

# Acrison®

## WEIGH FEEDERS

Model 403 Series

*“Weight-Loss-Differential”*

*For Dry Solids or Liquids*



*Advanced design technologies for superior performance, quality and reliability.*

# WEIGH FEEDERS Model 403 Series

*“Weight-Loss-Differential”  
 (“Weight-Loss”)*

## ***For Continuous or Batch Weigh Feeding Applications***

**Proven in thousands of installations world-wide, Acrison’s “Weight-Loss” Weigh Feeders, with their exceptionally *precise and reliable weighing technology and leading edge controls*, provide users with superior operational performance, lowest maintenance requirements and unexcelled longevity.**

### **Background**

Introduced in 1970, Acrison’s Model 403 was the first commercially successful “weight-loss” type continuous weigh feeder produced in the United States. Developed and perfected by Acrison, the Model 403 was initially intended for low feed rate applications since sustained accurate low rate weigh feeding performance was next to impossible to obtain by the then ‘conventional’ type weigh feeders. However, as users quickly began to recognize the extraordinary viability of Acrison’s continuous “weight-loss” weigh feeding principle of operation and its inherent ability to provide consistently accurate, unattended metering performance, feed rates were gradually expanded.

Today, “weight-loss” feeders are, by far, the weigh feeders of preference throughout the various global Processing Industries. And although the operating principles employed by the various “weight-loss” weigh feeder manufacturers are similar in nature, *very distinct differences exist in the overall design and manufacture of such equipment*. And these differences, both mechanical and electronic in nature, have a direct effect upon the type of overall performance a user can realistically expect from a given feeder. Primary among these differences is the design and integrity of the weighing system, which due to the manner in which a “weight-loss” weigh feeder operates, is a *paramount* consideration.

Acrison’s Model 403 Series of “Weight-Loss” Weigh Feeders presently encompass over 60 distinct model sizes and are available with 16 different size/type metering/hoppering mechanisms that provide an overall output capacity ranging from several pounds upwards to about 200,000 pounds per hour. These feeders, unrivaled in their materials-handling capabilities, are also adjustment-free, extremely durable and highly reliable; longevity is inherent in their design.

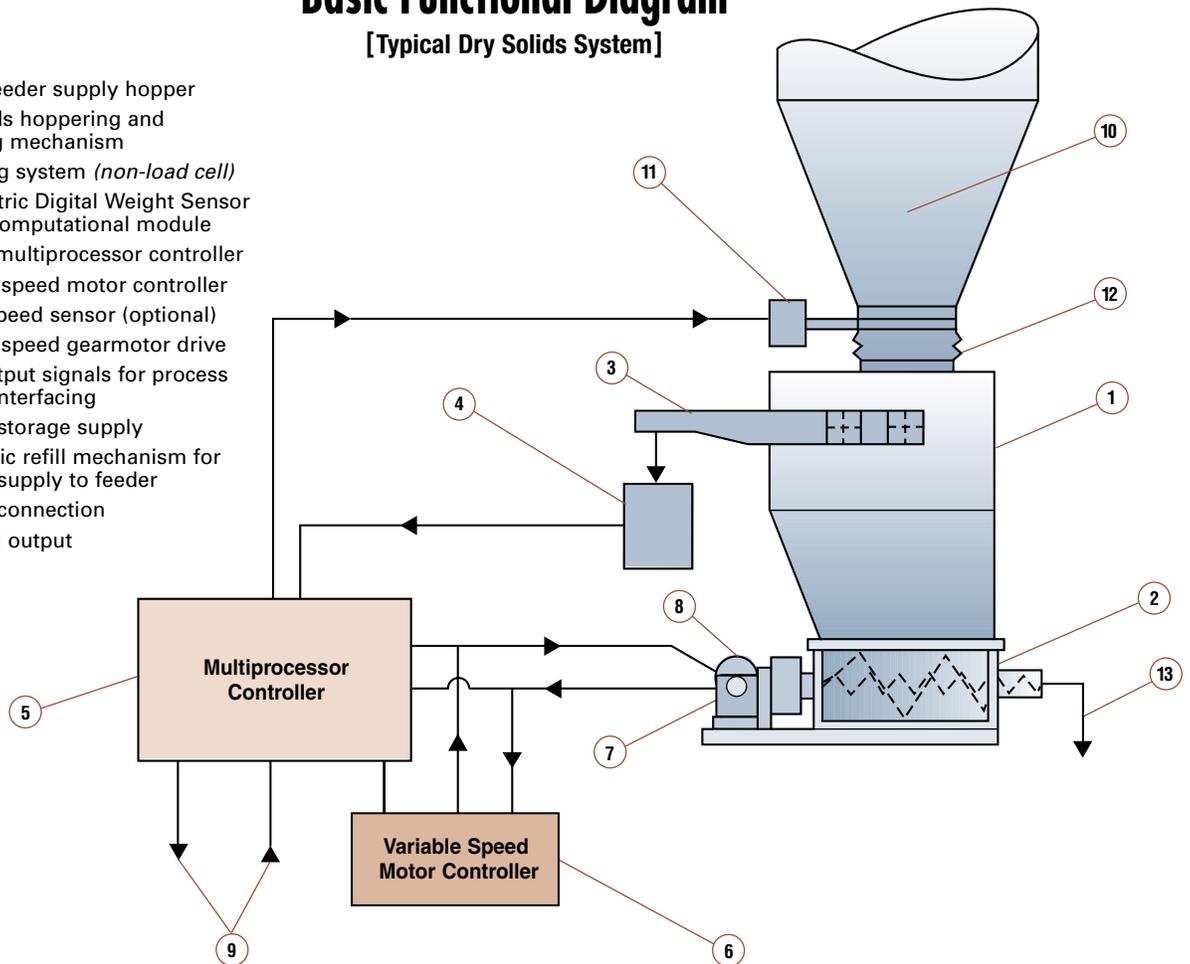


Model 403-105Z

# Model 403 Series of Weigh Feeders

## Basic Functional Diagram [Typical Dry Solids System]

1. Weigh feeder supply hopper
2. Dry solids hopping and metering mechanism
3. Weighing system (*non-load cell*)
4. Ratiometric Digital Weight Sensor and its computational module
5. Parallel multiprocessor controller
6. Variable speed motor controller
7. Digital speed sensor (optional)
8. Variable speed gearmotor drive
9. Input/output signals for process control interfacing
10. Product storage supply
11. Automatic refill mechanism for product supply to feeder
12. Flexible connection
13. Weighed output



## Principles of Operation

Referring to the Functional Diagram above, an Acrison "Weight-Loss" Weigh Feeder basically consists of the appropriately selected Acrison positive-flow metering/hoppering mechanism, when handling a dry solid material, or a tank when metering a liquid, mounted as an integral component of a precision weighing system.

As product discharges (feeds) out of the scale-mounted metering mechanism (or tank), the weighing system transmits precise "loss-of-weight" information, numerous times per second, to the feeder's controller. The controller then instantaneously calculates the rate at which it is feeding and compares this rate to the selected feed rate. In turn, and simultaneously, the feeder's control system adjusts the variable speed drive of the metering mechanism to accurately maintain the selected feed rate, while continuously monitoring all aspects of feeder operation. Response of the metering mechanism is instantaneous and thus, excellent short-term accuracy

with the highest possible degree of long term performance is achieved.

The "weight-loss" principle for continuous weigh feeding requires periodic refilling of the feeder's supply hopper (or tank) as a necessary operational requirement, which is usually a completely automatic function. The frequency of refills is determined by the feed rate throughput in relation to the size of the supply hopper (or tank) within realistic parameters necessary to maintain optimum weigh feeder performance in the gravimetric mode.

All Acrison "Weight-Loss" Weigh Feeder control systems also include "Acric-Lok<sup>®</sup>", an Acrison innovation that will ensure accurate metering should the feeder's weighing system sense any type of abnormal disturbance that otherwise, would adversely affect performance.

# Model 403 Series of Weigh Feeders

## “Weight-Loss” Weighing Systems

**Because the functional parameters of a “weight-loss” weigh feeder are totally different than those utilized by all other type weigh feeders, its weighing system must be specifically designed for such usage if consistently precise metering performance and long-term trouble-free operation are to be expected.**

Acrison “weight-loss” weigh feeders include technologically advanced weighing systems designed and manufactured by Acrison *specifically* for such service. Unmatched in precision, reliability and ruggedness, these permanently calibrated, adjustment-free, non-temperamental weighing systems will not falter even in the harshest operating environments. They are also virtually maintenance-free mechanisms that boast a five-year warranty and a minimum life expectancy of 30 years.

However, most manufacturers of “weight-loss” weigh feeders utilize weighing systems (scales) that are the least costly to obtain or manufacture. Consequently, many users of such equipment frequently experience problematic, maintenance-intensive operation, with a good percentage of these difficulties attributed to the delicate and temperamental nature of the weighing systems.

Most common among these difficulties is inaccurate metering performance (feed rate drift or shift), primarily due to the inability of the feeder’s weighing system to remain precise (loss of calibration). In turn, this obviously creates havoc with process formulations, adversely affecting the quality of the end product. And when this occurs, it’s necessary to stop the process so that the weighing system can be re-calibrated and/or repaired, which at times requires technical support from the equipment manufacturer.

The weighing system of a “weight-loss” weigh feeder must also be robustly constructed to endure a wide variety of adversities common to many industrial environments. Yet,

it must be fully capable of producing a very high degree of “base” weight-sensing resolution. In addition, a “weight-loss” weighing system must be fully capable of tolerating the never-ending “impacts” associated with refills, especially larger units where such impacts can be severe, without damage or loss of calibration. Clearly, this is a most demanding requirement associated with the weighing system of a “weight-loss” type weigh feeder.

**Since their introduction in 1970, Acrison “weight-loss” weighing systems have more than proven their ability to remain precise and trouble-free for indefinite periods of time. Their remarkable history of unparalleled reliability and consistently accurate performance places them in a category exclusive to Acrison. [They do not use a load cell (or cells) for weight sensing.]**

**As an indication of Acrison’s confidence level in the weighing systems of their various model weigh feeders, all Acrison weighing systems are covered by an unconditional five year warranty, which also includes the electronics associated with the weighing systems.**



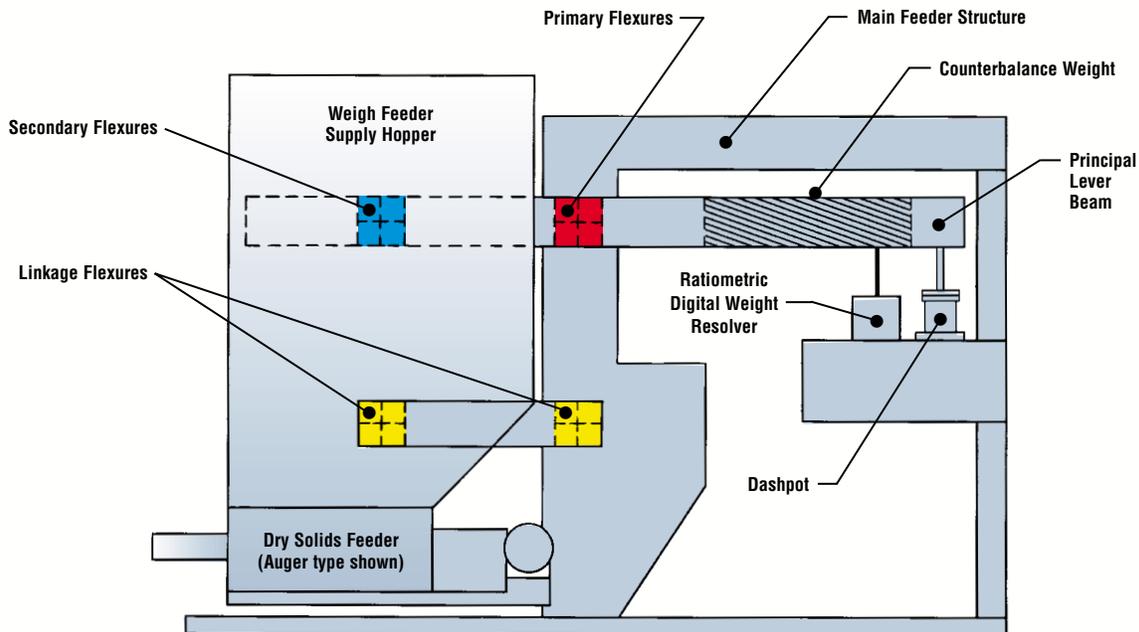
Model GP403-101



Model 403-140-0

# Model 403 Series of Weigh Feeders

## Acrison's "Overhead" Weighing Systems Used with Model 403 "Weight-Loss" Weigh Feeders



### DRY SOLIDS FEEDER ILLUSTRATED

**NOTE:** For liquid feeders, the dry solids supply hopper is replaced with a tank and the dry solids metering mechanism with a pump.

### Functional Operation

The Model 403 Series of Weigh Feeders utilize an "Overhead" Weighing System specifically designed by Acrison for "weight-loss" weigh feeding applications. The basic weighing system is a uniquely configured, modified parallelogram type lever network utilizing Acrison designed and manufactured flexures for all pivotal connections. This technologically advanced weighing mechanism is frictionless in operation, extremely stable, ruggedly constructed, and very precise in its ability to sense weight. The weighing system is also counterbalanced so that only the net weight of material in the metering mechanism (and in its supply hopper or tank) is weighed.

As noted in the above illustration, two *Primary Flexures* connect the *Principal Lever Beam* to the *Main Feeder Structure*, with two *Secondary Flexures* connecting the actual *Supply Hopper* (or Tank) to the *Principal Lever Beam*. In addition, two or four *Linkage Flexures* connect the lower portion of the *Supply Hopper* (or Tank) to the *Main Feeder Structure*. These novel, time-proven, stainless steel Flexures provide optimum structural rigidity of the lever network both in

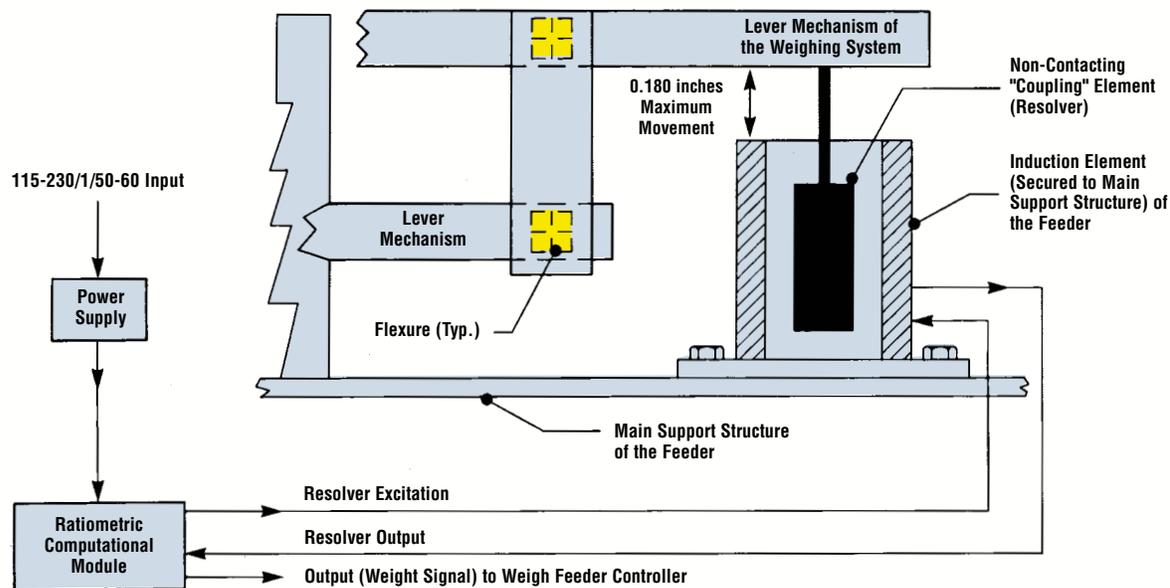
the horizontal and vertical planes, ensuring weighing stability and permanence of the weighing systems' accuracy and calibration.

Operationally, as weight is added to, or subtracted from the metering mechanism and its supply hopper (or tank), the lever network "moves" in an extremely precise relationship to that weight. In turn, this movement is sensed by Acrison's Ratiometric Digital Weight Resolver (RDWR), and instantaneously converted into an equally precise signal directly proportional to weight.

In differing from the common variety of load cell based weighing systems, the physical sensing element of the RDWR does not attach to any part of the lever network and therefore, cannot be damaged by any amount of shock, overload and/or abuse that the weighing system may experience. In addition, the entire weighing mechanism, including the RDWR System, is completely calibration and adjustment-free and guaranteed for five years. And this warranty also includes the electronics associated with the RDWR System.

# Model 403 Series of Weigh Feeders

## Ratiometric Digital Weight Resolver (RDWR)



### Technical Information

Acrison's exclusive Ratiometric Digital Weight Resolver (RDWR), used with all Acrison weigh feeders, computes the linear movement of the frictionless lever mechanism (scale) into a true binary coded, serially transmitted data stream, having a discrete resolution of 20 bits (or the ability to sense 1 part in 1,048,576). This highly precise and advanced electronic displacement measuring technique basically consists of a sensing element and its computational logic.

The physical sensing element is composed of a series of windings collated on a common element that are equally affected by environmental changes and therefore, self-compensating. In addition, because the computational logic of the RDWR System compares relative measurements, rather than absolute values, its input power source can vary up to  $\pm 30\%$  without affecting the output. Also, all non-weight data, both cyclic and random in nature that may be super-imposed on the actual data, are cancelled-out.

The RDWR is linear to within 0.01 percent, repeatable to 0.005 percent, possesses long term stability of 0.005 percent (10,000 hours) and carries a 40,000 hour MTBF.

Acrison's RDWR is FM (Factory Mutual) Approved and Listed for operation in hazardous environments...Classes I, II and III; Divisions 1 and 2;

Groups C, D, E, F and G. This weight sensing system also complies with European hazardous area classifications EEx ia IIB T4 and EEx d [ia] IIB T6.



Model 403-BDF-2.5

# Model 403 Series of Weigh Feeders

**Model 403 “Weight-Loss” Weigh Feeders are available with 16 different dry solids metering mechanisms, the selection of which is based upon product characteristics and application parameters.**

- **Single auger metering mechanisms [Model 130 Series]** for use with granular or pelletized free-flowing materials. *Reference Equipment Specification 1-200-0479.*
- **Double Concentric Auger Metering Mechanisms [Models 105 and 140 Series]** for use with a variety of materials. *Reference Equipment Specifications 1-200-0480.*
- **Single auger/agitator, self-emptying metering mechanisms [Model 1015 Series]** for use with a variety of materials. *Reference Equipment Specifications 1-200-0481.*
- **Flat bottom, self-emptying metering/hoppering mechanisms [Model 170 Series]** for use with a wide variety of materials. *Reference Equipment Specifications 1-200-0525.*
- **Bin Discharger Feeders [Models BDF-1.5, BDF-2, BDF-2.5, BDF-3, BDF-4 and BDF-5]** for use with a very wide variety of materials, especially those classified as “difficult-handling.” *Reference Bulletin 712.*



Model 403-1015Z



Model 403-BDF-2

# Model 403 Series of Weigh Feeders

## Models GP403-101 and GP403-130 “Weight-Loss” Weigh Feeders

**For metering free-flowing, granular dry solid materials**

**Utilizing a modified Acrison Model 101 Metering Mechanism, the Model GP403-101 is capable of a feed output capacity ranging from 1 to 2 pounds per hour up to approximately 75 cubic feet per hour. The Model GP403-130, designed with a modified Acrison Model 130 Metering Mechanism, is capable of a feed output capacity ranging from about 15 pounds up to approximately 200 cubic feet per hour.**

*Please reference Design Specifications 1-200-0479.*

### Models GP403-101 and GP403-130

Also designed with the most advanced, durable and trouble-free weighing and control system technology available, these particular model weigh feeders offer users an economical and compact means to accurately and dependably meter most free-flowing granular or pelletized dry solid materials. The single auger metering mechanisms of these weigh feeders also include a bottom discharge slide gate for rapid, complete, and easy clean-out/emptying.

Like all Acrison Model 403 “Weight-Loss-Differential” Weigh Feeders, the Models GP403-101 and GP403-130 have been specifically designed for the industrial environment with an exceptionally rugged, permanently calibrated weighing mechanism that never requires recalibration, adjustment or rezeroing.



Model GP403-101



Model GP403-130

# Model 403 Series of Weigh Feeders

## Standard Design Features

- **Continuous metering or batch weighing on a “weight-loss” basis** — Acrison’s “weight-loss” operational concepts and equipment designs combine rugged-duty, permanently calibrated, adjustment-free state-of-the-art weighing systems with the most versatile dry solids metering/handling mechanisms and related controls to provide users with an unsurpassed level of highly reliable overall performance.
- **Accuracy** — All Acrison continuous weigh feeders typically provide metering accuracies ranging between  $\pm 0.25$  to 1 percent or better (error), at two sigma, based on a given number of consecutive one minute weighments. Batch accuracies typically range between  $\pm 0.1$  to 0.5 percent or better (error), at two sigma, based on a given number of repetitive consecutive weighments.
- **No response lag** — Acrison’s various positive-flow metering mechanisms respond instantaneously upon command from the controller to alter the feed output. Absolutely no lag exists since product discharge is directly out of the scale-mounted metering device.
- **Feed range** — As standard, all Acrison “weight-loss” weigh feeders are capable of an overall feed range of 100:1.
- **Feed output capacity** — Depending upon the model and size, the overall feed rate output capability for the various model “weight-loss” weigh feeders described in this Bulletin ranges from several pounds up to approximately 200,000 pounds per hour.
- **Weighing System** — Acrison’s various patented weighing mechanisms are, by far, the most reliable, sensitive and accurate in the industry. The novel lever mechanisms of these frictionless, ultra-high resolution counterbalanced “weight-loss” weighing systems have been ruggedly designed for tough industrial weigh feeding applications. They are designed with an uncommonly high service factor easily capable of withstanding the continual “impacts” associated with refilling without any adverse consequences.

Also, once calibrated (factory completed) these unique weighing systems do not require any type of mechanical re-calibration or adjustment; in fact, such provisions do not exist. They are permanently calibrated.
- **Ratiometric Digital Weight Resolver (RDWR)** — Acrison’s Ratiometric Digital Weight System utilizes synchro-resolver technology and innovative electronics to produce a digital weight signal having extraordinary performance specifications. This unamplified, non-integrated, highly precise and stable weight signal is a count ranging from 0 to 1,048,576 (20 bits), capable of use by any of Acrison’s multiprocessor weigh feeder controllers. Please see pages 5 and 6 for additional information.
- **No rezeroing** — Acrison’s “weight-loss” principle of operation does not require a zero reference point; thus, the need for rezeroing the weighing system is never required.
- **Acric-Lok®** — All Acrison “weight-loss” weigh feeders include a unique operational feature... *Acric-Lok*... developed and patented by Acrison to ensure accurate metering whenever the weighing system is disturbed in any manner that would otherwise affect the accuracy of the metered output.
- **Batch-Lok®** — In addition to *Acric-Lok*, should an abnormal disturbance be detected by the weighing system of an Acrison “weight-loss” weigh feeder operating in a batching mode, a supplementary feature... *Batch-Lok*... is provided to ensure the highest possible degree of batch accuracy.
- **Automatic refilling** — All Acrison “weight-loss” weigh feeder control systems provide for the automatic refilling of the feeder’s integral supply hopper (or tank). When automatically refilled, the controller initiates a refill command upon sensing low hopper (or tank) level, provided the feed rate output is within pre-established tolerances. During the refill period, the feeding mechanism operates in a volumetric control mode, returning to gravimetric control after refill and when the controller senses a normal “weight-loss” condition.

Although refill is generally rapid, Acrison “weight-loss” controllers include a number of very effective operational features specifically designed to ensure optimum metering accuracy during all phases of refill, when the feeder is not in gravimetric control.
- **Unaffected by typical in-plant vibration and dust** — Typical in-plant vibrations do not affect Acrison weigh feeders, as proven in scores of worldwide installations. The novel overall mechanical design of Acrison’s various weighing mechanisms inherently provides excellent resistance to in-plant vibrations without the need to integrate the actual weight signal for stability purposes.

Also, based on the “weight-loss” principle of operation, dust accumulation onto any part of the weigh feeder will not present any operational problems whatsoever.
- **Ambient operating temperature range** — All Acrison weigh feeders will operate within an ambient temperature range of  $-10$  to  $140$  degrees Fahrenheit without any affect on performance.
- **Totally enclosed product zone** — Because of the completely enclosed design of all Acrison “weight-loss” weigh feeders, product remains totally confined, thus assuring a dust-tight and clean operation.
- **Minimum of moving parts** — All Acrison “weight-loss” weigh feeders have been designed with a minimum number of moving parts to ensure the highest possible degree of dependability and longevity, with lowest maintenance requirements.
- **Silent operation** — All Acrison weigh feeders are virtually silent when operating.

# Model 403 Series of Weigh Feeders

## Model 403 Liquid Weigh Feeders

Model 403 Liquid “Weight-Loss” Weigh Feeders incorporate the same identical weighing systems used with Acrison’s Model 403 Series of Dry Solids Weigh Feeders. The only difference is that the dry solids metering mechanism and its supply hopper are replaced with a liquid metering pump and tank.

Also, as with a dry solids “weight-loss” weigh feeder, refilling the feeder’s integral supply tank is usually a completely automatic function, performed either by an automatically operated valve attached to the bottom of a storage tank (mounted above the feeder), or by means of a pump that transfers product from storage.

Metering pump selection is based upon applicable user specifications, product characteristics, and feed rate requirements. Depending upon application parameters, the metering pump may either be mounted on the feeder’s weighing mechanism or supplied as a separate assembly.

The feeder’s integral supply tank can be provided in various materials of construction, and with a number of “specialty” features to suit the specifics of a given application.



Model 403L-15



Model 403L-30

## Optional Weigh Feeder Construction

- **Sanitary Construction** — Special construction with easy access to all product contact surfaces, including quick removable components (when applicable) to suit food, pharmaceutical and similar sanitary requirements is available with Model 403 “Weight-Loss-Differential” Weigh Feeders. This design complies with USDA/FDA requirements.
- **High temperature Construction** — Certain Model 403 “Weight-Loss-Differential” Weigh Feeders are available for use with elevated product temperatures.
- **Quick Disassembly Construction** — Certain Model 403 “Weight-Loss-Differential” Weigh Feeders are

available with quick disassembly construction for accessibility to critical product contact parts, including quick removable components for easy cleaning.

- **Explosion-Proof Construction** — Model 403 Weigh Feeders are available with explosion-proof motors and electrical components with appropriate wiring for Classes I, II and III; Divisions 1 and 2; Groups D, E, F and G area classifications. In addition, Acrison weigh feeders can be manufactured to conform to most European hazardous area classifications.

# Weigh Feeder Controllers and Control Systems

Acrison Weigh Feeder Controllers and Control Systems are universally recognized for their design superiority, unparalleled versatility, ease-of-use and operational reliability. From basic single weigh feeder controllers to complex multi-feeder supervisory control systems, the technologically advanced designs of these devices, including their cutting-edge software

routines, provide users with unexcelled weigh feeder performance to satisfy the most demanding metering requirements across a broad spectrum of applications. With a wide range of options, accessories and interfacing capabilities, these controllers and control systems are also available in a number of different packaging configurations.

## Acrison Weigh Feeder Controllers

Acrison Weigh Feeder Controllers will operate in either a continuous or batch mode, gravimetrically or volumetrically, and/or in a master/slave or ratio proportioning mode. They are available with a variety of keyboard or graphic touch-screen color displays in various languages and can be provided with recipe storage capabilities as well as with a wide range of I/O interfacing options (i.e., analog, digital, modem, infrared, wireless, serial and network I/O).

For decades, Acrison Weigh Feeder Controllers have provided state-of-the-art performance for thousands of users worldwide. Leading edge products such as the Models C-702, BC-702, SBC-2000 and MD-II Family of Controllers, including the MD-II MFC (Multi-Feeder Controller) and the AD-2000 Supervisory System Controller, have gained universal acceptance throughout all sectors of the Processing Industries, and are highly recognized for their versatility and reliability.

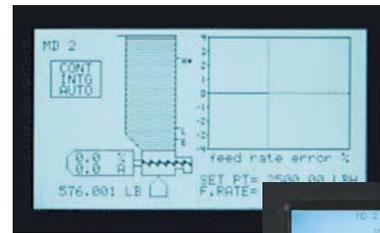
## SBC-2000 Weigh Feeder Control Module

Acrison's ongoing investment in research and development continues to result in the evolution of the Company's Controls and Control Systems' capabilities with the launch of the technologically advanced Model SBC-2000 Weigh Feeder Control Module. This new, small and powerful module, encompassing the latest in microcomputer logic and functional algorithms, provides an unprecedented number of standard and optional features, along with broad-scope flexibility for single and multi-feeder control requirements in a compact and cost-effective assembly, particularly those applications that require central computer control, minimal hardware and which do not necessarily require a local user interface or keyboard/display. The advanced SBC-2000 Weigh Feeder Controller can be supplied with various display options if so required.

## Multiple Weigh Feeder Control Systems

Model SBC-2000 Controller Modules, when configured for multi-feeder operation, offer unprecedented ease-of-operation, maximum user flexibility and outstanding performance capabilities. When SBC-2000 Modules are combined with Acrison's AD-2000 Supervisory Control and Software package, it is possible to operate and monitor up to 20 Acrison weigh feeders, while providing rapid data and screen updates, including recipe storage and retrieval, all of which are selectable and operable from the AD-2000 display.

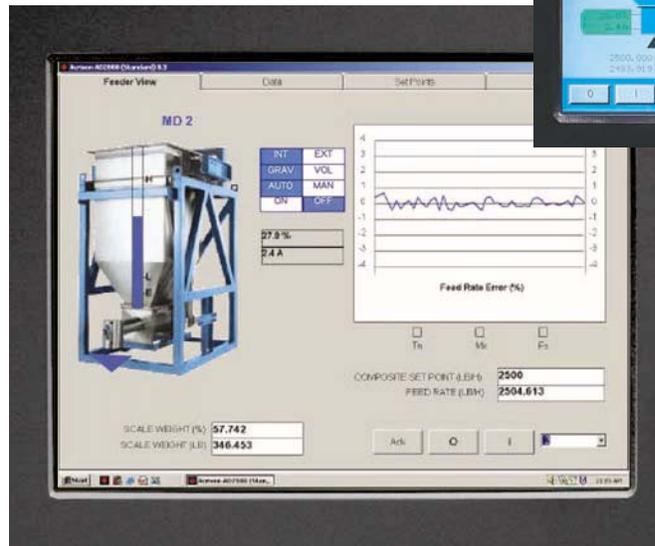
*Reference Design Specifications 1-200-113, 1-200-342, 1-200-0601, 1-200-602, 1-200-627 and 1-200-642 and Bulletin 949.*



◀ Single Feeder Keyboard Display



▲ Single Feeder Color Touchscreen Display



◀ AD-2000 Color Touchscreen Display

All Acrison controllers are certified to UL, CSA and EC specifications.

## Discover the difference!

We cordially invite you to witness a test in Acrison's state-of-the-art Customer Demonstration Facilities handling your actual product(s) with the specific equipment we recommend for the application. Usually, there is no cost or obligation for this service.

Discover the difference in technology, quality and performance of Acrison equipment.



## Acrison products...

- Models 101 and 130 Volumetric Feeders
- Models V101 and V130 Volumetric Feeders
- Model 1015 Volumetric Feeder Series
- Model 105 Volumetric Feeder Series
- Model W105 Volumetric Feeder Series
- Model 120 Volumetric Feeder
- Model 140 Volumetric Feeder Series
- Model 170 Volumetric Feeder Series
- Bin Discharger Feeders
- Model 200 Series of Weigh Belt Feeders
- Model 203B Series of Weigh Auger Feeders
- Model 270 Series of In-Line Weigh Feeders
- Models 402, 404, A405, 406 and 407 Series ("Weight-Loss-Differential") Weigh Feeders
- Model Series 403 ("Weight-Loss-Differential") Weigh Feeders
- Model 403B(D) Batch/Dump Weighing Systems
- Model 404BZ(BU) Bulk Bag Unloader Batch Weigher
- Models 350 and 301 Continuous Blenders and Blending Systems
- Multiple Auger Bin Dischargers and Multiple Auger Bin Discharger Hoppering Systems
- Vibratory Bin Dischargers
- Model 500 Series of Polyelectrolyte Preparation Systems
- Water and Waste Water Treatment Systems
- Volumetric and Gravimetric Feeder Controllers and Control Systems
- Accessory Equipment for Acrison Products
- Systems Engineering

"Visibly Different... Measurably Better"

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