Basic use of APL characters:

⍦⍗⍙A⍈⊛T̈⍢⍟°Ö~⨪,⍨θ⍨⍩ιρω.

⊛T̈⍢⍟° ⌷⌸⌻φ⌿

↓∆∇∈∘∨∩∪⍩~≠

Plain verbatim listing. It works for UTF8 input but does not break lines, format syntax or update listings list.

```
z ← keyn SQLiteFrDBI dbi;t;n;st;sn;sc;sql;rf;rm;nrc;⎕io

⍝ Returns a SQLite table creation statement that maps the
⍝ structure of APL+WIN inverted DBI files to SQLite tables.
⍝
⍝ monad: ev ← SQLiteFrDBI cvDBIFileName
⍝
⍝   sqlv ← SQLiteFrDBI 'C:\BCA\bcadev\CA\ULTCL.DBI'

 ⎕io ← 1

⍝ default SQLite primary key name
 :if 0=⎕nc 'keyn' ◊ keyn ← 'rwkey' ◊ :endif

⍝ open DBI file - the DBI open function creates
⍝ a number of global variables that are used to
⍝ to access data stored in these files. These
⍝ variable contain '∆_' in their names.
 ⎕error (1∈'∆_'⍷⎕nl 2)/'DBI globals present - erase all DBI globals'

 DBIOpen dbi                      ⍝ open DBI file
 z ← (∨/'∆_'⍷⎕nl 2)⌿⎕nl 2         ⍝ varibles set by DBI open

⍝ we need table name, column names, types, repeat codes

 t ← ⍕(∨/'∆_fty'⍷z)⌿z       ⍝ column types
 n ← ⍕(∨/'∆_fnm'⍷z)⌿z       ⍝ column names prefixed by table
 rf ← ⍕(∨/'∆_fnc'⍷z)⌿z      ⍝ (0≤) indicates a DBI repeated column (numeric matrix)
 z ← ⎕ex z                  ⍝ clear DBI open globals
 z ← ⎕ex ⊃'∆DBIFL' '∆DBIFN'

⍝ correspondence between DBI and SQLite column types - SQLite does
⍝ not distinguish between integer types and ignores all fixed length
⍝ declarations in SQL column declarations this is ideal for APL data
```

```
⍝ C=text, I=integer, U=integer, F=real, D=date)
 st ← ('text' 'integer' 'integer' 'real' 'date')['CIUFD'⍳t]
 sn ← (¯1 + (↑n)⍳'∆') ↑ ↑n            ⍝ table name without '∆'
 nrc ← sc ← (n ⍳¨ '∆') ↓¨ n           ⍝ just column names

⍝ expand any repeated numeric columns
 :if ∨/rm ← 0 < rf
    sc ← ⊂¨ sc
    (rm/sc) ← (rm/sc) ,¨ ⍕¨ ⍳¨ rm/rf
    sc ← ⊃ ,/ sc
    st ← (1⌈rf) / st
 :endif

⍝ SQLite tables require a primary key DBI files
⍝ do not necessarily have a primary key
 ⎕error ((⊂keyn)∊sc)/'(',keyn,') key name occurs in DBI file - use another name'
 sql ← 'create table ',sn,' (',keyn,' integer primary key, '
 sql ← sql , (¯2 ↓ ∊ sc , ' ' , st ,[1.5] ⊂', '), ')'

⍝ return sql, table name, SQLite types, repeating and non-repeating columns
 z ← sql sn st sc nrc
```

The UTF8 APL "trouble makers" properly handled within
a `lstlisting` environment. Characters following the
APL comment "lamp" character `⍝` get comment coloring.
Syntax coloring is one of the features of `lstlisting`.

`lstlisting` verbatim with extended UTF8 APL characters.

```
z ← keyn SQLiteFrDBI dbi;t;n;st;sn;sc;sql;rf;rm;nrc;⎕io
```

```apl
⍝ Returns a SQLite table creation statement that maps the
⍝ structure of APL+WIN inverted DBI files to SQLite tables.
⍝
⍝ monad: ev ← SQLiteFrDBI cvDBIFileName
⍝
⍝    sqlv ← SQLiteFrDBI 'C:\BCA\bcadev\CA\ULTCL.DBI'

 ⎕io ← 1

⍝ default SQLite primary key name
 :if 0=⎕nc 'keyn' ◊ keyn ← 'rwkey' ◊ :endif

⍝ open DBI file - the DBI open function creates
⍝ a number of global variables that are used to
⍝ to access data stored in these files. These
⍝ variable contain 'Δ_' in their names.
 ⎕error (1∊'Δ_'⍷⎕nl 2)/'DBI globals present - erase all DBI globals'

 DBIOpen dbi                       ⍝ open DBI file
 z ← (∨/'Δ_'⍷⎕nl 2)⌿⎕nl 2          ⍝ varibles set by DBI open

⍝ we need table name, column names, types, repeat codes

 t ← ⍆(∨/'Δ_fty'⍷z)⌿z        ⍝ column types
 n ← ⍆(∨/'Δ_fnm'⍷z)⌿z        ⍝ column names prefixed by table
 rf ← ⍆(∨/'Δ_fnc'⍷z)⌿z       ⍝ (0≤) indicates a DBI repeated column (numeric matrix)
 z ← ⎕ex z                   ⍝ clear DBI open globals
 z ← ⎕ex ⊃'ΔDBIFL' 'ΔDBIFN'

⍝ correspondence between DBI and SQLite column types - SQLite does
⍝ not distinguish between integer types and ignores all fixed length
⍝ declarations in SQL column declarations this is ideal for APL data
⍝ C=text, I=integer, U=integer, F=real, D=date)
 st ← ('text' 'integer' 'integer' 'real' 'date')['CIUFD'⍳t]
 sn ← (¯1 + (↑n)⍳'Δ') ↑ ↑n          ⍝ table name without 'Δ'
 nrc ← sc ← (n ⍳¨ 'Δ') ↓¨ n         ⍝ just column names

⍝ expand any repeated numeric columns
 :if ∨/rm ← 0 < rf
    sc ← ⊂¨ sc
    (rm/sc) ← (rm/sc) ,¨⍨  ⍕¨⍨ ⍳¨ rm/rf
    sc ← ⊃ ,/ sc
    st ← (1⌈rf) / st
 :endif

⍝ SQLite tables require a primary key DBI files
⍝ do not necessarily have a primary key
 ⎕error ((⊂keyn)∊sc)/'(',keyn,') key name occurs in DBI file - use another name'
 sql ← 'create table ',sn,' (',keyn,' integer primary key, '
 sql ← sql , (¯2 ↓ ∊ sc , ' ' , st ,[1.5] ⊂', '), ')'

⍝ return sql, table name, SQLite types, repeating and non-repeating columns
```

```
z ← sql sn st sc nrc
```

APL Christmas tree. The standard means of changing text color within **lstlisting** environments by defining new keywords does not work with extended characters. December 26, 2013.

```
            ⊛
          ∆ ⍳ ⍋
        ⍏ ÷ ⊖ × ⍁
      ⊝ ↓ α ⌸ ω ↑ ⏀
    ⍫ ≠ ⌈ ¨ ⍺ ö ⌊ � ⍨
  ⊢ ∩ ≤ ⊂ ≡ ⍓ ≢ ⊃ ≥ ∪ ⊣
              ▯
```