Cerner Millennium Interface Definition.

This document describes the interface capabilities between the Cerner Millennium LIS system to EpiCenter.

The document is divided into 6 main sections
- » **Demographic Download Capabilities:** this describes the actual download capabilities in more detail, specifying what fields are supported and any known issues or workflows that require special consideration.
- » **Result Capabilities:** This describes the ability of the driver to support result upload and posting and which
- » **Physical Architecture:** This section described the physical and low level mechanism for connecting the systems, and where relevant what tools can be used to test the low level communication is working.
- » **LIS Driver:** This provides an overview of how the driver is installed and configured in the LIS system. It provides an insight into what is required in order to get the interface operational.
- » **Expected Timelines:** This section gives an estimate of the ideal timeline required to install, configure and test this interface.
- » **Driver Ordering Process:** This section describes the process and responsibilities for ordering this interface.

Demographic Download Capabilities

Driver able to multiplex multiple instrument type orders?	✓
Host Query supported?	✗
Unsolicited demographic only download supported? But test codes are sent by default and can not be disabled in the driver. To do demographic download only (no test ordering), disable the Organism name, Isolate Number and Test Code fields from download in the EpiCenter Field Map in EpiCenter configuration	✓
Unsolicited Test ordering supported? Test codes for AST panels ordered in Millennium are sent by default. If generic test codes are built in Millennium, disable the test code download in EpiCenter to prevent tests from being ordered in EpiCenter.	✓
LIS result query?	✗

Able to order offline test?
  » Kirby Bauer
  » E-test
  » Manual susceptibilities test ordering is possible if appropriate test codes are created in Millennium and configured to be accepted by EpiCenter for unsolicited test ordering as described above.
	✓

Able to download offline ID results to EpiCenter	✗
Able to download offline AST results to EpiCenter	✗
Able to write logic rules to change results	✓

Patient ASTM Field Mapping

EpiCenter Field Name	Sent By Cerner	F	C	R	Cerner Field Name
Patient ID	✓	4	1	1	Medical Record Number
Patient Last Name	✓	6	1	1	Person Last Name
Patient First Name	✓	6	2	1	Person First Name
Patient Middle Name	✗	6	3	1	
Patient Name Suffix	✗	6	4	1	
Patient Name Title	✗	6	5	1	
Date of Birth	✓	8	1	1	Date of Birth
Patient Sex Code	✓	9	1	1	Sex
Street Address	✗	11	1	1	
City Address	✗	11	2	1	
State Address	✗	11	3	1	
Zip Code Address	✗	11	4	1	
Country Address	✗	11	5	1	
Patient Phone Number	✗	13	1	1	
Admitting Physician Code	✓	14	1	1	Attending Physician
Patient User Field 1 Code	✗	15	1	1	
Patient User Field 2 Code	✗	15	1	2	
Patient User Field 3 Code	✗	15	1	3	
Patient User Field 4	✗	15	1	4	
Patient User Field 5	✗	15	1	5	
Patient Diagnosis	✗	19	1	1	
Patient Therapy 1	✗	20	1	1	
Patient Therapy 2	✗	20	1	2	
Patient Therapy 3	✗	20	1	3	
Patient Therapy 4	✗	20	1	4	
Patient Therapy 5	✗	20	1	5	
Admission Date/Time	✓	24	1	1	Admission Date/Time
Room Number	✓	26	1	1	Room Number
Hospital Service LIS Code	✓	33	1	1	Location Code/Nursing Unit
Client Code	✓	34	1	1	Client (SCR - currently Institution Name)

Order ASTM Field Mapping

Field Name	Sent By Cerner	F	C	R	Cerner Field Name
Accession Number	✓	3	1	1	Accession Number
Isolate Number	✓	3	2	1	Isolate Number (#)
Organism LIS Code	✓	3	3	1	Organism
Test Code	✓	5	4	1	Panel
Test Sequence Number	✗	5	5	1	
Collect Date/Time	✓	8	1	1	Collection Date/Time
Collected By Code	✗	11	1	1	
Received By Code	✗	11	2	1	
Specimen Action Code	✗	12	1	1	
Isolate Source Test 1	✗	14	1	1	
Isolate Source Test 2	✗	14	1	2	
Isolate Source Test 3	✗	14	1	3	
Isol Source Test Start Time 1	✗	14	2	1	
Isol Source Test Start Time 2	✗	14	2	2	
Isol Source Test Start Time 3	✗	14	2	3	
Receipt Date/Time	✓	15	1	1	Specimen Receive Date/Time
Specimen Type Code	✓	16	1	1	Specimen Type
Body Site Code	✓	16	2	1	Body Site
Ordering Physician Code	✗	17	1	1	
Ordering Physician Phone	✗	18	1	1	
Ordering Physician Fax	✗	18	2	1	
Ordering Physician Pager	✗	18	3	1	
Specimen User Field 1 Code	✗	19	1	1	
Specimen User Field 2 Code	✗	19	1	2	
Specimen User Field 3 Code	✗	19	1	3	
Specimen User Field 4	✗	19	1	4	
Specimen User Field 5	✗	19	1	5	
Finalized Date/Time	✗	23	1	1	
Specimen Reimbursement	✗	24	1	1	
Test Reimbursement Value	✗	24	1	2	
Isolate Classification	✗	29	1	1	

Result Upload Capabilities

Capability	Supported	ASTM Reference
Driver able to multiplex multiple instrument type results? Untested	✓	8
Able to receive Isolate level ID/AST results?	✓	1
Able to handle multiple Isolates? Currently an issue where Millennium needs to select 1 or 2 digit isolates number. If 1 digit then only 9 isolates supported. If 2 digits, then "0" prefix required on single digit isolate numbers reported back from EpiCenter. EpiCenter currently does not do this, sending only the single digit and as a result Millennium not posting results correctly. SCR open with Cerner.	✓	2
Isolate Results use Test Source field? The test source is required for posting purposes. The test source code must be configured in the Millennium external files as well as translation tables in order to post.	✓	1
Able to receive Test level ID/AST results?	✗	
Able to receive Preliminary results?	✓	
Able to receive Final results?	✓	1
Does retransmission of results update the LIS? As long as the entire isolate is not verified in Millennium, causing the isolate to be completed for susceptibilities, then any value (organism and drug result) can be updated. The update will OVERWRITE the existing value. Drug results in "Pending" or "Performed" status can be updated. A "Verified" drug result can NOT be updated.	✓	1
Rapid Complete "C" results supported? Provided the value of "C" is added as a valid MIC result for that drug.	✓	
Non-numeric MIC values supported? Provided the value is added as a valid MIC result for that drug.	✓	1
Blank MIC values supported? A blank value will simply not post in Millennium. In order to be able to verify the result (with an SIR value), the drug should be configured as not required on that panel. The isolate can not be verified and completed if a required drug is missing an MIC. It is recommended that all but one drug on a panel be defined as not required to lessen the impact of this.	✓	4
MIC and SIR "X" supported? Provided the value of "X" is added as a valid MIC and valid SIR result for that drug.	✓	
MIC and SIR "N" supported? Provided the value of "N" is added as a valid MIC and valid SIR result for that drug.	✓	

Variable number of result records supported?	✓	
Inferred results supported? The list of predefined drugs for a panel are displayed in the results entry screen, but they should be set to be not required. In this case all drugs in the formulary will be listed on the panel but would remain blank and in a pending status unless inferred. As long as the inferable drug is defined as not required, the panel can be verified.	✓	4
MGIT AST supported?	✗	
Able to receive offline test-level results?	✗	

Able to receive offline Isolate results (Kirby Bauer, E-Test)?
    » E-tests are handled.
    » Any other manual susceptibilities can be defined as MIC type tests.
    » Kirby Bauer's can be ordered separately and reported in Isolate message. Result posted to KB test with the SIR interpretation posted in the "Interpretations" column and "00" posted in the "KB Zones" field.
 	
NOTE: In order to allow the driver to handle isolate level results, the software flag "+INTERP 4" must be added. This also seems to resolve an issue with the posting of manual E-Test results. Without the flag added, in order for the Isolate level manual AST results to post to the correct isolate, the manual AST test MUST be ordered at the same time that the Phoenix instrumented test is ordered in Cerner. Ordering the manual AST test afterwards, causes the results not to post correctly.
	✓	

Resistance markers treated as drug results?
    When a resistance marker is identified it will set the MIC value of a custom drug named as the resistance marker. The MIC value will be set to the Resistance marker code sent from the EpiCenter. (It is likely that a translation table entry will allow the MIC value to be something other than the RM code from Epicenter – not tested)
    » A custom drug must be created for each resistance marker to be reported.
    » For each drug, a valid MIC result must be created that matches the resistance marker code.
    » The custom drug must be added to the panel as a "not required" antibiotic.
	✓	

Resistance markers treated as separate results?	✗	
Patient Comments supported?	✗	
Specimen Comments Supported?	✗	
Isolate comments supported?	✗	
Unrecognized LIS Code Behavior? Any unrecognized code will simply cause the result not to be posted. No error messages will be generated on the front end. Backend log files accessible to the Cerner MDI may indicate the reason a value was not posted.		

	Example ASTM Messages
1	Sample1 Isolate1 Simple.TXT
2	Sample1 Isolate2 Simple.TXT
3	Sample2 Isolate1 SIR X.TXT
4	Sample2 Isolate3 Inferred.TXT
5	
6	
7	
8	Bactec G&D Positive, Bactec G&D Negative

Isolate Result ASTM Field Mapping

Field Name	Accepted By Cerner	Coded Field	F	C	R	Comments
Result Type	✓		3	4		
Antimicrobial Code	✓	✓	3	6		
Antimicrobial Conc.	✗		3	7		
Antimicrobial Conc. Units	✗		3	8		
MIC (AST)	✓		4	2		
Organism (ID)	✓	✓	4	2		
Final SIR (AST)	✓		4	3		
Organism Profile (ID)	✗		4	3		
Interpreted SIR (AST)	✗		4	4		Configuration setting possible in Cerner to take interpreted value instead of final SIR
Resistance Marker 1 (ID)	✓		4	4		Posted as drug results
Expert SIR (AST)	✗		4	5		
Resistance Marker 2 (ID)	✓		4	5		Posted as drug results
AST Test Source	✓		4	6		
Resistance Marker 3 (ID)	✓		4	6		Posted as drug results
Resistance Marker 4 (ID)	✓		4	7		Posted as drug results
Resistance Marker 5-10	✓		4	8		Posted as drug results

Field Name	Accepted By Cerner	Coded Field	F	C	R	Comments
Comment Text	✗		4	1	1	
Comment Type	✗		5	1	1	

Test Result ASTM Field Mapping

Field Name	Coded Field	F	C	R	Phoenix	MGIT	BT9000	Comments
Result Type		3	4		✗	✓	✓	
Sequence Number		3	5		✗	✗	✗	
Antimicrobial Code	✓	3	6		✗	✗	✗	
Antimicrobial Conc.		3	7		✗	✗	✗	
Antimicrobial Conc. Units		3	8		✗	✗	✗	
Test Status Code	✓	4	1		✗	✓	✓	
Result Data Field 1	✓*	4	2		✗	✓	✗	
Result Data Field 2		4	3		✗	✗	✗	
Result Data Field 3		4	4		✗	✗	✗	
Result Data Field 4		4	5		✗	✗	✗	
Result Data Field 5		4	6		✗	✗	✗	
Preliminary/Final Status		9	1	1	✗	✓	✓	
Entry Date/Time		12	1	1	✗	✗	✗	
Test Result Date/Time		13	1	1	✗	✗	✗	
Test Complete Date/Time		13	2	1	✗	✓	✓	
Instrument Type		14	1	1	✗	✗	✗	
Media Type		14	2	1	✗	✗	✗	
Protocol Length		14	3	1	✗	✗	✗	
Instrument Number		14	4	1	✗	✗	✗	
Instrument Location		14	5	1	✗	✗	✗	
Additional Result Quantity 1		15	1	1	✗	✗	✗	
Additional Result 1		15	2	1	✗	✗	✗	
Additional Result Quantity 2		15	1	2	✗	✗	✗	
Additional Result 2		15	2	2	✗	✗	✗	
Additional Result Quantity 3		15	1	3	✗	✗	✗	
Additional Result 3		15	2	3	✗	✗	✗	
Additional Result Quantity 4		15	1	4	✗	✗	✗	
Additional Result 4		15	2	4	✗	✗	✗	
Additional Result Quantity 5		15	1	5	✗	✗	✗	
Additional Result 5		15	2	5	✗	✗	✗	

*Coded Organism field for ID tests only

Note: G&D test result posting utilizes the ANG function.

Query ASTM Field Mapping

Field Name	Sent By Cerner	Supported by Cerner	Coded Field	F	C	R	Comments
Request Start Patient ID	✕	✕		3	1	1	
Request Start Accession No	✕	✕		3	2	1	
Request Start Sequence No	✕	✕		3	3	1	
Request End Patient ID	✕	✕		4	1	1	
Request End Accession No	✕	✕		4	2	1	
Request End Sequence No	✕	✕		4	3	1	
Request Test ID	✕	✕		5	1	1	
Request Test Status Code	✕	✕		5	2	1	
Request Instrument Type	✕	✕		5	3	1	
Request Instrument Number	✕	✕		5	4	1	
Request Result Qualifier	✕	✕		5	5	1	
Request Time Qualifier	✕	✕		6	1	1	
Request Starting Date/Time	✕	✕		7	1	1	
Request Ending Date/Time	✕	✕		8	1	1	
Request Information Status	✕	✕		1	1	1	

Comment ASTM Field Mapping

Field Name	Accepted By Cerner	Coded Field	F	C	R	Comments
Comment Text	✕		4	1	1	
Comment Type	✕		5	1	1	

Physical Architecture

Term Server: The serial connection from the EpiCenter is converted from 9-pin serial to CAT5 network cable using a 9-pin serial to RJ45 converted attached to the serial port of the EpiCenter. The CAT5 network cable is connected to a port on the terminal server. The terminal server typically has a number of input ports for connecting multiple serial devices. This port must be enabled for communication by logging on to the term server and using the onboard configuration software to achieve this The single output or network port on the term server connects to the Cerner server over standard TCP/IP.	✓
Known Term Servers Supported » Xyplex	
Serial to RJ45 Wiring. The wiring of the 9-pin serial to RJ45 converter is typically terminal server dependant. The wiring for the Xyplex term server is defined below. **Standard RJ45 to 9-pin RS232 per Xyplex documentation** This connector only connects three pins on the serial side to 3 pins on the RJ45 side. Two pins on the RJ45 side are bridged. Please note the wire colors in the explanation are example only to easily differentiate the diagram. They will probably not be the same as your connectors so you need to do this based on pin count. Pins not mentioned below can be left disconnected. The first diagram shows the view from the front/outside of each side of the connector with the wires running away. The second diagram is of the same connector, but from the inside viewpoint of the connector with wires facing towards you. Use this for pin counting to identify the correct pictures. On the RJ45 side, pins 4 & 5 must be soldered together and joined to the single pin 5 on the RS232 side. 	
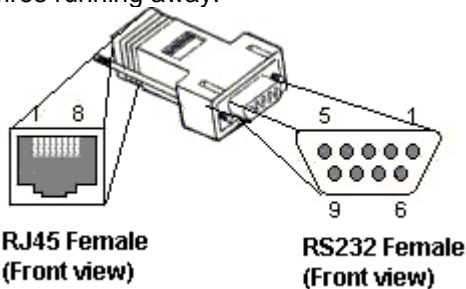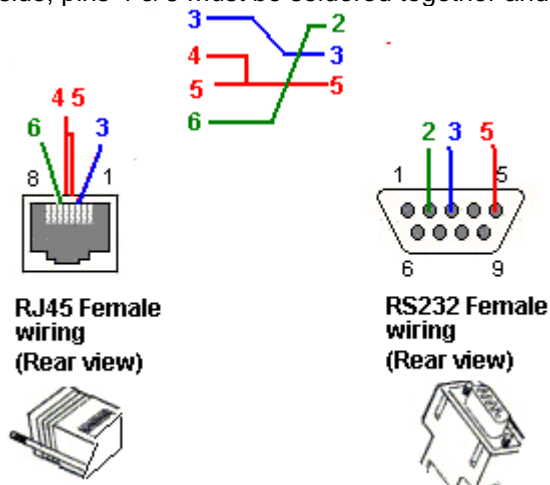
RJ45 to 9-pin RS232 per Xyplex documentation

I have no reason to doubt the previous ones will work, as EpiCenter is only making use of the three pins described. However, I found another pin diagram where all the ancillary wiring is connected between the two sides of the connector. If the first one does not work you can try this too. I believe the XFDTE91 code is actually a catalogue number for ordering the connector from Xyplex.

```
                    XFDTE91
         female           female
         RJ-45             DB-9
              blu
          1 ───────────►  8
              om
          2 ───────────►  4
              blk
          3 ───────────►  3
              red
          4 ───────────   5
              gm
          5 ───────────
              yel
          6 ───────────◄  2
              bm
          7 ───────────◄  6
              gry
          8 ───────────►  7

         APACN p/n 24490-12
```
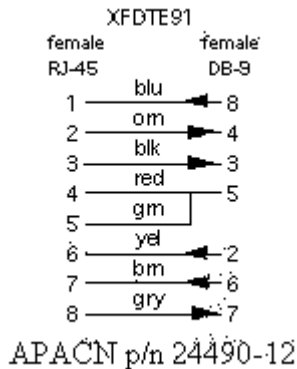
Physical Communication Logging

The logging of physical communication is possible for both incoming and outgoing streams. Logging can typically only be seen by the Cerner MDI with access to the backend.

The log displayed in the interface can be exported to text file. The same log file is used for both incoming and outgoing queues to the LIS.
The log displays both communication control characters with date and timestamps, as well as the logical message content within the low level frames. The log also contains comments relevant to processing states in the Cerner system, such as available data fields.

Each interface has its own log file created, created new every regular interval.   ✔

An example of the download ASTM in the log file for EpiCenter is embedded in this document below.

Cerner Order
Download.txt

Millennium Driver

Each Cerner MDI should be provided with a document entitled "Becton Dickinson EpiCenter MDI Device Interface Reference Guide". This document is Cerner's internal specification describing the interface and how to configure it at a client site.

Driver Name Confirmation

As many LIS vendors have multiple drivers that support BD instrument direct connections as well as connections of the instruments through EpiCenter, it is useful to confirm that the correct driver has been installed.

The driver program name for Cerner Millennium connection to EpiCenter is:
- » Epicenterbd.exe

Driver Installation

Driver installation is performed by the Cerner Engineering department who typically dial in and install the files. Driver installation comprises of the
- » Driver executable file - Epicenterbd.exe
- » External files - Epicenterbd.SUS and Epicenterbd.MAP. Created manually. On first run created a default external file. Changes in the sus file.

The Cerner MDI should build an instrument definition in PathNet and link it to the executable that was installed.

Prior to driver installation, the MDI must verify that the appropriate Cerner Service Packages have been installed.

Driver Configuration

Configuration of the driver is done through backend tools and can typically only be performed by the Cerner MDI. These configuration tasks are high level summaries and are described in more detail in the Cerner Interface Device Reference Guide.

1. Driver Flag Configuration

The driver makes use of software flags that allow the interface to have different functionality. Each customer is able to have a different configuration and thus different behaviour. The driver flags are configured using the"oen_proc_view" utility in CCL. CCL is the Cerner back-end language for configuration (similar to SQL). Oen_proc_view is a backend table containing configuration values. Changing any flag requires the driver interface to be restarted in Cerner for the changes to take effect. Refer to Appendix A for detail on these driver flags.

2. MDI Install Tool Configuration

The install tool is used by the MDI to set some Millennium system parameters related to the Isolate number generation and micro Identifier. These settings should be set to
1. Sequential Isolate Number
2. The micro identifier is not used by EpiCenter

3. Manual Db setup – Name Changes

Prior to sending down an Order, an organism name must be added to Cerner. Typically this is set to a generic value such as "GNR". It is expected that this value will be changed based on the true organism ID from the instrument. However, in order to allow organism name changes to occur, Cerner requires a confidence % from the instrument. As EpiCenter does not send this, a default value (>90%) is configured in the Driver Flag Configuration described above. Additional records must be manual added to the Cerner database for this feature to work.

4. Lab Instrument Settings

The Cerner database table lab_instrument requires some settings to control how the Isolate number is assigned and the creation of the Instrument ID number and micro identifier.

The Instrument ID number is created based on the accession number and sent to EpiCenter as the Accession number. The ability to create an instrument ID number different to the accession number based in the legacy limitations of AST systems such as Vitek and MicroScan, where those instrument have 6-8 character accession number length restrictions. The instrument ID is linked internally in Cerner to the accession number.

However, as the EpiCenter has no such limitations, it is important for the Cerner MDI to define the instrument ID to be exactly the same as the Accession number with no additional characters added or dropped.
- » Thus the instrument number the actually the one that is used as the accession number and appears in the barcode label.
- » ISOLATE_NBR_SIZE = 1
- » ISOATE_TYPE = 0

Cerner "deleted all of the o3's on the mic_instr_trans table" to resolve the issue.

5. External File configuration

The external files are additional driver configuration files located in the cer_config directory. These files MUST be configured in order for the interface to work. These work in addition to the translation and mapping tables defined in the Cerner application. There are two external files, one managing the posting of ID/AST results and the second managing the G&D results.

EPICENTERBD.SUS is used to determine what LIS Code the results will have for a given Phoenix panel or susceptibility test.
   » Every instrumented panel that will be performed on the Phoenix or MGIT, as well as manual tests entered directly in EpiCenter, must be defined in this file. It is not necessary to define each drug on the panel if all drugs for that panel are posted in the same manner.
   » Where a specific drug will be handled differently based on which panel it comes from, each drug and panel combination must be defined.
   » This file is also required for posting of Inferred (deduced) results. Each inferred drug should appear in this file with a blank panel code.

NOTE: 7 different posting mechanisms are defined and the method used to post for a particular panel code must be defined in the same line as that panel code. However, it is recommended that only the posting types 1,2 and 3 are used for MIC, KB, and E-Test panels respectively. In testing, the remaining combination panel type codes did not work well in posting. E.g.
"",   "NMICID24",   "1"
"",   "KB1",   "2"
"",   "FOXETST",   "3"

EPICENTERBD.MAP is used to determine what blood culture status will be recognized and processed by Cerner. This will translate a status LIS code into a Cerner growth indicator

Millennium Application Configuration

The configuration activities described in this section typically refer to configuration settings that can be done by the Lab LIS administrator, or by the Cerner MDI. This configuration covers translation tables and procedures.

These are typically achieved using front-end tools such as the DB Microbiology Configuration module pictured below. (This tool is referred to as "MIC DB Tools" in the Cerner documentation)

The Service Resource for the EpiCenter must be built in the Millennium Location tool (location.exe).

1. Panel Creation

Using the DB microbiology Configuration tool, run from the Cerner toolbar, the panels to be run on the instrument must be created. These will later have translation tables defined for them.
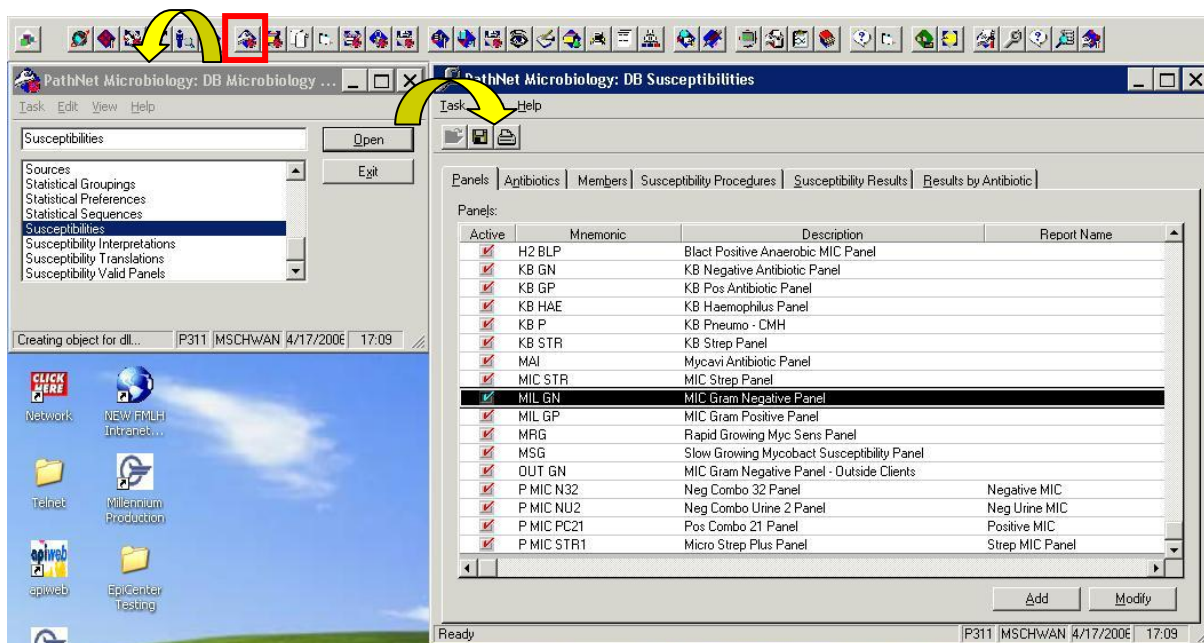
After the Panel setup is completed, the drugs on that panel must be defined. At least 1 drug on a panel MUST be marked as a required drug, meaning there must be a value entered for that drug in order to complete the panel. If a result is not entered, then the user must manually set the panel to complete in order to validate and report results from Cerner. It is recommended that the lab manager or microbiologist is consulted to determine the best drug to set as required on a panel. For Phoenix panels, try to avoid a drug that may have common FDA limitations on it.

2. Susceptibility Result Creation

Using the same DB Microbiology configuration tool, susceptibility results must be created for each possible result value that could be received over the interface. The same table will handle definition of both MIC values and SIR values, as well as other characters that can be received over the interface and posted in the results screen. Each entry has to be defined as an "alpha" result to appear in the first result column (MIC or KB ZONE), or as an "interp" to appear in the second result column as an interpretation.

Use this table for definition of
- » MIC values
- » SIR values
- » MIC and SIR "X", "N", "C"
- » Resistance Markers

Roger Nicolson – BD-Cerner_Millennium_LIS_Interface_Definition_v2008.pdf.doc
Last Modified: 01/05/2013 11:26:00
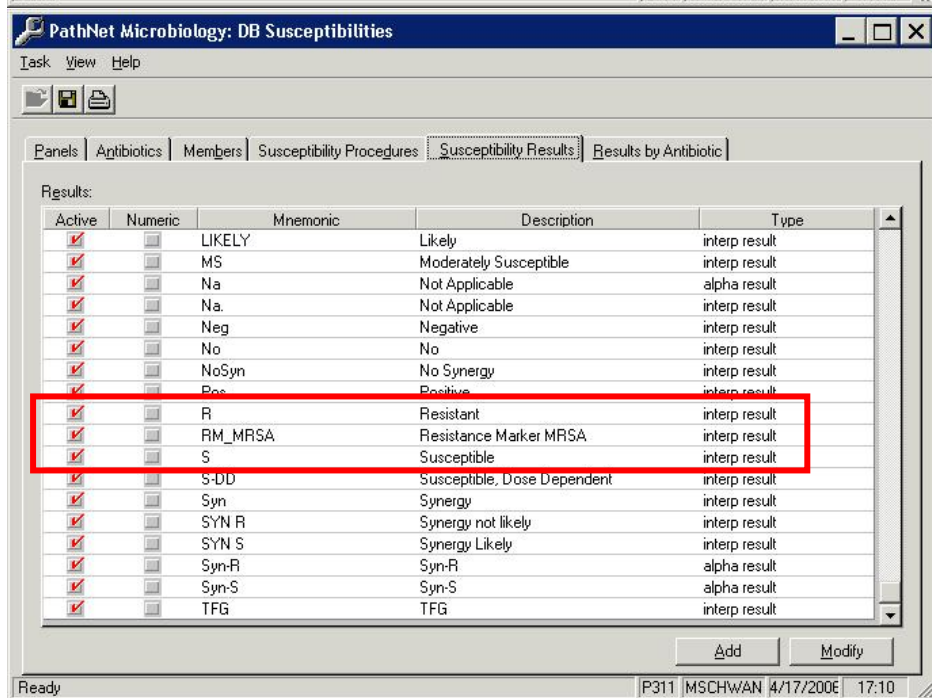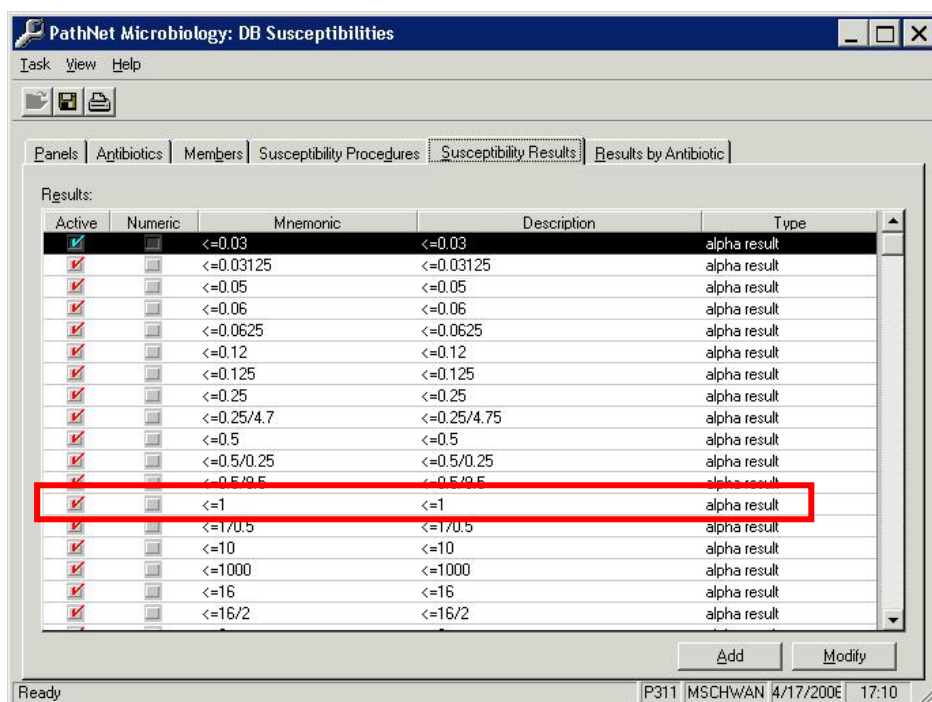
3. Inferred Results

Inferred results can be handled simply by adding the antibiotic name to be inferred, to the external file Epicenterbd.sys. In this case the standard Cerner drug name will be inferred and appear as a susceptibility result

NOTE:

If the customer would like to be able to differentiate an inferred result from a standard result, it is also possible to create custom antibiotic names in both EpiCenter and Cerner. EpiCenter would then infer the custom drug rather than the standard drug. The LIS codes of the Cerner and EpiCenter inferred drug should be the same.

- » This antibiotic would then have to be added as a valid result to the panel that it can be inferred on.
- » In EpiCenter, the custom antibiotic should be a replica of the BD drug, differing only in name (e.g. "Cefoxitin Inferred", mnemonic and LIS Code).
- » EpiCARE rules that duplicate the inference logic of the BDXpert system will have to be written for all rules that infer the specific antibiotic. The EpiCARE rule will instead infer the custom drug name.
- » EpiCARE rules are not required for BDXpert rules that infer based on drug class or group.

4. Resistance Markers

Resistance Markers are handled by the Cerner driver as additional drug results. For each resistance marker code that will be reported, the following must occur in Cerner:

» Create a custom antibiotic with the name that matches the resistance marker drug code.
» Create a susceptibility result definition with a value that matches the resistance marker code that will be sent from EpiCenter. The result must be created as an 'alpha' result that will
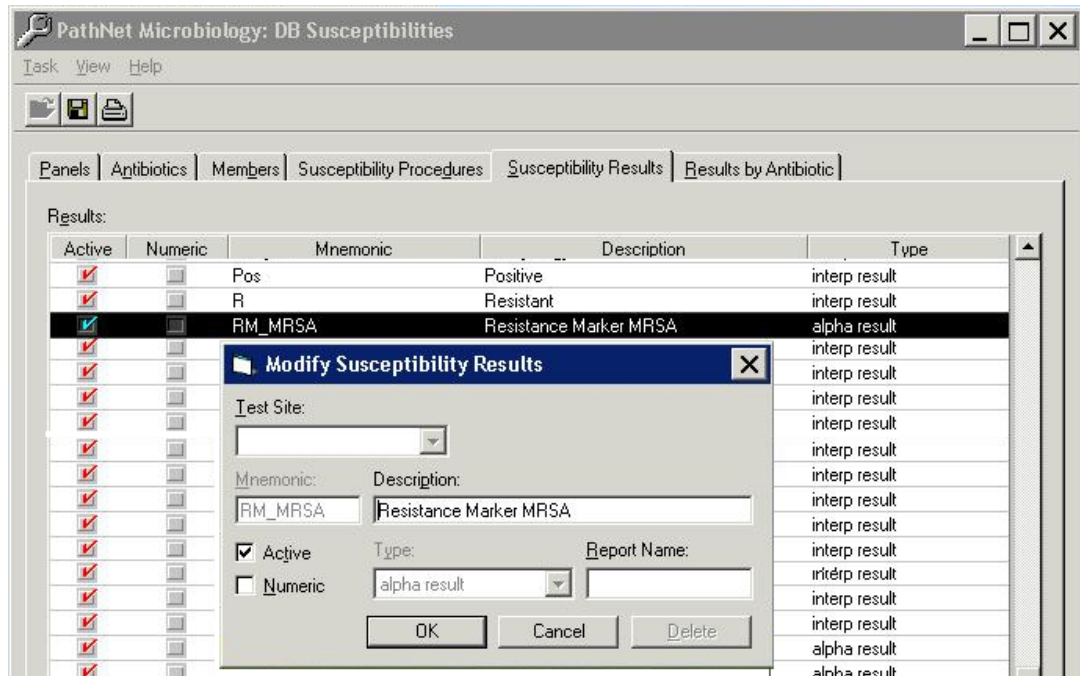
appear in the "MIC" column of the results screen

» Add the result definition as a valid result for the desired Organism/Antibiotic combination.
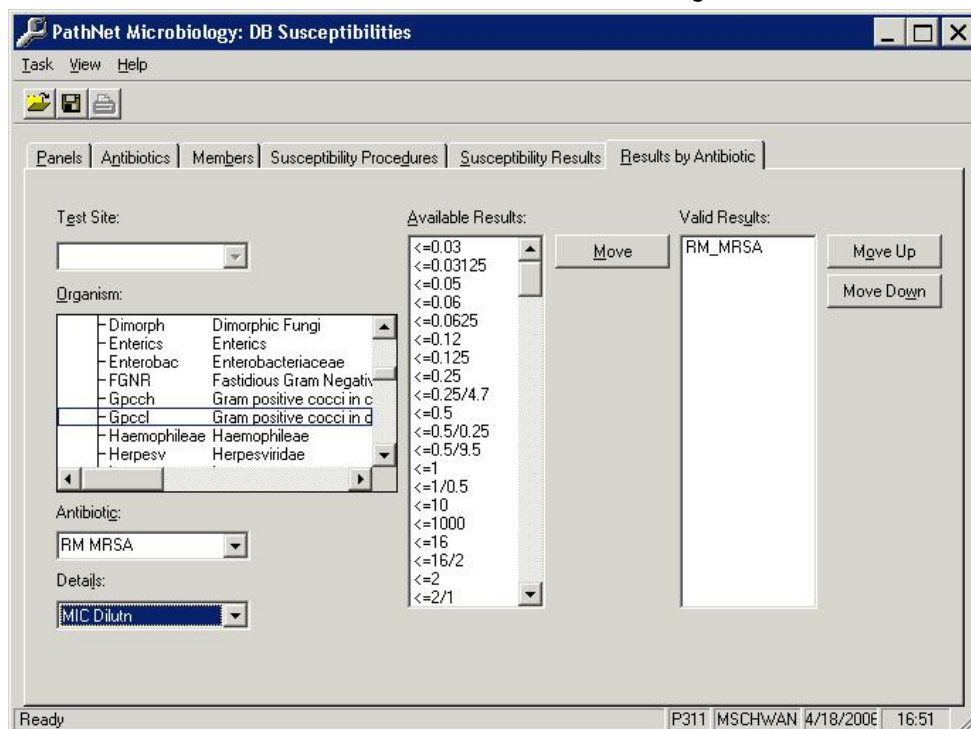
» In the Results screen it should be possible to see the resistance marker code as a valid result.
» Does the value need to be added to the external file?

NOTE:
Other options for handling Resistance markers could include the following.
1. Create a custom antibiotic in EpiCenter to represent a resistance marker. Write an EpiCARE rule to infer this drug result (setting it to R for example) in the presence of a resistance marker in EpiCenter. This custom drug will then be reported to the LIS as an inferred drug result. A corresponding custom drug bust exist in Cerner
2. After V5.5, the Organism Resistance marker mapping feature can be used to report an organism code to Cerner for a custom organism that reflects the presence of the RM in the organism name. E.g. instead of reporting STAAU as the LIS code, report STAAUMR which could represent a Methicillin Resistant Staph Aureus in the LSI. This assumes the custom organism name exists in the LIS.

5. Translations

Organisms: Translation table exists for defined Cerner organisms. The EpiCenter LIS code must match what is in the Cerner translation column.

Sources: Translation table exists for Cerner "source" to match what is defined in the EpiCenter Specimen Type field. Cerner has a 6 character limit on LIS code. The EpiCenter LIS code must match what is in the Cerner translation column.

Susceptibility Results: There is no need to translate results as long as the value being sent matches what has been built as "valid results" in Susceptibilities tool in MICDBTools. If a value is received that is not listed in the "Translation" columns as a valid result, then this will not be posted in Cerner.

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Antibiotics: Translation table for antibiotics that will be uploaded from EpiCenter. The LIS Code listed in EpiCenter configuration here must match what is in the Cerner "Translation" column. The "Mnemonic" value is what appears in Cerner as the drug code.

When you are building these translation values for AST results from MGIT, the alias will comprise of both the antibiotic and the concentration.

PathNet Microbiology: DB Susceptibility Translations

Task   View   Help

Instrument Test Site: DYN Epi Center   Misc Settings...

Translation Type
- ○ Organisms
- ○ Sources
- ○ Susceptibility Results
- ● Antibiotics
- ○ Panels
- ○ Susceptibility Procedure

Medications

Translation	Mnemonic	Description
Acyclo	Acyclo	Acyclovir
AN	Amik	Amikacin
AMC	Amox/Cla	Amoxicillin/Clavulanate
AM	Amp	Ampicillin
SAM	Amp/Sul	Ampicillin/Sulbactam
Ampho	Ampho	Amphotericin B
AZITPRE	Azit p	Azithromycin (Predicted)
Azith	Azith	Azithromycin
Azl	Azl	Azlocillin
Azt	Azt	Aztreonam
Bacit	Bacit	Bacitracin
Bet	Bet	Beta Lactamase
Carb	Carb	Carbenicillin
Cas	Cas	Caspofungin
CASPO	Cas	Caspofungin
Cefac	Cefac	Cefaclor
Cefaz	Cefaz	Cefazolin
Cefd	Cefd	Cefdinir
Cefep	Cefep	Cefepime
Cefet	Cefet	Cefetamet
Cefix	Cefix	Cefixime
Cefm	Cefm	Cefmetazole
Cefman	Cefman	Cefamandole
Cefo	Cefo	Cefotaxime
Cefon	Cefon	Cefonicid
Cefot	Cefot	Cefotetan

Add...   Modify...

Panels: Translation table describing the panels that will be downloading to EpiCenter or that will be reported back as a Source Test with result records. Cerner has a 10 character limit for this code. The LIS Code listed in the EpiCenter test configuration screen for each test must match what is in the Cerner "Translation" column. The value appearing in the "Mnemonic" column is the panel code that is ordered in Cerner.

Note that it is possible here to have multiple Phoenix Panel codes mapped to one Mnemonic code in Cerner. This will allow for the definition of generic panels in Cerner and have multiple Phoenix/EpiCenter tests report to it. This is useful if one is running Phoenix panels only and no manual tests need to be ordered on the EpiCenter. On Cerner the tech will not have to order a specific panel, they can then order a GP or GN test.

However if this method is used, then the "Test Code" field must be disabled for download in EpiCenter as Cerner will send only one test code, which is not necessarily the panel that will be run.

Susceptibility Procedure: This translation table does not directly relate to LIS codes being received from the EpiCenter, but is required for the LIS driver to know which Cerner procedures are managed by the interface.   This should always be set up.

The first three items in the table below are used to identify what methods will be transmitted from Cerner to EpiCenter
The following six items are the tests that make up the 3 procedures available for download.

TEST MNEMONIC	TRANSLATION
MIC	Method 1
KB	Method 2
ETest	Method 3
MIC Dil	a3
MIC Int	a4
KB Dil	ZONE
KB Int	INTERP
E Test Dil	MIC
E Test Int	NCB

Use the "Misc Settings" button to enter a % probability that must be met before the organism name change will occur.

Typically this is set at the same value as the corresponding parameter in Oen_proc_view table (set at 90% confidence).

6. Blood Culture Setup

Blood cultures must be routed to this instrument in Department Order Catalogue Wizard (deptorcwizard.exe). This program is where all orderable tests are created and routed to the different instruments.

This is normally configured by the Cerner Micro specialists using the MIC DB front end setup tool.

Media Tool

It is necessary to add a translation for the bottle that is built on Cerner to the EpiCenter test code for the bottle or tube loaded to the instrument. The translation code entered here must match the LIS test code defined in the EpiCenter.

TEST MNEMONIC	TRANSLATION
MGIT 960	4301
Bactec Aerobic	PLUSAEF
Bactec Anaerobic	PLUSANF

NOTE: In the table above, the default EpiCenter codes for MGIT 7ml tube and Bactec aerobic and anaerobic bottles are illustrated. This may be different if different media type is used by the customer.

ANG Tool

ANG is where the automatic no growth status is defined in Cerner. The Reports and disqualifying responses tab must be built before Cerner will transmit any blood cultures down to the instrument.
- » "Active within the ANG Process" box should be checked.

Ordering Process in the LIS

The following section will give a brief overview of the process and screens used in Cerner to Order a test and download it to EpiCenter

1. Using the Cerner Toolbar, open the Order Entry screen.

2. Recall a Patient and enter the required information. Fields appearing in yellow are required. Order must then be saved/submitted. See Figure below.

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3. Using the Cerner Toolbar, open the Results Entry Screen.
4. Add a culture (isolate) using the right-click context menu in the lower half of the screen.

5. Once created (see blue highlighted section above), the right-click context menu can be used to add a test. Select the test type using the radio buttons and move the test/panel name from the "Available" list to the "Selected" list and press the <OK> button.

6. The test order will be automatically downloaded to EpiCenter at this point.

TROUBLESHOOTING (Kent Upgrade not posting Results, everything in Epicenter Uploading correctly, Cerner ACK – OK but not results posted to user.

CERNER ACTION:

**Cerner** "deleted all of the o3's on the mic_instr_trans table" to resolve the issue.

Expected Timelines

A Cerner Millennium interface project can be expected to complete within 3 months. The following points highlight activities in the process, how long each activity should take and the potential risks for delay. This timeline should be used as a guide only and assumes:

- A completed driver with no additional requirements needed for development.
- A Cerner MDI is assigned to the account
- A dedicated resource from the customer is available to configure the Cerner system, and they have some experience in preparing instrument interfaces.

Interface Ordering
1. **Interface quotation:** The interface quotation should normally be requested by BD. The response to an interface quotation request is normally prompt. This is done during the sales process so does not impact the timeline. Allow 1 week.
2. **Customer PO to Cerner:** Once the PO has been placed with BD for the instrument, the PO should be placed with Cerner for the interface. See the driver ordering process description in the following section. Allow 1 week for receipt and processing.
3. **Driver Payment:** Once the PO has been received, payment should be made. Depending on the sales agreement, the PO Invoice should normally be settled by BD. Typically the driver is not installed until payment is received. Allow 2 weeks for processing and confirmation of receipt.
4. **Driver installed in Customer Test System:** After payment of the driver, driver installation is based on (MDI schedule?). Allow 2 weeks.
5. **Cerner Configuration – MDI**: The basic configuration of the driver done by the MDI. While the MDI may continue to do configuration with the customer, typically they have to do theirs first before the customer can begin. Note that while the activity is performed by the LIS vendor, someone from BD is accountable for ensuring the activity takes place. Allow 1 week
6. **Cerner Configuration – Customer**: Configuration by the customer using the User interface tools. Resource availability and skills impact the duration of the activity, but it should be possible to complete in 4 weeks. Note that the activity is performed by the customer, but a BD associate is accountable for monitoring progress.
7. **EpiCenter Configuration:** Configuration of LIS based on Audit, loading of coded lists. The customer providing the coded lists and reformatting is often related to their configuration effort in the LIS, so while it can be done quickly in EpiCenter, can only be completed over an extended period of time. Allow 2 weeks.
8. **Driver Testing**: There will normally be an element of testing during the configuration process, but once all configuration is completed, final testing of all aspects should be done using a normal routine workflow, covering as many variations as possible. Note that some customers may elect to do their configuration and testing directly in to the "Live" environment. This is often done as a result of time pressures, or where the test environment differs so much from the live environment that testing there would not provide significant benefit. In such cases the last step is not required. Duration is variable based on customer protocols, but allow 2 weeks.
9. **Configuration Transport to Live Cerner**: This final step copies the setup in the test environment to the live environment and may involve some limited testing again. This could take between 1-2 weeks.
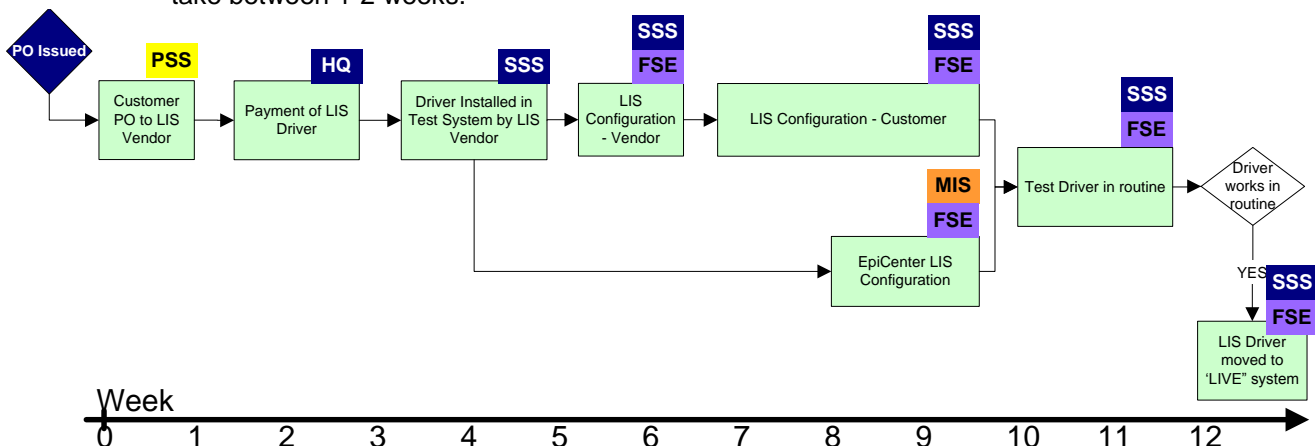
Driver Ordering Process

The process for ordering a Cerner Interface driver is described below. This process is the same for Cerner Classic and Cerner Millennium systems, and remains consistent regardless of instruments being connected.

1. Send request for interface ordering to Roger Nicolson. This should only be done once the PO has been received by BD with all signatures. Detailed information about the interface needs to be included in the request:
    a. Listing all the instruments that will be connected.
    b. Indicate whether the connection is via EpiCenter or a direct instrument-LIS connection.

2. Cerner Regional sales associate or regional team leader is contacted, requesting Interface quotation and Interface invoice. The request for quotation should indicate the detailed connection requirements, and include the Cerner specific interface codes.

3. Cerner will respond with a quotation and invoice that should be reviewed for correctness of the driver and charges.

4. If correct and no invoice correction is needed, the invoice will be paid by BD.

Appendix A: Driver flags

Flag	Description
+PRO[XX]	In order for the system to change an organism's name from GNR to the specific one identified by the device, a percent probability has to be provided. This device does not send a percent across the interface, however, it will not send an organism unless it is 90% certain the organism it identified is correct. The probability that is entered in this software flag will be what appears in MICResultEntry
+RM	This enables the interface to process resistance markers. The maximum number of markers the interface and epicenter can handle is 5. In order for these markers to be viewable in MICResultEntry, they will need to be built as if they were antibiotics. When the interface processes this data, the presence of the marker indicates that it is true. Both the result and the marker name will be the LIS code defined on the instrument for that particular marker.
+INTRP[4]	The Epicenter can send two different types of interpretations, a generic interpretation and an expertised interpretation. With this flag enabled, the expert interpretation will be used for our MINT (interpretation) **Adding this causes KB to post at isolate level.**
+PHNX	Use this flag if the Epicenter has a Phoenix attached to it.
AR:X	Numeric results will be prefixed with a character.
AL_ID	Alpha identifier is enabled
CAN	Canadian date logic is in use.
+MGIT	This flag will media type from 3,5, default is 14,2
+MRN	The MRN will be downloaded in the patient record, default is accession number
L[x,y]	This tells the interface how many digits of the accession are downloaded. Starting at position 'x', the interface will send 'n' digits to the instrument. The default is L[0,9].
+ML	Enables Multiplexor logic.

Flag	Description
-ISO	Suppresses the downloading of the organism from Cerner to the device. This particular device will not perform an ID if we download an organism, even if it is aliased as GNR.
+DN	This software flag enables the doctor number (person_id) to download instead of the doctor name.
+MIC[X,X]	This flag must correlate to what is built in the susceptibilities translation, under susceptibility procedures. The default translation for MIC dilution is a3 and MIC interpretation is a4. If this flag is enabled, enter either ZONE or MIC in the first position and INTERP or NCB in the second position. Note what you have defined here must not conflict with the +KB[X,X] or +ETST[X,X] flags.
+KB[X,X]	This flag must correlate to what is built in the susceptibilities translation, under susceptibility procedures. The default translation for KB dilution is ZONE and KB interpretation is INTERP. If this flag is enabled, enter either a3 or MIC in the first position and a4 or NCB in the second position. Note what you have defined here must not conflict with the +MIC[X,X] or

+ETST[X,X] flags.

+ETST[X,X] This flag must correlate to what is built in the susceptibilities translation, under susceptibility procedures. The default translation for E-test dilution is MIC and E-test interpretation is NCB. If this flag is enabled, enter either a3 or ZONE in the first position and a4 or INTERP in the second position. Note what you have defined here must not conflict with the +MIC[X,X] or +KB[X,X] flags.

Appendix B: Troubleshooting

1. If the organism is not posting on ID/AST or ID panels, make sure that they have added the +PRO[XX] flag in the driver. Normal configuration is to enter it as +PRO[>90%]. This is because Millennium requires a percent confidence that EpiCenter does not transmit. Entering >90% in the +PRO flag will allow the ID to post with a >90% as the stated confidence.

2. If results do not post on combo or ID only panels and Millennium reports a locked accession, but results post correctly on AST only panels, it is likely that the account has a Millennium upgrade patch released mid-2007. This patch prevents IDs with profile numbers from posting because the Phoenix profile is too long for Millennium to accept. Have the MDI go into the mic_instr_trans table and remove the o3 variable for the EpiCenter Service Resource.