

# **The ALKON Spectrum Version 4**

## **The Link-20 User's Guide**

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## Introduction

The Link-20 communications protocol connects the ALKON Spectrum Version 4.x to an accounting computer or a dispatching system, such as ALKON's Mini-Dispatch Version 5.x and 6.x. This includes the hardware to connect the Spectrum Version 4.x to telephone lines or local hardware connection and the software to control the communications. The Link-20 protocol requires a computer or dispatching system with a free serial port with a modem connected.

The Link-20 protocol connects to a computer in the same manner that an additional terminal is connected. It responds to commands or requests for information from the computer in the same manner that a data entry clerk responds to commands and requests at a terminal. The Link-20 protocol may be connected to any computer which supports at least one asynchronous terminal in addition to the system console.

The data transmission rates are low to allow communication over poor or questionable quality telephone lines. If errors are encountered, the Link-20 protocol signals the computer to re-transmit the data. This results in very reliable data transmission with almost no lost or garbled data.

## Communications Parameters

The table below contains a summary of the serial port parameters required for communications.

| <b>Data Type</b>    | <b>Data Format</b>             |
|---------------------|--------------------------------|
| Transmission Type   | Serial, Asynchronous ASCII     |
| Baud Rate           | 1200, 2400, 4800, 9600, 19200* |
| Number of Data Bits | 8                              |
| Parity Setting      | None                           |
| Number of Stop Bits | 1                              |

\* Please contact ALKON if faster baud rates are required.

## Leased Lines

For systems requiring telephone company leased lines, the local telephone company should be given the following instructions:

- Contact person's name and telephone number for installations.
- Name of business.
- Locations, or street addresses of hook-ups.
- Point-to-point type 3002 line, 4-wire, full duplex or  
multi-point type 3002 line, 4-wire, full duplex.
- RJ-11 jacks at hook-up points.

Informing the telephone company of these requirements before the equipment arrives minimizes delays in getting the system on-line.

The "3002" and "RJ-11" terminology only apply to installations in the United States.

## Protocol Description

In order to assure accurate and rapid data transfer, the Spectrum Version 4.x uses a communications protocol to handle basic low-level errors. This protocol is used for all data, allowing data errors to be corrected by the serial port drivers instead of the higher level applications program. The driver waits on character strings to either receive or transmit.

When the Spectrum Version 4.x is receiving, the driver buffers all incoming characters until it receives a **<CR>**, which signals the end of the transmission. The driver then generates a CRC, or cyclical redundancy check, based on the data received, and verify that it matches the CRC sent. If it matches, an **<ACK>** is sent. If not, a **<NAK>** is sent, in which case the fields are re-translated a maximum of three (3) times before aborting. A successful transmission signifies that the next data field(s) can be transmitted.

When the Spectrum Version 4.x is transmitting, the driver generates a CRC and sends it at the end of the data string, followed by a **<CR>**. If it receives an **<ACK>**, the next field can transmit. If it receives a **<NAK>**, it retries a maximum of three (3) times before aborting and reporting back to the higher level application program.

---

## Command Syntax

The computer transmits a command in the Link-20 protocol which may contain data for the Spectrum Version 4.x or a request for data from the Spectrum Version 4.x. Link-20 always transmits a response back to the computer. The response may acknowledge proper receipt of a command, signal an error, or contain the requested data from the Spectrum Version 4.x. In order to simplify the structure, all commands and responses have the same general format.

<STXT><Command Code><␣><Data><ETXT><CRC><CR><LF>

The command and response are in ASCII. The notational convention is given below.

**<STXT>** is the start of text character 02 hex

**<Command Code>** is a five digit number of the form <D><GG><FF>, where <D> is a single digit reserved for Destination information. This should be the digit "4" in Commands. Responses return with the digit "3".

**<GG>** is a two digit Command Group Code (see commands).

**<FF>** is a two digit Field Number, or the command code extension of the specified command (see commands).

**<␣>** is a space, or a blank. 20 hex

**<Data>** is an optional ASCII character string that must start with a printable character, not a space. It must contain only printable characters or spaces. The data field may not be present in all commands and responses. Specific data field formats are required in some commands.

**<ETXT>** is the end of text character 03 hex

**<CRC>** is the calculated cyclical redundancy check code used to insure that no errors have occurred in data transmission. The CRC calculation uses all the characters from the <STXT> up to and including the <ETXT>.

The CRC is sent as a 4 character ASCII string representing the hexadecimal expression of the 16-bit CRC code. For example, if the CRC calculated was "12BC" hex, then ASCII 1, 2, B and C characters are sent for the CRC. This method avoids the problem of sending certain binary codes that may affect code activated switches (CAS) and other communications equipment, and also allows 7-bit ASCII transmission, even though 8 bits are standard for the Link-20 protocol. Specifically, the Link-20 protocol uses the CRC generation method known as "CRC-16". The generator polynomial equation is given below.

$$X^{16} + X^{15} + X^2 + 1.$$

**<CR>** is the carriage return character 0D hex

**<LF>** is the optional line feed character 0A hex

The CRC checking can be disabled if necessary, however, we recommend leaving the CRC checking enabled to ensure reliable data transmission. Contact ALKON for information to disable the CRC checking. If the CRC checking has been disabled, substitute "0000" as the CRC code in all cases.

## **Code Activated Switches**

Several Spectrum Version 4.x computers may be connected on a single multi-drop communications line. Only one Spectrum Version 4.x at a time may react to commands sent from the Mini-Dispatch computer. A specific Spectrum Version 4.x is selected by preceding a group of transmissions with an arming code followed by a unique address, or unit number. A unique multi-drop unit number from 1 through 15 must be chosen for each Spectrum Version 4.x in the system, with a zero used for non-multi-drop systems. Select a unit number not used by any CAS already in the system. Once a Spectrum Version 4.x is selected, the Spectrum Version 4.x remains selected, and the others de-selected, until a different Spectrum Version 4.x is selected. The arming code is an ASCII DC3 (13hex). The Spectrum Version 4.x asserts an RTS (request to send) before each response, waits for the selected CTS (clear to send) delay, then transmits its response. At the end of transmission, the Spectrum Version 4.x drops RTS.

---

## Command Codes

The following sections list the commands, their normal responses, their error responses, and examples of using the commands. All commands are a 5 digit number beginning with a 4, and all responses are a 5 digit number beginning with a 3.

In addition to the error responses shown for specific commands, there are several general error responses shown below. The complete error list is on page 36.

| Error Code | Error Description                                    |
|------------|--|
| 30002      | Syntax error. The command is not in a proper format. |
| 30004      | Undefined command.                                   |
| 30090      | This command is not implemented.                     |

## Command Code Summary

| Tickets          |        | Mix Designs             |       |
|------------------|--------|-------------------------|-------|
| Description      | Code   | Description             | Code  |
| Create & Open    | 40390  | Create & Open           | 41190 |
| Close            | 40391  | Close                   | 41191 |
| Delete           | 40393  | Delete                  | 41193 |
| Query Field      | 40400* | Open on Mix Name        | 41192 |
| Open on Ticket # | 40500  | Transfer Mix (Fixed)    | 41200 |
| Transfer Block   | 406FF  | Update Mix (Fixed)      | 41300 |
|                  |        | Transfer Mix (Flexible) | 41400 |
|                  |        | Update Mix (Flexible)   | 41500 |

\*This feature has not been implemented.

## General Commands (Code 2)

### **40200: Request system identification.**

*Normal Response:*

30200 <System ID>

<System ID> is the Sales Order Number of the Spectrum Version 4.x.

*Error Response:*

30006

Command extension not defined.

*Example:*

Command: 40200

Response: 30200 SO-012800

---

**40210: Set system clock.**

This command sets the Spectrum Version 4.x real time clock to this date and time.

**NOTE: This is a new function that only works on version 4.39 and upwards.**

*Normal Response:*

30210 00000

*Error Response:*

30002

Syntax error: format could be incorrect or number out of range.

*Example:*

Command: 40210mmddyyHHMMSS.

The following table shows the allowed range of values for each variable.

| Variable | Allowed Values |
|----------|----------------|
| dd       | 00-31          |
| mm       | 00-12          |
| yy       | 00-99          |
| HH       | 00-23          |
| MM       | 00-59          |
| SS       | 00-59          |

## Ticket Commands

### *Open, Delete, Close Commands (Code 3)*

**40390 <Customer Code>: Creates and opens a ticket.**

The Spectrum Version 4.x system can hold a maximum of 200 tickets in its job index to be batched upon command by the Spectrum Version 4.x operator. Open tickets cannot be loaded or run until closed. A ticket must be open to perform any of the following data transfer operations.

#### *Normal Response:*

30390 <Code>

<Code> is an internally generated number from 0 through 199.

#### *Error Responses:*

30007

Attempt to create a ticket when no space is available.

30010

Attempt to create a ticket while another ticket is open.

30011

Attempt to create a ticket while a customer file is open.

30012

Attempt to create a ticket while a product file is open.

---

**40391: End ticket transfer (Close ticket)***Normal Response:*

30391 &lt;Ticket Code&gt;

*Error Responses:*

30009

Attempt to transfer, close or query an unopened ticket.

30030

Attempt to close a ticket that is not open.

**40393: Delete an open ticket.***Normal Response:*

30393 &lt;Ticket Code&gt;

*Error Response:*

30015

Attempt to delete while no ticket is open.

*Example:*

| Command | Response    | Comment              |
|---------|-------------|----------------------|
| 40500 2 | 30500 00000 | Open Ticket Number 2 |
| 40393   | 30393 00000 | Delete the Ticket    |

The specific data items stored, their formats, and their field numbers are defined by the "Ticket Record Definition" on page 38.

### ***Query Ticket Field Commands (Code 4)***

**This feature is not implemented.**

**404XX: Query field number XX of the current open ticket**  
(Please see ticket command 40390 described above).

The specific data items stored, their formats, and their field numbers are defined by the "Ticket Record Definition" on page 38.

*Normal Response:*

304XX <Data>

<Data> is the current field data.

*Error Responses:*

30008

Illegal field reference, field number too large.

30009

Attempt to query with no ticket open.

*Example:*

| <b>Command</b> | <b>Response</b> | <b>Comment</b>                                 |
|----------------|-----------------|--|
| 40392 2        | 30392 00002     | Open Ticket #2                                 |
| 40438          | 30438 000030.00 | Query delivered quantity 30<br>yards delivered |
| 40391          | 30391 00002     | Close the ticket                               |

---

***Find Field and Open Commands (Code 5)***

**40500 <Data>: Open the ticket whose ticket number matches <Data>.**

*Normal Response:*

30500 <Ticket Number>

*Error Response:*

30010

Attempt to open a ticket while another ticket is open.

30014

Attempt to open a batching or loaded ticket.

30016

Data field missing.

*Example:*

| Command     | Response    | Comment                  |
|-------------|-------------|--------------------------|
| 40500 12345 | 30500 00002 | Open Ticket Number 12345 |

***Transfer Ticket Block Mode Commands (Code 6)***

**406FF <Data>: Transfer <Data> to currently open ticket using block mode transmission.**

<Data> is the starting field number <FF> in the Ticket Record, and continues through as many fields for which is <Data> available. <Data> has no fixed length, and a length of zero is allowed. As many fields as desired can be sent in this manner, or the record can be sent in one large field. If fields are sent individually, this command behaves exactly as command <408FF>.

***Normal Response:***

306FF <Ticket Code>

***Error Response:***

30008

Illegal field reference, field number too large.

30009

Attempt to transfer data with no open ticket.

---

## Batch Commands

**Retrieve Batch Results by Ticket Number Commands (Code 7) *\*\*Not Implemented -- Do Not Use\*\* Use The 40800 Command Instead.***

**40700 <Ticket Number>:** Open and retrieve set of batch results for the specified ticket number.

<Ticket Number> is a seven-digit numeric string, right justified, with leading blanks.

*Normal Response:*

30700 <Batch Results> The desired batch results were located and retrieved.

The <Batch Results> data conforms to the format specified by the Spectrum Version 4.x's Link-20 Record Format which can be configured by the operator. For the sake of consistency, this document assumes that the data conforms to the following format. In the table below, "A" means alphanumeric, or any printable character, "N" means numeric, or "0" through "9", "+", "-", ".", or " " (blank).

| Item          | Length | A/N | Format  |
|---------------|--------|-----|---|
| Ticket Number | 7      | N   | 1234567<br>(Right justified with leading blanks)                        |
| Date          | 8      | A   | MM/DD/YY (Month/Day/Year; months are numeric, starting with 01=January) |
| Batch Time    | 5      | A   | HH:MM (Hours: Minutes 24-Hour Format)                                   |
| Load End Time | 5      | A   | HH:MM (Hours: Minutes 24-Hour Format)                                   |
| Customer Code | 10     | A   |   |
| Job Number    | 2      | N   |   |
| Mix Name      | 10     | A   |   |
| Load Size     | 5      | N   | 12.34   |
| Truck Number  | 5      | A   |   |
| Driver Number | 5      | A   |   |
| Sand Moisture | 5      | N   | 12.34 (Percent)   |
| Tolerance OK  | 1      | A   | Y/N   |

*Example:*

<46390 01/08/92 09:35 09:39 CUSTOMERX 03 2075OPC200 5.50 123 67890 4.25>

Blanks shown between fields are for clarity only. Blanks in the data stream are represented by " ".

*Error Responses:*

30713

Batch results record with that ticket number does not exist.

30717

Format error in ticket number, probably caused by incorrect length or presence of alphabetical characters.

30718

Spectrum Version 4.x disk I/O error reading batch results. Service required.

**\*\*The preceding section, not implemented -- Do Not Use\*\***

---

**Retrieve Batch Results Commands (Code 8)****40800: Open and retrieve batch results.**

**NOTE: This is a new function that only works on Spectrum Version 4.39 and upwards.**

*Normal Responses:*

30800 <Batch Results> The batch results were located and retrieved.

The <Batch Results> data conforms to the format specified by the Spectrum Version 4.x's Link-20 Record Format which can be configured by the operator. For the sake of consistency, this document assumes that the data conforms to the following format. In the table below, "A" means alphanumeric, or any printable character, "N" means numeric, or "0" through "9", "+", "-", ".", or " " (blank).

The V4 column states the number to key on the Link-20 format screen line column field.

| Item          | Length | A/N | Format  | V4 |
|---------------|--------|-----|---|----|
| Ticket Number | 7      | N   | 1234567<br>(Right justified with leading blanks)                        | 1  |
| Date          | 8      | A   | MM/DD/YY (Month/Day/Year; months are numeric, starting with 01=January) | 8  |
| Batch Time    | 8      | A   | HH:MM:SS (Hours: Minutes: Seconds 24-Hour Format)                       | 16 |
| Load End Time | 8      | A   | HH:MM:SS (Hours: Minutes: Seconds 24-Hour Format)                       | 24 |
| Customer Code | 10     | A   |   | 32 |
| Mix Name      | 10     | A   |   | 42 |
| Load Size     | 5      | N   | 12.34   | 52 |
| Truck Number  | 5      | A   |   | 57 |
| Driver Number | 5      | A   |   | 62 |
| Sand Moisture | 5      | N   | 12.34 (Percent)   | 67 |
| Tolerance OK  | 1      | A   | Y/N   | 72 |

A maximum of 1512 characters may be retrieved.

Note: The V4 batchweights can be retrieved by a V6 System with Link-20 if the number '73' is keyed in the "batch report" line column field on the V4 Link-20 format screen.

*Example:*

<46390 01/08/92 09:35:10 09:39:17 CUSTOMERX 2075OPC200 5.50 123 67890 4.25 Y

Blanks shown between fields are for clarity only. Blanks in the data stream are represented by "b."

*Error Responses:*

30813

No Batch Results exist.

30817

Format error in ticket number, probably caused by incorrect length or presence of alphabetical characters.

30818

Spectrum Version 4.x disk I/O error reading batch results. Service required.

**40893: Delete all batch results.**

This command deletes **all** of the batch results.

*Normal Response:*

30893 00000

All batch results were successfully deleted.

*Error Responses:*

30813

No batch results exist.

30818

Spectrum Version 4.x disk I/O error reading batch results. Service required.

---

## Mix Commands

### *Open, Delete, Close Mix Commands (Code 11)*

#### **41190 <Mix Name>: Create and open a mix design.**

When a mix is open, the Spectrum Version 4.x operator is prevented from viewing or modifying mix designs. The Spectrum Version 4.x can hold a maximum of 1000 mixes. <Mix Name> is a 10-character string, whose first character must be non-blank. If the string exceeds 10 characters in length, the Spectrum Version 4.x uses the first 10 characters. If the string is less than 10 characters long, the Spectrum Version 4.x fills the remainder with spaces.

#### *Normal Response:*

31190 00000

The new mix was successfully created.

#### *Error Responses:*

31107

No space available for new mixes.

31120

Mix already exists.

31110

Another mix already open.

31114

Operator using formula or ingredient screens, or formula reports. Operation not performed.

31117

Format error. Mix name starts with a blank or is not 10 characters long.

31118

Spectrum Version 4.x disk I/O error reading or writing mix. Service required.

31000

Spectrum Version 4.x internal error. Contact ALKON Engineering.

#### **41192 <Mix Name>: Open existing mix.**

This is identical to the 41190 command described on the previous page, except it does not create a new mix, but only opens an existing mix design.

*Normal Response:*

31192 00000. The mix with that name was located and opened.

*Error Responses:*

31110

Another mix already open.

31113

Mix with that name does not exist.

31114

Operator using formula or ingredient screens, or formula reports. Operation not performed.

31117

Format error. Mix name starts with a blank or is not 10 characters long.

31118

Spectrum Version 4.x disk I/O error reading or writing mix. Service required.

31000

Spectrum Version 4.x internal error. Contact ALKON Engineering.

---

**41191: Close open mix.**

This permanently stores the open mix in the Spectrum Version 4.x and allows the mix to be used.

*Normal Response:*

31191 00000

The mix was successfully closed.

*Error Responses:*

31109

There was no open mix to close.

31118

Spectrum Version 4.x disk I/O error reading or writing mix. Service required.

31000

Spectrum Version 4.x internal error. Contact ALKON Engineering.

**41193: Delete and close an open mix.**

The Spectrum Version 4.x automatically deletes an open mix if the communications line has been idle for more than 15 seconds, but for maximum reliability, explicitly delete the mix.

*Normal Response:*

31193 00000

The mix was successfully deleted and closed.

*Error Responses:*

31115

No open mix to delete.

31114

Operator using formula or ingredient screens, or formula reports. Operation not performed.

31118

Spectrum Version 4.x disk I/O error reading or writing mix. Service required.

31000

Spectrum Version 4.x internal error. Contact ALKON Engineering.

---

**Transfer Mix Commands (Code 12): Fixed Format**

**41200 <Data>.** Transfer data to open mix design using block mode transmission.

Any existing data in the open mix is cleared (alphas=blank, numerics=0) before the new data is stored. The data must start at the first character of the "Data" field, and must adhere to the following formats listed in the tables below. "A" means alphanumeric, or any printable character, "N" means numeric, or "0" through "9", "+", "-", ".", or "b" (blank).

| Item        | Length | A/N | Format  |
|-------------|--------|-----|---|
| Description | 40     | A   |   |
| Price       | 6      | N   | 999.99 (Positive, leading zeroes or blanks)             |
| Tax Flag    | 1      | A   | "Y" or "N" (unrecognized characters interpreted as "Y") |

The following four fields are optional, and are enabled and disabled from the Link-20 Control window under the System Parameters screen in Version 4.41. Choose the option titled "Enable Mix Design Transfer 441 Format" to enable these fields.

|              |   |   |  |
|--------------|---|---|--|
| Mixing Time  | 4 | N | 9999 (Positive, leading zeroes, or blanks)   |
| Mixer Number | 2 | N | 99 (Positive, leading zeroes, or blanks)   |
| Design Slump | 5 | N | 99.99 (Positive, leading zeroes, or blanks)  |
| US/Metric    | 2 | A | "YD" is yards, "M3" is meters. Unrecognized characters are interpreted as the mix default. |

Zero to twelve pairs of Ingredient/Quantity data follow, each pair consisting of:

|            |    |   |   |
|------------|----|---|---|
| Ingredient | 10 | A |   |
| Quantity   | 6  | N | 999999 (Positive, leading zeroes or blanks, with no imbedded decimal point. |

The Spectrum Version 4.x assumes that the quantity field contains extra decimal places as follows: Aggregate and Cement: 0 decimal places; Water: 1 decimal place; Admixtures: 2 decimal places.

*Example:* If 16 ounces of an admix is required, the computer transmits "bb1600" or "001600".

*Normal response:*

31200 00000

The data was successfully transferred.

*Error Responses:*

31217

One or more ingredient names not recognized by Spectrum Version 4.x. This may be acceptable. Transfer complete.

31222

Format error. Data length not consistent with field specifications, too many ingredients, or alpha data detected in numeric field. No transfer made.

31209

Attempt to transfer data with no open mix.

31223

Numeric value out of range. The Spectrum Version 4.x only accepts values between zero (0) and:

|                      |  |
|----------------------|--|
| Aggregates & Cements | 16383  |
| Water                | 1638.3   |
| Admix                | 16.383 or<br>163.83 or<br>1638.3 or<br>16383 * |

No transfer was made.

\* Note: The programming resolution of each admixture is set in the Spectrum Version 4.x Ingredient Table.

---

***Update Mix Commands (Code 13): Fixed Format*****41300 <Data>: Update or add ingredient data to open mix design.**

The data must start at the first character of the "Data" field, and consists of zero to twelve pairs of ingredients/quantities as described in the Code 12 section above.

This command allows modification of mix designs without checking the other ingredients. If you choose this, you must take care to insure that your computer does not add incompatible ingredients to mixes created by the Spectrum Version 4.x operator.

***Normal Response:***

31300 00000

The data was successfully updated.

***Error Responses:***

31317

One or more ingredient names not recognized by Spectrum Version 4.x. This may be acceptable. Update complete.

31321

Mix is full. Sum of old and new ingredients exceeds 12.

31322

Format error. Data length not consistent with field specifications, too many ingredients, or alpha data detected in numeric field. No update was made.

31309

Attempt to update data with no open mix.

31323

Numeric value out of range. The Spectrum Version 4.x only accepts values between zero (0) and:

|                      |  |
|----------------------|--|
| Aggregates & Cements | 16383  |
| Water                | 1638.3   |
| Admix                | 16.383 or<br>163.83 or<br>1638.3 or<br>16383 * |

No transfer was made.

\* Note: The programming resolution of each admixture is set in the Spectrum Version 4.x Ingredient Table.

---

**Transfer Mix Commands (Code 14): Flexible Format**

**41400 <Data>:** Transfer data to open mix design using block mode transmission.

**NOTE:** This is a new function that only works on Spectrum Version 4.39 and upwards.

Any existing data in the open mix is cleared (alphas=blank, numerics=0) before the new data is stored. The data must start at the first character of the "Data" field described on page 4, and must adhere to the following format shown in the table below. "A" means alphanumeric, or any printable character, "N" means numeric, or "0" through "9", "+", "-", ".", or " " (blank).

| Item        | Length | A/N | Format  |
|-------------|--------|-----|---|
| Description | 40     | A   |   |
| Price       | 6      | N   | 999.99 (Positive, leading zeroes, or blanks)            |
| Tax Flag    | 1      | A   | "Y" or "N" (unrecognized characters interpreted as "Y") |

The following four fields are optional, and are enabled and disabled from the Link-20 Control window under the System Parameters screen in Version 4.41. Choose the option titled "Enable Mix Design Transfer 441 Format" to enable these fields.

|              |   |   |  |
|--------------|---|---|--|
| Mixing Time  | 4 | N | 9999 (Positive, leading zeroes, or blanks)   |
| Mixer Number | 2 | N | 99 (Positive, leading zeroes, or blanks)   |
| Design Slump | 5 | N | 99.99 (Positive, leading zeroes, or blanks)  |
| US/Metric    | 2 | A | "YD" is yards, "M3" is meters. Unrecognized characters are interpreted as the mix default. |

Zero to twelve pairs of Ingredient/Quantity data follow, each pair consisting of:

|            |    |   |   |
|------------|----|---|---|
| Ingredient | 10 | A |   |
| Quantity   | 8  | N | 99999.99 (Positive, leading zeroes or blanks; decimal point allowed). |

*Normal Response:*

31400 00000

The data was successfully transferred.

*Error Responses:*

31317

One or more ingredient names not recognized by Spectrum Version 4.x. This may be acceptable. Transfer complete.

31322

Format error. Data length not consistent with field specifications, too many ingredients, or alpha data directed in numeric field. No transfer made.

31309

Attempt to transfer data with no open mix.

31323

Numeric value out of range. The Spectrum Version 4.x only accepts values between zero (0) and:

|                      |  |
|----------------------|--|
| Aggregates & Cements | 16383  |
| Water                | 1638.3   |
| Admix                | 16.383 or<br>163.83 or<br>1638.3 or<br>16383 * |

No transfer was made.

\* Note: The programming resolution of each admixture is set in the Spectrum Version 4.x Ingredient Table.

---

***Update Mix Commands (Code 15): Flexible Format***

**41500 <Data>:** Update/add ingredient data to open mix design.

**NOTE:** This is a new function that only works on Spectrum Version 4.39 and upwards.

The data must start at the first character of the "Data" field and consists of 0 to 12 pairs of ingredients/quantities as described in the Code 12 section above.

This command allows modification of mix designs without checking the other ingredients. If you choose this, you must take care to insure that your computer does not add incompatible ingredients to mixes created by the Spectrum Version 4.x operator.

***Normal Response:***

31500 00000

The data was successfully updated.

***Error Responses:***

31317

One or more ingredient names not recognized by Spectrum Version 4.x. This may be acceptable. Update complete.

31321

Mix is full. Sum of old and new ingredients exceeds 12.

31322

Format error. Data length not consistent with field specifications, too many ingredients, or alpha data detected in numeric field. No update.

31309

Attempt to update data with no open mix.

31323

Numeric value out of range. The Spectrum Version 4.x only accepts values between zero (0) and:

|                      |  |
|----------------------|--|
| Aggregates & Cements | 16383  |
| Water                | 1638.3   |
| Admix                | 16.383 or<br>163.83 or<br>1638.3 or<br>16383 * |

No transfer was made.

\* Note: The programming resolution of each admixture is set in the Spectrum Version 4.x Ingredient Table.

---

**Transfer: Example 1**

The following pages show the commands and responses that result with a proper transmission.

| Command | Response |
|---------|----------|
|---------|----------|

(1) <STX>40390bBuildersETX><CRC><CR><LF>

(2) <ACK><STX>30390b00003<ETX><CRC><CR>

(3) <ACK><STX>40600b23bbuildersbJohnbSmithbCorp.bDublinb  
ApartmentbComplexb1234bFifthbAve.bColumbusb  
Oh.43212b54321Deliverbto3456bDublinbRd.b<ETX><CRC><CR><LF>

(4) <ACK><STX>30600b00003<ETX><CRC><CR>

(5) <ACK><STX>40635b2500bLowbSlumpbMixb#2b  
8.00b38.00b8.00b25.00b200.00<ETX><CRC><CR><LF>

(6) <ACK><STX>30635b00003<ETX><CRC><CR>

(7) <ACK><STX>40391b<ETX><CRC><CR><LF>

(8) <ACK><STX>30391b00003<ETX><CRC><CR>

- (1) Create and open a ticket.
- (2) Ticket number 3 successfully opened
- (3) Transfer block of data starting at Field 0.

*Example:*

| Field Name            | Field Data               |
|-----------------------|--------------------------|
| Ticket #              | 23                       |
| Customer Code         | Builders                 |
| Customer Name         | John Smith Corp.         |
| Customer Information  | Dublin Apartment Complex |
| Customer Address Line | 1234 Fifth Ave.          |
| City                  | Columbus                 |

- (4) Block data successfully received
- (5) Transfer block of data starting at Field 35.

*Example:*

| Field Name         | Field Data       |
|--------------------|------------------|
| Product Code #1    | 2500             |
| Description        | Low Slump Mix #2 |
| For Future Use     | bbb              |
| Quantity this load | 8.00             |
| Total Ordered      | 38.00            |
| Total Delivered    | 8.00             |
| Price              | 25.00            |
| Ext. Price         | 200.00           |

- (6) Block data received
  - (7) Close ticket number 3
  - (8) Ticket successfully closed
-

---

**Transfer: Example 2**

This shows the resulting transmission codes for a transmission with one transmission error and the following “not acknowledge,” or “NAK,” reply.

| Command | Response |
|---------|----------|
|---------|----------|

(1) <STX>403900BuildersETX><CRC><CR><LF>

(2) <ACK><STX>30390000003<ETX><CRC><CR>

(3)<ACK><STX>40600023000000Builders00John0Smith0Corp.0000000000000000Dublin0  
Apartment0Complex0000000012340Fifth0Ave.0000000000000000Columbus00000000  
Oh.432120000000000054321Deliver0to034560Dublin0Rd.0000<ETX><CRC><CR>

(4)<NAK>

(5)<ACK><STX>40600023000000Builders00John0Smith0Corp.0000000000000000Dublin0  
Apartment0Complex0000000012340Fifth0Ave.0000000000000000byColumbus00000000  
Oh.432120000000000054321Deliver0to034560Dublin0Rd.0000<ETX><CRC><CR>

(6)<ACK><STX>306000000003<ETX><CRC><CR>

(7)<ACK><STX>4063502500000000Low0Slump0Mix0#2000000000000000000000000000000000008.000  
00038.000000008.0000000025.00000000200.00<ETX><CRC><CR>

(8)<ACK><STX>306350000003<ETX><CRC><CR>

(9)<ACK><STX>403910<ETX><CRC><CR>

(10)<ACK><STX>303910000003<ETX><CRC><CR>

- (1) Create and open a ticket.
- (2) Ticket number 3 successfully opened
- (3) Transfer block of data starting at Field 0.

*Example:*

| Field Name            | Field Data               |
|-----------------------|--------------------------|
| Ticket #              | 23                       |
| Customer Code         | 02                       |
| Customer Name         | John Smith Corp.         |
| Customer Information  | Dublin Apartment Complex |
| Customer Address Line | 1234 Fifth Ave.          |
| City                  | Columbus                 |

- (4) Noise on line causes data error and CRC test fails. <NAK> is sent.
- (5) Transfer block is repeated as in (3).
- (6) Block data successfully received
- (7) Transfer block of data starting at Field 35.

*Example:*

| Field Name         | Field Data       |
|--------------------|------------------|
| Product Code #1    | 2500             |
| Description        | Low Slump Mix #2 |
| For Future Use     | bbb              |
| Quantity this load | 8.00             |
| Total Ordered      | 38.00            |
| Total Delivered    | 8.00             |
| Price              | 25.00            |
| Extended Price     | 200.00           |

- (8) Block data successfully received
  - (9) Close ticket number 3
  - (10) Ticket successfully closed
-

## Error Codes

| Error Code | Error Description   |
|------------|---|
| 30001      | Communication error.  |
| 30002      | Syntax error.   |
| 30004      | Undefined command.  |
| 30006      | Command extension not defined.  |
| 30007      | Attempt to create a ticket: no space.   |
| 30008      | Illegal field reference.  |
| 30009      | Attempt to transfer, close or query an unopened ticket.   |
| 30030      | Attempt to transfer, close or query an unopened ticket.   |
| 30010      | Attempt to create/open a ticket: another ticket previously opened.  |
| 30011      | Attempt to create/open a ticket: customer file presently open.  |
| 30012      | Attempt to create/open a ticket: product file presently open.   |
| 30013      | Attempt to open a non-existing ticket.  |
| 30014      | Attempt to open a batching or loaded ticket.  |
| 30015      | Attempted to delete ticket without opening.   |
| 30016      | Data field (ticket code) missing.   |
| 30017      | Attempt to access an unknown table.   |
| 30018      | Request command is incomplete: end of buffer reached.   |
| 30060      | Returned concrete error.  |
| 30713      | Attempt to retrieve batch results: record with that ticket number doesn't exist.                            |
| 30717      | Attempt to retrieve batch results: ticket number format error.  |
| 30718      | Attempt to retrieve batch results: disk I/O error occurred which requires Spectrum Version 4.x service.     |
| 30813      | Attempt to retrieve all batch results: record with that ticket number doesn't exist.                        |
| 30817      | Attempt to retrieve all batch results: ticket number format error.  |
| 30818      | Attempt to retrieve all batch results: disk I/O error occurred which requires Spectrum Version 4.x service. |

| Error Code | Error Description   |
|------------|---|
| 31000      | Spectrum Version 4.x internal error. Contact ALKON Engineering.   |
| 31107      | Attempt to create a mix: no space.  |
| 31109      | Attempt to close a mix: not open.   |
| 31110      | Attempt to create a mix: another mix already open.  |
| 31113      | Attempt to open a mix: name doesn't exist.  |
| 31114      | Attempt to open a mix: operator using formula screen.   |
| 31115      | Attempt to delete a mix: not open.  |
| 31117      | Attempt to create/open a mix: mix name format error.  |
| 31118      | Attempt to create/open/delete/close a mix: disk I/O error occurred which requires Spectrum Version 4.x service. |
| 31120      | Attempt to create a mix: mix with that name already exists.   |
| 31209      | Attempt to transfer a mix: not open.  |
| 31217      | Attempt to transfer a mix: ingredient not recognized.   |
| 31222      | Attempt to transfer a mix: format error.  |
| 31223      | Attempt to transfer a mix: numeric value out of range.  |
| 31317      | Attempt to update a mix: ingredient not recognized.   |
| 31321      | Attempt to update a mix: mix is full: sum of old and new ingredients exceeds 12.                                |
| 31322      | Attempt to transfer a mix: format error.  |
| 31323      | Attempt to update a mix: numeric value out of range.  |
| 31309      | Attempt to update a mix: not open.  |
| 30090      | This feature is not implemented.  |

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## Ticket Fields

The table below lists the number of each field, a description of the field, the length of the field, and the field type.

| Field Number | Field Description           | Field Length  | Position of First Character | Field Type |
|--------------|-----------------------------|---------------|-----------------------------|------------|
| 0            | Ticket Number               | 7             | 1                           | A          |
| 1            | Customer Code               | 10            | 8                           | A          |
| 2            | Customer Name               | 30            | 18                          | A          |
| 3            | Customer Information        | 30            | 48                          | A          |
| 4            | Customer Address Line       | 30            | 78                          | A          |
| 5            | City                        | 15            | 108                         | A          |
| 6            | State                       | 3             | 123                         | A          |
| 7            | Zip Code                    | 10            | 126                         | A          |
| 8            | Account Number              | 10            | 136                         | A          |
| 9            | Delivery Instruction Line 1 | 30            | 146                         | A          |
| 10           | Delivery Instruction Line 2 | 30            | 176                         | A          |
| 11           | Delivery Instruction Line 3 | 30            | 206                         | A          |
| 12           | Delivery Instruction Line 4 | 30            | 236                         | A          |
| 13           | Delivery Instruction Line 5 | 30            | 266                         | A          |
| 14           | Delivery Instruction Line 6 | 30            | 296                         | A          |
| 15           | Memo Line 1                 | 19            | 326                         | A          |
| 16           | Memo Line 2                 | 19            | 345                         | A          |
| 17           | Notes                       | 30            | 364                         | A          |
| 18           | Purchase Order Number       | 10            | 394                         | A          |
| 19           | Sales Order Number          | 10            | 404                         | A          |
| 20           | COD Flag (Y/N)              | 1             | 414                         | A          |
| 21           | Credit Code                 | 5             | 415                         | A          |
| 22           | Order Tax Rate              | 9 (xxxxx.xxx) | 420                         | N          |
| 23           | Order Tax Code              | 4             | 429                         | A          |
| 24           | Taxable                     | 1             | 433                         | A          |
| 25           | Project Code                | 9             | 434                         | A          |
| 26           | Zone                        | 9             | 443                         | A          |
| 27           | Use                         | 9             | 452                         | A          |

| Field Number | Field Description                             | Field Length     | Position of First Character | Field Type |
|--------------|---|------------------|-----------------------------|------------|
| 28           | Reference Number                              | 3                | 461                         | N          |
| 29           | Truck Number                                  | 4                | 464                         | N          |
| 30           | Driver Initials                               | 5                | 468                         | A          |
| 31           | Driver Name                                   | 15               | 473                         | A          |
| 32           | Date (MM/DD/YY)                               | 8                | 488                         | A          |
| 33           | Time (HH:MM)                                  | 5                | 496                         | A          |
| 34           | Spacing (Load Interval) (HH:MM)               | 5                | 501                         | A          |
| 35           | Extra Product Code 1 (Mix Code)               | 10               | 506                         | A          |
| 36           | Description (Mix)                             | 30               | 516                         | A          |
| 37           | (For future use)                              | 3                | 546                         | A          |
| 38           | Quantity This Load                            | 9 (xxxxxx.xx)    | 549                         | N          |
| 39           | Total Ordered                                 | 9 (xxxxxx.xx)    | 558                         | N          |
| 40           | Total Delivered                               | 9 (xxxxxx.xx)    | 567                         | N          |
| 41           | Price This Product                            | 10 (xxxxxxxx.xx) | 576                         | N          |
| 42           | Extended Price This Load*<br>(Quantity*Price) | 10 (xxxxxxxx.xx) | 586                         | N          |
| 43           | Extra Product Code 2 (Mix Code)               | 10               | 596                         | A          |
| 44           | Description (Mix)                             | 30               | 606                         | A          |
| 45           | (For future use)                              | 3                | 636                         | A          |
| 46           | Type  | 1                | 639                         | A          |
| 47           | Taxable                                       | 1                | 640                         | A          |
| 48           | Quantity                                      | 9 (xxxxxx.xx)    | 641                         | N          |
| 49           | Ordered                                       | 9 (xxxxxx.xx)    | 650                         | N          |
| 50           | Delivered                                     | 9 (xxxxxx.xx)    | 659                         | N          |
| 51           | Price   | 10 (xxxxxxxx.xx) | 668                         | N          |
| 52           | Extended Price*                               | 10 (xxxxxxxx.xx) | 678                         | N          |
| 53           | Extra Product Code 3 (Mix Code)               | 10               | 688                         | A          |
| 54           | Description (Mix)                             | 30               | 698                         | A          |
| 55           | (For future use)                              | 3                | 728                         | A          |
| 56           | Type  | 1                | 731                         | A          |
| 57           | Taxable                                       | 1                | 732                         | A          |
| 58           | Quantity                                      | 9 (xxxxxx.xx)    | 733                         | N          |

| Field Number | Field Description               | Field Length     | Position of First Character | Field Type |
|--------------|---------------------------------|------------------|-----------------------------|------------|
| 59           | Ordered                         | 9 (xxxxxx.xx)    | 742                         | N          |
| 60           | Delivered                       | 9 (xxxxxx.xx)    | 751                         | N          |
| 61           | Price                           | 10 (xxxxxxxx.xx) | 760                         | N          |
| 62           | Extended Price*                 | 10 (xxxxxxxx.xx) | 770                         | N          |
| 63           | Extra Product Code 4 (Mix Code) | 10               | 780                         | A          |
| 64           | Description (Mix)               | 30               | 790                         | A          |
| 65           | (For future use)                | 3                | 820                         | A          |
| 66           | Type                            | 1                | 823                         | A          |
| 67           | Taxable                         | 1                | 824                         | A          |
| 68           | Quantity                        | 9 (xxxxxx.xx)    | 825                         | N          |
| 69           | Ordered                         | 9 (xxxxxx.xx)    | 834                         | N          |
| 70           | Delivered                       | 9 (xxxxxx.xx)    | 843                         | N          |
| 71           | Price                           | 10 (xxxxxxxx.xx) | 852                         | N          |
| 72           | Extended Price*                 | 10 (xxxxxxxx.xx) | 862                         | N          |
| 73           | Extra Product Code 5 (Mix Code) | 10               | 872                         | A          |
| 74           | Description (Mix)               | 30               | 882                         | A          |
| 75           | (For future use)                | 3                | 912                         | A          |
| 76           | Type                            | 1                | 915                         | A          |
| 77           | Taxable                         | 1                | 916                         | A          |
| 78           | Quantity                        | 9 (xxxxxx.xx)    | 917                         | N          |
| 79           | Ordered                         | 9 (xxxxxx.xx)    | 926                         | N          |
| 80           | Delivered                       | 9 (xxxxxx.xx)    | 935                         | N          |
| 81           | Price                           | 10 (xxxxxxxx.xx) | 944                         | N          |
| 82           | Extended Price*                 | 10 (xxxxxxxx.xx) | 954                         | N          |
| 83           | Extra Product Code 6 (Mix Code) | 10               | 964                         | A          |
| 84           | Description (Mix)               | 30               | 974                         | A          |
| 85           | (For future use)                | 3                | 1004                        | A          |
| 86           | Type                            | 1                | 1007                        | A          |
| 87           | Taxable                         | 1                | 1008                        | A          |
| 88           | Quantity                        | 9 (xxxxxx.xx)    | 1009                        | N          |
| 89           | Ordered                         | 9 (xxxxxx.xx)    | 1018                        | N          |
| 90           | Delivered                       | 9 (xxxxxx.xx)    | 1027                        | N          |

| Field Number | Field Description                    | Field Length    | Position of First Character | Field Type |
|--------------|--------------------------------------|-----------------|-----------------------------|------------|
| 91           | Price                                | 10 (xxxxxxx.xx) | 1036                        | N          |
| 92           | Extended Price*                      | 10 (xxxxxxx.xx) | 1046                        | N          |
| 93           | Previous Total                       | 10 (xxxxxxx.xx) | 1056                        | N          |
| 94           | Sub Total                            | 10 (xxxxxxx.xx) | 1066                        | N          |
| 95           | Sales Tax                            | 10 (xxxxxxx.xx) | 1076                        | N          |
| 96           | Ticket Total                         | 10 (xxxxxxx.xx) | 1086                        | N          |
| 97           | New Total                            | 10 (xxxxxxx.xx) | 1096                        | N          |
| 98           | Slump                                | 7 (xxxx.xx)     | 1106                        | N          |
| 99           | Batch Flag ** (Y/N)                  | 1               | 1113                        | A          |
| A0           | Number of Loads                      | 5               | 1114                        | N          |
| A1           | Delivery Address Line 1 Extension    | 19              | 1119                        | A          |
| A2           | Delivery Address Line 2 Extension    | 19              | 1138                        | A          |
| A3           | Other Address Line Extension         | 19              | 1157                        | A          |
| A4           | Product Code 1 Description Extension | 10              | 1176                        | A          |
| A5           | Return Mix                           | 10              | 1186                        | A          |
| A6           | Returned Amount                      | 5 (xx.xx)       | 1196                        | N          |
| A7           | % Hot                                | 3 (xxx)         | 1201                        | N          |
| A8           | % Calcium                            | 4 (x.xx)        | 1204                        | N          |
| A9           | Water Trim (per yard)                | 4 (xx.x)        | 1208                        | N          |

**NOTE:** The following fields are valid only for Spectrum Version 4.40 and upwards.

| Field Number | Field Description           | Field Length | Position of First Character | Field Type |
|--------------|-----------------------------|--------------|-----------------------------|------------|
| B0           | Delivery Instruction Line 7 | 79           | 1212                        | A          |
| B1           | Delivery Instruction Line 8 | 79           | 1291                        | A          |
| B2           | Delivery Instruction Line 9 | 79           | 1370                        | A          |
| B3           | User Defined #1             | 30           | 1449                        | A          |
| B4           | User Defined #2             | 30           | 1479                        | A          |
| B5           | User Defined #3             | 30           | 1509                        | A          |
| B6           | User Defined #4             | 30           | 1539                        | A          |
| B7           | User Defined #5             | 30           | 1569                        | A          |

| Field Number | Field Description         | Field Length | Position of First Character | Field Type |
|--------------|---------------------------|--------------|-----------------------------|------------|
| B8           | User Defined #6           | 30           | 1599                        | A          |
| B9           | User Defined #7           | 30           | 1629                        | A          |
| C0           | User Defined #8           | 30           | 1659                        | A          |
| C1           | User Defined #9           | 30           | 1689                        | A          |
| C2           | User Defined #10          | 30           | 1719                        | A          |
| C3           | User Defined #11          | 30           | 1749                        | A          |
| C4           | User Defined #12          | 30           | 1779                        | A          |
| C5           | User Defined #13          | 30           | 1809                        | A          |
| C6           | User Defined #14          | 30           | 1839                        | A          |
| C7           | User Defined #15          | 30           | 1869                        | A          |
| C8           | User Defined #16          | 30           | 1899                        | A          |
| C9           | User Defined #17          | 30           | 1929                        | A          |
| D0           | User Defined #18          | 30           | 1959                        | A          |
| D1           | User Defined #19          | 30           | 1989                        | A          |
| D2           | User Defined #20          | 30           | 2019                        | A          |
| D3           | User Defined #21          | 30           | 2049                        | A          |
| D4           | User Defined #22          | 30           | 2079                        | A          |
| D5           | User Defined #23          | 30           | 2109                        | A          |
| D6           | User Defined #24          | 30           | 2139                        | A          |
| D7           | User Defined #25          | 30           | 2169                        | A          |
| D8           | User Defined #26          | 30           | 2199                        | A          |
| D9           | User Defined #27          | 30           | 2229                        | A          |
| E0           | User Defined #28          | 30           | 2259                        | A          |
| E1           | User Defined #29          | 30           | 2289                        | A          |
| E2           | User Defined #30          | 30           | 2319                        | A          |
| E3           | US/Metric Flag (YD/M3)*** | 2            | 2349                        | A          |

**Total length of record: 2350 characters.**

\* The Spectrum Version 4.x does not recalculate or check these prices or any amounts in any fields.

\*\* The table below shows the abbreviations used and their meanings.

|   |   |
|---|---|
| Y | Batch and print ticket                              |
| N | Do not batch, only print ticket                     |
| B | Batch and print ticket without weights              |
| P | Do not batch, print ticket with theoretical weights |

\*\*\* The US/Metric Flag is a "YD" for yards or an "M3" for meters. Unrecognized characters are interpreted as the mix default in system setup.

Fields B0-B2 result in a total of six 79-character lines of delivery information. The first 3 lines of delivery information are supported by using concatenations of shorter fields, as shown in the table below.

|         |  |
|---------|--|
| Line 1: | [Field 9: "Delivery Instruction Line 1" (30)] +      |
|         | [Field 12: "Delivery Instruction Line 4" (30)] +     |
|         | [Field A1: "Delivery Address Line 1 Extension" (19)] |
| Line 2: | [Field 10: "Delivery Instruction Line 2" (30)] +     |
|         | [Field 13: "Delivery Instruction Line 5" (30)] +     |
|         | [Field A2: "Delivery Address Line 2 Extension" (19)] |
| Line 3: | [Field 11: "Delivery Instruction Line 3" (30)] +     |
|         | [Field 14: "Delivery Instruction Line 6" (30)] +     |
|         | [Field A3: "Other Address Line Extension" (19)]      |

This convention was adopted in earlier versions of the Link-20 and has been maintained for backwards compatibility.

Many of the Link-20 data items are "pass through" fields that cannot be viewed or modified by the Spectrum Version 4.x operator. The Delivery Instruction fields are in this category, with the exception of Link-20 fields 9, 10, and 11. Because of the way ALKON builds the long Instruction fields as described above, the Spectrum Version 4.x operator may only access the first 30 characters of the first 3 lines of Delivery Instructions. The User Defined fields, as their name implies, may be used for any printable data that must be transferred from the dispatch system to the delivery ticket without significant processing by the Spectrum Version 4.x. In other words, they are also "pass through" fields. Over time ALKON may develop informal conventions for the use of some of the fields.

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