menu

Function Block Number 11
11. **- PRECALIBRATE -**

To view or alter the precalibrate menu press Enter + when the PRECALIBRATE function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Precalibrate is a simple way to set up a strain-gauge loadcell system. All the loadcell variables are inserted here so that the system is reasonably accurate before adding test weights. In some instances, such as very large weightanks where it is not possible to use test weights, precalibration using factory test certificates for loadcell sensitivity results in an acceptable overall system accuracy.

Excitation Voltage: Measure or Set.
In Measure you select an excitation voltage which the transmitter will generate. The transmitter then measures the excitation voltage on it's own sense terminals and uses this value in the display calculation.
In Set you can key in a theoretical excitation value. This is normally only used if the system excitation is external, coming from a stable source other than the 6004MF.

Loadcell mV/V: This is the loadcell sensitivity and is nominally the mV/V on the lable or specification sheet. For higher accuracy use the mV/V off the calibration certificate supplied with the loadcell. For higher accuracies on multiple loadcell systems add all the mV/V together and divide by the number of loadcells. All sensitivities should be approximately the same on a multiple system. (Do not mix 2mV/V with 3mV/V) Good quality loadcells have matched internal impedances.

Decimal: Select a decimal place in the six digit display to give the best reading in the range and units required.(eg, 150.00 tonne or 1000.0 kg)

Zero: Key in low-end range, usually 000.000 with decimal point as selected above. (Can also be 1.000 for example in Specific Gravity (SG) measurement)

Full Scale: Key in the full scale range of the system (For example, 3 x 10 tonne loadcells equals 30.000 tonnes)

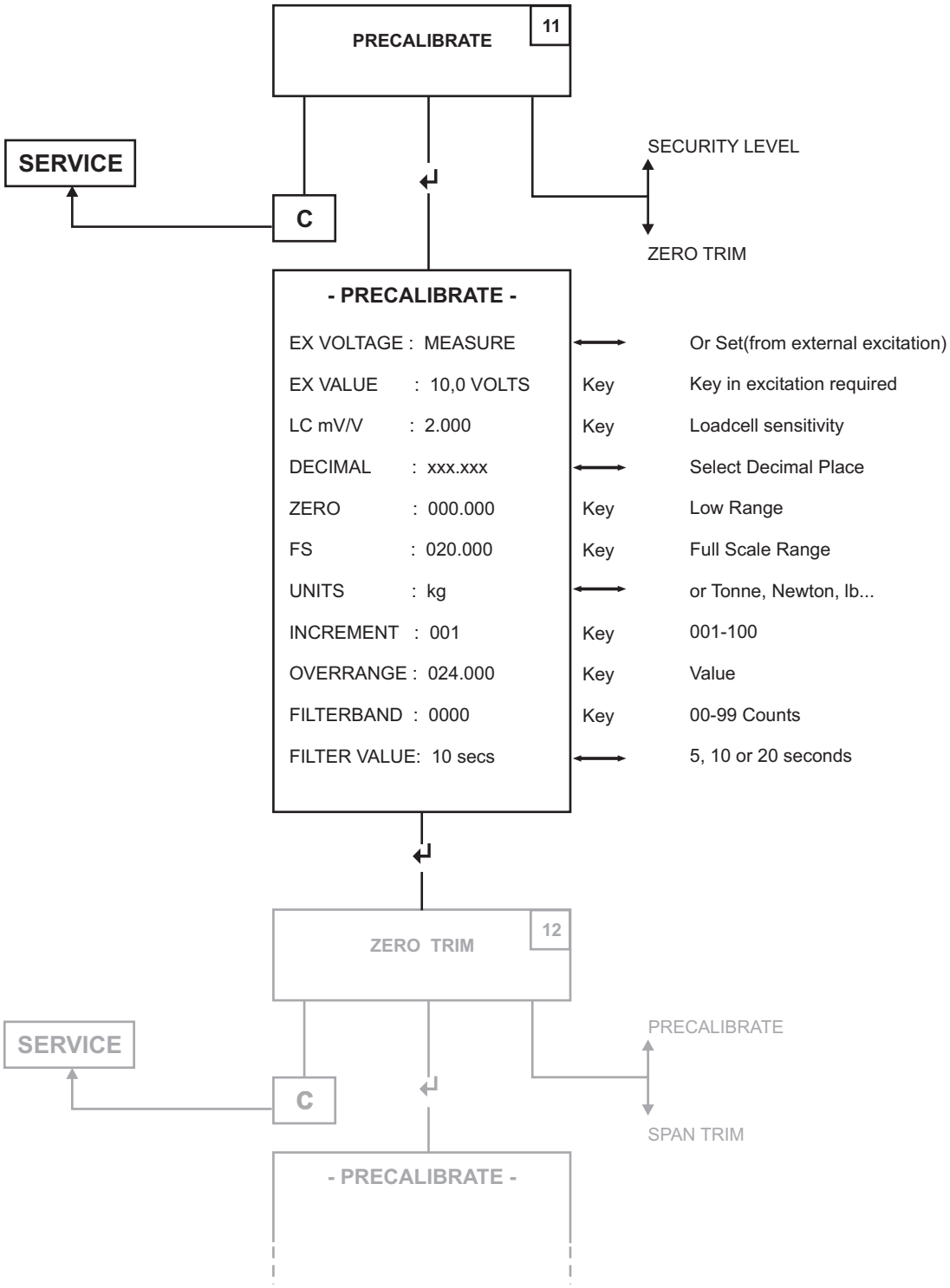
Units: Select (Metric) mg, g, kg, tonne, N or (Imperial) oz, lb, ton
Increment: Key in (001-100) 1 is 1,2,3. 2 is 2,4,6. 10 is 10,20,30 for last digit
Overrange: Key in. Typically fullscale + 20% or 80% bin capacity

Filter Band: Key in filter band (000-999)
Filter Value: Select filter time in seconds. 5, 10 or 20 seconds.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case ZERO TRIM.

● Service Menu

Function Block Number 11 (LCT or (08) Beltweigher or (08) Loss-in-Weight)
11. **- PRECALIBRATE -**



Service Menu

Function Block Number 12

12. **- ZERO TRIM -**

To alter the zero trim press Enter + when the ZERO TRIM function block is displayed. Do not press enter until you are ready to zero trim

Zero Trim (or Backbalance) is the way the 6004MF automatically deducts the empty bin weight (or weighbridge deck weight or beltweigher dead-weight) from the total loadcell measurement to leave a pure gross weight. In most systems Zero Trim is carried out during initial commissioning and at annual or bi-annual routine service intervals, but, in some cases where the bin weight can change due to regular, permanent material buildup, such as paint weighbins, Zero Trim may have to be carried out more often.

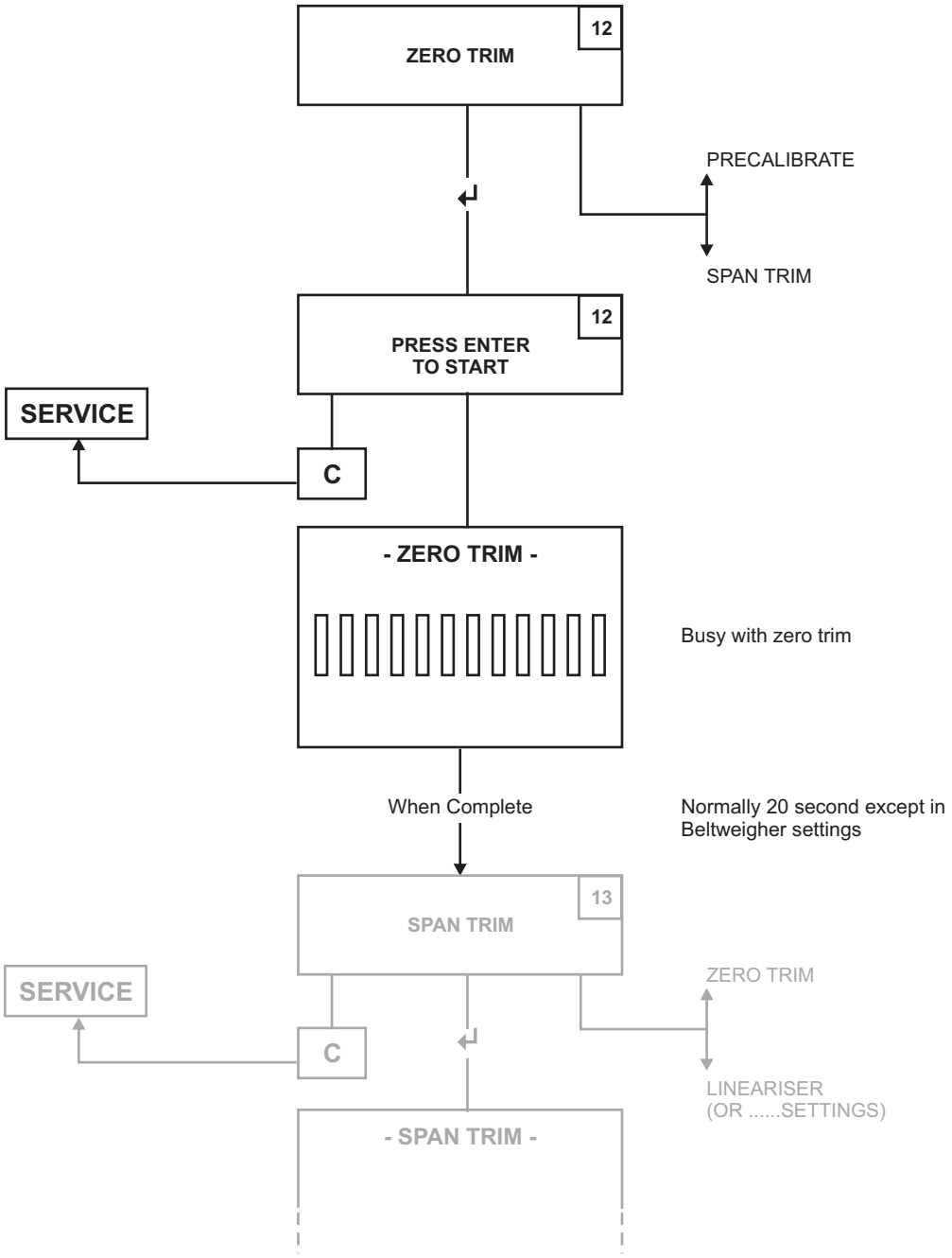
The standard averaging time for the Zero Trim to take place is 20 seconds but, in the case of the Beltweigher application, this averaging time can be lengthened to exceed one belt revolution by only pressing Enter when you want the zero averaging to end.
(Pressing Enter +early during trimming sets the zero value at that moment and may not give a good average.)

When enter+is pressed for zero trim the auxilliary LCD display shows a time bar. Do not move the system or add on extra weight whilst this zero trimming is taking place. At completion of the time bar the main display should show 000000, the Zero Trim menu will close and move on to the next block, in this case SPAN TRIM.

Service Menu

Function Block Number 12 (LCT or (09) Beltweigher or (09) Loss-in-Weight)

12. **- ZERO TRIM -**



Service Menu

Function Block Number 13

13. **- SPAN TRIM -**

To alter the span trim press Enter + when the SPAN TRIM function block is displayed. Do not press enter until you have applied test weights and keyed in the test weight mass.

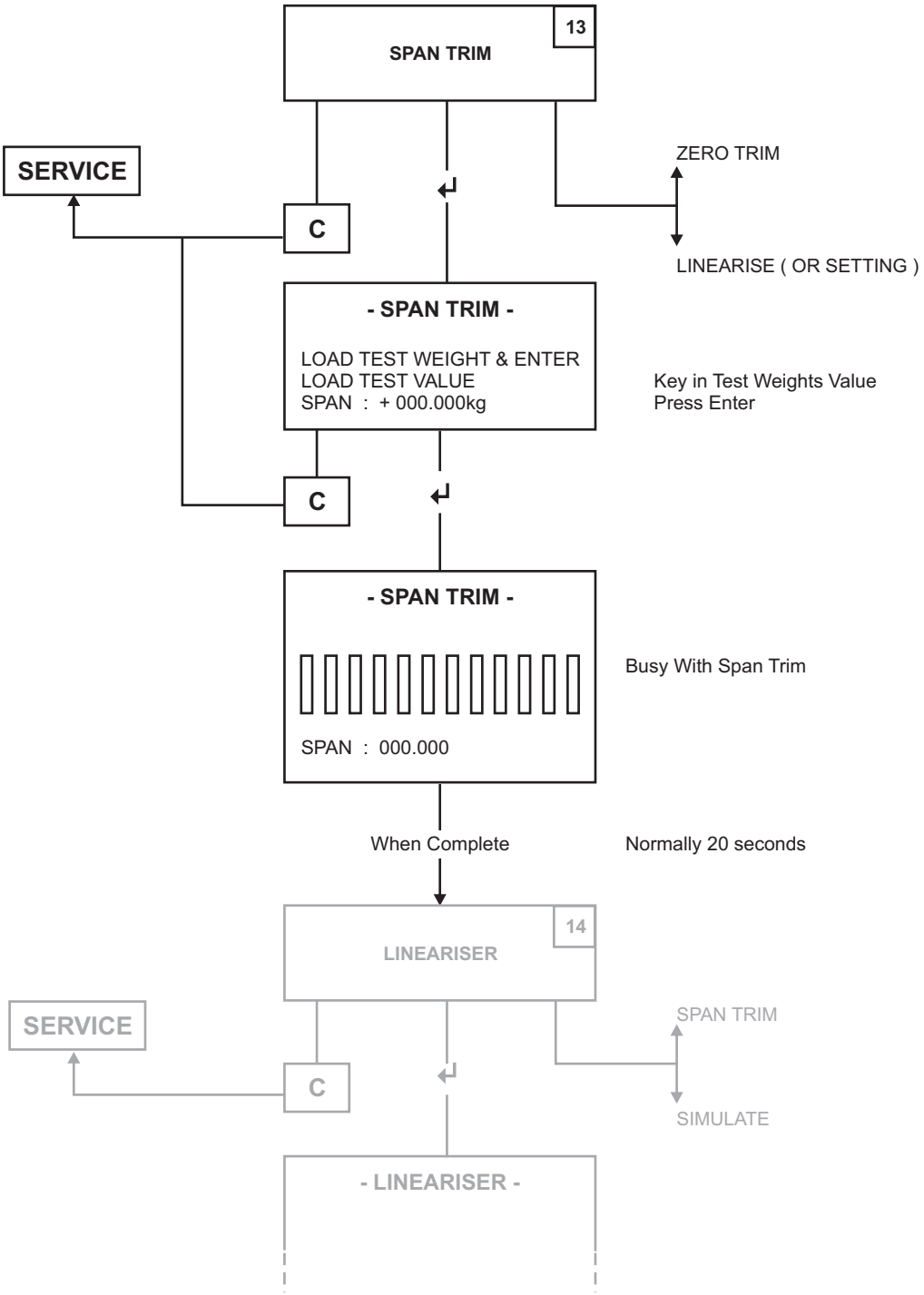
Span Trim is a way to set the range to a better accuracy than using the precalibration values only. If possible use test weights to the full scale mass. If this is not possible due to weighbin size or shortage of test weights then a partial load can be applied, preferably as high as possible but should exceed 25% of the full scale value.

After applying test weights and keying in the test weight value press Enter+.

The auxilliary LCD display shows a time bar for 20 seconds. Do not move the system or add on extra weight whilst this span trimming is taking place. At completion of the time bar the main display should show the test weight value, Span Trim menu will close and move on to the next block, in this case LINEARISER.

● Service Menu

Function Block Number 13 (LCT or (10) Beltweigher or (10) Loss-in-Weight)
13. **- SPAN TRIM -**



• Service Menu

Function Block Number 14

14. **- LINEARISER -**

To view or alter the lineariser settings press Enter + when the LINEARISER function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

The Lineariser is used to correct any repeatable linearity errors due to poor quality loadcells or mountings or weightank distortions. Be careful that errors are not caused by fouling or friction as these will not be repeatable. The lineariser can also be used for other applications such as converting mass to level in non-symetrical weightanks or for inverting the output signal. The linearising is relative to the Gross display and decimal point is as Gross.

If the Lineariser is selected On then up to 15 values in ascending order of actual input values can be keyed in with corresponding desired output values.

For example, if a mid-range only correction of +10 counts is required on a full scale range of 160,000 select 3 points, 1: 000,000 actual/desired, 2: 080,000 actual / 080,010 desired and 3: 160,000 actual / 160,000 desired.

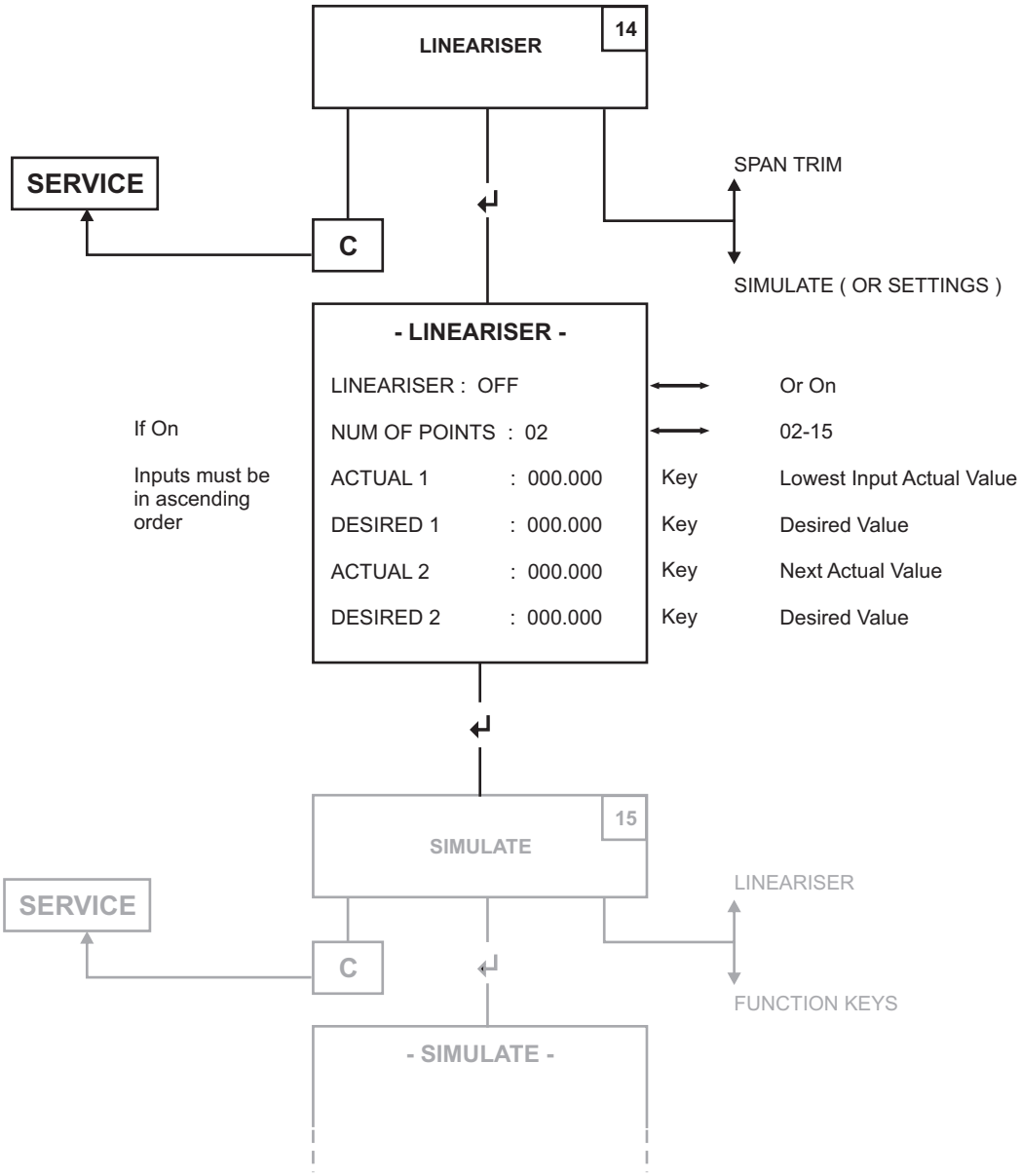
In run mode the linearisor will extrapolate output values between the inserted points, for example 040,000 in above would be 040,005 out.

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case SIMULATE for Loadcell Transmitter or SETTINGS for the other applications.

● Service Menu

Function Block Number 14 (LCT or (13) Beltweigher or (12) Loss-in-Weight)

14. **- LINEARISER -**



Service Menu

Function Block Number 15

15. **- SIMULATE -**

To view or alter the simulate settings press Enter + when the SIMULATE function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until you no longer need the Simulate function.

Simulate is useful during commisioning to test analog and relay/photomos outputs whether the system is running or not. All Simulate outputs default to inactive when not in the Simulate function block.

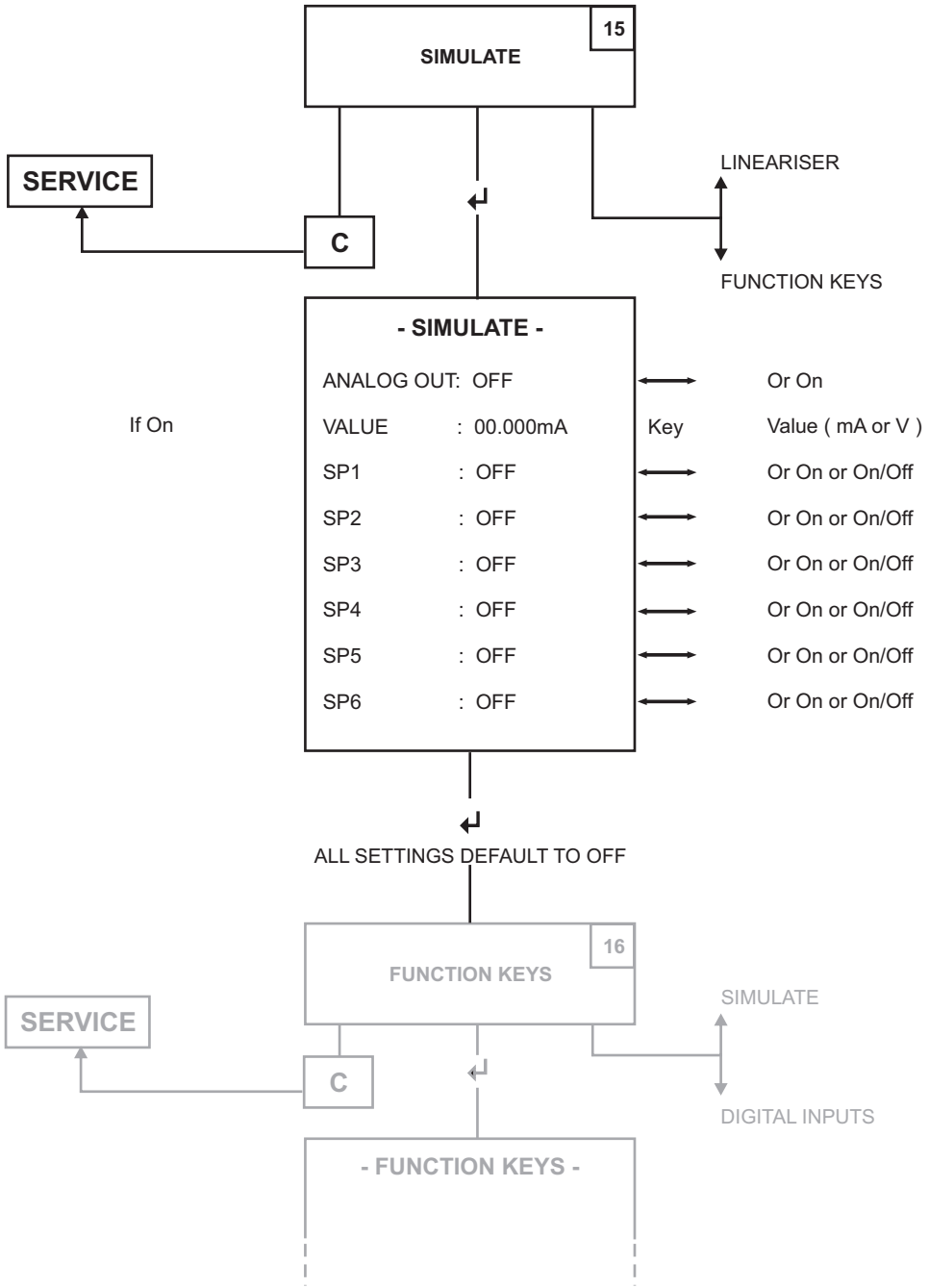
Select the Analog output: to On and you can key in a value for the mA or Volt output (which was selected in Analog Outputs). Select any Setpoint output (SP 1-6) and you can use the side arrows to select On, Off or On/Off (which will cycle 1 second On and 1 second Off).

When you no longer need the simulate function press Enter +. This will de-activate the whole block and move on to the next block, in this case FUNCTION KEYS.

● Service Menu

Function Block Number 15 (LCT or (14) Beltweigher or (13) Loss-in-Weight)

15. **- SIMULATE -**



• Service Menu

Function Block Number 16
16. **- FUNCTION KEYS -**

To view or alter the Function Keys settings press Enter + when the FUNCTION KEYS block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

The Function keys (F1-4) on the front keypad of the 6004MF can be individually selected for a number of functions such as None, Tare, Display Gross, Display Net, Display Power, Display RPM, Display Torque, Set Setpoints, Display Setpoints, Print, Reset Min/Max, Reset Latch, Start, Stop, Man/Auto, Service menu, ...

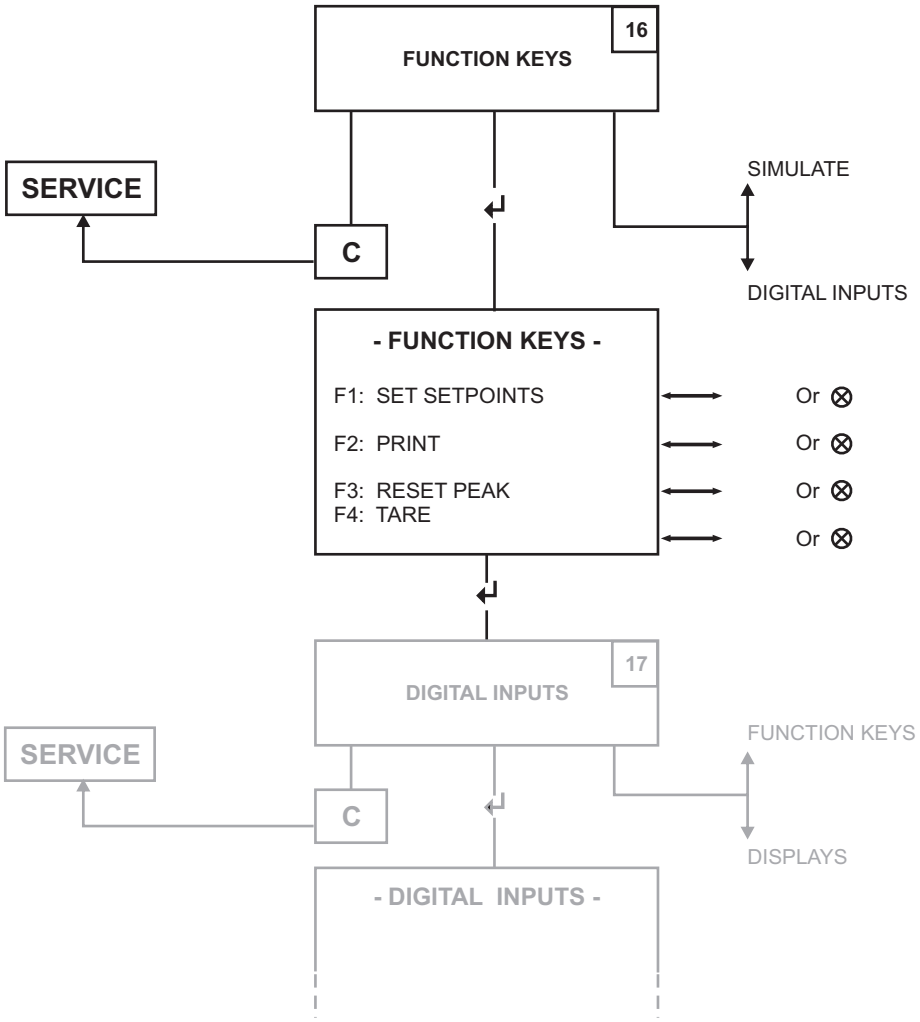
Note that in run mode pressing any Function key first displays the function chosen. Press it again to activate the function.

Default functions	*F1*	*F2*	*F3*	*F4*
Loadcell Transmitter	*Set SPs*	*Print*	*Reset peak*	*Tare*
Suggested Functions for other applications				
Loadcell + PI Control	*Set SPs*	*Start PI*	*Man/auto*	*Stop*
Loadcell Tx + Pretare	*Set Sps*	*Print*	*None*	*None*
Beltweigher	*Set Sps*	*Print*	*Show Rate*	*Show Total*
Beltweigher + PI	*Set Sps*	*Start PI*	*Man/Auto*	*Stop PI*
Loss-in-Weight Tx	*Set Sps*	*Start LiW*	*Print*	*Stop LiW*
L-in-W + PI Control	*Set Sps*	*Start PI*	*Man/Auto*	*Stop LiW*
Throughput Weigher	*Set Sps*	*Start TPut*	*Residual*	*Stop TPut*
Dynamometer	*Set Sps*	*Show kW*	*Show RPM*	*Show Torque*
Bag Filler	*Set Sps*	*Start BFill*	*Print*	*Stop BFill*
Batch Weigher	*Set SPS*	*Start Batch*	*Add Water*	*Stop Batch*

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case DIGITAL INPUTS.

● Service Menu

Function Block Number 16 (LCT or (15) Beltweigher or (14) Loss-in-Weight)
16. **- FUNCTION KEYS -**



⊗ No Function, Tare, Toggle Net/Gross, Print, Reset Sp Latch, Reset, Max Value, Reset Min Value, Reset MIN/MAX, Reset Totaliser 1, Set Setpoints, Pretare, PI man/auto, PI Start, PI Stop LIW Start, LIW Stop .....

• Service Menu

Function Block Number 17
17. **- DIGITAL INPUTS -**

To view or alter the digital inputs press Enter ↵ when the DIGITAL INPUTS function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

Digital Inputs (D1-6) are inputs from remote potential free contacts. Contact closure activates the input. Each input can be individually selected for a number of functions such as None, Tare, Toggle Net/Gross, Show Gross, Show Net, Show Power, Show RPM, Show Torque, Print, Set Setpoints, Min/Max Reset, Reset Latch, Start.., Stop.., Man/Auto, Residual, Interlock 1-5, Add Water, ...

Default inputs

	D1	D2	D3	D4	D5	D6
Loadcell Tx	**None**	**Net/Gross**	**M/M reset**	**Tare**	**None**	**None**

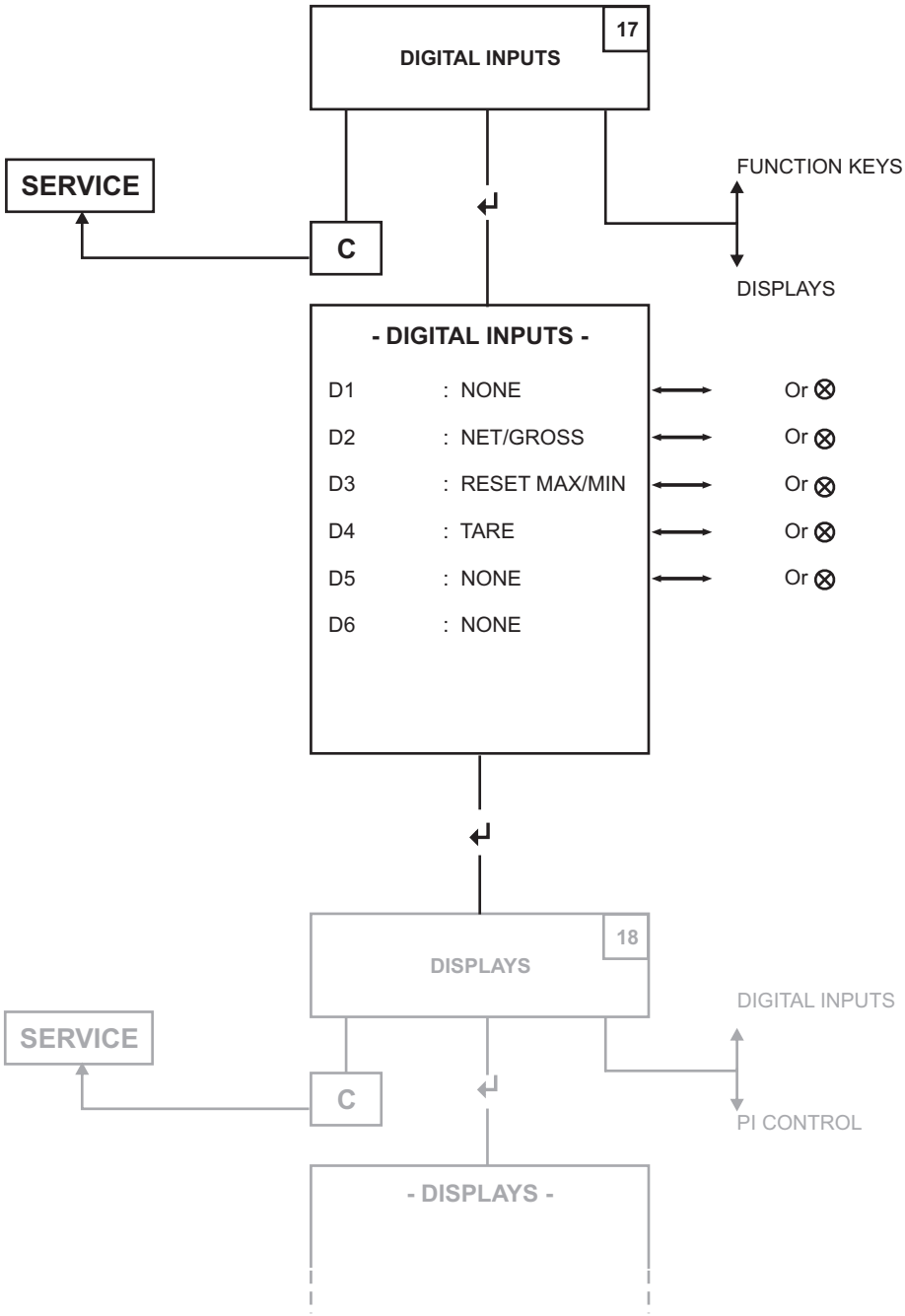
Suggested Digital Inputs for other applications

LCT + Pretare	**None**	**Set Sps**	**M/M reset**	**Print**	**None**	**None**
LCT + PI	**Stop LCT**	**None**	**M/M reset**	**Print**	**Start PI**	**Man/auto**
Beltweigher	**None**	**Tot reset**	**M/M reset**	**Print**	**None**	**None**
Belt W + PI	**Stop BW**	**Tot reset**	**M/M reset**	**Print**	**StartPI**	**Man/Auto**
Loss-in-Wght	**Stop LiW**	**Tot reset**	**M/M reset**	**Print**	**Start LiW**	**Non**
Loss in W+PI	**Stop LiW**	**Tot reset**	**M/M reset**	**Print**	**Start LiW**	**Start PI**
Throughput	**StopTP**	**Tot reset**	**Discharge**	**Print**	**Start TP**	**Residule**
Dynamometer	**None**	**Print**	**M/M reset**	**Show kW**	**Show Nm**	**Show RPM**
Bag Filler	**Stop BW**	**Tot reset**	**RemoteTare**	**Bagclamp**	**Psensor**	**FootSwitch**
Batch Weigh	**Stop BW**	**Intlok1**	**Intlok2**	**Intlok3**	**Intlok4**	**Start Batch**

When the entire block is ready press Enter ↵. This will set the whole block and move on to the next block, in this case DISPLAYS.

● Service Menu

Function Block Number 17 (LCT or (16) Beltweigher or (15) Loss-in-Weight)
17. **- DIGITAL INPUTS -**



⊗ No Function, Tare, Toggle Net/Gross, Print, Reset SP Latch, Reset Max Value, Reset Min Value, Reset min/max, Reset Totaliser 1, Set Setpoints, Show setpoints, Pretare, PI man/auto, PI Start, PI Stop, LIW Start, LIW Stop .....

• Service Menu

Function Block Number 18

18. **- DISPLAYS -**

To view or alter the displays selection press Enter + when the DISPLAYS function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

The Displays function block allows you to select what you want the Main LED display to be as well as up to four selections for the LCD graphics display. In most common uses for the Loadcell transmitter and Bagfiller the Main display would be Gross, with a Beltweigher and Loss-in-weight transmitter it would be Rate, a Throughput weigher Total and the Dynamometer would be kW or HP.

The auxilliary LCD display can be used for a group of other useful values such as (for LCT) net, analog output, mV, excitation voltage,... (Beltweigher) belt speed, (Loss-in-weight) gross [bin contents], (Throughput) non-resettable total, (Bagweigher) bag total, (Dynamometer) RPM & torque and (Batchweigher) aggregate and water values.

Note that if PI Control (Service menu function block 19) is selected then the first line of the auxilliary LCD automatically becomes Manual Output (00.0-99.9)% and the next line becomes Auto Setpoint 000,000 . These values can be changed in the Setpoint Values menu, hold down arrow 3 seconds (or set F1-4 for setpoint values) and you go into Operator's menu (observe Security Level). Values can be keyed in and entered when in run mode.

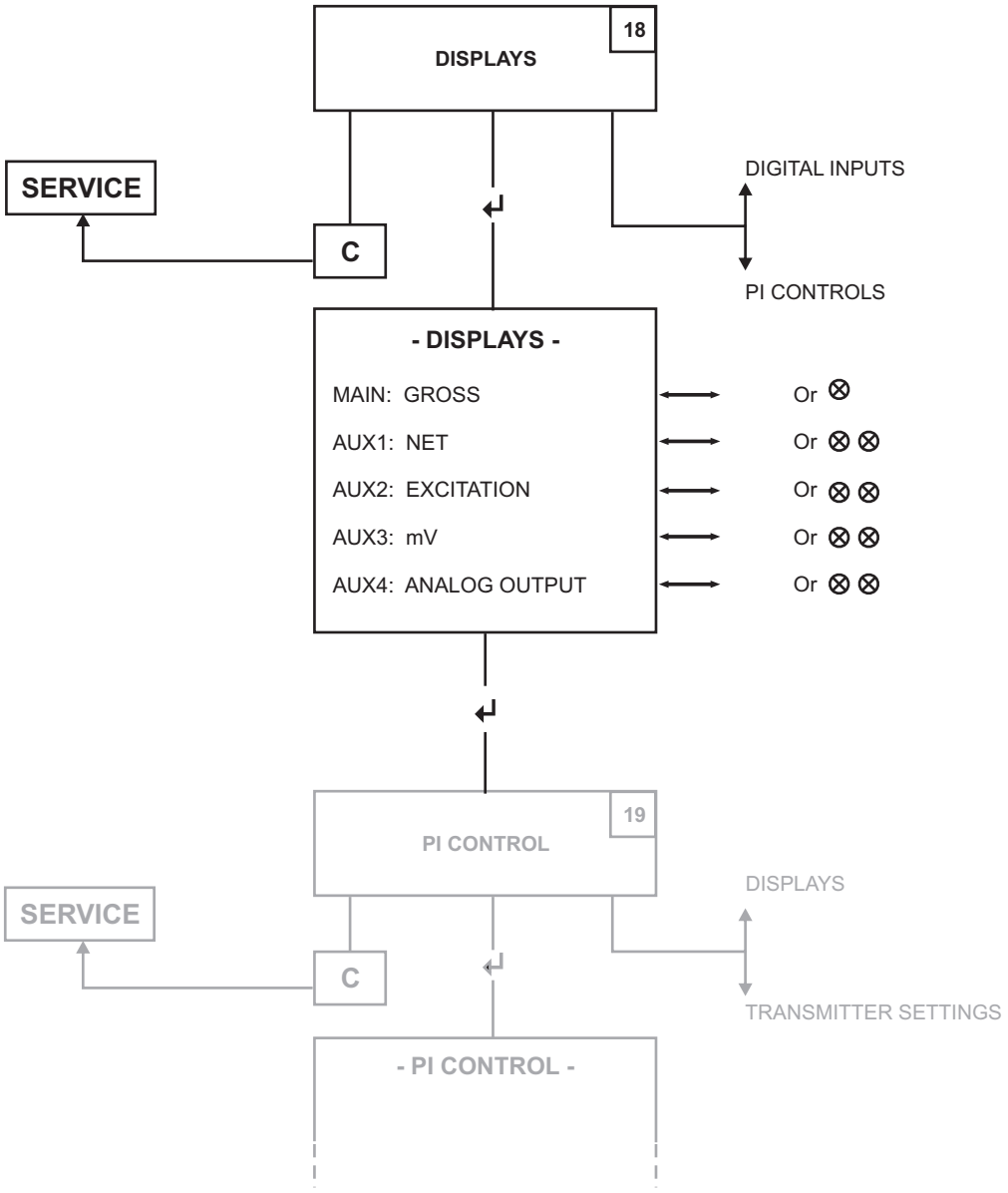
If Preset Tare (Service menu, function block 9) is selected then the Pretare Value will be displayed on the first line. The value can be keyed in and entered in Setpoint Values when in run mode. Select F1-4 for Setpoint Values.

Default displays	*Main*	*Aux1*	*Aux2*	*Aux3*	*Aux4*
Loadcell Transmitter	*Gross*	*Net*	*Ex Volts*	*mV*	*A Out*
Suggested displays for other applications					
Loadcell + PI Control	*Gross*	*Man %*	*Auto SP*	*None*	*A Out*
Loadcell Tx + Pretare	*Gross*	*Pretare*	*None*	*None*	*A Out*
Beltweigher	*Rate*	*Total*	*Reset Total*	*Beltspeed*	*A Out*
Beltweigher + PI	*Rate*	*Man %*	*Auto SP*	*Total*	*A Out*
Loss-in-Weight Tx	*Rate*	*Gross*	*Total*	*Reset Total*	*A Out*
L-in-W + PI Control	*Rate*	*Man %*	*Auto SP*	*Gross*	*A Out*
Throughput Weigher	*Total*	*Reset Total*	*Gross*	*None*	*None*
Dynamometer	*kW*	*Nm*	*RPM*	*Max*	*None*
Bag Filler	*Total*	*Reset Total*	*Gross*	*None*	*None*
Batch Weigher	*Gross*	*Net*	*Total*	*Reset Total*	*None*

When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case PI CONTROL.

• Service Menu

Function Block Number 18 (LCT or (17) Beltweigher or (16) Loss-in-Weight)
18. **- DISPLAYS -**



⊗ Gross, Net, Max, Min, Totaliser 1, Totaliser 2, Belt Rate, LIW Rate

⊗⊗ None, Gross, Net, Max, Min, Totaliser 1, Totaliser 2, Belt Rate, Beltspeed, Beltfreq, Analog out, mV, Ex Voltage, Date and Time, PI Man output, PI Auto SP, Setpoint 1, 2, 3, 4, 5, 6, Tare Value, Model Number, Preset Tare, Tag Number, Message, F1, 2, 3, 4, e=0000, RPM, Torque Nm, Torque, ft/lb, Power kW, Power HP

If Preset on Then AUX1: Preset (000,000)
If PI Control on then AUX1: Manual Output 00.0%,
and AUX2; Auto Setpoint 000.000

• Service Menu

Function Block Number 19

19. **- PI CONTROL -**

To view or alter the PI control selection press Enter + when the PI CONTROL function block is displayed. All values can be inserted or altered when highlighted. Do not press enter until all required changes to the entire block are completed.

When the PI Control function is switched On the 6004MF becomes a PI (proportional+integral) controller. This function can only be used where the application is controllable such as load, rate or specific gravity (SG). For example where a loadcell weighing system is controlling the level in a surge tank, controlling SG in an overflow tank or where a Beltweigher or Loss-in-Weight can measure a flow rate which can be varied by a control actuator or variable drive.

In order to take a control action you need a Process Variable (PV) (load, rate, SG) which must be on the Main display and is compared to the Setpoint (SP).

PI Control Action: is normally set for Reverse Action (Increasing PV results in decreasing output) but some systems may need Direct Action (increasing PV results in increasing output).

Start: selection allows you to set the controller to start in Manual with the output value set in Setpoint Values and displayed on the auxiliary LCD to a percentage (00-99,9%) of the chosen analog output. Only when Man/Auto F3 (or F1-4 or D1-6) is activated does the output follow the PI Control action. If Auto is selected then the output goes to Manual % for one second to set the start value then automatically begins controlling from the Auto Setpoint value. If Power on is selected the PI action will automatically begin in Auto mode 20 seconds after the power is applied to the 6004MF.

The Start Pushbutton: displays the Start activator, suggest F2 (F1-4 or/and D1-6) select in Function keys or Digital Inputs.

The Manual/Automatic: displays the Man/Auto activator, suggest F3 (F1-4 or/and D1-6) select in Function Keys or Digital Inputs.

With PI Control the analog output is now no longer proportional to the measured variable (load, rate or SG) as in a transmitter but is proportional to the deviation of the measured Process Variable from the Auto Setpoint which is set in Setpoint Values and displayed on the auxiliary LCD. The proportional action can be varied using the P-Gain setting (0,5 to 50,0). A low proportional gain setting results in weak corrections whilst a high gain value can overreact causing wild oscillations. To correct for any offset due to system load variations the Integral Time can be set from 001-999 seconds. (000 is treated as off). A low time value results in a fast offset correction and a long time a very slow offset correction. When the entire block is ready press Enter +. This will set the whole block and move on to the next block, in this case TRANSMITTER SETTINGS.

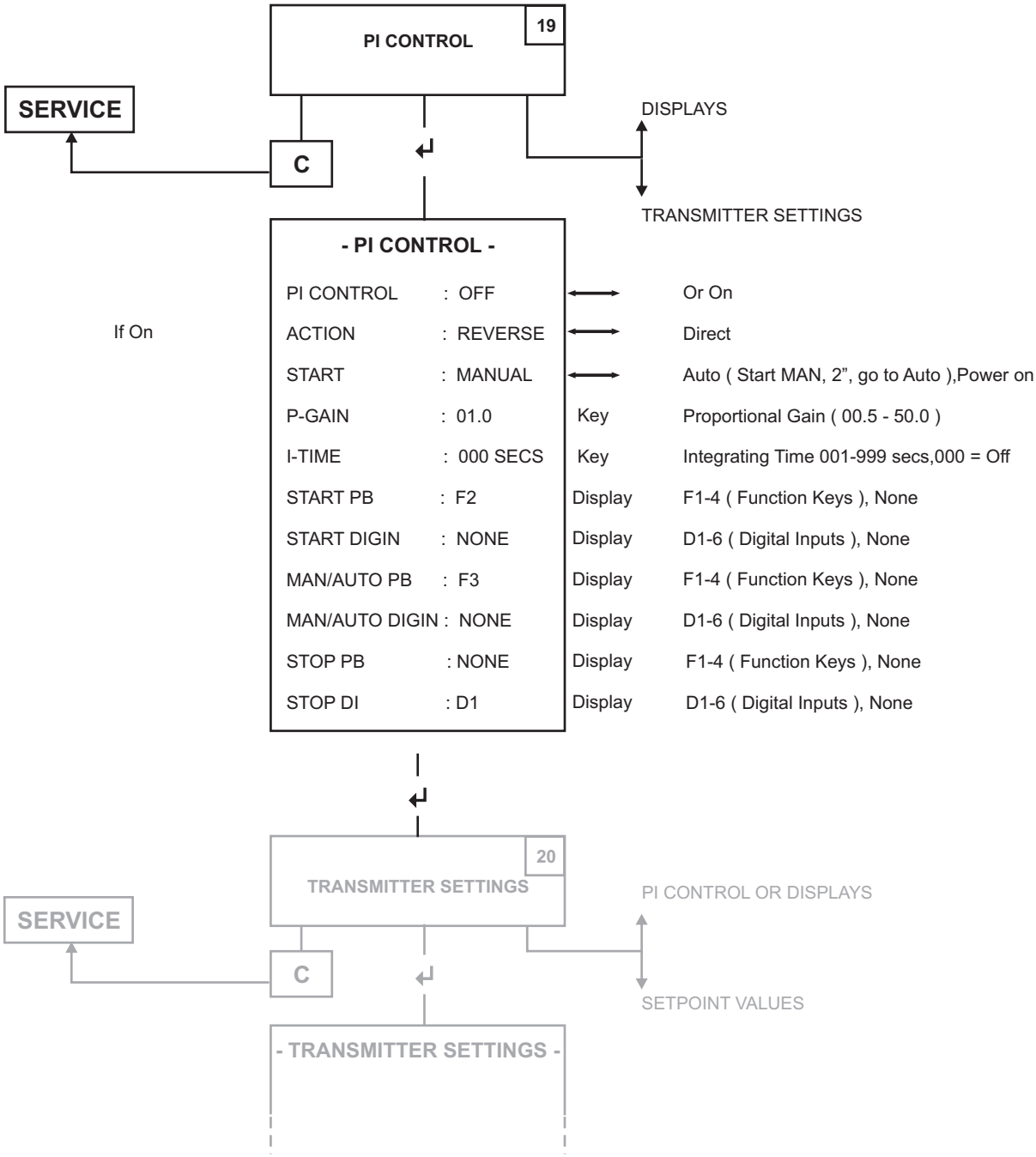
Ziegler-Nichols Closed Loop Tuning

When optimising start the loop in automatic with a gain low enough to prevent oscillation. Increase the gain in steps one half the previous gain, If no oscillation occurs change the Setpoint slightly in order to trigger an oscillation. Adjust the gain until the oscillation is sustained. If the oscillation is increasing decrease the gain slightly. If it is decreasing, increase the gain slightly. Note the gain which causes the sustained oscillation and measure the period of oscillation (high peak to high peak). Set the P-Gain to 45% of this value. To optimise the integral time take the period of oscillation and set the I-Time to 1,2 x oscillation period in seconds.

Service Menu

Function Block Number 19 (LCT or (18) Beltweigher or (17) Loss-in-Weight)

19. **- PI CONTROL -**



PI Control Formula used in the 6004MF

REVERSE ACTING : Ao = Mo + Pg.E + Pg.E.Ts/Ti + Ic

DIRECT ACTING : Ao = Mo - Pg.E - Pg.E.Ts/Ti - Ic

Where

Ao = Analog output % (Volt or mA as selected in Analog out)
E = Deviation error ± % = (SP % - PV %)
Pg = Proportional Gain (P-Gain: 0,01 - 50)
Ts = Sample period seconds (fixed to 1 second)
Ti = Integration Time seconds (I-Time: 001 to 999)
Mo = Manual analog output % (00-99,9%)
Ic = Start at 0, each 1 sec cycle add previous Pg.E.Ts/Ti value
PV = Process Variable % (PV value in % , 00-99,9%)
SP = Auto Setpoint % (Auto SP in % , 00-99,9%)

• Service Menu

Function Block Number 20

20. **- TRANSMITTER SETTINGS -**

To view or alter the Transmitter Settings selection press Enter + when the TRANSMITTER SETTINGS function block is displayed. In this function block use Enter to set each sub-menu and return to the Tx Settings menu.

The Transmitter Settings are used to set functions related to the transmitter itself. These include Cold Start, LCD Contrast, Unit Information, Change Password, Access code for calibration, Hardware fitted Menu timeout, Date & Time and Reset Totaliser 2.

Cold Start: No (or Yes) is used to reset the 6004MF to default factory settings. This may be used due to requiring a new starting point for programming or if an old unit is being used on a new system and you want to clear all old programming data. Please note that all your existing programming will be lost and you will have to re-enter all values and re-commission the system.

Contrast: use side arrow for LCD screen contrast bar display.

Unit Information: use side arrow to display Model, Version and Serial number.

Change Password: use side arrow to display Change Password menu.

Access Code: use side arrow to display Access Code. Key in the Password to enter the calibration menu and follow instructions for calibrating internal mV, Excitation Voltage, mA outputs and Voltage outputs.

Hardware Options: use side arrow to List Hardware options fitted. These are Setpoints: 1-6, SD card: No (or yes), GPS: No (or Yes).

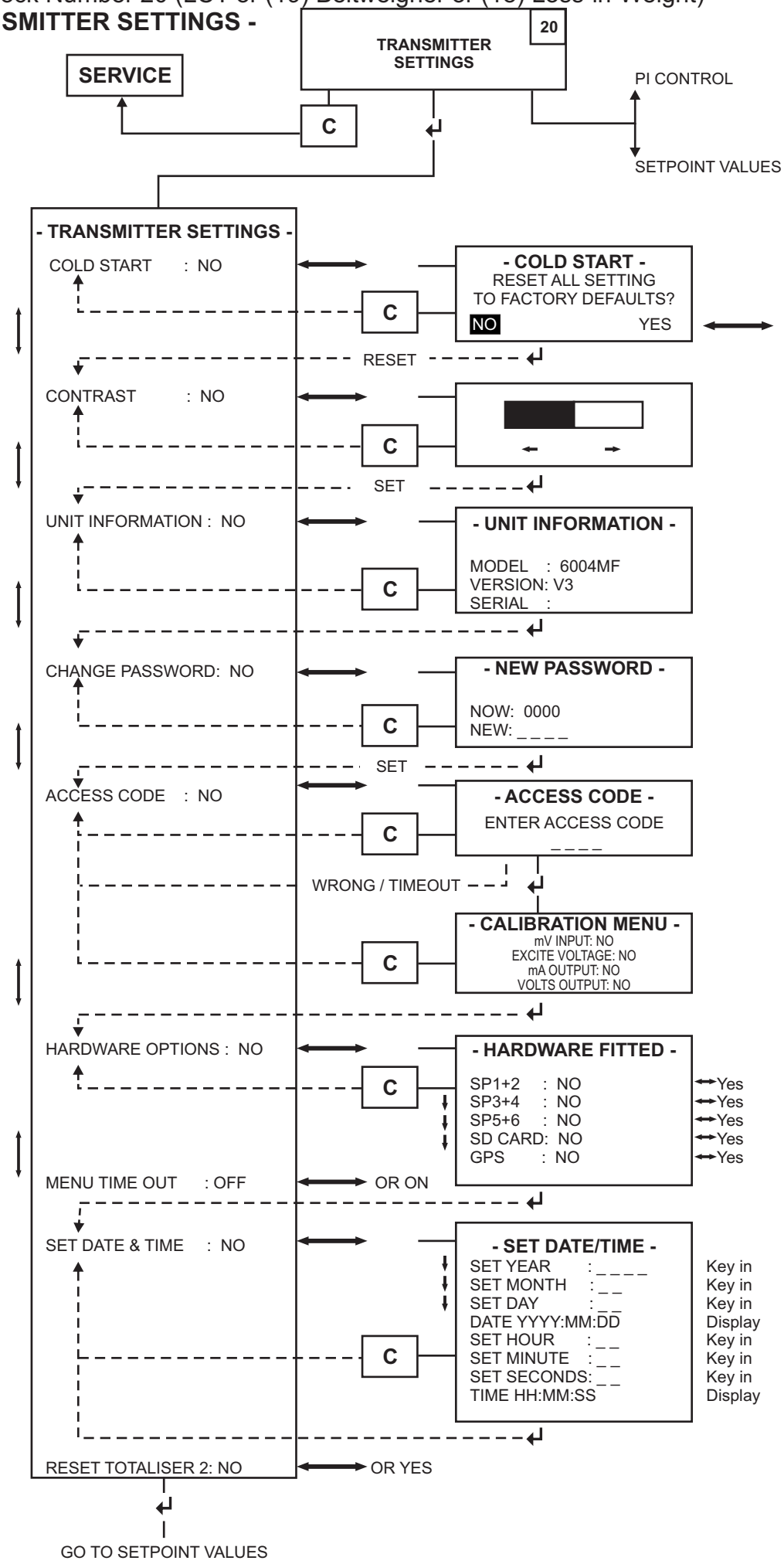
Menu Timeout: No (or Yes) (Use No during commissioning)

Date & Time: use side arrow to display Date/Time menu. Date is YYYY:MM:DD, Time is displayed as a 24 hour clock HH:MM:SS. Move highlight down and key in the values. Press Enter to set and return to Tx Settings menu.

Reset Totaliser 2: No (or Yes) Caution! This is the 'non-resettable' totaliser. Press Enter to reset and return to the Tx Settings menu.

When you have completed all changes to the block press Enter+. This will move on to the next block, in this case SETPOINT VALUES at the beginning of the service menu. Pressing Clear will then take you to the Service Menu block and Clear again to RUN.

• Service Menu

Function Block Number 20 (LCT or (19) Beltweigher or (18) Loss-in-Weight)

20. **- TRANSMITTER SETTINGS -**