

INTEGRATED BEXTRA SCALE

Operating Manual



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1. Process

Integrated **BEXTRA** scale measures material flow on a belt and allows controlling this flow changing belt's speed. A power source supplies an analogical signal from 4 to 20mA, to be connected to a frequency investor that determines belt's speed.

Software allows programming flow in tons per hour and the scale maintains material passing in a programmed value. Power source control algorithm is the known PID (proportional, integral and derivative), being that the 3 components' coefficients can be programmed with the system operating.

Besides, in both applications the scale allows adding contactor boards for a remote totalizer, error indication and total reached weight indication. Software allows installing a tachometer to measure belt's speed.

Flow indication is made through a 4 digit numeric display and a web keyboard allows equipment's programming.

An alphanumeric display shows totalizers' value and is used in data programming. Programmed values are not lost in case of power interruption.

2. Installation

BEXTRA scale has a metallic box containing a digital module, power source, displays and web keyboard; loading cell installed on the platform's mechanic structure; and connection to asphalt and filler pumps.

Cables are internally connected on the equipment's printed boards and should be installed by a duly qualified technician.

ATTENTION

ALL SCALES LEAVE FACTORY WITH

A 220 VOLTS POWER VOLTAGE.

In case a 127 V power voltage is needed change the voltage exchange key on the back panel with the scale disconnected from the power net.

3. To Turn On

To turn the equipment on and off use the < F4 > keyboard function. To connect BEXTRA scale to the power net it should present the thermal stabilization cycle (display segments turn on in sequence until completing a rectangle). Afterwards the display shows instant belt flow.

Note that on turning the scale on and off via < F4 > key flow appears without the thermal stabilization cycle. This happens because the scale remains with its circuits active, not needing to heat up to start operating. < F4 > key turns the scale off per software, but its circuits continue powered. Thermal stabilization cycle occurs only when power is interrupted. During thermal stabilization the alphanumeric display shows the initial message with software version and this version's year (VERSION 3.6; of 1997):

INTEGRATED BEXTRA V3.3/96 SCALE

To tare the scale (assume current flow as zero) press < F2 >. The scale will ask for confirmation. To confirm press < ENTER >. In case you want to abort this operation press < o >. TARE is allowed until a maximum of 50% of the scale's capacity. This tare value is not lost upon power failure.

Note that the equipment does not tare upon turning on, allowing that it is turned on with the belt loaded (with material on the belt).

In case the scale detects the belt has stopped, flow indication will be null, obviously. This detection can be made via tachometer or, on its fault, by the TAC jumper of IC-45 board open.

In this case there will be an intermittent 'TAC' warning message on the main display. If the scale loses its internal memory (RAM) message upon turning the scale on will be:

**** ERRO RAM ****

BEXTRA V3.3/96

If this error repeats it will be necessary calling BEXTRA's Technical Assistance. It is possible that the internal rechargeable battery is damaged.

4. Keyboard Functions

Following are the available functions on equipment's keyboard:

F1	Parameter Programming.
F2	Tare scale.
F3	Reduces totalizer to zero.
F4	Turns scale on/off (or enables/disables flow control).
ENTRA	Commutes alphanumeric display.
O	Enables/disables totalizers.
0	Printing.
1	Water Flow (quick access).
2	Addictive flow (quick access).

- 3 Emulsion flow (quick access).
- 4 Serial communication parameters.
- 5 Weight simulation upon starting water, additive, emulsion control.
- 6 Enables/disables water, additive, emulsion control.



Besides these functions, < ENTER > key makes the scale accept data entry and < o > (point) key aborts operation during programming (< F1 > key).

4.1. F1 Key – Parameter Programming

This key is used to program various scale parameters. In case the scale does not have voltage sources (asphalt and filler, in case the scale is controlling an asphalt plant) nor contactor boards, this key decreases corresponding to accessible parameter numbers. On pressing < F1 > the alphanumeric display shows the message:

SENHA: ----- (PASSWORD)

F1 - Parameters

On scale reception it contains a standard 99999 password. Password changing will be explained further on. Note that password is always a 5 number digit. Type the password and press <ENTER>. As the password is being typed the display is filled with the # character. In case password is incorrect the display will show:

SENHA: ERRADA (PASSWORD: WRONG)

F1 – Parameters

On typing the correct password it will show:

DIGITE DE 1 A 9. (TYPE FROM 1 TO 9.)

F1 - Parameters

That is, numbers from 1 to 9 can be typed according to the desired function. Besides, < 0 > allows entering mathematic calibration during scale operation and < ENTER > allows simulating scale's material flow. < F1 > and < F2 >, when pressed at this point, access data referring flow control on the belt. Yet < F3 > and < F4 > access data referring water, additive and emulsion flow control:

1	SOURCE 1
2	SOURCE 2
3	MOISTURE
4	DELAY
5	PASSWORD CHANGING
6	HOUR AND DATE
7	TIMING FOR AVERAGE TARE
8	TOTALING LIMITS
9	FLOW LIMITS
0	MATHEMATIC CALIBRATION
ENTER	FLOW SIMULATION
F1	CONTROLLED FLOW
F2	FLOW CONTROL PARAMETERS (PID)

According to scale's configuration (specified on complete gauging) the options might not be available. < 0 > and < ENTER > options are always available. So, if there are no power sources nor contactors < F1 > will stay completely inhibited, except options 5 to 7 (and the above mentioned keys), which do not depend on contactor boards or on power sources. In this case the following message will show:

DIGITE DE 5 A 7. (TYPE FROM 5 TO 7.)

F1 – Parameters

Yet if there are only power sources the 2 last options will not be available and the message after typing correct password will be:

DIGITE DE 1 A 7. (TYPE FROM 1 TO 7.)

F1 –Parameters

In case the equipment has only contactors, the 4 first options will be inhibited and the message will be:

DIGITE DE 5 A 9. (TYPE FROM 5 TO 9.)

F1 –Parameters

1 - SOURCE 1

This parameter controls source 1's stimulation percentage. For example, with the scale on maximum flow, if this item is programmed with half of maximum percentage value (defined on calibration) power source 1 will assume a 12 mA value (half way between 4 and 20 mA). This considering it is not an asphalt plant and, therefore, source 1 does not depend on source 2. In this case message will be:

FONTE 1: 00.0 % (SOURCE 1: 00.0%)

F1 - Parameters

Type the desired percentage and press < ENTER >. To abort parameter programming just press < 0 >.

2 - SOURCE 2

Allows programming power 2 stimulation source. In case the scale is not controlling an asphalt plant the alphanumeric display will show:

FONTE 2: 00.0% (SOURCE 2: 00.0%)

F1 - Parameters

Type the desired percentage and press < ENTER >.

3 - MOISTURE

UMIDADE: 00.0 % (MOISTURE: 00.0%)

F1 - Parameters

This option programs moisture percentage existing in weighted material on the belt (aggregated, in case of asphalt plants). Type measured value and press ENTER. If J3 jumper of IC-45 board is inserted, flow of material shown on numeric display is automatically discounted from moisture value. So, if the scale is indicating a 100 tons/h flow and a 10% moisture has been typed, upon closing J3 jumper the scale will indicate 90 tons/h.

On pressing ENTER the scale goes automatically to the next option, delay. Again, in case programming must be interrupted at this point (if it is not necessary to change delay) just press < o > (point).

4 - DELAY

On calling this option the display shows:

ATRASSO: 00 s (DELAY: 00 s)

F1 - Parameters

For some applications it can be necessary that power 1 source suffers a temporary delay relating to measured flow value. For example: a mixture of another material to the material running through the belt, being that this mixture is controlled by power 1 source. Let's suppose that belt's transit time until the place where mixture is made is of 10 seconds. So, it is convenient to program a 10 seconds delay so that flow fluctuations occurred now will get to mixture point after 10 seconds, when they will be correctly compensated.

5 – PASSWORD CHANGING

Initial message is:

SENHA: ----- (PASSWORD)

F1 – Programming

After typing the new password press < ENTER >. The equipment should assume the new password and exit programming mode (< F1 >). To return to programming mode it will be necessary to use the new password.

It is necessary to type the password with 5 digits. In case the number of digits is less than five, password will not be accepted, remaining the previous password. Note that when receiving the scale it contains the standard password - 99999. Also after calibration the scale assumes the standard 99999 password. To abort password see item 8.3.

Write your password in the box below to avoid annoyances.

Pr

6 – HOUR AND DATE

Through item 6 it is possible to update equipment's hour and date. Note that hour and date are lost when equipment is unconnected from power net (date is maintained the same as upon disconnection and hour is restarted when equipment is turned on). When equipment is turned off per software (F4 key) the internal clock continues operating and hour and date continue being updated.

This function allows programming actual hour. Type value in hours, minutes, and seconds, and press < ENTER >. If it is 3 p.m., 23 minutes and 30 seconds type:

HORA: 152330

If typed value is inconsistent (for example, hour higher than 23) data is rejected and display shows:

HORA: INVÁLIDO (HOUR: INVALID)

On pressing < ENTER > the scale goes to next option that is date programming. To abort programming press < o >.

After hour entry there is date. Note that the scale has a permanent calendar that foresees leap years. Therefore date is automatically increased each 24 hours. However, each time power failures occur this data should be restored, as well as hour. Type the value in the day, month, and year format and press ENTER. For example, if we are in March 9, 1997:

DATA: 090397

Note that on typing date and pressing <ENTER> the equipment exits parameter programming (< F1 >). If an absurd value has been typed (month higher

than 12, for example), data will not be accepted and for a second this message will show:

DATA: INVALIDO (DATE: INVALID)

7- TIME FOR MEDIUM TARE / DEAD ZONE

This is an interesting resource to tare (zero) the belt scale. Many times there are weight differences of the transporting belt on its different parts, as on the connection, for example. So, when the scale is tared with the belt moving (and with no material on it, naturally), zero value can be obtained for flow on this point of the belt, but not necessarily on all its extension. The tare resource by average allows obtaining weight value on whole belt's extension and tare the scale by arithmetic average of the values obtained. So, a tare value is obtained between the transporting belt's weight ends, minimizing errors. The scale must be informed in how many seconds the transporting belt makes a complete turn. To obtain this data just time the turning time from any mark on the belt (made with chalk, for example). The scale asks:

TEMPO TARA: 0 s (TARE TIME: 0 s)

F1 - Parameters

Type the value and press < ENTER >. In case conventional tare (instantaneous) is wanted, just type 0 seconds.

On pressing < ENTER > the following questions is shown on the alphanumeric display:

Z.MORTA: 0000 (DEAD ZONE: 0000)

F1 - Parameters

This parameter allows programming a dead zone around the scale's zero in tons per hour. So, if flow is lower than the programmed value for dead zone, totalizers are not increased and power sources, in case there is one, remain at minimum value. Type the desired value in ton/h and press < ENTER >. The scale will exit F1 (Parameter Programming).

8 – TOTALING LIMITS

Totaling limits allow flap 3 contactors in different partial totaling values. So, it is possible to fix 3 total values, under which the respective contactor will be activated until the partial totalizer is reduced to zero. The contactors are:

contactor 1- totaling limit 1
contactor 2- totaling limit 2
contactor 3- totaling limit 3

TOTALING LIMIT 1

TOTAL 1: 000.0 ton

F1 – Parameters

This is the value that must be reached by the partial totalizer so that contactor 1 of the contactors' board is activated. When partial totalizer is equal or higher than total 1, contactor 1 is activated. To turn the contactor off just reduce partial totalizer to zero.

This option is only available if there is a contactor board that serves, for example, to alert the operator when a certain material quantity has passed (outlet sile's capacity limit, or another value). Besides, if the scale has been programmed with power source 3 active (FC3), totaling limit 1 is disabled, because contactor 1 of IC-48 board (contactors' board) is used to indicate flow control process via active belt speed. In this case, upon pressing < 8 > in < F1 > totaling limit 2 arises.

Type the desired value and press < ENTER >.

TOTALING LIMIT 2

TOTAL 2: 000.0 ton

F1 - Parameters

This is the value that must be reached by the partial totalizer so that contactor 2 of the contactors' board is activated (similar to previous item). Type the limit value for contactor 2 and press <ENTER>.

TOTALING LIMIT 3

TOTAL 3: 000.0 ton

F1 - Parameters

This is the value that must be reached by partial totalizer so that contactor 3 of the contactors' board is activated. Note that there are 3 contactors for totaling limit, each one of them independently programmed. Type desired value and press < ENTER >. Upon informing total value for contactor 3 the equipment exits automatically parameter programming option (< F1 > key).

9. FLOW LIMITS

These are 4 flow values to be specified by the user that activates 3 contactors (contactors 4 to 6). Just as the previous option, this item is only available in equipments with contactor board. Contactors are:

contactor 4 – minimum flow contactor
contactor 5 – normal operation group contactor
contactor 6 – maximum flow contactor

MINIMUM FLOW

This is the flow value measured by the scale below which contactor 4 (minimum flow contactor) is activated. Note that decimal point is fixed according to scale's gauging. Keyboard's < o > key aborts parameter entries. Type desired value and press < ENTER >.

VAZ.MIN: 000.0 (MINIMUM FLOW)

MAXIMUM FLOW

This is the flow value measured by the scale above which contactor 6 (maximum flow contactor) is activated. Type the desired value and press <ENTER>.

VAZ.MAX: 000.0 (MAXIMUM FLOW)

LOWER FLOW

This value, together with the following, upper flow, allows fixing a performance group for contactor 5 (normal operation group contactor). If flow

measured by the scale is among flow values specified for lower flow and upper flow, that is, measured flow higher than lower flow and lower than upper flow, contactor 5 is activated.

VAZ.INF: 000.0 (LOWER FLOW)

Type desired value and press < ENTER >.

UPPER FLOW

Last item is upper flow, that is, upper limit for performance group of contactor 5. Type the value and press < ENTER>. The equipment will return automatically to normal operation, exiting parameter programming (< F1> key).

VAZ.SUP: 000.0 (UPPER FLOW)

0 – MATHEMATIC CALIBRATION

One of the available options via < F1 > key is mathematic calibration. So, it is possible recalibrating the scale without disconnecting it from power net nor putting internal jumpers.

On pressing <0> (zero, not point) the following question shows up:

CONFIRMA? (CONFIRM?)

Cal. Matemática (MATHEMATIC CALIBRATION)

To confirm press < ENTER >. In case you want to abort press < o > (point). Upon confirming the numeric display does not indicate flow anymore and shows "CAL" message. Besides, the alphanumeric display allows selecting between two mathematic calibration categories, percentage or absolute:

1) Perc. 2) Absol.

Cal. Matemática (MATHEMATIC CALIBRATION)

Press < 1 > or < 2 > according to option chosen. To abort calibration just press < o > (point).

Percentage Mathematic Calibration

In this case BEXTRA scale asks which the desired income percentage variation is:

GANHO: 00.00 % (INCOME: 00.00%)

Cal. Matemática (MATHEMATIC CALIBRATION)

Note that desired income variation should be informed, no matter if income should increase or decrease. This is the next question for, described below. For example, if the scale totalized 300 tons when the actual value that passed through the belt is of 348 tons. So, income should suffer a 16% percentage variation, because $348/300 = 1.16$. Thus, type 16.00% under this item and under the following item we say that income should increase.

Note that there are 2 fixed decimal points for income description. <0> should not be pressed because it aborts gauging.

The next question refers to percentage variation previously specified:

GANHO DEVE? (INCOME SHOULD?)

1)Subir 2) Descer (1)INCREASE? 2)DECREASE?)

Afterwards the scale blinks during a short time and soon the display shows the new flow value, corresponding to the scale's income change. *The belt can be maintained loaded (with material on it) during mathematic calibration.* Mathematic calibration does not arrest scale's zero value during the process, so mathematic gauging is completed!

ESTABIL. TÉRMICA (THERMAL STABILIZATION)

Cal. Matemática (MATHEMATIC CALIBRATION)

Absolute Mathematic Calibration

In this case, instead of specifying a variation percentage for income, its value is typed directly on a floating point. Note that decimal point is fix and income is always a number lower than 1:

GANHO: 0.037831 (INCOME:)

Cal. Matemática (MATHEMATIC CALIBRATION)

Type new value for income and press < ENTER >. Afterwards the scale blinks for a short time and soon shows new flow value, due to income change. *The belt can be maintained loaded (with material on it) during mathematic calibration.* Mathematic calibration does not arrest scale's zero value during the process, so mathematic gauging is completed!

ESTABIL. TÉRMICA (THERMAL STABILIZATION)

Cal. Matemática (MATHEMATIC CALIBRATION)

ENTER – Flow Simulation.

On pressing < ENTER > after the equipment indicates correct password in option < F1 > - Parameter Programming, the following questions arises:

1)Ativa 2)Inibe 1 (1)ACTIVATES 2)INHIBITS)

Simular vazão (SIMULATE FLOW)

On pressing < 1 > flow simulation is activated. The scale will ask which the desired flow is:

VAZ.SIM: 000.0 (SIMULATED FLOW:)

Simular vazão (SIMULATE FLOW)

Type the value in tons per hour and press < ENTER >. The scale will return to normal operation, but indicating typed flow. Numerical display alternates typed flow indication with the "SIMU" message to indicate that a material flow is being simulated.

To exit simulation just select again < ENTER > option and type < 2 >, inhibiting flow simulation. "SIMU" message should disappear from the flow display.

F1 – Controlled Flow

If < F1 > is pressed again after entering parameter programming – < F1 > key – the display will indicate (since the equipment has a FC3 power source – specified on calibration):

VAZAO: 00.00 (FLOW:)

Vazão controlada (CONTROLLED FLOW)

This is the flow the scale will try to reach via speed control of the belt. Therefore, a belt speed controller must be connected (frequency converter or electromagnetic variator) to power source outlet 3. Flow control algorithm is of PID type (proportional, integral, derivative). In case this flow is null, flow control is inhibited and power source 3 is maintained at minimum. In this case, < F4 > key only turns the scale on or off. Yet if this flow is different from zero, < F4 > key allows, besides turning the scale on and off, activating and disabling material flow control on the belt.

F2 – Flow control parameters (PID)

On pressing < F2 > key in parameter programming - < F1 > key – the proportional constant of belt's PID speed control arises (and consequent flow control). This option only arises if upon calibration FC3 power source existence has been specified:

GANHO: 0.0000 (GAIN:)

Cte. Proporcional (PROPORTIONAL COMPONENT)

This would be the component income only proportional to flow error. Type the value and press < ENTER >. The scale will allow access to integral income:

GANHO: 0.0000 (GAIN:)

Cte. Integral (INTEGRAL COMPONENT)

This income allows reducing error to zero in permanent system, but can instabilize control if too high. The last parameter is derivative income:

GANHO: 0.0000 (GAIN:)

Cte. Derivativa (DERIVATIVE COMPONENT)

This is the component income proportional to flow variation. Allows a quicker flow stabilization.

Suggestion to adjust PID control parameters:

1. Maintain integral and derivative income reduced to zero.

2. Increase gradually proportional income and observe flow control.
3. For a certain proportional income value, the system will stay unstable and oscillatory.
4. Write down proportional income value that started oscillation (KP') and the oscillation period in seconds (T').
5. Adjust proportional income (KP), integral income (KI) and derivative income (KD) according to the following formulas:

$$\begin{aligned} KP &= (3 KP') / 5 \\ KI &= (6 KP') / (5 T') \\ KD &= (3 KP'T') / 40 \end{aligned}$$

For example, if KP is increased slowly, the system started oscillating to KP = 0.25 with a 7 seconds oscillation period. In this case, KP' = 0.25 and T' = 7. Then:

$$\begin{aligned} KP &= (3 \times 0.25) / 5 = 0.15 \\ KI &= (6 \times 0.25) / (5 \times 7) = 0.0429 \\ KD &= (3 \times 0.25 \times 7) / 40 = 0.1313 \end{aligned}$$

4.2. F2 Key – Tare Scale

On pressing < F2 > the scale asks for confirmation to tare (reduce to zero) it:

CONFIRMA? (CONFIRM?)

F2 - Tarar balança (F2 – TARE SCALE)

To confirm press < ENTER >. To exit press < o >.

Note that tare value is not lost upon power interruption.

In case a medium tare different than zero has been programmed, scale's tare will not be instantaneous, and the display will show:

TARANDO P/ MÉDIA. (TARING BY AVERAGE)

Tempo: xxx s (TIME:)

The display keeps on showing the remaining time to finish tare by average. In case you want to abort tare just press < o > (point) here.

4.3. F3 Key – Reduces Totalizer to Zero

There are 2 totalizers in the scale. These totalizers' contents are constantly presented on the alphanumeric display. The upper totalizer (T1) allows reducing to zero. The scale requests confirmation:

CONFIRMA? (CONFIRM?)

F3 - Zera totaliz. (F3 – REDUCES TOTALIZER TO ZERO)

To confirm press < ENTER > and to abort operation press < 0 >.

Note that this totalizer is used to activate totalizing limit contactors, when these exist.

4.4. F4 Key – Turns Scale On/Off and Enables/Disables Flow Control.

This key, when flow control is not activated (controlled flow equal to zero), simply turns the equipment on or off. Note that < F4 > in fact turns only the display off and not the whole scale. So circuits are always powered, dispensing a thermal stabilization cycle. In case the scale is turned off and there is a power failure, upon power return it will automatically turn on. As the scale is always powered, *it is necessary to unplug it to perform any maintenance.*

Yet if flow control is activated (option < F1 > - Controlled flow – not reduced to zero), on pressing < F4 > shortly flow control is activated or disabled. During more or less half a second the alphanumeric display presents one of the following messages:

*** ATIVA *** (ENABLES)

Vazão controlada (CONTROLLED FLOW)

*** DESATIVA *** (DISABLES)

To turn the scale off keep < F4 > pressed during more or less 1 second. To turn it on again press < F4 > again.

Note that, in case the scale has flow control (FC3 power source), contactor 1 from IC-48 contactor board stops acting as totalizer 1 limit to act as active flow control process indicator.

4.5. ENTER Key – Commutes Alphanumeric Display

On pressing this key during scale operation, alphanumeric display changes between totalizers value indication and power sources value indication (asphalt and filler, in case of asphalt plant). Note that, even with the display indicating control voltages of the pumps, totalizers continue being updated internally.

In case the scale has a tachometer, < ENTER > commutes the alphanumeric display among 3 information: totalizers, voltage sources and belt speed.

In case the scale does not have voltage sources nor tachometer, this key will not operate.

Besides, this key allows viewing actual hour and date and also contactors' value, in case there is a contactor board in the equipment.

In case the equipment has all the optionals, that is, contactor board, power source board and tachometer, the following data will show on the alphanumeric display:

T1: 0.0 ton

T2: 0.0 ton

Initially the two totalizers are shown on the display. On pressing < ENTER > once the display changes to belt speed indication (measured by the tachometer) and activated contactors indication:

VELOC. 60 m/min (SPEED:)

RELES: 00010111 (CONTACTORS:)

The above example shows a belt speed of 60 meters per minute and contactors 1, 2, 3 and 5 are activated. On pressing <ENTER > again the value of the equipment's 2 voltage sources can be seen:

FC1: 4.00 mA

FC2: 4.00 mA

Note that the voltage sources can vary from 4 to 20 mA. On pressing < ENTER > once more the alphanumeric display is going to present asphalt and filler flow (only for asphalt plant):

ASF: 0.0 kg/min

FIL: 0.0 kg/min

This is the estimated value that is being inserted via voltage sources, considering the asphalt percentages, filler and programmed moisture, besides the aggregated flow on the scale.

On pressing < ENTER > again the display shows hour and date:

HORA: 15:30:45 (HOUR:)

DATA: 03/03/94 (DATE:)

On pressing < ENTER > again instantaneous weight on the scale's weighting platform should arise. This information is useful, for example, to check static gauging on a scale with tachometer. As static gauging, like the name mentions, is made with the belt stopped, the flow display always indicates 0 ton/h. Through the alphanumeric display it is possible to observe value of standard weight put on weighting platform. Besides, if the equipment has a FC3 voltage source (belt speed control) this source's value will be shown on the lower line. The display shows:

PESO: 0.0 kg (WEIGHT:)

FC3: 0.00 mA

In case there are FC5, FC6, FC7 voltage sources (defined on calibration), the display shows, on pressing < ENTER > again, water and additive flows:

ÁGUA: 0.00t/h (WATER:)

ADITIVO: 0.00t/h (ADDICTIVE:)

Pressing < ENTER > again the display will show emulsion flow:

EMULSAO: 0.00t/h (EMULSION:)

Finally, on pressing < ENTER > again, the display returns to totalizers' value.

4.6 - o Key – Activates/Disables Totalizers

Allows activating or disabling totalizers. With totalizers disabled material flow that runs through the scale is not accounted for. Totalizers' condition (activated or disabled) is not lost in case there is power interruption.

Upon exiting gauging totalizers start activated. Note that < o > here mentioned refers to the left lower key of the keyboard and not to < 0 > - zero.

4.7. 0 Key – Printing

We are now referring to < 0 > (zero). On pressing this key, if there is a printer connected to the parallel outlet of the equipment, a line with the following format is printed:

HORA - DATA- VASÃO INSTANTÂNEA -VELOCIDADE DA ESTEIRA –TOTAUZADORES
(HOUR – DATE – INSTANTANEOUS FLOW – BELT SPEED – TOTALIZERS)

Belt speed is only printed in scales with tachometer. If there is no printer, if it turned off or out of line, on pressing < 0 > the following message arises on the alphanumeric display:

Impressora (PRINTER)

Desligada. (NOT ON)

4.8. Serial Address, Baud-rate and Communication Protocol

On pressing < 4 > the scale will present the question:

ENDERECO: 00 (ADDRESS:)

Comunic. 232/485.

This is scale's logical address, that is, equipment's access address in serial communication in circle (RS-232C) or bars (RS-485). Type a value from 0 to 99 and press < ENTER >. Note that, in case of communication via RS-232C, this address can be altered by 65h instruction coming from serial communication port.

Afterwards communication baud-rate can be programmed (between 150bps and 4800 bps.):

Baud-Rate: 4800

150bps a 4800 bps.

Standard baud-rate is 4800 bps. Selectable baud-rates are 150, 300, 600, 1200, 2400 and 4800 bps. Type the value and press < ENTER >. BEXTRA scale will ask for communication protocol to be used:

Protocolo:

1)BEXTRA 2)MODBUS

Press < 1 > or < 2 > according to the required protocol. At the end of this manual there is a description of the protocols. If MODBUS protocol is selected, another question will arise:

ENDereco: 000 (ADDRESS:)

Registro inicial. (INITIAL REGISTER)

This is the address of initial register if MODBUS protocol is used. Thanks to this resource it is possible to use various scales in MODBUS protocol, all with the same logical address, they just need to have different initial register addresses (see MODBUS protocol at the end of this manual).

5. Numeric Display Messages

MESSAGE	CAUSE
ovEr	Excessive weight on the scale. ATTENTION: Weight excess can damage weight sensor (loading cell) existing in the equipment.
UndE	Weight too negative (weight sensor is compressed instead of tractioned). Check installation and cables.
CAL	Scale lost gauging. Call BEXTRA's Technical Assistance (see address on page 21 of the manual).
ZErO	Scale lost internal RAM and has been turned on with weight on the platform. In case there is weight on the platform it is necessary to take it off (clean the belt). This message indicates that RAM (internal memory) has been lost and, therefore, totalizers have been reduced to zero. If this problem repeats, call BEXTRA's technical assistance (it is possible that there is a problem with the internal battery that detains RAM data).
Err1	Problems with weight sensor. Check cables. If not broken call Technical Assistance.
Err2	Problems with weight sensor. Check cables.

If not broken call Technical Assistance.

- FC1** Voltage source 1 (asphalt) saturated at 20 mA (calculation bottom). It is possible that a too high asphalt percentage has been programmed, that the pump can not supply with current aggregated flow.
- FC2** Voltage source 2 (filler) saturated at 20 mA (calculation bottom). It is possible that a too high filler percentage has been programmed, that the pump can not supply with current aggregated flow.
- rAM** Indicates that equipment's RAM memory is not working. As this memory keeps totalizers' values, if this message is shown on the flow display, value shown on alphanumeric display for totalizers is not true. Memory stops working if power net is too low. Check, and if this is the case, turn the scale off until power supply is normalized.
- tAC** Indicates that the belt has stopped and, therefore, flow indication is null. Serves to alert the operator that the belt is not moving. In case there is a tachometer, detection is made through it. Yet if there is no tachometer, detection of stopped belt is made by the TAC jumper of the IC-4S board open (high level).
- EEPr** This message occurs at the end of calibration if the equipment can not record EEPROM memory with new calibration data. Check JP23 jumper existing on IC-45 board version 1.2. This jumper should be closed to allow EEPROM recording. Just set it to record data and take this message from the display. If jumper is set and EEPr message persists probably EEPROM (chip U5 on IC-45 board) is damaged.
- SIMU** Intermittent message that indicates flow being simulated instead of average flow.
- FC3** Voltage source 3 (flow control) saturated at 20 mA (calculation bottom). It is possible that the scale can not reach desired flow, even with the belt at maximum speed.

FC5	Voltage source 5 (water flow control) saturated at 20 mA (calculation bottom). It is possible that the scale can not reach desired flow, even with voltage source 5 at maximum.
FC6	Voltage source 6 (addictive flow control) saturated at 20 mA (calculation bottom). It is possible that the scale can not reach desired flow, even with voltage source 6 at maximum.
FC7	Voltage source 7 (emulsion flow control) saturated at 20 mA (calculation bottom). It is possible that the scale can not reach desired flow, even with voltage source 7 at maximum.
dESA	Belt disordered (disordering sensors are installed on both sides of the belt). After 40 seconds, flow control is disarmed if it is under operation.

6. Technical Specifications

Environmental Characteristics

Operation Temperature	5 to 45 degrees Celsius
Relative moisture	5 to 95% without condensation

Power Characteristics

Net Voltage	127/220 VAC +1- 10%
Frequency	60 Hz
Spend Power	5 W
Fuse	0.5 A

Cabinet's Physical Characteristics

Dimensions	372 x 170 mm (front panel)
280 mm (depth)	
Weight	6 kg

Weighting Characteristics

Number of Divisions	2000
Capacity	200.0 ton/h
Minimum Division	0.1 ton/h
Effective Length	3 meters

Voltage Sources

Calibration	Totally by software
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Loading	= < 1.000 ohms
Voltage	4 to 20 mA
DIA Converter	10 bits

Contactors

Maximum Power	1 A.
Contacts' Protection	Varistor for 250 V and RC filter
Maximum Voltage	220 VAC

Characteristics

- Micro processed 8031 CPU.
- Assembled in metallic cabinet, IP-54 protection degree.
- Display with 4 digits in liquid crystal to indicate instantaneous flow in t/h and error messages (loading excess, etc.).
- Alphanumeric liquid crystal display with 2 lines with 16 characters per line, for parameter programming and messages to help operations.
- Net keyboard with 16 keys to enter programming data, appropriate for aggressive environments.
- Totally electronic; counters in CPU memory, data recorded in non-volatile RAM.
- In case of power failure, data remain stored for until 4000 hours.
- Calibration completely made by software, with no adjustments via trimpots.
- Scale allows 4 calibrations forms: static weight, standard power, mathematic calibration and per totalization.
- Two totalizers until 100,000,000 (one hundred million) countings, being one of them with reduction to zero.
- Process data are accessed through password (for safety).
- Two power sources of 4 a 20 mA, with D/A converter of 10 bits.
- Protected tachometer to measure transporting belt's speed.
- Loading cell's reading circuit protected against electric overloads.
- Internal connections with flat-cables with few ways, decreasing significantly the possibility of bad contact.
- A/D converter of 16 bits for loading cell reading, with auto zero and auto calibration, as well as resource digital filter.
- Simplified gauging operation due to software calibration and display's alphanumeric help.
- Total warranty of 1 year.
- Remote tachometer (dry contactor contact).
- Error contactor (over, under, etc.).
- Contactors for minimum flow, maximum flow and normal operation group.
- Contactors for material totaling indication.

- Clock with permanent calendar (including leap year).
- System expansion possibility, like printer connection and serial communication with central computer.
- Capable to simulate belt flow, allowing gauging of power sources.
- Capable to control flow through belt speed. PID control algorithm for belt speed.
- Capable to control water, additive and emulsion flow through 3 additional power sources, via PID algorithm.
- Communication interface RS-232C or RS-485.
- BEXTRA or MODBUS protocol.

7. Maintenance Plan

BEXTRA scale is granted against manufacturing defects for a 1 (one) year period, as of the date sales fiscal note is issued. Warranty excludes damages originated from transportation, from accidents and/or misuse.

Warranty limits are not applied to pieces, parts, components and equipments acquired from third parties, here applying warranty terms granted by suppliers.

Installation and eventual repairs should be made by BEXTRA's Technical Assistance. Users are not authorized to perform any installation or maintenance procedures.

Contact BEXTRA's Technical Assistance to discuss a preventive maintenance plan.

BEXTRA Technical Assistance

FACTORY

Address: Rua Arabutan, 372 – Bairro Navegantes

ZIP: 90240-470 – Porto Alegre – RS

Phone/Fax: (51) 3325-3001

E-mail: técnico@bextra.com.br

Visit our site: www.bextra.com.br

8. Enclosures

8.1. Electrical Installation

Duly connected power cable already accompanies equipment. Loading cell cable must be connected to the JP18 connector of IC-45 board. Power sources cable must be connected to IC-51 board (JP3). Contactor' contacts are available at IC-48 board (JP11). Note that installation must be made by an authorized technician of BEXTRA's technical assistance department, upon warranty loss penalty.

ATTENTION
TO PERFORM ANY MAINTENANCE ON THE SCALE,
UNPLUG IT FIRST. REMEMBER THAT INTERNAL CIRCUITS
ARE ALWAYS POWERED AND CAN BE
DAMAGED IF THIS PROCEDURE IS NOT FOLLOWED.

8.2. Cleaning

The equipment is furnished in a metallic box protected against dust. Therefore there is no need for internal cleaning. To clean the cabinet externally use only a water moistened cloth. *Never use solvents or alcohol.* In case internal cleaning is necessary use only dehumidified compressed air jet (and without lubricant, obviously) or, if that is not available, a brush to remove dust accumulation.

8.3. Power Cable

A 1.5 meter long power cable and 2P+T plug are supplied with the equipment. Ground terminal is connected to the equipment's framework to protect the operator. An efficient grounding for the scale must be provided.

In spite powering is protected against over-voltage and transients because this is an electronic equipment, it is recommended that the net where the scale is connected does not power noisy loads, especially reactive loads (engines, for example). If this occurs, an exclusive power line can be derived to the scale coming directly from the plant's entrance transformer.



Front view
2P + T Connector

8.4. Complete Gauging

Gauging described under item 8.2 of this manual is a quick gauging, appropriate for the scale's calibration during final installation. It consists basically of scale's gauging as to weight measures and choice of asphalt pump to be used (1.5" or 2.0") (in case of an asphalt plant). However, there is a complete gauging, launched in case the J1 and J3 jumpers of JP20 connector (IC-45 board) are connected when scale is turned on. Therefore, to enter complete gauging, unplug the scale from power net (it is not enough to turn it off via <F4> key), connect the J1 and J3 jumpers and plug the scale again to the power net. The numeric display should present the CAL message (calibration).

First gauging item is scale's division.

Division

The alphanumeric display should show:

DIVISAO: n (DIVISION: n)

Valor de 1 a 8. (VALUE FROM 1 TO 8.)

This item adjusts scale's division, that is, from how many to how many tons/h the scale will weight. So, if a 2 division is selected, the flow display will skip from 2 to 2 and can indicate a division of 0.002 ton/h, 0.02 ton/h, 0.2 ton/h or 2 tons/h, according to decimal point's programming. Divisions usually used are 1.2 or 5.

Maximum advisable division number for the scale is of about 2000. So, if calculation bottom is of 400 tons/h it can be calibrated with a 2 division and decimal point in the first house (reads from 0.2 to 0.2 ton/h with a calculation bottom of 400 tons/h. totaling 2000 divisions).

Type desired division value and press < ENTER >. If you wish to keep value unaltered just press < ENTER > directly. If you want to abort gauging press < o >. This key aborts gauging at any point, maintaining previous gauging.

Digital Filter

Afterwards there is the digital filter adjustment. The higher filter value more stable is scale's weight indication, but on the other hand its updating is also each time slower. The display shows:

FILTRO: n (FILTER: n)

Valor de 0 a 7. (VALUE FROM 0 TO 7.)

Being that filter value is previously programmed, type desired filter value and press <ENTER>. If scale is unstable, filter value can be increased. On the other hand, if the scale has a very slow response to weight variations of the belt, it is convenient to decrease digital filter value.

On the following table there is the approximate stabilization time for each filter value, considering a weight variation of 100 divisions.

FILTER	STABILIZATION TIME	COMMENTS
0	0.5 seconds	No filter
1	8 seconds	First order filter
2	9 seconds	Second order filter
3	10 seconds	Second order filter
4	20 seconds	Second order filter
5	30 seconds	Second order filter
6	40 seconds	Second order filter
7	1 minute and 20 seconds	Second order filter

Calculation

Calculation is the scale's number of divisions. Together with division and decimal point it defines scale's calculation bottom above which the scale starts indicating weight excess (OVER). So, a scale with a calculation of 1750, division of 5 and decimal point of 2, measures from 0.05 ton/h to 0.05 ton/h until 87.50 tons/h. Note that number of divisions should always be multiples of 250, being minimum value 250 and maximum of 30000. For a belt scale it is recommended a maximum of 2000. The alphanumeric display shows:

ESCALA: nnnnn (CALCULATION: nnnn)

Múltiplos de 250. (MULTIPLES OF 250.)

Type desired value and < ENTER >. If typed value is not valid, it will not be accepted.

Decimal Point

Next item is decimal point's position:

PONTO: n (POINT: n)

Valor de 0 a 3. (VALUE FROM 0 TO 3.)

Decimal point position can be fixed on the flow display and on the totalizers. Point 0 indicates no decimal point, point 1 indicates one house after comma (x,x ton/h), point 2 indicates 2 decimal houses (x,xx ton/h), and point 3 indicates 3 decimal houses (x,xxx ton/h).

Contactors' Board (IC-48)

The equipment asks if there is a contactors' board or not. If the answer is no options 6 to 8 of F1 key (parameter programming) are inhibited.

PLACA RELÉS ? (CONTACTORS' BOARD ?)

1)SIM 2)NÃO (1)YES 2)NO)

Type < 1 > or < 2 > according to the case.

If the above question is answered affirmatively, the scale enters contactors' test. All contactors of IC-48 board (contactors board) keep on flapping in sequence until < ENTER > is pressed. This allows a quick test of contactors activation.

TESTE DE RELES . (CONTACTROS TEST)

Tecla ENTRA = Fim. (PRESS ENTER = END.)

Remote Totalizer Division.

Contactor 8 is used to activate a remote totalizer. Under this item it can be chosen if the remote totalizer increments in the same rate of the local totalizers at a 10 times lower rate or yet at a 100 times lower rate. The display shows the message:

DIVIDE TOT.REM.:

1)1 2)10 3)100

Choose the factor pressing < 1 >, < 2 > or < 3 >.

Entry Board (IC-49)

The equipment asks if this unit is equipped with a digital entry board (IC-49) or not. The display shows the message:

PLACA ENTRADAS ? (ENTRY BOARD ?)

1)SIM **2)NÃO** (1)YES 2)NO)

Type < 1 > or < 2 > according to the case.

If the above question is answered affirmatively, the scale enters entry board test. All entries of the IC-49 board (entry board) are monitored and presented on the alphanumeric display. There is an example below, where entries 3, 4 and 8 of the board are energized and the others not.

ENTR.: 10001100

Tecla ENTRA = Fim. (PRESS ENTER = END.)

Power Sources FC1 and FC2

Afterwards there is the power sources FC1 and FC2 calibration, in case the scale has these outlets. The alphanumeric display shows the question:

FONTES FC1,FC2? (SOURCES FC1,FC2?)

1)SIM **2)NÃO NÃO** (1)YES 2)NO)

If yes is answered, the scale has power sources, the questions described below are made to gauge FC1 and FC2.

If no is answered, the scale does not have power sources, gauging goes to page 36 (Source FC3). Note that a negative answer to this question means that the scale does not have power sources FC1 and FC2. If power source calibration is to be maintained answer YES to this question and use < ENTER > to maintain power source calibration data.

On answering this question affirmatively about the existence of power sources, the alphanumeric display shows the following message:

TESTE FONTE CORR (POWER SOURCE TEST)

Tecla ENTRA= Fim (PRESS ENTER = END.)

Equipment stays in a closed loop increasing power sources' value until reaching the maximum. Then it returns to minimum power value and so forth. This generates a kind of mountain power wave, subject to be observed in an oscilloscope. It should be continuous (except on transition discontinuity from maximum to minimum, of course) and linear. On pressing < ENTER > this test is approved. To perform this test put a 200 ohms resistor on FC1 source outlet (pins 1 and 2 of JP3 of the first IC-51 board – address 2) and another 200 ohms resistor on FC2 source outlet (pins 3 and 4 of JP3 of the first IC-51 board – address 2). Then put the oscilloscope to approximately 500m V/ division and check wave format in the resistors.

Asphalt Plant

If the scale has power sources, the next questions will be:

USINA ASFALTO ? (ASPHALT PLANT?)

1)SIM **2)NÃO** (1)YES 2)NO)

The equipment should be informed if it is installed at an asphalt plant or not. If affirmative, power source 1 will be referred to by the program as ASPHFALT and power source 2 as FILLER. Besides, power source 1 (asphalt) would have its value influenced by the sum of aggregated flow over the scale with the associated filler percentage. For example, for a 50 tons/h flow and a filler percentage of 50%, asphalt value will be calculated for a total flow of 52.5 tons/h.

Press < 1 > or < 2 > according to the case.

Minimum FC1 Stream

This data is used to calibrate power source 1 (asphalt, in case of asphalt plant) by software. Stream should be measured with a digital multimeter and the value should be typed in. This value should be slightly lower than 4.00 mA. Place multimeter at DC power calculation (for at least 25 mA) and connect ferrules to pins 1 and 2 of JP3 existing on printed circuit board IC-51.

CORRENTE: xx.xx mA (STREAM:)

Valor mínimo FC1 (MINIMUM FC1 VALUE)

Type stream's measured value and press < ENTER >. To maintain previous value just press < ENTER > straight. Note that decimal point is *fix*. < o > *existing on the keyboard is used to abort gauging*.

Maximum FC1 Stream

Again outlet stream of power source 1 (asphalt) should be measured. Now value must be slightly higher than 20.00 mA. Measuring point continues the same, that is, pins 1 and 2 of JP3 connector - IC-51 board.

CORRENTE: xx.xx mA (STREAM:)

Valor máximo FC1. (MAXIMUM FC1 VALUE)

Again, if < ENTER> is pressed directly, previous view (that appears on the display) will be maintained. < (o) > aborts gauging.

Flow for Maximum FC1 Value

Afterwards it is necessary specifying which aggregated flow power source 1 (asphalt) should assume as maximum value (20.00 mA). That is, with aggregated flow specified at this point asphalt pump assumes maximum rotation (also in case of asphalt plant).

V AZAO: xxx.x ton/h (FLOW:)

p/valor máx. FC1 (FOR MAXIMUM FC1 VALUE)

Percentage for Maximum FC1 Value

This is maximum asphalt percentage injected in the mixture with asphalt pump and aggregated flow specified in previous item. If an aggregated flow of 100 tons/h has been specified in the previous item, then for a 1.5 inch pump the percentage is of 6%, while for a 2.9 inch pump it is of 12%. (In quick calibration these are the values assumed in the question about pump diameter.)

PERC.: xx.x %

p/valor máx. FC1 (FOR MAXIMUM FC1 VALUE)

Yet if it is not an asphalt plant, this data, together with the previous one (flow), allows fixing flow value for power source 1 to reach its maximum value. For example, if source 1 should reach a maximum value for a 16000 tons/h flow, previous item can be programmed as 800.0 tons/h and this item as 90.0 %. To

reach a maximum value of 16000 tons/h, a 4.5% of source 1 percentage (via <F1> key) should be programmed later.

4.5 % - 800 ton/h

90.0% - FLOW > FLOW= (90.0 x 4.5)/800.0

FLOW= 16000 tons/h

Minimum FC2 Stream

The same way as for power source 1 (asphalt), minimum value and maximum stream of power source 2 (filler, in case of asphalt plant) are necessary to calibrate per software. A digital multimeter should be used to read stream. This should be slightly lower than 4.00 mA. Now multimeter (in DC stream scale) should be connected between pins 3 and 4 of TP3 connector – IC-51 board.

CORRENTE: xx.xx mA (STREAM:)

Valor mínimo FC2. (MINIMUM FC2 VALUE)

Maximum FC2 Stream

Again value of power source 2 (filler) should be read with a digital multimeter and this value should be typed in the alphanumeric display. Value should be slightly higher than 20.00 mA. Measuring point continues being pins 3 and 4 of JP3 - IC-51 board.

CORRENTE.: xx.xx mA (STREAM:)

Valor máximo FC2. (MAXIMUM FC2 VALUE)

Flow for Maximum FC2 Value

Specified for which aggregated flow power source 2 (filler) should assume maximum value (20.00 mA). That is, with aggregated flow specified, filler pump will assume maximum rotation.

VAZAO: xxx.x ton/h (FLOW:)

p/valor máx. FC2 (FOR MAXIMUM FC2 VALUE)

Percentage for Maximum FC2 Value

This is maximum filler percentage injected in the mixture with filler pump and an aggregated flow equal to the one previously specified.

PERC.: xx.x % .

p/valor máx. FC2 (FOR MAXIMUM FC2 VALUE)

If it is not an asphalt plant these data (flow and percentage) allow fixing flow in which power source 2 reaches maximum value (20 mA).

FC3 Power Source

This power source is used to control belt speed and so maintain material flow constant on it. If question is answered affirmatively, flow control will be activated and the scale will ask for minimum and maximum FC3 values to calibrate. Yet if the answer is that FC3 source does not exist, there will be no flow control and gauging will go to FC.5, FC6, FC7 sources.

If FC3 exists and in case there is a contactor board in the equipment, contactor 1 will start acting as active flow control process indicator. Thus, whenever belt speed control process via FC3 power source is on, this contactor will be energized.

FONTE FC3? (FC3 SOURCE?)

1)SIM **2)NÃO** (1)YES 2)NO)

If source exists the scale will enter power sources test:

TESTE FONTE CORR (POWER SOURCE TEST)

Tecla ENTRA = Fim. (PRESS ENTER = END)

The equipment stays in a closed loop incrementing power source value until reaching maximum. Then it returns to minimum power value and so forth. This generates a mountain power wave form, subject to be observed in an oscilloscope. It should be continuous (except on transition discontinuity from maximum to minimum, of course) and linear. On pressing < ENTER > this test is approved. For this test place a 100 ohms resistor on FC3 source outlet (pins 5 and 6 of JP3 of the first IC-51 board – address 2). Afterwards put oscilloscope to around 500mV/division and check wave form in the resistor.

Minimum FC3 Stream

This data is used to calibrate power source 3 (flow control by belt speed) per software. Power should be measured with a digital multimeter and value should be typed in. This value should be slightly lower than 4.00 mA. Place multimeter on DC power scale (for at least 25 mA) and connect ferrules on pins 5 and 6 of JP3 existing on printed circuit board IC-51.

CORRENTE: xx.xx mA (STREAM:)

Valor mínimo FC3. (MINIMUM FC3 VALUE)

Type measured stream value and press < ENTER >. To maintain previous value just press < ENTER > straight. Note that decimal point is fix. < o > key existing on keyboard is used to abort gauging.

Maximum FC3 Stream

Again, stream on power source 3 (flow control) outlet should be measured. Now value must be slightly higher than 20.00 mA. Measuring point continues the same, that is, pins 5 and 6 of JP3 connector - IC-51 board.

CORRENTE: xx.xx mA (STREAM:)

Valor máximo FC3. (MAXIMUM FC3 VALUE)

Again, if < ENTER > is pressed directly, previous value (shown on the display) will be maintained. < o > aborts gauging.

FC5, FC6, FC7 Power Sources

These power sources are used to control water, additive and emulsion flow (when these materials exist) via PID algorithm. In case the question is answered affirmatively, flow control of these materials will be activated and the scale will perform power sources' test. Yet if the answer is that sources FC5, FC6, FC7 do not exist, there will be no water, additive, emulsion flow control and gauging will go to tachometer.

FONTES FC5,6,7? (SOURCES FC5,6,7?)

1)SIM **2)NÃO** (1)YES 2)NO)

If these sources exist the scale will enter power sources test:

TESTE FONTE CORR (POWER SOURCE TEST)

Tecla ENTRA = Fim. (PRESS ENTER = END)

The equipment stays in closed loop incrementing value of power sources until reaching maximum. Then it returns to minimum stream value and so forth. This generates a mountain stream wave, subject to be observed in an oscilloscope. It should be continuous (except at transition discontinuity from maximum to minimum, of course) and linear. On pressing < ENTER > this test is approved. For this test put 200 ohms resistors at FC5 source outlet (pins 1 and 2 of JP3 of second IC-51 board – address 3), FC6 (pins 3 and 4 of JP3 of second IC-51 board – address 3) and FC7 (pins 5 and 6 of JP3 of second IC-51 board – address 3). Afterwards put oscilloscope to around 500mV/division and check wave form in the resistors.

Water Hydrometer

Next item is water hydrometer calibration. Pulse number that the hydrometer furnishes on passing of 1 kg water should be specified.

PULSOS. 0.0 (PULSES)

p/1 kg de água (PER 1 KG WATER)

Type the value and press < ENTER >.

Addictive Hydrometer

Next item is addictive hydrometer calibration. Pulse number that the hydrometer furnishes on passing of 1 kg addictive should be specified.

PULSOS: 0.0 (PULSES)

p/1kg de aditivo (PER 1 KG ADDICTIVE)

Type the value and press < ENTER >.

Emulsion Hydrometer

Then there is emulsion hydrometer calibration. Pulse number that the hydrometer furnishes on passing of 1 kg emulsion should be specified.

PULSOS: 0.0 (PULSES)

p/1kg de emulsão (PER 1 KG EMULSION)

Type the value and press < ENTER >.

Tachometer

Afterwards calibration program asks if the scale has a tachometer to measure belt speed. Press < 1 > or < 2 > according to the case.

TEM TACOMETRO? (DOES IT HAVE TACHOMETER?)

1)SIM **2)NÃO** (1)YES 2)NO)

If yes is answered, the scale has a tachometer, the display shows:

TIPO: 1) Matemática (TYPE: 1) MATHEMATIC)

2)Amostragem (2) SAMPLING)

Here it refers to calibration type that will be used to gauge tachometer. On mathematic calibration pulse number that tachometer furnishes for 1 meter belt is specified. This can be calculated with the rub diameter and the number of rips of the optical disk, for example. That is why this is called mathematic calibration. The display, at this calibration, shows the question:

PULSOS: XXX (PULSES)

p/1 metro esteira (PER 1 METER BELT)

Many times there is only the number of pulses per lap furnished by the tachometer. To obtain number of pulses per belt meter just use the following formula (note that tachometer's rub diameter is necessary):

$$\text{PULSES} = (1000 \times PV) / (rr \times D)$$

Being: PULSES = pulses per belt meter (pure number)
PV = pulses per tachometer lap (pure number)
rr = 3.1416
D = tachometer's rub diameter (in mm)

For example, let's say that the tachometer furnishes 30 pulses per lap and rub's diameter is of 95 mm. In this case, this tachometer furnishes 101 pulses per belt meter, because:

$$\text{PULSES} = (1000 \times 30) / (rr \times 95) > \text{PULSES} = 100,52 > \text{PULSES} = 101$$

Yet if tachometer calibration per sampling is selected, it is necessary to measure belt speed to inform the scale. Note that, at this point, it is necessary to maintain the belt working, because the command will associate the number of pulses that comes from the tachometer with the specified speed. Therefore, the belt should be kept running to measure its speed. Type this speed (in meters per minute) in the alphanumeric display and press < ENTER >. As of this point it is already possible to turn the belt off.

VELOC.: XXX m/min (SPEED:)

Vel. da esteira. (BELT SPEED)

If the question about existence or not of a tachometer is answered as no, it does not have a tachometer, the scale asks for belt's speed. Note that, in this case, as there is no tachometer, speed is assumed as invariable (independent of the load that is submitted to the belt). Speed belt should be measured and the following question should be answered:

VELOC.: XXX mínimo (SPEED:)

Vel. da esteira. (BELT SPEED)

Tachometer signal entry is made by the TAC jumper existing on IC-45 board. In case the equipment does not have tachometer this jumper acts as a moving belt sensor. So, whenever this jumper is open flow indication will be null, independent on weight on the belt. That is, this open jumper indicates to the scale that belt is stopped. Besides, on detecting a null belt speed (via tachometer or TAC jumper) the scale indicates this situation in blinking the message "tAC" on the numeric display.

Gauge Scale

This item allows maintaining weight gauging. For example, it might be necessary only to recalibrate 15 power sources or include an additional resource to the equipment, as a contactor board. For this gauging must be entered, pertinent parameters are changed and, when reaching this question, the answer should be no. The program will perform thermal stabilization and return operating with weight calibration unaltered. Besides, RAM memory should be maintained and, therefore, during thermal stabilization cycle the scale can be under load and programmed values (via < F1 > key) totalizers are maintained. This question will not appear in case scale's calculation has been modified. In this case a weight regauging is obligatory.

AFERIR BALANÇA ? (GAUGE SCALE?)

1)SIM **2)NÃO** (1)YES 2)NO)

If yes is answered the scale will present subsequent item, weight calibration type. If answer is no, the scale will perform thermal stabilization cycle and the alphanumeric display will show:

ESTABIL. TERMICA (THERMAL STABILIZATION)

Cal. peso mantida (WEIGHT CALIBRATION MAINTAINED)

Weight Calibration Types

The display presents 4 options:

1)Total. **2) Estat.**

3)Corr. **4)Matem.**

One can choose among 4 weight calibration types in just pressing keys < 1 > to < 4 >. In case weight calculation has been changed option 4 will not show. This is because mathematic calibration is the only calibration that does not demand that belt is empty to be performed. An alteration on the scale's calculation requires necessarily a zero recapture and, therefore, can not be performed via mathematic calibration.

Option 1 is calibration per totalization, that is, a determined material quantity is run through the scale and afterwards this material's weight is measured on another scale (a road scale, for example). So the belt scale has conditions to calibrate itself in comparing the totalized value to the value measured on the road

scale. This calibration type is very precise because it is performed with the belt moving, and therefore considers dynamic influences of the process.

However, it is convenient to initially perform a static calibration to obtain a rough gauging, so that totalized value and the one measured on calibration per totalization are not too different. In case the scale has never been calibrated previously, it can inclusively occur that gain is null or absurdly high, hindering a totalization calibration (it is first necessary to calibrate statically or per standard voltage).

Option 2 is *static calibration*, that is, a known weight is placed on the weighting roll with the belt stopped. Knowing this weight's value and the scale's effective length it is possible to calculate gauging. However, this gauging is very imprecise and because of this, right after static calibration the scale itself asks if totalization calibration will be performed.

Option 3 is *calibration per standard voltage*. A voltage is placed on the scale with a known weight per meter, so performing calibration. This is also a precise calibration, but it needs a standard voltage. (Note that calibration per totalization is still the most precise because it uses the material itself to be weighted.)

Option 4 is *mathematic calibration*. This option allows correcting scale's gain by a specified percentage value. So gain can be increased or decreased in a precise way, without the need to put weights on the scale. Besides, this is the only calibration modality that does not need to clean the transporting belt initially because there is no zero capture of the scale.

Calibration per Totalization

If calibration per totalization is selected the scale enters thermal stabilization cycle and the alphanumeric display shows the message:

(ENTRA) Fim total ((ENTER) TOTAL END)

Cal. por Totaliz. (CALIBRATION PER TOTALIZATION)

Before starting calibration per totalization turn the belt on and keep it without material. During thermal stabilization cycle scale's zero is captured. After stabilization cycle, upper alphanumeric display's line starts indicating totalizer's value 1 (T1), dully reduced to zero. The scale totalizes material that runs through the belt. Run the material to be measured and afterwards press < ENTER >. The scale will ask which is total weight value that was run by the scale (in tons):

PESO: x.xx ton I (WEIGHT:)

Cal. por totaliz. (CALIBRATION PER TOTALIZATION)

Type the value (measured on a road scale, for example) and press < ENTER > .Note that decimal point is fix. < o > key aborts gauging!

Gauging per totalization is complete! Note that it is convenient to pass a significant material value to obtain a good precision (higher than 5 tons).

Static Calibration

In this case the belt must be stopped and without material. The scale asks for the standard weight that will be used to gauge the equipment:

PESO: xxx.x kg (WEIGHT:)

Cal. por peso est. (CALIBRATION PER STATIC WEIGHT)

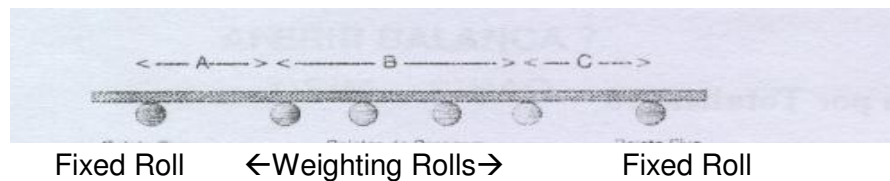
Type the value and press < ENTER > . Again decimal point is fix and < o > key aborts operation. The scale now asks for effective weighting length (in meters):

COMPR.: xx.xx m (LENGTH:)

Cal. por peso est. (CALIBRATION PER STATIC WEIGHT)

Type value and press < ENTER > . Note that this is the effective weighting length of the scale, that is, the length where it detects weight on the belt. Scales are usually made with lengths of 1, 2 or 3 meters.

Effective length of a belt scale is calculated taking into consideration distance between the fixed roll immediately prior to the scale, distance between scale's rolls and distance from fixed roll immediately after the scale.



Formula for effective length is given by:

$$\text{LENGTH} = A/2 + B + C/2$$

Afterwards the scale presents thermal stabilization cycle (segments of numeric display turn on in sequence until completing a rectangle). During this period of time equipment's zero acquisition is made and because of this there

should be no weight on the scale (the belt must be empty). The alphanumeric display advises that the scale is reducing to zero:

ZERANDO BALANÇA. (REDUCING SCALE TO ZERO)

Cal. por peso est. (CALIBRATION PER STATIC WEIGHT)

After thermal stabilization cycle, where scale's zero level is captured, numeric display presents the WEIGHT message and the alphanumeric display instructs:

COLOQUE O PESO E (PUT ON WEIGHT AND)

PRESSIONE ENTRA. (PRESS ENTER.)

At this moment standard weight should be put, whose value has been previously specified, on the weighting platform. Wait for some seconds to stabilize and press < ENTER >. The display will turn off for a short time and afterwards the scale will already be weighting. Static gauging is complete!

Due to intrinsic errors of static calibration it is advisable, whenever possible, to perform calibration per totalization after static calibration. For this reason the equipment asks:

CAL POR TOTALIZ. (CALIBRATION PER TOTALIZATION)

1)SIM **2)NÃO** (1)YES 2)NO)

Answer the question in pressing keys < 1 > or < 2 >. In case option 2 (NO) is chosen, the scale finishes gauging and starts indicating flow on numeric display, while alphanumeric display shows totalizers' value.

In case gauging per totalization option is selected, the scale starts performing procedures previously described to calibrate per totalization.

Calibration per Standard Voltage

In this case a voltage with known linear density should be used. The scale asks for this data:

DENS.: xx.xx kg/m

Cal. por corrente (CALIBRATION PER VOLTAGE)

Type corrected linear density value calculated and press < ENTER >. *Decimal point is fix*; < 0 > key of the keyboard aborts gauging. Belt must be turned

on and without weight. The scale will perform thermal stabilization cycle (segments turn on in sequence until completing a rectangle). During this period of time equipment's zero acquisition is made and therefore there should be no weight on the scale (belt empty and on). The alphanumeric display advises that the scale is reducing to zero:

ZERANDO BALANÇA. (REDUCING SCALE TO ZERO)

Cal. por corrente. (CALIBRATION PER VOLTAGE)

After thermal stabilization cycle, when scale's zero level is captured, numeric display presents WEIGHT message and alphanumeric display instructs:

COLOQUE O PESO E (PUT ON WEIGHT AND)

PRESSIONE ENTRA (PRESS ENTER.)

At this moment standard voltage should be put on the scale. To facilitate, belt can be momentarily turned off. After installing standard voltage turn the belt on again, wait for some seconds to stabilize and press < ENTER >. The display will turn off for a short time and afterwards the scale will already be weighting. Gauging per voltage is complete!

Mathematic Calibration

Alphanumeric display allows selecting between two mathematic calibration modalities, percentage or absolute:

1) Perc. 2) Absol.

Cal. Matemática (MATHEMATIC CALIBRATION)

Press key < 1 > or < 2 > according to option chosen. To abort calibration just press < 0 > (point).

Percentage Mathematic Calibration

In this case BEXTRA scale asks which the desired gain percentage variation is:

GANHO: 00.00 % (GAIN:)

Cal. Matemática (MATHEMATIC CALIBRATION)

Note that desired gain variation should be informed, independent if gain should increase or decrease. Because of this there is the next question, described below. For example, let's suppose the scale totalized 300 tons when actual value that passed through the belt is of 348 tons. Thus gain should suffer a percentage variation of 16%, because $348/300 = 1.16$. So 16.00% should be typed under this item and on the next item it should be said that gain should increase.

Note that there are 2 fix decimal houses to describe gain. Do not press < o > key because it aborts gauging.

Next question refers to percentage variation signal previously specified:

GANHO DEVE ?. (GAIN SHOULD?)

1)Subir **2)Descer** (1)INCREASE 2)DECREASE)

Afterwards the scale enters thermal stabilization. *Belt can be maintained loaded (with material on it) during thermal stabilization.* Mathematic calibration does not capture scale's zero value during thermal stabilization. At the end of thermal stabilization mathematic gauging is complete!

ESTABIL. TERMICA (THERMAL STABILIZATION)

Cal. Matemática (MATHEMATIC CALIBRATION)

Absolute Mathematic Calibration

In this case, instead of specifying a gain variation percentage, its value in fluctuating point is directly typed. Note that decimal point is fix and gain is always a number lower than 1:

GANHO: 0.037831 (GAIN:)

Cal. Matemática (MATHEMATIC CALIBRATION)

Type the new gain value and press < ENTER >. Afterwards the scale enters thermal stabilization. *The belt can be maintained loaded (with material on it) during thermal stabilization.* Mathematic calibration does not capture scale's zero value during thermal stabilization. At the end of thermal stabilization mathematic gauging is complete!

ESTABIL. TERMICA (THERMAL STABILIZATION)

Cal. Matemática (MATHEMATIC CALIBRATION)

8.10. Loading Cell Connection

Loading cell cable is connected to the JP18 connector of IC-45 board. Pins are the following:

PIN 1	Mesh
PIN 2	Black Wire (negative power)
PIN 3	Green or Blue Wire (positive sign)
PIN 4	Yellow or White Wire (negative sign)
PIN 5	Red Wire (positive power)

8.11. Contactors' Function

Contactors are numbered from 1 to 8 on IC-48 board (contactors board – address 1). Note that contactors 7 and 8 operate in case board is installed, even that in calibration it has been informed that the equipment does not have contactors board.

CONTACTOR 1	TOTALLING LIMIT 1
CONTACTOR 2	TOTALLING LIMIT 2
CONTACTOR 3	TOTALLING LIMIT 3
CONTACTOR 4	MINIMUM FLOW
CONTACTOR 5	NORMAL FLOW GROUP
CONTACTOR 6	MAXIMUM FLOW
CONTACTOR 7	ERROR OVER, UNDER, ERR1, ERR2, FC1, FC2, ZERO, TAC, DESA)
CONTACTOR 8	REMOTE TOTALIZER

8.12. Flow Calculation Formula

Flow calculation takes into consideration weight measured on the scale, belt speed and weighting's effective length. Thus, for example, at the end of static calibration flow value presented depends on all these factors and not only on standard weight value used.

Formula is:

$$\text{FLOW} = (0,06 \times \text{WEIGHT} \times \text{SPEED}) / \text{LENGTH}$$

Being: FLOW in t/h (tons per hour)
WEIGHT in kg (kilograms)
SPEED in m/min (meters per minute)

LENGTH in m (meters)

So, if static calibration is made with a standard weight of 50 kg, belt speed is of 60 m/min, and effective scale's length is of 3 m, upon static gauging end the scale will indicate a flow of:

$$\text{FLOW} = (0.06 \times 50 \times 60)/3 \quad > \quad \text{FLOW} = 60\text{t/h}$$

8.13. Power Source Connection to IC-45 Board

IC-45 board is powered via JP6 connector (GSE connector of 9 pins):

PIN 1	BATTERY VOLTAGE SENSOR (NOT USED)
PIN 2	ANALOGIC POSITIVE POWER (+8V)
PIN 3	ANALOGIC NEGATIVE POWER (-8V)
PIN 4	SERIAL POSITIVE POWER (+ 12V)
PIN 5	SERIAL NEGATIVE POWER (- 12V)
PIN 6	DIGITAL POWER (+5V)
PIN 7	ANALOGIC GROUND WIRE
PIN 8	DIGITAL GROUND WIRE
PIN 9	POWER NET FAILURE SENSOR

8.14. IC-49 Board Entries

The equipment allows installing an IC-49 board (address 1), with the following functions:

IC-49 BOARD ADDRESS 1

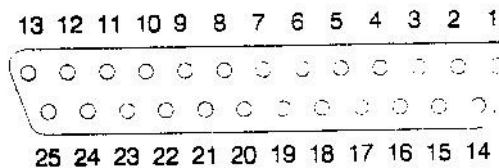
ENTRY 1	BELT SENSORS NOT ALIGNED
ENTRY 2	EXTERNAL INHIBITION SIGN
ENTRY 3	WATER HYDROMETER
ENTRY 4	ADDICTIVE HYDROMETER
ENTRY 5	EMULSION HIDROMETER
ENTRY 6	NOT USED
ENTRY 7	NOT USED
ENTRY 8	NOT USED

Entries 1 and 2 (belt not aligned and external inhibition sign) must be activated for a correct scale operation, that is, lack of entry sign 1 of IC-49 indicates a not aligned belt and lack of entry sign 2 of IC-49 indicates external inhibition request (for flow control process).

8.15. Printer Connector Pins

Communication with printer is made by parallel interface, compatible to PC computers. Pins are the following:

Pin 1	Strobe
Pin 2	Date 0
Pin 3	Date 1
Pin 4	Date 2
Pin 5	Date 3
Pin 6	Date 4
Pin 7	Date 5
Pin 8	Date 6
Pin 9	Date 7
Pin 10	Not used
Pin 11	Busy
Pins 12 to 17	Not used
Pins 18 to 25	Logical ground wire



FEMALE DB-25 CONNECTOR

FRONT VIEW

8.16. Serial Communication – BEXTRA Protocol

Equipment allows monitoring and command at distance via serial interface RS-232C or RS-485. Communication with the scale is made per serial port configured as below:

4800 bps, without parity, 8 bits, 1 stop bit

Baud-rate can be altered via < 4 > key among 150 and 4800 bps. The scale does never communicate directly with the computer. The scale must receive a command from the computer to respond to communication (or, the computer is the master and the scale the slave terminal). Messages are always in 11 bytes,

starting with STX (02h). Afterwards come command code, scale number (until 16 scales in circle can be connected), 6 data bytes and two final checksum bytes.

Below is a connection example of two integrating scales to an IBM-PC computer, compatible via RS-232C. In case of connection via RS-485 topology is in bars of 2 wires, that is, all scales connected in parallel.

The last two bytes of each transmission were the checksum of Word. It is simply the sum of the 9 previous bytes.